The Zachman Framework

Zachman Framework

- Regarded the origin of enterprise architecture frameworks (originally called "Framework for Information Systems Architecture")
- First version published in 1987 by John Zachman
- It is still further developed by Zachman International (http://www.zachman.com)
- Often referenced as a standard approach for expressing the basic elements of enterprise architecture

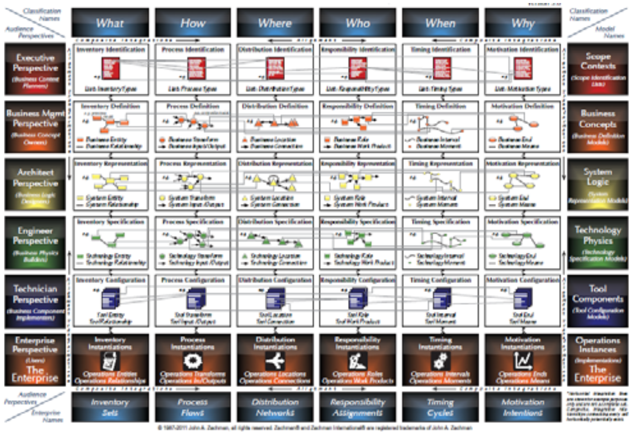
Zachman, J.A., 1987. A framework for information systems architecture. *IBM Systems Journal*, 26(3).

Rationale of the Zachman Architecture

- There is not a single descriptive representation for a complex object ... there is a SET of descriptive representations.
- Descriptive representations (of anything) typically include:
  - Perspectives
  - Abstractions

Abstractions

Perspectives



(Zachman 2012)

Dimension 1 – Perspectives

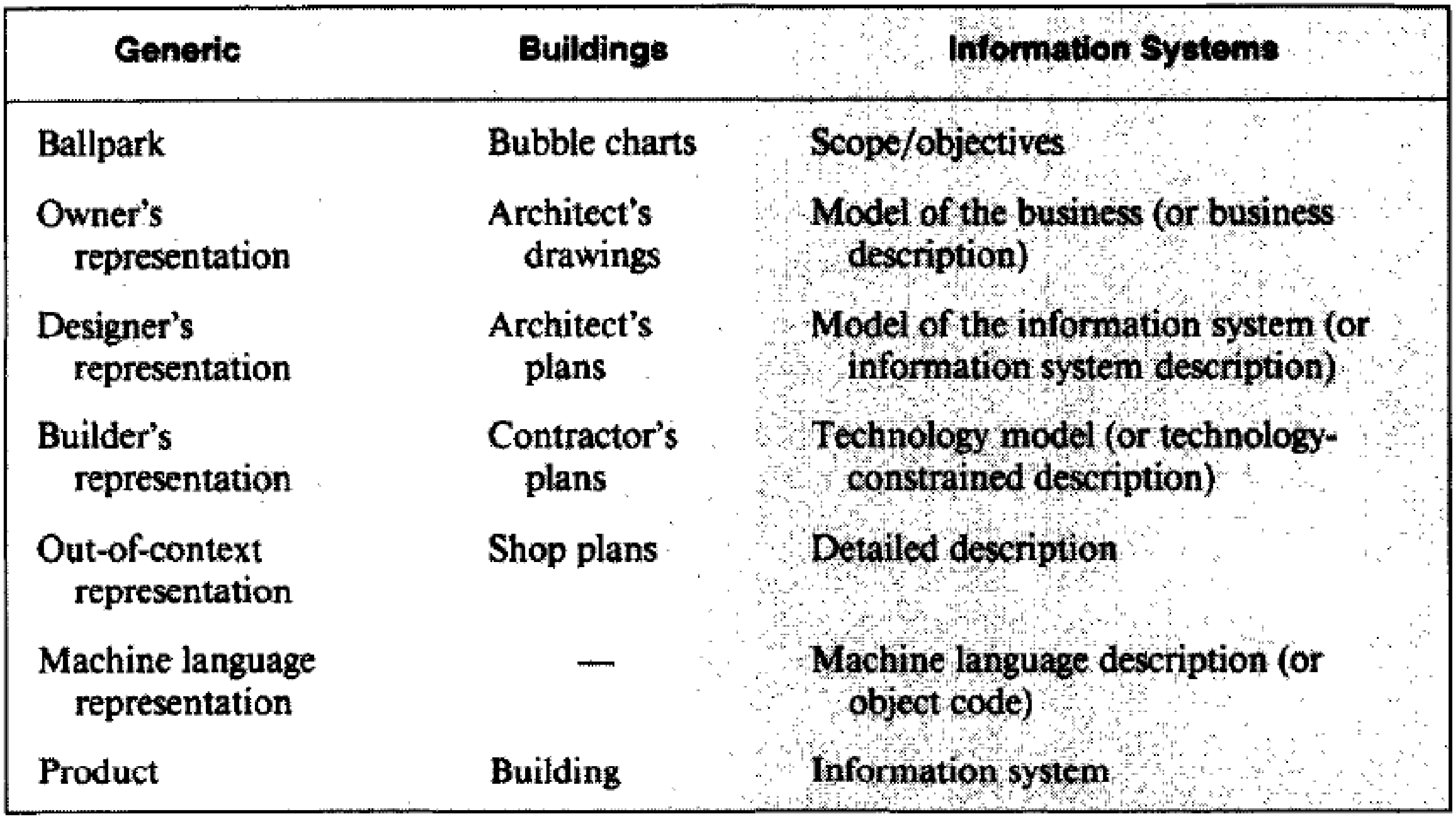
Zachman originally used the analogy of classical architecture

For the different stakeholders different aspects of a building are relevant - models of the building from different perspectives

- **Bubble charts:** conceptual representation delivered by the architect
- **Architect's drawing:** transcription of the owner's perceptual requirements – *owner's perspective*
- **Architect's plans:** translation of the owner's requirements into a product – *designer's perspective*
- **Contractor's plans:** phases of operation, architect's plans contrained by nature and technology – *builder's perspective*
- **Shop plans:** parts/sections/components of building details (out-of-context specification) – *subcontractor's perspective*
- **The building:** physical building itself

(Zachman 1987)

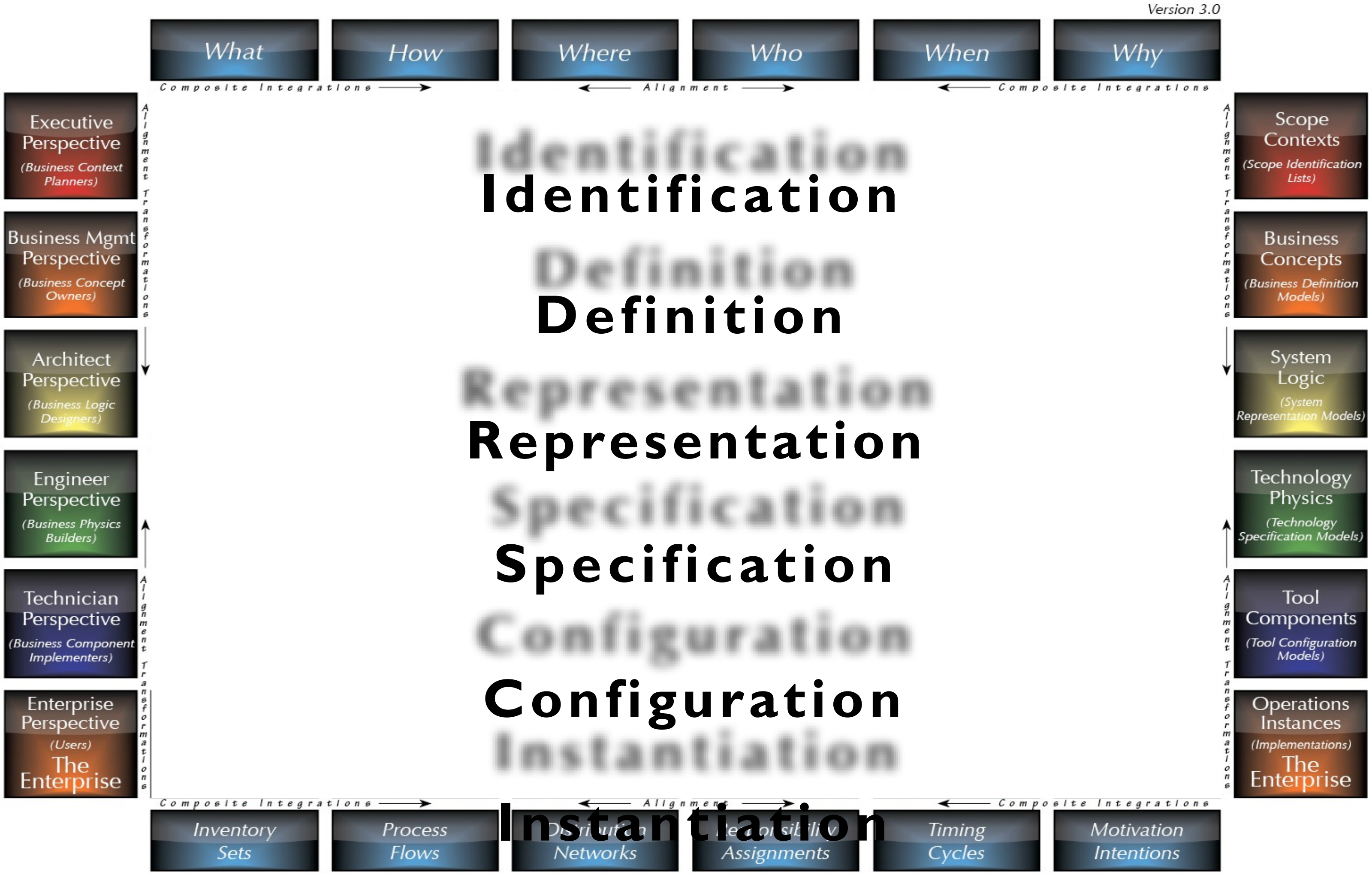
Dimension 1: Architectural Representations with analogies in Building and Information Systems



Generic	Buildings	Information Systems
Ballpark	Bubble charts	Scope/objectives
Owner's representation	Architect's drawings	Model of the business (or business description)
Designer's representation	Architect's plans	Model of the information system (or information system description)
Builder's representation	Contractor's plans	Technology model (or technology-constrained description)
Out-of-context representation	Shop plans	Detailed description
Machine language representation	—	Machine language description (or object code)
Product	Building	Information system

(Zachman 1987)

Reification



Version 3.0

What | How | Where | Who | When | Why

Composite Integrations → ← Alignment → ← Composite Integrations

Executive Perspective (Business Context Planners)

Business Mgmt Perspective (Business Concept Owners)

Architect Perspective (Business Logic Designers)

Engineer Perspective (Business Physics Builders)

Technician Perspective (Business Component Implementers)

Enterprise Perspective (Users) The Enterprise

Alignment Transformations

Scope Contexts (Scope Identification Lists)

Business Concepts (Business Definition Models)

System Logic (System Representation Models)

Technology Physics (Technology Specification Models)

Tool Components (Tool Configuration Models)

Operations Instances (Implementations) The Enterprise

Identification

Definition

Representation

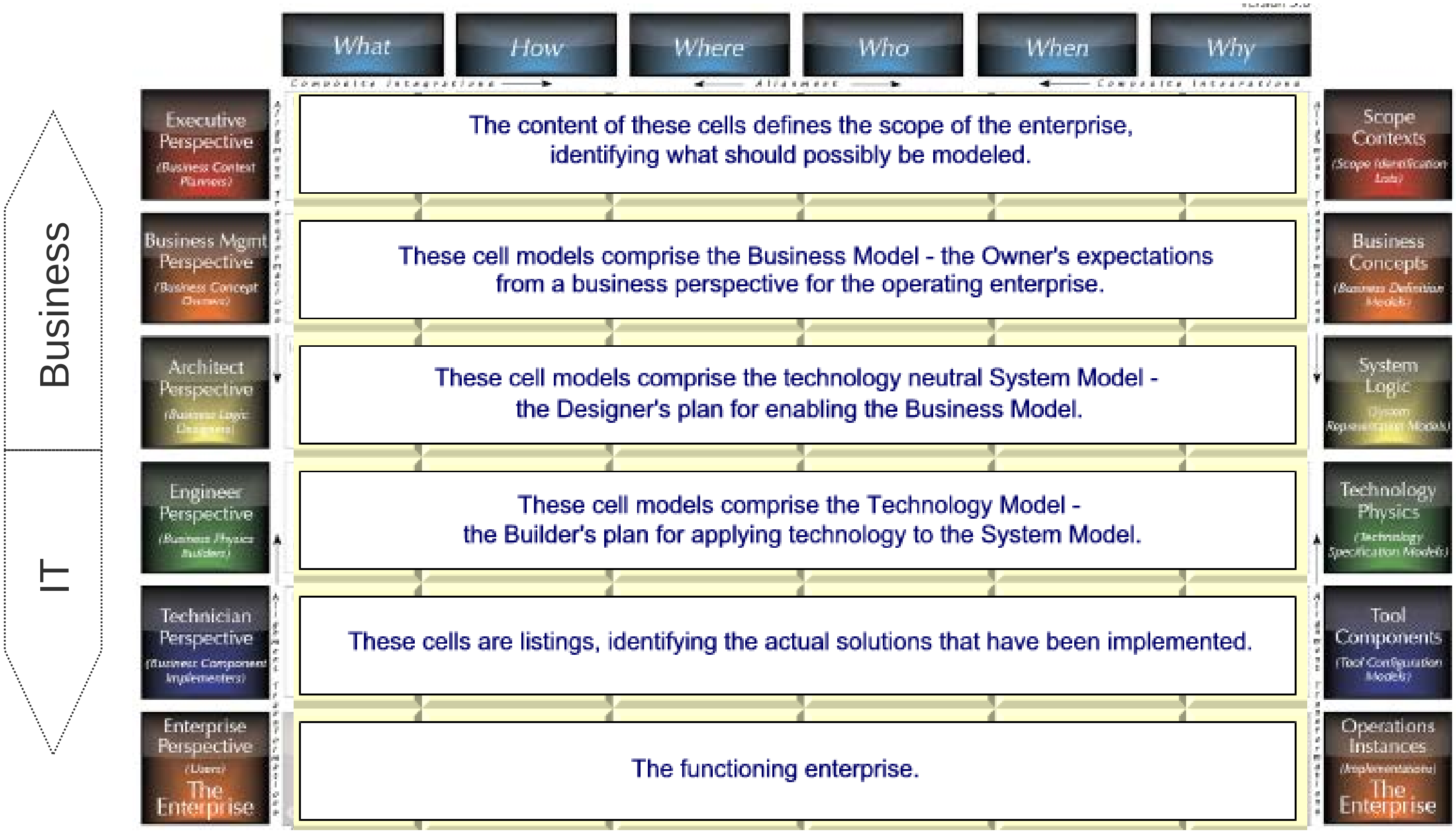
Specification

Configuration

Instantiation

Inventory Sets | Process Flows | Distribution Networks | Responsibility Assignments | Timing Cycles | Motivation Intentions

Perspectives



The content of these cells defines the scope of the enterprise, identifying what should possibly be modeled.

These cell models comprise the Business Model - the Owner's expectations from a business perspective for the operating enterprise.

These cell models comprise the technology neutral System Model - the Designer's plan for enabling the Business Model.

These cell models comprise the Technology Model - the Builder's plan for applying technology to the System Model.

These cells are listings, identifying the actual solutions that have been implemented.

The functioning enterprise.

Scope
(Boundaries)

Requirements
(Concepts)

Design
(Logic)

Plan
(Physics)

Part
(Configurations)

Product
(Instances)

- Each row is different in nature, in content, in semantics from the others – representing different perspectives
- Representations do not correspond to different levels of details – level of detail is an independent variable, varying within one representation

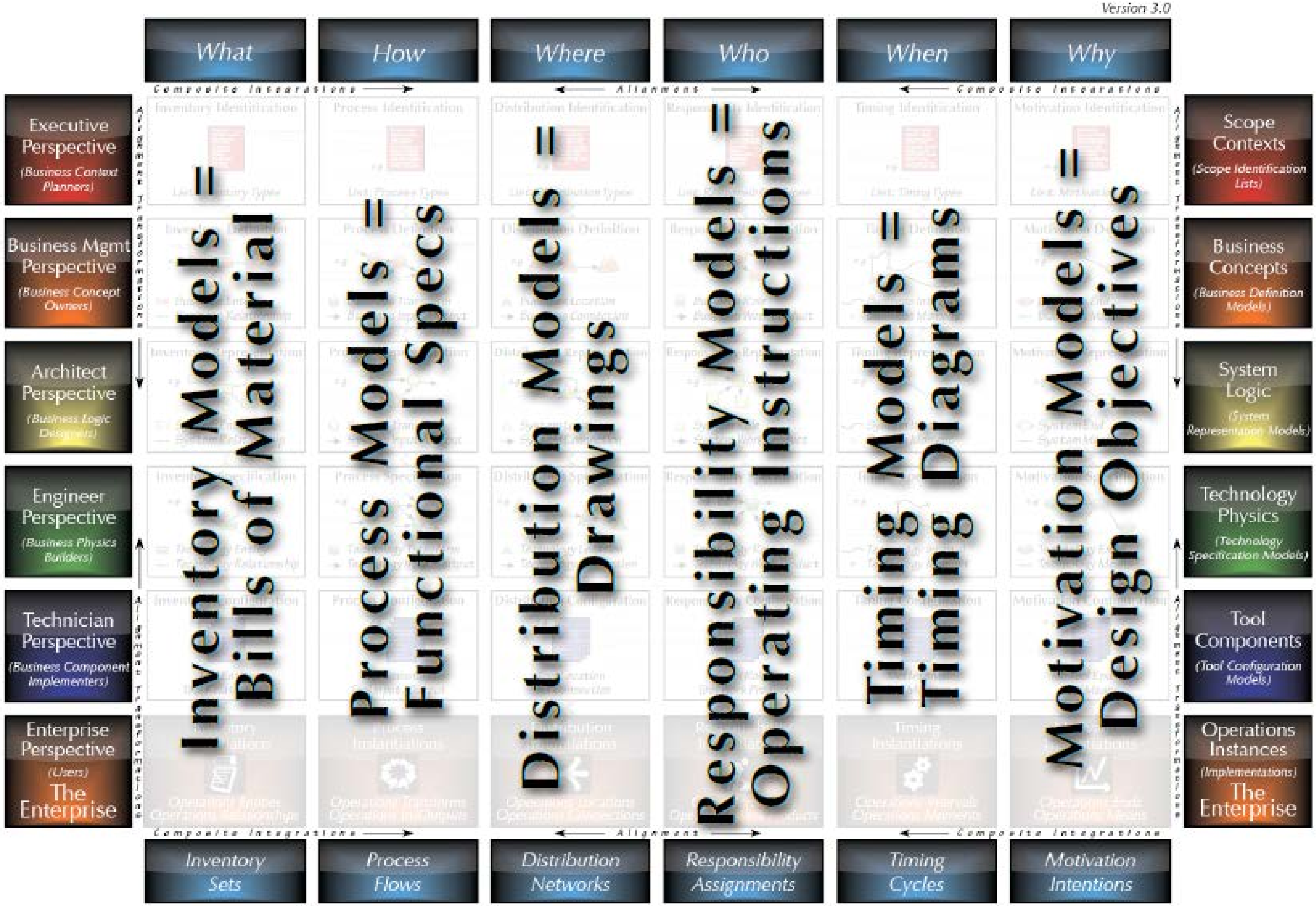
Dimension 2: Aspects of an Architecture

- There exist different types of descriptions oriented to different aspects
- Zachman associates each aspect with a question word

WHAT	inventory models
HOW	functional/process models
WHERE	location/distribution models
WHO	organisation models
WHEN	timing models
WHY	motivation models

(Zachman 1987)

Abstractions for Manufacturing


Version 3.0
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Inventory Models = Bills of Material
Process Models = Functional Specs
Distribution Models = Drawings
Responsibility Models = Operating Instructions
Timing Models = Timing Diagrams
Motivation Models = Design Objectives
Inventory Sets
Process Flows
Distribution Networks
Responsibility Assignments
Timing Cycles
Motivation Intentions

(Zachman 2012)

The Zachman Framework for Enterprise Architecture – Enterprise Ontology

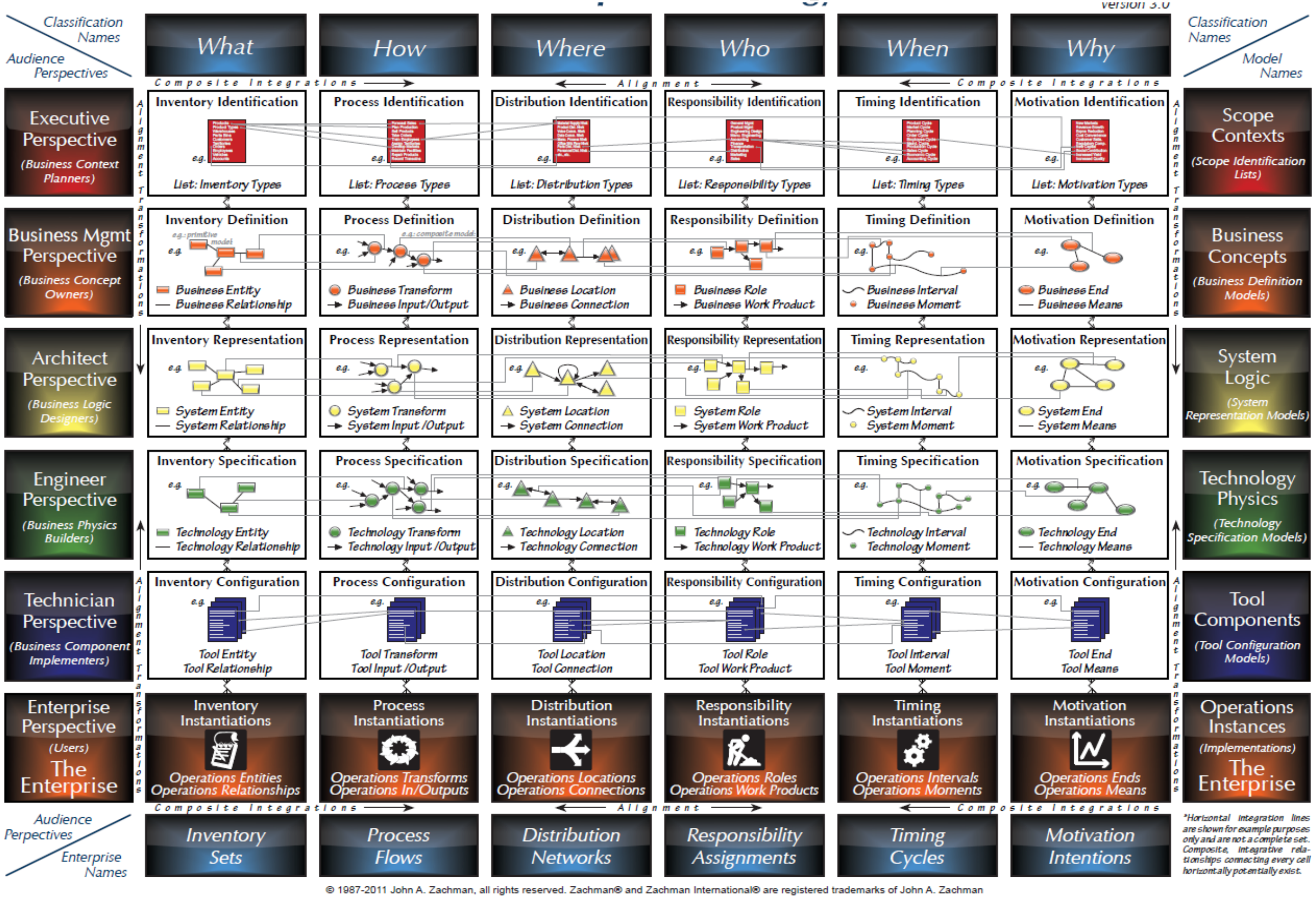
Each cell contains models

Abstractions/Aspects

Perspectives

Business

Information Technology



version 3.0

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Composite Integrations → ← Alignment → ← Composite Integrations

Alignment Transformations

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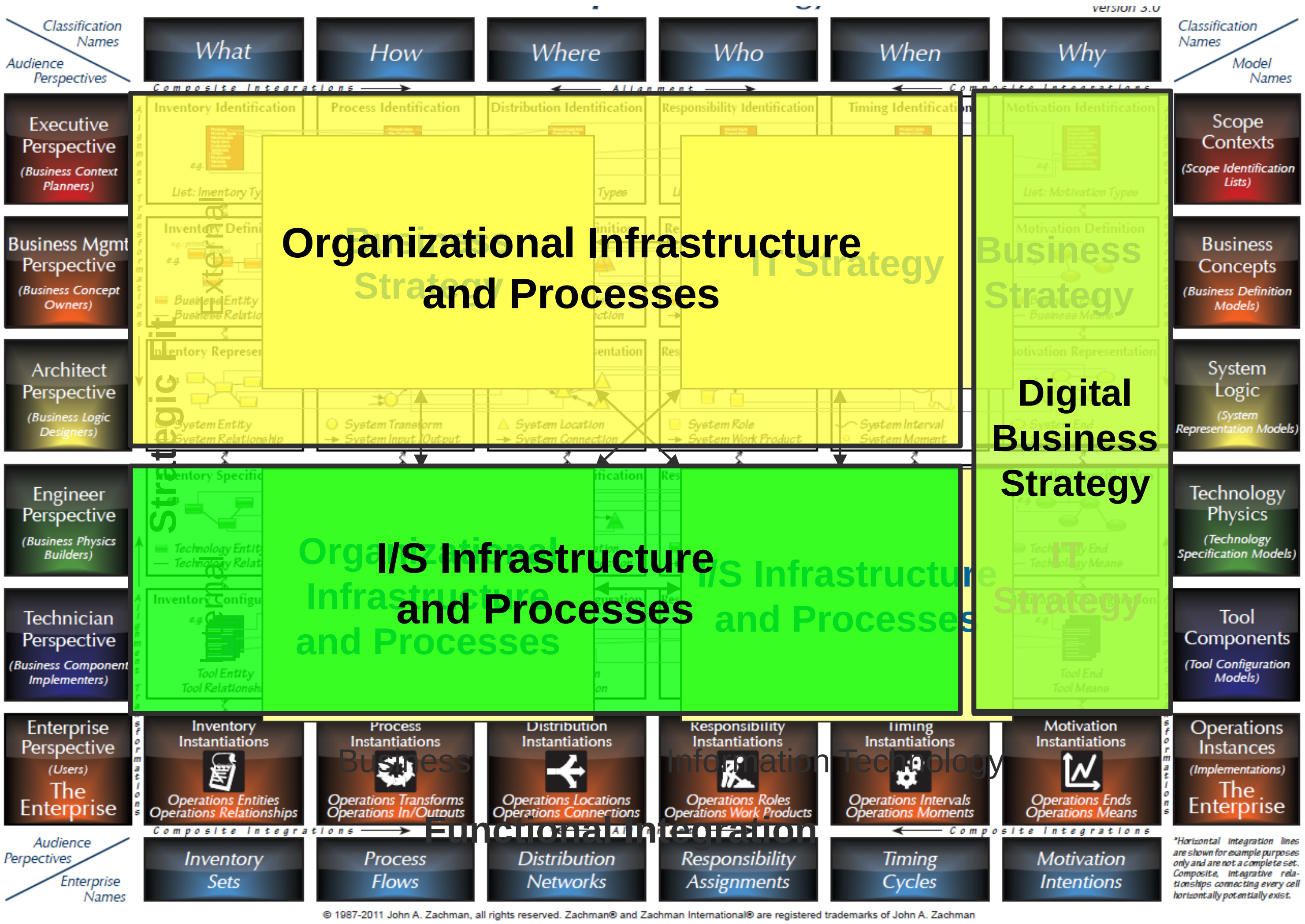
Strategic Alignment Model and Zachman Framework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Organizational Infrastructure and Processes
Business Strategy
IT Strategy
Digital Business Strategy
I/S Infrastructure and Processes
Organizational Infrastructure and Processes
Strategic Fit
External
Internal
Business
Information Technology
Functional Integration
Inventory Instantiations
Process Instantiations
Distribution Instantiations
Responsibility Instantiations
Timing Instantiations
Motivation Instantiations
Operations Entities Operations Relationships
Operations Transforms Operations In/Outputs
Operations Locations Operations Connections
Operations Roles Operations Work Products
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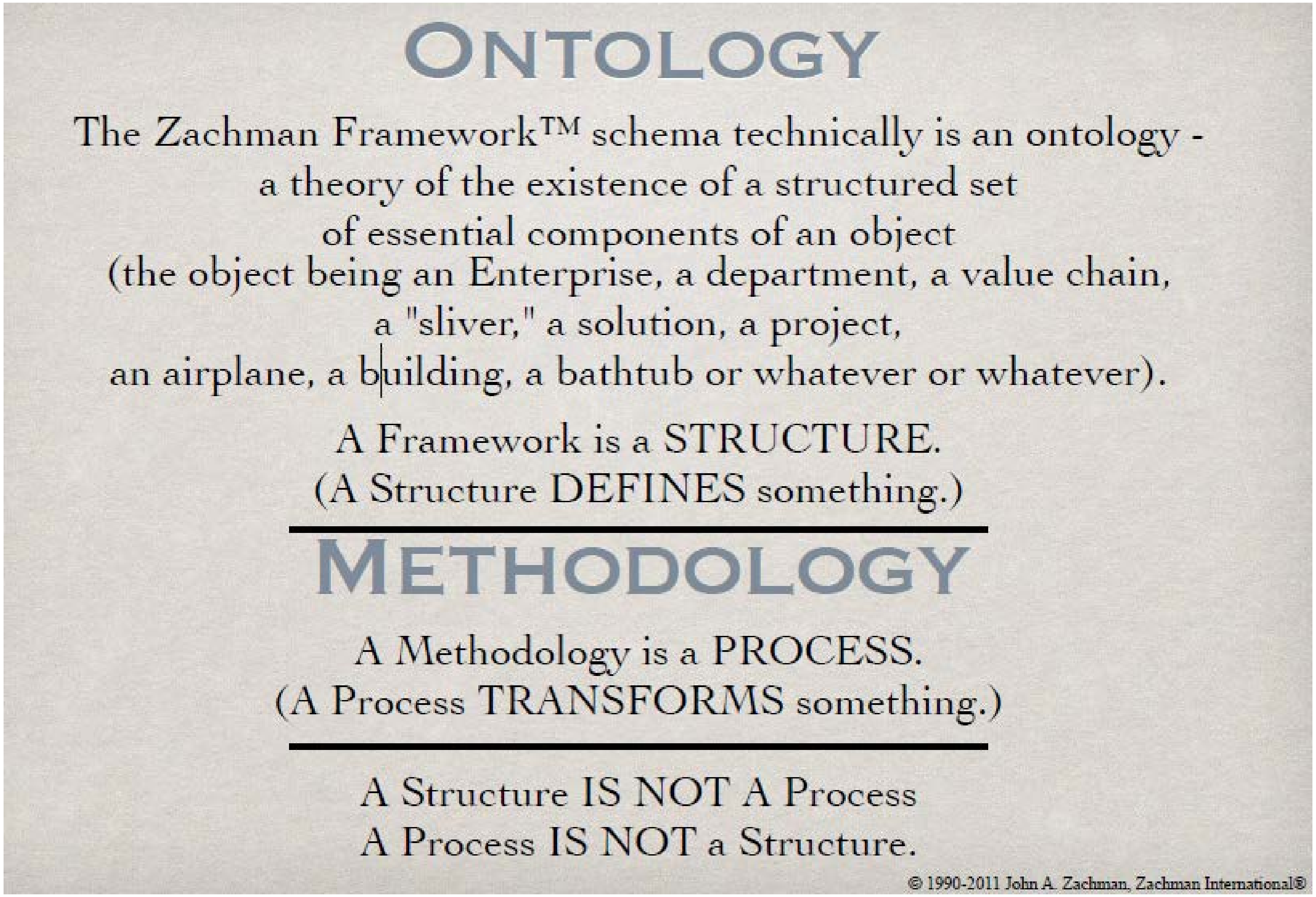
The Zachman Framework is not a Methodology



ONTOLOGY

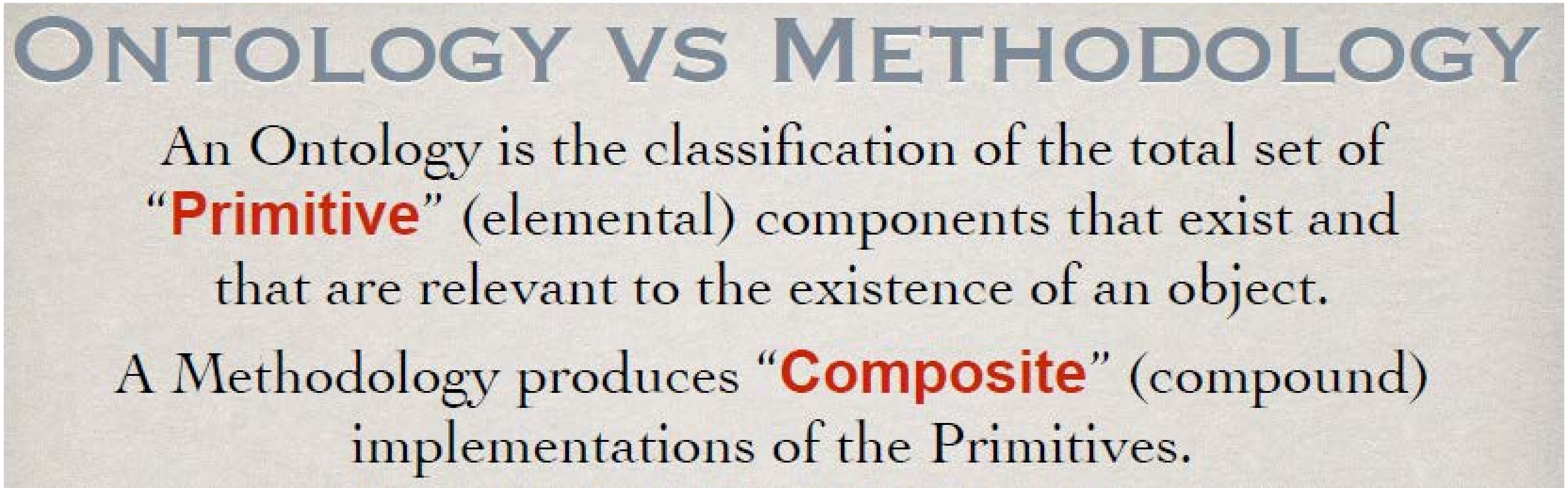
The Zachman Framework™ schema technically is an ontology -
a theory of the existence of a structured set
of essential components of an object
(the object being an Enterprise, a department, a value chain,
a "sliver," a solution, a project,
an airplane, a building, a bathtub or whatever or whatever).

A Framework is a STRUCTURE.
(A Structure DEFINES something.)

METHODOLOGY

A Methodology is a PROCESS.
(A Process TRANSFORMS something.)

A Structure IS NOT A Process
A Process IS NOT a Structure.

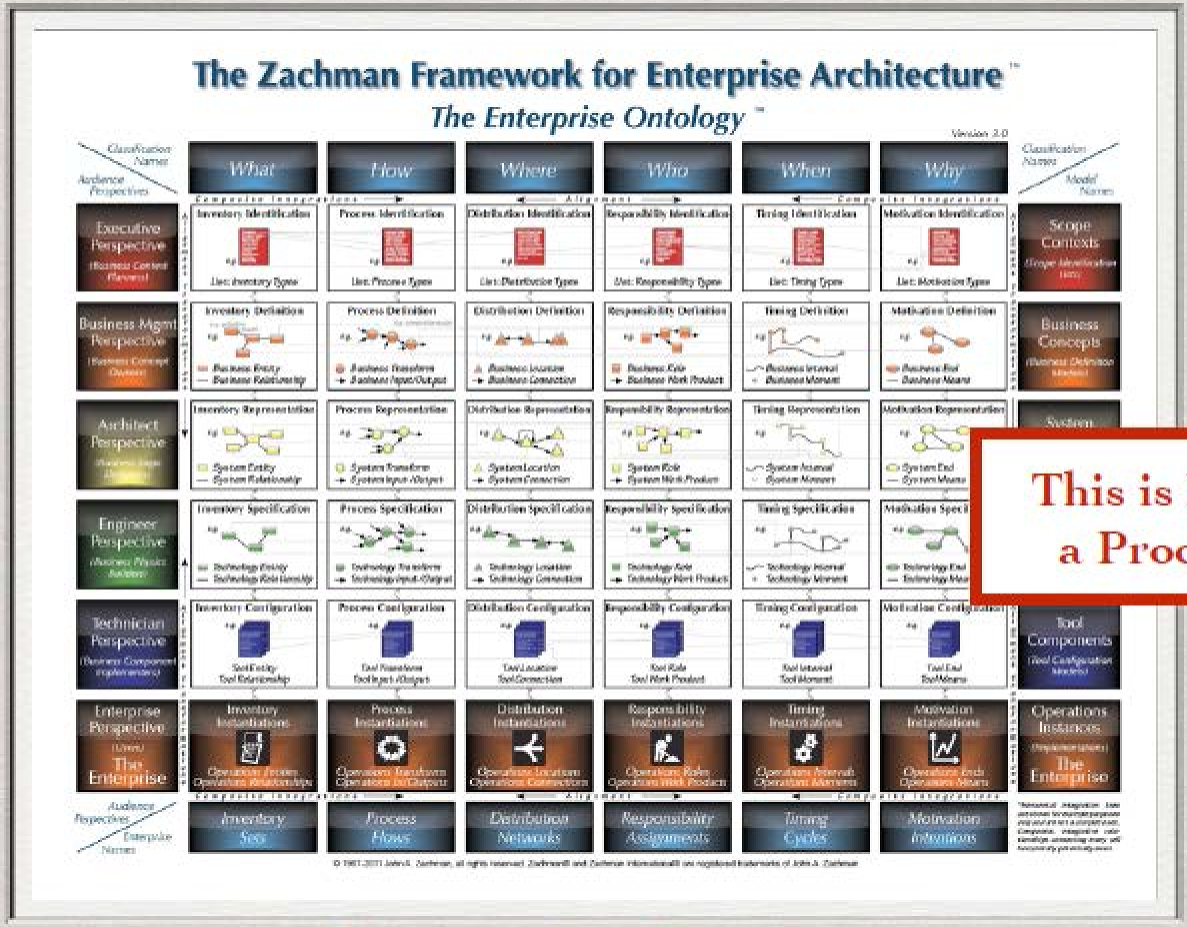


ONTOLOGY VS METHODOLOGY

An Ontology is the classification of the total set of "**Primitive**" (elemental) components that exist and that are relevant to the existence of an object.

A Methodology produces "**Composite**" (compound) implementations of the Primitives.

ONTOLOGY



The Zachman Framework for Enterprise Architecture™

The Enterprise Ontology™

Version 3.0

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Composite Integrations → ← Alignment → ← Composite Integrations

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This is NOT
a Process.

“Primitives” are Timeless.

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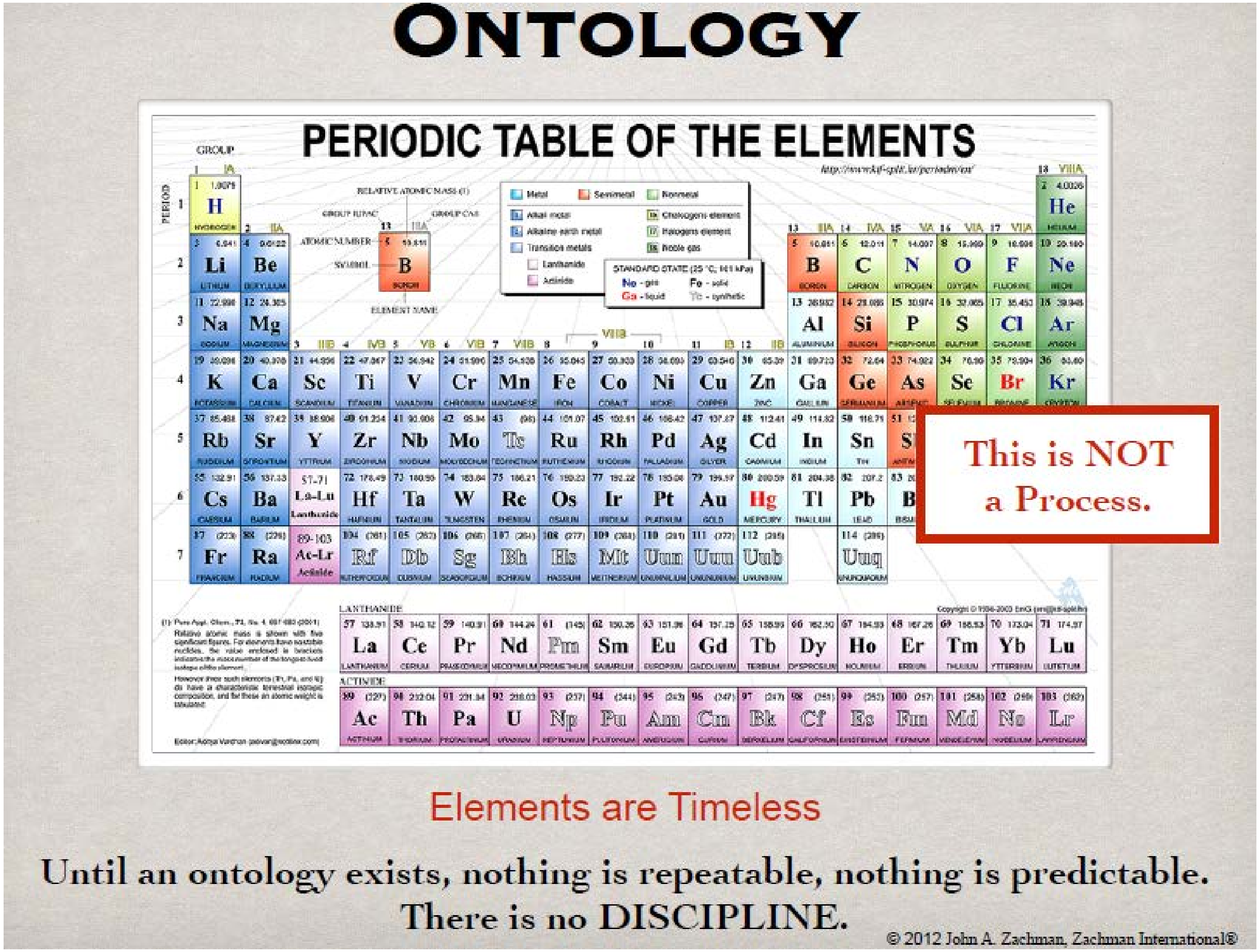
Analogy: Chemistry



ONTOLOGY

PERIODIC TABLE OF THE ELEMENTS

This is NOT a Process.

Elements are Timeless

Until an ontology exists, nothing is repeatable, nothing is predictable.
There is no DISCIPLINE.

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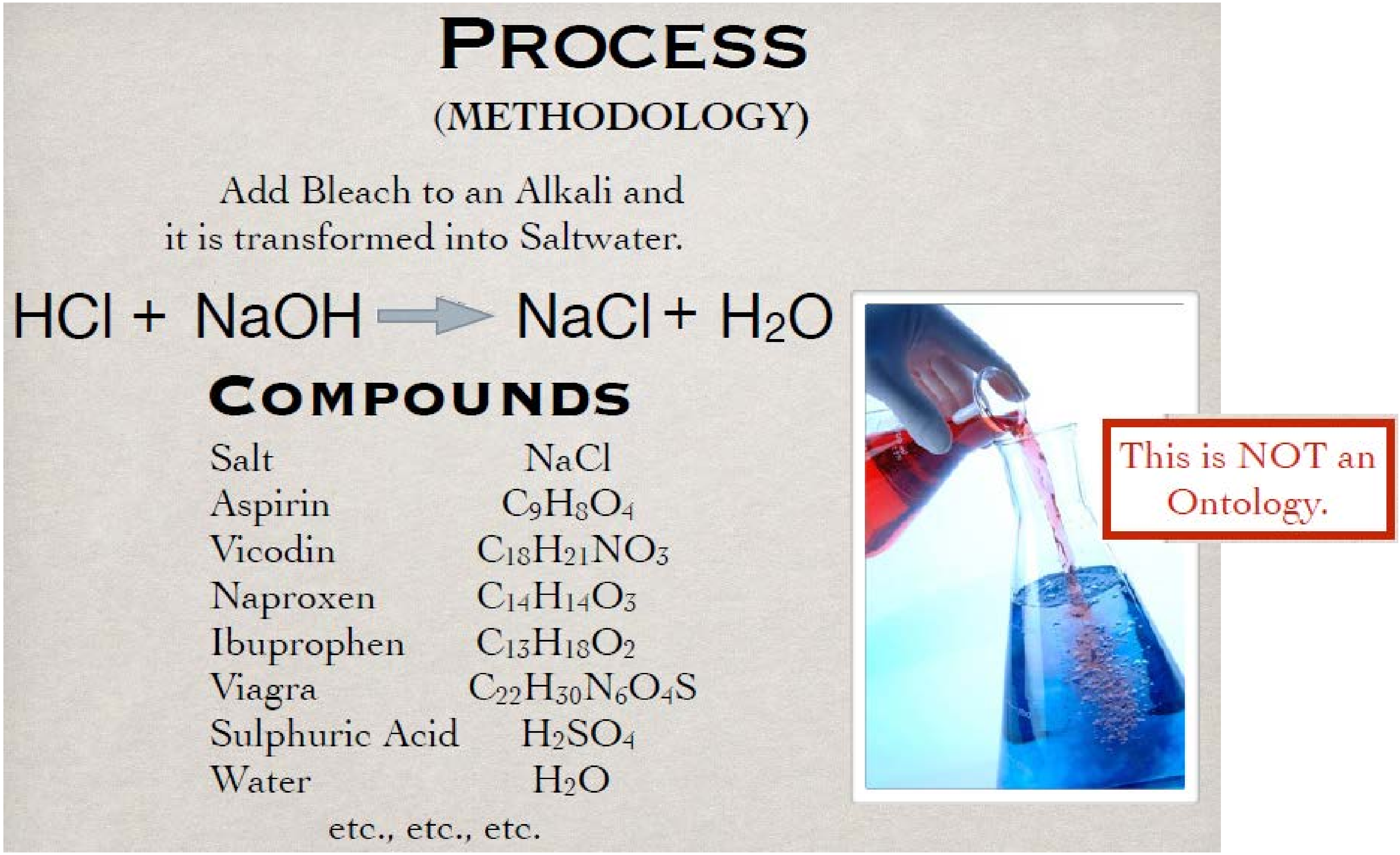
Analogy: Chemistry



Process

(Methodology)

Add Bleach to an Alkali and
it is transformed into Saltwater.

$$HCl + NaOH \longrightarrow NaCl + H_2O$$

Compounds

Salt	$NaCl$
Aspirin	$C_9H_8O_4$
Vicodin	$C_{18}H_{21}NO_3$
Naproxen	$C_{14}H_{14}O_3$
Ibuprophen	$C_{13}H_{18}O_2$
Viagra	$C_{22}H_{30}N_6O_4S$
Sulphuric Acid	H_2SO_4
Water	H_2O

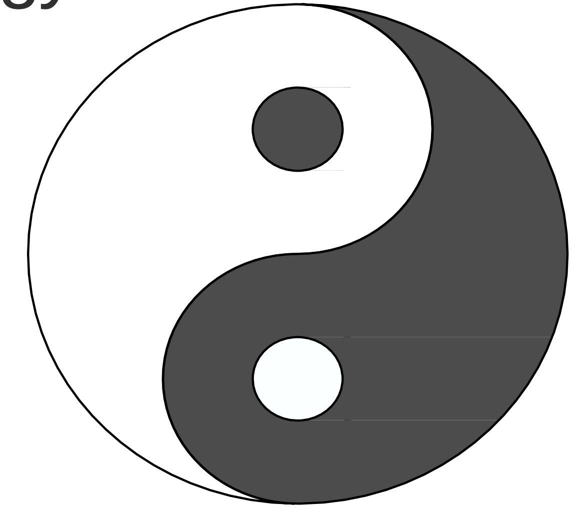
etc., etc., etc.

This is NOT an Ontology.

Ontology and Methodology

It is NOT either Ontology OR Methodology It

IS Ontology AND Methodology



Ontology and Methodologies
do not COMPETE
they COMPLETE

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Alchemy - A Practice

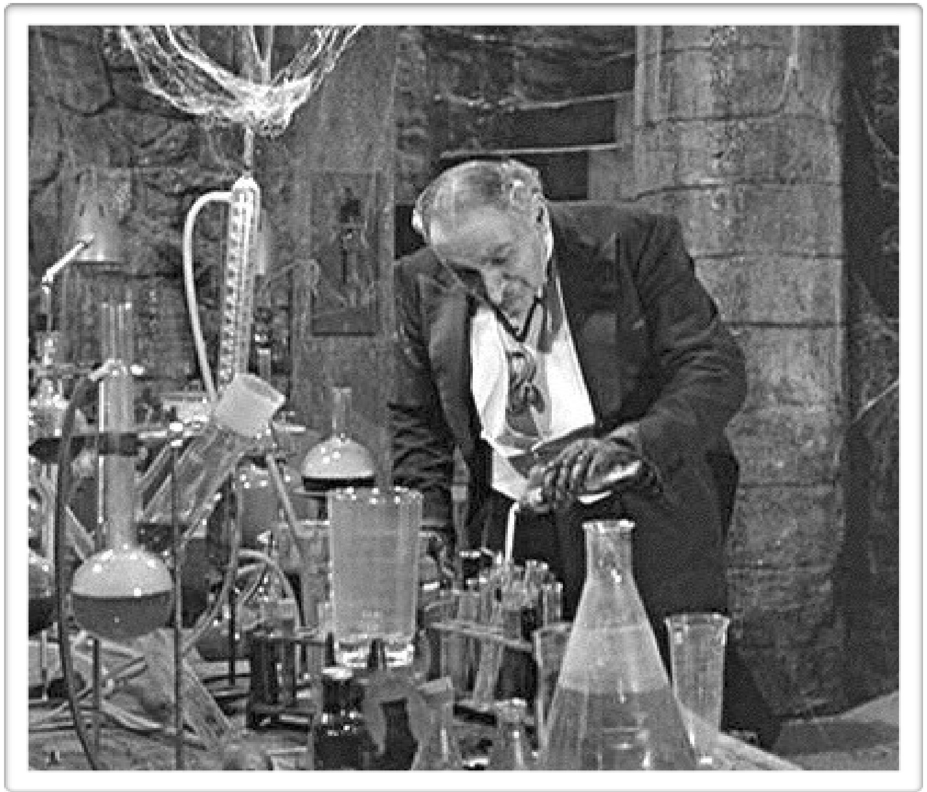
This is a Methodology WITHOUT an Ontology

A Process with no ontological structure is ad hoc, fixed and dependent on practitioner skills.

This is NOT a science.

It is ALCHEMY,

a "**practice**."



Quality

"Producing end results (the product)
that meet the requirements
as defined by the customer."

Quality in the context of the Enterprise

Producing Implementations
(manual and/or automated)
i.e. the ENTERPRISE (Row 6)
that are "aligned" with
the intentions of Management (Row 2).

Making Enterprise Architecture Explicit

Zachman defines Laws of Enterprise Physics:

- Every cell of the enterprise ontology exists
  (remember: an architecture exists whether or not it is written down)
- If something is not made explicit, one has to make assumptions – incorrect assumptions are sources of defects, miscommunication and misunderstanding
  - If rows 1-3 (the business view) are not made explicit row 6 (the implemented enterprise) probably has nothing to do with the intentions of business
  - If rows 4 and 5 are not made explicit and aligned with rows 1-3 the implemented enterprise probably has nothing to do with the intentions of business (rows 1-3)

Enterprise Physics

The First Law of Enterprise Ontological Holism

Every Cell of the Enterprise Ontology exists. Any Cell or portion of Cell that is not made **explicit** is **implicit** which means that you are allowing anyone and everyone to make whatever assumptions they want to make about the contents and structure of that Cell.

The Second Law of Enterprise Ontological Holism

Correct assumptions about **implicit** Cell contents and structure save time and money. Incorrect assumptions are sources of defects … and the source of miscommunication and misunderstanding - conflicts, escalating General and Administrative costs (entropy) in the implemented Enterprise of Row 6.

Enterprise Physics

ENTERPRISE PHYSICS

The Third Law of Enterprise, Ontological Holism.
Every Cell or portion of Cell that is **not** explicit (i.e. is **implicit**) is guaranteed to be a source of inconsistent assumptions and therefore discontinuities, risking potential conflicts, escalating General and Administrative costs (entropy) and even Enterprise liabilities.

The Fourth Law of Enterprise, Ontological Holism.
To avoid misunderstanding and miscommunication about the Enterprise, there should be only a single version of Cells in Rows 1, 2 and 3. However, the Row 3 System Logic can be transformed to more than one Technology and the Row 4 Technology Physics transformed with more than one Vendor Tool as long as content redundancy is controlled.

Enterprise Physics

Enterprise Physics

The Fifth Law of Enterprise, Ontological Holism.

Any fact that is not classifiable according to the defined classification rules is either not relevant to the Enterprise or not a single-variable, "Primitive" fact.

That fact (if it is a fact and if it is relevant to the Enterprise) is likely a "Composite" fact.

Enterprise Physics

Enterprise Physics

The First Law of Reification Incontrovertibility.

If Cells in Rows 1, 2 or 3 are not made explicit, whoever is formalizing Cells in Rows 4, 5 and 6 has to make assumptions about Rows 1, 2 and 3 and the probability of the implemented Enterprise of Row 6 having anything to do with the intentions of Rows 1, 2 or 3 is low to zero.

The Second Law of Reification Incontrovertibility.

If Cells in Rows 4, 5 or 6 are not made explicit and aligned with the transformations of Rows 1, 2 and 3, whether the Cells in Rows 1, 2 and 3 are made explicit and aligned or not, the probability of the implemented Enterprise of Row 6 having anything to do with the intentions of the “stakeholders” of Rows 1, 2 or 3 is low to zero.

Challenge to Enterprise Architects

Reframe the concept of Enterprise Architecture ...

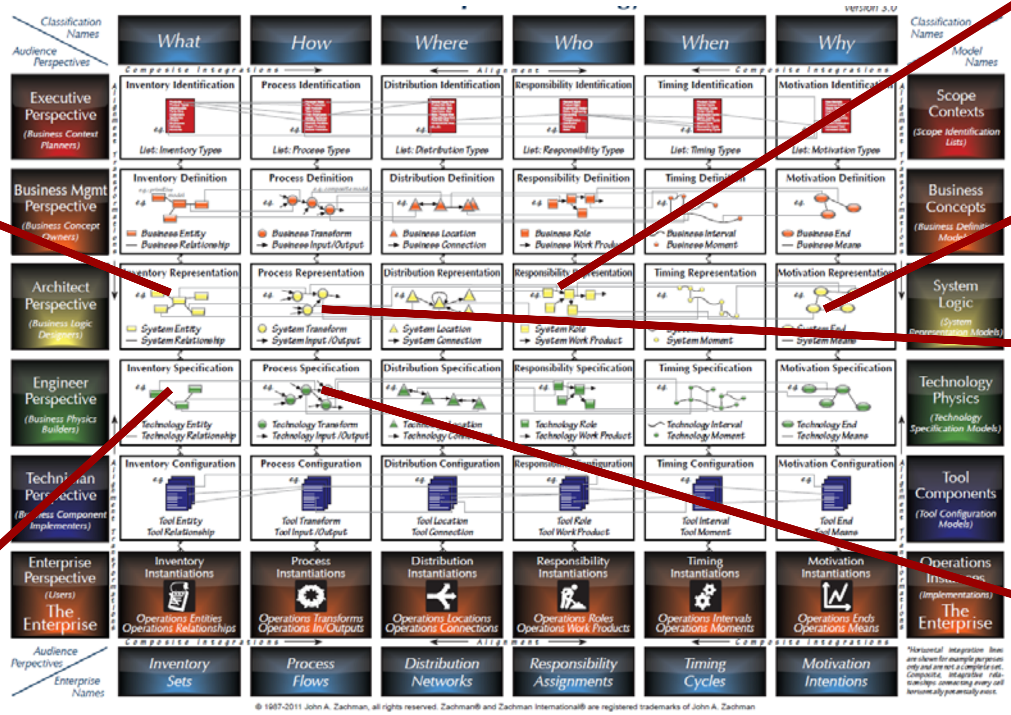
It is not about building models!

It is about solving Enterprise problems while iteratively and incrementally building out the inventory of complete, reusable, Primitive Models that constitute:

Enterprise Architecture.

Models and the Zachman Framework

- Concepts for modelling are related to cells.
- Models are composites, they can roughly be assigned to cells, if they are composed of elements (concepts) of this cell.
- The elements of models can (roughly) be assigned to cells, but often cover



Organisation model

Logical data model

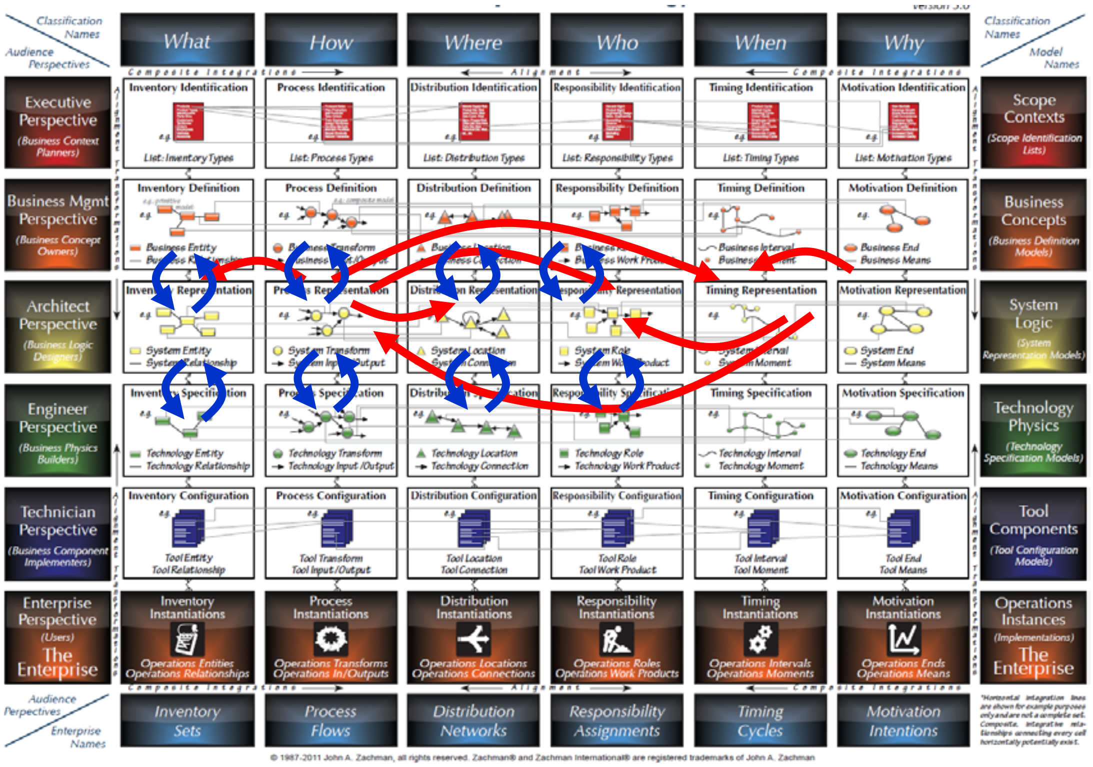
Motivation Model

Process model

Physical data model

Workflow model

Relations between Models and Model Elements



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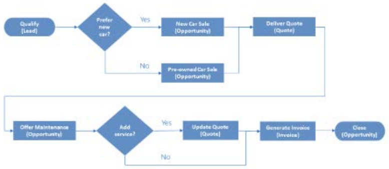
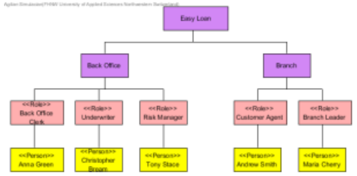
- There are relations between (elements of) the models
- Horizontal Relations: In same perspective, e.g.
  - Data used in a process
  - Application implementing a process activitiy
- Vertical relations: Between different perspectives
  - Implementation of an application
  - Database model for an entity relationship model

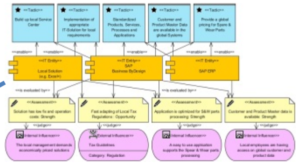
Enterprise Architecture Modeling – Examples of Models Kinds

Process Model

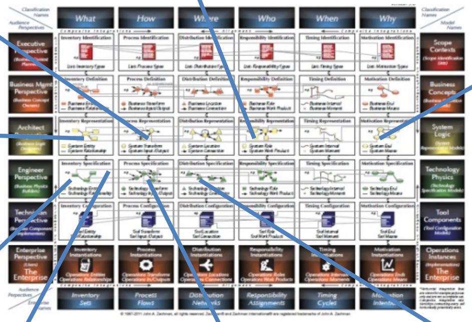

Qualify (Lead)
Prefer new car?
Yes
New Car Sale (Opportunity)
Deliver Quote (Quote)
No
Pre-owned Car Sale (Opportunity)
Offer Maintenance (Opportunity)
Add service?
Yes
Update Quote (Quote)
Generate Invoice (Invoice)
Close (Opportunity)
No

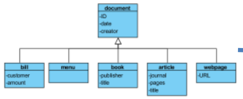
Organisation Model





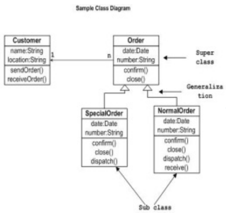
Business Motivation



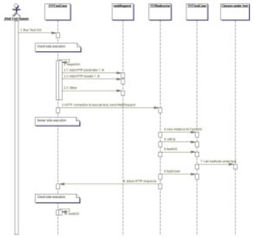


Data/Documents

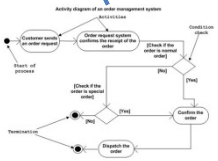
Fact Type Model



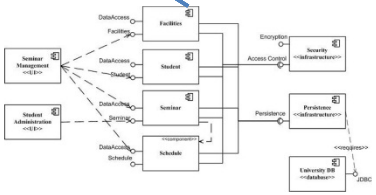
UML class diagram



UML sequence diagram



UML activity diagram


Facilities
Student
Seminar
Schedule
Seminar Management
Student Administration
Security <<infrastructure>>
Persistence <<infrastructure>>
University DB <<database>>
JDBC

UML component diagram