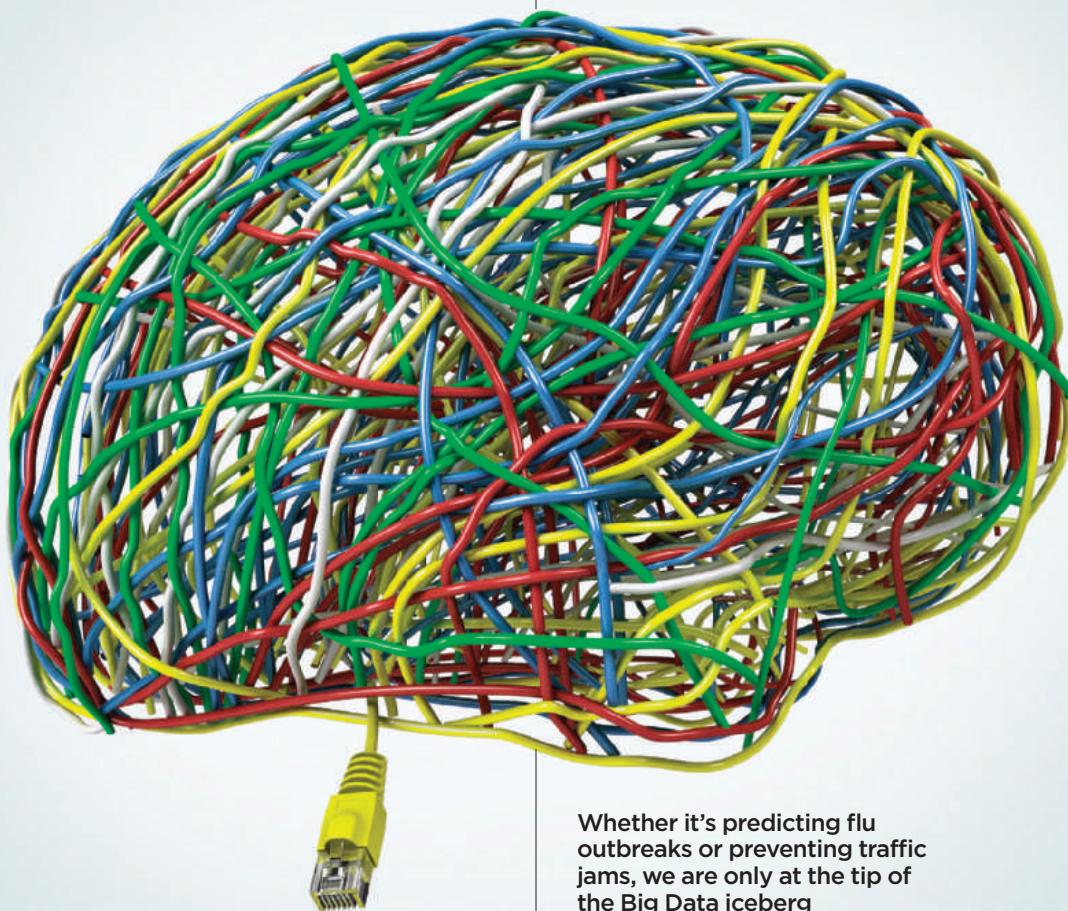


# DATA ANALYTICS: GO BIG OR GO HOME



Whether it's predicting flu outbreaks or preventing traffic jams, we are only at the tip of the Big Data iceberg

## THE ERA OF “BIG DATA”—

a time when petabytes of information on consumer behavior and countless other topics fly onto corporate and government servers every week—is irrevocably upon us.

While the term generally refers to data volumes or processing tasks that are too large or complex for conventional computing firepower to handle, many Americans regard Big Data as shorthand for widespread personal information harvesting and analysis mainly done for surveillance and marketing purposes—the kind that lets government agencies capture your phone records and corporations examine your online behavior in order to sell you products using targeted advertising.

That type of activity certainly occurs, but such uses are only the tip of the Big Data iceberg. From predicting flu outbreaks and preventing traffic jams to anticipating shifts in the political zeitgeist and reducing crime, Big Data science has countless applications—and potential rewards that go beyond what we can currently imagine.

“We’d rather call Big Data ‘decision analytics,’ because processing that data has to help you make better decisions and take intelligent actions in the real world,” says Ramayya Krishnan, Ph.D., Dean of Carnegie Mellon University’s Heinz College in Pittsburgh, a private graduate school that has been a leader in data analytics since its founding in 1968.

“This is why we use ‘intelligent action’ as the watchword for decision analytics,” adds Krishnan, who is also the W.W. Cooper and Ruth F. Cooper Professor of Management Science and Information Systems at Carnegie Mellon. “The ‘intelligent’ piece is, how do you derive value from data and make evidence-based decisions? The ‘action’ piece is, how do you apply this to important problems?”

Finding cost-effective ways to create safer, cleaner and more navigable communities is one of those important problems that many data scientists are trying to tackle. “Smart cities are a big issue,” says Krishnan. “For one example, decision analytics can make new contributions to urban mobility and transportation by applying ‘smart traffic’ technology, in which a video camera monitors traffic and then adaptively changes the sequence or schedule of the stoplights, making them work together to optimize traffic flow.” In recent Pittsburgh pilots, this approach reduced urban travel times by 25 percent, Krishnan says. It also reduced emissions by 21 percent by reducing wait times at intersections.

Using Big Data to speed traffic or curb air pollution barely scratches the surface of how decision analytics can help us live healthier lives. Advances in health care analytics are yielding new strategies to measure care quality, predict clinical outcomes, reduce hospital errors and even encourage patients to stay healthy between doctor visits (for example, by prescribing exercise while wearing trackable sensor devices like Fitbit and Jawbone).

“Data analytics is truly at the cutting edge of how healthcare is evolving,” says Krishnan. “To help lead this evolution,



“BUSINESSES  
MUST NOW CATER  
TO A MARKET  
OF ONE, AND  
EACH INDIVIDUAL  
CUSTOMER NOW  
NEEDS TO BE  
UNDERSTOOD  
AND APPRECIATED  
FOR THEIR  
UNIQUE NEEDS.”

Heinz College works with large insurance companies as well as big healthcare providers, such as the University of Pittsburgh Medical Center, to train executives, physicians and staff to engender a culture of evidence-based thinking and policy to get the most value out of analytics.”

The mere mention of medical records, however, underscores the need for stewards to use this power wisely. Creating the human capital to thrive in the Big Data era while remaining ethical is a responsibility faced by companies in every sector.

“Developing people to use data analytics intelligently requires combining social science, data science and computer science to train folks to have a deep understanding of these new capabilities,” says Krishnan. “Our capacity to bring these disciplines together is unique at Heinz College, as our School of Information Systems and our School of Public Policy and Management function together to

produce leaders in business intelligence and decision analytics. We also work with about 100 firms and organizations every year in applied learning ‘intelligent action’ projects to solve real-world problems.”

### Individual Needs for Individual Customers

In addition to training qualified people, other hurdles to capitalizing on Big Data stem from logistical factors, such as knowing where relevant data is, an organization’s dependence on its technology systems and its ability to scale them. Industries that have been awash in digital data for decades, like telecom, are seeing strain as players struggle to cope with the massive amount of information they need to process just to keep their doors open.

“Customer expectations are changing, and many telecoms are at a point now where they can’t manage the information they need to deliver the new relevant services that consumers are asking for,” says Christopher Williams, Head of Global Marketing at Amdocs, a global market leader in providing software and consulting solutions to the world’s largest communications, entertainment and media service providers. “They have amassed a tremendous amount of information stored across a variety of systems, but the analytics capabilities the companies built up over many years are no longer adequate to provide the kind of service, support and customization that customers are demanding from their telecom provider.”

The extreme customization among consumers that Big Data allows is no longer a perk; it’s the price of entry for many businesses. “With the Internet, consumers are much more empowered and are in a position of dictating the services that they want,” says Williams. “Businesses must now cater to a market of one—not to a market of many or even a few—and each individual consumer now needs to be understood and appreciated for their unique needs.”

When companies fail to deliver these personalized services, other organizations—including those from sectors never before seen as competitors—will quickly fill the need. This truth has fundamentally redefined good customer service, says Williams. To describe a series of prerequisites that businesses must now deliver in a tightly integrated manner to win and keep

customers, Amdocs coined the term “The New World of Customer Experience.”

While targeted to telecoms, this has applicability across all industries, and is based on four fundamental principles. The first is that you must deliver an exciting new set of services to your customer. Second, those services must be wholly personalized and contextualized for every customer at every interaction point. “Not only do you need to know what I want and when I want it, but you also need to know how I want it delivered to me,” Williams explains.

Amdocs’ third principle states that the customer experience must be dynamic and consistent, regardless of how they’re accessing it. Finally, services must contain efficiencies that make them practical and cost-effective to bring to market quickly.

“Integrating these four quantifiable elements is ultimately the only long-term, sustainable source of competitive advantage, because competitors can replicate almost everything else you do,” says Williams. “It’s a secret-sauce formula that really hits what customers are looking for.” Loyalty metrics, especially the key Net Promoter Score (which measures how likely customers are to recommend a service to their family and friends), prove this.

While most business leaders are acutely aware of the do-or-die need to transform their organization’s data analytics capabilities, finding the right partner or vendor to

help achieve this transformation can be a challenge, and also pose a steep learning curve. The right vendor must not only understand the company’s industry, but also its technical and cultural barriers to change. As the global leader in the telecom space, Amdocs’ focused strengths meet these core needs for the largest communications service providers.

“Amdocs’ heritage is in the telecommunications space. Over the last 32 years, together with our customers we have designed systems and best practices to automate service providers’ business processes, and we understand the challenges in these environments very well,” says Williams. “Many telecom service providers have their most critical data in systems that we originally developed and built for them, and this gives us unique insights into how to extract and analyze that data, add relevant new information and then pull it all together with data from other sources into strategies that are actionable for the company. Additionally, many clients have us manage their environments after we build them. Currently, Amdocs already manages some of the largest enterprise data warehouses in the telecoms industry, and we are working with our customers to move to new Hadoop-based technologies that allow the efficient harnessing of this Big Data for business improvement.”

“A lot of people have called data ‘the oil

of the 21st century,’ or the new resource that’s going to drive the economy forward and create innovation,” adds Matt Roberts, Head of Big Data Analytics Marketing for Amdocs. But crude oil is useless for key practical necessities—such as fueling automobiles and planes—until it’s refined into gasoline, he points out. “Likewise, you not only need to find the right data at the right time, but refine it and get it analytics-ready in order to run your machine, and Amdocs offers targeted approaches that can meet the big challenges in accomplishing this.”

### Slaying the Storage Dragon

The stratospheric storage capacities required in the Big Data era are obviously a barrier and burden to companies with overstretched IT resources. A global corporation might have a half-petabyte of data across all of its systems—that’s 500,000 gigabytes, or enough data to contain twice the entire holdings of the Library of Congress—and more gigabytes fly in every day.

However, “the failure rate for standard hard disk drives is extremely high,” says Sumit Sadana, Executive Vice President, Chief Strategy Officer and General Manager of Enterprise Solutions for SanDisk, a global leader in flash digital storage, based in Milpitas, Calif. “If a company has a data center the size of a football field, it will need people who spend a lot of time just replacing failing disk drives each day.”

S5

## BYTE BY YOTTABYTE: HOW DATA GETS BIG

Bit	The smallest unit of data that a computer uses	
Byte (B)	= 8 bits	
Kilobyte (KB)	= 1,000 bytes	
Megabyte (MB)	= 1,000,000 bytes	
Gigabyte (GB)	= 1,000,000,000 bytes	
Terabyte (TB)	= 1,000,000,000,000 bytes	= 1 thousand gigabytes
Petabyte (PB)	= 1,000,000,000,000,000 bytes	= 1 million gigabytes
Exabyte (EB)	= 1,000,000,000,000,000,000 bytes	= 1 billion gigabytes
Zettabyte (ZB)	= 1,000,000,000,000,000,000,000 bytes	= 1 trillion gigabytes
Yottabyte (YB)	= 1,000,000,000,000,000,000,000,000 bytes	= 1 quadrillion gigabytes

“IF A COMPANY HAS A DATA CENTER THE SIZE OF A FOOTBALL FIELD, IT WILL NEED PEOPLE WHO SPEND A LOT OF TIME JUST REPLACING FAILING DISK DRIVES EACH DAY.”

IT leaders have long known that the failure rate of flash storage—the chip-based memory found in cellphones, thumb drives and solid state drives (SSDs)—is much lower than that of rotating hard drives. But historically, with the cost of flash hovering at two to three times that of hard disk drives, many businesses have been reluctant to implement flash storage at a large scale, despite the numerous advantages it offers beyond superior reliability and performance.

That price barrier is now effectively gone. “Today, flash can effectively be deployed at the same cost structure as a hard disk drive solution in many applications,” says Sadana. The media itself is still more expensive than that of hard disk drives, but flash offers efficiencies and reductions in data center infrastructure that greatly lower the upfront investment as well as the long-term costs—i.e. the performance factor of flash allows companies to drastically shrink their data center footprint. One of the dirty secrets of data centers is that a staggeringly large percentage of servers are underutilized because data simply can’t be delivered to them fast enough due to the bottleneck created by hard disk drive-based storage systems. These servers are literally waiting around for work.

“Right away, you can cut the number of servers by up to 50 percent—and fewer

servers means fewer software licenses, less rack space and lower maintenance costs,” says Sadana. “You can also reduce the total storage footprint because virtually all of the capacity in flash systems gets utilized. Flash also consumes dramatically less power than 15K RPM hard drives, and that’s important, as Big Data is causing the power consumption and associated costs in data centers to skyrocket.”

These savings come with a major boost in speed and performance, too. “Flash memory is more than 100 times faster than hard disk drives,” Sadana explains. This doesn’t just mean increased network speed and faster core business functions—it also allows for new approaches to solving existing challenges. For example, faster data analytics enabled by flash can allow credit card companies to quickly identify fraudulent credit card usage. “Any application that requires fast access to lots of data can benefit from leveraging flash at scale,” Sadana adds. With flash, the data needed to detect and analyze suspicious activity can be accessed much faster, allowing speedier processing during a fast-moving breach by a sophisticated hacker.

While CIOs and IT decision-makers have known that the total cost of ownership for flash is lower than for hard disk drives, only recently have the acquisition costs reached parity. “That’s a big change we’ve created in the marketplace,” says Sadana. “Our new InfiniFlash mass-storage solution, for example, offers five times the capacity, four times the reliability and 50 times the performance of hard disk drive solutions, while it consumes 80 percent less power. This technology used to be very expensive, and we’ve created waves in the marketplace by shattering the \$1 per gigabyte price barrier for raw, uncompressed flash storage.”

SanDisk has strong relationships around the world with server vendors like HP, Dell and Lenovo, so many companies are already using their solid state drives. “We work with many large companies to help them meet the challenges of today’s dramatic increases in data,” Sadana adds. “We can help them implement full-system solutions that make their storage more resilient, while dramatically simplifying their infrastructure.”

With Big Data pulling us ever closer to the day when the IT department talks in exabytes, simpler is no small feat.

— Ron Geraci

# ANALYTICS FOR IMPACT



Analytics  
+  
Information Technology  
+  
Deployment  
=  
Real World Impact

World Class Expertise in:

Information Technology •  
Health Care • Digital Media •  
Information Assurance  
and Security

Carnegie Mellon University  
**HeinzCollege**

[www.heinz.cmu.edu](http://www.heinz.cmu.edu)

Copyright of Business Week is the property of Bloomberg, L.P. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.