The IBIT Report

A publication of the Institute for Business and Information Technology

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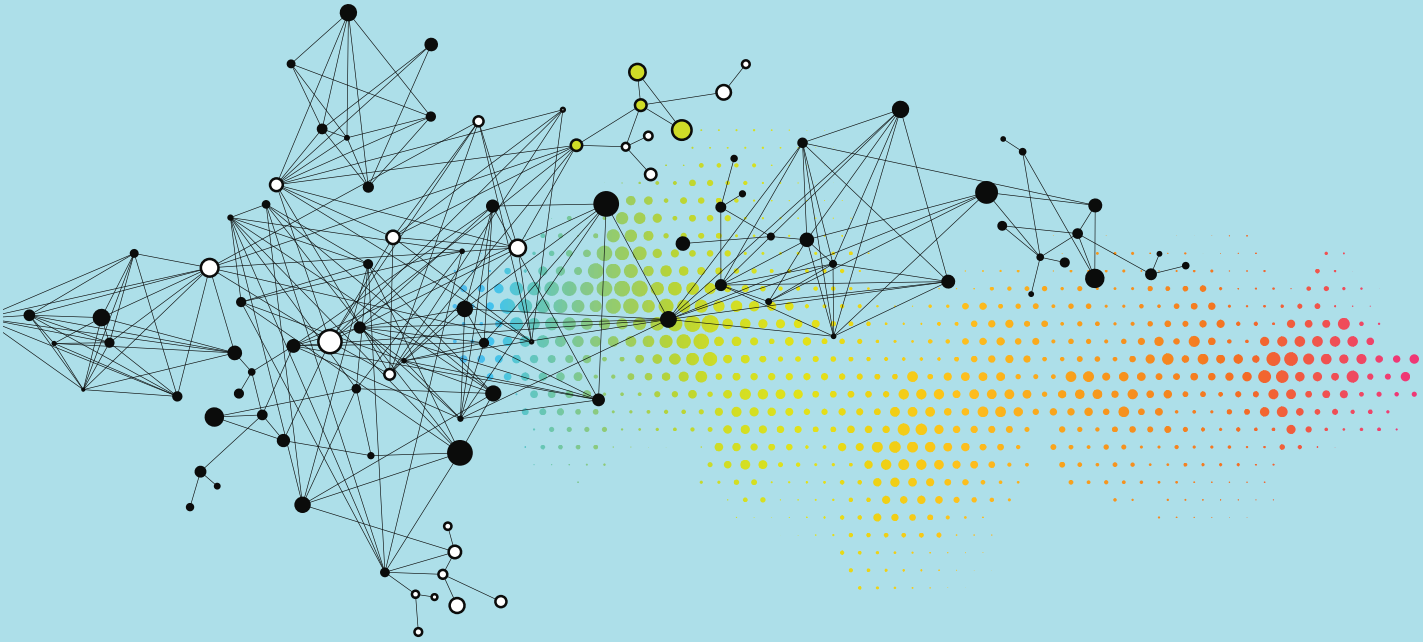
March 2013

The Business Value of Big Data:

Insights from Temple University's 2012 Big Data Conference



Fox School of Business
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The Business Value of Big Data:

Insights from Temple University's 2012 Big Data Conference

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Foreword

"Big data and the analytics techniques that go with it is likely to recast industries and ultimately separate the winners from the losers."

This is one of the insights from the conference on Big Data hosted by the Fox School of Business on September 27, 2012. Over 130 professionals addressed the best practices in the acquisition, modeling, prediction, optimization, and simulation of the vast amount of data now available to companies. Speakers from the retail, pharmaceutical, technology, aerospace, insurance, consulting, and public sectors shared stories, examples, and best practices. This report summarizes the insights from the conference and provides several key takeaways for companies looking to get started with Big Data.

Bruce Fadem
Editor-in-Chief
March 22, 2013

Introduction

In the enterprise, big data sits squarely at the convergence of multiple inflection points. The falling price of storage, increasingly powerful hardware and software tools, and companies' realization that their terabytes of data are an untapped resource all have pushed big data analytics to the forefront. Research firm International Data Corporation forecasts that the big data market will be valued at $16.9 billion in 2015, up from $3.2 billion in 2010 (Vesset and Woo, 2012). Gartner points out that big data related technologies, such as in-memory databases, content analytics, and complex event processing tools are likely to have a transformational impact on the enterprise (Columbus, 2012). Half a billion dollars of venture capital has been poured into the big data market. Some of those investments in companies like Splunk have launched initial public offerings (Dignan, 2012).

The talk surrounding big data will also drive the overall market for business and data analytics. A survey by the Society of Information Management found business intelligence software - the front end to analytics and big data - was the top priority for Chief Information Officers (CIOs) in 2012 (Luftman, 2012). According to IDC, the business analytics software market will hit $50.7 billion in 2016 and have a compound annual growth rate of 9.8 percent (Vesset and Melgarejo, 2012).

While big data has received great attention, an open question is how this collection of technologies and best practices can be leveraged to create value. For big data to live up to its promise it must be aligned with a firm's overall technology strategy. What remains to be seen is whether companies will be able to navigate the never-ending flow of information to create real insight.

This topic was directly addressed at Temple University's first Big Data Conference, hosted by the Fox School of Business. Seventeen speakers from the retail, pharmaceutical, technology, aerospace, insurance, education, consulting, and public sectors shared stories, examples, and best practices for the use of Big Data in organizations (for a breakdown by industry, see Figure 1). This report summarizes the insights gained from the event, highlighting several illustrative use cases from Chartis, Merck, and Accenture. We will also present several key takeaways to provide direction for organizations looking to get started with big data.

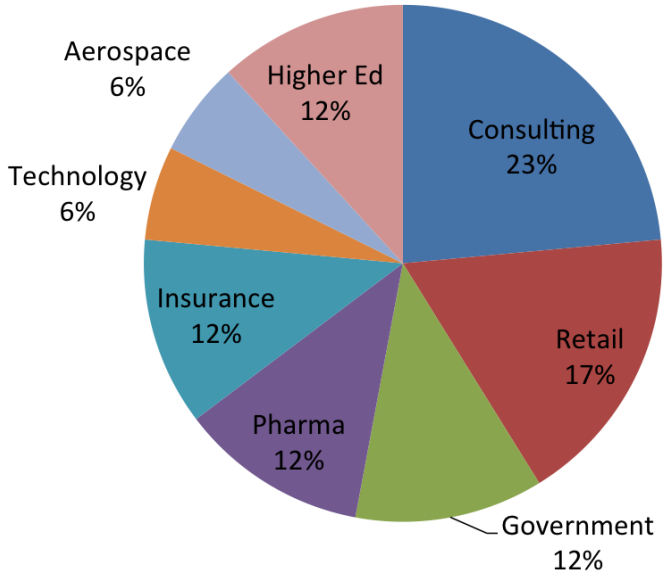

Figure 1: Breakdown of Participants by Industry

Big Data Defined

Gartner defines big data as comprising "extreme information management and processing issues which exceed the capability of traditional information technology along one or multiple dimensions to support the use of the information assets" (Freidman, 2012). More specifically, big data is defined by three characteristics (Dumbill, 2012):

- Volume: There's too much data to manage using conventional technologies, such as relational databases.
- Velocity: Data is being added, changing, and being assimilated in real time.
- Variety: Data comes from multiple sources from within and beyond the enterprise, and this data can be both structured and unstructured, including social networking, sensor information, and video.

The rise of new technologies, such as Hadoop and in-memory analytics, will have to co-exist with existing enterprise systems. These solutions are designed to support data-intensive, massively scalable, distributed applications and have been embraced by established vendors such as Oracle, Teradata, SAP, and IBM.

According to the presenters at the conference, business intelligence, analytics, and big data all drive modern data strategy. Walmart's Suja Chandrasekaran, Vice President of Enterprise Information Management, told attendees in her keynote talk that analytics, big data, and business intelligence will blend together into a single "enterprise fabric." Chandrasekaran said that all data can be relevant to her company, but technology systems need to be built to analyze it and find signals that equate to real business value.

Presenters at Temple's conference noted that they were starting Hadoop clusters, analytics pilots, and meshing big data approaches with their established analytics programs. To many companies, big data was often about unifying their internal data, which is often siloed and hard to access. Talk of navigating social networking chatter as big data was viewed as a "nice to have" at this stage of big deployments.

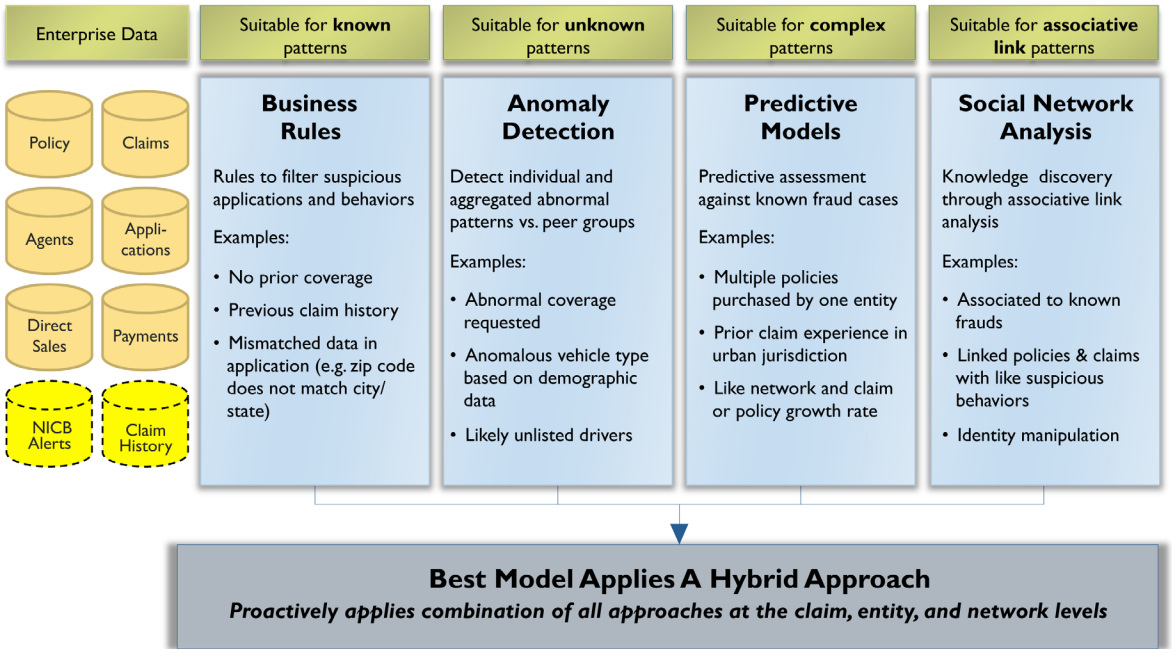

Figure 2: At Chartis, an interdisciplinary social network analysis helps detect fraud

Big Data Use Cases: Three Stories

In Use cases of big data abound, and they are often tied to revenue growth, managing risk, and cutting costs. To date, many big data use cases have revolved around large, well-known web companies such as Google, Facebook and Yahoo. They have leveraged scalable technologies like Hadoop because they simply had too much structured and unstructured consumer data to track using conventional tools. Temple's conference highlighted how established businesses across a variety of industries were developing new, exciting use cases for big data. This report highlights four exemplars.

Chartis: Social networking gets fraud detection assist

Clark Frogley, Executive Vice President and Global Head of Chartis, an AIG unit, outlined how big data can improve fraud investigations. To insurance companies, fraud detection is the equivalent of loss prevention in retail organizations. Frogley highlighted data from the Coalition Against Insurance Fraud:

- False injury claims from slips and falls and costs from litigation amount to $2 billion a year.
- 80 percent of healthcare fraud is committed by medical providers, 10 percent by consumers and 10 percent by other actors.
- Arson and suspected arson are the largest causes of property damage.

Fraud detection is essentially a big data problem even though investigations have largely been manual. There are fraud databases, third party information, investigations, millions of claims around the world and policy, payment and regulatory data to consume.

Chartis has deployed a series of rules to filter

data and combine it with manual investigations (see Figure 2). One direct use of big data is triangulating a claim with social networking data to detect suspicious activity. Details such as accidents that have occurred within a week in the same building and repeating phone numbers and addresses may be clues to a fraudulent claim. Social networks make combing that data easier. Frogley argued that a hybrid approach that utilizes known and unknown patterns, predictive modeling and social networking analysis can comb enterprise data and determine whether a claim should be approved. Social network analysis, combined with other data sources, reduced total claims by 2 percent to 3 percent. That small percentage equates to millions of dollars that can result in reserve reductions and ultimately rate reductions.

Under this (Open Government Initiative), one of the government's biggest roles is to be a data provider.

NASA: Big Data to Enable Public/Private Partnerships

Adrian Gardner, Chief Information Officer at NASA's Goddard Space Flight Center, noted in his keynote talk that big data techniques and usage can lead to better public/private partnerships. Specifically, NASA has released three datasets via the federal Open Government Initiative, which provides easy access to government data and encourages its use. Under this initiative, one of the government's biggest roles is to be a data provider.

NASA has released the following:

- The Global Change Master Directory, a platform that keeps the Earth's vital signs including temperature, the size of the ozone hole, sea levels, and carbon dioxide in atmosphere. The database has 30,000 descriptions of Earth science datasets.
- The Planetary Data System, an archive of information compiled by NASA planetary missions. Scientists use this archive and the data also serves as a baseline for Google Moon and Google Mars.
- NASA World Wind, an open source project that allows people to zoom from satellite altitude to any place on earth in three dimensions.

These datasets serve as a basis for the National Weather Service as well as aid the National Oceanic and Atmospheric Administration (NOAA) in predicting large storms and their impacts. In addition, Gardner said that government data to business uses can aid everything from wind turbine manufacturers to insurers to technology companies.

Ultimately, the compilation of these datasets will be automated and distributed for mass consumption. Gardner also noted that cloud computing vendors are likely to offer data analytics and visualization as a service, because companies will be too occupied with their own datasets to aggregate third party data effectively.

Gardner said that leveraging big data can remake industries and strengthen market share for individual companies.

Merck: Cutting Costs using Big Data Insights

Pharmaceutical giant Merck has a big data approach that blends new techniques with a broad analytics portfolio (see Figure 3). According to Bill Stolte, Executive Director at Merck, the primary

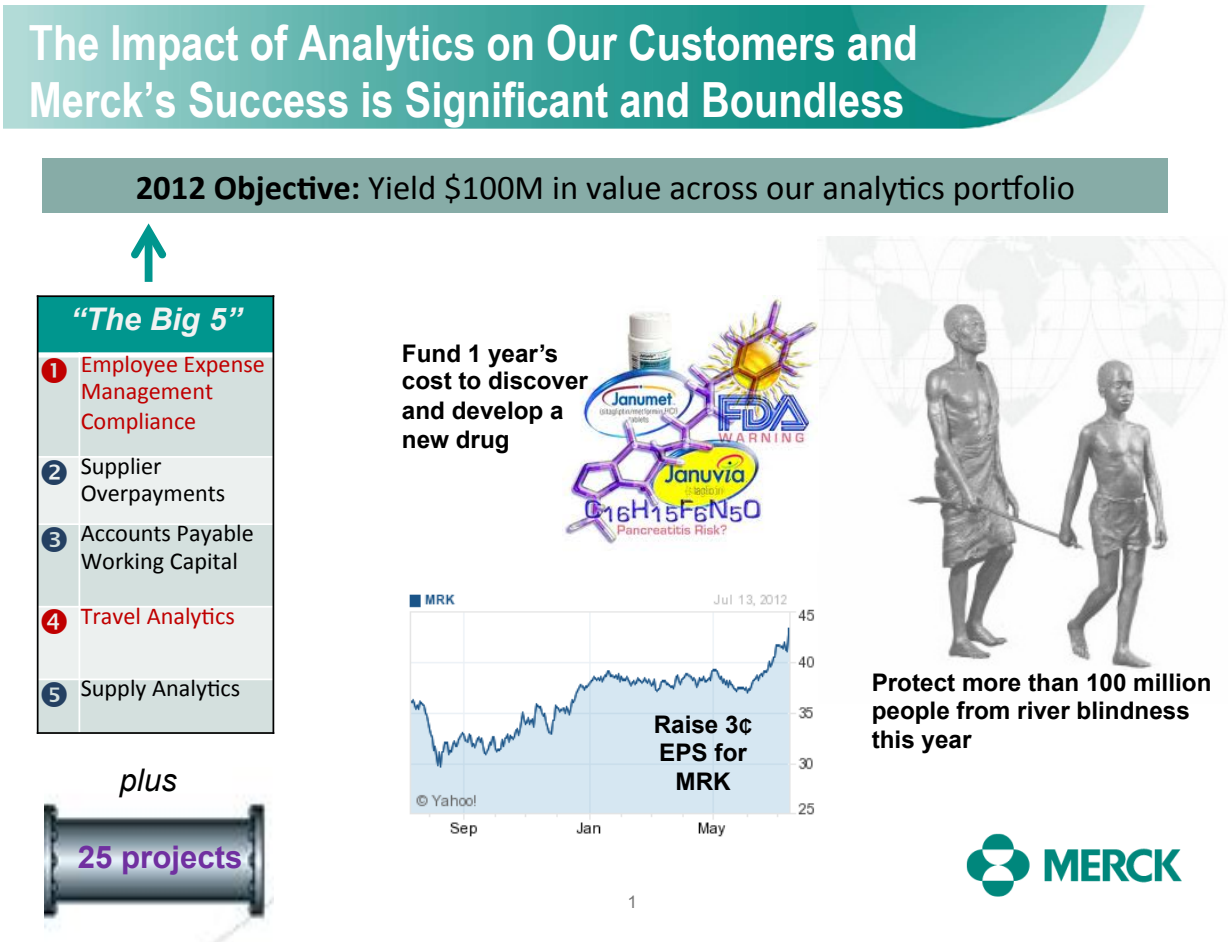

Figure 3: Merck's strategy is to link analytics to specific, measurable outcomes.

focus of the company's big data and analytics unit concerns generating sales and cutting costs..

Merck's size, at over 86,000 employees worldwide, brings its own big data challenges. Stolte's group has 30 concurrent initiatives underway as well as 25 projects in the pipeline. The biggest lesson from Stolte was that enterprise big data efforts need to focus on strategic business questions and then seek opportunities for advanced analytics. In other words, big data projects start with pilots. Once the organization achieves a few wins, programs can be expanded and things can snowball from there.

Most of Merck's analytics efforts revolve around internal efforts. Overall, big data projects are focused on low hanging fruit that can generate quick returns. Among the notable Merck case studies:

- Using analytics to detect bad behavior in employee expense claims through large-scale analysis of employee expense reports. Overall, 30 employee behaviors were used to identify high-risk patterns such as duplicate expenses, excessive mileage, and misuse of the corporate card.
- Travel management tools allowed Merck to cut spending through profiling and visualizing employee behavior. This effort enabled travel cuts estimated between $20 million to $50 million.
- Merck also has active projects exploring saving on accounts payable, supplier overpayments, clinical trial analysis, inventory optimization and human resources hiring.

Accenture: Healthcare Informatics as a Big Data Petri Dish

Accenture Director Jim Golden argued that healthcare is itself a big data problem. In fact, data will revolutionize healthcare and its constituents such as insurers, providers and consumers (see Figure 4).

"In healthcare, most of the data is outside of your walls. Healthcare is incredibly screwed up and there is not one group of providers. Healthcare is a group of very disconnected people," said Golden. "Big data isn't bringing in all the data in the world and putting it in your data warehouse.

Golden argued that economic conditions, notably shrinking budgets, along with politics, healthcare systems, changing information technology, talent shortages, and medical advances will force big data experiments. Big data and data analytics experiments will be pushed by both the private and public sector as changing patient needs and new regulation drive fundamental change in the health sector.

Among the key themes noted by Golden:

- Pharmaceutical companies will have to personalize treatments and lessen their dependence on drug blockbusters.
- Evidence-based medicine will need big data approaches to compare treatment effectiveness.
- Large-scale analytics will determine what interventions are needed for individual patients and at what costs.
- The new healthcare model will largely be enabled by big data across the healthcare value chain, said Golden.

Big data has the potential to enable the healthcare industry to target the right patient at the right time, increasing quality of care and lowering costs while increasing profitability for pharmaceuticals

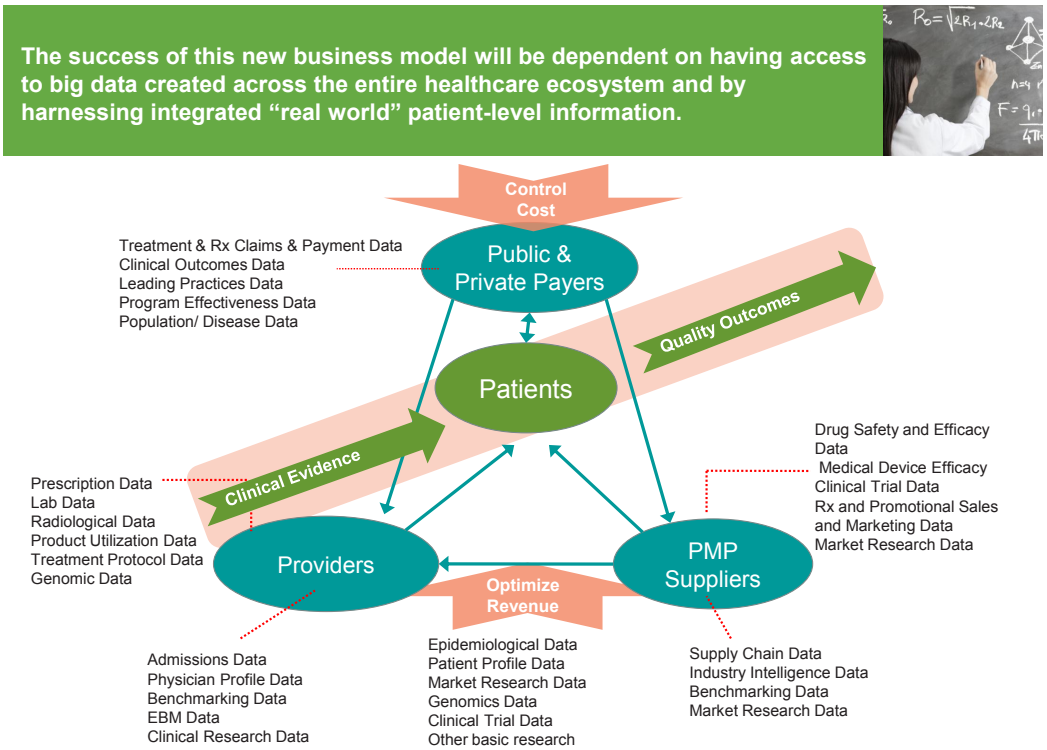

Figure 4: Accenture combines data from many sources across the healthcare ecosystem to create a complete picture of the patient.

Delivery Models and Challenges

The one common theme from the conference is that delivery models are likely to be centralized and blended in with current business analytics projects. For many enterprises, the line between big data and data analytics will become increasingly murky.

For instance, Merck uses a "shared services" approach where analytics and big data knowledge is centralized. This single business unit delivers analytics to multiple divisions in a company. The benefits are productivity, service, global reach, and re-engineering, said Stolte. "The goal is to embed analytics into business processes."

Stolte's group has grown from a handful of people to dozens in just a few years. Talent was a recurring issue among conference attendees. Companies have been pairing consultants with business unit leaders and experts and seeding university programs to develop talent in the future.

Walmart' Chandrasekaran agreed that talent will be an ongoing big data challenge. Indeed, research firm Gartner predicts that 4.4 million jobs will be created as big data is adopted through 2015. In Global 1000 companies, more than 1 million big data jobs will be created, but only a third of them will be filled.

The big data talent crunch will create many organizational challenges, added Chandrasekaran. For instance, database administrator roles will shift to focus more on administering databases for big data. A business analyst may morph into a data modeler. And data scientists will be in high demand.

On the technical front, Chandrasekaran said she expects a big data infrastructure "mesh" will be the predominant framework. This framework will consist of the following parts:

- **Big data** at the base level to integrate syndicated data, internal data that is structured and unstructured, sensor information and third party sources ranging from credit card processors to Facebook and Twitter.
- A **data management layer** that will feature an enterprise data repository and automated processes. This layer typically includes the traditional enterprise data warehouse.
- Intelligence, including global dashboards and consolidated reports.
- And a **dissemination layer** that will include a bevy of systems that connect with partners to simulate possibilities. Ultimately, machine learning will fall in this category.

> The traditional ways of managing data are no longer working for us.

Big data and analytics infrastructure will feature a wide variety of applications and infrastructure. "The traditional ways of managing data are no longer working for us," said Chandrasekaran.

Where do we go from here?

Big Data Priorities and New Opportunities

The conference speakers highlighted three common areas where big data can provide value: increasing revenue, reducing costs, and improving service. Many projects can, of course, achieve multiple objectives. By looking at the specific project goals for the industries represented at the conference, an interesting story develops regarding the opportunities for big data analytics. In areas such as healthcare, retail, and insurance, cost reduction was emphasized as a benefit more often than revenue generation. It is also interesting to note that among many industries, improving service was least often cited as a benefit.

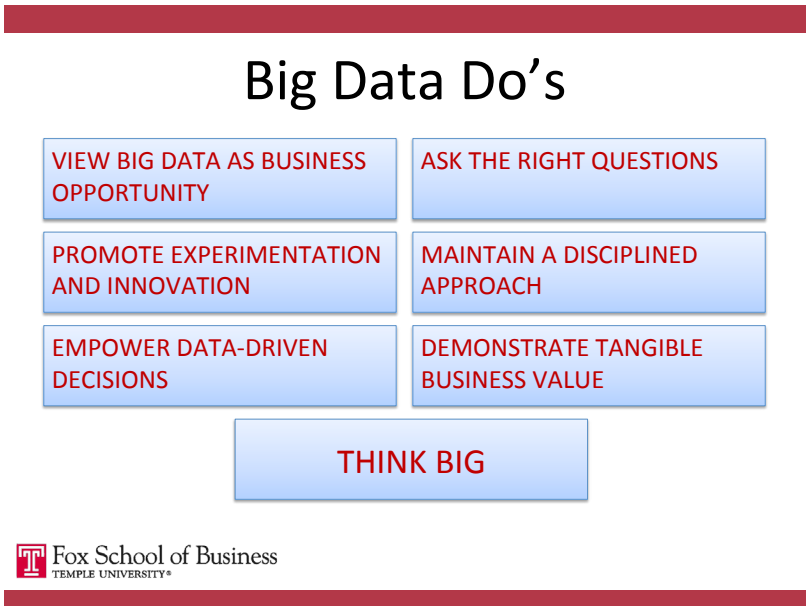

Figure 5: The "Do's" of Big Data focus on delivering value.

Conversely, government organizations placed their focus on how big data can improve services instead of cost reduction or revenue generation.

Two insights emerge from looking at the focus of the speakers' big data initiatives. First, this indicates that we are still in an early stage of sophistication regarding big data. Operational efficiencies may be the "low-hanging fruit" that provide the first, best business case for investing in big data. Generating revenue is a more complex problem whose opportunities are more difficult to conceptualize. Second, this analysis underscores the need for public/private partnerships around big data problems. It is not just a matter of sharing data – bringing together diverse perspectives is also critical. Combining the public sectors' focus on providing new, improved services with the private sectors' expertise in cost reduction and revenue generation will produce "best of breed" applications that can achieve all three of these goals.

The Do's and Don'ts of Big Data

Another key set of insights from the conference presentations is the advice they offer for organizations that are looking to build a competency in big data. While there is not a single approach, a set of best practices emerged from the talks. Fox School Professors Paul A. Pavlou and David Schuff concluded the conference by organizing these best practices into a set of Do's and Don'ts for big data initiatives. Pavlou first presented seven key "Do's" for a firm's successful Big Data strategy (see Figure 5):

1. **View Big Data as Business Opportunity**

Citing earlier presentations that illustrated the business value of big data, Pavlou and Schuff made a conceptual case that data patterns can identify new business opportunities and potential sources of value. Applying analytics to Big Data is a tremendous source of potential knowledge. However, this requires openness to changes in thinking about the way an organization does business and new approaches.

2. **Ask The Right Questions**

Given the vast breadth and depth of big data, it is easy to get sidetracked. There are numerous av-

enues – both in data and techniques - to explore the value of Big Data. Asking the right questions, Pavlou and Schuff explained, by starting with a specific business problem or opportunity, setting reasonable expectations given available data, differentiating signal from noise, and linking findings to strategy are necessary to provide the focus that leads to business value.

3. Promote Experimentation and Innovation

The use of big data opens up many opportunities for experimentation and innovation. Creating experiments that render large datasets can result in innovative solutions, Pavlou and Schuff argued. Examples from the Temple conference speakers include new product testing at Wawa, combining art and science in predictive analytics at Lockheed Martin, Machine-Man solutions at Opera solutions, and structured and unstructured data integration and real-time discovery at Coldlight.

4. Maintain a Disciplined Approach

It is easy to lose control when tackling complex problems with vast amounts of data. Maintaining a disciplined approach and following rigorous analytical approaches are important to avoid incorrect or spurious findings. There were several examples of disciplined practices outlined at the conference, such as data quality controls described by Merck and detailed data management at Campbells Soup. Moreover, proper interpretation and accurate visualization of big data findings are important; Pavlou and Schuff pinpointed several best practices, such the analysis solutions at Chartis, the visualization tools described by Pfizer and Lockheed Martin, and the dashboards and scorecards at Campbell.

5. Empower Data-Driven Decisions

The ultimate value of big data is to rely less on ad-hoc "gut feeling" approaches and more on scientific evidence derived from analyses. Firms must empower strategic decisions based on data-driven intelligence, Pavlou noted during his presentation. Examples of effective practices in empowering data-driven decisions include automated decision-making at Walmart, real-time decision support described by SAP, and activity-based intelligence at Lockheed Martin.

6. Demonstrate Tangible Business Value

Consistent with the theme of "business value of big data", it is important to achieve demonstrable benefits. This is important as it is easy to get distracted by interesting findings that may not impact the bottom line. Some tangible examples of business value of big data were noted, such as Merck yielding $100 million in value across its analytics portfolios by enhancing expense reporting compliance, $92 million in savings from optimizing working capital at Campbell's Soup, $35 million in higher prices gained from used cars auctions as described by Opera Solutions, hundreds of millions in savings from reducing frivolous claims by 2% to 3% at Chartis, and increased membership by intelligent targeting at Independence Blue Cross.

7. Think Big!

Ultimately, leveraging Big Data is about change: rethinking long-held assumptions, challenging conventional thinking, and exploring novel ideas that can fundamentally transform existing business processes, current corporate practices, and existing industry structures, Pavlou and Schuff stressed. Some notable examples from the Temple Big Data conference was Accenture's goals to "hack" healthcare and rethink the industry, NASA's World Wind systems to track hurricanes, and Walmart's process of combining Big Data and Big Analytics to create insights and value.

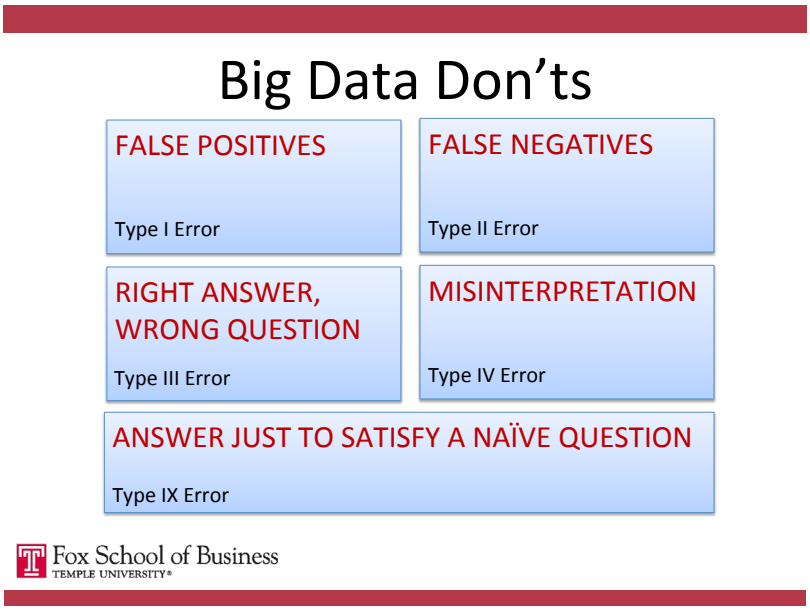

Figure 6: The "Don'ts" of Big Data focus on avoiding false conclusions from your anaysis.

Despite the promise of Big Data, such paradigm-changing initiatives must be approached with caution. The most frequent issue is the temptation to get "drawn in" by the numbers. To demonstrate the potential pitfalls, and how to avoid them, Pavlou and Schuff adapted common statistical "errors" and applied them to a Big Data context to create a list of "Don'ts" (Figure 6):

1. Type I errors – The False Positive

This refers to seeing what isn't there, believing falsehoods, and acting when one should not. This is a real risk with big data as any small effect can be statistically significant. Data alone should not trump sound business judgment, Pavlou and Schuff warned.

Remedies: Maintain a disciplined approach (Do #4) by challenging findings, taking into account prior effects, and exercising business judgment; Demonstrating tangible business value (Do #6) ensures that any effect, albeit practically small, can result in measurable economic value.

2. Type II errors – The False Negative

This error refers to missing what is there and not acting when one should. Many small things can go unnoticed given the wealth of findings available, as Pavlou and Schuff explained with examples during the conference.

Remedy: Be open to experimentation and innovation (Do #3).

3. Type III errors – Misunderstanding

This happens when one arrives at the right answer, but by answering the wrong question, essentially getting right answers to the wrong questions. This misunderstanding is commonplace when firms are asking easy questions or ask questions based on which questions they can readily answer.

Remedies: Ask the right questions (Do #2) and view big data as a business opportunity (Do #1) by keeping the core problem in hand and focusing on business value.

4. Type IV errors – Misinterpretation

This refers to the incorrect interpretation of correct empirical findings, usually resulting in poor business decisions by neglecting business logic and relying on spurious, data-driven findings.

Remedy: Empower data-driven decisions (Do #5), but makes sure the decisions must be accompanied by sound business acumen.

5. Type IX error – Satisficing

This refers to giving weak solutions for the sake of satisfying naïve questions. Satisficing is less common, but a general problem that companies should avoid, Pavlou and Schuff noted.

Remedy: Think big (Do #7) and ask groundbreaking questions to avoid succumbing to naïve questions and poor solutions.

In the end, all data is actionable but the challenge revolves around finding the so-called signals, or information that provides business value if acted on. Chandrasekaran noted that "all data is relevant to Walmart." That refrain will become increasingly common among enterprises. Big data and the analytics techniques that go with it is likely to recast industries and ultimately separate the winners from the losers.

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