



"Housekeeping"

Twitter: #ACMLearning

- Welcome to today's ACM Learning Webinar, ["From BI to Big Data and Beyond: Architecture, Ethics and Economics"](#) by Barry Devlin. The presentation starts at the top of the hour and lasts 60 minutes. Slides will advance automatically throughout the event. You can resize the slide area as well as other windows by dragging the bottom right corner of the slide window, as well as move them around the screen. On the bottom panel you'll find a number of widgets, including Twitter, Sharing, and Wikipedia apps.
- If you are experiencing any problems/issues, refresh your console by pressing the **F5** key on your keyboard in Windows, **Command + R** if on a Mac, or refresh your browser if you're on a mobile device; or close and re-launch the presentation. You can also view the Webcast Help Guide, by clicking on the "Help" widget in the bottom dock.
- To control volume, adjust the master volume on your computer. If the volume is still too low, use headphones.
- If you think of a question during the presentation, please type it into the Q&A box and click on the submit button. You do not need to wait until the end of the presentation to begin submitting questions.
- At the end of the presentation, you'll see a survey open in your browser. Please take a minute to fill it out to help us improve your next webinar experience.
- You can download a copy of these slides by clicking on the Resources widget in the bottom dock.
- This session is being recorded and will be archived for on-demand viewing in the next 1-2 days. You will receive an automatic email notification when it is available, and check <http://learning.acm.org/> in a few days for updates. And check out <http://learning.acm.org/webinar> for archived recordings of past webcasts.



From BI to Big Data and Beyond

Architecture, Ethics and Economics

16 March 2016

ACM Learning Webinar



Dr Barry Devlin

**Founder & Principal
9sight Consulting**



ACM Highlights

- Learning Center tools for professional development: <http://learning.acm.org>
 - 4,500+ trusted technical books and videos by O'Reilly, Morgan Kaufmann, etc.
 - 1,300+ courses, virtual labs, test preps, live mentoring for software professionals covering programming, data management, cybersecurity, networking, project management, more
 - Training toward top vendor certifications (CEH, Cisco, CISSP, CompTIA, ITIL, PMI, etc.)
 - Learning Webinars from thought leaders and top practitioner
 - Podcast interviews with innovators, entrepreneurs, and award winners
- Popular publications:
 - Flagship *Communications of the ACM* (CACM) magazine: <http://cacm.acm.org/>
 - *ACM Queue* magazine for practitioners: <http://queue.acm.org/>
- ACM Digital Library, the world's most comprehensive database of computing literature: <http://dl.acm.org>.
- International conferences that draw leading experts on a broad spectrum of computing topics: <http://www.acm.org/conferences>.
- Prestigious awards, including the ACM A.M. Turing and Infosys: <http://awards.acm.org>
- And much more... <http://www.acm.org>.





"Housekeeping"

Twitter: #ACMLearning

- Welcome to today's ACM Learning Webinar, ["From BI to Big Data and Beyond: Architecture, Ethics and Economics"](#) by Barry Devlin. The presentation starts at the top of the hour and lasts 60 minutes. Slides will advance automatically throughout the event. You can resize the slide area as well as other windows by dragging the bottom right corner of the slide window, as well as move them around the screen. On the bottom panel you'll find a number of widgets, including Twitter, Sharing, and Wikipedia apps.
- If you are experiencing any problems/issues, refresh your console by pressing the **F5** key on your keyboard in Windows, **Command + R** if on a Mac, or refresh your browser if you're on a mobile device; or close and re-launch the presentation. You can also view the Webcast Help Guide, by clicking on the "Help" widget in the bottom dock.
- To control volume, adjust the master volume on your computer. If the volume is still too low, use headphones.
- If you think of a question during the presentation, please type it into the Q&A box and click on the submit button. You do not need to wait until the end of the presentation to begin submitting questions.
- At the end of the presentation, you'll see a survey open in your browser. Please take a minute to fill it out to help us improve your next webinar experience.
- You can download a copy of these slides by clicking on the Resources widget in the bottom dock.
- This session is being recorded and will be archived for on-demand viewing in the next 1-2 days. You will receive an automatic email notification when it is available, and check <http://learning.acm.org/> in a few days for updates. And check out <http://learning.acm.org/webinar> for archived recordings of past webcasts.



Talk Back

- Use Twitter widget to Tweet your favorite quotes from today's presentation with hashtag [#ACMLearning](#)
- Submit questions and comments via Twitter to [@acmeducation](#) – we're reading them!
- Use the sharing widget in the bottom panel to share this presentation with friends and colleagues.



From BI to Big Data and Beyond

Architecture, Ethics and Economics

16 March 2016

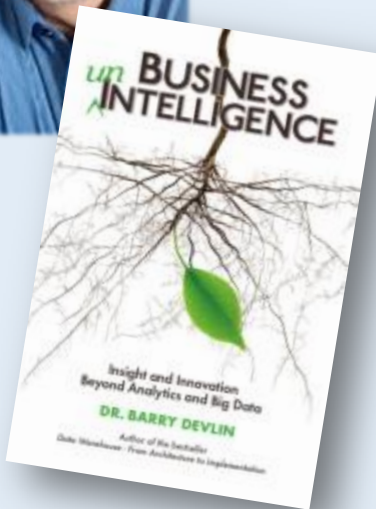
ACM Learning Webinar



Dr Barry Devlin

**Founder & Principal
9sight Consulting**

Dr. Barry Devlin



Founder and Principal 9sight Consulting, www.9sight.com

Dr. Barry Devlin is a founder of the data warehousing industry, defining its first architecture in 1985. A foremost authority on business intelligence (BI), big data and beyond, he is respected worldwide as a visionary and thought-leader in the evolving industry. Barry has authored two ground-breaking books: the classic "Data Warehouse--from Architecture to Implementation" and "Business unIntelligence--Insight and Innovation Beyond Analytics and Big Data" (http://bit.ly/BunI_Book) in 2013.

Barry has over 30 years of experience in the IT industry, previously with IBM, as a consultant, manager and distinguished engineer. As founder and principal of 9sight in 2008, Barry provides strategic consulting and thought-leadership to buyers and vendors of BI and Big Data solutions. He is an associate editor of TDWI's Journal of Business Intelligence, and a regular keynote speaker, teacher and writer on all aspects of information creation and use.

Barry operates worldwide from Cape Town, South Africa.

Email:
barry@9sight.com

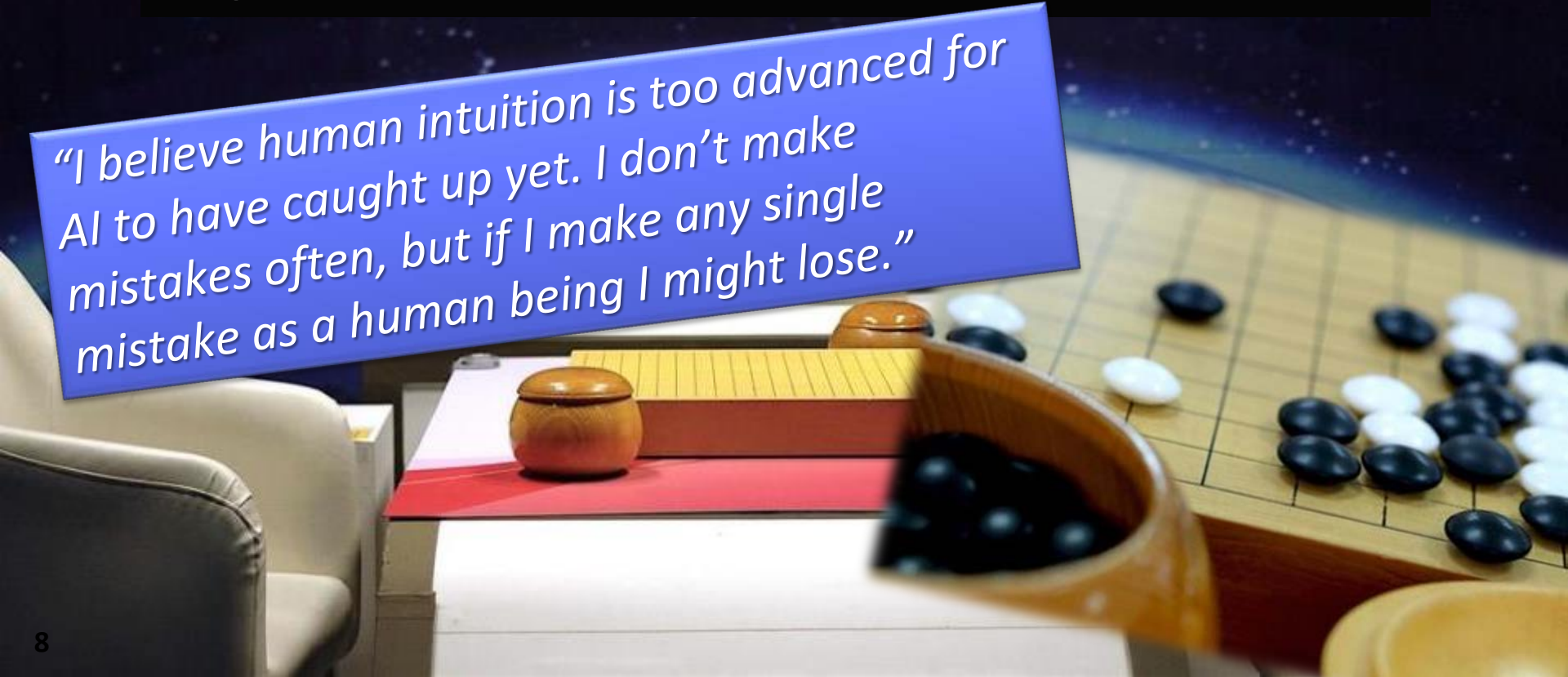
Twitter:
[@BarryDevlin](https://twitter.com/BarryDevlin)



Google DeepMind Challenge Match

AlphaGo vs Lee Se-dol, March 2016

"I believe human intuition is too advanced for AI to have caught up yet. I don't make mistakes often, but if I make any single mistake as a human being I might lose."

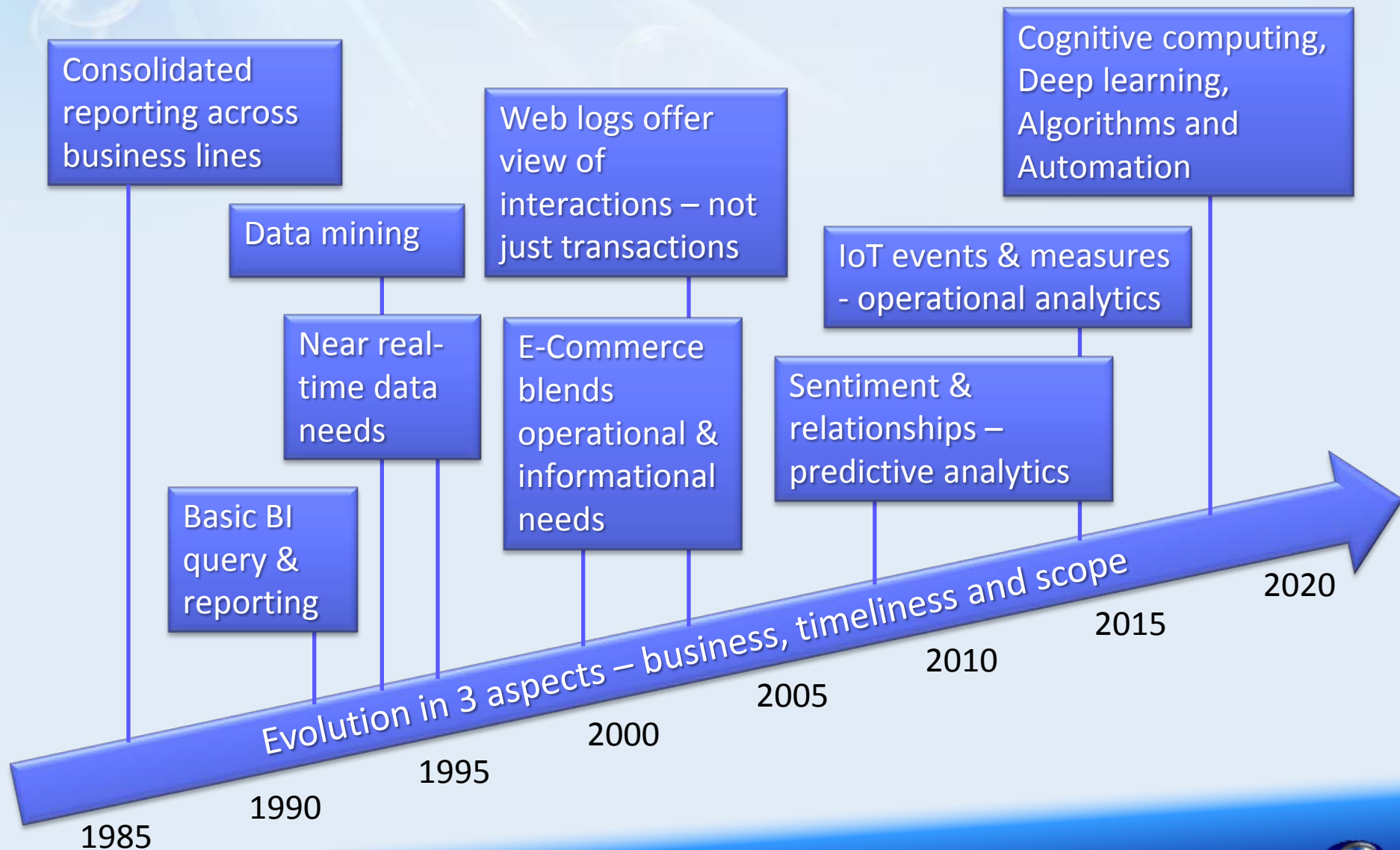


Agenda

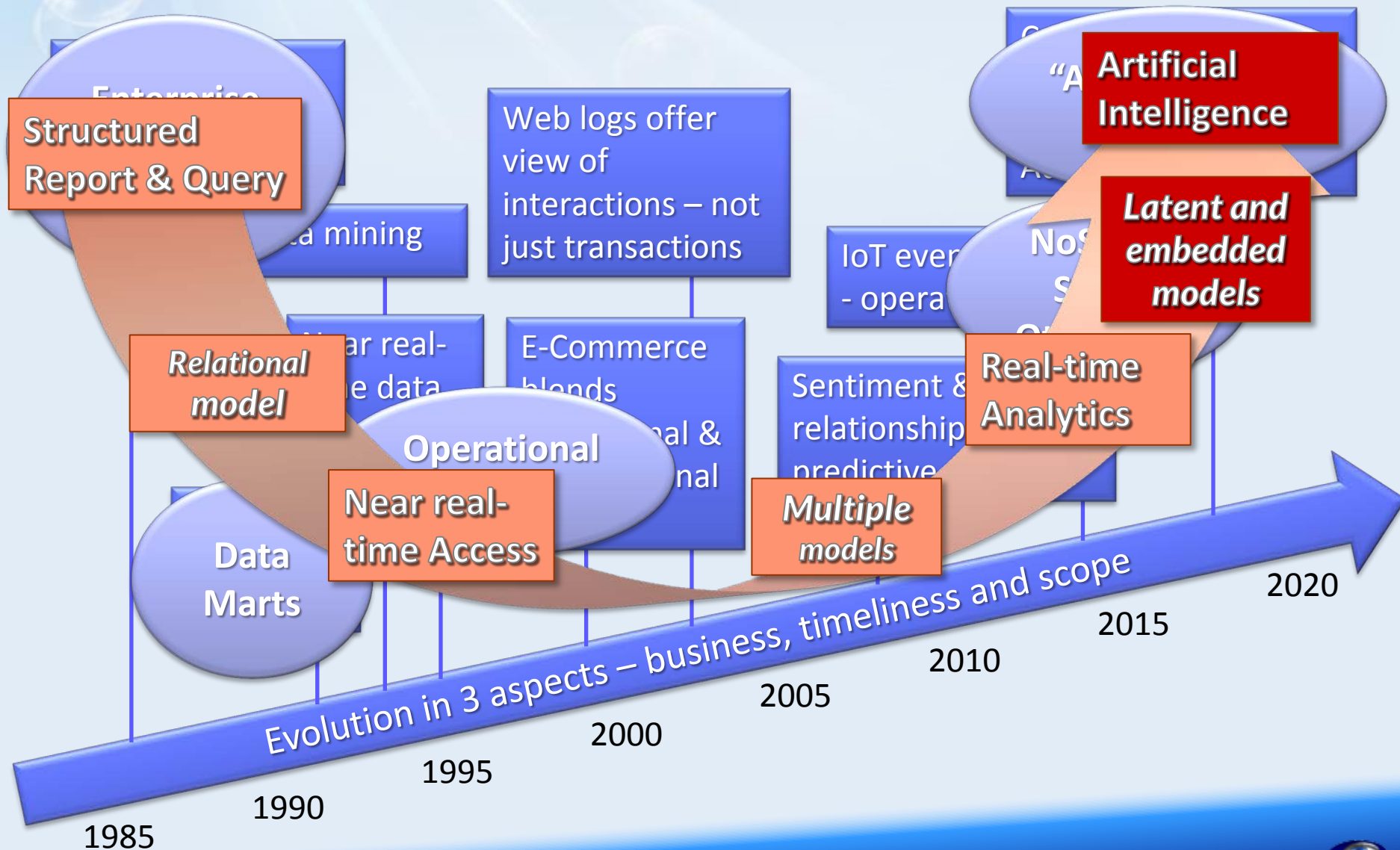
1. Algorithms & big data – architecture
 - A revolution emerging
2. Algorithms & big data – ethics
3. Algorithms & big data – economics & society
4. Three thoughts to take away



35 years of evolution of BI / analytics needs

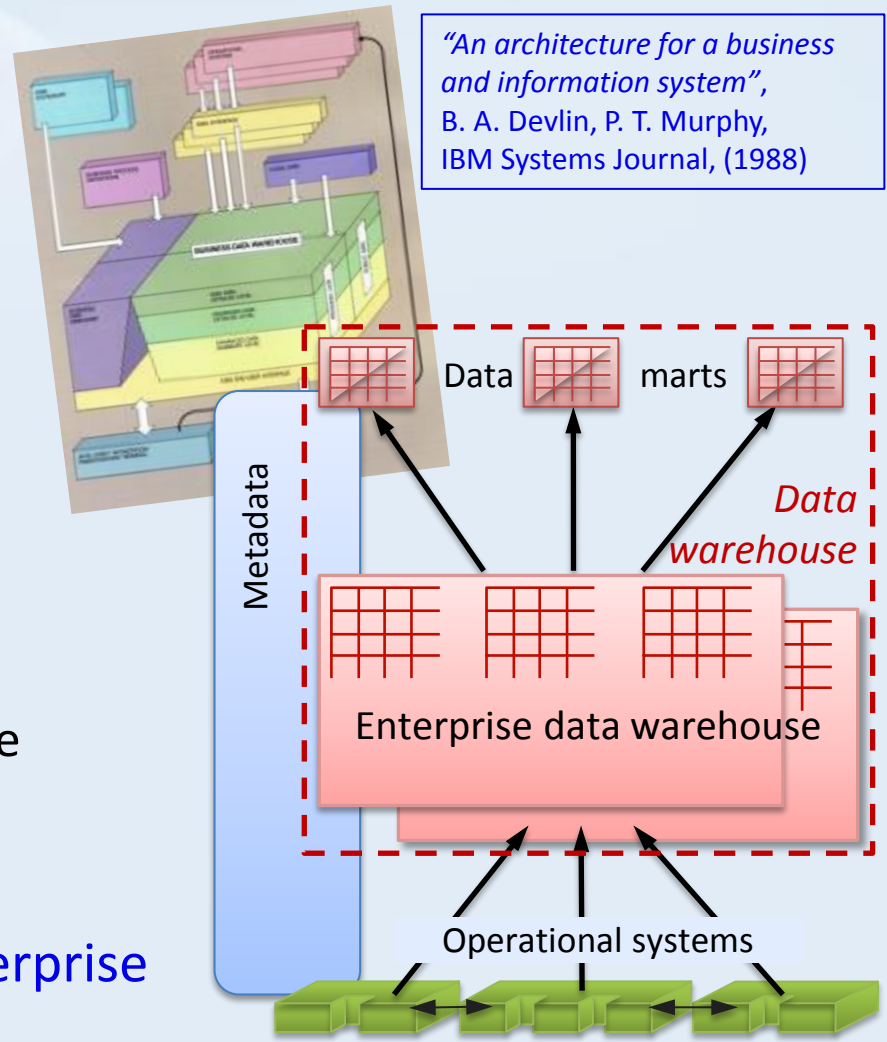


From Business Intelligence to Artificial Intelligence

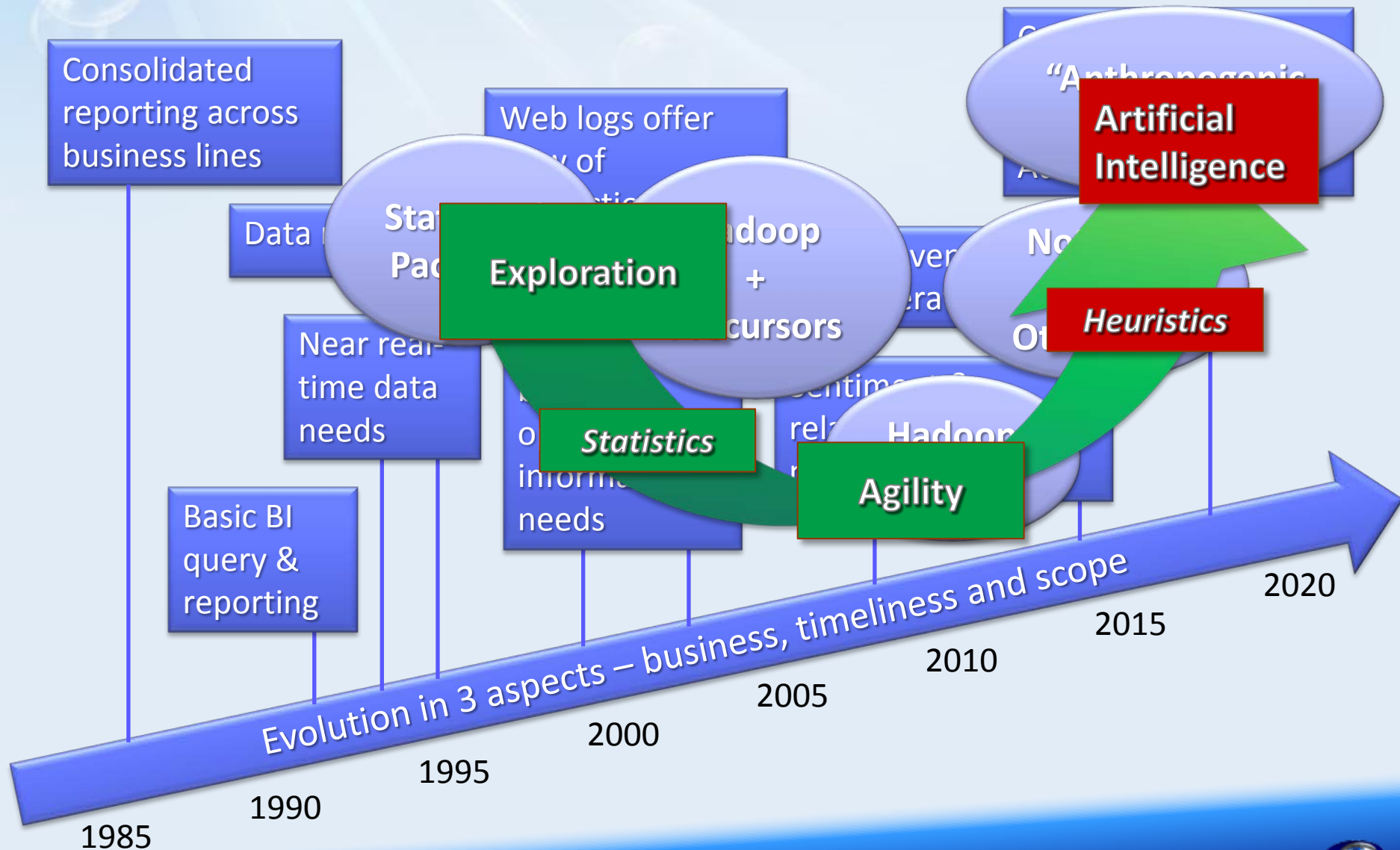


The data architecture since the mid-'80s

- Two layers within the Data Warehouse...
 1. Enterprise data warehouse
 - *Reconciled data*
 2. Data marts
 - *What the users need*
- ... fed from and separate to operational systems
 - Data to run the business
 - Created by the processes of the business
- All data created within the enterprise (or within partner ecosystem)



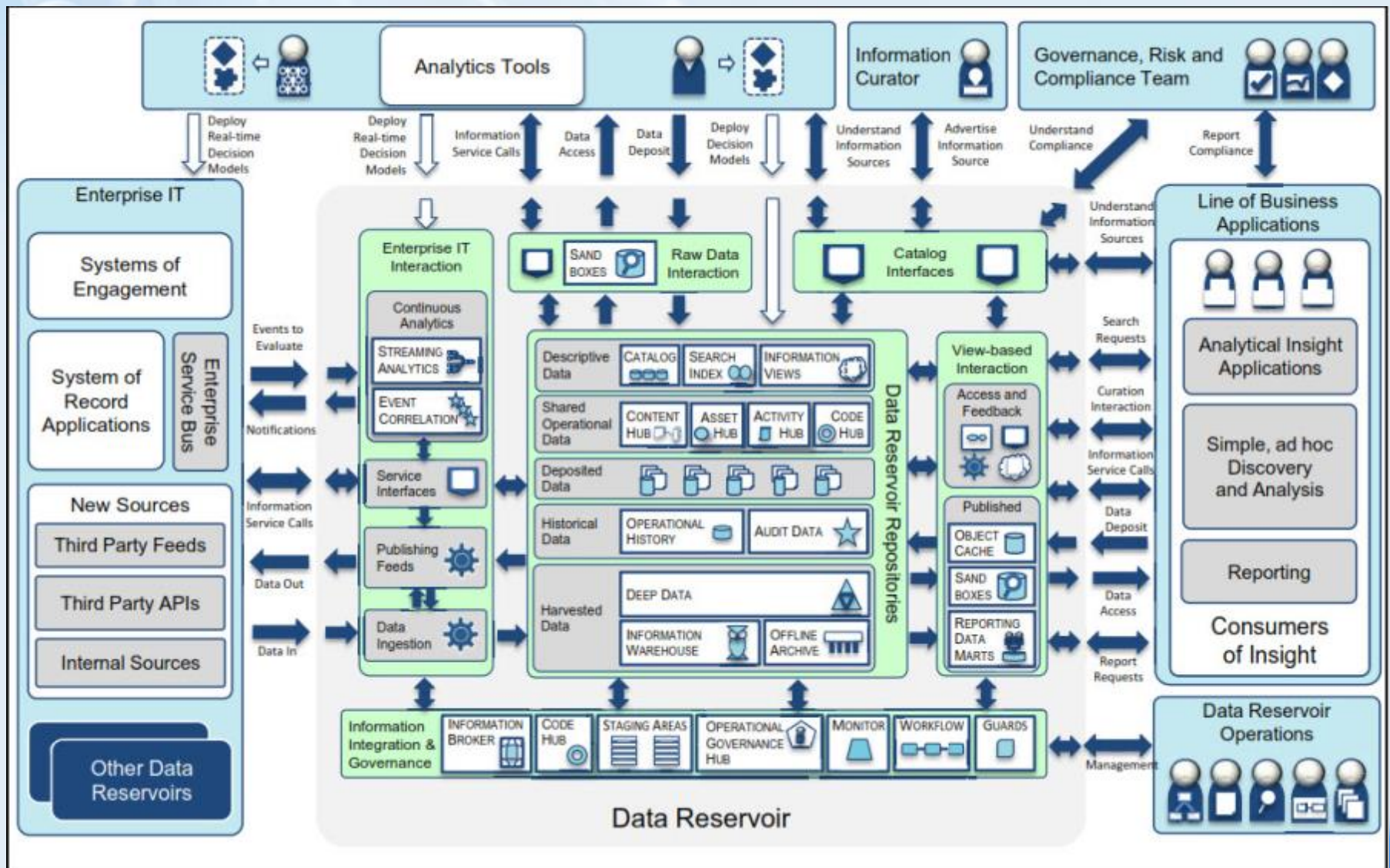
From Big Data to Artificial Intelligence



Current “marchitecture” offers a data lake as the answer...

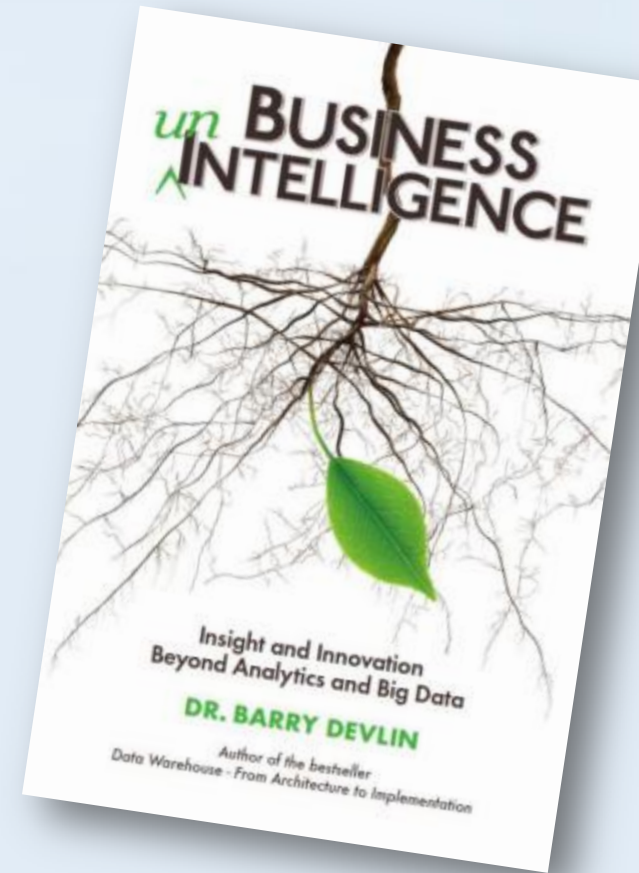


Data reservoir (or lake) architecture from IBM



From BI to Business unIntelligence

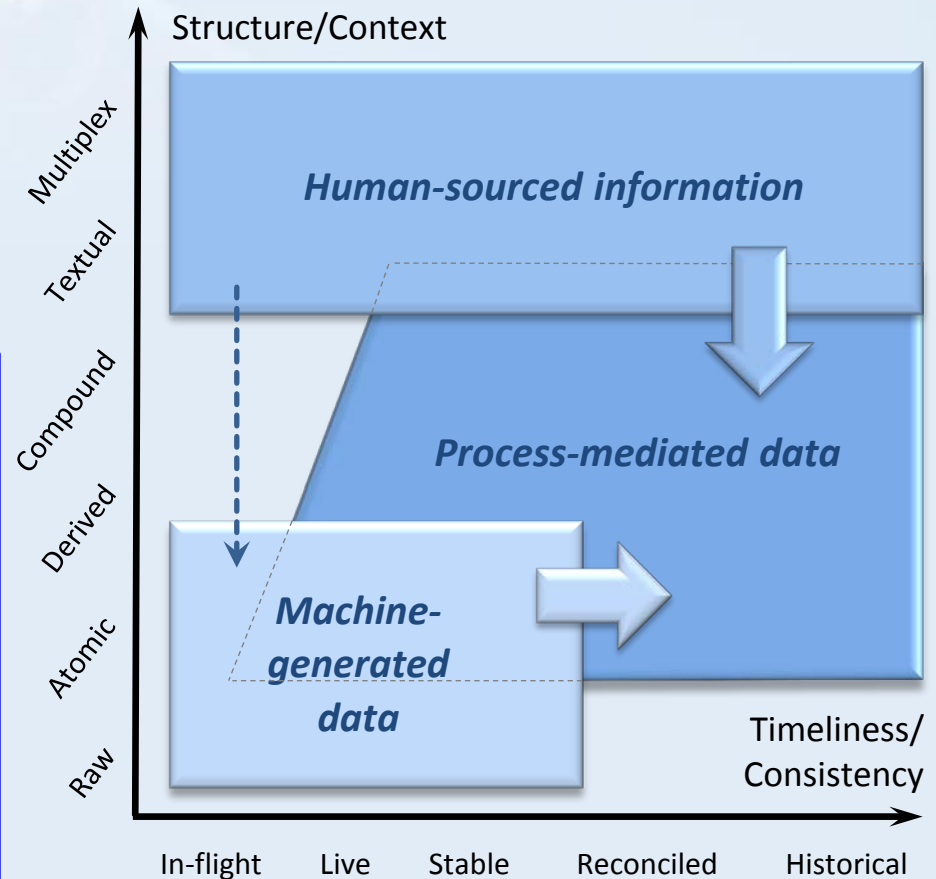
- People: Rational thought and far beyond
 - People make all decisions!
- Process: Logic – predefined and emergent
 - Decision making is a process
- Information: Data, knowledge and meaning
 - Data/information is only the foundation
- People process information
- Not business intelligence...
Business unIntelligence
- Amazon: http://bit.ly/BunI_Book
- Or <http://bit.ly/BunI-TP1>: 25% discount with code “BIInsights25”



Big data and beyond demands a new architecture: the tri-domain information model is the basis

- Process-mediated **data**
 - “Traditional” operational & informational data
 - Via data entry & cleansing processes
- Machine-generated **data**
 - Output of machines and sensors
 - The Internet of Things
- Human-sourced **information**
 - Subjectively interpreted record of personal experiences
 - From Tweets to Videos

“Big data”

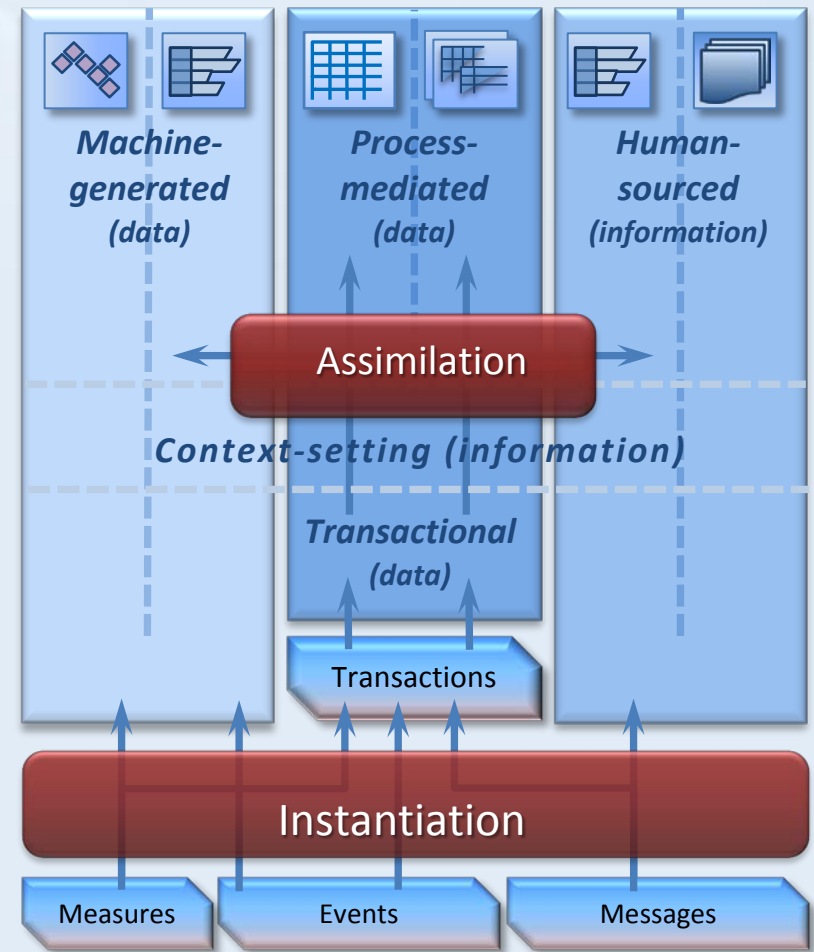


[“**Data**” is well-structured and/or modeled and
“**information**” is more loosely structured.]



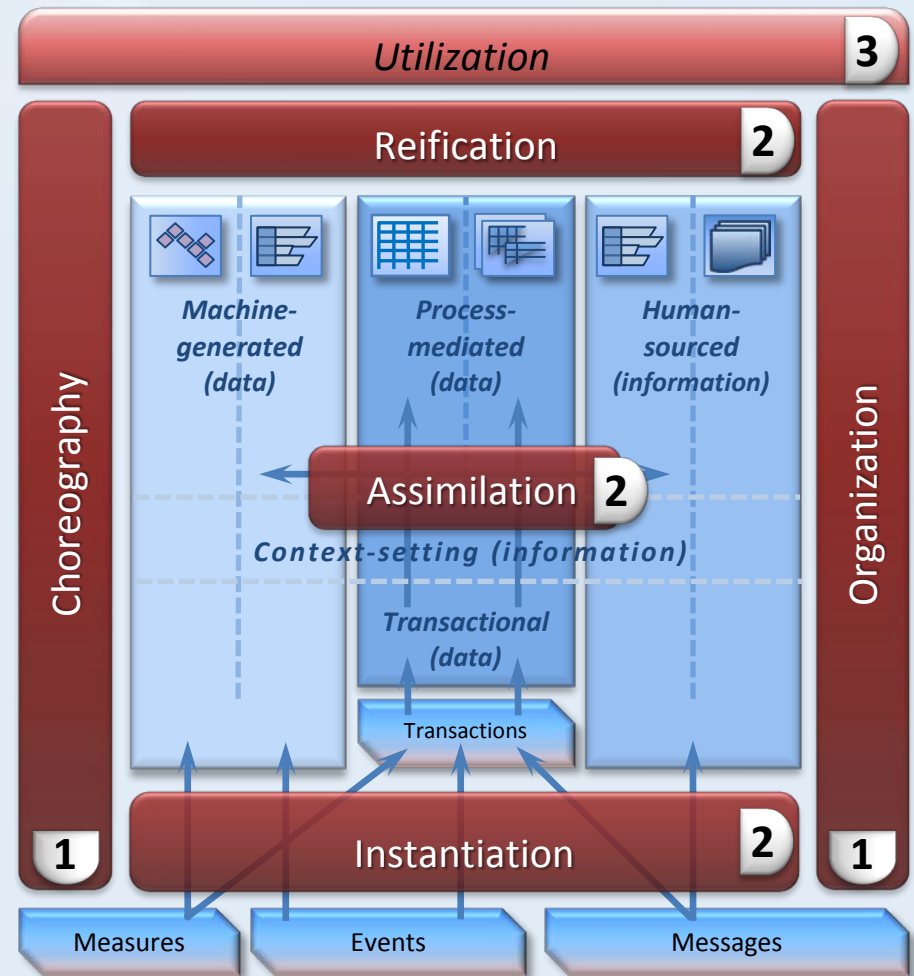
Information pillars replace data layers

- One architecture for all types of information
 - Mix/match technology as needed
 - *Relational, NoSQL, Hadoop, etc.*
- Integration of sources and stores
 - Instantiation gathers inputs
 - Assimilation integrates stored info.
- Data flows as fast as needed and reconciled when necessary
 - No unnecessary storage or transformations
- Distinct data management / governance approaches as required



The REAL architecture defines the logical components.

- Realistic, Extensible, Actionable, Labile
- Used mainly by IT
 - Processes for creating, maintaining and using business information
- Three broad areas
 1. Choreography and organization
 2. Information processing
 3. Utilization



Agenda

1. Algorithms & big data – architecture
2. Algorithms & big data – ethics
 - Doing the right algorithmic thing

3. Algorithms & big data – economics & society

4. Three thoughts to take away



Cognitive computing... aka algorithmic decision making

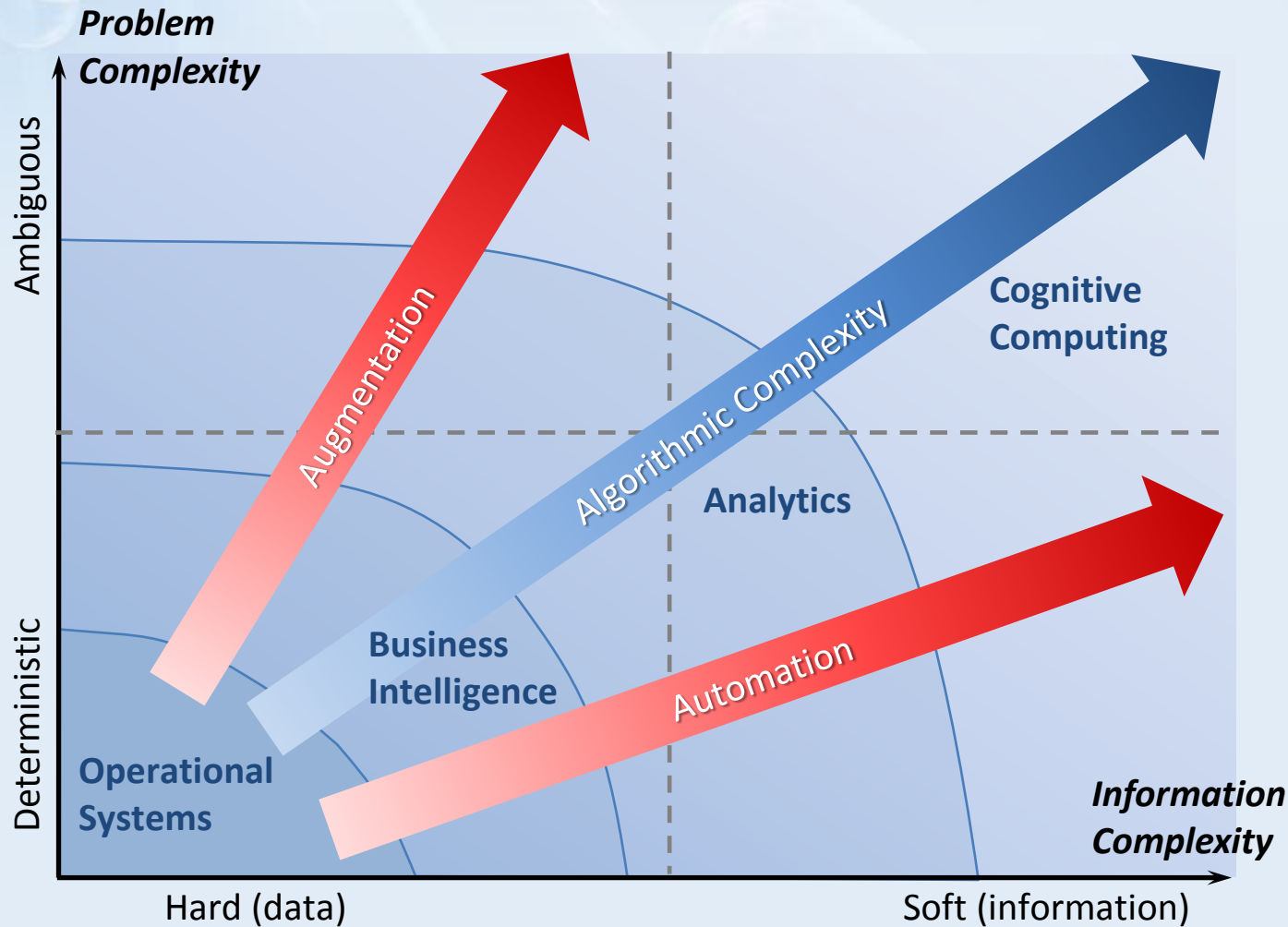
- Augment human cognition
 - Interact naturally in a process of exploration and discovery
 - Make sense of highly complex data in context
 - Expose insights and propose alternative solutions
- Automate the decision making process
 - Eliminate human intervention, where possible
 - Speed up business processes
- Continuously improve
 - Apply self-learning techniques
 - Adaptively respond to dynamic conditions



See: Cognitive Computing - Transforming the Analytics Landscape, Gonzales, Aug 2015
and <http://www.cognitivecomputingconsortium.com/definition-of-cognitive-computing/>



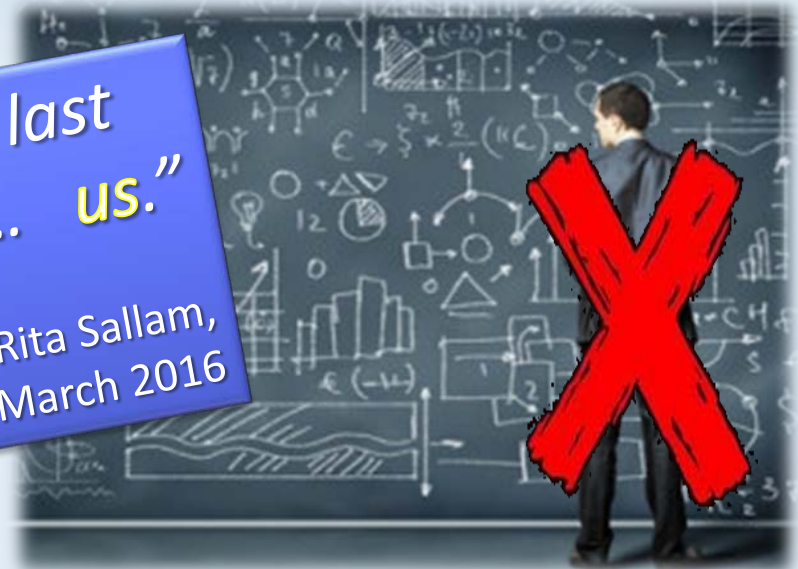
The algorithmic journey – from BI to cognitive



Abdicating responsibility?

“Algorithms will eliminate the last weak link in decision making... **us.**”

Rita Sallam,
Gartner BI Summit keynote, 14 March 2016



- Who defines / designs the algorithms?
- Who checks the algorithms for bias (intended or unintended), errors, etc.?
- Who monitors the algorithms for changes in behavior due to hacking, deep learning by the algorithm, etc.?
- As algorithms self-learn, who will be able to do so?



Algorithmic decisions – ethical considerations

Industry and government reality

- Lack of transparency
- Minimal accountability
- No systematic benchmarking
- Limited evaluation of results
- Lack of data correction procedures

Transparency needed in:

- Human involvement
- Use of algorithms
- Data and model
- Inferencing

Developer responsibilities

- Acting in the public interest
- Personal accountability
- Balance public good and private interest
- Safety and privacy
- Avoiding deception
- Considering the disadvantaged
 - *ACM Codes of Ethics*

Accountability in Algorithmic Decision Making,
Diakopoulos, Comms. of the ACM Vol. 59, No. 2 (2016)

Understanding technology limitations

- E.g. “Hidden Technical Debt in Machine Learning Systems”
Sculley et al, Google, NIPS Proceedings, 2015



Agenda

1. Algorithms & big data – business opportunities
2. Algorithms & big data – ethics



3. Algorithms & big data – economics & society
 - Economic implications, societal impacts
4. Three thoughts to take away



Capitalist model, automation drives production costs down by displacing jobs; algorithms continue the trend

- Travis Kalanick, CEO and founder of Uber, *“would replace human Uber drivers with a fleet of self-driving cars in a second”*
- Autonomous trucks could displace 4-8 million jobs in the US within 10+ years
 - May 6, 2015, first self-driving truck on American road in Nevada
 - See <http://bit.ly/1JMAp6S>
- The ever reducing need for more advanced skills
 - Researchers construct statistical model able to predict the outcome of 70% of U.S. Supreme Court cases
 - Hong Kong-based venture capital firm Deep Knowledge Ventures adds AI program with equal voting rights to its board of directors
 - See <http://bit.ly/1KXxecB>



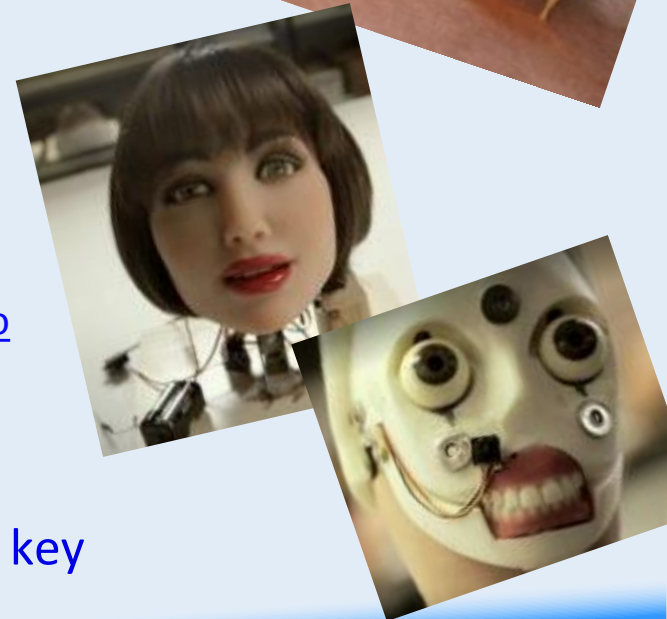
Big data is driving a revolution in robotics

- Manufacturing robots come out of the cage
 - Working safely along side humans on production lines (Baxter)
 - Trained through direct human interaction
<http://www.rethinkrobotics.com/baxter/>
- Robots are moving into the front office and home
 - June 2014, SoftBank Mobile (Japan) customers greeted by Pepper in selected stores, in more than 2,600 stores by year end 2015
 - “Pepper is the first humanoid robot designed to live with humans”; converses with people, recognizes and reacts to emotions
www.aldebaran.com/en/a-robots/who-is-pepper
- Advances in machine learning stemmed from widespread availability of big data



Robotics is driving potentially extensive social disruption

- Care of the elderly
 - US National Science Foundation \$1.2 million grant to teach robots to assist the elderly in picking an outfit and helping them dress
 - <http://freebeacon.com/issues/feds-spend-1-2-million-for-robots-to-dress-old-people/>
- Sex with a seemingly human touch
 - According to developer: “robotic, AI-driven heads—dubbed *Realbotix*—will be commercially available in two years, priced at around \$10,000”
 - <http://www.nytimes.com/2015/06/12/technology/robotica-sex-robot-realdoll.html>
- Sensors, IoT data and high speed processing are key



With exponentially improving technology, the classical capitalist economic model breaks down

- The old/current model:
 - Human work produces goods
 - Automation reduces their cost; increases affordability
 - Workers move to new industry
 - Income from work *purchases goods*
- Automation and algorithms finally break the model
- The forthcoming model:
 - Capital increasingly produces goods (via technology)
 - Work becomes unavailable, or poorly paid
 - Lack of income to purchase goods
 - See <http://tcrn.ch/1LZGVnY>
- The capitalist model contains the seeds of its own demise



We must question broader **economics & societal perspectives** in strategic business / IT decisions

- Is the “ever-increasing profit” motive still valid?
 - Lower costs or higher sales?
 - (N.B. In real life, everything is cyclical)
- Does your cost-saving project:
 - Reduce employment / income?
 - Lower the job skills needed?
 - ***How to mitigate reduced purchasing power?***
- Does your marketing/sales project:
 - Just create a need?
 - Drive “hyper-competition”?
 - ***Beyond the shareholders, who really benefits?***
- Isn't business essentially a social enterprise?
 - From profit to “public good”



Two novel economic/social solutions to explore

1

Universal Basic Income

An income unconditionally granted to all individuals, without means test or work requirement, driven by technological displacement and enabled by redistribution of wealth generated through capital and technology

<http://www.basicincome.org/basic-income/history/>

- CANADA: Ontario Commits to Basic Income Pilot, Feb 2016 Budget
- FINLAND: Basic income experiment planned in 2017
- SWITZERLAND: Referendum in June 2016 (following rejection in Parliament)
- NETHERLANDS: Four municipalities to make a uniform plan for basic income pilot projects



Two novel economic/social solutions to explore

2

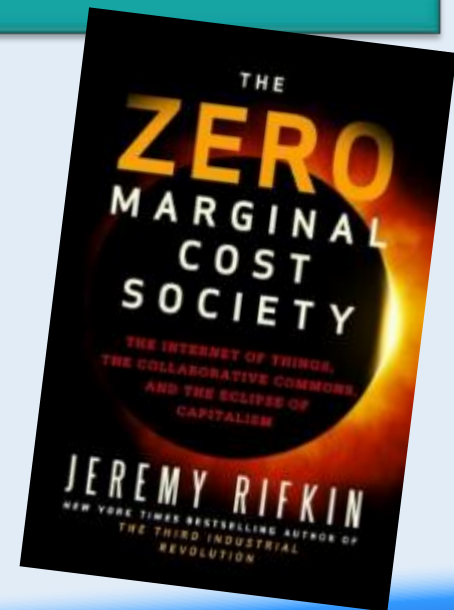
Collaborative Commons

Co-operative global sharing and inter-connection driving towards zero marginal cost production (Jeremy Rifkin), potentially leading to sustainable production-consumption of the finite resources of the planet

<http://thezeromarginalcostsociety.com/>

Foundations

- Internet of Things
- Distributed energy production
- 3D printing
- <https://medium.com/basic-income/post-capitalism-rise-of-the-collaborative-commons-62b0160a7048>



Agenda

1. Big data – architecture
2. Big data – ethics
3. Big data – economics and society



4. Three thoughts to take away



Conclusions

1. A revolution in decision making

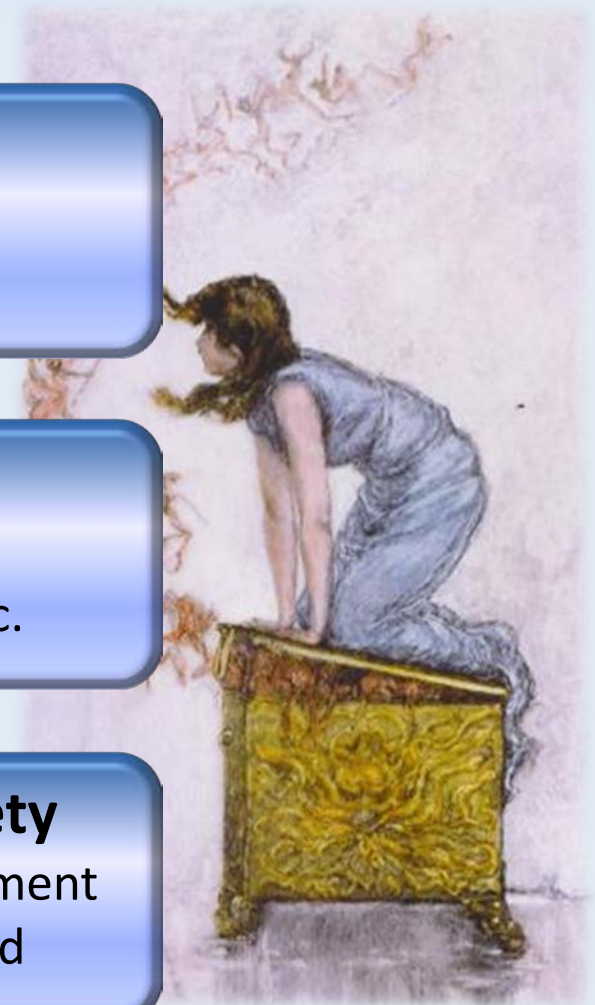
- Biggest change in history of BI just beginning
- BI and big data are merely the foundation

2. Big data delivers artificial intelligence

- Augmentation and automation of decisions
- Ethical dilemmas for privacy, responsibility, etc.

3. Big data affects the economy and society

- Analytics / automation are disrupting employment
- New economic and societal models are needed



Thank You



Dr Barry Devlin

Founder & Principal
9sight Consulting



ACM: The Learning Continues...

- Questions about this webcast? learning@acm.org
- ACM Learning Webinars (on-demand archive):
<http://learning.acm.org/webinar>
- ACM Learning Center: <http://learning.acm.org>
- SIGMIS: <http://sigmis.org/>
- Queue: <http://queue.acm.org/>
- Applicative Conference: <http://applicative.acm.org/>

