THE PREDICTIVE ENTERPRISE:
WHERE DATA SCIENCE MEETS SUPPLY CHAIN

DHL Supply Chain

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DHL

> *"The next generation of data analytics will save our customers time and money by moving to a 'predict and fix' model… All across our company, we are driving down operating costs and increasing uptime for our customers by turning big data into valuable, actionable information."*
>
> **Doug Oberhelman, Chairman and CEO, Caterpillar Inc.[1]**

Harnessing the true power of data-driven insight is the holy grail of future business. A wealth of this data comes from the supply chain. But, while the information is there, companies are not yet capitalizing on its real value as a source of insight capable of shaping the future of the enterprise.

Most companies are, in fact, awash with a potential gold mine of untapped supply chain information. And while this body of data certainly runs the day-to-day flow of goods around the world, it remains largely underutilized for enterprise-level business insight and transformation.

But not for long.

Companies are no longer restricted to running their business by 'looking in the rearview mirror' – i.e. managing based on information that is weeks or months old. Thanks to new technologies – combined with new management science – organizations are starting to anticipate and even predict the future, to get ahead of their business and direct their global operations accordingly.

Data mining, pattern recognition, business analytics, business intelligence – along with other tools – are coalescing into an emerging field of supply chain data science that has the potential to drive this evolution. These new intelligent analytic capabilities are changing supply chains – from reactive operations, to proactive and ultimately predictive operating models. The implications extend far beyond just reinventing the supply chain. They will help map the blueprint for the next-generation global company – the insight-driven enterprise.

[1] Doug Oberhelman, Caterpillar Inc., Remarks as Prepared for Delivery at 2015 Annual Stockholders Meeting, http://www.caterpillar.com/en/news/caterpillarNews/innovation/ceo-doug-oberhelmans-full-remarks-at-the-2015-annual-stockholders-meeting.html
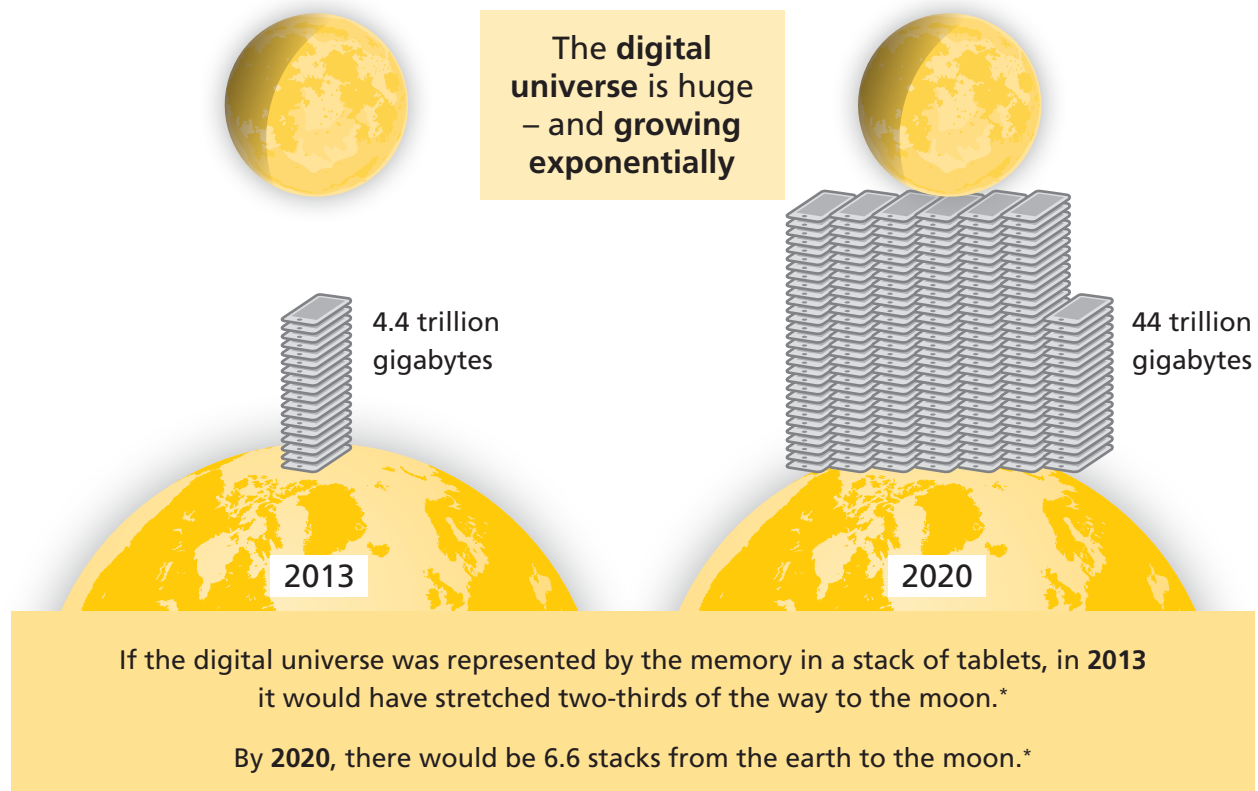
PART 1:
RIDING THE TIDAL WAVE

Today, companies are flooded with data. More data has been created in the last two years than in all of human history, due in large part to the convergence of the Internet of People with the Internet of Things. Market research firm IDC notes that in 2014 the digital universe equaled 1.7 megabytes a minute for every person on earth. Between now and 2020, the digital universe will grow by a factor of 10 – from 4.4 trillion gigabytes to 44 trillion (Figure 1).[2]

Frustratingly though, most of this data is not useful because of its raw state and the fact that it is often held captive inside organizational siloes. One such silo is the supply chain.

In any global company, the supply chain is one of the largest sources of big data. It carries and produces information that affects almost every other area of the business.

[2] "The Digital Universe of Opportunities: Rich Data and the Increasing Value of the Internet of Things," last modified April 2014, http://www.emc.com/leadership/digital-universe/2014iview/executive-summary.htm

FIGURE 1:
GROWTH OF THE DIGITAL UNIVERSE

The **digital universe** is huge – and **growing exponentially**

4.4 trillion gigabytes

44 trillion gigabytes

2013

2020

If the digital universe was represented by the memory in a stack of tablets, in **2013** it would have stretched two-thirds of the way to the moon.*

By **2020**, there would be 6.6 stacks from the earth to the moon.*

* iPad Air – 0.29" thick, 128 GB

Source: IDC, 2014.

Most businesses, however, do not tap this potential treasure-trove of information effectively, despite the fact that they recognize the potential value of doing so. According to an Accenture survey, 97 percent of executives report having an understanding of how big data analytics can benefit their supply chain, but only 17 percent report having already implemented analytics in one or more supply chain functions.[3]

If you are responsible for your company's smartphone sales in the United States, for example, with good data analytics you get up on Monday morning, switch on your tablet and see real-time analysis of your sales in every state, along with your shipping costs and your pain points (e.g. lagging sales). Based on this information, you dynamically adjust your production schedule, the marketing budget, sales promotions, inventory position, stock locations and transportation routing – and intelligently decide to back off in one area and ramp up in another. As a result, you capture sales, avoid excess inventory, improve service, shrink product obsolescence and improve your bottom line.

> Using big data analytics moves us beyond being reactive ... it allows industries to make game changing predictions.

That's what supply chain big data can mean for the enterprise.

Capitalizing on big data goes beyond the internal borders of the company, however. It also includes gathering, analyzing and incorporating external sources of information, both structured and unstructured. This incorporates everything from news feeds and weather predictions to social media.

"Data is the key to the future of everything," stresses Jesse Laver, Vice President, Global Sector Development, Technology, for DHL. "We need to be able to look not just at real-time sales but also at industry trends, and even what's going on in the news for 'X' celebrity who wears a red headset to an event. We need to follow and mine social media for that celebrity, because now everyone wants a new headset in red, and we need to immediately adjust our production and distribution to capture that opportunity."

"Using big data analytics… moves us beyond being reactive and allows industries to predict and prevent," comments Craig Williams, Vice President, Quality, Johnson Controls Power Solutions, in an Accenture report on the industrial internet. "Ultimately, we want to be able to leverage predictive analytics to prevent and solve problems, while continuously improving processes."[4]

[3] "Big Data Analytics in Supply Chain: Hype or Here to Stay? Accenture Global Operations Megatrends Study," Accenture, 2014, p. 3.
[4] "Industrial Internet Insights Report," Accenture, 2015, p. 11.

PART 2:
CRAWL, WALK, RUN

While supply chain analytics tools and technologies have come a long way in the last few years, integrating them into the enterprise is still far from easy. Companies typically progress through several stages of maturity as they adopt these technologies. Richard Sharpe, CEO of Competitive Insights, refers to this as the 'crawl, walk, run' continuum.

The first rungs on this continuum – the 'crawl and walk' phases – are in place today at many global companies. Collectively, these two stages are known as the descriptive supply chain, whereby organizations use descriptive information and analytics systems to capture and present data in a way that helps managers understand what is happening. Descriptive analytics comprise business intelligence systems, such as supply chain dashboards and scorecards, and enable ad hoc queries. They also include data visualization and geographic mapping, which help tell a story with the data. Utilizing these tools, companies can manage the day-to-day operation of their supply chain to become more agile and cost-effective.[5]

> Companies that continue to rely on traditional supply chain models will struggle to remain competitive.

These tools have been very effective in helping companies cut costs and eliminate waste in their supply chains. But, as a study by Deloitte and the Material Handling Institute (MHI) indicates, these "incremental improvements are leading to diminishing returns. This is driving the need for supply chain executives to seek more innovative

solutions." According to George Prest, CEO of MHI, "Companies that continue to rely on traditional supply chain models will struggle to remain competitive."[6]

As a result, leading corporations are rapidly moving beyond the 'descriptive' phase and aggressively pursuing the 'run' stage – known as the predictive supply chain. These companies are layering analytic techniques and tools onto their existing descriptive information architecture. With these tools, organizations can reduce inventory, start to sense and shape demand, streamline networks, improve agility and responsiveness, and generally get out ahead – not just of their supply chain but of their business as a whole.

Companies are only at the beginning of this journey toward the predictive enterprise. According to the MHI/Deloitte study, which canvassed 400 supply chain professionals from across industry verticals, less than 25 percent of respondents have adopted predictive analytics to date, although that number is expected to climb to 70 percent over the next three to five years. Only 24 percent of surveyed companies currently use these types of systems. However, 38 percent cited them as a source of competitive advantage.

[5] Lisa Harrington, "Richard Sharpe Interview," 2015, p. 9.
[6] "The 2015 MHI Annual Industry Report, Supply Chain Innovation – Making the Impossible Possible," Deloitte-MHI, 2015, p. 4.
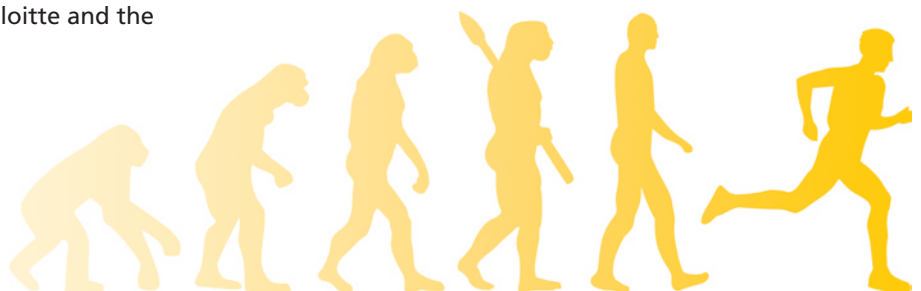
PART 3:
THE POWER OF PREDICTIVE

The predictive supply chain is an essential underpinning of a reimagined, predictive enterprise. That much is clear.

"The reality of this new kind of supply chain is now within reach," says Gary Keatings, Vice President Global Solutions Design Center of Excellence and Product Development, DHL Supply Chain.

But the bigger opportunity of the predictive supply chain lies in using the analytical output to inform the strategic direction of the entire enterprise. The supply chain touches or affects every area of the global organization and is steward to a wealth of

information. It is the keeper of current and past performance and, with the help of new tools and smart analysts, may well be a determiner of future success.

"This is not about making incremental improvements to distribution, logistics, inventory efficiency or the like," Sharpe, of Competitive Insights emphasizes. "This has the power to transform companies."

"For example," Keatings explains, "from supply chain data, we can calculate the current cost to serve for each product line, each market, etc., and can adjust the supply chain strategy accordingly. We

As a supply chain intelligence partner, we can help our customers run their entire business better to improve the bottom line. That is powerful.

become a supply chain intelligence provider to our customer, and help them optimize global business in a way that is not happening today. As a supply chain intelligence partner, we can help our customers run their entire business better to improve the bottom line. That is powerful."

Organizations that have adopted supply chain analytics in pursuit of a more predictive enterprise report a high return on investment in multiple areas
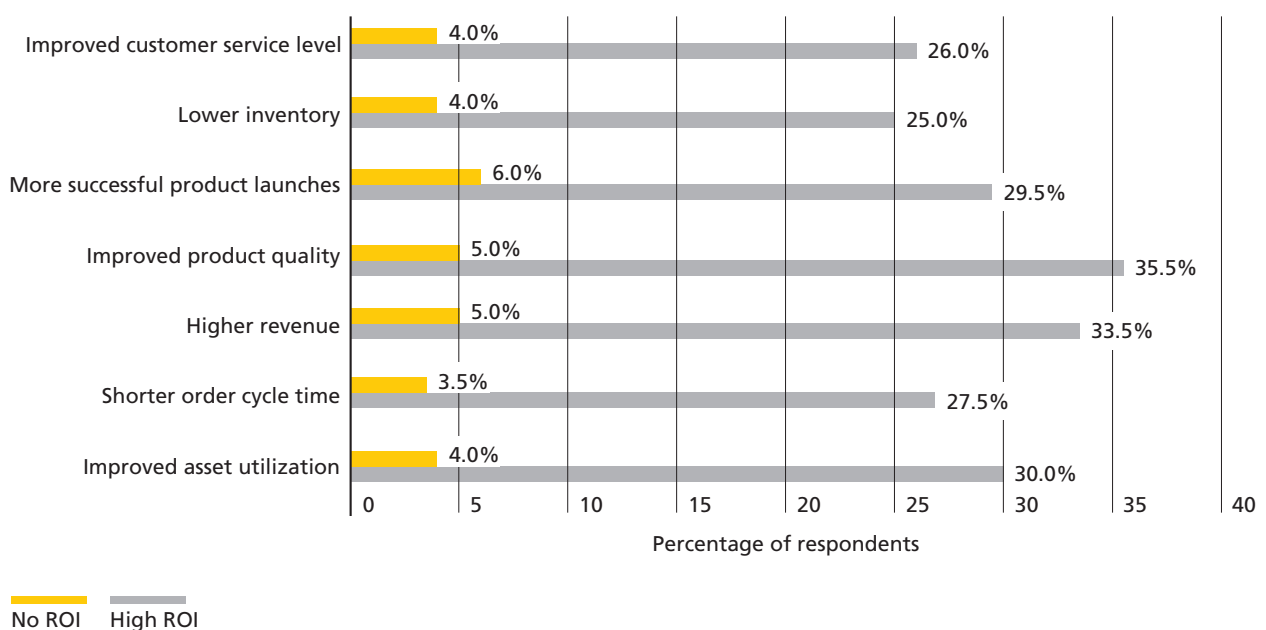
of the business (Figure 2). According to Gartner, better analytics produced tangible benefits in areas of product quality, revenue, asset utilization, product launches, order cycle time and more.[7]

Gartner finds that companies that do a better job of predicting future demand can often cut 20 to 30 percent out of inventory, depending on the industry, while increasing the average fill rate by three to seven percentage points. Such results can generate margin improvements of as much as one to two percentage points.[8]

[7] "Deconstructing Supply Chain Analytics," Gartner, April 10, 2015, p. 4.
[8] Michele Brocca, Christian Greiser, Libor Kotlik, "Making Big Data Work: Supply Chain Management," Boston Consulting Group, January 27, 2015, accessed 11/9/15, https://www.bcgperspectives.com/content/articles/technology_making_big_data_work_supply_chain_management

FIGURE 2:
THE ROI OF SUPPLY CHAIN ANALYTICS

	No ROI	High ROI
Improved customer service level	4.0%	26.0%
Lower inventory	4.0%	25.0%
More successful product launches	6.0%	29.5%
Improved product quality	5.0%	35.5%
Higher revenue	5.0%	33.5%
Shorter order cycle time	3.5%	27.5%
Improved asset utilization	4.0%	30.0%

Percentage of respondents

No ROI   High ROI

Source: Gartner, 2015.

"Supply chain is in the data orchestration business," notes Laver. "It's our job to make sure that all of the different ballerinas on the stage don't trip over each other and fall into the orchestra pit. That means insight and coordination on an entirely new level."

What will it take to realize this vision? It requires extending the linkages in the supply chain beyond their current state. "We need to be connected not just to our customers' supply chains but to their manufacturing operations and to their suppliers, as well as to the machines and devices that work across the supply chain," says Keatings. "This gives us a true 360-degree cockpit view of the entire extended supply chain."

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The primary driver behind companies pursuing transformation to a predictive enterprise is the bottom line – margins, profits and competitive advantage. "It becomes a question of science," says Sharpe. "Does the company want to move from decisions partially supported by data and opinions to an environment where they are solely based on real-time facts coupled with business insight? That question should drive the whole conversation."
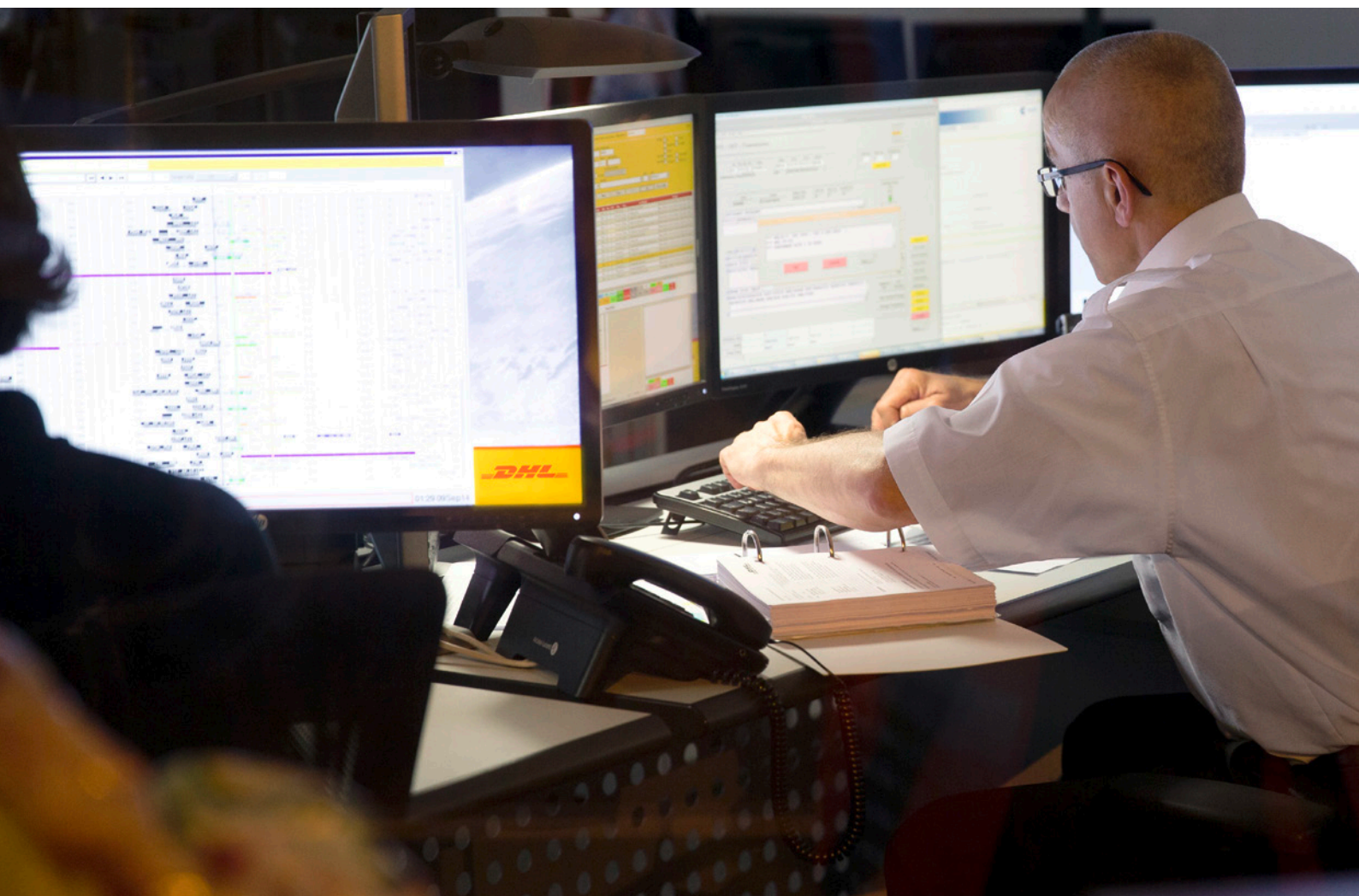
HELP WANTED: NEW SKILLSET NEEDED

Business analytics and intelligence are great tools. But they require guidance and interpretation by people who know the tools as well as the business – including the supply chain. "You need to lead with the people who know the business – they're the ones who can tell you what questions to ask to guide the analytics," says Richard Douglass, Industry Value Consultant, IBM Analytics.

Others agree. "Being a data scientist is not only about data crunching. It's about understanding the business challenge, creating some valuable actionable insights to the data, and communicating their findings to the business," says Jean-Paul Isson, the Global Vice President of Predictive Analytics and Business Intelligence at Monster Worldwide, Inc.[9]

That's driving a completely new supply chain skillset requirement – the need for data scientists. "Supply

chain data scientists have three kinds of expertise," explains Keatings. "Technical knowledge about tools and technology capabilities, functional knowledge about supply chain management and mathematical knowledge of algorithms. The blend of these three skillsets enables them to combine data into new insights for the enterprise."
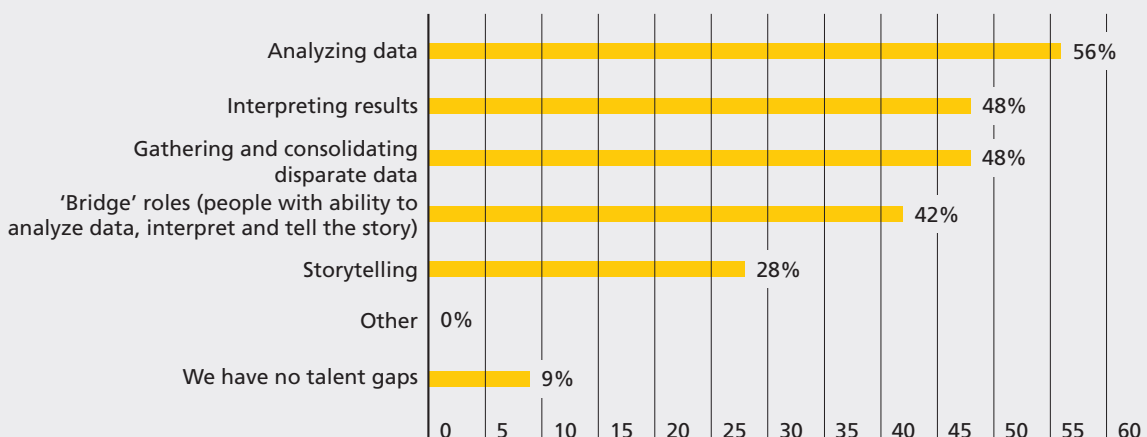
But this skillset is in short supply, now and for the foreseeable future, across all areas of the business – not just the supply chain (Figure 3).

"This is an issue companies will have to address," observes one senior supply chain executive in the heavy industrials sector. "It is a major concern, and a potential constraint to our growth."

[9] Allan E. Alter, Jeanne G. Harris, Krista Schnell, Nathan Shetterley, "The Team Solution to the Data Scientist Shortage," Accenture, 2013, p. 3.

FIGURE 3:
THE DATA SCIENCE TALENT GAP

In which of the following areas do you have gaps in your talent? (Multiple responses)

Area	Percentage
Analyzing data	56%
Interpreting results	48%
Gathering and consolidating disparate data	48%
'Bridge' roles (people with ability to analyze data, interpret and tell the story)	42%
Storytelling	28%
Other	0%
We have no talent gaps	9%

Percentage of respondents

Source: Accenture and GE, "Industrial Internet Insights 2015," 2014, p. 27.

PART 4:
A BIGGER END GAME

The data within the supply chain, when used creatively and with appropriate analytics and interpretation, can provide invaluable information to the enterprise as a whole – far beyond the supply chain itself. Therefore, the task ahead for far-seeing companies is to apply predictive analysis to supply chain data, and use the results to attain measurable competitive advantage.

"This is not about having a better supply chain," concludes Sharpe. "This is about having a smarter

> This is not about having a better supply chain. This is about having a smarter enterprise.

enterprise. The end-game objective is far bigger than just operational improvement. Ultimately, it's about creating profit, growth and value on a sustained basis."

ABOUT THE AUTHOR

Strategic consultant, academic and co-author of three books, **Lisa Harrington** offers a global supply chain perspective.

At the Robert H. Smith School of Business, University of Maryland, Lisa is Senior Research Fellow of the Supply Chain Management Center and Faculty Lecturer on Supply Chain Management. She is also President of the lharrington group LLC, a firm providing strategic consulting services across global supply chain strategy, operations and best practice.

Lisa's articles have appeared in Fortune, Industry Week, The Economist, Inbound Logistics, The European Business Review and many other publications.

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