BRIDGING THE TECHNICAL SKILLS GAP

How IT teams can keep up with growing talent needs as technology and big data mature

upwork enterprise™

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PART 1

TECH'S NEW ROLE

IMPACT OF TECHNOLOGY

Big data is one of the top priorities for companies determined to remain competitive and grow. But as big data technologies continue to mature, companies are scrambling to keep up with the talent needed to support it.

The problem is, most companies haven't caught up with the tech talent shortage yet. And the job market is still highly competitive. This means the talent gap that's plaguing engineering teams is quickly expanding into a chasm.

But as any good engineer knows, if there's a problem, there's a solution.

Here's how the expanding digital world is creating new tech demands and how it changes the makeup of the ever-present talent shortage. Just as importantly, see how other engineering teams are bridging the gap using creative workforce solutions.

INVESTMENTS IN BIG DATA

Big data is now mainstream within Fortune 1000 companies. Of those **surveyed**, over six out of 10 have at least one big data process in operation. This is nearly double the 31.4 percent in 2013.

Their efforts show so much promise, it's expected that these companies will continue to increase investments into big data. Nearly **70 percent** of the companies surveyed see big data as very important or critical to their business success.

But one of the biggest changes from big data isn't the technology. It's how IT functions within business.

FROM THE BACK OFFICE TO THE BOARDROOM

In the last few years, IT moved from working largely as a supporting role within organizations to becoming a critical business partner. Together, IT and business leaders can turn insights into decisions that drive innovation and increase revenue. IT benefits an organization's bottom line by using big data to

- make information transparent and usable at much higher frequency
- collect more accurate and detailed information to boost performance
- make better management decisions
- fine-tune customer segmentation to provide customized products or services
- improve development of next generation products and services

IT functioning as a business partner may feel a bit new still, but it is a natural evolution. Business leaders recognize they must adopt an "all in" approach if they want to benefit from big data. This requires full commitment and collaboration with technology.

CASE STUDY

ENGINEERS PROTECT LIVES IN REAL TIME

Rolls-Royce manufactures powerful engines that are used by over 150 armed forces and 500 airlines. A single manufacturing failure can cost billions—and worse, human lives. Because of the immense consequences, Rolls-Royce uses big data to identify potential problems before they happen.

Rolls-Royce relies on big data processes in three vital areas: design, manufacture, and after-sales support.

"We have huge clusters of high-power computing which are used in the design process. We generate tens of terabytes of data on each simulation of one of our jet engines. We then have to use some pretty sophisticated computer techniques to look into that massive dataset and visualize whether that particular product we've designed is good or bad," says Chief Scientific Officer, Paul Stein.

> **"We have huge clusters of high-power computing which are used in the design process...[to] visualize whether that particular product is... good or bad."**
>
> — Paul Stein // Chief Scientific Officer

Add to that, the company's manufacturing systems are becoming networked and moving quickly towards an Internet of Things (IoT) based solution.

As part of their after-sales support, Rolls-Royce engines and propulsion systems are all fitted with hundreds of sensors that record every detail about their operation. The sensors report all data changes back to engineers located in service centers worldwide. The engineers receive this information in real time, then decide the best course of action.

Engineers also consolidate data from their engines to highlight factors and conditions under which engines may need maintenance. Rolls-Royce foresees that computers will carry out most of the interventions. People will step in as needed to avoid engine problems before they occur.

The company says using big data to diagnose faults, correct them, and prevent them from happening again has "significantly" reduced costs. It also enabled Rolls-Royce to offer a new model to clients, which they call Total Care.

"That innovation in service delivery was a game-changer, and we are very proud to have led that particular move in the industry. Outside of retail, it's one of the most sophisticated uses of big data I'm aware of," says Stein.

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— Paul Stein // Chief Scientific Officer

EVOLVING TECH DEMANDS

Until recently, companies focused on storing, processing, and extracting valuable insights from big data. But as companies collect more information, it's demanding new technologies that extract more value with more agility.

The need for speed

As IT seeks to pull more value from existing data, our focus is less about big data and more about the right data. We aim our efforts at asking the right questions and making use of the data we have.

However, processing enormous volumes of data isn't enough. Today, we must process it faster to make decisions in real time. Hence the rise of stream processing platforms like Apache and Kafka.

Few were faster than the retail industry in recognizing the value of real-time decision making.

When shopping on **Amazon**, you've probably noticed the "you might also want" prompts at the bottom of product pages. They're generated by passing real-time transaction information into collaborative filtering. Then it combines results with other unstructured data, such as product reviews, to generate the most fitting recommendations. These suggestions are so successful that at one point, Amazon reported that 30 percent of sales came from these recommendations.

Adopting more AI

Deep Learning, a sub-set of artificial intelligence, is helping companies use their large data sets to solve a wider array of business problems. This may lead to the emergence of new tools for collecting and analyzing data. **Forrester Research** envisions more services will develop "support applications and processes with machines that mimic some aspects of human intelligence."

While AI platforms speed up analysis, true answers begin with the data quality. This requires data scientists and machine learning (ML) experts to structure the data for each business, before a data model is used.

Preserving privacy

More people are remaining connected to digital networks through handheld devices, wearables, and the IoT. This generates more data and provides companies more access to information than ever imagined. Therein lies the threat.

With greater amounts of data comes herculean responsibility. Data analysts must remain vigilant against data breaches, discriminatory algorithms, exposing identities, inaccurate analysis…the list goes on.

Maintaining stringent privacy controls and procedures is more important than ever. And doing it at the speed of technology is more difficult than before. **Gartner** predicts that by 2018, 50 percent of business ethics violations will be related to data. A statistic all companies want to avoid.

Flexible technology

Tableau predicts companies will explore use case-specific architecture design based on needs. "They'll combine the best self-service data-prep tools, Hadoop Core, and end-user analytics platforms in ways that can be reconfigured as those needs evolve."

In the quest for greater flexibility, Tableau also sees a trend towards platforms that are data- and source-agnostic. This can provide analytics on all data—a feature more companies are demanding.

Variety over volume

Big data is made up of what Gartner calls the three Vs: a huge amount of volume, velocity, and variety. While this trifecta remains true, a recent **survey** of Fortune 1000 companies found more are investing in variety over all other factors. In 2016, 40 percent of technological investments were driven by increasing variety, versus 14.5 percent for volume, and 3.6 percent for velocity.

The movement to integrate more new and legacy data sources will continue to grow. Of the companies surveyed, **73.2 percent** built an analytics sandbox, and 41 percent adopted a data hub. If analytics platforms want to continue meeting company demands, they better provide live, direct connectivity to various data sources.

PART 2

THE WIDENING SKILLS GAP

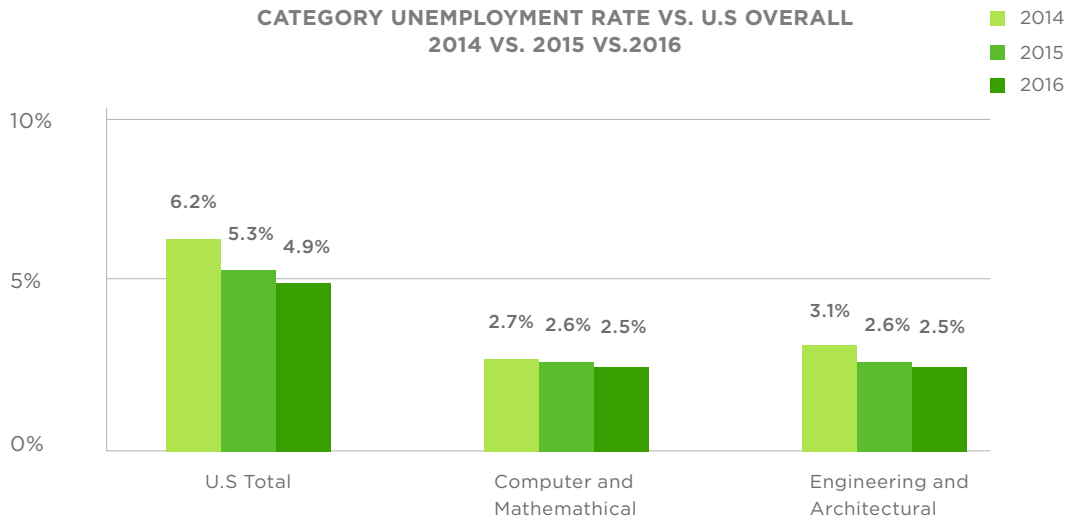
STRUGGLING TO KEEP PACE

While technology continues to advance, the people needed to support it are falling behind. Our schools and tech programs aren't churning out enough qualified graduates to keep pace with demand. Last year alone, **1.3 million** software jobs opened, and it's estimated nearly 513,000 remain unfilled.

The U.S. Bureau of Labor Statistics predicts that in 2020, 1.4 million software development jobs will remain open because there aren't enough skilled people to fill them. Last year,

- **88 percent** of businesses with 1,000+ employees were having a hard time finding employees.
- **73 percent** of businesses with <1,000 employees were having a hard time finding employees.

Tech unemployment rate remains low and continues dropping. In the high-demand computer and engineering segments, tech unemployment stands nearly half that of the national average.



(Sources: EMSI | U.S. Bureau of Labor Statistics)

The bottom line is: The enormous stream of data holds tremendous potential, but it's only useful if you use it. Unfortunately, many companies don't. In fact, more than **90 percent** of companies admit they don't use their data effectively.

The two largest reasons are because many companies don't have a data analytics infrastructure in place. Possibly because they don't have the talent to implement it. And because they don't have the time to analyze their data. Again, due to a lack of talent.

Trouble is, the demand for freelance experts and employees continues to surge.

DATA ROLES ARE MULTIPLYING

Data scientists were the third fastest growing skill in demand on Upwork in Q4 2016. With a 16 percent rise in job postings over the past year. And a 2015 MIT Sloan Management Review survey showed **40 percent** of companies were struggling to find and retain data analytics talent.

The numbers will continue worsening. By 2018, it's predicted demand will create

- **190,000** more deep analytical talent jobs
- **905,000** more jobs involving data management and interpretation skills
- **1.5M** more data-savvy management roles in the U.S.

CRITICAL TECH ROLES IN HIGH DEMAND

Below are seven critical business intelligence skills that are becoming especially difficult to find.

Data visualization

Data visualization is a blend of art and science. A data visualization expert presents data and explains concepts visually for a universal audience. This helps others grasp the information quickly, see answers to problems, and identify patterns.

Data analytics

Data analysts focus on developing actionable insights from data sets. Data analysts should have a baseline understanding of these core competencies:

- business acumen
- programming
- multiple software languages
- data interpretation
- quantitative skills

Data science

Data scientists analyze data with mathematical techniques and algorithms to transform a high volume and high velocity of data into actionable insights. They turn sheaths of data into visualizations and stories that can help inform more targeted, effective strategies.

Data architecture

Data architects design and deploy the systems and related processes to gather, process, and analyze all the valuable data coming in from a multitude of sources. Not all data sets look the same, so data architects are crucial in helping to build custom solutions that can handle the specific storage and processing requirements of diverse data points.

Data engineering

Data engineers scale data solutions and build products. According to Ashish Thusoo, CEO of **Qubole**, data engineers are rare because they understand infrastructure and architecture. And they understand how to process data and how it will be used. Data engineers will be in greater demand as more organizations scale their data initiatives.

Artificial intelligence / Machine learning

Machine learning (ML) is one approach to the field of artificial intelligence (AI) in which computers learn from each other. Using algorithms that iteratively learn from data, computers find hidden insights without being programmed where to look. ML makes it possible to quickly produce models that can analyze bigger, more complex data and deliver accurate results faster. This helps companies avoid risks and better identify profitable opportunities.

Data modeling

Data modeling is the basis for how all databases are designed. It provides the logic that allows database architects to create the physical schema of a system. It involves documenting the relationships between data items and identifying the organizational business requirements, so the database meets all requirements from the top down.

PART 3

FILLING THE VOID

SECURING THE RIGHT TALENT

No matter how technology changes, the most important component in IT is the people. Without the right engineering talent, you can't build the structure or implement the tools to create success.

It's difficult enough that schools and programs aren't graduating enough skilled talent. But you're also facing a growing workforce that's demanding more freedom.

FREELANCER GROWTH

Millennials to Baby Boomers are seeking more work flexibility. And they're choosing to work on projects that provide more personal and professional satisfaction. That's why a growing number of professionals are turning down traditional jobs to go freelance.

Upwork's latest **Freelancing in America** survey reports there are 57.3 million freelancers today. And it's predicted freelancers will total more than half of the U.S. workforce by 2027.

Convincing freelancers to return to a traditional job may be a hard sell. Some companies attract talent by allowing telecommuting. Many are dividing the job into project-based work and engaging freelancer experts to fill the talent gaps.

TALENT SHORTAGE SOLUTIONS

With new problems come new solutions. No matter how formidable the talent gap may seem, these four options can help you secure the right talent.

Groom from within

Doug Henschen of InformationWeek suggests companies don't just compete for the same tiny talent pool. Instead, create your own talent pool by investing in your employees. "We hate to dash the hopes of those counting on a lot of external hiring, but it's unlikely you'll fill the talent gap with recent graduates and people lured away from other companies. The good news? It's a good bet you won't have to beg existing employees...to line up for training opportunities," says Henschen.

PROS	CONS
• Eager talent pool • Train according to your company needs	• Must design your own vetting and training processes • Longer learning curve • Limited talent pool • Inexperienced team

Divide the roles

In the end, data isn't about the elegance of the analytics. It's about solving real business problems. That's why more companies realize the answer may lie in dividing work between STEM-based science and business analysis.

For example, a successful data scientist must be technically and mathematically capable of analyzing data. They must also be skilled storytellers adept at drawing insights from the raw data and presenting it in a compelling way.

Instead of finding that single unicorn to do it all, play to people's inherent strengths. You may have someone within your team who is skilled at storytelling, or can be with a bit of training. Then you may just need someone who can analyze the data. And assign data management to another person.

PROS	CONS
• Potentially faster time to hire • Improves output and morale as talent focuses on their core strengths • Increases productivity as it frees staff to work on key responsibilities	• Requires more people to get the work done • Increases management responsibilities • Adds administrative time

Hire a traditional agency

With their niche expertise and specialized knowledge, working with a traditional staffing agency can help you fill the gaps across many types of positions. However, finding the right agency can be time-consuming. As technology continues to change at a brisk pace, it's difficult for traditional agencies to maintain a proper talent pool and anticipate a company's needs. Other factors to consider: onboarding times can be lengthy, and their fee markups can get costly.

PROS	CONS
• Provides specialized knowledge and expertise • Frees the tech staff to work on core responsibilities, instead of recruiting • Reduces recruiting burden from HR or procurement	• It can take time to find the right agency • Agency markups can be costly • Lengthy onboarding and time to start • Finding the right talent can require costly trial and error

Work with freelancers

Freelancers are experts in their field. They can provide new perspectives that may help improve project outcomes and increase innovation. To benefit from their freelancers' expertise further, more companies are creating hybrid or distributed teams.

These teams are made up of employees and freelancers who collaborate on projects of any size. Employees perform the ongoing work that moves your company forward. Freelancers perform project-based work requiring specialized skills.

For years, some IT departments adopted hybrid teams because it provides greater access to talent, increases agility, and improves cost effectiveness. As technology makes collaboration across time zones easier, hybrid teams are becoming a more mainstream practice. So you truly can work with the best talent, not just the best talent available locally.

PROS	CONS
• Faster time to hire • Fill talent gaps on special projects • Cost-effective, avoid agency markups • There are no agency overhead costs • Access global talent pool • Greater agility and flexibility	• Training staff to work with freelancers • Communication challenges • Choosing the right talent • Availability of talent for subsequent projects

PART 4

BENEFITS OF BIG DATA

STAYING AHEAD

As our world becomes more digital, business relies on IT to stay competitive. Your challenge lies in finding the skilled help you need to execute big data initiatives at the pace and sophistication you require.

But relying on traditional workforce solutions may leave your team without critical skills. Those solutions were developed during the industrial-age when work expectations and the market were predictable and stable. Today, markets can change daily.

Today, technology—not business—determines the speed of change.

The talent you need to stay ahead is out there. But just as the work has changed, so must your workforce solutions.

What's more important is you don't need to find the talent yourself. Upwork Enterprise is immersed in this fast-changing talent landscape. Instead of filling the talent gap on your own, see how Upwork Enterprise can help you implement and execute more data-driven initiatives with freelancers.

ABOUT UPWORK ENTERPRISE

Upwork Enterprise is a freelancing website that combines technology and services, giving companies a single solution that makes it easier to get work done with freelancers. Built on the world's largest freelancing website, enterprise businesses get simple, quick, and cost-effective access to qualified contractors and agencies. The result is work delivered to you faster and more affordably.

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