BIG DATA ANALYTICS
IN SUPPORT OF EVIDENCED-BASED MANAGEMENT
May 26, 2016  |  5:30 p.m. to 7:30 p.m.

In this presentation we elaborate on evidence based managerial decision-making and provide guidance for using big data analytics to enhance the quality of these decisions. Audience key take aways: Pros & cons of big data analytics; How businesses can improve their bottom line by using big data; How big data tools support evidence based management decisions; Decision maker – gut feelings vs. big data analytics “evidence based” decisions.

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Evidence-Based Management

Large-Scale Data Management

Big Data Analytics

Data Science and Analytics

• How to manage very large amounts of data and extract value and knowledge from them
Data Analytics in Action

- Baseball movie Moneyball: How Oakland Athletics used data analytics to improve its performance.
- SAP Match Insight: Helped German soccer team analysed the data captured by video cameras around the pitch and turned it into information that could be viewed on tablet or mobile devices to help improve team performance and gain a deeper insight into its rivals.
NFL use of Big Data Analytics

Replays of hits are fed to team doctors along the sidelines.

SENSORS
Soon in shoulder pads, eventually in the ball, in helmets, and along sidelines.
Wi-Fi access points are underneath the seats at Levi’s Stadium the site of Super Bowl 50
Digital Sport Division
Nike a powerhouse in Big Data and Social Media Marketing
7 plus million runners now log on to Nike (NKE) to check their performance.
What is Big Data?

What makes data, “Big” Data?
Big Data Definition

- No single standard definition…

“Big Data” is data whose scale, diversity, and complexity require new architecture, techniques, algorithms, and analytics to manage it and extract value and hidden knowledge from it…
Characteristics of Big Data: 1-Scale (Volume)

- **Data Volume**
  - 44x increase from 2009 to 2020
  - From 0.8 zettabytes to 35 zb

- Data volume is increasing exponentially

<table>
<thead>
<tr>
<th>terabytes</th>
<th>petabytes</th>
<th>exabytes</th>
<th>zettabytes</th>
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| the amount of data stored by the average company today

Exponential increase in collected/generated data
Characteristics of Big Data: 2-Complexity (Variety)

- Various formats, types, and structures
- Text, numerical, images, audio, video, sequences, time series, social media data, multi-dim arrays, etc…
- Static data vs. streaming data
- A single application can be generating/collecting many types of data

To extract knowledge → all these types of data need to be linked together
Characteristics of Big Data: 3-Speed (Velocity)

- Data is being generated fast and need to be processed fast
- Online Data Analytics
- Late decisions ➔ missing opportunities

**Examples**
- **E-Promotions:** Based on your current location, your purchase history, what you like ➔ send promotions right now for store next to you
- **Healthcare monitoring:** sensors monitoring your activities and body ➔ any abnormal measurements require immediate reaction
Big Data: 3V’s

Big Data = Transactions + Interactions + Observations

Source: Contents of above graphic created in partnership with Teradata, Inc.
Some Make it 4V’s

Volume: Data at Rest
Terabytes to exabytes of existing data to process

Velocity: Data in Motion
Streaming data, milliseconds to seconds to respond

Variety: Data in Many Forms
Structured, unstructured, text, multimedia

Veracity*: Data in Doubt
Uncertainty due to data inconsistency & incompleteness, ambiguities, latency, deception, model approximations
Harnessing Big Data

- **OLTP**: Online Transaction Processing (DBMSs)
- **OLAP**: Online Analytical Processing (Data Warehousing)
- **RTAP**: Real-Time Analytics Processing (Big Data Architecture & technology)
Who’s Generating Big Data

- Social media and networks (all of us are generating data)
- Scientific instruments (collecting all sorts of data)
- Mobile devices (tracking all objects all the time)
- Sensor technology and networks (measuring all kinds of data)

- The progress and innovation is no longer hindered by the ability to collect data
- But, by the ability to manage, analyze, summarize, visualize, and discover knowledge from the collected data in a timely manner and in a scalable fashion
The Model Has Changed…

- The Model of Generating/Consuming Data has Changed

**Old Model:** Few companies are generating data, all others are consuming data

**New Model:** all of us are generating data, and all of us are consuming data
What's driving Big Data

- Optimizations and predictive analytics
- Complex statistical analysis
- All types of data, and many sources
- Very large datasets
- More of a real-time

- Ad-hoc querying and reporting
- Data mining techniques
- Structured data, typical sources
- Small to mid-size datasets
Challenges in Handling Big Data

- **The Bottleneck is in technology**
  - New architecture, algorithms, techniques are needed

- **Also in technical skills**
  - Experts in using the new technology and dealing with big data
Managing with Big Data

- Pros and cons of big data analytics
- How businesses can improve their bottom line by using big data
- How big data tools support evidence based management decisions
- Decision maker – gut feelings verses big data analytics "evidence based" decisions

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Managing with Big Data

- What is Evidence-based Management?
- What is evidence?
- How do we create useable evidence from Big Data?
- Synergy between EBMgt and Big Data toward competitive advantage.
Evidence-based Management

• Evidence-based management is about making decisions through the conscientious, explicit, and judicious use of information gleaned from practitioner expertise and judgment, evidence from the local context, a critical evaluation of the best available research evidence, and the perspectives of those people who might be affected by the decision. (Briner, Denyer, Rousseau, 2009)

• Big Data analytics provide a handle on how to wrap all of these into evidence to support managerial decisions.
Evidence

Useable evidence for a phenomenon is a function of the appropriateness of the methodology that generated the evidence, its fit with the context, replicability by others, the transparency of its methods, and consensus among its producers. The evidence is stronger when there is a greater degree of overlap between the dimensions of methodological fit, contextualization, replicability, transparency and consensus. The overlap is enhanced and sustained by an established collaboration among the producers and users of evidence. Evidence has to be rigorous, relevant and actionable to be useful.
Values guiding evidence-based management

• Rationality
• Empiricism
• Transparency
• Professionalism
• Pluralism
• Realism?
• Imperfectability?
Evidence–based Management

- Relevant Research Question
- Professional Consultation
- Rigorous Research
- Sound Training
- Practical Insight
- Professional Collaboration
- Influential Theory
- EBM
- Actionable Evidence
- Systematic Review
- Learning Organization
- Strong Profession
- Professional Consultation
- Sound Training
- EBM
- Actionable Evidence
- Strong Profession
- Relevant Research Question
- Professional Consultation
- Professional Consultation
Evidence–based Management

Collaboration

Evidence

Template

Systematic Review

Rigour

Relevance

Actionability

Value

Strength
Evidence-based management enabled by collaboration

The model depicts the process of evidence-based management enabled by a formal ongoing collaboration among management researchers who produce knowledge through rigorous research, editors and reviewers who attest to the quality of the research and its relevance, and managers who judge its actionability and make use of the research variously. The nature of the collaboration promotes the coherence of rigor, relevance and actionability toward the enhancement of value of management knowledge. This knowledge is curated into evidence along with some indications of its strength and is guided by a theory of evidence. The evidence is codified into a systematic review using the template proposed. The systematic review is made available online to a practicing manager at the time of need for use in management decisions.
Evidence-based Management: Top down

- Develop Knowledge & Skills in Evidence use
- Codification of Decisions & Practices
- Development of Guidelines
- Accountability & Transparency
- Mature & Robust Practice
- Organizational Change
- Quality Decision New Resources, SR Training Programs
- Professionalization
Decision Quality and Decision Outcome

Incompleteness of Knowledge, Indeterminacy of Decisions, Imperfectness of Implementation

- Outcome 1
- Outcome 2
- Outcome 3

Ability X
Motivation X
Opportunity

Evidence: SR

Decision Quality

Implementation Effectiveness

Foundational Knowledge

Domain Knowledge, Experience

BD Analytics

X

X
Use Big Data evidence to differentiate products, curtail costs, target innovation, promote growth and form strategic alliances – Know your evidence – Manage!
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Routines and dynamic capabilities as mediating structures

• Routines can be viewed as institutional mechanisms that store experience and govern attention to internal and external stimuli.
Routines and dynamic capabilities as mediating structures

- Dynamic capabilities as the capacity:
  - to sense and shape opportunities and threats,
  - to seize opportunities, and
  - to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise’s intangible and tangible assets.
The dynamic nature of the environment does not allow for choices exclusively based on the success and reality test of past solutions, that is, learning from experience.
The new way information is generated, aggregated and presented to managers will significantly alter the importance of their mental representations and more generally reframe the role individuals have assumed in the process of strategy making.
Power Shifts

Before an organization can make real-time decisions, it must get data scientists and analytics experts embedded into decision processes.
Big Data’s Impact on Organization

- Digital capability
- Digital business

- Data scientists
- Social media experts
- Software developers
- Digitally competent managers

- People
- Strategy
- Structure
- Processes
- Rewards

- Corporate digital champion
- Digital units in businesses or countries
- Digital business unit

- Integrated digital infrastructure
- Cross-functional newsroom teams

- Use performance management to reward digital skills development, execution and teamwork
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