Technology Ecosystem in Illinois: 2012

by
Robert Yadon, Ph.D.; Barry Umansky, J.D.; and David Loomis, Ph.D.
# Table of Contents

Executive Summary ................................................................................................................................................. 3  

*Forward by the Illinois Technology Partnership* ..................................................................................................... 5  

STEM Education......................................................................................................................................................... 6  
Tech Employment....................................................................................................................................................... 7  
Human Capital............................................................................................................................................................ 7  
Research and Development and Patent Output ......................................................................................................... 8  
Venture Capital........................................................................................................................................................... 8  
Communications, Broadband and Wireless Infrastructure .......................................................................................... 8  
Introduction................................................................................................................................................................. 10  

Defining the Illinois Business Landscape .................................................................................................................. 12  

Tech Education............................................................................................................................................................. 12  
Tech Employment......................................................................................................................................................... 14  
Human Capital............................................................................................................................................................... 16  
Research and Development and Patent Output ......................................................................................................... 19  
Venture Capital........................................................................................................................................................... 23  

Communications, Broadband and Wireless Infrastructure .......................................................................................... 25  

Lessons learned in Wisconsin, Michigan and Indiana ............................................................................................... 29  
Conclusion...................................................................................................................................................................... 30  
Appendix ......................................................................................................................................................................... 32  

About the Authors ......................................................................................................................................................... 33  

For questions regarding *Technology Ecosystem Illinois: 2012*, contact Lindsay Mosher, executive director of the Illinois Technology Partnership, 312-768-4760 or Lindsay@iltechpartner.org.
Executive Summary

While Illinois has experienced some positive growth in tech, particularly among startups, areas important to the state’s technology ecosystem have seen continual deterioration over the past decade. When looking at key technology ecosystem indicators, the state ranks well below other states. Illinois needs to achieve numerous improvements in order to remain competitive, and year-over-year growth is itself is not enough – we must increase our rate of growth just to keep pace.

Without fiscal constraint and modern regulations, little hope remains for the state to take advantage of technology as a driver of economic recovery. With the threat of continual loss of tech sector jobs and a weakening investor pool in the fastest growing areas, Illinois is currently in a position that necessitates action. Below, you will find an analysis of areas where Illinois lags and an action agenda that can help improve the economy and bolster innovation.

Here’s what Illinois must do:

- Improve K-12 education and increase the number of STEM graduates at the undergraduate and graduate level;
- Halt the loss and seek the growth of high-tech jobs, which can support other sectors of the economy through the multiplier effect;
- Create a climate of entrepreneurship so that graduates from Illinois universities establish technology businesses in the state;
- Support Illinois universities’ R&D activities, especially those leading to innovative patents;
- Encourage venture capital funding expansion in the state, especially in internet and mobile sectors;
- Revise Illinois’ outdated and uneven telecommunications regulations and create incentives for Illinois technology infrastructure investments.
Forward by Lindsay Mosher, executive director of the Illinois Technology Partnership

The Illinois Technology Partnership (ITP) is a project of Mobile Consumers for Choice and Competition, a non-profit organization of individual consumers interested in technology, broadband, and telecommunication issues. ITP brings together industry experts, thought leaders, and Illinois consumers to foster an environment that will encourage emerging technologies, jobs, and investment, and spur economic growth on the state and local level.

*In today’s modern economy, technology serves as the backbone of nearly every business. As the economy continues to recover, growth in the technology sector is outpacing industries across the board. The sector is responsible for new innovations that have created a global marketplace – one in which every organization, city, state and country must compete. Therefore, if Illinois is to remain viable in the innovation-driven economy, we must look at where we stand, not only in comparison to Silicon Valley, New York and Boston, but also compared to other smaller, lesser-known American tech hubs like Huntsville, Alabama and Wichita, Kansas.*

While we have seen bright spots in Illinois’ tech economy, the research is unmistakably clear: Illinois is not keeping pace. Illinois lags neighboring states and known tech hubs in a series of key measurements.

**Why should we care?**

*In the modern technology economy, states must ensure they are developing policies that create welcoming environments to attract high-tech investment. This, in turn, will attract not just high-tech businesses, but also brick and mortar businesses and service industries that need modern technology to operate efficiently. Illinois needs to close the gap to position the state as an international leader in investment, innovation and jobs.*
As the Bay Area Economic Institute writes, “While the average worker may never be employed by Google or a high-tech startup, our jobs are increasingly supported by the wealth created by innovators. The reason is that high-tech companies are generating a growing number of jobs outside high-tech in the communities where they are located.”

Thus, the health of Illinois’ technology sector is a key indicator of the state’s overall economic health.

Key benchmarks allow comparisons among different regions and indicate Illinois’ overall place in the innovation economy. These benchmarks include tech education and job creation, attracting and retaining human capital, research and development and patent output, venture capital and communications infrastructure. Unfortunately, after reviewing the data, Illinois fails to lead in nearly every category. To position Illinois as a leader in these areas, the state needs to take action now.

**STEM Education**

Illinois is behind when it comes to STEM education. Starting in high school, Illinois students fall below the national average on standardized test scores in the areas of math and science, and a declining number of college students are pursuing STEM degrees. Illinois college graduates are missing out on high-skill, high-wage jobs, and those who pursue these degree paths are often forced to leave Illinois in search of jobs that meet their skill sets in other states.

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**Tech Employment**

During the recession, tech unemployment was lower than in other industries; however, Illinois had some of the most significant high-tech job losses of any state, losing 6,400 high-tech jobs between 2009 and 2010 and ranking in the bottom five nationally. While this is a problem for the industry itself, it is a significant problem for the Illinois economy overall. The creation of one job in the high-tech sector or a region is associated with the creation of 4.3 additional jobs in the local goods and services economy. Tech jobs create other jobs. Therefore, when a job is lost in Illinois, the state is not losing just one job: the state is losing all of the jobs created to support the next-generation economy.

**Human Capital**

Illinois is losing human capital. The 2010 U.S. Census revealed that Illinois, at 3.3 percent, had the lowest growth population rate in the Midwest aside from Michigan, which lost residents. The state was well below the national growth average of 9.7 percent. While overall, 45 percent of entrepreneurs typically set up shop in the state where they graduated from college, only 28 percent of Illinois entrepreneurs follow this trend. Entrepreneurs create small businesses; small businesses create jobs. Illinois is losing a major engine for job growth.
Research and Development and Patent Output

Illinois’ investment in academic research and development trails every other Midwestern state, and while other major Metropolitan Statistical Areas (MSAs) experienced slow to moderate growth in R&D business establishments during the past decade, Chicago’s numbers remained largely flat. This may be one reason why patent growth in Illinois has been gradual, increasing by only 10 percent between 1963 and 2010. Our state is missing the mark when it comes to the research and development necessary to support innovation and the creation of entirely new industries.

Venture Capital

Finally, while venture capital is currently considered a bright spot for Illinois, the state only secured 2.4 percent of the total VC dollars available in 2011, far behind the top state, California, which secured more than half of the total capital. In addition, when it comes to emerging technologies, such as mobile, where the sector experienced a five quarter high in number of deals Q4 2012, Illinois does not make the list of top states for these types of investments. We are falling behind the innovation curve.

Communications, Broadband and Wireless Infrastructure

When it comes to broadband infrastructure, Illinois ranks 24th in the United States, according to TechNet’s State Broadband Index. Wireless adoption is growing, and it is quickly becoming the most accessible and affordable way for most to obtain high-speed
internet access. Unfortunately, Illinois’ telecommunications providers are still subject to outmoded laws, creating an unequal playing field between broadband providers and limiting investment in the new technologies that more consumers are demanding. Nearby states, including Wisconsin, Indiana and Michigan, have already updated their laws and are reaping the benefits.

Illinois must recognize that we are behind in technology and, therefore, behind in every other aspect of the innovation race. Urgent action should be taken to help restructure our economy and our public policy to help close the gap. In an industry that moves at an incredible velocity and evolves every day, the longer we wait to address our state’s challenges, the further and further we will fall down the rankings – meaning more loss of jobs, human capital, economic capital and the state’s ability to grow into a modern tech engine.

There are positive trends in tech, with several newly established incubators and co-working spaces and numerous startups cropping up throughout the state – these are the types of opportunities we can capitalize on as a state to continue to foster growth and innovation in this economy-driving sector, but they are not themselves enough to turn the economy around.

This whitepaper provides an overview of how Illinois compares to other technology ecosystems, and the Illinois Technology Partnership will be addressing solutions to many of these issues in 2013 and the years to come through our support and promotion of forward-thinking public policies.
Technology Ecosystem in Illinois: 2012

by

Robert Yadon, Ph.D.; Barry Umansky, J.D.; and David Loomis, Ph.D.

Introduction

With the 2012 presidential election over, the 98th Illinois General Assembly will be facing a number of critical issues in 2013 that will impact the Illinois business environment for generations to come. It is no longer just a good idea for government to provide an environment conducive to a flexible and innovative business climate, it has become a necessity at all levels of governance – national, state and local – to ensure that policy decisions set in place reflect a dedication to a dynamic business culture suited to compete in the ever-changing and increasingly fast-paced knowledge-based, global economy.

Technology is a key economic driver, and the Illinois technology landscape has seen growth over the years, especially among startups. But when measured against competitors from the region and around the country, there are areas where Illinois has fallen behind. The reasons for this are likely multifaceted. Economic landscape changes can inhibit sectors from continued
growth, and once-practical but outdated and irrelevant regulations can also affect a world for which they have no context or practical function. Antiquated, left-over regulations, high taxes and past uncontrolled spending – all factors present in Illinois – have changed the business climate and represent a disservice to the economies they are meant to propel. Policymakers should not ignore their potential to hinder growth and dissuade future investment.

As one of the most fast-paced, forward-looking industries, technology is a key economic driver and also a key economic backbone. Virtually every individual, educational institution and business relies on technology, and therefore, if Illinois falls behind in this sector, the state is falling behind in other sectors across the board.

Clearly the time has come for Illinois to reconsider its business climate and regulatory framework in order to ensure that it is not left behind while next-generation industries are steered toward more-predictable and profitable destinations in competing states and regions. At stake are the companies, both large and small, which require an educated workforce and an improved technological infrastructure to maintain a competitive edge.

This analysis intends to define the Illinois technology ecosystem landscape and explain current impediments. Additionally, this analysis explores the state’s opportunity to reap some of the same benefits its neighbors were able to accrue as a result of sound fiscal policy, a “light” regulatory touch and the growth and competition which generally follows – this is especially true in the telecommunications and broadband sector.

With a focus on the positive effects of widespread and highly-competitive information technologies on job creation, capital investment, education, healthcare and the economy as a whole, this analysis hopes to encourage a practical, forward-looking legal framework as Illinois heads into the future.
As TechNet’s 2012 State Broadband Index report points out, states are actively pursuing ways to use broadband to promote economic development; build stronger communities; improve delivery of government services; and upgrade their educational systems. In order for broadband to impact these areas, there is a need for fast and ubiquitous broadband networks, a population of online users, and an economic structure that helps drive broadband innovation. Unfortunately, Illinois doesn’t have these ingredients in equal measure, and the fifth most populous state ranks no higher than 24th when measured against other states in 2012. The ratings show that the top five states are: Washington, Massachusetts, Delaware, Maryland and California.  

**Defining the Illinois Business Landscape**

In his State of the State Address on February 1, 2012, Illinois Governor Pat Quinn stated that it was the goal of the state to “build smart communities that will foster the job engines of the future” and its desire for “[its] neighborhoods to become Gigabit communities with internet connections more than 100 times faster than today.” These stated interests are clearly congruent with the outlook of this analysis, but first one must ask: Where is Illinois now and how does it succeed in achieving its goals? What has driven Illinois to be the 18th largest economy in the world? What industries have bolstered its successes up to this point, and what must be done to ensure that it can continue to evolve and grow seamlessly?

**Tech Education**

As early as high school, Illinois students are already behind in the areas of math and science, and college students are not pursuing the degrees necessary for today’s technology

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beginnings at the K-12 level, Illinois high school students who took the ACT test in 2010 (100%) ranked 37th nationally in science. When looking at the ACT math scores, Illinois ranked 34th the same year. For Illinois college graduates in 2007, the number of STEM bachelor degrees in National Science and Engineering was 7.2 per 1,000 individuals, as measured against the U.S. total of 8.1. For those obtaining graduate degrees at Illinois schools in 2007, the number of STEM degrees was 14.3 per 1,000 individuals, which was slightly better than the national figure of 12.3.\textsuperscript{4}

Table 1
Comparison between Illinois and Surrounding States
In Percent of STEM Degrees 2009

<table>
<thead>
<tr>
<th></th>
<th>Total bachelor's degrees</th>
<th>Number of STEM degrees</th>
<th>Percent of all degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>1,601,368</td>
<td>386,824</td>
<td>24.2</td>
</tr>
<tr>
<td>Michigan</td>
<td>54,641</td>
<td>15,091</td>
<td>27.5</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>33,651</td>
<td>9,117</td>
<td>27.1</td>
</tr>
<tr>
<td>Indiana</td>
<td>39,583</td>
<td>10,371</td>
<td>26.2</td>
</tr>
<tr>
<td>Ohio</td>
<td>60,084</td>
<td>15,351</td>
<td>25.6</td>
</tr>
</tbody>
</table>

\textbf{Illinois} | 69,339 | 15,767 | 22.7 |


Table 1 above shows the number of STEM degrees for Illinois as measured against the total number of bachelor’s degrees for 2009. Not only did Illinois have a lower percentage of STEM graduates than the national average (24.2), but it scored lowest of the other Great Lakes

states and ended up in the bottom one-third percentage of all states for percentage of STEM degree graduates across the nation. In 2003, Illinois reached its peak of STEM degrees conferred with 20,248. This number declined from 2003 to 2007 and has not recovered since. Illinois conferred 18,400 STEM degrees in 2011, which represents only 11 percent of all degrees conferred in the state. Illinois might consider following the lead of Connecticut which is dedicating $1.5 billion to developing strategies to grow STEM graduates.\(^5\) Regardless, some attention is warranted to the generation and retention of STEM degree graduates in Illinois.

Employment in the high-tech industries and STEM is expected to grow 16.2 percent and 13.3 percent respectively from 2011 to 2020.\(^6\) It is critical Illinois students are trained for jobs of the future.

**Tech Employment**

According to TechAmerica’s *Cyberstates Report 2011*, the U.S. high-tech industry lost 115,800 net jobs in 2010, for a total of 5.75 million workers removed from the workforce. However, the high-tech industry fared better than the private sector as a whole during the span of the economic downturn, from 2007 to 2010, with a 4 percent decline as compared to a 7 percent decline overall. Illinois had some of the most significant losses of any state, losing 6,400 high-tech jobs between 2009 and 2010 and ranking in the bottom five.\(^7\)

“Why should local authorities care about attracting high-tech jobs when they represent a small share of total employment nationally? The answer is that these jobs provide a lot of economic bang for the buck. This occurs through two channels – first through income gains

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\(^6\) See http://new.livestream.com/hattery/TechJobs

generated by innovation, productivity and a global marketplace, and second from the local jobs that are supported by that income generation.”

With tech employment down, the jobless picture overall should be a concern for Illinois residents. According to the Bay Area Council Economic Institute, the creation of one job in the high-tech sector or a region is associated with the creation of 4.3 additional jobs in the local goods and services economy. If Illinois continues losing high-tech jobs, it could have a significant impact on the rest of the economy.

According to the Regional Economics Applications Laboratory at the University of Illinois at Urbana-Champaign’s “Illinois Job Index” report, Illinois is 708,100 jobs short of its peak in November 2000.

Chicago is among eight metros that remain more than 100,000 jobs below their pre-recession levels. “The biggest deficits belong to Los Angeles (down 333,300 private-sector jobs), Chicago (down 204,300), Miami-Fort Lauderdale (down 160,900) and Phoenix (down 150,800).”

Austin, Texas; New York City and Boston, all known tech hubs, have already achieved pre-recession employment levels, along with smaller metros including Raleigh, North Carolina; Columbus, Ohio; and Knoxville, Tennessee.

“Some regions – such as San Francisco, Silicon Valley, Seattle, Boston and Austin – are well-known tech hubs. Others, like Huntsville, Alabama and Wichita, Kansas, may come as a surprise. Identifying where high-tech employment is concentrated and where job growth in this sector is occurring is important for policymakers because it is precisely these types of jobs that

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9 Regional Economics Applications Laboratory (REAL) at the University of Illinois at Urbana-Champaign. (Oct. 2, 2012). Illinois Job Index. Retrieved from: http://www.real.illinois.edu/
have large impacts on local economic growth.” 11 Illinois has between 3.5 percent and 5 percent of total U.S. high-tech employment. Chicago does not make the list of top 25 metros for high-tech employment concentration, but Lake County-Kenosha (Illinois-Wisconsin) does rank 24th. 12 As the future of job growth becomes more reliant on the high-tech sector, Illinois must become a more attractive home for businesses, or the state runs the risk of losing companies and jobs to other states that are more formidable.

**Human Capital**

Illinois is losing entrepreneurs who are creating jobs and building the next-generation economy. According to a 2008 report by the Kauffman Foundation, a national survey found the vast majority of technology entrepreneurs are college educated, with nearly half holding degrees in science, technology, engineering and mathematics (STEM) related areas. One third of the tech entrepreneurs held degrees in business, accounting and finance.

There was a strong correlation between the state where the entrepreneur graduated and the state in which he or she eventually established a startup. The research shows that nearly 45 percent of these entrepreneurs established startups in the same state in which they received one or more of their degrees. Highest ranking states for retaining entrepreneurs include: California, 69 percent; Michigan, 58 percent; Texas, 53 percent; and Ohio, 52 percent. Unfortunately, only 28 percent of technology entrepreneurs who graduate from an Illinois institution find Illinois to be attractive for their startup. 13

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12 “Ibid

A case in point is the browser Mosaic, which was invented in 1993 by two University of Illinois students, Marc Andreessen and Eric Bina. Andreessen and Bina both left for Silicon Valley after graduation and soon became co-founders of Netscape. Today, Andreessen is an entrepreneur, venture capitalist and multi-millionaire and sits on the board of directors of Facebook, eBay and HP. Bina now lives in Singapore. Had they stayed in Illinois, one can only guess the impact they would have had on the local economy.

Likely as a result, entrepreneurial activity in Illinois is down. According to Kauffman’s index of entrepreneurial activity, the highest ranked states for entrepreneurial activity were Arizona, Texas, California, Colorado and Alaska. Illinois was ranked 47th.14

Population growth in the state has also slowed. The 2010 U.S. Census revealed Illinois had the lowest growth population rate in the Midwest at 3.3 percent, and was well below the national average of 9.7 percent.

The only Midwestern state that fared worse was Michigan, which saw a population decline. Chicago saw a slight increase in population, adding

<table>
<thead>
<tr>
<th>Inbound State</th>
<th>Total # Returns Leaving Illinois</th>
<th>Total # Exemptions Leaving Illinois</th>
<th>Total AGI Leaving Illinois (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 New York</td>
<td>7,831</td>
<td>11,241</td>
<td>$514,749</td>
</tr>
<tr>
<td>9 Michigan</td>
<td>7,917</td>
<td>13,730</td>
<td>$416,168</td>
</tr>
<tr>
<td>8 Arizona</td>
<td>7,702</td>
<td>13,625</td>
<td>$444,114</td>
</tr>
<tr>
<td>7 Iowa</td>
<td>9,687</td>
<td>17,024</td>
<td>$386,462</td>
</tr>
<tr>
<td>6 Missouri</td>
<td>15,590</td>
<td>26,708</td>
<td>$632,346</td>
</tr>
<tr>
<td>5 Texas</td>
<td>16,611</td>
<td>34,007</td>
<td>$929,800</td>
</tr>
<tr>
<td>4 Wisconsin</td>
<td>15,463</td>
<td>28,608</td>
<td>$715,440</td>
</tr>
<tr>
<td>3 Florida</td>
<td>15,928</td>
<td>27,709</td>
<td>$1,138,103</td>
</tr>
<tr>
<td>2 California</td>
<td>17,957</td>
<td>29,716</td>
<td>$1,108,320</td>
</tr>
<tr>
<td>1 Indiana</td>
<td>19,182</td>
<td>38,357</td>
<td>$816,344</td>
</tr>
<tr>
<td>All States</td>
<td>223,511</td>
<td>404,189</td>
<td>$11,984,977</td>
</tr>
</tbody>
</table>


about 11,500 people from 2010 to 2011, according to new U.S. Census Bureau numbers. However, this is in contrast to about 200,000 residents who left the city over the decade 2000 to 2010.

IRS data from individual tax returns provide some indication where Illinois people are migrating. As expected, the surrounding states of Indiana and Wisconsin are heavily favored locations; however, states like California and Florida, and job creating states such as Texas, are among the top 10 locations.

According to the Tax Foundation study on migration, between 2008 and 2010, Illinois lost both people and money into the 10 states listed in Table 2 above.

In addition, the United Van Lines Annual Migration study for 2012 shows Illinois is the second ranked outbound state behind New Jersey, while Michigan dropped to the number six spot from the number four spot it held in 2011.15

1. New Jersey
2. Illinois
3. West Virginia
4. New York
5. New Mexico

A strong possibility why entrepreneurs find Illinois an unsuitable place to set up shop and residents leave is the state’s unfavorable business climate.

Each year, Pollina Corporate, a site selection firm, ranks the Top 10 Pro-Business States based on 32 factors including: taxes, human resources, right-to-work legislation, energy costs, infrastructure spending, worker compensation legislation, and jobs lost or gained. In addition, the survey examined 13 additional state government-controlled factors, including state financial incentive programs and state economic development department evaluations. Those states showing the greatest decline in position over the past three years included Connecticut (-21), Nevada (-13) and Illinois (-12). Illinois’ poor performance is also reflected by Standard & Poor’s Ratings Services which recently downgraded the state’s credit rating for the second time in twelve months by one category from “A” to “A-,” placing it dead last in credit worthiness among all 50 states. This negative outlook is indicative of the state’s unfunded pension liability problems, estimated at $96.8 billion, and struggles with budgetary constraints.\textsuperscript{16}

Research and Development and Patent Output

According to the Georgetown University Center on Education and the Workforce, during the past 50 years, taxpayer investment in technology and STEM education has indirectly produced more than half the nation’s economic growth. They say, and prominent economists agree, no other investment generates a greater long-term return to the economy than scientific R&D.\textsuperscript{17}

However, when it comes to academic R&D, in all but seven states, appropriations have either declined or have not kept pace with enrollment and inflation, and inflation adjusted state funding per enrolled student dropped an average of 20 percent nationally at major public

research universities between 2002 and 2010. In Illinois, funding per enrolled student declined 37 percent to $7,566 during this period. Among all 50 states in 2010, Illinois ranked 28th in per-student funding for its major public research universities.

As Table 3 above indicates, since 2006 Illinois has invested less in Academic Science and Engineering R&D per $1,000 of GDP than any other Great Lakes state.

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>3.58</td>
<td>3.53</td>
<td>3.63</td>
<td>3.91</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>4.54</td>
<td>4.50</td>
<td>4.67</td>
<td>5.02</td>
</tr>
<tr>
<td>Michigan</td>
<td>3.91</td>
<td>3.90</td>
<td>4.24</td>
<td>4.71</td>
</tr>
<tr>
<td>Ohio</td>
<td>3.61</td>
<td>3.89</td>
<td>3.88</td>
<td>4.10</td>
</tr>
<tr>
<td>Indiana</td>
<td>3.30</td>
<td>3.05</td>
<td>3.62</td>
<td>3.87</td>
</tr>
<tr>
<td>Illinois</td>
<td>3.03</td>
<td>2.97</td>
<td>3.10</td>
<td>3.34</td>
</tr>
</tbody>
</table>

Source: National Science Foundation and the U.S. Census Annual Population Estimate

There are also regional differences in expenditures for academic research and development. Sixty-five percent of the R&D funding at Illinois universities is concentrated in the Chicago region with Northwestern, University of Chicago, the University of Illinois at Chicago, Loyola and the Illinois Institute of Technology. The notable exception is the University of Illinois at Urbana-Champaign, which leads the state with $564 million in R&D expenditures (see Table 4 below).

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18 The following states did not experience a per-student funding decline between 2002 and 2010: New York (+72%), Wyoming (+62%), Alaska (+10%), North Dakota (+4%), Louisiana (+3%), Delaware (+1%), and North Carolina (0%).
This clustering of R&D expenditures in the Chicago area tends to hold true for private expenditures as well. In 2010, 431 of the 700 companies with R&D operations in Illinois were located in the Chicago metropolitan area. According to the Illinois Innovation Index, “While other major MSAs experienced slow to moderate growth in R&D business establishments during the past decade, Chicago’s numbers remained largely flat.”

Less research and development expenditure may be one reason why patent growth has slowed in Illinois. For metropolitan Chicago it is a similar story, as indicated below in Table 5, with the region falling behind in patent output compared to other regions of the country such as

---

**Table 4**

<table>
<thead>
<tr>
<th>Region</th>
<th>Institution</th>
<th>All R&amp;D Expenditures (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
<td>Northwestern University</td>
<td>$515</td>
</tr>
<tr>
<td></td>
<td>University of Chicago</td>
<td>$378</td>
</tr>
<tr>
<td></td>
<td>University of Illinois, Chicago</td>
<td>$342</td>
</tr>
<tr>
<td></td>
<td>Loyola University</td>
<td>$35</td>
</tr>
<tr>
<td></td>
<td>Illinois Institute of Technology</td>
<td>$23</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$1,293</strong></td>
</tr>
</tbody>
</table>

**Downstate**

<table>
<thead>
<tr>
<th>Institution</th>
<th>All R&amp;D Expenditures (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Illinois, Urbana-Champaign</td>
<td>$564</td>
</tr>
<tr>
<td>Southern Illinois University, Carbondale</td>
<td>$66</td>
</tr>
<tr>
<td>Southern Illinois University, Edwardsville</td>
<td>$32</td>
</tr>
<tr>
<td>Northern Illinois University, DeKalb</td>
<td>$21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$683</strong></td>
</tr>
</tbody>
</table>


---

**Table 5**

<table>
<thead>
<tr>
<th>Metropolitan Area</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Jose-Sunnyvale-Santa Clara, CA</td>
<td>8129</td>
<td>7191</td>
<td>7213</td>
<td>7840</td>
<td>10074</td>
</tr>
<tr>
<td>New York-Northern New Jersey-Long Island, NY-NJ-PA</td>
<td>4947</td>
<td>4284</td>
<td>4398</td>
<td>4603</td>
<td>6383</td>
</tr>
<tr>
<td>San Francisco-Oakland-Fremont, CA</td>
<td>4810</td>
<td>4337</td>
<td>4298</td>
<td>4711</td>
<td>6290</td>
</tr>
<tr>
<td>Los Angeles-Long Beach-Santa Ana, CA</td>
<td>4443</td>
<td>3693</td>
<td>3591</td>
<td>3864</td>
<td>4992</td>
</tr>
<tr>
<td>Boston-Cambridge-Quincy, MA-NH</td>
<td>3461</td>
<td>3027</td>
<td>3039</td>
<td>3165</td>
<td>4330</td>
</tr>
<tr>
<td>Seattle-Tacoma-Bellevue, WA</td>
<td>2290</td>
<td>2346</td>
<td>2622</td>
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<td>4052</td>
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<tr>
<td>San Diego-Carlsbad-San Marcos, CA</td>
<td>2220</td>
<td>2043</td>
<td>1900</td>
<td>1964</td>
<td>2993</td>
</tr>
<tr>
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<td>2314</td>
<td>2192</td>
<td>2312</td>
<td>2933</td>
</tr>
<tr>
<td>Minneapolis-St. Paul-Bloomington, MN-WI</td>
<td>2399</td>
<td>2098</td>
<td>2012</td>
<td>2031</td>
<td>2827</td>
</tr>
<tr>
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<td>1912</td>
<td>1794</td>
<td>1951</td>
<td>2137</td>
<td>2449</td>
</tr>
</tbody>
</table>


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San Jose or Boston. The most recent report from the Brookings Institution shows that Chicago trails many of its peers in innovation. For 2012, among its peers, Chicago ranks ninth among the 25 biggest metro areas per 1,000 workers.\textsuperscript{21}

“Patent filings worldwide passed the 2 million mark in 2011, showing significant growth of 7.8 percent compared to 2010 and exceeding 7 percent growth for the second year in a row.”\textsuperscript{22}

While there has been patent growth overall, Table 6 below shows some states, such as California and Washington, have seen prodigious increases over the past four years in annual patent volumes, but the growth in Illinois has been more gradual, increasing by only 10 percent between 1963 and 2010.

\begin{table}[h]
\centering
\small
\begin{tabular}{|l|c|c|c|c|}
\hline
\hline
United States and Foreign Origin & 157,772 & 167,349 & 219,614 & 224,505 \\
\hline
California & 19,102 & 20,640 & 27,337 & 20,140 \\
Washington & 3,517 & 4,309 & 5,258 & 4,767 \\
\hline
Illinois & 2,741 & 2,898 & 3,611 & 3,806 \\
Indiana & 985 & 1,095 & 1,492 & 1,437 \\
Wisconsin & 1,349 & 1,467 & 1,814 & 1,784 \\
Ohio & 2,227 & 2,341 & 3,230 & 3,177 \\
Michigan & 2,996 & 2,983 & 3,823 & 3,964 \\
\hline
\end{tabular}
\caption{Number of Patents Granted by Year Breakout by State 2008-2011}
\end{table}

Venture Capital

Where the dollars are going and how relative distribution changes each year indicates the states in which entrepreneurs and investors are most certain to be stable and productive. Money will move quickly if prompted to do so by unbalanced markets. If the necessary return on investment in one state is much higher than a neighboring state due to taxes on investment, etc., money would tend to go toward the low-cost state. The state of Illinois recognized the importance of access to capital in 2011 when it passed SB 107 into law, which increased the permitted level of the state’s investment in the Technology Development Account from 1 percent to 2 percent.

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
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<th>2010</th>
<th>2011</th>
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<tr>
<td>United States</td>
<td>100%</td>
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<td>100%</td>
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</tr>
<tr>
<td>California</td>
<td>50.42</td>
<td>50.58</td>
<td>50.31</td>
<td>51.03</td>
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<tr>
<td>Massachusetts</td>
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<tr>
<td>New York</td>
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<td>5.12</td>
<td>6.14</td>
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<tr>
<td>Texas</td>
<td>4.54</td>
<td>3.76</td>
<td>4.08</td>
<td>5.14</td>
</tr>
<tr>
<td><strong>Illinois</strong></td>
<td><strong>1.56</strong></td>
<td><strong>1.30</strong></td>
<td><strong>2.64</strong></td>
<td><strong>2.40</strong></td>
</tr>
</tbody>
</table>

Table 7
Share of U.S. Total VC Investment by State 2008-2011

Illinois has been successful in the venture capital arena. Currently ranked fifth in capital dollars invested by state, it follows California, Massachusetts, New York and Texas. As Table 7 above indicates, Illinois captured 2.4 percent of all venture capital dollars in the United States in 2011, outpacing the other Great Lakes states like Indiana (.83 percent), Wisconsin (.38 percent), Michigan (.29 percent), and Ohio (.72 percent). Despite Illinois’ ranking, it is worth noting the
Illinois is far behind the leading state, California, which secured more than half of the total capital invested.

Illinois is also behind in capital investments when it comes to the fastest growing sectors of the economy. When looking specifically at venture capital in the digital space, Illinois ranks fifth, securing four percent of the venture capital in the internet sector. However, as Table 8 above indicates, Chicago does not make the list of top cities for internet deals.

Mobile continues to boom. As a result, investments in the mobile sector reached a five quarter high in Q4 2012. Behind new innovators, Illinois does even make the list when it comes
to states at the forefront of these investments. Top contenders for venture capital dollars in this space are California, New York, Massachusetts, New Jersey, Florida and Washington.23

**Communications, Broadband and Wireless Infrastructure**

While government alone has a more limited ability to impact STEM or human capital retention in the short-term, it does have direct control over telecommunications policy and the ability to better align regulation and oversight with modern services and consumer demand. In turn, the government’s ability to encourage investment in next-generation infrastructure, on which every industry relies, will drive positive results for Illinois in education, employment, retention of human capital, research and development and venture capital.

Illinois, like virtually all of the country, is enjoying the benefits of contemporary communications technology, and is poised to gain further benefits as internet connectivity – and the speed of that connectivity – increases over time. However, Illinois’ telecommunications laws are outdated, forcing telecommunications providers to invest in older technologies that fewer consumers are using – literally requiring telecommunications firms to invest in outdated, and increasingly abandoned, landline or “wireline” networks. Each dollar diverted from upgrading and expanding mobile and high-speed broadband networks delays innovation and limits consumer access to new technologies.

This requirement has created an uneven playing field for providers in Illinois and is compromising future investments in mobile technologies. According to the National Broadband Plan, “today’s telephone companies, dominant firms, in the eyes of many – are at risk of

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obsolescence if they are not able to find a way effectively to compete with cable’s cost-effective DOCSIS 3.0 technology.”

In recent years, as more companies have offered customers a wide array of telecommunications services, wireless phones and internet, multichannel video and other services, state legislatures around the country have been reevaluating whether there is need for state regulation and oversight of these companies and their services. Now is the time for Illinois to engage in such a review.

Despite the fact Illinois residents receive the same or similar services through different technologies, some providers are heavily regulated, while others are not. In addition, Illinois regulations do not account for the fact consumers are not just making purchasing decisions between provider and provider. Other factors, including networks, prices, devices and operating systems, also play into consumers’ choices. Many are also opting for free services such as Skype, iChat and Google Voice to communicate. “Both the antitrust agencies and the telecommunications regulatory agencies – the FCC and state public utility commissions – continue in many cases to base their analyses largely on traditional concepts of market definition and concentration.” Rather, they should craft regulations that better reflect the modern technology landscape.

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Figure 1 above shows the number of telephone lines in Illinois decreasing since deregulation under the Telecommunications Act of 1996. Figure 2 shows the total number of high-speed lines in Illinois growing from almost nothing in 1999 to 8,645,000 in June 2011. Figure 3 shows the rapid growth of wireless subscribers from 4 million in 1995 to 12.3 million in June 2011. In short, these figures document the changing landscape of technology in Illinois and the country.
In a 2010 filing, the Department of Justice wrote:

“In any industry subject to significant technological change, it is important that the evaluation of competition be forward-looking rather than based on static definitions of products and services. Insight can best be gained by looking at product life cycles, the replacement of older technologies by newer ones, and the barriers facing suppliers that offer those newer technologies. In the case of broadband services, it is clear that the market is shifting generally in the direction of faster speeds and additional mobility.”

Illinois’ laws need to account for the fact consumers are adopting mobile technologies more rapidly than ever. “Broadband is the fastest-propagating technology in history, and mobile broadband is propagating even more rapidly than wireline.” According to the Partnership for a Connected Illinois, “Smartphones have a strong foothold in how people in Illinois access the internet. Some 46 percent of Illinois residents have a Smartphone, which permits wireless online access using a handheld device.”

The problem is not fewer consumers are using landlines, it is that the state’s laws are hindering private sector companies from investing in the products and services their consumers are increasingly demanding. Most importantly, dire predictions of diminishing access or rising consumer prices for telecommunications services have not been realized in less regulated markets.

As such, it is incumbent upon the Illinois legislature and the state’s regulators to eliminate or modify those laws placing telecommunications companies at a disadvantage, thereby limiting the benefits available to the public they serve.

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28 Broadband Competition in the Internet Ecosystem, supra note 7 at 9.
As the Illinois legislature considers telecommunications law reform, a review of neighboring states and their updated regulatory policies can be very informative and help establish a reasonable prediction of the likely benefits and effects of such a change.

**Lessons learned in Wisconsin, Michigan and Indiana**

While the vast majority of telecommunications regulation occurs at the federal level, several states have taken steps to update their laws in the sector. Their experience can help establish expectations and demonstrate how policy can help encourage greater access to cutting-edge broadband services and enable additional innovation. Wisconsin, Michigan and Indiana have each enacted a more modern approach to telecommunications oversight, providing lessons for Illinois.

The fact everyone needs access to two-way communication tools is undisputed. However, many consumers are no longer using monopoly-era, regulated landlines as their primary form of phone service. Changing the laws to recognize the growing consumer demand for wireless and other technologies will free up money that is currently directed toward outmoded technologies and put those dollars toward investment in technologies that more people want.

During the past two years, Wisconsin, Michigan and Indiana have considered these factors and addressed long-standing requirements regarding the development and deployment of

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31 On May 26, 2011, Wisconsin Bill SB 13 was signed into law. Section 117 of the bill provides for a new Section 196.503 of the Wisconsin Statutes and Annotations to establish an interim mechanism for waiver of state POLR requirements and a total elimination of those requirements as of April 30, 2013.

32 Signed into law on June 14, 2011, Michigan Public Act No. 58. (House Bill No. 4314) states that: “…any telecommunications provider that provides either basic local exchange or toll service, or both, shall not discontinue either service to an exchange unless 1 or more alternative providers for toll service, or 2 or more alternative providers for basic local exchange service, are furnishing a comparable voice service to the customers in the exchange. A comparable voice service includes any 2-way voice service offered through any form of technology
specific communications technologies. All three states defined basic voice as two-way communication and provided that telecommunications companies could meet the requirement for this service through any mode of technology.

By taking regulatory and legislative steps similar to those taken by Wisconsin, Michigan and Indiana – among many other states – Illinois’ residents can receive substantial competitive and service benefits. Absent such action, it will limit the ability of telecommunications companies to invest in technologies consumers demand and will continue to funnel funds into outdated technologies that consumers are rapidly abandoning. This in turn will create an influx of stranded investment that results in wasted dollars that could have been used for modern technologies that consumers demand.

Investment in next-generation infrastructure will foster innovation, which will drive emerging and existing companies. It will also positively impact educational programs along with the state’s ability to attract and retain talent. These investments will contribute to new growth, new research and development, new products and companies, and therefore open the doors for new investment and perpetuating results.

Conclusion

Illinois is clearly falling behind other states in key areas that bolster and support the technology sector. If Illinois fails to adjust to the changing environment in technology, it will drag down every other sector of the economy, all of which rely on technology for a competitive

33 Indiana deregulation began in 2006 with the passage of HEA1279, which resulted in over $2.5 billion in capital investment in Indiana since 2006. Deregulation continued with HEA1112 which was signed into law by Governor Daniels on February 2nd, 2012 providing additional deregulation in the area of legacy provider-of-last-resort [POLR] requirements.
advantage. Rather, if Illinois can execute a turn-around in the technology sector, it will create a positive ripple effect throughout the rest of the Illinois economy.

If Illinois does not create effective change, it will continue to lose tech sector jobs at a rate of 6,400 or higher annually and continue to see a low number of STEM-field graduates who can enter the technology workforce. Furthermore, the Illinois technology-sector graduating entrepreneurs who set up shop in Illinois will decline from a low 28% to almost nothing as better opportunities exist in other states. Likewise, Illinois R&D investment and new patents filings will decline and venture capital will migrate to other states. Illinois’ telecom infrastructure will continue to deteriorate and will lack the investment needed to expand and modernize.

But Illinois’ future does not have to be like this if the state can enact policies to reverse this downward spiral. In addition to dealing with high taxes and uncontrolled spending, Illinois must undertake policies aimed at improving the technology-related educational outcomes in the state. Specifically, it must improve K-12 education and increase the number of STEM graduates at the undergraduate and graduate level. The state must also improve the climate of entrepreneurship so that graduates from Illinois universities establish technology businesses in the state. In addition, Illinois must support its universities’ R&D activities, especially ones leading to innovative technology patents.

While educational initiatives are important, they take a long time to affect a technology sector turnaround. In the meantime, the state must work on its business climate to halt the loss and seek the growth of high-tech jobs which can support other sectors of the economy through the multiplier effect. Illinois should encourage the expansion of venture capital funding in the state, especially in internet and mobile sectors. Finally, the state must revise its outdated and
uneven telecommunications laws and create incentives for investments in its telecommunications infrastructure.

The time to act is now. Illinois cannot afford postponing action in these areas until other issues are resolved. Other states and other countries will not be standing still in the meantime, and Illinois must be more aggressive than others if it is to surpass them in the technology sector.
Appendix

About the Authors

Robert Yadon, Ph.D.

Dr. Yadon holds a Ph.D. in Mass Media from Michigan State University, and a M.S. degree in Mass Communications from Oklahoma State University. He is a professor of Information and Communication Sciences and a member of the graduate faculty at Ball State University. Dr. Yadon teaches courses in technology, business aspects, and regulatory policy issues, and he serves as the director of the Applied Research Institute and Digital Policy Institute. Since his arrival at Ball State, Dr. Yadon has been involved with the early development of the Center, including primary responsibility for funding of the Applied Research Institute and development of the Digital Policy Institute (DPI).

Prior to Ball State University, Dr. Yadon served as the Vice President of Television Operations at the National Association of Broadcasters (NAB) in Washington, D.C. He also has served as a member of the faculty at Michigan State University and the University of Oklahoma, and has extensive leadership experience in applied research projects including NSF-funded and FEMA-funded research. He is a member of the Institute of Electrical and Electronic Engineers (IEEE).

Barry Umansky, J.D.

Barry D. Umansky is a professor in the Telecommunications Department at Ball State University, following a term as the Edmund F. and Virginia B. Ball Chair in Telecommunications at Ball State. He is a communications lawyer who has represented broadcasters and other electronic media and has had an extensive communications career in government and industry. After work in college and law school at radio and TV stations in the Midwest, he served for seven years as an attorney doing communications policy work at the Federal Communications Commission (FCC) in Washington, D.C. Mr. Umansky then began a twenty-year career as Deputy General Counsel with the National Association of Broadcasters (“NAB”) in Washington. He was in the private practice of communications law in Washington prior to coming to Ball State in 2003.

He has been an active member of the Federal Communications Bar Association and currently is on the Board of Trustees of the Kansas Association of Broadcasters Foundation and the Board of Directors of the Broadcast Education Association. In addition to teaching responsibilities and heavy involvement in university governance, Mr. Umansky is faculty advisor to three Ball State student organizations: “Station WCRD,” the “Pre-Law Interest Group” and “Media Matters.” He also is chief legal advisor and a senior research fellow at the Digital Policy Institute at Ball State.
Dave Loomis, Ph.D.

Dr. Loomis is a Professor of Economics at Illinois State University. He joined the Department in 1996 after almost 12 years of work at Bell Atlantic (now called Verizon). He is also Executive Director of the Institute for Regulatory Policy Studies (IRPS) The IRPS, which is housed within the Department of Economics, seeks to provide a vital link between students, academicians, regulators, consumer advocates, and industry. The Institute provides input into the curriculum, internships for students, state-level workshops, and research.

He was formerly Chair of the International Communications Forecasting Conference (ICFC). The ICFC was a four-day telecommunications conference focused on empirical issues that attracts people from universities and industry from the US and around the world.

NOTICE

The opinions expressed in this paper are exclusively those of the individual authors and the Digital Policy Institute alone; as is responsibility for any errors, and do not necessarily represent the views of Ball State University or Illinois State University. Support for this research was provided by the Illinois Technology Partnership.