Cognitive Computing

Bioingine.com

inferring knowledge from uncertain system

Dirac-Ingine

quantum math driven machine learning algorithm

DRAWN FROM THEORETICAL PHYSICS, LINGUISTIC SEMANTICS AND ARTIFICIAL INTELLIGENCE

What is Cognitive Computing

suited to model a very large complex system

- **Cognitive computing** - in the light of ever increasing system complexity and stalked by uncertainty; advances the order of the system design by the employ of semantics driven architecture. Such that, it develops into systemic capability for mining and employing tacit knowledge, as ascertained by experience and evidence, that needed by a decision support system addressing a highly complex system. – Ingine Inc
- **Cognitive computing** systems learn and interact naturally with people to extend what either humans or machine could do on their own. They help human experts make better decisions by penetrating the complexity of Big Data. – IBM Research

Generative Transformation

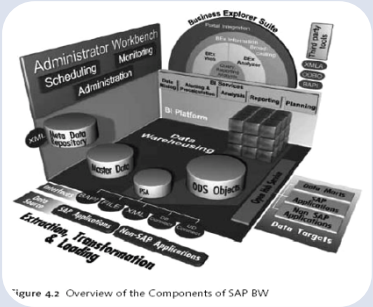
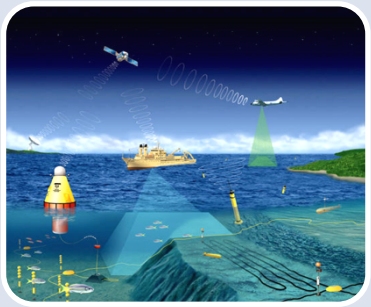
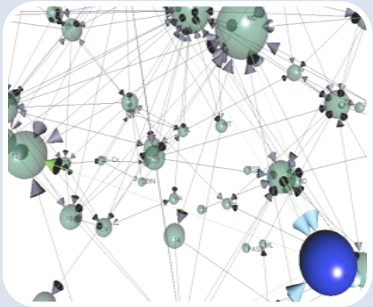


Figure 4.2 Overview of the Components of SAP BW





Information Centric

- **Simple System**
- Monolith
- Homogenous
- Simple 'Unit of Work'
- Uni-Functions
- Localized
- Information – taxonomy
- Entity Models
- SQL & RDBMS
- Very High Business Divn Boundaries
- Highly Mechanistic (Cartesian)

Functional Centric

- **Simple Systems**
- Distributed
- Heterogeneous
- Complex Functions
- CORBA
- Tight-coupling
- Multiple 'Unit of Work' in a Workflow
- Fine Grain
- 'Peer – Peer' Dependence
- Functional – Class structure
- Object Oriented
- High Business Boundaries
- Mostly Inter-business
- Simple Intra-business
- Functional centric – Ontology
- Highly Mechanistic (Cartesian)

Process Centric

- **Complex System of Systems**
- Distributed
- Heterogeneous
- Complex Process
- Multiple Workflows
- Coarse Grain
- Loose Coupling
- BPM, SOA, Event Driven
- Simple Correlation in Time
- Object Oriented
- Functional Class Structure – constraint experienced
- Less Business Boundaries
- Complex Inter-business
- Simple Intra-business
- Process centric – Ontology
- Highly Mechanistic
- Some Randomness
- Homogeneous Agents
- Probabilistically Deterministic
- Pluralistic Framework Desired
- Cartesian breakdown imminent

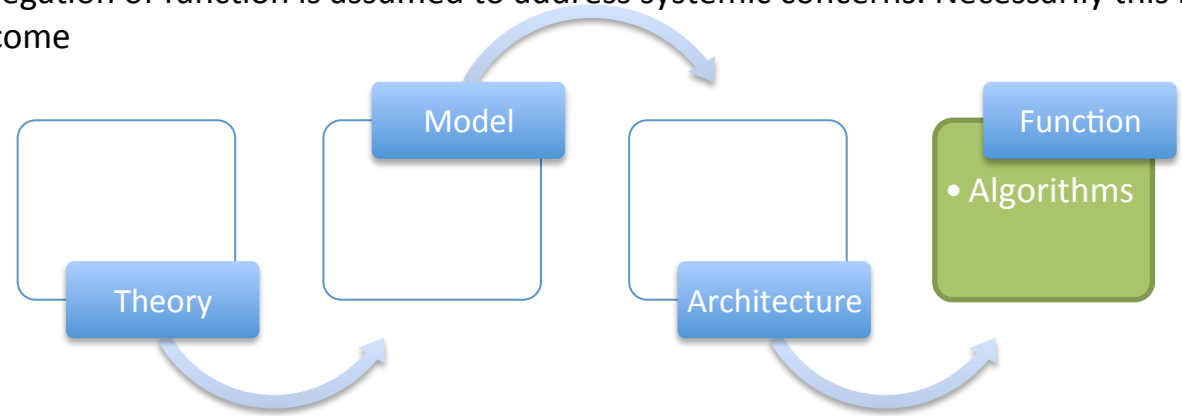
Implicate Order

- **Universe of Systems of Systems**
- Highly Distributed
- Complex Correlation
- Synchronicity
- No more Cartesian
- Ontology Enfolded
- Active Information
- Holo-movement
- Holographic
- Fractals
- Highly Pluralistic
- Extreme Individualization
- Heterogeneous Agents
- Probabilistically Deterministic
- Higher Random Occurrences
- Complex Stochastic Behavior
- Highly Networked Cloud Computing

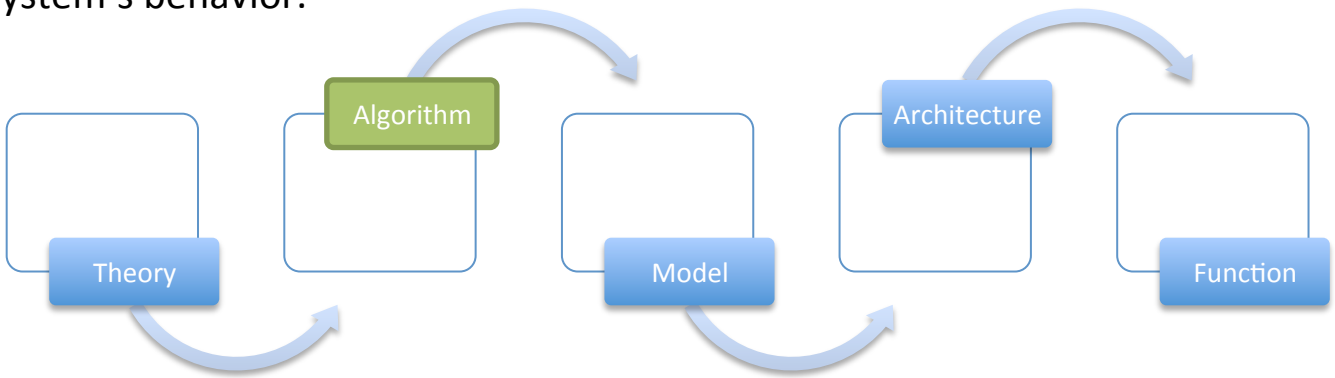
Generative Transformation

Algorithms Rule Business Model

Predicated :- Existing systems are designed and developed by Functional Classification. The aggregation of function is assumed to address systemic concerns. Necessarily this is not the outcome



Non-Predicated:- Large unbounded systemic (business) concerns poses problem of Ontological un-decidability. This is resolved by applying algorithms to extract and depict system's behavior.



Characteristics of Cognitive Computing

- Architecture style moves from Event driven into Semantics driven
- Paradigm shift in defining system behavior – it is no more predicated and deterministic
- Design is "systemic" contrasting the technique such as objected oriented based design, development and assembling components
- As such a system is better probabilistically studied.
- Design is context driven, where the boundary diminishes between context and concept
- System capability is probabilistically programmed by machine learning based on A.I, NLP and algorithms driven by ensemble of Math
- Design based on Semantic mining and engineering takes precedence to complex event processing (CEP). CEP and Event Driven Architecture (EDA) are the part of the predicated system design. Business rules engine may be an overkill.
- Ontology is created driven by both information and numbers theory
  - Algebra – relationship amongst variables
  - Calculus – rate of change in variable and its impact on the other
  - Vector Space – study of states of the variables

Probabilistic Ontology

- Probabilistic Ontology characterizes the ecosystem's behavior
- Complex System's semantic representation evolves generatively
- System better represented by semantic triples
- Human's interact with the system employing knowledge inference technique
- Inductive knowledge precedes knowledge by deduction

Probabilities, Statistics and Vector Calculus

- System's behavior better modeled by the employ of probability, statistics and vector calculus
- Generally the system is characterized by high dimensionality in its data set (variability) in addition to volume and velocity

Implicate Order and Explicate Order

Implicate order and **explicate order** are concepts coined by David Bohm to describe two different frameworks for understanding the same phenomenon or aspect of reality. He uses these notions to describe how the same phenomenon might look different, or might be characterized by different principal factors, in different contexts such as at different scales. Macro vs Micro overcoming Cartesian Dilemma.