# *The Business Imperative for Cognitive Computing*

## Judith Hurwitz

# Why Cognitive is a Business Change Agent?

- Business models are changing fast
- Organizations are developing new strategies to compete
- Software is the engine of growth
- Software development must start with data linked to domain logic
- As data changes; business logic will change

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# The future of business transformation

- Focus on deep domain expertise
- Continuously exploding data sources
- Change based on machine learning
- Leading with data to implement change

The bottom line: a cognitive computing approach that enables machines to collaborate with human experts will change the speed of business change

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# The Three Principles of Technology Transition

1. Revolutionary technologies take decades to evolve
2. Dramatic change happens when technology is mature enough and ubiquitous
3. Technology transitions can revolutionize industries

Bottom line: when these three principles converge innovation and revolutions happen

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# Digital Disruption is Real

Every industry is being disrupted by emerging technology and changing business models

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# What is Cognitive Computing?

Cognitive Computing is the ability of humans and machines to collaborate by analyzing and correlating huge amounts of data tied to a knowledge domain.

*Cognitive computing is a problem-solving approach that uses **hardware** or **software** to approximate the **form** or **function** of natural cognitive processes.*

# Why traditional computing models are flawed

- Programs are designed based on logically assumptions about how the business operates
- Programs are not designed for changing business models or new data sources
- Data is ingested into systems after they are designed
- The programmer creates a system based on outcome assumptions

Bottom line: Traditional systems are based on the past and cannot anticipate the future

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# How is cognitive computing different?

- A cognitive system is designed based on data and letting the data lead to the logic

- A cognitive system changes and morphs as more data is introduced and analyzed

- A cognitive system learns from patterns and anomalies

- A cognitive system creates a model or representation of a domain based on understanding the context of a problem

- A cognitive assumes there is not a single correct answer. It is therefore probabilistic. It uses hypotheses based on the data.

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# Cognitive Computing is based on how the brain works

- Humans learn from observing their world and collecting and storing data

- Humans are able to make correlations based on small amounts of data

- Humans learn based on observations, reinforcement, and motivation

Bottom line: the human brain is an amazing system of systems that cannot be easily replicated

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# How do Humans Learn?

- Experience
- Perception
- Memory
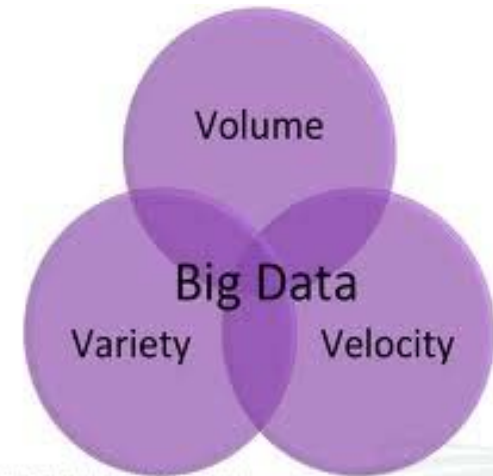- Reasoning
- Conceptual development
- Deduction
- Inference

# Perception is a key requirement for cognitive computing

- How do we sense/recognize data in the outside world?

see    hear    smell    taste    touch

# Definition of Big Data

- Volume:
  - *Amount* of data

- Variety:
  - *Types* of data - structured and/or unstructured

- Velocity:
  - *Speed* that data moves from one location to another

- Veracity:
  - *Accuracy* - do the results of the analysis make sense?

Volume

Big Data

Variety        Velocity

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# To be Useful Data Requires Context

- Big data sources need to be based on the context of how they are analyzed and used

- Determining patterns and anomalies in data is paramount

- Big data analytics are changing with the inclusion of machine learning algorithms

- The combination of big data, machine learning, and cognitive computing is changing the way data is becoming a strategic asset.

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Machine learning is a discipline grounded in computer science, statistics, and psychology that includes algorithms that learn and improve their performance based on exposure to patterns in data rather than explicit programming

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# What is Required to Support Change?

- Lead with data

- Provide the ability to ask questions when you don't know what the answers will be

- Provide a platform that learns from the data, process, and interactions

- Abstract the platform so it provides the type of agility and flexibility that you need to change as constituent needs change

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# The ways that systems learn

**supervised**

The system is *taught to detect or match* patterns
based on training data. Learning by example.

**reinforcement**

The system *learns/develops strategies* based on performance feedback.

**unsupervised**

An unsupervised learning system *discovers* patterns based on experience.

# Deep Learning

- A sophisticated model of machine learning that is intended to solve complex problems by using sophisticated layers of abstractions and parallelism to learn and model data similar to how the brain functions.

- It is being used in many of the emerging applications where there is complex data from many different sources that needs to be analyzed at great speed. This would include applications in security and drug discovery.
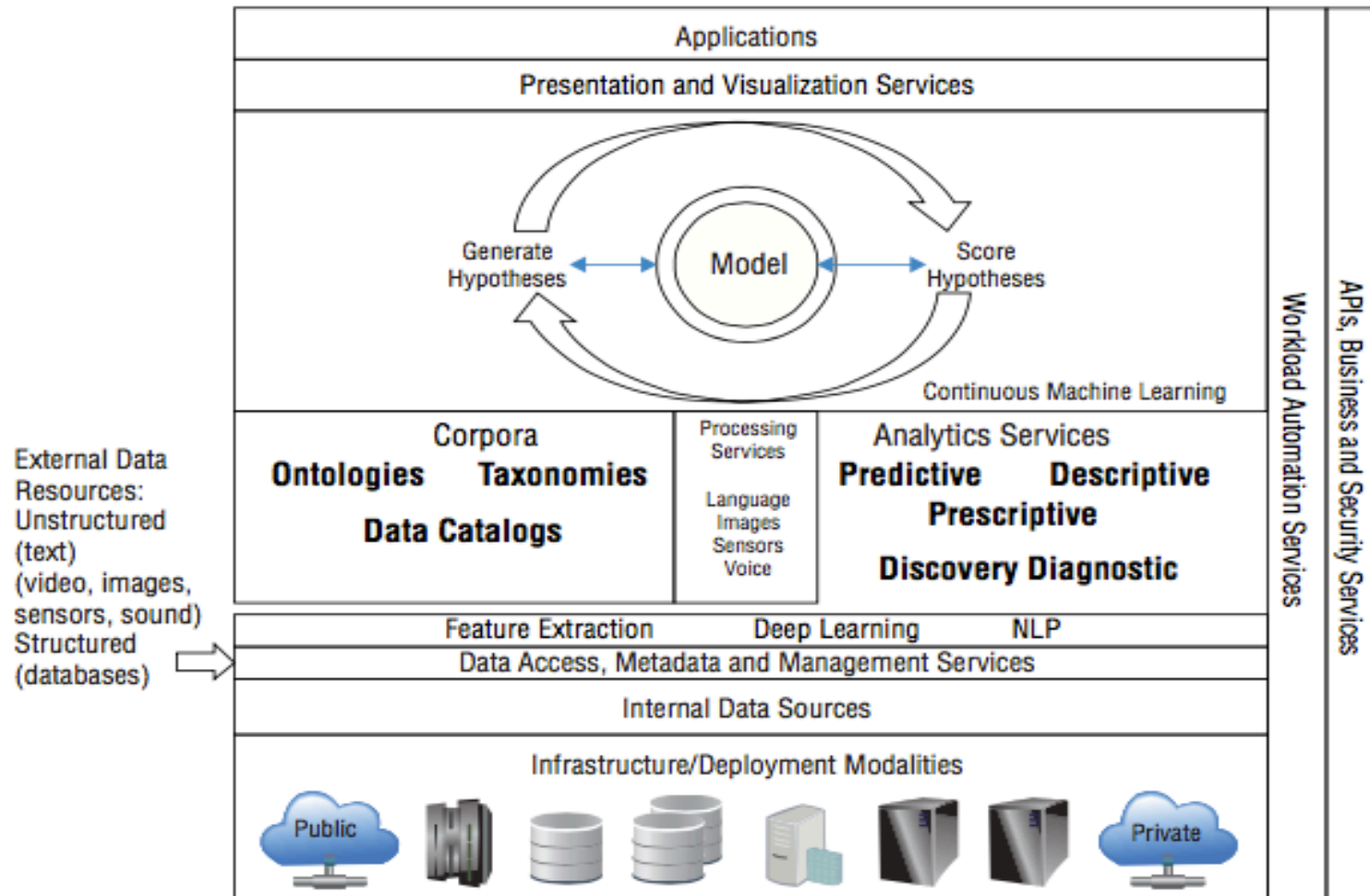
# Elements of a Cognitive System



Figure 1-2. Foundations of Cognitive Computing for Smarter Cities
*from Cognitive Computing and Big Data Analytics, Hurwitz, Kaufman & Bowles, 2015*
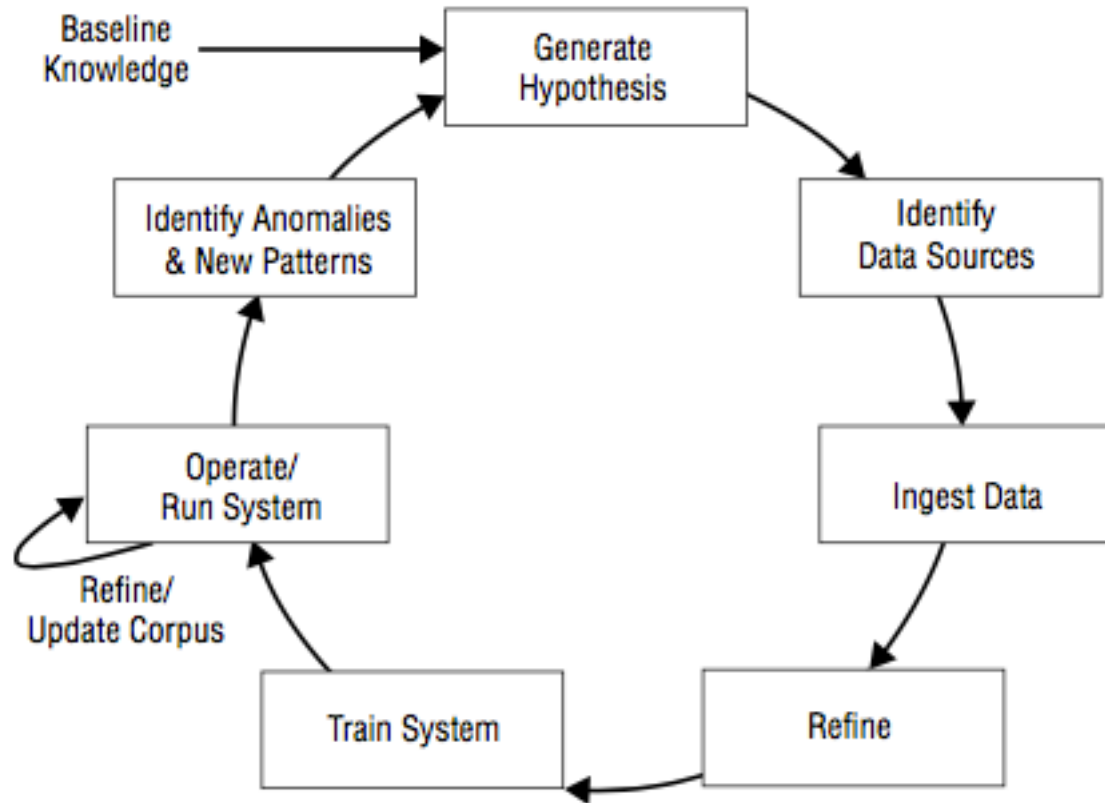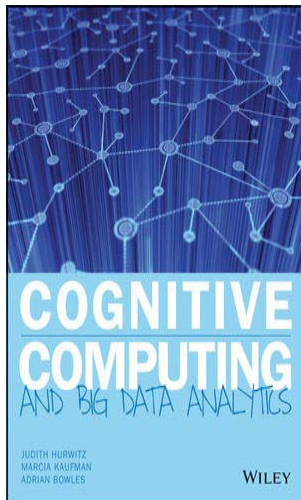
# The Lifecycle of Knowledge Management



Figure 14-1. Foundations of Cognitive Computing for Smarter Cities
*from Cognitive Computing and Big Data Analytics, Hurwitz, Kaufman & Bowles, 2015*

# The Transition to a connected technology world

- Shifting away from the programming paradigm
- Emerging technology as the secret sauce of business innovative
- Transforming the customer experience



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