

The Big Data Talent Gap



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Introduction

Big data—the massive amounts of information companies routinely collect through web crawlers, social media feeds, server logs, customer service databases, and other sources (CIO editors, 2012)—is quickly becoming big business in today’s competitive marketplace. If HR and talent management professionals haven’t added big data to their strategic agenda yet, they will be compelled to in the near future. Few organizations possess technical leaders with the expertise needed to collect, organize, and analyze the data and provide meaningful insights. Even fewer have business leaders with the knowledge and experience needed to create value from big data.

This white paper:

- Analyzes the big data revolution and the potential it offers organizations.
- Explores the critical talent needs and emerging talent gaps related to big data.
- Offers examples of organizations that are meeting this challenge head on.
- Recommends four steps HR and talent management professionals can take to bridge the talent gap.

The Big Data Revolution

The International Data Corporation (IDC) describes big data as “the new generation of technologies and architectures designed to extract value economically from very large volumes of a wide variety of data by enabling high-velocity capture, discovery and/or analysis.” (Villars, Eastwood & Olofson, 2011.) In other words, as authors Viktor Mayer-Schönberger and Kenneth Cukier write in their book, *Big Data: A Revolution that Will Transform How We Live, Work, and Think* (2013), big data “refers to the things one can do at a large scale that cannot be done at a smaller one, to extract new insights or create new forms of value in ways that change markets, organizations, the relationships between citizens and governments, and more.”

The potential applications of big data analytics are vast. Internet giant Google, for example, uses big data analytics to identify flu outbreaks in the United States in real time—a feat that takes the Centers for Disease Control and Prevention (CDC) about two weeks to complete because it relies on slower reporting mechanisms. Google can do

this because it receives more than three billion search queries on a daily basis. By using big data analytics, Google was able to identify 45 search terms that when used in a mathematical model, showed a strong correlation between their predictions and the CDC's flu outbreak statistics (Schönberger & Cukier, 2013).

What Is Big Data?

"Big data are high volume, high velocity, and/or high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization."

Source: Beyer & Laney, 2012.

Another example of big data analytics comes from Target Corporation. Target wanted to capture a very attractive and lucrative market: new parents. New parents spend a lot of time and money shopping and creating new buying habits, and building loyalty among this audience can be very profitable. This market is so valuable that Target worked to identify customers who *might be* pregnant—before a new parent buys the first diaper, or even registers for the baby shower. Since Target captures and records vast amounts of consumer data, they were able to review purchase patterns looking for trends and examine the items couples tended to buy prior to pregnancy, like vitamins, unscented lotion, hand towels, etc. Through mathematical machinations, Target determined the likelihood that couples were pregnant and used these insights to market to these couples well before their child's birth, creating customer loyalty and capturing an extremely valuable market segment.

Big data is transforming every industry, as companies realize opportunities to leverage big data analytics in marketing, sales, and operations—and HR leaders are realizing the potential as well. Technical recruiting firm Gild, for example, identifies highly-skilled engineers by analyzing open-source code, assessing it for quality, and reaching out to engineers who make the cut. Online auction company eBay uses analytics to fight attrition. Beth Axelrod, e-Bay's senior vice president of human resources, notes in a recent *Forbes* article that big data analytics allows them to identify managerial or departmental hotspots for talent loss. "If somebody has been in a role for three years, hasn't been promoted, and hasn't changed roles, there's a far higher probability of attrition than someone who doesn't have those circumstances," she says (Clark, 2013). And, according to some reports, Yahoo! CEO Marissa Mayer relied on big data analysis to ban telecommuting in the company. *Business Insider* reports that Mayer analyzed Yahoo's computer logs for the company's virtual private network (the network telecommuting employees access when working remotely) and determined that remote employees weren't logging in to the VPN often enough to justify the policy (Klobucher, 2013).

The Trends Fueling the Revolution

Several trends have converged to fuel the big data revolution. First, technology costs continue to plummet. It is cheaper than ever to purchase memory and storage, and good quality, open-source software is competing with commercial software, putting pressure on commercial software developers to keep their prices down (CIO editors, 2012). Second, technology has evolved to make business analytics more accessible and faster than ever before. Third, businesses are acquiring new data at an astonishing rate and from more varied sources, such as operational data, customer service data, sales transaction data, and machine or device data (Manyika et al., 2011).

The Three Vs of Big Data

Data challenges can be “big” in terms of three characteristics, commonly known as the “Three V’s”:

- **Volume** – Challenges that arise from the vast amount of data that must be processed.
- **Velocity** – Challenges that arise from the need to process data within a certain timeframe.
- **Variety** – Challenges that arise from the many different types of data needed to understand a situation.

Source: Ahalt, 2012.

The amount of new data being created is mindboggling. The IDC forecasts that there will be 4 trillion gigabytes of new data created in 2013, nearly 50 percent more than in 2012 (Press, 2012). Google alone processes more than 24 petabytes of data each day, a thousand times more than all of the printed materials currently housed in the U.S. Library of Congress (Mayer-Schönberger & Cukier, 2013). Mayer-Schönberger and Cukier also report that Facebook has more than 10 million photos uploaded every hour, and that the number of messages on Twitter grows about 200 percent each year. That’s a lot of data.

Mayer-Schönberger and Cukier note that while technology has played a large part in creating the big data revolution, something else also occurred to push it along. “There was a shift in mindset about how data could be used,” they write. “Data was no longer regarded as static or stale....Rather, data became a raw material of business, a vital economic input, used to create a new form of economic value.”

Seven Insights into Big Data

Research conducted by MGI and McKinsey's Business Technology Office examined the state of big data and found the following seven insights:

1. Data have swept into every industry and business function and are now an important factor of production, labor, and capital.
2. There are five ways big data can create value:
 - a. Big data can unlock significant value by making information transparent and usable at much greater frequency.
 - b. As organizations create and store more transactional data in digital form, they can collect more accurate and detailed performance information on everything.
 - c. Big data allows ever-narrower segmentation of customers and can result in much more precisely tailored products or services.
 - d. Sophisticated analytics can substantially improve decision-making.
 - e. Big data can be used to improve the development of the next generation of products and services.
3. Big data will become a key basis of competition and growth for individual firms.
4. Big data will underpin new waves of productivity growth and consumer surplus.
5. While the use of big data will matter across sectors, some sectors are set for greater gains.
6. **There will be a shortage of talent necessary for organizations to take advantage of big data.**
7. Several issues such as privacy, security, intellectual property, and even liability, will have to be addressed to capture the full potential of big data.

Source: Manyika et al, 2011.

The Big Data Talent Shortage

The demand for big data talent is growing rapidly. A 2012 survey by InformationWeek found that 40 percent of respondents said they planned to increase their staff in big data and analytics in the upcoming year and estimated that big data staffing would increase by 11 percent over the next two years (Henschen, 2012).

The McKinsey study supports these findings. The authors predict that there will be a severe shortage of those who can analyze and interpret big data, predicting that by 2018, the United States could face a shortage of up to 190,000 workers with deep analytical skills and 1.5 million managers and analysts with the ability to use the big data analytics to make effective decisions. (Manyika et al, 2011.) This includes the ability to integrate findings from big data with knowledge derived from other techniques which offer different strengths and biases, such as focus groups and targeted surveys.

The increasing demand for big data analysts who can crunch and communicate the numbers and the lack of managers and business leaders who can interpret the data means there is a growing talent shortage in the field. A survey conducted by The Big Data London group (in Raywood, 2012) found that 78 percent of respondents said there was a big data talent shortage, and 70 percent believed there was a knowledge gap between big data workers and those commissioning the projects (e.g., managers and CIOs). Another survey by NewVantage Partners (2012) found that 60 percent of respondents reported finding it very difficult to find and hire big data professionals, and 50 percent of respondents said it was very difficult to find and hire business leaders and managers who could identify and optimize business applications in big data.

This impending talent shortage will create a significant challenge for HR and talent management professionals responsible for recruiting, developing, and retaining a critical skill set that will soon be in high-demand. To help their organizations realize the full potential of big data, HR and talent management professionals must understand the fundamentals of big data, why it matters, and what skills their organizations will need to analyze and interpret the large amounts of data they collect.

Big Data Skills

According to the editors of *CIO*, big data scientists and analysts need strong math skills and proficiency in working with massive databases and with emerging database technology. Plus, they must have a deep knowledge of their businesses, understanding the business processes, customers, and products. The most difficult big data skills to find, they contend, include:

- Advanced analytics and predictive analysis skills
- Complex event processing skills
- Rule management skills
- Business intelligence tools
- Data integration skills (CIO editors, 2012.)

Big data analysts or scientists must possess skills similar to their IT predecessors—they must have a solid computer science background that includes knowledge of applications, modeling, statistics, analytics, and math—but they also need business savvy and the ability to communicate their findings to business and IT leaders in meaningful ways, skills that are not typically required on IT job descriptions. “Good data scientists,” writes IBM, “will not just address business problems, they will pick the right problems that have the most value to the organization.” (IBM staff, n.d.).

As Rob Sentz, vice president of marketing for Economic Modeling Specialists International, notes in an interview for Career Builder, big data analysts “need to understand why they are using data. What is the end goal? Data is...like an assembly (line) of facts, which aren’t necessarily the same thing as truth. If facts are poorly interpreted, it could lead to the wrong conclusions.” (Lorenz, 2012).

Hilary Mason, chief scientist for bitly, a URL shortening service, offered her opinion in *The Wall Street Journal*. Data scientists, she says, “must be able to take data sets and model it mathematically and understand the math required to build those models. And they must be able to find insights and tell stories from that data. That means asking the right questions—and that is usually the hardest piece.” (Rooney, 2012).

CIOs will also need to adjust their roles in this new, big data environment. The authors of the *Strategic Guide to Big Data Analytics* noted that CIOs will need to realize that useful data can come from anywhere and everywhere. Big data, for example, can

come from the organization's server log files which track who checks into a website and what pages they visit. Analyzing who is checking in and where they go after they leave a page can give an organization better insight in what their customers want. CIOs will also need to realize that big data does not need to be organized beforehand; instead, data should be collected first with the goal to decide what to do with it later. Finally, CIOs will also need to recognize the skills their organizations will need to analyze big data and be an active participant in the training of or search for talent (CIO editors, 2012).

It is not just the technical leaders who need to rise to meet the challenges of big data; managers at all levels will also have to develop new knowledge, skills, and experience to be effective. As Jeanne Harris, senior executive research fellow for Accenture Institute for High Performance, wrote in an blog for *Harvard Business Review*, managers must become more adept at mathematical reasoning, and while they do not need to have the depth of statistical knowledge required of big data analysts, they will need to understand how to use statistical models and how to interpret data, metrics, and the results of statistical models. They must also have the ability to look beyond their functional areas and see the big picture so they can tell the story the data reveals (Harris, 2012).

It is this combination of business acumen, knowing the right questions to ask, and deep technical knowledge that is confounding most organizations when it comes to finding big data talent. One survey found that more than 60 percent of respondents said their employees need to develop new skills to translate big data into insights and business value (Harris, 2012). Developing these skills will take time, so many organizations are also looking to recruit critical talent – but these hard-to-find men and women won't come cheap; a *Wall Street Journal* article estimated that some data scientists were making as much as \$300,000 a year (Press, 2012) which gives large companies an advantage over small and medium sized companies for acquiring the big data talent.

Recruiting and Developing Big Data Talent

Unfortunately, you won't find big data talent coming out of many colleges and universities because big data majors are few and far between. The rapid growth of big data has outpaced colleges' and universities' ability to develop and implement new curriculums. A few universities are ahead of the curve, though, including North Carolina State University, which has a one-year Master of Science in Analytics (MSA)

program (supported by SAS, a business analytics software and services provider headquartered in Cary, North Carolina), University of Ottawa, Northwestern University, DePaul University, University of Connecticut, and Louisiana State University. Oklahoma State, Texas A&M, Texas Tech, California State University at Long Beach, and the University of Alabama also have strong analytics programs (Henschen, 2012). Data analytics courses are also available through Carnegie Mellon and New York University (Bradshaw, 2013).

IBM is following SAS' footsteps in helping move formal big data analytics education forward. In late 2012, IBM announced that it would partner with Ohio State University to develop a new data analytics center in Columbus, Ohio. The center will offer research, client services, and skills training (Press, 2012). IBM plans to hire 500 big data consultants and researchers in the next three years to staff the center and to work with the university to develop a curriculum in business analytics and mathematics (SmartBrief staff, n.d.).

IBM and SAS are both involved in another effort designed to unite the private and educational sectors to meet big data analytics educational needs. IBM, SAS, GE, Cisco, and NetApp have recently joined with a number of leading research universities to form the National Consortium for Data Science (NCDS). This consortium aims to better align university curricula and research with the needs of the private sector.

In response to the talent shortage, HR and talent management professionals are getting creative and looking outside the box when it comes to finding big data talent. Big data talent could come from the fields of research and development, finance, physics, biology, medicine, and even meteorology (Henschen, 2012, Hall, 2012). Jeremy Howard, chief scientist at an Internet startup that runs data prediction competitions has a degree in philosophy. He believes that the key job requirements in data science is really curiosity, flexibility, and the willingness to learn, capabilities that can be found in a wide variety of studies and job backgrounds (Hall, 2012).

At Google, recruiters try to assess a candidate's agility, curiosity, and willingness to experiment in the interviewing process by asking questions like, "How many golf balls would fit in a school bus?" or "How many sewer covers are there in Manhattan?" Getting the right answer isn't really the point of the exercise—the point is to assess a candidate's skills in experimental design, logic, and quantitative analysis (Harris, 2012).

Capital One also assesses mathematical reasoning in the recruiting process. All prospective employees—including senior executive candidates—are tested for mathematical reasoning, logic, and problem-solving skills. Proctor & Gamble has

developed a big picture/data literacy program which establishes a baseline digital-skills inventory for all employees. The program then offers developmental opportunities tailored to every level in the organization (Harris, 2012).

As demand for big data talent grows, competition for this talent will become more aggressive - and expensive. Recruiting and retaining big data talent will become a significant challenge. HR and talent management professionals will also need to provide development opportunities; helping managers and business leaders at all levels develop the right skills. According to a survey conducted by The Big Data London group, 80 percent of respondents said that on-the-job training is among the best ways to learn and keep up-to-date with the latest big data skills, and 72 percent cited “self-teaching” (Raywood, 2012). The NewVantage Partners survey found that 69 percent of respondents were training their existing analytic professionals to get up to speed (NewVantage Partners staff, 2012).

On-the-job training and self-teaching may not be adequate in developing existing staff, particularly if they “don’t know what they don’t know.” Fortunately, according to an *Information Week* report, a growing number of organizations are offering big data training and development through conferences, seminars, online courses, webinars, and certification programs (Henschen, 2012).

4 Steps to Bridge the Big Data Talent Gap

To address the talent gap created by the big data revolution, HR and talent management professionals should:

1. Educate themselves about big data.

HR and talent management professionals must educate themselves about big data and learn how big data will be a strategic driver for competitive advantage in their organizations. This means they must be proficient in big data and familiar with the skills and abilities big data scientists, analysts, managers, and senior executives need to be successful. HR and talent management professionals must also understand how big data can be applied to their own jobs, in recruiting (e.g., Gild’s analyzing of open-source code to recruit technical engineers), salary, benefits, retention, social media, and performance reviews, and they must be leaders in using big data to advance the HR function.

2. Educate managers and senior leaders about big data.

To use big data successfully, managers and senior leaders (including the CIO) must also develop new knowledge and skills—and they must understand the real potential of big data. Business leaders must develop and continue to nurture a broad perspective, to see what’s possible. Successful leaders will be those prepared to look beyond the current business model to see future opportunities that are made available through big data. They must be prepared to ask “blue sky” questions. They must be willing to take some risks. They need to become comfortable with the complexity that is inherent in big data and become adept at making the complex easier to understand. They must also embrace the change that is inevitable through big data, and have the ability and courage to lead the organization through change.

Many of these skills are not new, but they take on new meaning—and urgency—when viewed through the lens of big data. HR and talent management professionals must work with managers and business leaders at all levels to educate them about big data and help them to develop the skills they will need to be successful.

HR and talent management professionals must also work as business partners to the various business units seeking to attract big data talent. As noted, a key component of recruiting the right big data people will be asking the right questions—and this will require close collaboration with business leaders to understand the business needs.

3. Develop creative strategies to recruit and retain big data talent.

Big data analysts and business leaders who understand big data will be in high-demand and ripe for poaching. Talent management professionals should anticipate this talent shortage and adopt a more aggressive recruitment strategy for this population. They should also think outside the box and become more creative in recruiting for this skill set – considering non-traditional background and experience to meet the growing need. Retaining this talent may also become a challenge, so HR should consider compensation, incentive, and recognition systems designed to keep this talent within the organization.

4. Offer solutions to build big data talent in their organizations.

HR and talent management professionals may want to consider taking a page from Proctor & Gamble’s training book and develop an appropriately scaled organization-wide big data literacy program. The program can include formal programs and seminars, but on-the-job training, mentoring, and self-paced learning programs can

also offer affordable and effective results. These developmental opportunities may also provide an opportunity to identify employees in departments other than IT who possess an aptitude for, and interest in, big data analysis.

Conclusion

Big data is big business, but its sudden appearance in the marketplace has left a huge hole in terms of talent. HR and talent management professionals must stay ahead of the curve by learning more about big data, its applications to their organizations as a whole and their functions in particular, and plan now to develop existing talent and recruit new talent that will be needed to realize the full potential of big data.

About RENCI

RENCI (**Renaissance Computing Institute**) develops and deploys advanced technologies to enable research discoveries and practical innovations. RENCI partners with researchers, policy makers, and technology leaders to engage and solve the challenging problems that affect North Carolina, our nation and the world. An institute of the University of North Carolina at Chapel Hill, RENCI was launched in 2004 as a collaborative effort involving UNC Chapel Hill, Duke University and North Carolina State University.

About UNC Executive Development

Our approach to program design and delivery draws upon the power of real-world, applicable experiences from our faculty and staff, integrated with the knowledge our client partners share about the challenges they face. We call this approach [The Power of Experience](#). We combine traditional with experiential and unique learning to ensure that all individuals gain relevant new skills that they can easily implement within their own organizations. Through action learning and business simulation activities, we challenge participants to think, reflect and make decisions differently.

Our Approach: The Partnership: Our team customizes each leadership program through a highly collaborative process that involves our clients, program directors, faculty and program managers. We are dedicated to following-up with our clients and individual participants to ensure that their learning experiences have been meaningful and impactful. This integrated approach consistently drives strong outcomes.

Our Approach: The Results: Our executive education programs are designed with results in mind, and we are focused on successfully meeting our clients' business and academic expectations. Below are a few examples of the results our client partners have achieved:

- Leadership refocused with new strategy and cohesive vision
- Strategic plans created for the global marketplace
- Supply chains streamlined
- Products redefined
- New markets targeted
- Cost-saving measures developed
- Silos leveled
- Teams aligned

Participants leave empowered to bring in new ideas, present different ways to grow business and tackle challenges. The result is stronger individuals leading stronger teams and organizations.

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