TechAmerica byline
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The talent shortage that's sapping America's innovative edge

When discussing the importance of analytics to economic growth and American competitiveness, it is inevitable that one must take a critical look at topics such as STEM education and data regulation. If you believe that analytics technology will power the next great wave of innovation, as I do, you can't assess our competitive situation without assessing the lifeblood of analytics talent: science, technology, engineering and math (STEM) education. Nor can you ignore the ongoing debates about the handling of data. Before we get there, let's examine the questions, "What are analytics and why are so many organizations scrambling to hire analytically trained talent?"

Analytics drive innovation

There are many examples of how analytics are being used in the commercial and public sectors to improve lives. In health care, analytics are used to increase positive patient outcomes, reduce costs by uncovering fraud and improper payments and discover new treatments through the analysis of anonymized electronic health records, to name a few applications.

Financial services companies use analytics to fight money laundering, organized fraud rings and credit card fraud. If someone receives a call from their bank asking if they just made the purchase shown in bank records, they've likely been touched by analytics. The purchase was somehow different from the normal pattern. The bank's fraud division saw a red flag and called the customer. That's anti-fraud analytics at work.

Since government runs programs that have such direct effects on citizens, the positive potential of analytics is strong in the public sector. Governments are facing declining tax revenues, requirements for maintaining high levels of service and unprecedented demands for increased efficiency, effectiveness, transparency and accountability. Utilizing analytics, public agencies can increase efficiencies in tax collection, combat fraud and maximize public services for their citizens.

For example, Los Angeles County uses analytics to fight child care benefits fraud. The Louisiana Workforce Commission and Washington Labor & Industries are tackling workers compensation fraud with analytics. North Carolina is also increasing the safety of its citizens through a criminal justice and law enforcement data system that has already led to several arrests and increased efficiencies. On the education front, many states and school districts are now using value-added assessment to measure the effectiveness of schools and districts on student performance.

Analytics provide decision makers with new and better answers, insights, likely outcomes and options through the analysis of enterprise data. Analytics tools include statistical analysis, forecasting, data mining and operations research, which are used to create an integrated environment for predictive and descriptive modeling, forecasting, process optimization and simulation. In turn, this environment offers a range of techniques and processes for the collection, classification, analysis and interpretation of data to reveal patterns, anomalies, key variables and relationships that would otherwise be obscured or invisible.

Forecasting analyzes trends to ask what will happen if they continue. Predictive modeling answers questions about what will happen next and about the impacts these actions or developments will have. Optimization offers best decisions and best-case scenarios for complex problems, as well as ways of doing things better.

Analytics give decision makers insight into where they're going and offer what-if scenarios and choices. Predictive analytics are forward-looking, using statistical analysis and modeling to predict what will happen in the future with varying degrees of certainty. They enable decision makers to think strategically and be proactive.

The rise of analytics and related data sciences coincides with another phenomenon: the rapid convergence of cloud, mobile and social computing. As more and more people use technology to interact with one another and with organizations, the data created by these myriad interactions will continue growing.

In addition, the growth of "big data" is spurring the development of technologies that rapidly analyze colossal amounts of data that commonly used software tools can't capture and process in a reasonable time frame. Terabytes and petabytes of data are generated by networks, the Web, streaming media, RFID readers, surveillance systems and sensors, etc.

Thanks to the growing use of information and communication technologies over the past 30 years, data has become an intrinsic part of our lives. Web-based services for consumers, corporations and citizens are growing extremely rapidly.

These vast quantities of data have different origins – commercial, personal and governmental – but they represent only one of the catalysts for innovation. More than machines, data is at the core of many of today's business and personal real-time interactions. Entire business strategies are established around data to better run supply chain processes, fine-tune pricing strategies, enhance customer interactions and improve efficiencies.

Often, big data is viewed as a technology discussion related to the storage mechanism. However, there's no value to data until it's analyzed. A more comprehensive data management/data governance approach to big data is needed for organizations to manage and use data effectively, regardless of the storage mechanism or technology.

That approach, in other words, is "big data analytics." Big data analytics cuts through the complexity and helps identify valuable insights so decision makers can solve complex problems faster than ever before.

Big data analytics is critical given the ever-increasing tidal wave of data – structured and unstructured, from financial reports and factory sensors to call center notes and customer product reviews on social media. Mobile and social technologies, in particular, generate valuable unstructured data that can be analyzed for sentiment and lead to better-informed decisions.

With that in mind, the next wave of analytics breakthroughs will come through technologies such as high-performance computing and high-performance analytics, business visualization, data management, analysis of unstructured data and supporting virtual storage technologies.

Those breakthroughs are just the beginning. What are organizations already doing with analytics to succeed in these difficult times?

In general, we already see the banking and financial industries rebounding. Their use of analytics will continue to contribute to overall economic recovery. Likewise, retailers are becoming more analytical with price and size optimization solutions, and the health care industry is furthering its use of data to improve outcomes for patients.

Within any organization, there will be analytics opportunities to optimize the business and squeeze inefficiencies out of organizational data to improve the bottom line. Analytics can help recognize opportunities that could extend to new product lines and improvement in top-line results. There are risk and regulatory opportunities in banking, insurance, telecommunications and the public sector that can lead not only to better compliance but to better business practices in general.

More jobs than talent available

So with those positive opportunities, what is the biggest threat to American companies seizing them? It continues to be the lack of qualified talent to fill highly skilled statistical and analytical positions.

The amount of analytics talent coming out of China is rising at an impressive rate, and it is that talent pool that is supporting their transition from a manufacturing to an innovation-based economy.

So why is there a shortage of qualified US talent?

It is apparent that we have a crisis in the STEM pipeline. In K-12 education, the US ranks behind 16 other developed nations in science and behind 24 other developed nations in math (source: Programme for International Student Assessment). This gap will lead to a shortage of qualified professionals in the STEM careers – jobs that are at the very heart of innovation. We are making progress, but in many states, the students who do well on state-mandated math and science tests may do poorly on the national tests. We give the public a false sense of security by focusing on state tests, when the national scores indicate far less progress.

By the year 2018, there may not be enough graduates to meet the demands of the US workforce. By that time, the US is projected to have 46.8 million job openings, 63 percent (or 29.5 million) of which will require some college education. One-third, or 16 million, will require a bachelor's degree or higher, according to a report by the Georgetown University Center on Education and the Workforce.

Companies will seek 22 million new postsecondary degree holders, but just 19 million or so will have earned an associate's degree or higher by then.

The difference averages to a 300,000 annual deficit of college graduates between 2008 and 2018.

By 2014, there are expected to be 2 million jobs created in STEM-related fields, but where will qualified American talent come from to meet those demands?

Forty percent of all students in the US test below basic math levels. Fifty percent test below basic science levels.

At the K-12 level, an approximate 30 percent dropout rate and poor performance on STEM assessments indicates the problem runs even deeper.

The US ranked 11 out of 15 participating countries on an international mathematics assessment taken by US high school seniors enrolled in advanced math. No country scored significantly lower. In the advanced physics assessment, US students tied with Australia for the lowest score.

A two-pronged policy approach

There are two policy areas that should be addressed to maintain the US as a leader in analytics technology. The first one is thoughtful, well-informed policies regarding the use of data.

Companies that collect personal data are put under enormous regulatory pressure to protect privacy, and rightly so. However, there are privacy regulations under debate that would have unintended consequences, stifling innovations that are ultimately beneficial for individuals, taxpayers and consumers.

These innovations can not only improve the commercial sector, but also help government run more efficiently, increase revenues, reduce waste and fraud and better serve citizens. With the incredible budget challenges government is facing, particularly those of states and municipalities, such over-regulation could be detrimental to economic recovery.

The ongoing debate should not be confused with one about data security. Regulations to strengthen data security and thwart cybercrimes are essential, and any organization that collects, keeps, disseminates or analyzes consumer data should be held to strict security requirements.

This debate is about maintaining a regulatory environment that encourages companies to push the edge of the envelope, and in the process develop technologies that make peoples' lives better.

The second area is STEM education, and I'm happy to say it is just beginning to get the attention it deserves.

From the president down to local education authorities, STEM is being emphasized like never before. In an effort to help shine the light on this problem, I joined Change the Equation (CTEq), a network of more than 110 American CEOs who are calling on governors to ensure that every student in their state has the opportunity for a STEM education equal to the best in the world.

Organizations like CTEq are rallying with the private sector to improve the teaching of STEM subjects, inspire students to take STEM courses and create a sustained effort to put STEM front and center of the national education discussion. To aid state-level decision makers in this important work, CTEq published state-by-state "Vital Signs" reports that describe conditions in each state and offer specific recommendations on improving STEM learning outcomes. By pulling back the curtain and looking at the data from a national perspective, we hope to inform vigorous and substantive policy conversations about what it will take to improve STEM learning nationwide.

For policymakers, legislation that supports the funding and growth of STEM education from K-12 through higher education is critical to keeping America not just as the leader in analytics, but the worldwide leader in technology and innovation.