Here with you today
Speaker

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PwC Data Analytics
Principal
Agenda

Data/Digital explosion & role of analytics
Big data and analytics opportunity
Analytics aspirations in the utility industry
Data/Digital explosion & role of analytics
Trends driving new data challenges

Data volumes explode by 40% every year
- Organizations are generating petabytes* of data annually but are only able to analyze terabytes
- Google processes about 24 petabytes of data per day
* 1 petabyte = 1,000,000,000 megabyte

Consumers live in a digital and connected world
- Smartphone sales started outpacing PC sales in 2011
- Social media is being extensively used by individuals and corporations
- More than 1 Billion active Facebook users

Storage costs decrease by 45% every year
- Throwing away data is becoming more expensive than storing data
- Generate business value now with scalable cost structure

Most data is unstructured and complex to analyze
- Only 5% of data is currently in a structured format suitable for traditional Business Intelligence (BI)
**Data/Digital explosion & role of analytics**

Accelerating trends in analytics and big data are impacting our clients' business models and competitive agenda.

Big data has complex data variety - As digital advances unlock a new ways for companies across industries to interact with customers, each new interaction brings new data structure and format that make big data big and complex.

- **Sensor data**
  - Medical devices, smart electric meters, car sensors, road cameras, satellites, traffic recording devices, processors found within vehicles, video games, cable boxes, assembly lines, office building, cell towers, jet engines, air conditioning units, refrigerators, trucks, farm machinery, etc..

- **Machine Log Data**
  - Event logs, server data, application logs, business process logs, audit logs, call detail records (CDRs), mobile location, mobile app usage, clickstream data, etc.

- **Public Web**
  - Government, weather, competitive, traffic, regulatory, compliance, health care services, economic, census, public finance, stock, OSINT, the World Bank, SEC/Edgar, Wikipedia, IMDb, etc.

- **Docs**
  - XLS, PDF, CSV, email, Word, PPT, HTML, HTML 5, plain text, XML, JSON, etc.

- **Media**
  - Images, videos, audio, Flash, live streams, podcasts, etc.

- **Social Media**
  - Twitter, Linkedin, Facebook, Tumblr, Blog, SlideShare, YouTube, Google+, Instagram, Flickr, Pinterest, Vimeo, WordPress, IM, RSS, Review, Chatter, Jive, Yammer, etc.

- **Business Apps**
  - Project management, marketing automation, productivity, CRM, ERP content management system, HR, storage, talent management, procurement, expense management Google Docs, intranets, portals, etc.

- **Archive**
  - Archives of scanned documents, statements, insurance forms, medical record and customer correspondence, paper archives, and print stream files that contain original systems of record between organizations and their customers

**Abundant customer information ... how actionable?**

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Data/Digital explosion & role of analytics
Capitalizing on the information explosion

We have seen high performing organization moving past business intelligence and adopting predictive analytics and a more agile approach to information management.
Building capabilities to compete with data and analytics is a top opportunity identified by executives, yet 58% indicate moving from data to insight is a major challenge.

Which trends will transform business the most over next five years? Which technologies are you investing in?

- Business analytics: 44%
- Socially enabled business processes: 41%
- Cybersecurity: 39%
- Mobile customer engagement: 39%
- On-demand business and technology services: 25%
- Sensors: 20%
- Battery and power technologies: 15%
- Robotics: 15%
- 3-D printing: 11%
- Wearable computing: 6%

What barriers do you face integrating better data and analytics into decision making?

- Low quality data: 35%
- Difficulties assessing data: 30%
- Limited benefits to role: 30%
- Senior management lacks skills: 29%
- Problems communicating data insights: 23%
- Lack sufficient skills/expertise: 20%
- Ability to take actions based on insights: 11%
- Senior management has enough info: 5%
- Doubts about usefulness for strategic decision making: 5%
- Presentation of data in an unusable format: 3%

PwC 2014 US CEO survey; PwC Digital IQ 2014 10 Technology Trends for Business
Data/Digital explosion & role of analytics
Successfully competing with decisions mean...

01
- Build “decision maps” of your value chain to specify how critical decisions impact shareholder value
- Isolate focus areas by assessing decision “speed” and “sophistication” compared to competition

02
- Specify and simulate the influence of trends on strategic alternatives
- Evaluate the impact of strategic alternatives across the business operating model

03
- Quantify the increase in expected value of specific metrics associated with improving decision making
- Address technological issues and opportunities in context of specific decision maps

04
- Define ‘Decision Specs’ to structure analytics and data organizations, processes and technology needs
- Pilot application of new analytics and data capabilities, learn and scale

Art & Science in Decision Making

Art = Leadership Judgment

Science = Analytics Excellence

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Big data and analytics opportunity

Big data is part of a broader data evolution which has impacted technology, information and advanced analytics.
# Big data and analytics opportunity

Information 2.0 operating model

Utilizing information as a strategic weapon requires an adaptive approach where fundamentals are executed well and augmented by agility and experimentation.

<table>
<thead>
<tr>
<th>Analysis Needs</th>
<th>Information as an investment</th>
<th>Information as a game changer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audience</td>
<td>Reporting</td>
<td>Predictive</td>
</tr>
<tr>
<td>ROI Approach</td>
<td>Return on Investment</td>
<td>Small User Base - Unfocused Needs</td>
</tr>
<tr>
<td>Execution</td>
<td>Waterfall</td>
<td>Option Creating Investments</td>
</tr>
<tr>
<td>Approach</td>
<td>Model then Store</td>
<td>Iterative/Agile</td>
</tr>
<tr>
<td>Sources</td>
<td>Transactional</td>
<td>Store then Model</td>
</tr>
<tr>
<td>Location</td>
<td>Internal</td>
<td>Interactions</td>
</tr>
<tr>
<td>Format</td>
<td>Structured</td>
<td>Outside the Company</td>
</tr>
<tr>
<td>Tools</td>
<td>Business Intelligence</td>
<td>Structured, Semi and Unstructured</td>
</tr>
<tr>
<td>Languages</td>
<td>SQL</td>
<td>Analytics, Simulation, Visualization</td>
</tr>
<tr>
<td>Storage</td>
<td>Relational</td>
<td>MapReduce, Embedded R, etc.</td>
</tr>
<tr>
<td>Integration</td>
<td>Traditional ETL</td>
<td>Hadoop, Cassandra, Mongo, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REST, SOAP, RSS/Atom,...</td>
</tr>
</tbody>
</table>

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**Big data and analytics opportunity**

What is big data?

**Big Data is about data sets & analysis**

Big Data is not a precise term; rather, it is a characterization of the never-ending accumulation of all kinds of data, most of it unstructured. It describes data sets that are growing exponentially and that are too large, too raw, too unstructured, or too rapidly changing in structure for analysis using (traditional) relational database techniques. Big Data is often described by its attributes – volume, velocity, variety and veracity.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Used to be...</th>
<th>Is now...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume</strong></td>
<td>The size of the data set</td>
<td>Measured in Kilobytes, Megabytes, Gigabytes</td>
<td>Measured in Terabytes, Petabytes, Exabytes</td>
</tr>
<tr>
<td><strong>Variety</strong></td>
<td>The diversity of data: source, type and structure</td>
<td>Well structured sales, marketing, operations, procurement data</td>
<td>Structured plus unstructured text, voice, video, sensor, and digital data</td>
</tr>
<tr>
<td><strong>Velocity</strong></td>
<td>The speed at which data is generated, analyzed and used</td>
<td>Periodic data dumps, FTP site uploads, daily and weekly database refreshes</td>
<td>10’s of thousands of data transactions generated and processed per second</td>
</tr>
<tr>
<td><strong>Veracity</strong></td>
<td>The level of quality and trustworthiness that can be ascribed to the data set</td>
<td>Transactional/master data easy to clean, QA and rely upon</td>
<td>Streaming unstructured data hard to monitor and govern</td>
</tr>
</tbody>
</table>
Big data and analytics opportunity
What is big data?

Big Data is about new technologies
The Big Data landscape has given birth to a host of emerging technologies. Big Data is not a single technology but a family of technologies, integrated with an organization’s “traditional” infrastructure.

- Open Source – Easy to code, extensible
- Relatively Inexpensive – Compared to legacy data warehousing/analytics hardware and software
- Quick Deployment – Doesn’t rely on structured data models
- Highly versatile – Designed to handle unstructured text, voice and video
- Minimal footprint – “As a Service” or Cloud-based models are available

Big Data does not negate the need for:

- Data governance
- Data definitions/taxonomy
- Data cleansing
- Data transformation/standardization
- Analytical algorithms
- Business rules

... and the people that develop or implement these.
Big data and analytics opportunity

Big data provides a solution for sets of data whose value to the organization is not proven but volume is enormous.

How Big Data Changes the Equation:

- Enables information of little apparent value to be mined to identify and prove potential value.
- Allows storage of large amount of data at an attractive price point using commodity hardware and open source software.
- Requires an effective coordination of both business and IT resources to intake data at cost efficient means with agility to innovate.
- Allows for reprocessing of data when new models or behavior patterns change.
- Requires adoption of new ways to store (e.g., JSON, BLOBs) and process data (e.g., Map-Reduce, In Database Analytics).
Big data and analytics opportunity

Big data’s promise: transforming data into insights & intelligence

- LMPs
- Plant Info – Sensor Data
- Click Stream, Website
- Smart Meter Data
- Weather – hyper local
- Search (Paid and Organic)
- SMS, Blogs, Twitter
- Recorded Lines (Audio)
- ISO Documents

Data Lake

Interlocking is critical for success

- Extract Golden Nuggets of Information
- Predictive Analytics-Model Conception, Testing and Promotion

Structured Data Warehouse

- Deals/Transactions
- Load
- Forward Prices
- Generating Costs
- Market Fundamentals
- Unit Characteristics
- Unit Status
- Weather Forecasts

Technology
- Hadoop
- CouchDB
- Cassandra
- Pig
- Hive
- MongoDB
- AsterData

Innovation Labs

Log
Match
Identify

Technology
- Oracle Exadata
- Teradata
- IBM Netezza
- Green plum

Analytics Mashup Engine

Insights & Analysis

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Big data and analytics opportunity
We are seeing companies use a variety of tactics to initiate and evolve analytics organizations

...Airlines, rail, movie theater chain using exploratory analysis and tool pilots to prove value of dynamic optimization capabilities before major investments

...Global agriculture & chemicals company building “decision maps” across stakeholder value chains to pinpoint data and analytic opportunities for customers

...Capital intensive industries using sensor data to understand early indicators and mitigate unplanned disruptions

...Pharma and business services companies embedding IT resources into analytics CoEs to support data sourcing, acquisition, and preparation activities

...Aerospace company separating Business Intelligence CoE from Analytics CoE organizationally and architecturally

...Multiple companies across sectors partnering with academic institutions and professional services firms to source and develop talent

...Healthcare and insurance companies bifurcating between analytics for innovation, disruption and executive support and operational analytics for business functions

...Global insurers testing analytics CoE organization models across geographies and functions in addition to new analytic applications for the business

...Funding through IT or functional budgets, zero based and pay per use models, and invest/co-investment models – with or without monetization strategies

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Analytical aspirations in the utility industry

Competing on insight

Business challenges can be better managed and controlled within the utilities industry when data and analytic business capabilities are meshed together to provide predictive insights which improve management decision making.
Analytical aspirations in the utility industry
Analytics maturity model

Integrated and best-in-class

Automated and analytic

Data captured and managed

Maturity level relative to consumer analytics

Aware  Developing  Practicing  Optimizing  Leading

Utilities

Communications

Financial services

Retailers

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## Analytical aspirations in the utility industry

Six critical design and execution dimensions need to be addressed

### Advanced analytics capability

<table>
<thead>
<tr>
<th>Business Applications</th>
<th>Data</th>
<th>Technology</th>
<th>Talent &amp; Organization</th>
<th>Processes</th>
<th>Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are we using analytics for?</td>
<td>Do we have access to the right data?</td>
<td>Do we have the right systems and tools?</td>
<td>Do we have the right skills and org structure?</td>
<td>Are our governance processes optimal?</td>
<td>How can we build a data-driven culture?</td>
</tr>
<tr>
<td>• Where is analytics currently being used?</td>
<td>• What systems and applications capture and generate data – internal and external?</td>
<td>• What analytics tools and reporting solutions are deployed?</td>
<td>• Where do the analytics teams reside and is the structure optimal for analytics production and adoption?</td>
<td>• Do formal governance structures and processes exist?</td>
<td>• Does the organization view itself as a knowledge company?</td>
</tr>
<tr>
<td>• What is the maturity of analytics usage across brands/ departments?</td>
<td>• What data is being acquired from external vendors?</td>
<td>• What technologies exist for data consolidation, storage, ETL, discovery, pre-processing and quality mgmt.?</td>
<td>• Have issues around data ownership and sharing been resolved?</td>
<td>• Have issues around data ownership and sharing been resolved?</td>
<td>• How embedded are analytics and insights in decision making processes?</td>
</tr>
<tr>
<td>• Have major use cases for analytics production been identified, prioritized, and valued?</td>
<td>• What data types are being accessed for analytics/research?</td>
<td>• Is metadata effectively managed in a central repository?</td>
<td>• Who owns data acquisition and quality assurance?</td>
<td>• Does leadership demonstrate data-driven behaviors?</td>
<td>• Is quantitative story-telling an established practice?</td>
</tr>
<tr>
<td>• Are activities focused on forward-looking analyses or historical reporting and scorecard development?</td>
<td>• Are the data sources integrated? Or is data siloed and fragmented?</td>
<td>• Does infrastructure for leveraging Big Data/structured data exist?</td>
<td>• Are periodic data audits carried out?</td>
<td>• Are front-line staff empowered to make insight-driven decisions?</td>
<td>• Does leadership demonstrate data-driven behaviors?</td>
</tr>
<tr>
<td>• Do reports provide insight and enable smarter decision making?</td>
<td>• Is extensive data hygiene carried out as pre-processing for analytics?</td>
<td>• Do formal data dictionaries exist for all data repositories and are definitions standardized?</td>
<td>• How is data theft/loss prevented?</td>
<td>• Are data and insights get shared transparently across the company?</td>
<td>• What technologies exist for data consolidation, storage, ETL, discovery, pre-processing and quality mgmt.?</td>
</tr>
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</table>
Analytical aspirations in the utility industry
The strategic roadmap should demonstrate value quickly and build momentum for enterprise scale and adoption

I. “Pilot”
- Build local, prioritized inventory of analytical pilot opportunities
- Understand information and analytic needs and investment appetite
- Frame the analytical capability conceptual design across dimensions
- Conduct 1-2 analytical pilots to prove value and develop foundation
- Secure business endorsement to proceed

II. “Deliver & Scale”
- Deep dive and deliver value from initial 1-2 analytics pilots
- Expand organizational coverage across functions/geographies
- Update prioritized inventory of analytic opportunities
- Develop future state blueprint and roadmap of capability delivery
- Deploy foundational components across process, organization, and technological components
- Begin working next wave of analytic opportunities
- Secure business endorsement to scale

III. “Enterprise Adoption”
- Deep dive and deliver value from next wave analytic pilots
- Expand organizational coverage further across functions/geographies
- Cultivate prioritized inventory of analytic opportunities
- Deploy enterprise standard components across process, organization, and technological components
- Begin working additional analytic opportunities
- Maintain business endorsement to operate

Going beyond insights through to execution showcases the value of further investment

Investment Required

Time

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### Analytical aspirations in the utility industry

Analytical solutions enable increased profitability and reduced risk across the value chain...

Analytical solutions address areas of the value chain where **significant data availability** and **sophisticated quantitative analysis** can be combined to drive valuable insights.

### Key Analytical Solutions

<table>
<thead>
<tr>
<th>Generation</th>
<th>Transmission &amp; Distribution</th>
<th>Retail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Data Management</td>
<td>Congestion Planning</td>
<td>Collection Analysis</td>
</tr>
<tr>
<td>Market Risk Management</td>
<td>Distribution Planning</td>
<td>Customer/Prospect Segmentation</td>
</tr>
<tr>
<td>Power Procurement Analysis</td>
<td>Energy Benchmarking</td>
<td>Customer Care Center Analysis</td>
</tr>
<tr>
<td>Short Term Load Forecasting</td>
<td>Network Tariff Policy Planning</td>
<td>Demand Side Management</td>
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<tr>
<td></td>
<td>Power Quality Optimization</td>
<td>Load Forecasting</td>
</tr>
<tr>
<td></td>
<td>Renewable Energy Forecasting</td>
<td>Marketing Analysis</td>
</tr>
<tr>
<td></td>
<td>Settlement Variance Analysis</td>
<td>Market Research Analysis</td>
</tr>
<tr>
<td></td>
<td>Storage Operation Analysis</td>
<td>Media Spend Optimization</td>
</tr>
<tr>
<td></td>
<td>Outage Analysis</td>
<td>Product Profitability</td>
</tr>
<tr>
<td></td>
<td>Storm Damage Management</td>
<td>Pricing Optimization</td>
</tr>
<tr>
<td></td>
<td>Theft Analysis</td>
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</tbody>
</table>

### Key Performance Indicators

- Master Data Foundation (Customer, Product, Location, Vendor, Employee, etc.)
**Analytical aspirations in the utility industry**

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<td>Asset Performance Management</td>
<td></td>
<td>PHEV Location &amp; Pricing</td>
</tr>
<tr>
<td>Asset Failure &amp; Condition Analysis</td>
<td></td>
<td>Rate Case Analysis</td>
</tr>
<tr>
<td>Asset Maintenance Strategy</td>
<td></td>
<td>Voice of Customer</td>
</tr>
<tr>
<td>Inventory Optimization</td>
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<tr>
<td>Procurement Analysis</td>
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<tr>
<td>Field Service Management</td>
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</table>

### Key Performance Indicators

- Master Data Foundation (Customer, Product, Location, Vendor, Employee, etc.)
Analytics aspirations in the utility industry
Strategic imperatives in the utilities industry

- Optimization of capital investment and rate design
- Customer Satisfaction – understanding customer usage and needs by analyzing Big Data generated through technology improvements (smart meters, sensors etc.) and improving business processes and product/service offerings
- Customer Engagement and public/regulatory perception
- Operational Excellence on system and asset reliability
- Operational Excellence on identifying customers likely to pay, bad debt analysis, uptake on desirable rate/payment plans
- Operational Excellence on full-lifecycle awareness of budgeted/actual O&M and Capital initiatives

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Analytics aspirations in the utility industry
Critical success factors for Information 2.0

We have consistently seen seven key attributes exhibited by organizations seeking to better leverage information to make impactful decisions:

1. **Invest effort up-front to define critical business information needs;** specify the decisions that would be made with better data, and estimate the value at play.

2. Use the value at play and explicit linkages to business strategy to secure sponsorship and a seat at the executive table.

3. **Use rapid “analytic pilots”** to demonstrate value early on, incrementally deliver business capabilities and build momentum.

4. **Design and test the organization capabilities and governance structures** in parallel with the technology development.

5. **Link (and quantify) architectural issues** with data quality, systems of record, data flows, repository and tool redundancy, etc. to business value, and tackle them once the business value is clear.

6. **Engage the business early and often,** and foster teamwork around issues like priorities, funding, and resources.

7. **Institute project basics** like effective program management, change management, and accountability for the business case!
Thank you

Contact me to discuss further:

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