Data and Technology Perspective

Ramesh Nair
Andy Narayanan

booz&co.

Benefitting from Big Data
Leveraging Unstructured Data Capabilities for Competitive Advantage

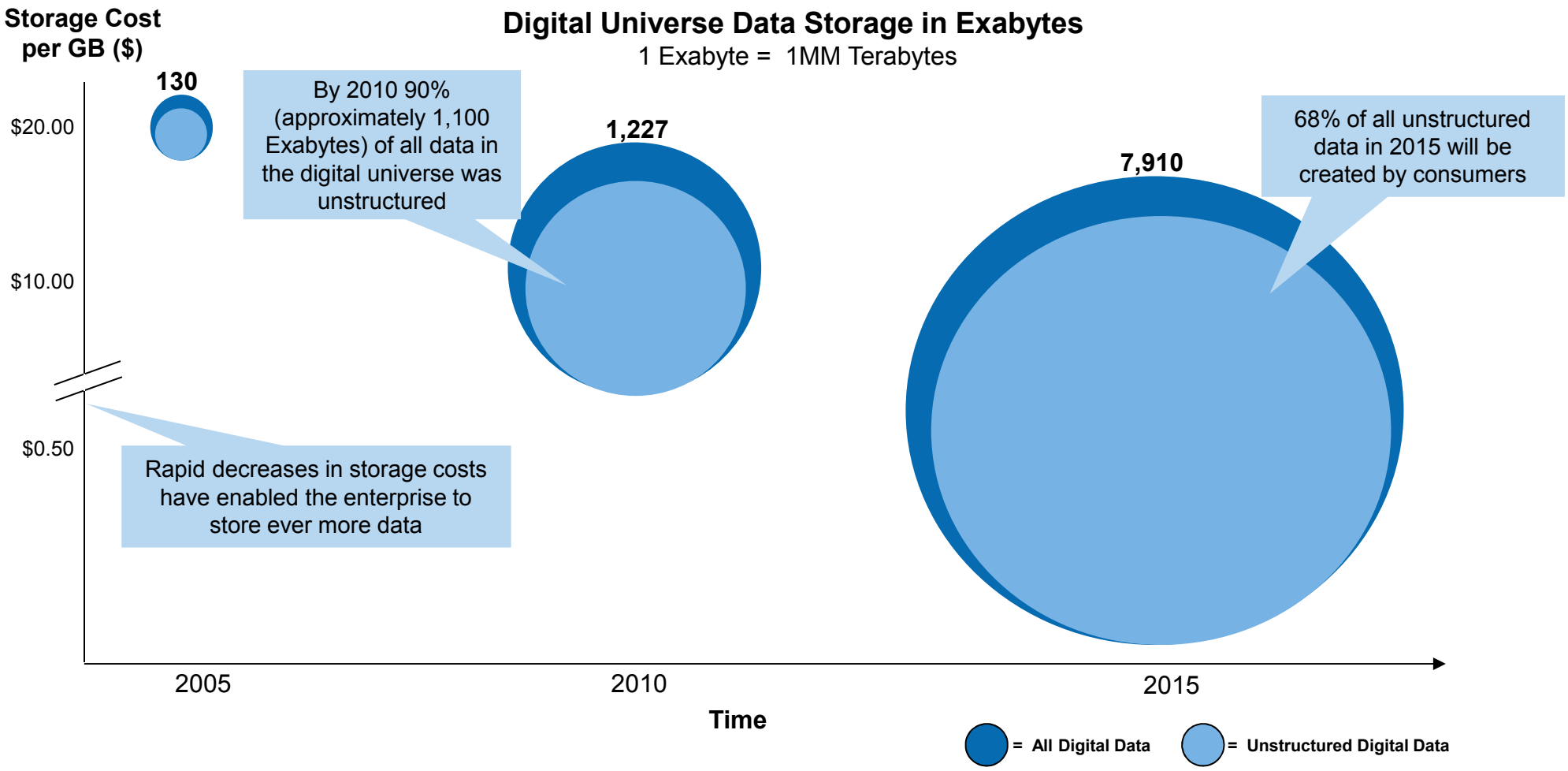
Executive Summary

The emergence of digital trends has accelerated the volume, speed and variety of unstructured consumer information referred to as "Big Data." Enterprises can benefit from this growth and seize market opportunities to drive value by implementing solutions that capitalize on the rampant growth of big data.

The data processed can provide companies with insight about customers that can help boost productivity in areas such as marketing, operations, and risk management. But with the amount of data expanding, technology challenges, organization limitations, and privacy/trust concerns - among other obstacles – businesses must approach analyzing this data with an array of new and emerging technologies.

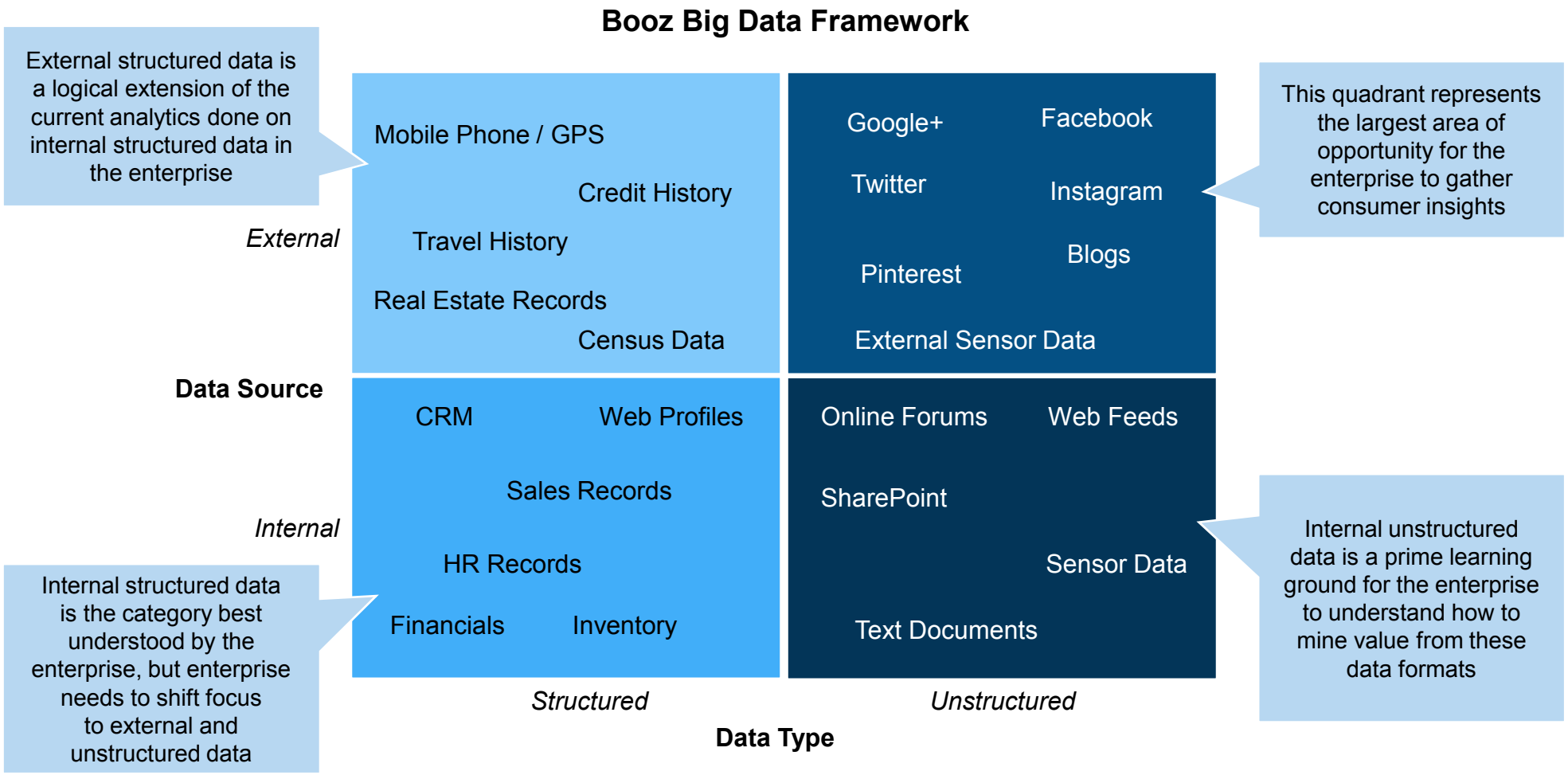
By overcoming the challenges that coincide with big technology solutions and leveraging distinct capabilities, companies across many industries can gain a tremendous competitive advantage.

Unstructured consumer data, called Big Data, represents majority of growth in data volume, up 56% CAGR since 2005



Source: IDC's Digital Universe Study, sponsored by EMC, June 2011

A first step is to understand the categories of Big Data that can be leveraged -- Structured vs. Unstructured and Internal vs. External



Source: IDC's Digital Universe Study, sponsored by EMC, June 2011

Notion of expanding data sets have appeared every decade or so -- but current Big Data trend is different along multiple dimensions

Characteristics Defining Big Data

Volume

- Volume of data stored in enterprise repositories have grown from megabytes and gigabytes to "petabytes"
- E.g. volume of data processed by corporations grew significantly, e.g. Google processes 20 petabytes / day
- By 2020, 420 Billion electronic payments are expected to be generated
- New York Stock Exchange creates 1 terabyte of data per day vs. Twitter feeds that generates 8 terabytes of data per day (or 80 MB per second)

Variety

- Data variety exploded from structured and legacy data stored in enterprise repositories to unstructured, semi-structured, audio, video, XML etc.
- Streaming data, stock quotes, social media, machine-to-machine, sensor data all drive increasing variety that needs to be processed and converted into information

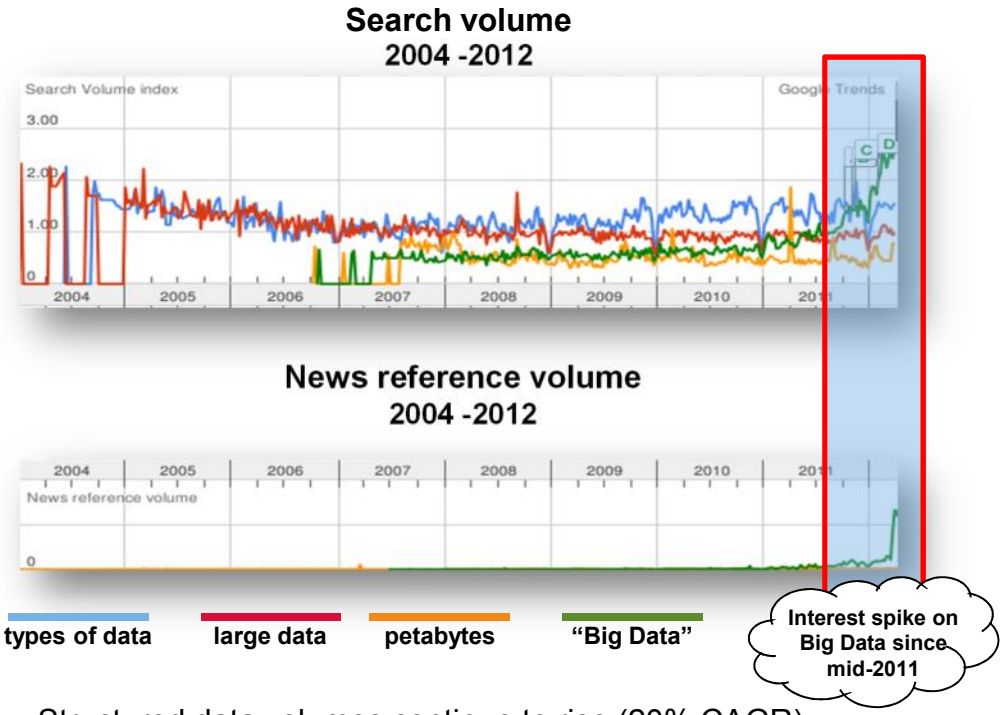
Velocity

- Speed of data movement, processing and capture in and outside enterprise went up significantly
- Model based business intelligence models typically takes days for processing - compared to 'almost' real-time analytics requirements of today using incoming stream of high-velocity data
- E.g. eBay is addressing fraud from PayPal usage, by analyzing real-time 5 million transactions each day.

Source: Information week, 2011

It is different this time because not only is the data universe expanding, but the universe of data is itself expanding

An Expanding Data Universe



- Structured data volumes continue to rise (20% CAGR)
- 80% of the world's data is unstructured – Unstructured data is growing at 15 times the rate of structured data
- Layers and layers of unstructured data gets added based on user interactions and data usage

Source: Google Trends April 6, 2012

An Evolving Data Universe

Interconnected

- Access to information is democratized
- Mature infrastructure for person-machine and machine-machine collaboration
- M2M continues to grow with peer-to-peer networking
- Mobility and social networking trends point to a Bi-2-Bi future, i.e., billions connected to billions

Intelligent

- Data analytics has gone mainstream
- Existing data analysis creates *new* data
- Raw computation power has risen rapidly: today's off-the-shelf components can provide what was previously only possible using a super-computer

Instrumented

- Cost of data acquisition has plummeted
- Infrastructure has delivered fine-grained data in real time, analyzed with cheaper CPU cycles

The rampant growth of connected technologies creates even more acceleration in Big Data trends – it is a "data tsunami"

Emerging Digital Trends

A recent Booz study conducted sees three digital eras emerging by 2015 in response to the trends

1. **Era of the working nomads**
   - Increase in telecommuting will be enabled by connectivity
   - Work previously done face to face will become more digital with more data stored in the enterprise
2. **Era of the "On" Life**
   - Ubiquitous and seamless connectivity will be readily available further enabling social networking
   - Standards will be in place for worldwide seamless mobile communication to complete the connected world
3. **Era of the Smart Cloud**
   - Smart cloud technology will emerge to respond to the needs of the enterprise and the consumer
   - Increase in the sensor economy will require remote data storage capabilities to hold the data collected by the devices

Impact on Big Data

Connected World

- Connected Consumer: 24/7 connection to the internet through PC and mobile devices - 80 percent of the world population will use mobile phones by 2020

Information Osmosis

- Consumption of digital information by consumers will increase - by 2020 there will be 4.7 billion internet users globally
- "Nonlinear" information consumption will become the norm as consumers pick and choose the information they want from the vast pool of available data

Social Networking

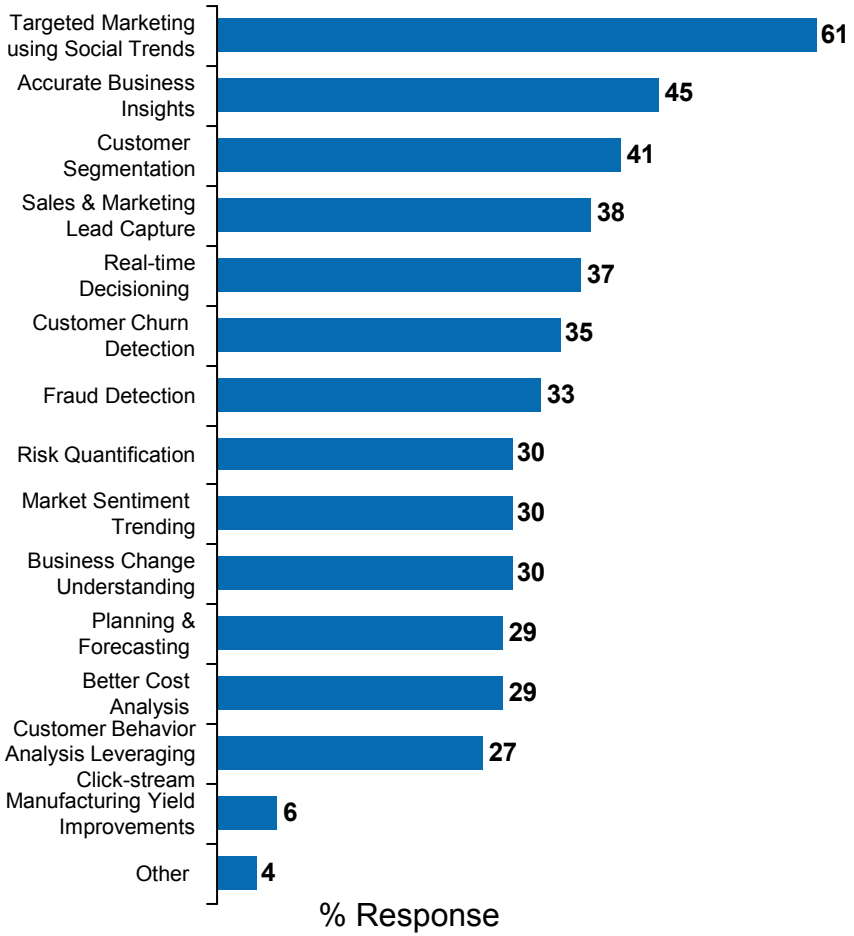
- Increase in the number of internet users will drive even more growth in social networks - on average a user will have a 200-300 contacts in their online social network
- Social Storefront will create more unstructured enterprise data as consumers migrate increasing amounts of purchasing activity to online

Sensor Economy

- Enhanced technological capabilities for sensor devices will usher in the "Era of the Sensor Economy"
- Environment and location aware devices used by consumers will deliver increasingly large amounts of digital data to the enterprise

1) Hal Varian, Computer Mediated Transactions, 2010 Ely Lecture at the American Economics Association
2,3) IDC's Digital Universe Study, sponsored by EMC, June 2011

Enterprises can benefit from Big Data in several areas including Customer Insights, Marketing, Operations and Risk Management



Examples

Customer Analytics

- Customer Driven Marketing: Targeting promotions and personalizing offers based on individual purchasing behavior, churn prevention
- Product Recommendation: Collaborative filtering, multi-channel activity based recommendations

Marketing Analytics

- Marketing Mix Modeling: Optimizing marketing mix and promotions by using econometric modeling to assess sales lift of different marketing tools and identifying most effective
- Pricing Optimization: Using data to assess demand sensitivity to pricing to optimize pricing through various points of product life cycle

Web/Mobile/ Social Analytics

- Customer Activity Analysis: Storing customer preferences to customize display, tracking usage to measure web metrics
- Social Media Monitoring: Analyze consumer sentiments towards company and products on social media platforms

Operational Effectiveness

- Operational data analytics leveraging large manufacturing data to improve process and product quality
- Improved planning and forecasting leveraging large historic process, resource and product data

Fraud and Risk Analytics

- Large customer, transaction and market data analysis for customer and product risk quantification
- Real-time fraud detection leveraging data from POS, transactional and analytical systems

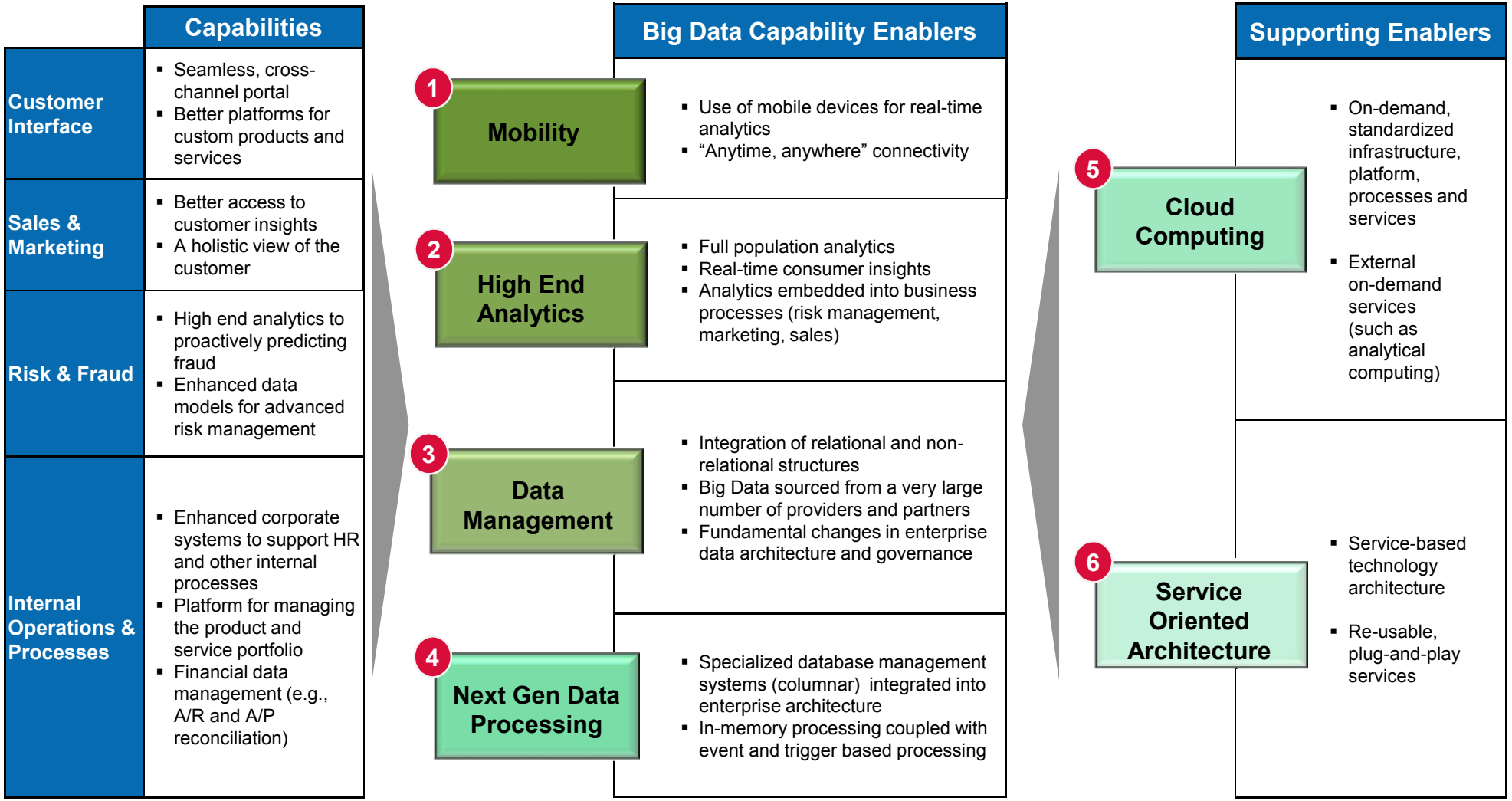
Source: TDWI Research (Q4, 2011), Booz & Company analysis

However, significant challenges exist in implementing Big Data solutions and using it to drive value in the enterprise

Big Data Challenges

Solution Maturity	▪ Limited number of large implementation of Big Data solutions exist in the enterprise ▪ Most of the enterprise implementations are in pilot stages
Organization Limitations	▪ Talent – Lack of truly skilled professionals on the types of data, and its appropriate use ▪ Culture – Organizations have not yet fully realized the implication of Big Data on business modeling and insights, and IT architecture and execution
Privacy/Trust Concerns	▪ As more data is available, acceptable use of personal data becomes of greater concern to customers ▪ Amount of data is increasing faster than organizations can properly secure the data
Technology	▪ Velocity, volume, and variety of data show no signs of slowing which will require new technology solutions

Secondly, the solution needs to be "architected" -- to benefit from Big Data, an array of new and emerging technologies is needed



These technologies and their use on Big Data will have a major impact on the IT programs and portfolios

Enablers	Architecture	Technology	Data & Applications
1 **Mobility**	▪ Separation of user interface from back end as enterprise applications are accessed by multiple customer devices	▪ Migration to web-centric tools that reduce dependency on specific devices and platforms	▪ To provide a full range of functions on mobile channels, build infrastructure to support apps and use cloud-sourced services
2 **High End Analytics**	▪ Infrastructure strategy to enable full population analytics ▪ Data architecture for real time context-aware analytical insights	▪ Database and infrastructure to support in-memory processing	▪ A data strategy to support high–end analytics and insights based on recurring customer events
3 **Data Management**	▪ Enterprise data warehouse and analytical data structure enhancement to accommodate unstructured data from multiple external providers	▪ Platforms (Apache, LexisNexis), tools (Hadoop, MapReduce) and delivery strategies for big data management	▪ Access to critical data sources (such as social media) needed for customer and process insights ▪ Refinement of data integration processes and tools to integrate unstructured data with relational data
4 **Next Gen Data Processing**	▪ Data, query and analysis architecture to support new database constructs	▪ Integrated data architecture to manage relational data with new data structures (columnar or inverted DBMS)	▪ Deployment of data warehouses and downstream applications to bring together traditional RDBMS with new columnar or inverted data
5 **Cloud Computing**	▪ Cloud strategy (private, public, hybrid) to source infrastructure, platform and applications to manage data intensive analytics, with minimal impact to internal systems	▪ Cloud services that support mobile payments and complex analytics ▪ Cloud-based platforms to enhance app. development capabilities	▪ Cloud–sourcing structured/unstructured data from multiple external sources ▪ Data sensitivity classifications to design clouds with appropriate security
6 **Service Oriented Architecture**	▪ Refinement of the SOA implementation approach – to provide outputs of Big Data processing as services	▪ Refinement of the enterprise technology strategy to ensure support for service-based interoperability	▪ Common services to be provided to front, middle and back office applications by aligning SOA strategy with enterprise business model

Existing data and technology initiatives should be augmented with Big Data technology enablers

Enterprise Initiative	Some Illustrative Scenarios
CRM Platform	▪ Explore hosting of CRM platform in the cloud ▪ Extend CRM platform by integrating social media technology to enhance customer view ▪ Integrate operational analytics with CRM modules to aid sales interaction
Customer Portal	▪ Enhance use of interfaces for internal customers to allow for seamless integration with external interfaces ▪ Incorporate all customer data into one portal so the consumer experience can be further customized
Customer Analytics and Insights	▪ Use new analytical tools to process a high volume of data to deliver customer insights ▪ Create custom or personalized products and services based on consumer insights and additional data collected about consumers from multiple channels
Operations Management	▪ Customized product and service offerings will require operational adjustments ▪ Use analytics to monitor operations processes and identify inefficiencies ▪ Enhance operations by delivering more real-time data to consumers
Enterprise Data Management	▪ Explore alternative technologies for data integration across channels (i.e. Hadoop, MapReduce) ▪ Leverage technology to integrate structured enterprise data with unstructured data from social media and other sources
Risk Management	▪ New analytical tools and processes can enable enhanced risk management models and proactive fraud and loss prediction ▪ Information security initiatives will also be necessary to protect data especially in light of trends such as Bring Your Own Device

Progressive "Snapshot" is a perfect example of commercial usage of Big Data technology

Progressive "Snapshot" Case Study 1

Overview

- Progressive Insurance, as part of its "Pay As You Drive" program, offers drivers the chance to lower their premiums based on real-time analysis of their driving habits
- Drivers plug a device, the "Snapshot," that collects large volume of data (e.g., time of the day, miles driven, number of hard brakes) over a period of time. Based on analysis of the data, progressive offers a discount to individual's insurance premium

Technology

- "Snapshot" combines Big Data analysis with mobile computing, and cellular communications technologies. The device is plugged into the car's on-board diagnostic port ; as the customer drives, a large volume of data is collected in a mobile, next generation database and analysed
- The device leverages AT&T network to share the information wirelessly with Progressive -- this is not fitted with GPS for privacy reasons

Future Plan

- Next generation database technology is becoming cheaper, making the Machine-to-Machine devices like "Snap-shot" more affordable -- consumerization of this technology is expected to happen within next 3-5 years
- In insurance industry, the competition for Big Data technology has already started – Allstate has started providing similar solution as "Snapshot" to their customer base for premium discounts

Source: Booz & Company research

Other leading companies across industries are beginning to leverage Big Data capabilities for competitive advantage

Case Study 2

WellPoint and IBM to use Watson to improve patient care

- Wellpoint to develop and launch Watson-based solutions to help improve patient care through the delivery of up-to-date, evidence-based health care
- Watson can process about 200 million pages of content in less than three seconds as it leverages analytical tool to analyze huge volumes of data to aid decision-making
- IBM will develop the base Watson healthcare analytics based on Watson's capabilities, for WellPoint's needs – this will be first commercial application of the Watson technology

Case Study 3

Intuit and 10gen enable real-time insights for customer websites

- Intuit Websites, uses a next generation database (MongoDB) from and real-time analytics tool from 10gen to derive interesting and actionable patterns from their 500,000+ customer website traffic
- This next generation database enables high performance unstructured data analysis and gleaning customer insights at a lower cost
- Deployment of MongoDB is faster than relational databases and easily integrates structured data with unstructured data

Case Study 4

Officemax uses ParAccel for effective marketing and sourcing

- OfficeMax moved from its maxed-out Teradata Data Warehouse to ParAccel, a columnar database for complex analytical queries
- ParAccel was implemented in a private cloud to provide horizontal scalability
- The solution is connected with Teradata, eliminating the need to additional data transformation and manipulation -- saving considerable additional effort

Source: Booz & Company research

Contact Information

Chicago
Andy Narayanan
Principal
+1-312-578-4781
andy.narayanan@booz.com

Florham Park, NJ
Ramesh Nair
Partner
+1-973-410-7673
ramesh.nair@booz.com

Team Members: *Arindam Chatterjee (Sr. Associate), Balu Nair (Sr. Associate), Alanna Hynes (Associate), Lucas Streit (Associate), and Jae Chang (Associate)*

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