CHAPTER 2

How Big Data Will Change Your Job, Your Company, and Your Company, and Your Industry

Big data is such a broad business resource that it is sometimes difficult to envision allthe ways that it can affect an organization and an industry.Therefore,I’ll start thischapter by describing several future scenarios for how big data might yield a transformational impact on a company or industry. It’s also likely to change the nature of work for many individual job roles, as the scenarios illustrate. Although each of the technologies needed to execute on these scenarios is actually available today, I suspect it will take several years for organizations to implement them.The challenges are more in the nature of systems integration-developing data standards and pulling the necessary data together-and business change,rather than pure technology.

If you enjoy speculation about the future, you’ll probably like these scenarios.If you are a hard nosed resident of the present, skim these ideas about the future quickly and get to my assessment of the role of big data in key industries and business functions.In each of these sections, my goal is to persuade ou that big things are coming from big data and that you should start thinking now about how to react.

As a general rule, I am pretty confident that big data is going to reshape a lot of different businesses and industries. For example, here are a few industry categories that might be transformed in a substantial fashion:

* Every industry that moves things
* Every industry that employs machinery
* Every industry that sells or uses content
* Every industry that provides service
* Every industry that has physical facilities
* Every industry that involves money

I haven’t donate a systematic classification, but I suspect that this list encompasses every industry! The more detailed scenarios and industry function analyses in the remainder of this chapter should provide some backup for sweeping argument.

Four Future Scenarios

In this section, I’ll describe four future scenarios for how big data will be used in several different industries in the future.They may seem far-fetched, but man of the big data innovations that make them possible are already in existence today.

A Big Data Scenario for Business Travel

Lynda Peters, an IT architect at insurance firm Tranquilife, is going to a business conference in March 2016; the subject is‘’Truly Massive Data and its Impact on Insurance.’’It is a popular topic, and she was almost denied the permission to attend because the employee had already registered. Fortunately, she was able to convince her boss that she really needed to go.

After Lynda registers for the conference, all the logistics-city, hotel, beginning and ending times-are automatically downloaded into her scheduling application. They are then transmitted-again automatically-to the travel management system that Tranquilife had chosen. The travel management system links to the agenda and details for the conference, and swings into action on her behalf.Without any actions on Lynda’s part, she receives a proposed itinerary with the following components:

* A flight on her preferred airline, with a frequent flyer upgrade already arranged and her preferred aisle seat reserved
* A hotel reservation for all the nights of the conference
* A self-driving rental car reservation at the airport ( because the conference

Hotel is forty miles away, and the travel management application has

compared the cost at prevailing rates of taxi, limo, and rental car for that

distance)

* A reservation at the best Italian restaurant in the conference city-Lynda’s

favorite dining option-for the ‘’on your own’’ night of the conference, with

three suggestions (and three alternate suggestions) for dining companions

who are valued members of her social network and who will also be

attending the conference; Lynda needs only to touch her tablet screen once

to invite them

Lynda’s self-driving car delivers her to the conference hotel with no problems; the travel management system had downloaded her destination address, preferred air-conditioning temperature and favorite satellite music station to the car. Lynda’s only complaint about self-driving rental cars is that antiquated regulations force her to sit in the driver’s seat, which limits her tablet access. She also resents the laws that prevent her from watching movies and TV while the car drives her; soon, she expects, these would be relaxed.

On the way to the conference, Lynda notes on her table that the organizers have recommended some excellent sessions based on her learning preferences and records in her business network profile of past sessions she’d attended.Also, she notes that one invited member of her dinner party will be unable to attend the conference, so her travel management apps is now recommending an invitation to the first alternate.

Lynda enjoys the conference, and even before she leaves, she notes that the data on sessions she attended (confirmed by her smartphone’s location certification app) have been added to both her business network profile and Tranquilife’s HR database. A couple of the sessions have even given her a little boost in her salary. After she returns to work, she receives an e-mail from the travel management system noting that all of her travel expenses-even an estimate of her hotel tips-have been submitted to her company for reimbursement. The automatically transcribed Lynda highlighted as relevant to her company-along with her: annotations-have been posted in the personal portals of all employees who showed an interest in massive data. Her notes suggest that insurance will never be the same after massive data, and neither will the experience of traveling to learn about the coming changes.

(Note to skeptics:Although many of these automated travel features are not yet available, travel management experts I interviewed suggested that they would be plausible in the fairly near future. And we know that the self-driving car already exist-described by Google as a big data project-and will probably be incorporated into the transportation system in some fashion.)

A Big Data Scenario for Energy Management

David Byron is a corporate facilities and energy manager for Bathworks, a large US pluming fixtures manufacturing company. He is in charge of facilities and energy management for Bathworks’s twenty office campuses and facilities around the country. He and his firm have a strong desire to save energy and use all possible tools and behaviors to do so, while keeping employees comfortable and company assets safe.

One key aspect of Bathworks’s energy management involves its fleet of vehicles. All company vehicles, including company cars (some driver-managed, some automated), are on a wireless network. As a result, at any time Byron knows their locations, distances traveled that day or overall, average and peak speeds,and acceleration and braking patterns. Drivers who operate vehicles in such a way as to waste energy or to put the driver and vehicle at risk are sent reminder e-mails and text messages. Some employees have found this monitoring invasive and turned down company cars. Most, however-including all senior executives-have become accommodated to it.

Byron and his staff also closely monitor and control energy consumption of the Bathworks’s hating, ventilation, and air -conditioning (HAVAC) systems. The know the temperature, humidity light levels and human presence in every room of every building-over twenty three thousand spaces are monitored. From the central climate management center, temperature can be instantly raised or lowered, and windows and shades opened or shut. They can tell if an office, floor, or building is currently occupied, or if a damper in an airflow passage is broken. They have predictive models of the best time to raise summer temperatures in a building, and the optimal time to turn on the heat on winter mornings. This micro-controlled climate environment has already saved Bathworks more than 20 percent in three years on its HVAC-related energy use.

Byron has also implemented the ability to remote control energy access to a number of inessential devices in order to lower consumption at particularly expensive times of the day and year. Copiers, printers, and even vending machines can have their energy reduced if needed. The company also provides onsite charging for electric vehicles, and charging rates can also be dialed down during energy shortages or expensive supply periods.

Byron’s team has integrated all of these diverse systems into a Facilities Data Operations Center in a nondescript building behind the headquarters location. It looks like the *Starship Enterprise* holodeck, but there is seldom a need for the energy management equivalents of Captain Kirk and Mr.Spock; most of the systems are fully automated. Byron likes to explain to visitors that the company has laid an ‘’analytical blanket’’ on top of the diverse systems used to manage the buildings.

Byron is beginning to look at some other frontiers in energy management, but they involve substantial investment in generation technologies. He has a plan to install solar and wind energy generation devices on many of the Bathworks’s building and is working with vendors to shape an RFP. The performance of these devices could be optimized based on the amount of available wind or sunlight, time of day, and price of energy. Byron knows this is a good idea, but unlike its other big data energy management tools, which have been done fairly inexpensively, Bathwork will need to spend considerable money to save money on energy generation.

(*Note to skeptics:*After dreaming up this futuristic scenario, I read that it’s not that different from what leading firms are already doing.Microsoft, in particular, has published an account of how it does similar activities on its own campus. In fact, the term *analytical blanket* comes from that document.[[1]](#footnote-1))

A Big Data Scenario for Video Analytics for Retail

Latitia Harris is a senior marketing executive for Pettopia, a pet products and services chain with over 220 stores in North America. Harris has been concerned for many years that Pettopia might be at a disadvantage in competing with online pet products retailers, which can know each of their customers identities and what they have bought and shopped for. Pettopia has a loyalty program, but many customers don’t belong to it, and the company can identify some customers only via their credit cards. There is also a small but significant shoplifting issue in the stores, in that customers often give treats to their pets from the treat bar without paying for them.

Harris concludes that video analytics are the key to solving all these problems and will thus give Pettopia competitive parity or even advantage with online the firms. Therefor, she introduces video cameras into each store and begins a program of video analytics. These analytics are necessary because there is far more video content than any human viewers can digest, and Harris is interested in fast response for some applications.

One of the first applications that Pettopia develops is a simple store visitor coynter, so that Harris can compare visitors to sales and compute the level of conversions. That information is used to understand which employees are best at converting customers and to adjust staffing levels at different times. It takes only a small extension to this system to analyze how often employees offer help to customers who seem to be looking for something in the store.

However, that’s only the beginning. The next application is more complex, and involves actually identifying the customers and even pets coming into the store. Based on matches of video images with loyalty cards,credit cards, check information , and the pet name inquiries at checkout, Pettopia is able to identify 90 percent of customers and 60 percent of pets. Harris learns that while customers find it somewhat creepy if store personnel knew their names without being told, they are delighted to have their pets recognized. So names of both customers and pets are displayed on mobile devices as soon as they came into the store.

Harris has also sponsored the development of an application that notes what products customers have looked at-but didn’t buy-on a trip to the store. If the have an e-mail address for the customer, they can send e-mail offering that product at a discount on the next visit or through an online order, and this move has resulted in a high conversion rate. Pettopia has also been able to bring in some additional revenue by selling information to manufacturers about which customers spend time at the manufacturer’s end cap display.

The most recent use of the video analytics system involves the shoplifting from the treat bar. Pettopia’s video system is able to determine how many treats were taken from the bar, and to display the number at the register when the customers (and pet)arrive at checkout. For small the numbers of treats taken by frequent customers, checkout personnel are instructed not to say anything on the first shoplifting occasion, and to say only ’’Your dog seems to really enjoy those treats’’, on the second. On any subsequent occasions, or if the customers is not loyal to Pettopia, the checkout employee simply announces, ‘’Plus four treats from the treat bar, correct?’’and adds the price to the total. Some customers have been surprised, but treat revenues have increased by 5 percent from the program.

Harris has been experimenting with other video analytics applications, including one that indicates whether pets need grooming, and another offering training program discounts for poorly behaved pets based on analysis of their behaviors in the store. She feels that she is only scratching the surface of what can be done with the big data analytics from video content.

(Not to skeptics: Video analytics are becoming increasingly capable, and could probably already perform most of the tasks described in this scenario if trained to do so.[[2]](#footnote-2) I know that facial recognition of humans it quiet far along already; facial recognition of dogs may be a few years off, but would seem to be possible.)

A Big Data Scenario for Home Education

Larry DiCecco is a seventeen-years-old high school junior. His parents know that he has a lot of raw intelligence, but his grades haven’t been terribly impressive, and they feel that he hasn’t exerted himself in school. They very much want him to go to college, and are concerned that unless he makes some additional effort, he won’t get into the college of his choice. Larry’s parents are not well off, and know that he will have to get considerable financial aid to afford college. Based on his result on the preliminary SAT college admissions exam, they also know that he needs tutoring to improve his college testing outcomes,but they can’t afford to pay a human tutor.

The parents have heard from the school’s guidance counselor about an ‘’Auto Tutor’’ program from a test preparation company. They research the program and decide to subscribe to it for several months. It is much less expensive than paying a human tutor. All of the test prep content is supplied in digital form, and Larry’s consumption of the content is ’’instrumented’’ so that the Auto Tutor program can monitor his study habits.

After beginning the Auto Tutor service, Larry and his parents quickly discover that his study habits are ineffective. The system has detected, for example, that Larry falls asleep too often, employs too much highlighting, and generally studies too slowly because he does too much rereading (which suggests that he isn’t concentrating while he studies). To no one in the family’s surprise, the program suggests that Larry has been multitasking while he studies - texting his friends, checking Facebook, listening to his favorite Pandora station, and occasionally playing a video game. He now makes a sincere effort to stop at least some of these activities while studying.

The program analyzes his vocabulary and determines that he is weak on science-related terms, so it offers drills involving those types of words. In math, it diagnoses that he has strong algebra skills but is weak on geometry, and it thus gives him a series of targeted geometry exercises.

There is a writing component of the SAT test, and the Auto Tutor words. In math, it diagnoses that he has strong algebra skins but is weak on geometry, and it thus gives him a series of targeted geometry exercises.

There is a writing component of the SAT test, and the Auto Tutor service has promised to improve Larry’s writing skills-at least those that are tested. The program has him write a series of essays , and automatically grades them. It finds that Larry’s essays are weakest in term of the topic sentences in each paragraph, and offers him a set of drills to strengthen this skill.

After each session on the computer or tablet, the score improvement app calculates Larry’s predicted SAT score range and the most likely percentile for each section of the test. He begins to make steady improvement in his predicted score.

The app also gets Larry’s parents involved in the learning and improvement process, sending them advice about Larry’s behaviors and progress, and recommending motivational interventions they might undertake that are targeted to Larry’s situation and the program’s inferences about his attitudes and behaviors. After some discussion with his parents, Larry actually seems to be making some progress in his schoolwork as well.

Larry uses the Auto Tutor service steadily for two months for far less money than a human tutor would have cost. The test preparation company has no human contact with Larry, but the family is very satisfied with the outcome. Larry improves his SAT score by 150 points.(at them midpoint of the Auto Tutor’s predicted range), and gets into range), and get into his first-choice college. He only wishes he could keep using Auto Tutor to improve his grades once he enrolls there.

(Note to skeptics: Companies like Kaplan, Capella, and the University of Phoenix are already doing some of what is described in this scenario. Large online education consortia such as Coursera and edX are also pursuing research on the feasibility of such measurement and recommendations. The area of big data from education will, I predict, be a major focus over the next several years, and what Larry does in this scenario will probably become commonplace.)

Making These Scenarios Real

These (I hope) provocative scenarios, or others like them, could become real in your business and industry. Raw technological capabilities are unlikely to be the barrier to them-in fact, as my notes to skeptics suggest, most aspects of the scenarios are possible today,at least on an experimental or pilot basis. What is needed most is the vision and determination of organizations to build and deploy these innovations. Considerable imagination, courage, and commitment will be required to embark on these big data journeys. Each will take a considerable amount of data collection, IT development, systems and data integration, and analytical model development, and firms could use some help with new and more productive tools for such activity. The scenarios will require a number of smart people to work for several years to make them possible. In some cases, they will requier regulatory change (e.g.,to allow self-driving cars on the nation’s highways).

It not entirely clear what the viable business model for each of these innovations is-how companies can make money with them. It’s also not clear that customers will want these innovations-particularly those like the pet store video cameras that pose a risk to human and pet privacy. However, it seems likely that some organization will pull them off, and that they will make those organizations very successful. Just as Google, for example, decided to make the self-driving car a reality, there are other organizations that will succeed with integrating it into a comprehensive travel management capability. Would you rather have your company be the architect and creator of these scenarios or a competitor?

Industries Well Suited to Big Data

In my previous research, I found that, with regard to traditional structured data analytics, some industries were definitely ahead of others in the race to understand their businesses and customer relationships (see table 2-1). The leaders-I call them *overachievers-*tended to be those in consumer-oriented industries with a lo of data to process:credit card companies like Capital One, insurance firms like Progressive, consumer travel companies like airlines and hotels, and casino companies like Harrah’s (now Caesars). Some consumer products companies, like Procter&Gamble, become good at analytics even without direct consumer data. When internet companies emerged in the mid-1990s, the smart ones like Amazon, eBay, and Netflix quickly.

**TABLE 2-1**

**Historical industry use of data and analytics**

**Data disadvantaged Underachievers Overachiever**

Health-care organizations Traditional banks Consumer products

B2B firms Telecom Insurance

Industrial products Media and entertainment Online

Retail Travel and transport

Electric utilities Credit cards

Become leaders in analytics because there was a large amount of data to crunch-and they did so well. I referred to them in my *Competing on Analytics* research as ‘’ analytical competitors from birth.’’

Data disadvantaged organizations were those that didn’t have much data-or if the did, their data wasn’t well structured. They were analytically impaired for this reason. There organizations included:

* Heath-care providers, which were disadvantaged because they didn’t yet have widespread electronic medical records and also had a lot of text -based notes about patients (50 percent of electronic medical record data consists of unstructured text)
* Business to business(B2B) firms, which were disadvantaged simply because they didn’t have very many customers-and hence couldn’t really do much with customer data
* Business-to-business-to-consumer (B2B2C) firms, which had intermediaries bet between them and their consumers (for example, retailers between consumer products firms and consumers, or doctors between pharmaceutical companies and their consumers), and hance often couldn’t get good data about who was buying their products and how they were being used
* Industrial products firms, which often fell into the disadvantaged B2B category and didn’t have much data about their products

Other industries had more data, but were simply *underachievers* with it-not using it effectively to benefit customers or themselves.These included:

* Telecom firms, which had lots of data, but for some reason did not take advantage of it (perhaps because they had historically been a regulated monopoly or because the were busy with mergers and acquisitions)
* Media and entertainment firms, which underachieved because they had decision cultures based on intuition and gut feel, and didn’t know how to assess whether people were looking at their content or not
* Retailers had great data from point-of-sale systems, but most have underachieved with it until recently; Tesco and to some degree Walmart have been higher achievers
* Traditional banks have massive amounts of data on the money their customers consume and save, but for the most part they have been underachievers in helping those customers make sense of it all and presenting targeted marketing offers to them
* Electric utilities have been talking about the ‘’smart gird’’ for a while, but are still a long way from achieving it;apart from some limited rollouts of smart metering devices and time-of-day pricing, very little thus far has happened in the United States

This environment has changed dramatically with the advent of big data. Many of the also-ran industries in the previous generation of analytics can be leaders in the big data race, although in order to do so they need to change their behaviors and attitudes. Bid data will be available in their business and industry, but the laggard need to work harder to take advantage of it than they did with traditional analytics.

So let’s think about what big data is likely to be available, and how it’s likely to be used, in some of those industries.

Health Care

In heath care, for example, there will be much more structured data from the money electronic medical record systems that hospitals and outpatient clinics are installing. In addition, there have always been voluminous amounts of text in the clinical setting, primarily from physicians’ and nurses’ notes. This text can inceasingly be captured and classified through the use of natural language processing technology. Insurance firms have huge amounts of medical claims data, but it’s not integrated with the data from heath-care providers. If all of that data could be integrated, categorized, and analyzed, we’d know a lot more about patient conditions. Image data from CAT scans and MRIs is another huge source; thus far doctors only look at it but don’t analyze it in any systematic fashion. Human genome data-at about 2 terabytes per human-is rapidly becoming inexpensive enough ($1,000 per patient within a few years) to gather on many patients. And it that weren’t enough, there will be massive amounts of data from *connected heath* (telemedicine and remote monitoring) and *quantified self* (personal monitoring) devices[[3]](#footnote-3). Imagine that doctors and hospitals could gather data on every patient’s weight, blood pressure, heart rate, physical activity, and even mental state-every day or even every hour or minute! The amount of data boggles the mind. In sum, the primary challenge in the health-care industry won’t be how to gather big data, but how to make use of it all.

B2B Firms

Business that sell only to businesses may not have a large number of customers, but they still have a big data future. One aspect of it is to consider not businesses, but the individuals that work in those businesses, as a company’s real customers. Some B2B marketers are already beginning to do that, and to track movement of individuals across companies. In addition, big data can arise from capturing conversations, service calls, sales inquiries, and other aspects of the broad customer relationship. Finally, since many B2B products and services will be ‘’instrumented’’ with chips and sensors that measure how they perform, companies will have a large amount of data on how their customers are actually using their products. With all this data, it’s likely that B2B firm can catch up to their consumer marketing colleagues in their reliance on big data and analytics.

B2B2C Firms

The consumer-oriented firms with intermediaries between them and their customers-I mentioned consumer goods makers and pharmaceutical firms-that have been at an informational disadvantage in the past can catch up in the world of big data. Overachievers in this category like Procter&Gamble, are venturing into online sales. P&G calls its online sales presence an ‘’eStore’’,and uses it not only to sell more products, but to learn from consumers about their behaviors and preferences . P&G is also working closely with major retailers like Walmart to share and analyze the large volumes of retail point-of-sale data. Others firms with intermediaries, like GM and Ford in the automobile industry, may not have direct exposure to their customers in car sales, but they learn a lot of about customers through credit card relationships. Consumer products firms are beginning to use video anslytics to learn more about consumers. PepsiCo, for example, employs a ‘’Learning Lad’’ from video analytics vendor RetailNext to better understand what motivates a consumer to pull a six-pack of Pepsi off the shelf.Pharmaceutical firms are likely in the future to not only sell drugs, but also devices-perhaps ’’smart’’ pillboxes or medicine cabinets-that record whether or not a drug has been taken at the prescribed frequency. While it’s unlikely that pills and soda cans themselves will have built-in sensors anytime soon, there will be plenty of data to analyze.

Industrial Products Firms

The big data for industrial products firms is likely to come from sensors and chips embedded in industrial products. I’ve already mentioned GE’s plans (and current activity) around monitoring locomotives, gas turbines, and aircraft engines. John Deere plans together big data from sensors and computers in its tractors. Boeing gathered a massive amount of in-flight data on its troubled 787 Dreamliner and was able to fix it faster as a result (though most of the problems with the plane’s batteries seemed to happen on the ground). Cisco Systems collects data on network performance and knows which network configurations are most likely to be reliable. Intel has an application to identify that your personal computer is having problems, and needs to be fixed ỏ replaced before it crashes. Companies like these will know the condition of the equipment they have sold, so they’ll be able to service it more effectively and know when it needs to be replaced. And they’re also likely to benefit from some of the B2B big data innovations mentioned previously, as well as some of the manufacturing and supply chain innovations I describe next.

Telecom Firms

Firms is the telecom industry-including internet service providers, wireline and mobile telecom services firms, and cable television firms-have had, as I noted before, lots of data on who communicates with whom, who is interested in what content, and who’s willing to spend serious money on networks. Just to give you an idea of how much data, IBM estimates that there are 5.2 million gigabytes of mobile data generated each day.[[4]](#footnote-4)Even the number of phones is approaching big data levels; the average household, according to Neustar, has 3.8 phone numbers.[[5]](#footnote-5) Unfortunately, however, the industry just hasn’t done much yet with all this data. You may have noticed that whether you are a big spender or a small spender on telecom, you are generally treated the same way as a customer. Some firms - particularly in the mobile telecom services industry - have focused on using data to identify customers who are likely to drop their service or attrite. A few of these mobile providers are beginning to analyze aspects of the social networks among their customers, and, for example, to identify particularly influential customers who might influence others in their “tribe”. These companies are only scratching the surface of what might be done in this industry, however. The telecom industry is one of the few that doesn’t really needs to make use of what it already has. In chapter 8, I’ll describe what Verizon Wireless is doing to create new business based on selling mobile data.

*Media and Entertainment Firms*

This industry faces a bonanza of big data opportunities. Although it hasn’t done much with data or analytics in the past, the fact that the industry increasingly distributes its products over the internet means that it can now learn a huge amount about what types of content customers really want. This industry could understand not only what kinds of movies, television programs, and short videos people enjoy, but could also acquire much more granular information. What stars bring out the viewers? Are consumers more likely to consume happy or sad content? Does profanity turn off certain viewers-or keep them watching? The current ‘’batting average’’ of media and entertainment companies is very low; most movies don’t make money, and most television shows are quickly canceled. It doesn’t have to be that way. When companies like Netflix and Amazon enter the content business, they are showing a new way to use big data to design content that succeeds. Netflix knew before it launched its *House of Cards* series that the directer, star actor, and British version of the same program had all done well with its audiences in the past-so doing a US version was close to a no-brainer.[[6]](#footnote-6)Amazon come launched fourteen pilot program for its streaming video service and used customer feedback on it to help it select the five it ultimately produced. These bid data-based models will surely penetrate to other content creation organizations shortly particularly because they seem to be very effective.

Banks

The banking industry is already beginning to take advantage of the data it has on customer payments and financial activities, though there is plenty of room to grow with big data. Banking is now a multichannel activity, and some large banks are starting to understand the complex journeys customers make though call centers, branches, ATMs, and online wedsites to meet their financial needs. The are also beginning to customize marketing offers to customers. However, I have yet to find the bank that truly uses all of its customers’ financial data to make personalized and high-quality recommendations for financial products. I hold out hope that this will come in the big data age.

Electric Utilities

The opportunities in the utilities industry are quite substantial, though companies would have to make significant investments to make them a reality. Possibilities include enterprise decisions around where to invest in new generation and distribution capabilities, grid operations involving real-time energy management decisions, and consumer intelligence about how people use energy.[[7]](#footnote-7)A variety of equipment, software, and services firm are offering big data solutions for the industry, but thus far few utilities have engaged with them.

Although I’ve described only a few industries, I hope you’re getting the impression that virtually every industry can be transformed by big data. If the laggard industries in the era of traditional analytics can excel with big data, it’s likely that virtually every industry can succeed with it.

Big Data and Key Business Functions

In addition to industry, the other key element of organizational structure is the business function. In the section, I’ll describe the impact of big data on the key business functions of virtually every large organization. While the impact of big data on some functions is greater than others, you may not be surprised at this point to learn that I think there are major opportunities to exploit big data in all of them.

*Marketing*

Marketing has been the happiest home for traditional analytics, but this function still has a lot of room for improvement with big data. New sources of data for marketing purposes include customer’ social, mobile, and locational data. Imagine the value of knowing not only what your customer is saying about you in social media, but exactly when he or she has entered your store. In addition to these relatively new data sources, many marketers still haven’t fully harnessed online data. Most markets today wish for ‘’omnichannel’’ relationships with customers-those that let consumers move seamlessly between multiple physical and virtual touch points-but few have achieved that elusive goal. They need to know low customers move from one channel-say, the online one-to a call center to solve a particular problem, or to a retail store to check out the merchandise. Integrating and analyzing data-some big and unstructured, some smaller and more structured-across multiple channels is, then, the primary big data agenda for marketers. They also need to accurately attribute sales to the variety of ads and messages they have sent out though the various channels. This is a complex analytical task, but there is software to analyze it and prioritize marketing spending accordingly.[[8]](#footnote-8)Of course, before marketers achieve these goals, it’s likely that a new channel or two will emerge. Therefore, big data for marketing is a never-ending task.

*Sales*

The sales function has been transformed over the past several years with the introduction of customer relationship management and call reporting systems. Companies generally now have a much better idea of what their sales forces are doing and of the prospects in the sales pipeline. One step forward would be to begin noting how accurate salespeople’s predictions of closing sales are by comparing predictions and actual sales, though this would be relatively small-volume, structured data. It would also be possible to use smartphones and car location devices to monitor how salespeople actually spend their time. While this would undoubtedly generate a lot of interesting data, it would probably be very unpopular with the sales force.

*Supply Chain*

Supply chain processes are among the most likely to be transformed by big data. Radio-frequency identification (RFID) devices-long discussed as a means of monitoring supply chain movements-are now actually becoming available at a reasonable cost. GPS tracking on trucks and trains means that arrival times for shipments can be more precisely predicted. Transportation companies, including UPS, FedEx, and Schneider National, have already installed tracking devices and are increasingly using them to monitor and optimize their networks. In chapter 8, I describe how UPS, for example, has recently used data from its package cars(brown trucks) to redesign its driving route structure for only the third time in over one hundred years. Other types of sensors are likely to lead to a flood of additional data and opportunities to analyze it. RFID and telematics sensors primarily track location, but so-called ILC (identification, location, condition) sensors can monitor the condition of goods in the supply chain as well, on such variables as light, temperature, tilt angle, g-forces, and whether a package has been opened. They can transfer data in real time via cellular networks. Obviously, the potential to identify supply chain problems in real time and take immediate corrective action is greatly enhanced with this technology. We have only begun to explore how analytics might be used to enhance the value of ILC - derived data.

*Manufacturing*

There are many opportunities to apply big data in manufacturing. Not only manufactured products but also manufacturing equipment increasingly contain data-producing sensors. Machining, welding, and robotic devices can report on their own performance and need for service. These devices are networked, so they can be monitored and controlled from a central control hub. And the prevailing trend to employ more automation in factories will continue and probably accelerate.

Manufacturing operations can also connect with big data-fueled supply chains to ensure that product supply is available to feed manufacturing, and that only the optimal amount of goods is manufactured.Discrete manufacturing companies have largely addressed this issue, but process manufacturing (oil companies, for example) have not made as much progress.

*Human Resources*

HR has been one of the least data-driven functions in the past, but HR information systems and analytics based on them are beginning to change that. This function could go a substantial step further in terms of analyzing employee location and communication data. For example, if we’re trying to decide where to locate facilities, shouldn’t we understand the locations of employees throughout their workdays before making that decision? No special sensors are necessary; mobile phones could easily supply the data if employees gave permission to harvest it. If we think it’s important that certain groups collaborate with each other-for example, that product development communicates with manufacturing-shouldn’t we measure the level and nature of collaboration? Server log files already allow such analytics, but very few organizations use them. The best organizations of the future will be those that design and actively monitor the collaborative and communication activities of their people. Alex (Sandy) Pentland, an MIT professor, has analyzed these types of human behaviors using the sensor trails the leave behind, and believes they are an invaluable guide to redesigning organizations and societies.[[9]](#footnote-9)

*Strategy*

The strategy function, often charged with making or supporting some of the most important decisions within an organization, has historically been rather bereft of data in analyzing those decisions.Strategist ma have gathered some data-or hired an external strategy consulting firm to do so-but it was rarely voluminous. Now, not to use a large amount of external data in strategic decisions might actually become strategic malpractice. The big data that is probably most relevant to such big decisions is internet data-addressing what people around the world are saying and doing. Three start-up firms that support this type of analysis are Quid, based in San Francisco; Recorded Future, based in Boston; and Signals Intelligence Group, based in Israel. Quid analyzes internet data to understand the prevalence of and connections between technology opportunities for a large IT vendor, and found that there were unexplored opportunities at the intersection of biopharma, social media, gaming, and ad targeting. Recorded Future analyzes internet data to understand predictions and temporal events; it is used b government intelligence agencies and by companies such as Protect&Gamble, which uses its data and tools to understand what events might affect sales forecasts. Signals uses principles from the Israeli military organization to inform strategists about innovation, competition, supplier relationships, and product development at consumer products firms like P&G, pharmaceutical firms such as Novartis and Johnson & Johnson, and technology firms.[[10]](#footnote-10) In short, if you are simply relying on internal information and your own experience, you are going to come up short as a strategist.

*Finance*

The financial services industry was perhaps the first to adopt big data.Financial traders and risk managers chewed through vast amounts of data to identify buying or selling opportunities, or to assess the likelihood that investment and assets would crater in value. Although the financial crisis of 2008-2009 revealed that these analyses were sometimes unreliable, these uses of big data continue apace. Analyses based on it will identify patterns in rising and falling assets and can also be used to identify customer marketing opportunities, as well as to detect fraud and money laundering. It is likely that in the near future, big data will find its way into corporate finance departments as well (though in the early days of big data, corporate finance has been something of an underachieve). These organizations also do trading, risk management, hedging, and other data-intensive activities. With the greater availability of external data, they are likely to become more involved in assessing the risk of working with particular customers, suppliers, and business partners.

*Information Technology*

The IT function, which often stores and crunches big data, could also rely much more on data in making its own decisions. Two areas that could use more data-based decisions are the reliability and security of IT operations. Virtually all IT devices-computers, network equipment, storage devices-throw off data about their own performance that can be analyzed, explained, and predicted. Neither IT organizations nor their vendors have used much of this data to optimize the reliability and performance of their operations, but there is an opportunity to do so. The availability of IT capabilities in ‘’the cloud’’ will accelerate this trend, as cloud services vendors will need to document and improve their reliability to get and keep customers. Security is another IT domain where more analytics are needed. Instead of simply responding to security breaches, organizations need to predict where and from whom security threats will emerge. What are the attributes that predict someone will try to hack into a system? What have been the most vulnerable areas in the past? Those organizations that can anticipate-and stop-security threats will inevitably be more successful than organizations that merely plug holes when they become obvious.

Summary of Big Data’ s Impact

I’ve provided some future scenarios and some ideas about how big data might transform key industries and functions. But many opportunities still fall between these cracks. How about the analytics of traffic, crime, and water management in local government? What will big data do to agriculture the oldest industry, but one that is increasingly creating a lot of data? What happens when our homes-our thermostats, refrigerators, and home theater systems-become smart, digitized, and connected to the internet? How will big data analytics -derived from player location or video footage-transform sports? It’s impossible to foresee all the impacts of big data.

The key point is not to be complacent. I recently talked with a senior R&D executive at a large automobile manufacturer. We were discussing big data, and I mentioned the Google self-driving ca as a big data project of enormous impact in his industry. I then asked whether his own company had a similar project.’’We’re leaving that one to Google’’, he said.

That’s probably a big mistake. If big data is going to transform your industry, shouldn’t your company be involved in the transformation-and not just a victim of it? That sort of complacency has doomed many a company to failure. To get out ahead with big data, you need to have extended discussions within your company about what this new tool might mean for your industry and business, and about what your response should be. To do nothing is to put your job and your organizations at great peril.

ACTION PLAN FOR MANAGERS

How Will Big Data Change Your Organization?

* Have you envisioned any future scenarios for how big data might change your industry, business models, and customer experiences?
* Is it anyone’s job today to monitor and inform senior executives of developments in big data that relate to your business?
* Have you considered the impact of big data on the key functions within your business?
* Does your senior executive team have regular discussions about the role of big data and analytics within your business?
* Have you converted any of this thinking and discussion into action?

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