Enterprise Architecture

The Practice of Enterprise Architecture

John A. Zachman
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Agenda

I. Global Environment
II. Enterprise Architecture - Definition
III. Ontology versus Methodologies
IV. Enterprise Quality - Definition
V. A Zachman Framework Story
VI. Profession Service Cycle
VII. Developing Alternative Strategies
VIII. Doing Enterprise Architecture
IX. Solving General Management Problems
X. Conclusions
XI. Appendix (Classification Rules)

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Enterprise Architecture

Enterprise Physics 101

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Preface

This seminar is NOT about increasing the stock price by the close of market, Friday afternoon.

It IS about the laws of nature that determine the success of an Enterprise ... particularly, continuing success in the turbulent times of the Information Age.

It is a presentation on Physics ... Enterprise Physics.

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Introduction

Enterprise Architecture presently appears to be a grossly misunderstood concept among management.

It is NOT an Information Technology issue.
It is an ENTERPRISE issue.
It is likely perceived to be an Information Technology issue as opposed to a Management issue for two reasons:

- Awareness of it tends to surface in the Enterprise through the Information Systems community.
- Information Technology people seem to have the skills to do Enterprise Architecture if any Enterprise Architecture is being or is to be done.

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Origins of Enterprise Architecture

- Frederick Taylor "Principles of Scientific Management" 1911
- Walter A. Shewhart "The Economic Control of Quality of Manufactured Product" 1931 (Dr. Edward Demming's Mgr.)
- Peter Drucker "The Practice of Management" 1954
- Jay Forrester "Industrial Dynamics" 1961
- Peter Senge "The Fifth Discipline" 1990
- Eric Helfert "Techniques of Financial Analysis" 1962
- Robert Anthony "Planning and Control Systems: A Framework for Analysis" 1965
- Sherman Blumenthal "Management Information Systems: A Framework for Planning and Development" 1969
- Alvin Toffler "Future Shock" 1970
- George Steiner "Comprehensive Managerial Planning" 1972
- Etc., etc., etc.

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The Information Age

"The next information revolution is well underway. But it is not happening where information scientists, information executives, and the information industry in general are looking for it. It is not a revolution in technology, machinery, techniques, software, or speed. It is a revolution in CONCEPTS."

Peter Drucker. Forbes ASAP, August 24, 1998

"Future Shock" (1970) - The rate of change.
"The Third Wave" (1980) - The structure of change.
"Powershift" (1990) - The culture of change.
-Alvin Toffler

"We are living in an extraordinary moment in history. Historians will look back on our times, the 40-year time span between 1980 and 2020, and classify it among the handful of historic moments when humans reorganized their entire civilization around a new tool, a new idea."

Peter Leyden. Minneapolis Star Tribune. June 4, 1995
"On the Edge of the Digital Age: The Historic Moment"

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Strategy Pattern

Short term, Expense-based Strategy
Custom Products (Make-to-Order)

If IT is in the business of building and running systems and the objective is to build systems faster and cheaper, then break them down into smaller pieces and start writing the code. Result is more of the same... legacy. (NOT integrated, NOT flexible, NOT aligned, NOT reusable, NOT interoperable, etc., etc. ... BUT, running.)

Modified Short Term Strategy Standard Products (Provide-from-Stock)

If the IT strategy is to buy rather than build... then implement "as is"... change the Enterprise to fit the package. Build and maintain "interfaces" with any replicated concepts in the existing legacy or in future system implementations.

Long Term, Asset-based Strategy Custom, Standard Products (Assemble-to-Order)

If IT is in the business of engineering and manufacturing Enterprises, then start building an inventory of Enterprise Architecture assets, engineering them to be reused in any implementation... the "asset paradigm"... that is, "Mass-Customization" of the Enterprise... ("custom Enterprises, mass-produced in quantities of one for immediate delivery"... at the click of a mouse.)

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The Challenge

What is your strategy for addressing:
Orders of magnitude increases in complexity,
and
Orders of magnitude increases in the rate of change?

Seven thousand years of history would suggest the only known strategy for addressing complexity and change is...

ARCHITECTURE

If it gets so complex you can't remember how it works ...
you have to write it down (Architecture)
If you want to change how it works ...
you start with what you have written down (Architecture)

The key to complexity and change: Architecture.

The question is: What is "Architecture,"
Enterprise Architecture?

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Introduction to
Enterprise Architecture

Defining Enterprise Architecture

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"Architecture"

If the object you are trying to create is simple, you can see the whole thing all at one time, and it is not likely to change, (e.g. a log cabin, a program, etc.), then you don't need Architecture.

```
for m1 = 1,M do begin
 for m2 = 1,M do begin
  for u1 = u_min,u_max do begin
   for u2 = u_min,u_max do begin
    if u1 gt u2 then begin
     for v1 = v_min,v_max do begin
      if v1 lt u1 then begin
       for v2 = v_min,v_max do begin
        if v2 ge v1 then begin
         KE_B = double(m1*u1^2+m2*u2^2)
         KE_A = double(m1*v1^2+m2*v2^2)
         if (KE_B gt KE_A) and (KE_A ge 0.965*KE_B) then begin
          x_axis[index]=index
          LM_B = double(m1*u1+n2*u2)
          LM_A = double(m1*v1+n2*v2)
          y_LM_Diffs[index]=LM_B-LM_A
          Total_LM=Total_LM+LM_B-LM_A
          y_LM_Total[index]=double(Total_LM/(index+1))
          index=index+1
          if index gt 65535 then goto, end_of_loop
         endif
        endif
       endfor
      endif
     endfor
    endif
   endfor
  endfor
 endfor
endfor
```

All you need is a tool (e.g. an ax, a compiler, etc.), some raw material (e.g. a forest, some data, etc.) and some time (then, build log cabins, write programs, etc.).

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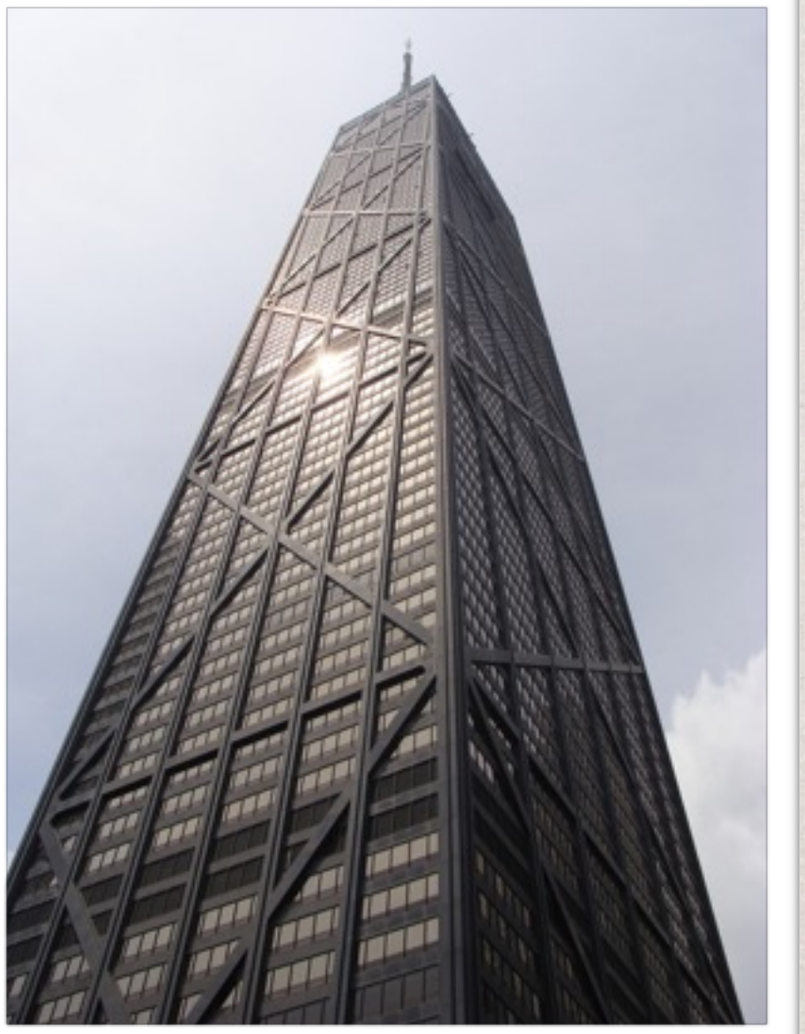
"Architecture"



On the other hand, if the object is complex, you can't see it in its entirety at one time and it is likely to change considerably over time (e.g. a hundred story building, or an Enterprise, etc.), now you need Architecture.

In short, the reasons you need Architecture:

COMPLEXITY AND CHANGE

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"Architecture"

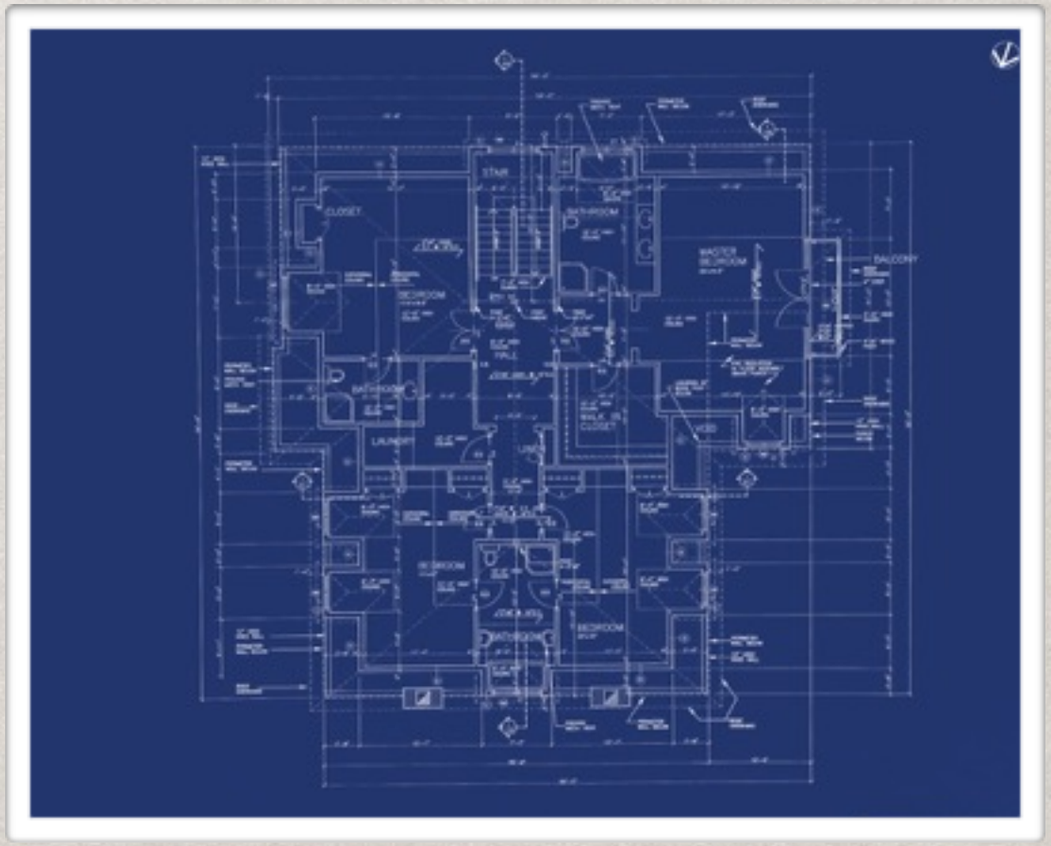
COMPLEXITY

If you can't describe it, you can't create it (whatever "it" is).

CHANGE

If you don't retain the descriptive representations after you create them (or if you never created them in the first place) and you need to change the resultant implementation, you have only three options:

- Change the instance and see what happens. (High risk!)
- Recreate ("reverse engineer") the architectural representations from the existing ("as is") implementation. (Takes time and costs money!)
- Scrap the whole thing and start over again.



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Architecture

Architecture ... what is it?

Some people think this is Architecture:

That is a common

MISCONCEPTION

(Note: This same misconception about Enterprises is what leads people to misconstrue Enterprise Architecture as being big, monolithic, static, inflexible and unachievable and ... it takes too long and costs too much.)

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Architecture

This is the RESULT of architecture. In the RESULT you can see the Architect's "architecture".
The RESULT is an implementation, an instance.

"Architecture" IS the set of descriptive representations relevant for describing a complex object (actually, any object) such that an instance of the object can be created and such that the descriptive representations serve as the baseline for changing an object instance (assuming that the descriptive representations are maintained consistent with the instantiation).

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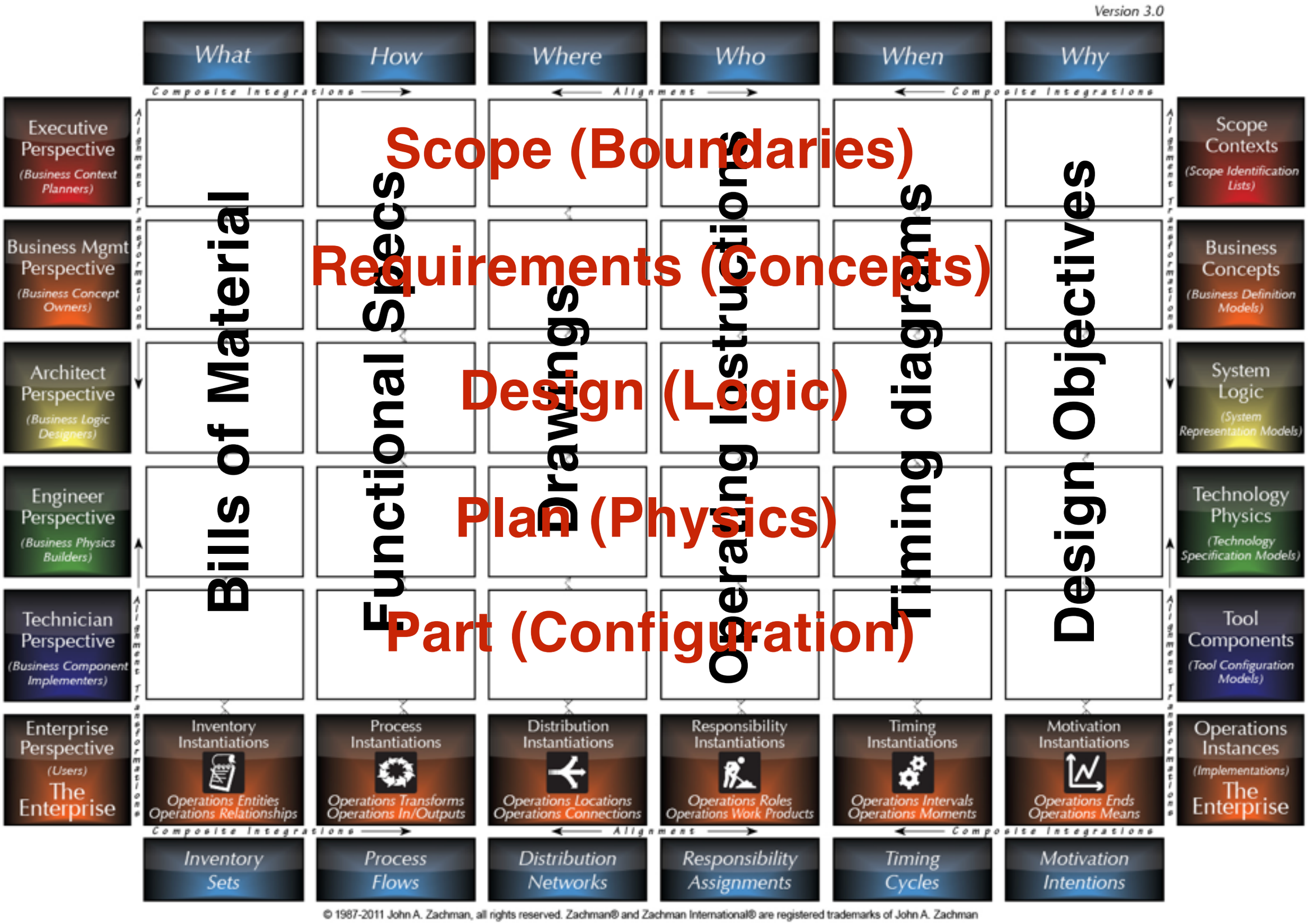
The Framework for Anything Architecture



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Reification

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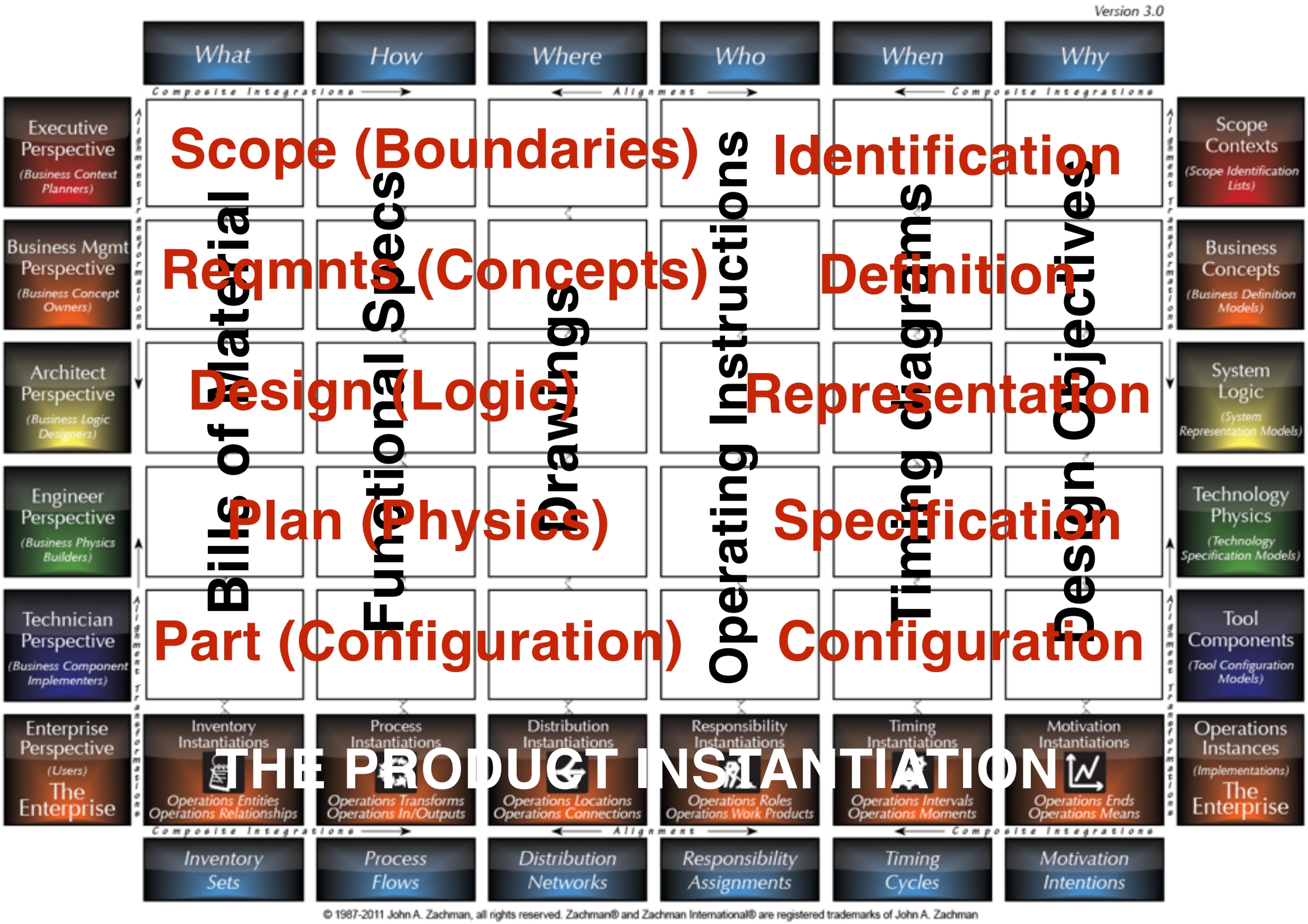
The Framework for Anything Architecture



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Engineering vs Manufacturing

Engineering work requires

single-variable,

(Synthesis)

ontologically-defined descriptions

of the ***whole*** of the object.

(Primitive)

(This is the NEW paradigm)

IN CONTRAST

Manufacturing work requires

multi-variable,

holistic descriptions

of ***parts*** of the object.

(Analysis)

(Composite)

(This is the CURRENT paradigm)

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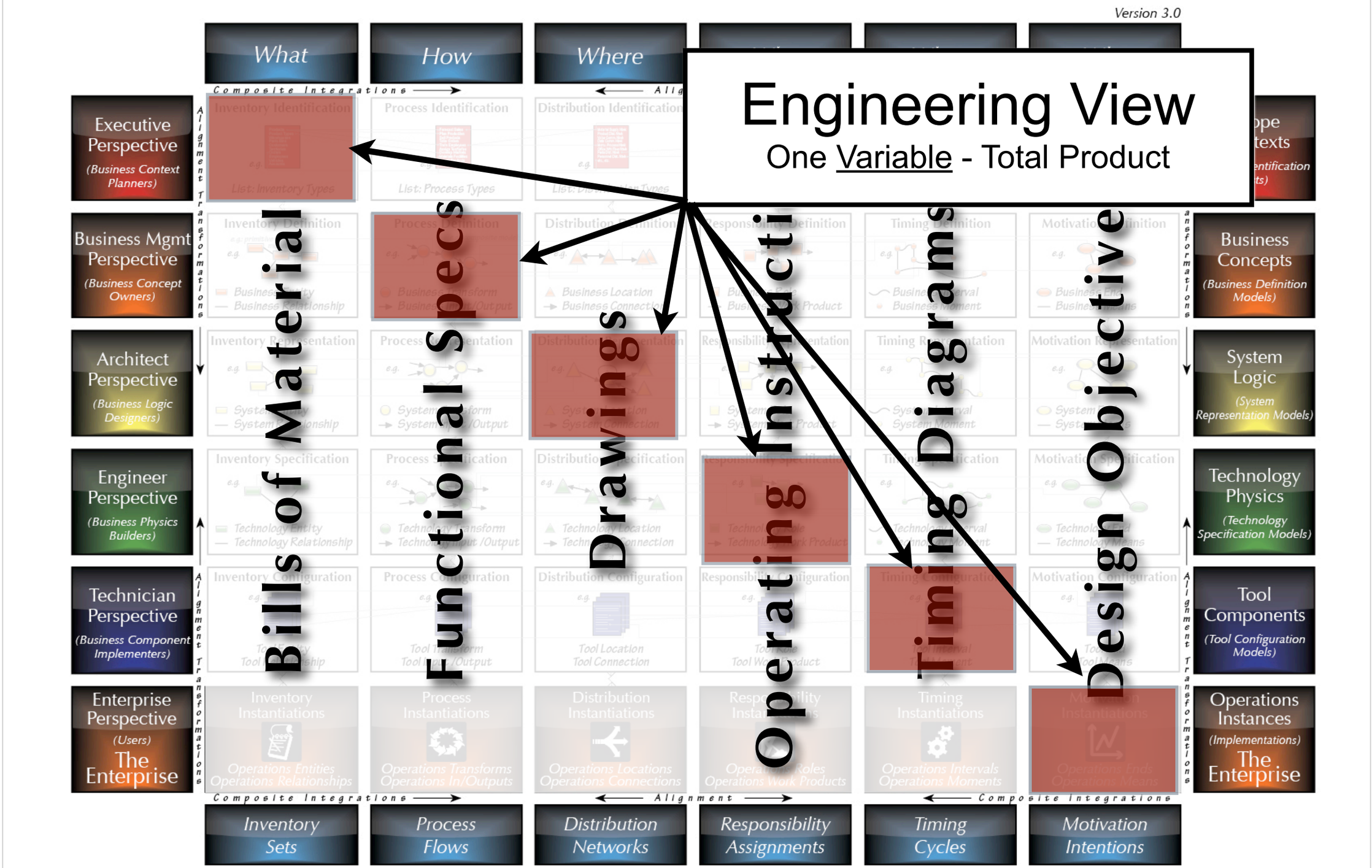
Engineering Versus Manufacturing



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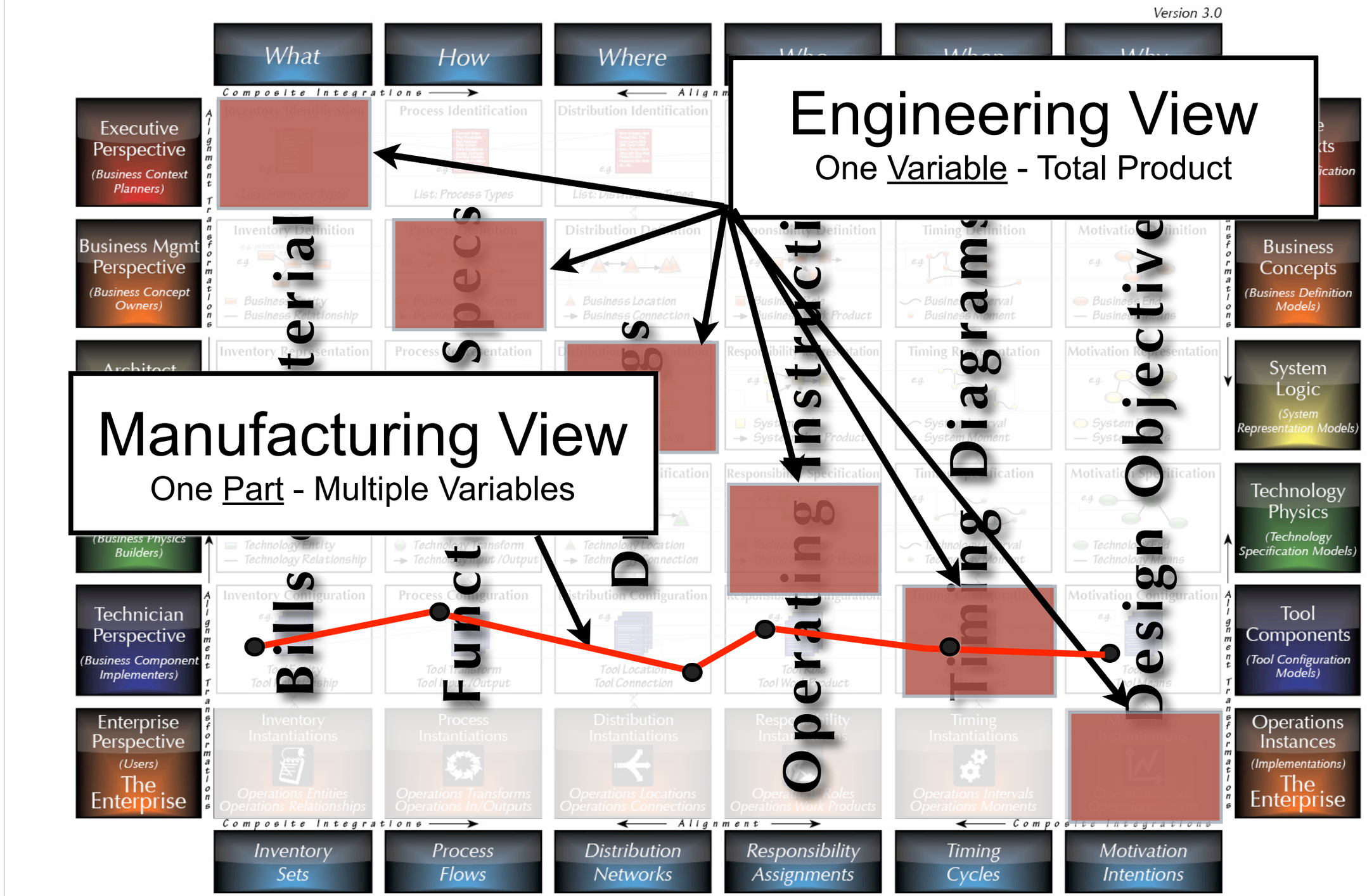
Engineering Versus Manufacturing



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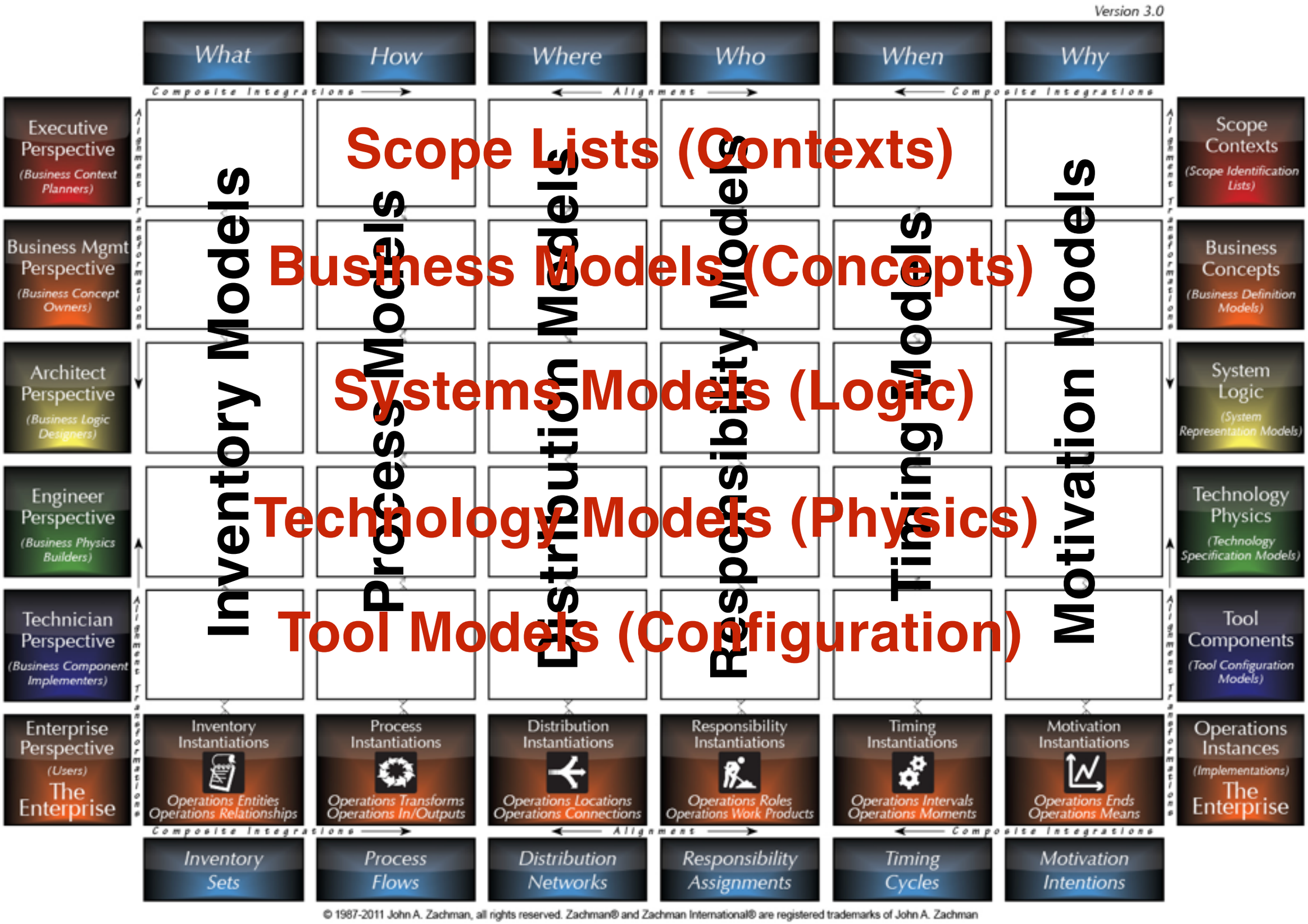
The Framework for Enterprise Architecture



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The Zachman Framework for Enterprise Architecture™

The Enterprise Ontology ™

Version 3.0

Classification Names / Audience Perspectives	What	How	Where	Who	When	Why	Classification Names / Model Names
	Composite Integrations →		← *Alignment* →		← *Composite Integrations*		
Executive Perspective *(Business Context Planners)*	**Inventory Identification** e.g. *List: Inventory Types*	**Process Identification** e.g. *List: Process Types*	**Distribution Identification** e.g. *List: Distribution Types*	**Responsibility Identification** e.g. *List: Responsibility Types*	**Timing Identification** e.g. *List: Timing Types*	**Motivation Identification** e.g. *List: Motivation Types*	**Scope Contexts** *(Scope Identification Lists)*
Alignment Transformations							*Alignment Transformations*
Business Mgmt Perspective *(Business Concept Owners)*	**Inventory Definition** e.g. *Business Entity / Business Relationship*	**Process Definition** e.g. *Business Transform / Business Input/Output*	**Distribution Definition** e.g. *Business Location / Business Connection*	**Responsibility Definition** e.g. *Business Role / Business Work Product*	**Timing Definition** e.g. *Business Interval / Business Moment*	**Motivation Definition** e.g. *Business End / Business Means*	**Business Concepts** *(Business Definition Models)*
	Inventory Representation e.g. *System Entity / System Relationship*	**Process Representation** e.g. *System Transform / System Input /Output*	**Distribution Representation** e.g. *System Location / System Connection*	**Responsibility Representation** e.g. *System Role / System Work Product*	**Timing Representation** e.g. *System Interval / System Moment*	**Motivation Representation** e.g. *System End / System Means*	**System Logic** *(System Representation Models)*
Engineer Perspective *(Business Physics Builders)*	**Inventory Specification** e.g. *Technology Entity / Technology Relationship*	**Process Specification** e.g. *Technology Transform / Technology Input /Output*	**Distribution Specification** e.g. *Technology Location / Technology Connection*	**Responsibility Specification** e.g. *Technology Role / Technology Work Product*	**Timing Specification** e.g. *Technology Interval / Technology Moment*	**Motivation Specification** e.g. *Technology End / Technology Means*	**Technology Physics** *(Technology Specification Models)*
Technician Perspective *(Business Component Implementers)*	**Inventory Configuration** e.g. *Tool Entity / Tool Relationship*	**Process Configuration** e.g. *Tool Transform / Tool Input /Output*	**Distribution Configuration** e.g. *Tool Location / Tool Connection*	**Responsibility Configuration** e.g. *Tool Role / Tool Work Product*	**Timing Configuration** e.g. *Tool Interval / Tool Moment*	**Motivation Configuration** e.g. *Tool End / Tool Means*	**Tool Components** *(Tool Configuration Models)*
Enterprise Perspective *(Users)* **The Enterprise**	**Inventory Instantiations** *Operations Entities / Operations Relationships*	**Process Instantiations** *Operations Transforms / Operations In/Outputs*	**Distribution Instantiations** *Operations Locations / Operations Connections*	**Responsibility Instantiations** *Operations Roles / Operations Work Products*	**Timing Instantiations** *Operations Intervals / Operations Moments*	**Motivation Instantiations** *Operations Ends / Operations Means*	**Operations Instances** *(Implementations)* **The Enterprise**
	Composite Integrations →		← *Alignment* →		← *Composite Integrations*		
Audience Perspectives / Enterprise Names	*Inventory Sets*	*Process Flows*	*Distribution Networks*	*Responsibility Assignments*	*Timing Cycles*	*Motivation Intentions*	

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Framework Graphic

For the latest version of the Framework Graphic,
register at **www.Zachman.com**
for a high resolution .pdf file.

(For a publication release of the Framework Graphic
send requests to the Contact Us link on zachman.com)

You may be interested in several articles by John A. Zachman at
Zachman.com
"Architecture Is Architecture Is Architecture"
"John Zachman's Concise Definition of the Zachman Framework"
and
"The Zachman Framework Evolution" by John P. Zachman

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Architecture Is Architecture

I simply put Enterprise names on the same descriptive representations relevant for describing anything.

Why would anyone think that the descriptions of an Enterprise are going to be any different from the descriptions of anything else humanity has ever described?

ARCHITECTURE IS ARCHITECTURE IS ARCHITECTURE

I don't think Enterprise Architecture is arbitrary ... and it is ***not negotiable***. My opinion is, we ought to accept the definitions of Architecture that the older disciplines of Architecture and Construction, Engineering and Manufacturing have established and focus our energy on learning how to use them to actually engineer Enterprises.

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Introduction to
Enterprise Architecture

Ontology versus Methodology

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Ontology

The Zachman Framework™ schema technically is an ontology -
a theory of the existence of a structured set
of essential components of an object
for which explicit expression is necessary (is mandatory?)
for designing, operating and changing the 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.

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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.

Primitives (elements) are timeless.

Composites (compounds) are temporal.

People who build **Composite** Models
think the **Roman Coliseum** is Architecture.

People who build **Primitive** Models
think the **Descriptive Representations** are Architecture.

What do YOU think is Architecture?

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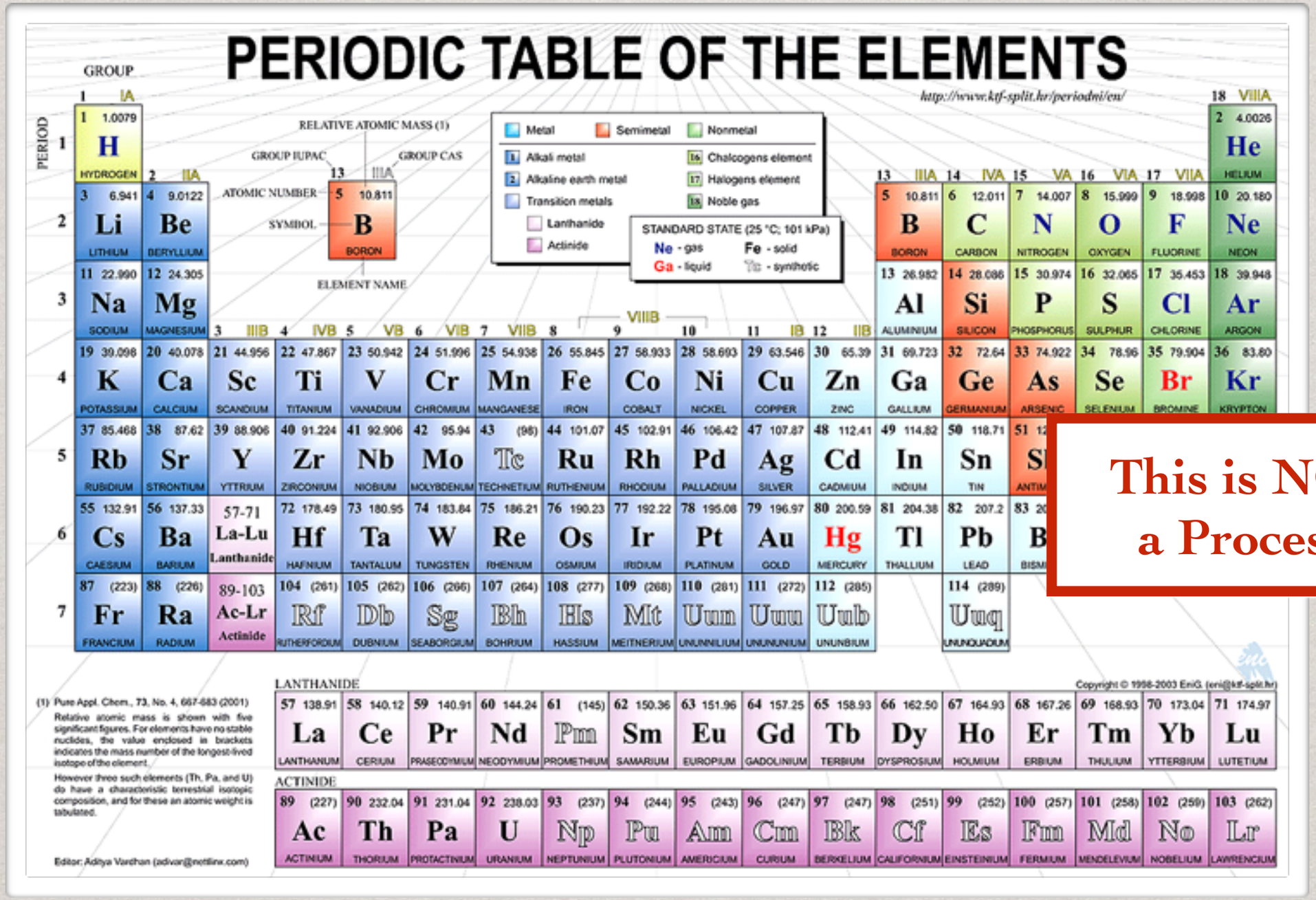
Ontology



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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Process

(Methodology)

A Process TRANSFORMS something.

This is a Process:

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

This is NOT an Ontology.

Compounds are Temporal

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Process

(Methodology)

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

$$HCl + NaOH \rightarrow NaCl + H_2O$$

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.

Compounds are Temporal

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Ontology

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The Enterprise Ontology ™

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Classification Names / Audience Perspectives	What	How	Where	Who	When	Why	Classification Names / Model Names
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Business Mgmt Perspective (Business Concept Owners)	Inventory Definition Business Entity Business Relationship	Process Definition Business Transform Business Input/Output	Distribution Definition Business Location Business Connection	Responsibility Definition Business Role Business Work Product	Timing Definition Business Interval Business Moment	Motivation Definition Business End Business Means	Business Concepts (Business Definition Models)
Architect Perspective (Business Logic Designers)	Inventory Representation System Entity System Relationship	Process Representation System Transform System Input /Output	Distribution Representation System Location System Connection	Responsibility Representation System Role System Work Product	Timing Representation System Interval System Moment	Motivation Representation System End System Means	System
Engineer Perspective (Business Physics Builders)	Inventory Specification Technology Entity Technology Relationship	Process Specification Technology Transform Technology Input /Output	Distribution Specification Technology Location Technology Connection	Responsibility Specification Technology Role Technology Work Product	Timing Specification Technology Interval Technology Moment	Motivation Specification Technology End Technology Means	
Technician Perspective (Business Component Implementers)	Inventory Configuration Tool Entity Tool Relationship	Process Configuration Tool Transform Tool Input /Output	Distribution Configuration Tool Location Tool Connection	Responsibility Configuration Tool Role Tool Work Product	Timing Configuration Tool Interval Tool Moment	Motivation Configuration Tool End Tool Means	Tool Components (Tool Configuration Models)
Enterprise Perspective (Users) The Enterprise	Inventory Instantiations Operations Entities Operations Relationships	Process Instantiations Operations Transforms Operations In/Outputs	Distribution Instantiations Operations Locations Operations Connections	Responsibility Instantiations Operations Roles Operations Work Products	Timing Instantiations Operations Intervals Operations Moments	Motivation Instantiations Operations Ends Operations Means	Operations Instances (Implementations) The Enterprise
Audience Perpectives / Enterprise Names	Composite Integrations →		← Alignment →		← Composite Integrations		
	Inventory Sets	Process Flows	Distribution Networks	Responsibility Assignments	Timing Cycles	Motivation Intentions	

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This is NOT a Process.

"Primitives" are Timeless.

Until an ontology exists, nothing is repeatable, nothing is predictable.

There is no DISCIPLINE.

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Process

(methodology)

Composites

(compounds)

COBOL Programs
Objects
BPMN Models
Swimlanes
Business Architecture
Capabilities
Mobility
Applications
Data Models
Security Architecture
Services

COTS
Technology Architecture
Big Data
Missions/Visions
Agile Code
Business Processes
DoDAF Models
Balanced Scorecard
Clouds
I.B. Watson
TOGAF Artifacts

Etc., etc., etc.

Compounds are Temporal

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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**."

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The Periodic Table Metaphor

Before Mendeleev published the Periodic table, Alchemist (practitioners) could create compounds based on their experience ... whatever worked. After Mendeleev figured out the Periodic Table, Chemistry became a science. Creating compounds became predictable and repeatable based on the natural laws (Physics) expressed in the Periodic Table. Within 50 years, the Chemists and Physicists (practitioners) were splitting atoms.

If I am right that Architecture is Architecture is Architecture, and if my work understanding the under-lying primitives (elements) of Architecture correctly reflects the natural laws of classification and has integrity, maybe my Framework will form the basis for making Enterprise Architecture a science ... and maybe in 50 years, the methodologists (practitioners) will be able to engineer Enterprises to be assembled to order from reusable "primitive" components dynamically. I don't know. I hope so.

We'll probably know in 50 years.

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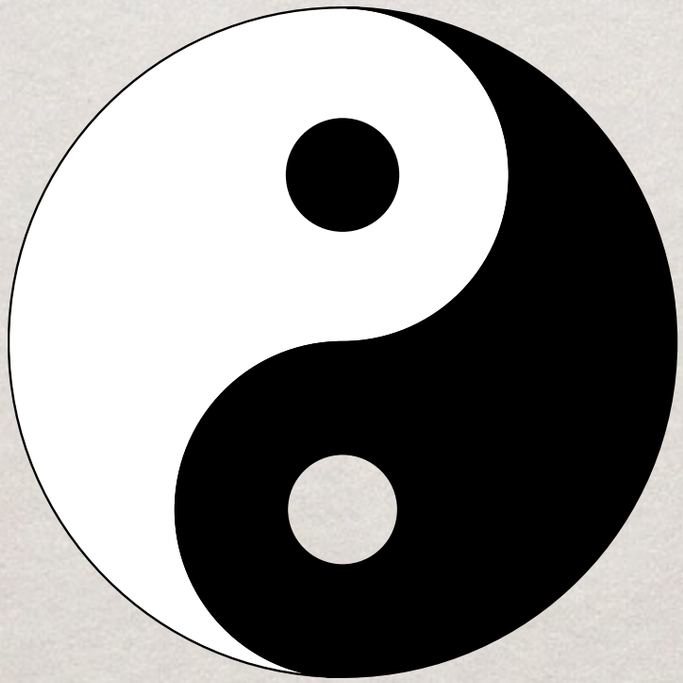
Ontology and Methodology

It is NOT either Ontology OR Methodology

It IS Ontology AND Methodology



Ontology and Methodologies
do not COMPETE
they COMPLETE

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Ontology and Methodology

Methodologies WITHOUT Ontology produce
LEGACY

Methodologies WITH Ontology produce
ARCHITECTURE

Timeless architectural Primitives (Ontology)
can be dynamically assembled (Methodology)
into an infinite number of
temporal Enterprise implementation Composites,
that is,
Custom Enterprises, mass-produced in quantities of 1 for immediate delivery.
(Enterprise "Mass-Customization.")

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Introduction to
Enterprise Architecture

Defining
Quality

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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).

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Composite Integrations → ← Alignment → ← Composite Integrations

ALIGNED

ALIGNED

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Quality Problems

Either:

A. The Requirements at Row 2 were incorrectly transcribed

Or:

B. In the transformation from Row 2 to Row 6, integrity was lost.

Or:

C. Whoever entered the data at Row 6 created errors.
(This is a Management problem, not an Architecture problem.)

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Fixing Quality Problems

A. Fix the Process of transcribing the Requirements (Row 2)

And/Or:

B. Fix the Process of transforming the Requirements (Row 2) into Implementation (Row 6)

And/Or:

C. Fix the data entry process. (A Management problem.)

and Iterate
until Row 6 is aligned with Row 2.

CONTINUOUS PROCESS IMPROVEMENT

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The Enterprise Ontology ™

Version 3.0

Classification Names / Audience Perspectives	What	How	Where	Who	When	Why	Classification Names / Model Names
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	Scope Lists (Contexts)						
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	Business oncepts)						
Architect Perspective *(Business Logic Designers)*	Inventory Representation	Process Representation	Distribution Representation	Responsibility Representation	Timing Representation	Motivation Representation	System Logic *(System Representation Models)*
	Systems Models (Logic)						
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Alignment Transformations (Executive → Business Mgmt → Architect)

Alignment Transformations (Engineer → Technician → Enterprise)

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Alignment Transformations

REALITY

Technology Models (Physics)

Tool Models (Configuration)

THE ENTERPRISE INSTANTIATION

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Alignment Transformations

REALITY

Technology Models (Physics)

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RESOURCE

Inventory Models *Process Models* *Distribution Models*

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Alignment Transformations

Responsibility Models

Timing Models

Motivation Models

BEHAVIOR

*Alignment Transformations

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Alignment Transformations (Executive → Business Mgmt → Architect → Engineer → Technician → Enterprise)

RESOURCE

BEHAVIOR

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Alignment Transformations

THE ENTERPRISE INSTANTIATION

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Enterprise Architecture

Enterprise Laws of Physics

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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 in Enterprises the source of miscommunication and misunderstanding - conflicts, escalating General and Administrative costs (entropy) in the implemented Enterprise of Row 6.

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Enterprise Physics

The Third Law of Enterprise, Ontological Holism.
Every Cell or portion of Cell that is **not** explicit (i.e. is **im**plicit) 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.

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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.

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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.

Introduction to Enterprise Architecture

Observations

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Observation

If:

1. The Enterprise has no Enterprise Architecture,

2. EA Primitives do not = the Enterprise at every given moment,

3. And, any fact recurs anywhere in the Enterprise unsynchronized,

Then, I humbly submit that the strong possibility exists that:

1. No one actually knows how the Enterprise works

2. Problems can't be diagnosed and multiple solution alternatives posed/simulated before making investments

3. General Management would not be able to change the Enterprise in time to accommodate the external rate of change.

4. The cost of operations is likely escalating.

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Introduction to Enterprise Architecture

A Zachman Framework Story

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Murder/Kidnapping Case

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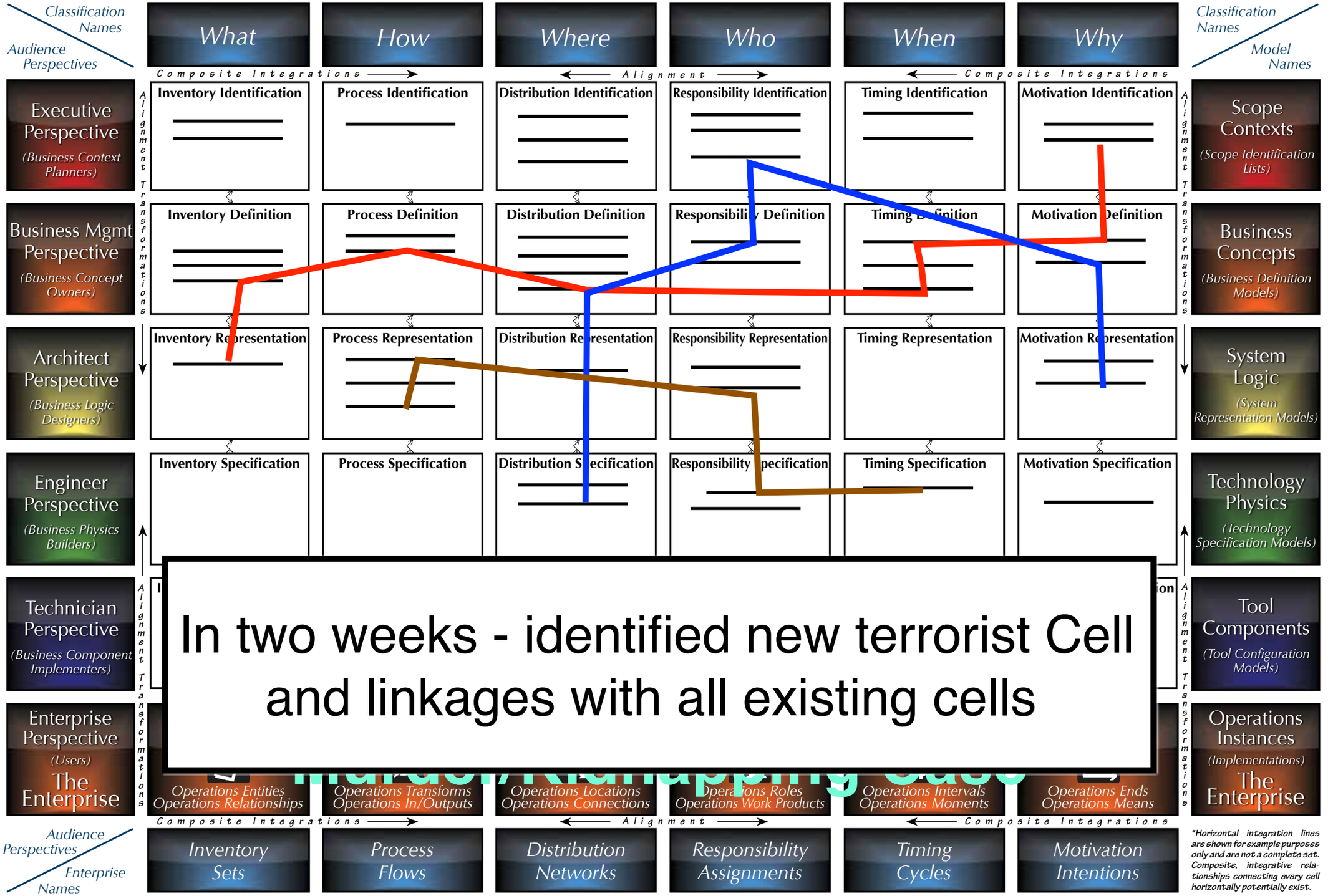

In two weeks - identified new terrorist Cell and linkages with all existing cells

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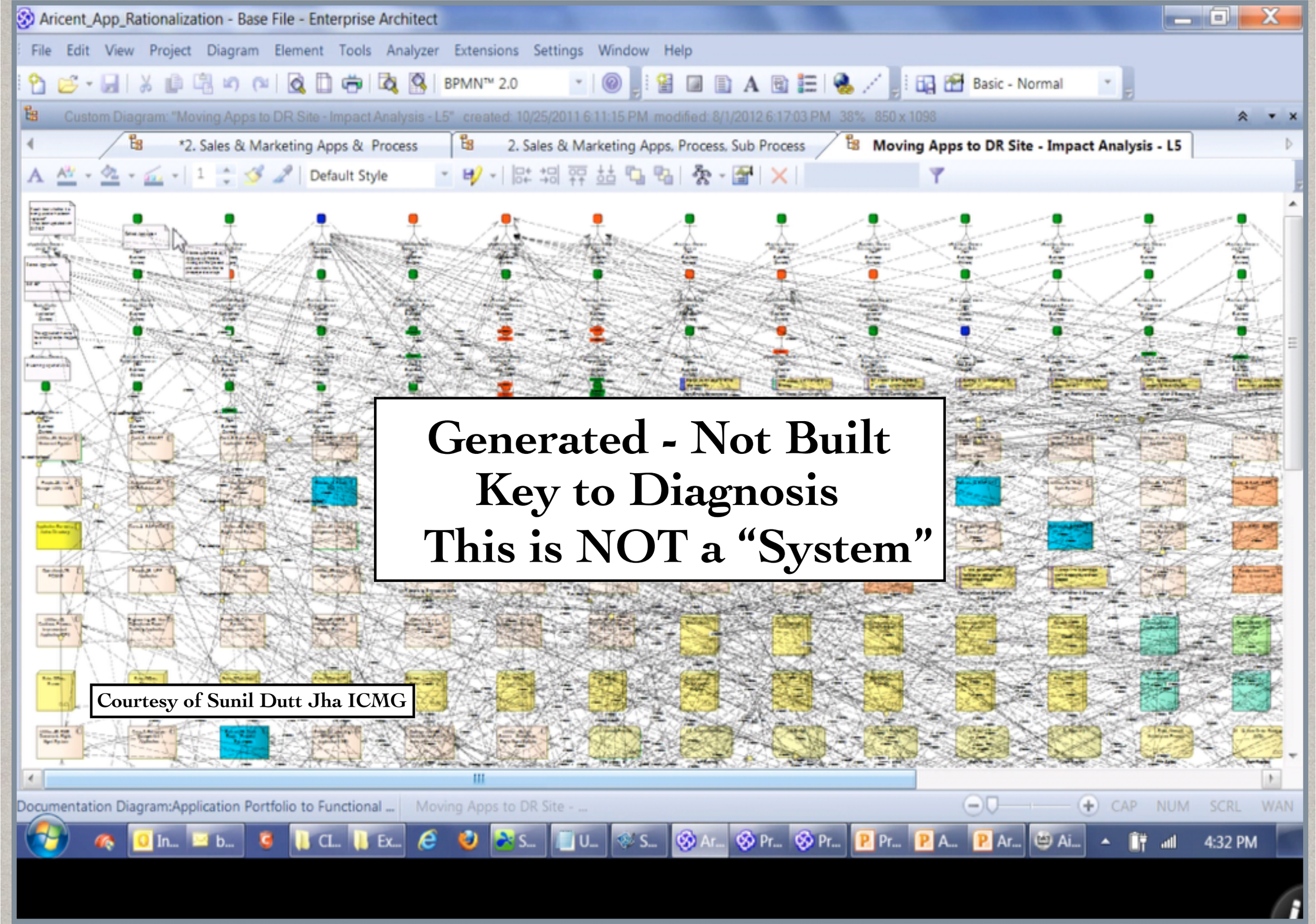
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File Edit View Project Diagram Element Tools Analyzer Extensions Settings Window Help
BPMN™ 2.0
Basic - Normal
Custom Diagram: "Moving Apps to DR Site - Impact Analysis - L5" created: 10/25/2011 6:11:15 PM modified: 8/1/2012 6:17:03 PM 38% 850 x 1098
*2. Sales & Marketing Apps & Process
2. Sales & Marketing Apps. Process. Sub Process
Moving Apps to DR Site - Impact Analysis - L5
Default Style
Generated - Not Built
Key to Diagnosis
This is NOT a "System"
Courtesy of Sunil Dutt Jha ICMG
Documentation Diagram:Application Portfolio to Functional ...
Moving Apps to DR Site - ...
CAP NUM SCRL WAN
4:32 PM

The Key

1. Single-variable, precisely unique, relevant (not arbitrary), ontologically-defined components.

2. Binary Relationships (only two components at a time).

The Key to
diagnosing the CEO's Problems
and prescribing alternative solutions

This IS an
(incomplete) Enterprise Architecture

A "system" **REUSES** these Architecture components.

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Introduction to
Enterprise Architecture

Profession
Service Cycle

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Professional Service Cycle

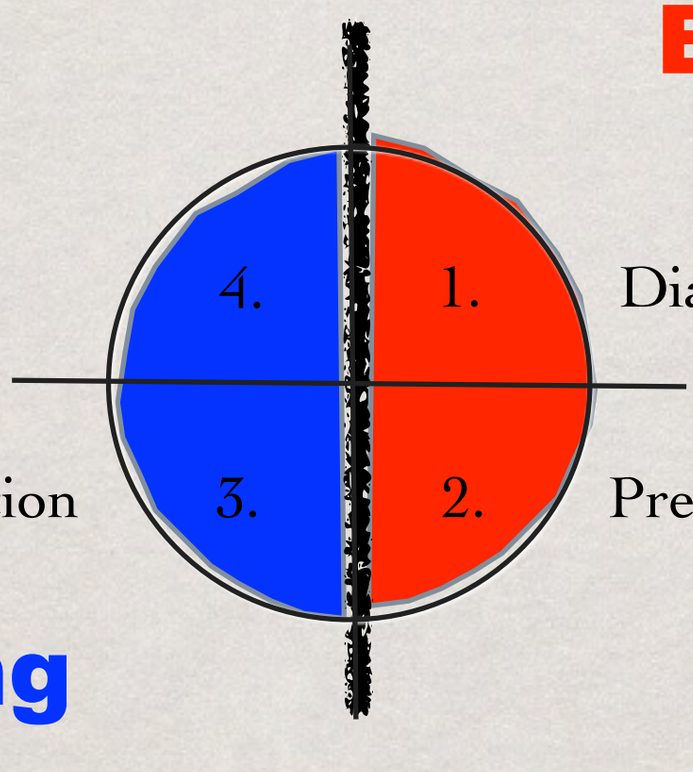
Trade

Engineering

(Ontology)

Technician
Evaluation

Professional
Diagnosis/Analysis of Need



Technician
Application/Implementation

Professional
Prescription/Recommendation

Manufacturing

(Methodology)

Profession

Roger Greer:
Dean
School of Library and Information Management
University of Southern California
(My notes from a 1991, IBM GUIDE Conference presentation)

Here is the metaphor:

The Enterprise is the PATIENT and Management is the Brain.

The Enterprise Architect **ought to be** the DOCTOR and IT is the Technician.

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Introduction to
Enterprise Architecture

Developing Strategy Alternatives

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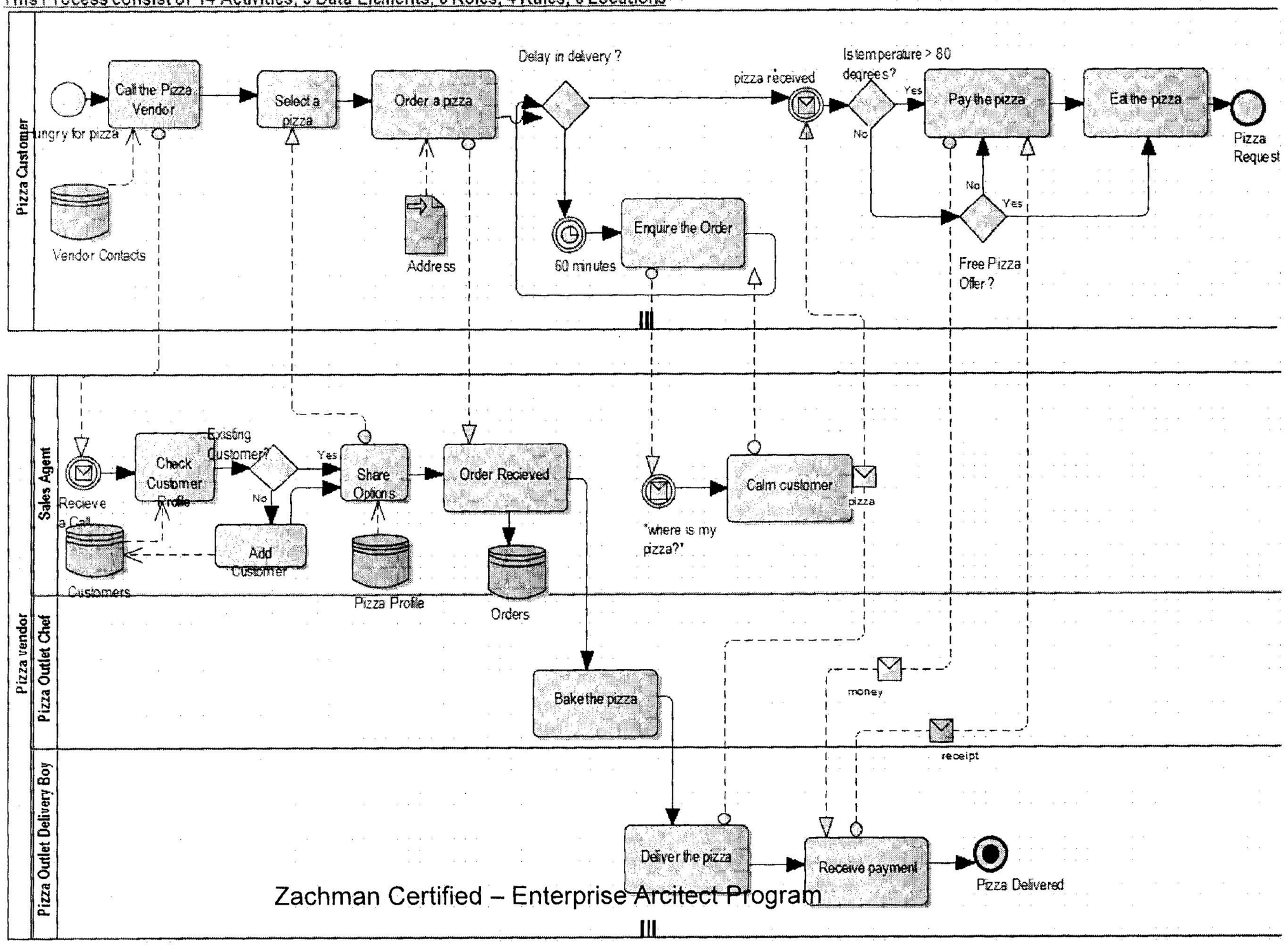
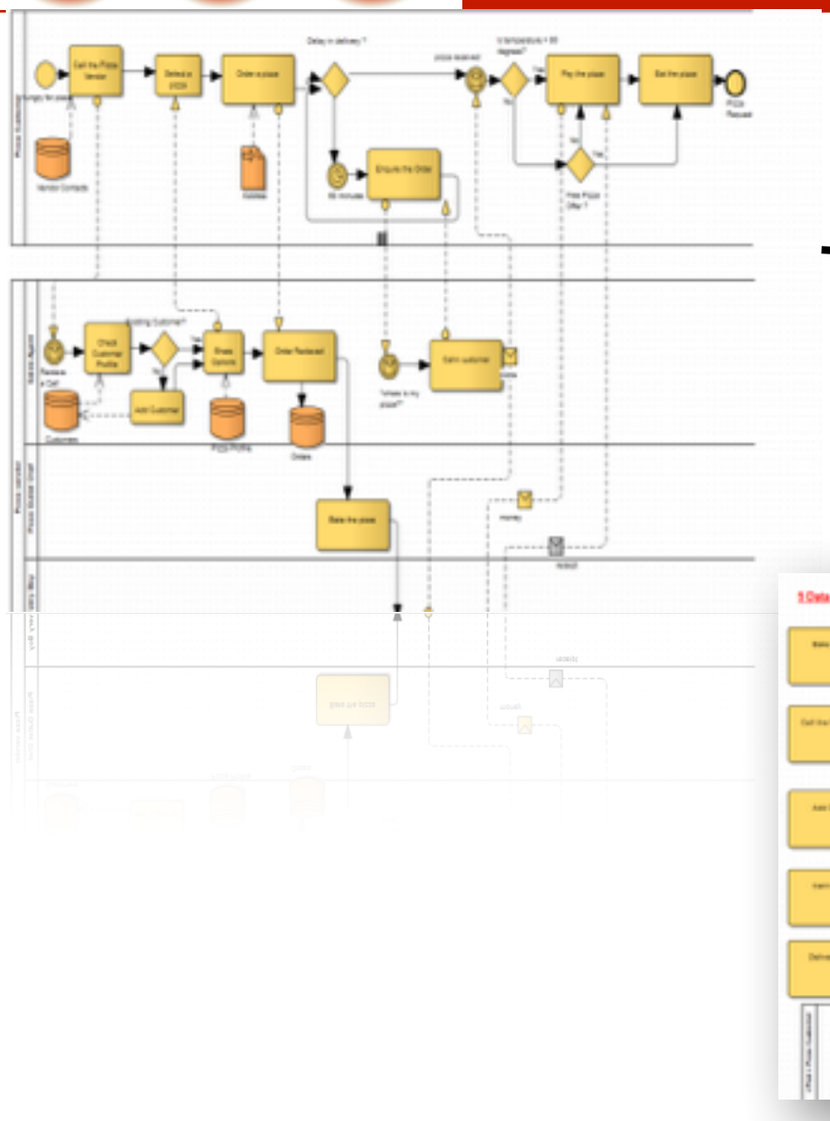
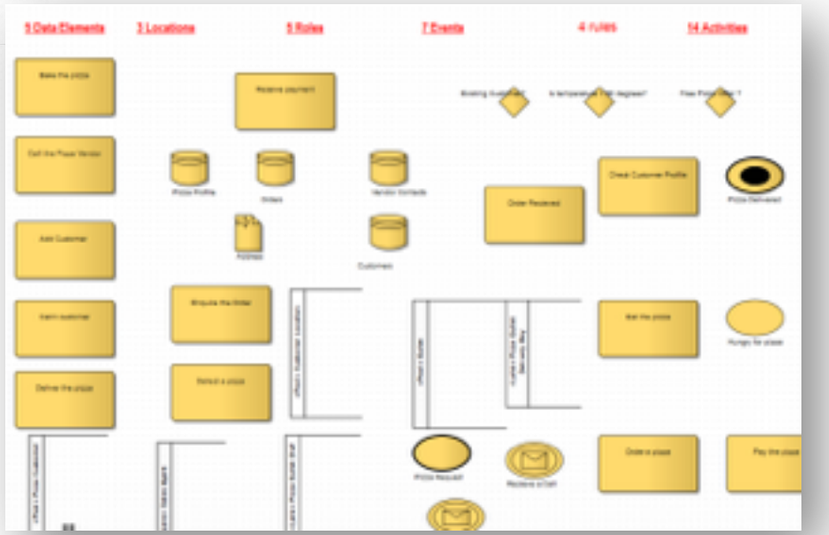
Exercise – Pizza Delivery Process

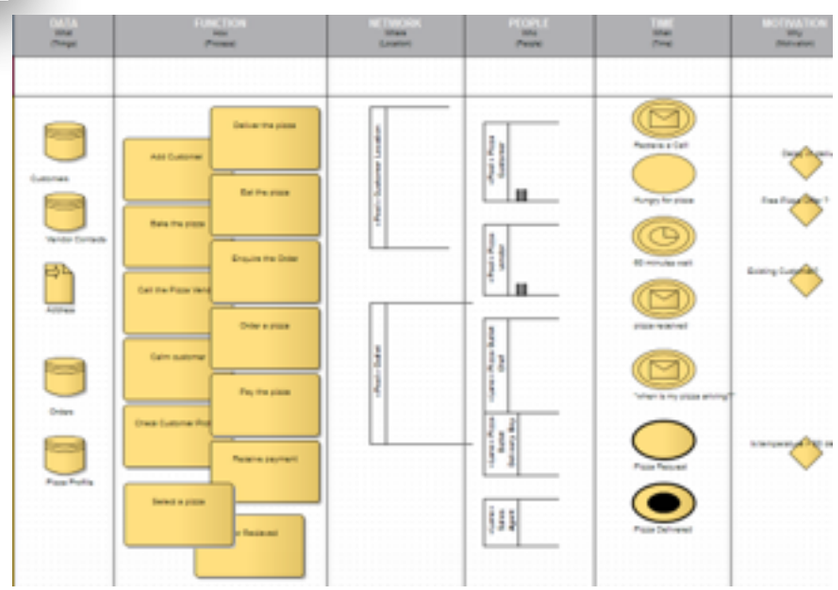
This Process consist of 14 Activities, 5 Data Elements, 5 Roles, 4 Rules, 3 Locations



Exercise 3







Courtesy of Sunil Dutt Jha ICMG

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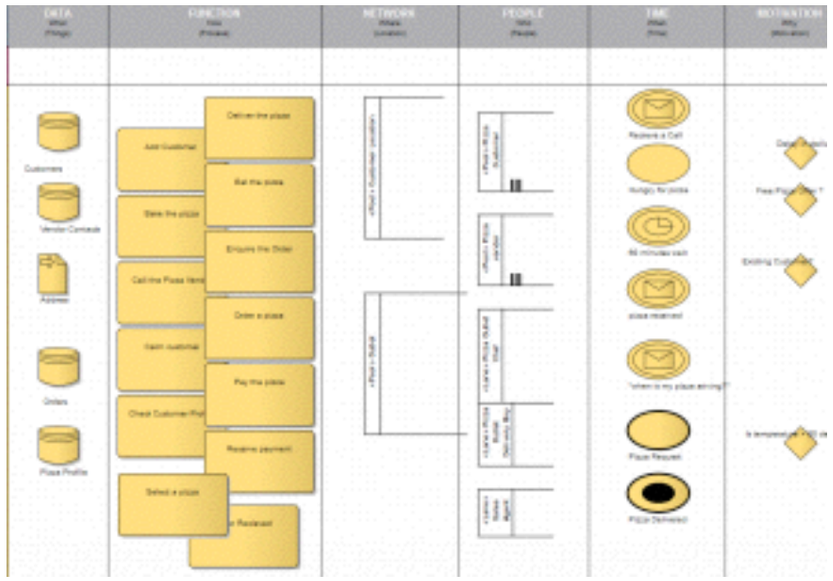
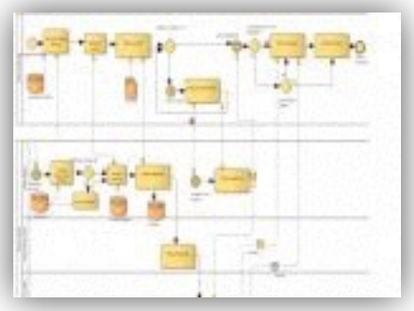
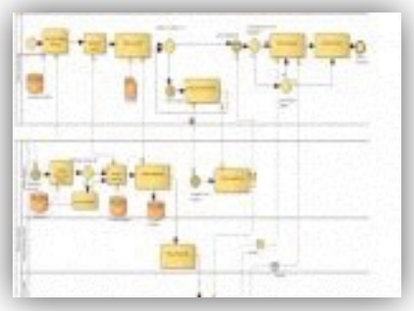
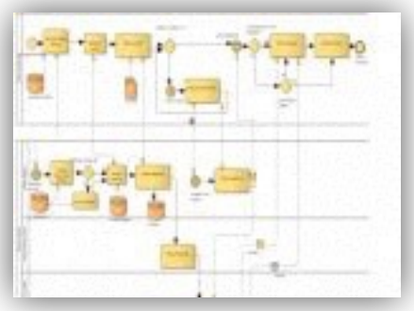
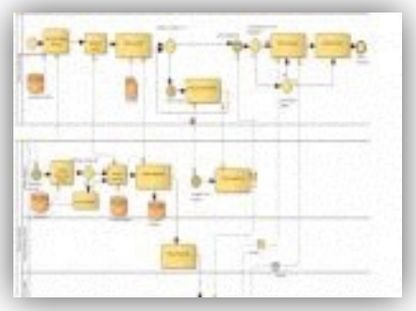
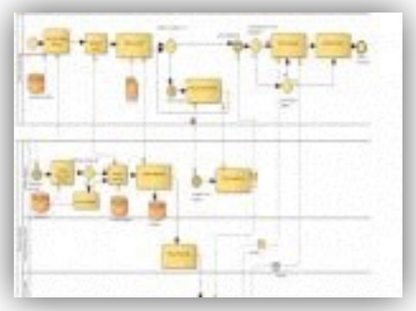
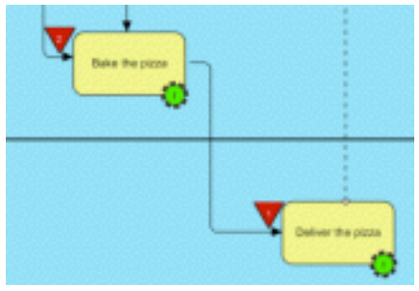
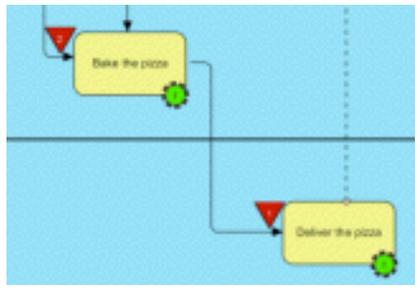
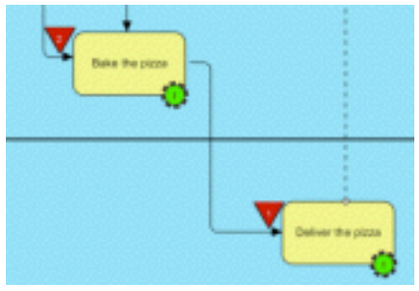
Exercise 3

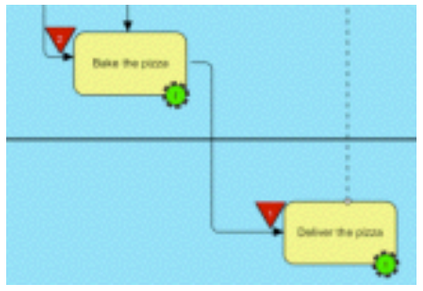


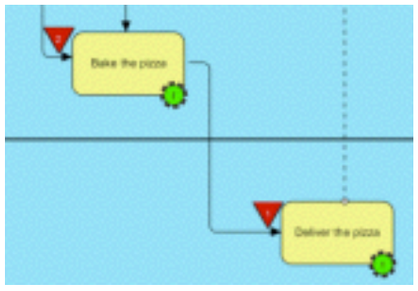






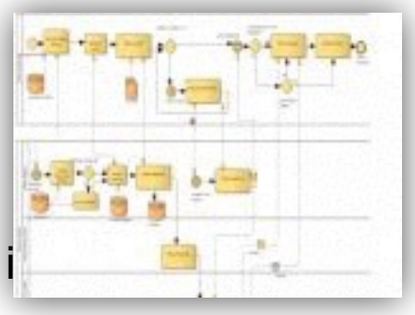












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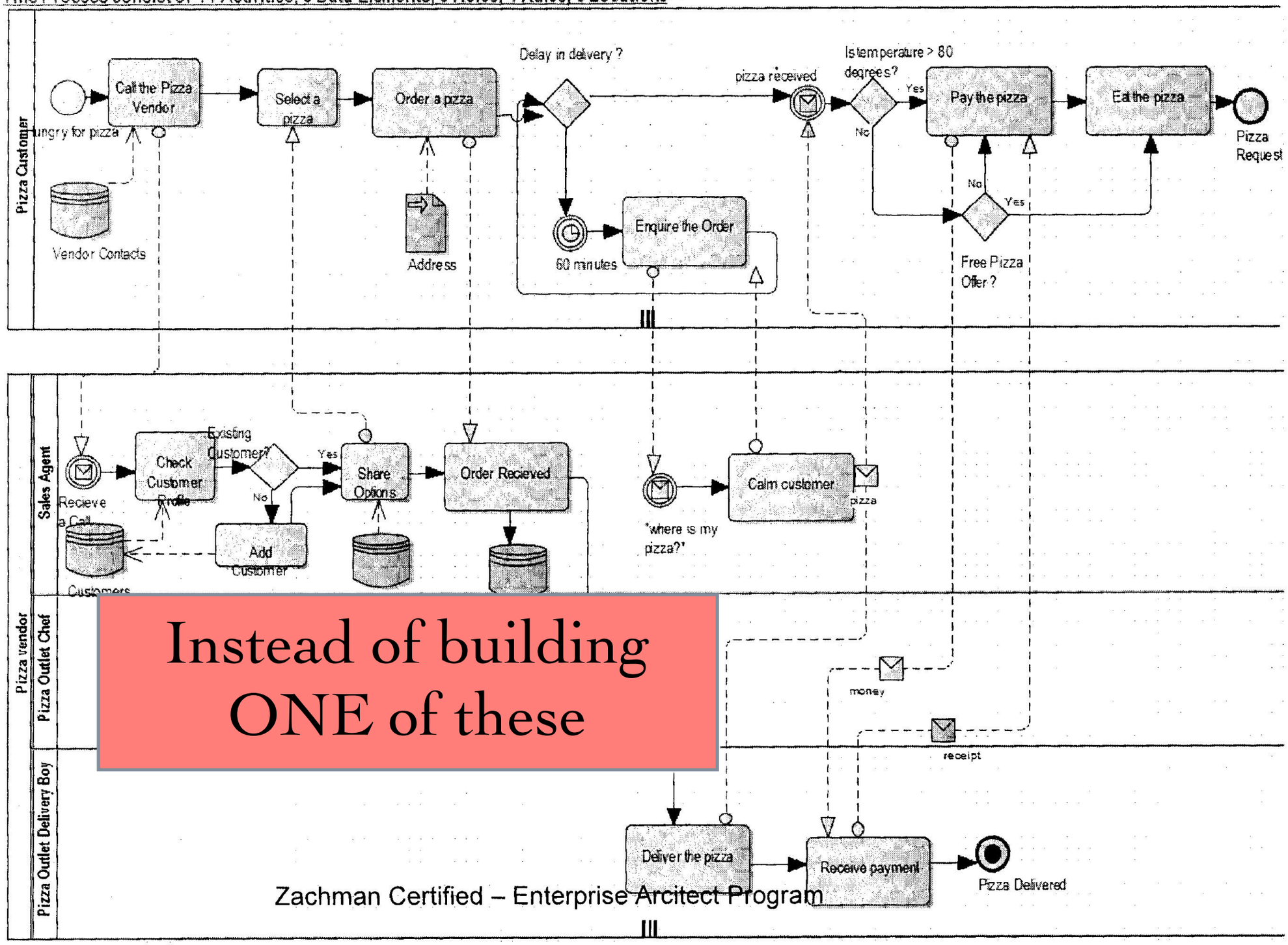
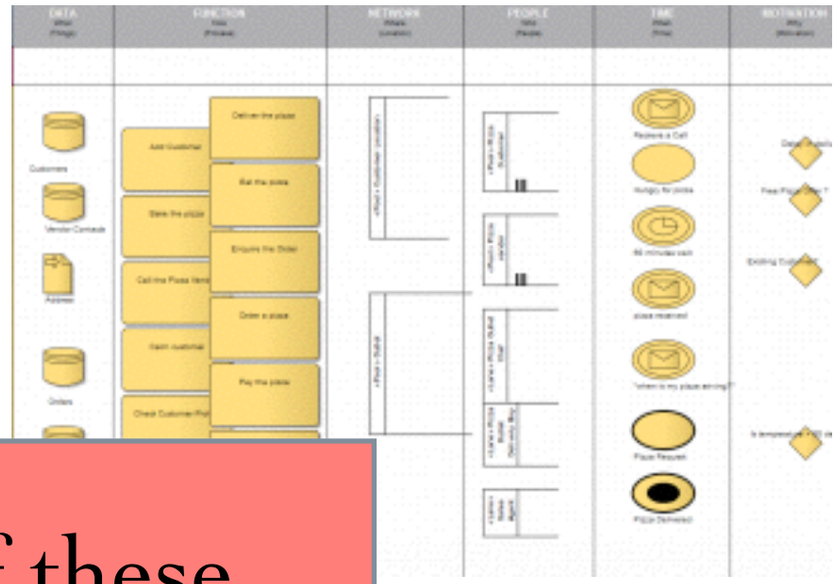
Exercise – Pizza Delivery Process

This Process consist of 14 Activities, 5 Data Elements, 5 Roles, 4 Rules, 3 Locations

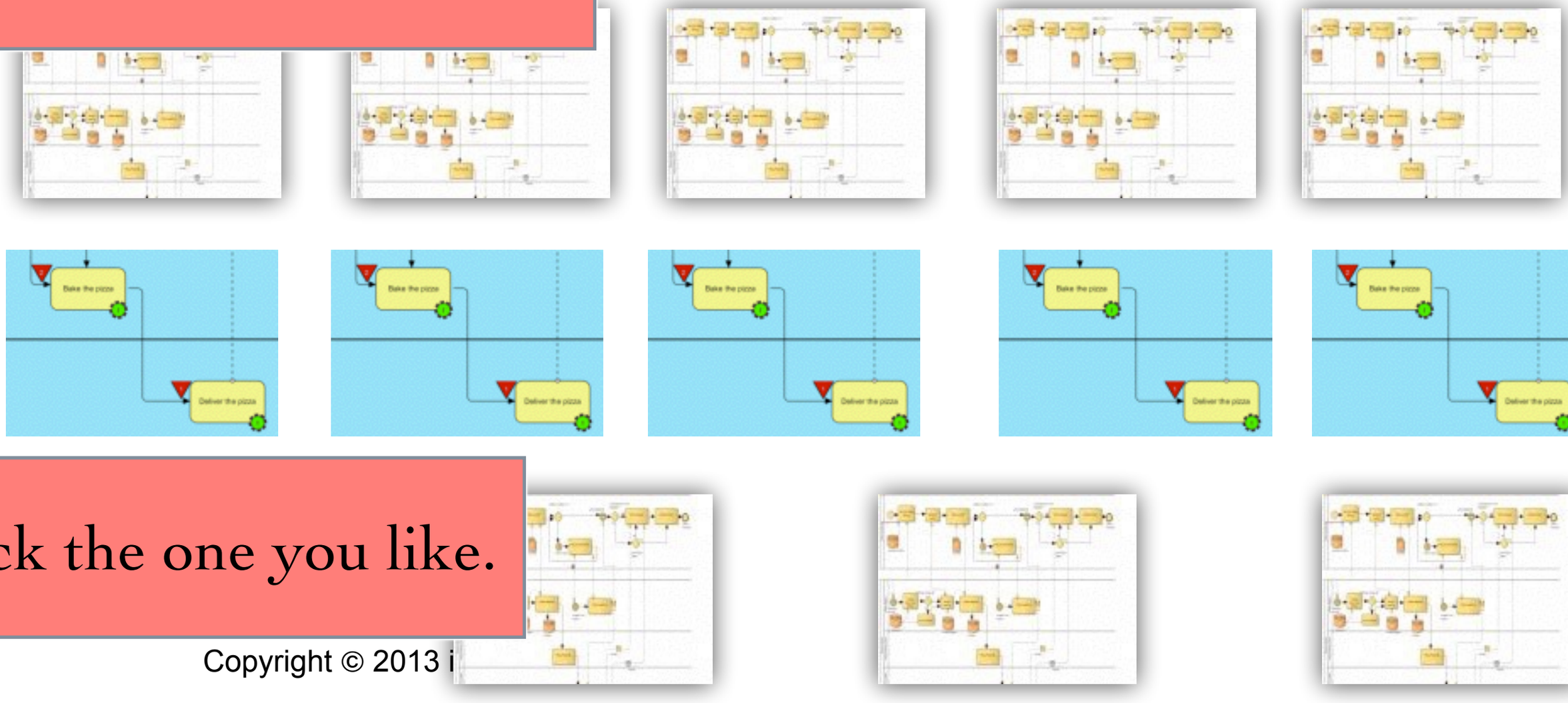


Instead of building ONE of these

Exercise 3



Build “n” of these.



Pick the one you like.

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The Key

1. Single-variable, precisely unique, relevant (not arbitrary), ontologically-based components.

2. Binary Relationships (only two components at a time).

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Introduction to
Enterprise Architecture

Doing Enterprise Architecture

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Remember! This is a PRIMITIVE (single-variable) Model used for Engineering.

It cannot be used for implementations which require COMPOSITE (multi-variable) Models.

(Some possible COMPOSITE integration relationships may be shown at the periphery of the model. The COMPOSITE implementation "view" would be created by re-using components of other Enterprise-wide, "engineered" PRIMITIVES.

What
(Column 1)
Inventory Identification

Row 1
Executive
Perspective

Note:
Air Transportation Case
Inventories (Entities)
Countable Things (Nouns)
(Likely have serial numbers)
A List - Scope
Level of Detail = High
Abstract (no instances)
As simple as Possible
No Recurring Concepts

Airplanes
Airplane Types
Airports
Gates
Passengers
Seats
Bookings
Employees
Vehicles
Routes
Flights
etc.

Row 6 Instances AS IS may or may not have anything to do with Owner's, Designer's, Builders perceptions until those are made explicit and transformed to Row 6.

Inventory
Sets

Scope
Contexts

Composites
There can be composite relationships with any or all other Row 1 Cells and with the Cell below and Instances in Row 6.

Note: This sample model is meant to illustrate the form of the expected Primitive, not necessarily the content.

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Enterprise Framework

Remember! This is a PRIMITIVE (single-variable) Model used for Engineering.
It cannot be used for implementations which require COMPOSITE (multi-variable) Models.
(Some possible COMPOSITE integration relationships may be shown at the periphery of the model. The COMPOSITE implementation "view" would be created by re-using components of other Enterprise-wide, "engineered" PRIMITIVES.

How
(Column 2)
Process Identification

Row 1
Executive
Perspective

Acquire Routes
Schedule Flights
Sell Bookings
Reserve Seats
Train Employees
Fly Airplanes
Schedule Crews
Repair Facilities
Develop Markets
Maintain Airplanes
etc.

Scope
Contexts

Note:
Air Transportation Case
Processes (Transformations)
(Transitive Verb-Object)
A List - Scope
Level of Detail = High
Abstract (no instances)
As simple as possible
No Recurring Concepts

Composites
There can be composite relationships with any or all other Row 1 Cells and with the Cell below and Instances in Row 6.

Row 6 Instances AS IS may or may not have anything to do with Owner's, Designer's, Builders perceptions until those are made explicit and transformed to Row 6.

Note: This sample model is meant to illustrate the form of the expected Primitive, not necessarily the content.

Process
Flows

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Inventory Sets	Process Flows	Distr. Networks
Airplanes Airplane Types Airports Gates Passengers Shareholders Local Carriers Seats Bookings Routes Employees Vehicles Flights etc.	Acquire Routes Schedule Flights Reserve Seats Train Employees Fly Airplanes Schedule Crews Repair Facilities Develop Markets Maint. Airplanes Load Airplanes Release Flights Develop Flt. Plans ScheduleMaint. etc.	Airplane Network Parts Distr. Net. Communications Freight Net. Airport Network (Runways, etc.) Regulatory Net. Passenger Net. Personnel Net. Catering Net. etc.

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Respon Assmts	Timing Cycles	Motive Intent.
Pilots	Flight Cycle	Equip. Utilization
Co-pilots	Customer Cycle	New Markets
Engineers	Maintenance Cyc.	Revenue Growth
Flt. Attend.	Telephone Wait C.	Exp. Reduction
Reservations	Plane Turnaround	Cust Convenience
Aircraft Maint.	De-Icing Cycle	Cust. Satisfaction
Flight Scheduling	Air Traffic Cntl. C.	Labor Contracts
Airport Ops.Mgt	Tarmac Cycle	Regulatory Comp
Customer Service	Airplane Cycle	New Capital
Marketing	Bag Handling C.	Load Factor
Sales	(TSA)Cycle	Route Optimize
Flight Dispatch	Planning Cycle	Flight Expansion
Accounting	Budget Cycle	Acquisition
etc.	etc.	etc.

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The Key

1. Single-variable, precisely unique, relevant (not arbitrary), ontologically-based components.

2. Binary Relationships (only two components at a time).

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Introduction to
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Methodology for Solving General Management Problems

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The Process

1. Select General Management Problem.

2. Factor out Primitive (**Single-variable**) Components, sort into ZF Cells (make Lists).

3. Define "binary" (only two at a time) dependencies (horizontal and vertical) between Primitive (**Single-variable**) Components.

4. Create Composite (**Multi-varible**) "snapshot" of problem area and diagnose.

5. Pose new Composite (**Multi-variable**) scenarios (change Lists and/or change dependencies) and re-compose.

6. Add time and cost to Primitive (**Single-variable**) Components and simulate alternatives.

(At this point CEO can pick solution and assign responsibilities for implementing the "quick-fix" solution.)

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The Process (cont.)

Pick subsequent General Management
Problem(s) and iterate through Steps 1 - 6

7. Pick several Cells in different Columns and assign modeling experts to build out complete (thing-relationship-thing) Primitive (**Single-variable**) Models, verifying horizontal alignment.

8. Create complete Composite (**Multi-variable**) integration for Row ensuring alignment.

9. Have Columnar modeling experts transform Primitive (**Single-variable**) Models to next Cell below ensuring "alignment" and iterate until all Cells in the Column are transformed and aligned vertically.

10. Transform Row 5 Primitives (**Single-variables**) to Row 6 implementations (**Multi-variables**)using either machines (automated) or people (manual).

11. Analyze next problem adding to/reusing Primitives, Steps 7 - 11.

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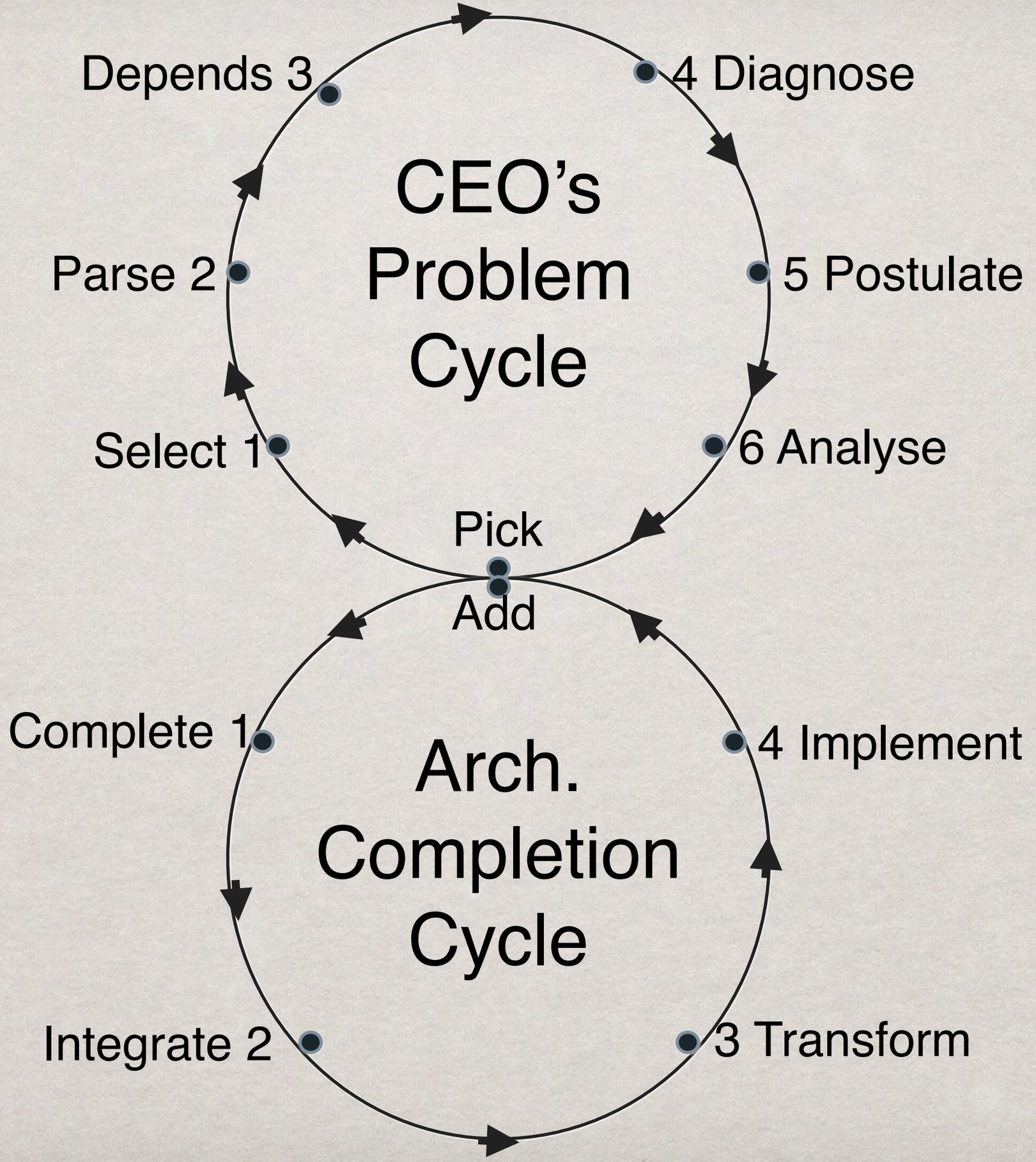

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The Process (cont.)

12. Institutionalize this process and govern Architecture as follows:
    a. prohibit redundancy except where explicitly controlled.
    b. maintain horizontal and vertical alignment
    c. use Primitive (**Single-variable**) Model inventory as base for managing **ENTERPRISE** changes.
    d. ensure **EVERY** new implementation Composite reuses components of Primitive models and migrate legacy to Architected Enterprise. (See Workshop "Migration Strategy".)
13. Acquire subject matter expertise for building additional Primitive (**Single-variable**) Models to be added to the Enterprise Architecture capability inventory.

Key: Single-Variable, PRIMITIVE Models, and Binary Relationships

For details see Level 2 Zachman Certification at www.Zachman.com

Note: This is the same process, somewhat abbreviated, and executed by students in the 4 day Zachman Level 1 Certification Workshop.

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Enterprise Architecture

Conclusions

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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.

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1965 Systems Problems

1. Didn't meet Requirements. (not "aligned")
2. The data was no good:
   - Not consistent from system to system.
   - Not accurate.
   - Not accessible.
   - Too late.
3. Couldn't change the system. (Inflexible)
4. Couldn't change the technology. (Not adaptable)
5. Couldn't change the business. (Couldn't change the system or the technology so couldn't change business.)
6. Little new development (80% $ for maintenance)
7. Took too long.
8. Cost too much.
9. Always over budget.
10. Always missed schedules.
11. DP budget out of control.
12. Too complicated - can't understand it, can't manage it.
13. Just frustrating.

(Adapted from Doug Erickson)

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2015 Systems Problems

1. Didn't meet Requirements. (not "aligned")
2. The data was no good:
   - Not consistent from system to system.
   - Not accurate.
   - Not accessible.
   - Too late.
3. Couldn't change the system. (Inflexible)
4. Couldn't change the technology. (Not adaptable)
5. Couldn't change the business. (Couldn't change the system or the technology so couldn't change business.)
6. Little new development (80% $ for maintenance)
7. Took too long.
8. Cost too much.
9. Always over budget.
10. Always missed schedules.
11. IT budget out of control.
12. Too complicated - can't understand it, can't manage it.
13. Just frustrating.

(Adapted from Doug Erickson)

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It's Funny...

COBOL didn't fix those problems!

MVS didn't fix those problems!
Virtual Memory didn't fix those problems!

IMS, DB2, Oracle, Sybase, Access, Fortran, PL/1, ADA, C++, Visual Basic, JAVA 2, 360's, 390's, MPP's, DEC VAX's, H200's, Crays, PC's, MAC's, Distributed Processing, didn't fix those problems!

Word, Excel, Powerpoint, Outlook Express, eMAIL, DOS, Windows 95, 98, 2000, NT, ME, XP, Unix, Linux, Object Oriented, COM, DCOM, CORBA, EDI, HTML, XML, UML, the Internet, B2B, B2C, Portals, Browsers didn't fix those problems!

IEF, IEW, ADW, ERWIN, POPKIN, Rational, Casewise, Rochade, Platinum, Design Bank, Data Warehouse, SAP, Baan, Peoplesoft, Oracle Financials, BSP, ISP, EAP, EAI didn't fix those problems!

And, I doubt that Web Services, .Net, Agile Programming, Service Oriented Architecture, Cloud Computing, BigData or I.B.Watson (whoever that is) is going to fix the problems.

IT MAKES ONE WONDER IF THERE ACTUALLY IS A TECHNICAL SOLUTION TO THE PROBLEMS!!!

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Engineering Problem

I'm not saying that there is anything wrong with any of these technologies.

In fact, any or all of them may well be very good ...

In fact, you may not be able to solve the Enterprise problem without employing some of these technologies.

However, The Enterprise problem is an ENGINEERING problem, NOT a technical problem.

My perception is that it is going to take actual work, ENGINEERING work, to solve the problems. My plan would be to start building out an inventory of models, PRIMITIVE MODELS, iteratively and incrementally, engineering them for alignment, integration, flexibility, reduced time-to-market, etc., etc.

What would be YOUR plan for solving the problems???

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Enterprise Architecture

Appendix

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Enterprise Architecture

Classification Rules

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Enterprise Architecture

Column

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"What" Column

Inventory Sets

This Column is descriptive of Enterprise Inventories -
things the Enterprise counts,
sufficiently significant that the Enterprise will keep
inventory records of them (data records at Row 3).

Inventories =

Countable Things =

Sets =

Nouns =

"Business Entities"

Test: The instances at Row 6 will have serial numbers.

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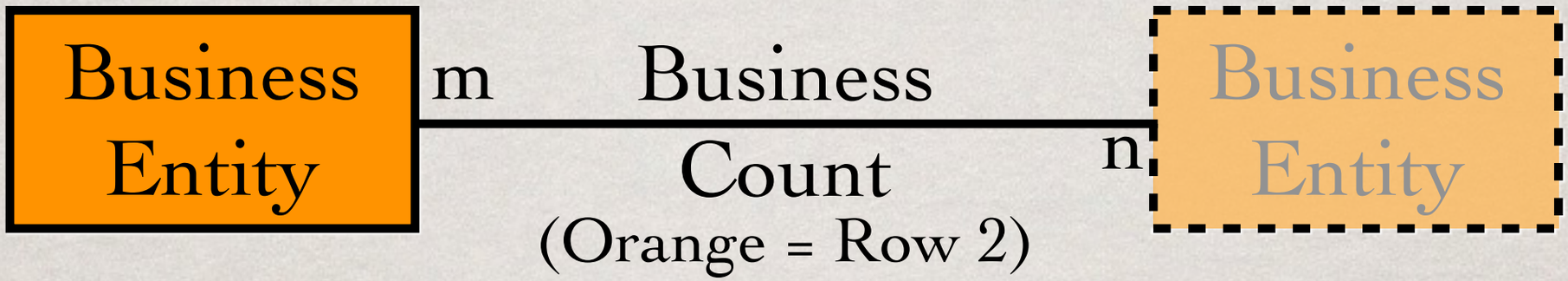
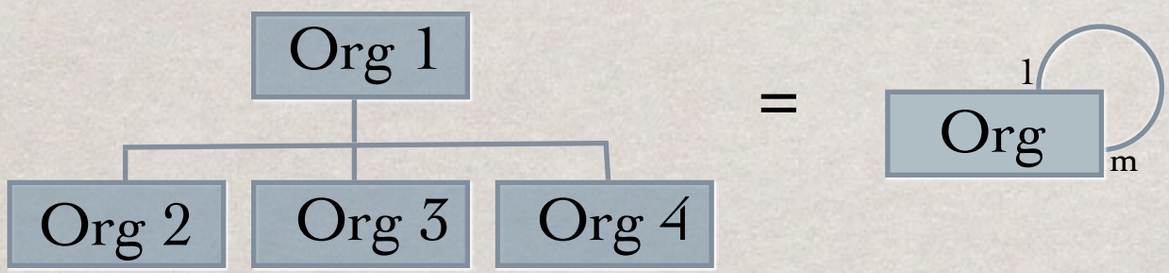
Inventory Definition
Meta Model



This kind of model is good for describing structural relationships including hierarchies, decompositions (generalizations, subtypes, 4th normal form) and aggregations (5th normal form).

e.g.



(Note: This type of model is no good for describing flows, or locations, or responsibilities, or time or motivations. If you add those characteristics to this type of model, you have created a Composite. These "Composites" are created from "integrations".)

Business Entity
Business Relationship

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"How" Column

Process Flows

This Column is descriptive of Enterprise Process Flows - Processes (Transformations) the Enterprise performs.

Typically expressed as a transitive verb-object.

Test: The instances at Row 6 will be actual Transformations being performed by people or machines.

(Take something in,
do something to it,
send something **different** out.)

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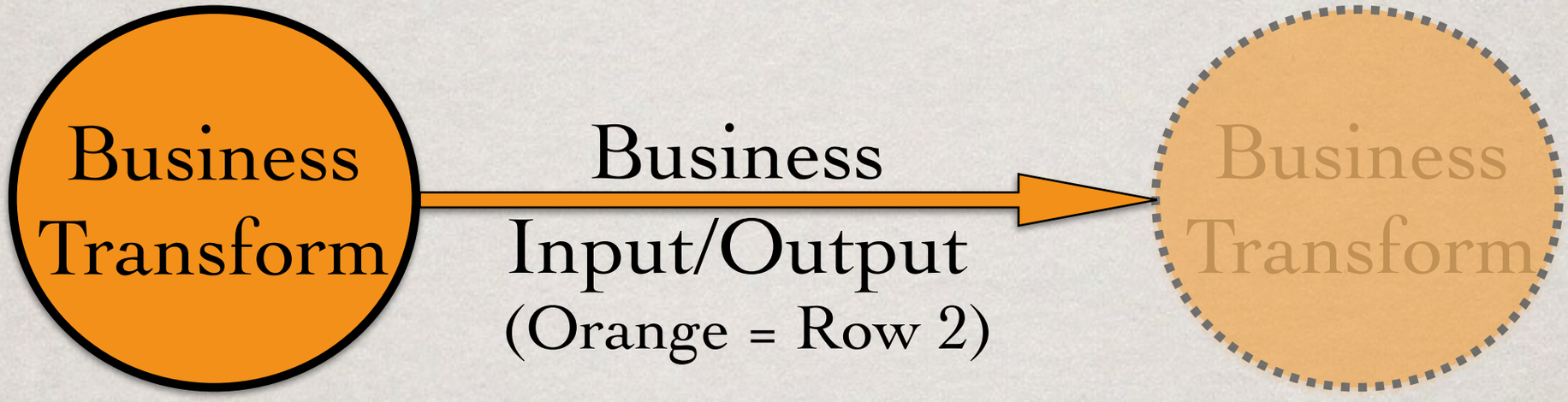
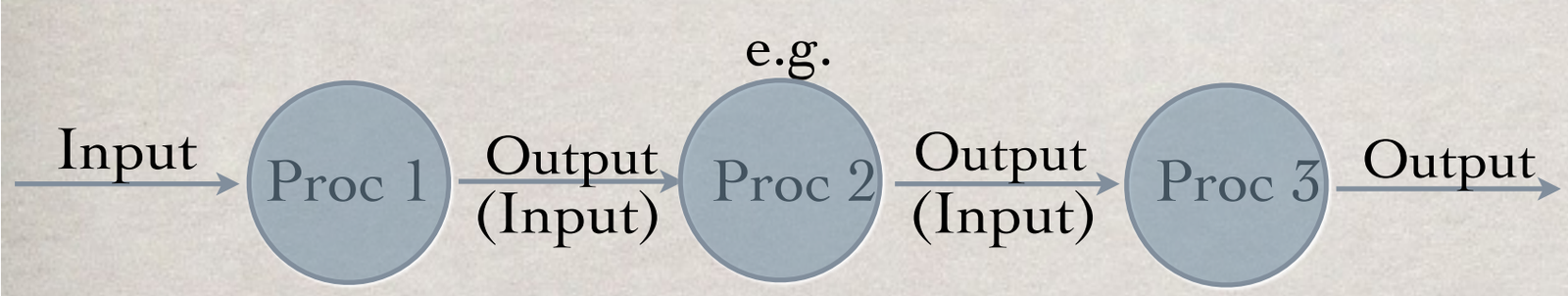
Process Definition
Meta Model



This kind of model is good for describing flows, resource flows, information flows, etc.



(Process = Transformation)

(Note: This type of model is no good for describing structure, or locations, or responsibilities, or time or motivations. If you add those characteristics to this type of model, you have created a Composite. These "Composites" are created from "integrations".)

Business Transform
Business Input/Output

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"Where" Column

Distribution Networks

This Column is descriptive of Enterprise Distribution Networks the Enterprise employs for storage and transportation.

Networks = Locations for storage
and connections for transportation.

Test: The instances at Row 6 will have Latitude and Longitude (and, maybe altitude).

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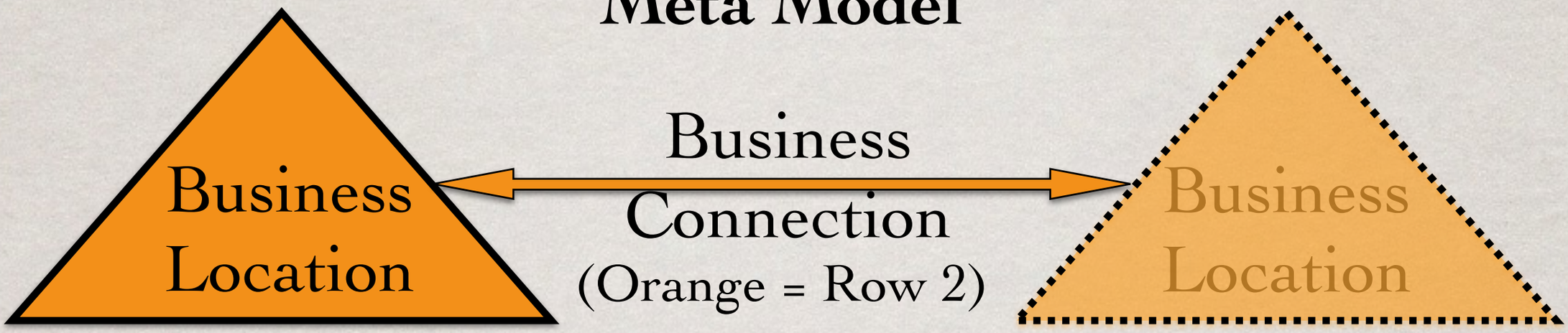
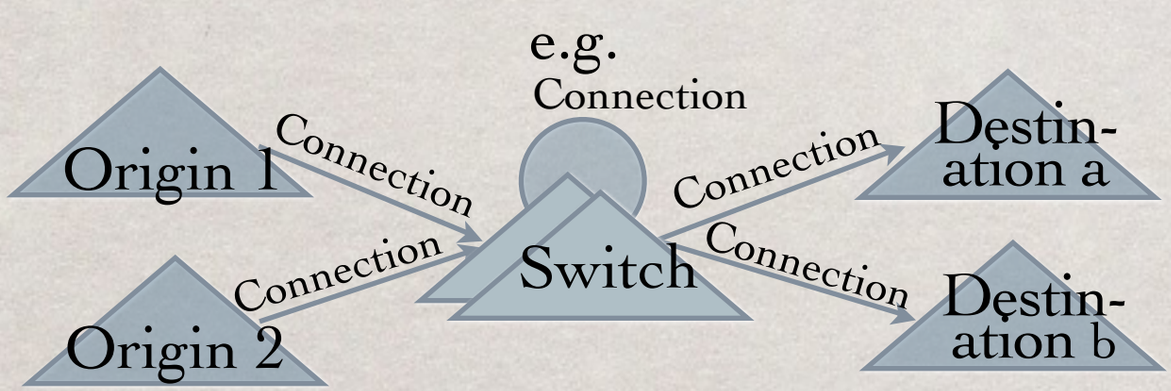
Distribution Definition
Meta Model



This kind of model is good for describing locations and connections: networks.



(Note: This type of model is no good for describing structure, or flows, or responsibilities, or time or motivations. If you add those characteristics to this type of model, you have created a Composite. These "Composites" are created from "integrations".)

Business Location
Business Connection

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"Who" Column

Responsibility Assignments

This Column is descriptive of Enterprise Responsibility Assignments

Roles - Innate Abilities or Learned Skills of individuals to which the Enterprise assigns responsibilities for producing specific Work Products, i.e. Assignments (e.g. Reports, Decisions, Telephone Calls, Repairs, etc.).

Test: The instances at Row 6 will be Roles (i.e. abilities, learned skills) of identifiable individuals and they likely will have a SIC Code (Standard Industrial Classification).

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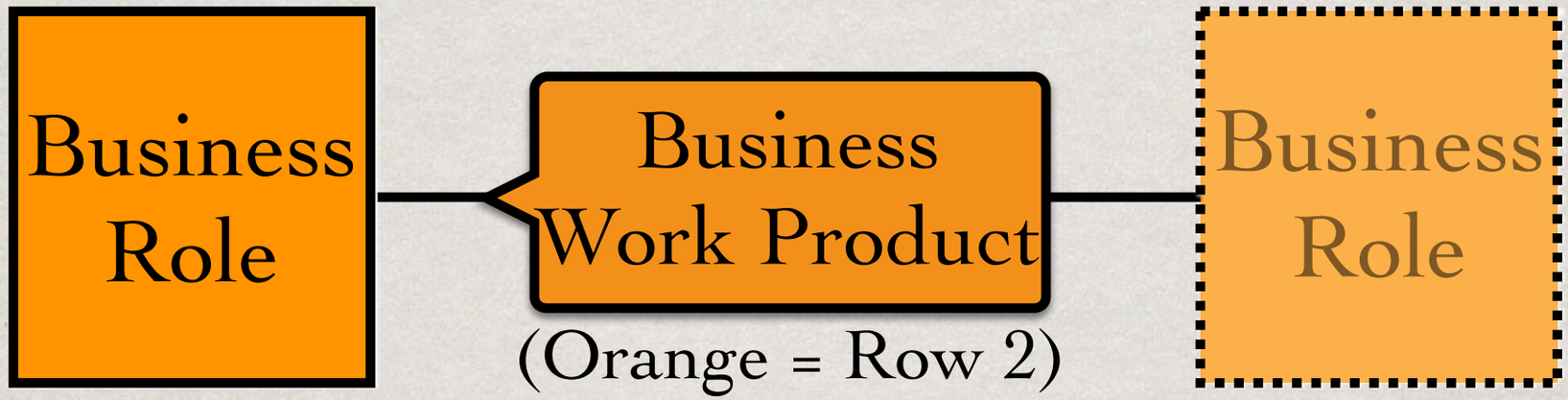
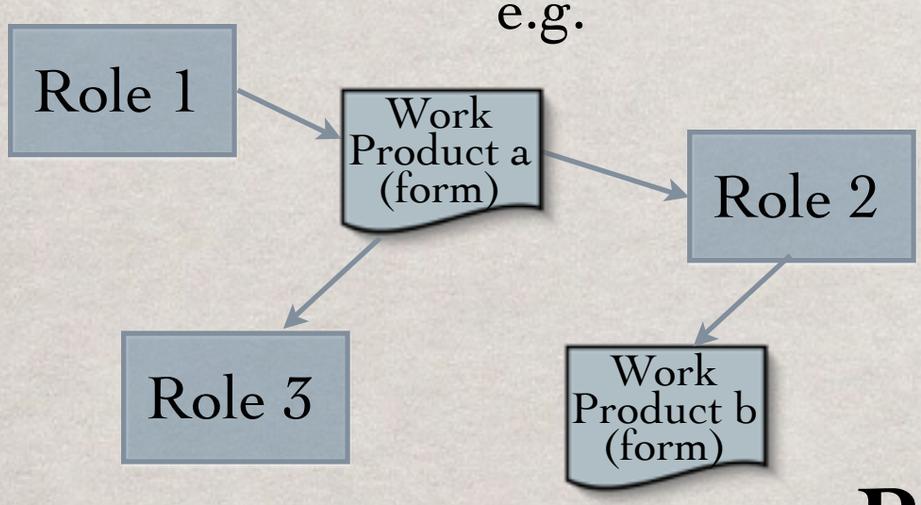
Responsibility Definition Meta Model



(Orange = Row 2)

This kind of model is good for describing Responsibilities: Roles (or, maybe "capabilities") and Work Products (Work Product FORMAT ... not Work Product Content ... content is an "integration" from an Output in Column 2. The Enterprise cares that the Work Product is created, fulfilling the responsibility.

e.g.



(Note: This type of model is no good for describing structure, or flows (contents), or locations, or time or motivations. If you add those characteristics to this type of model, you have created a Composite. These "Composites" are created from "integrations".)

Business Role

Business Work Product

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"When" Column

Timing Cycles

This Column is descriptive of Enterprise Timing Cycles

Timing Cycles sufficiently significant
that the Enterprise records them.

Test: The instances at Row 6 have actual clock/calendar times
(Points in Time and Lengths of Time).

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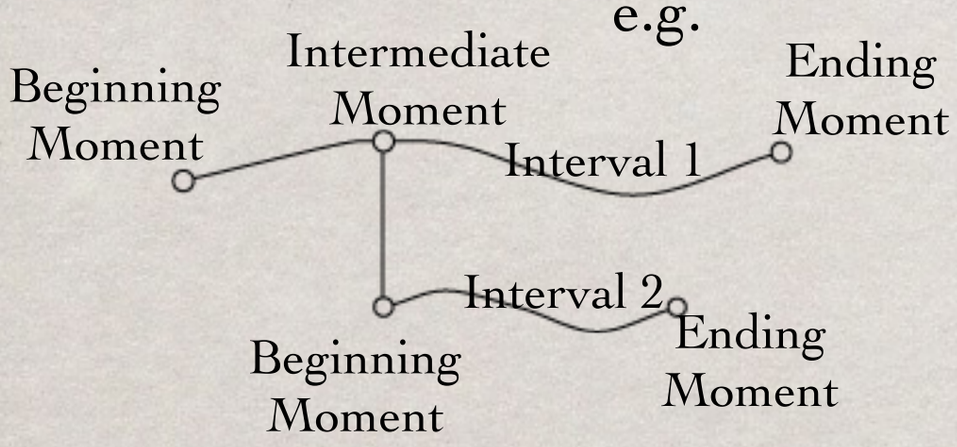
Timing Definition
Meta Model

(Orange = Row 2)

This kind of model is good for describing points in time (Moments) and lengths of time (Intervals): Timing Cycles.

e.g.



(Note: This type of model is no good for describing structure, or flows, or locations, or responsibilities, or motivations. If you add those characteristics to this type of model, you have created a Composite. These "Composites" are created from "integrations".)

Business Interval
Business Moment

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"Why" Column

Motivation Identification

This Column is descriptive of Enterprise Motivation Intentions
to change the "status quo"
"Ends" (Objectives)… Enterprise State Changes
"Means" (Strategies) … changes to the state of
Inventory Levels (including Products, Services, etc.)
Transformation Yields (including Manual, Automation, etc.)
Distribution Capacities (including Sources, Markets, etc.)
Role Assignments (internal, external, etc.),
Cycle Times,
et cetera.

Test: The instances at Row 6 have quantifiable targets.

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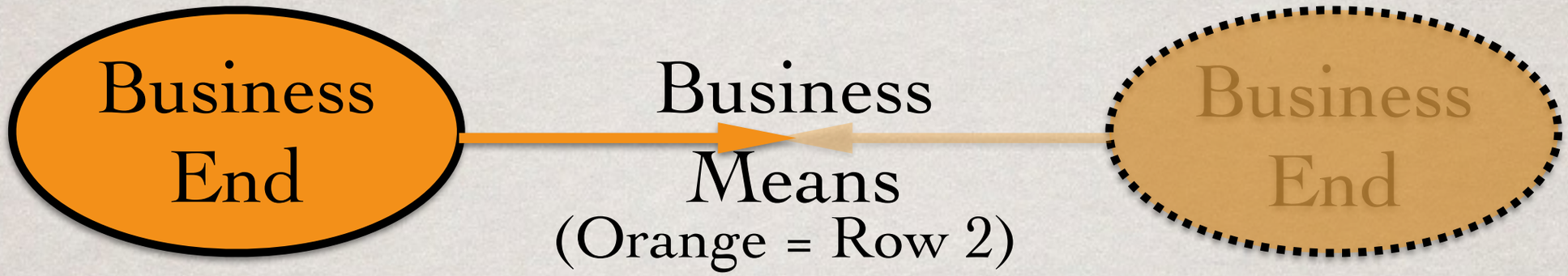
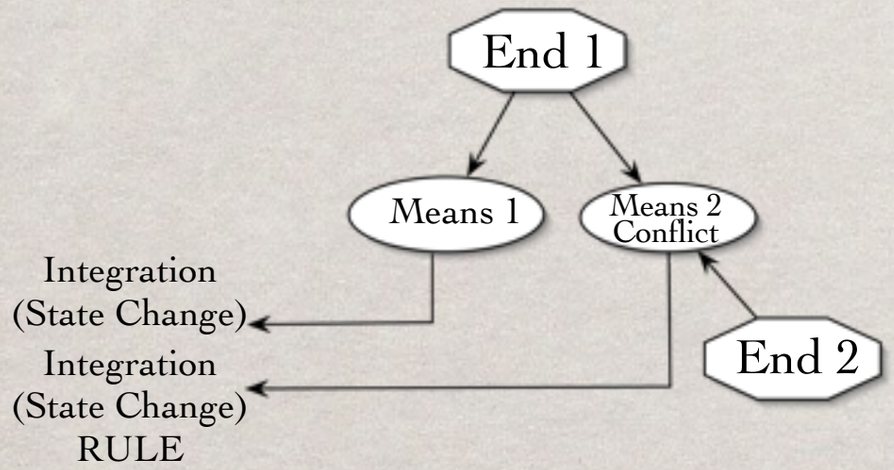
Motivation Definition
Meta Model



This kind of model is good for describing Ends (Objectives) and Means (Strategies) and forcing identification of the risks of changes to the states of architectural constructs due to conflicts in Objectives. The risks are mitigated by "Rules" that are the integration between the Motivation Means and the various architectural components.

e.g.



(Note: This type of model is no good for describing structure, or flows, or locations, or responsibilities, or time. If you add those characteristics to this type of model, you have created a Composite. These "Composites" are created from "integrations".)

Business End
Business Means

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Enterprise Architecture

Rows

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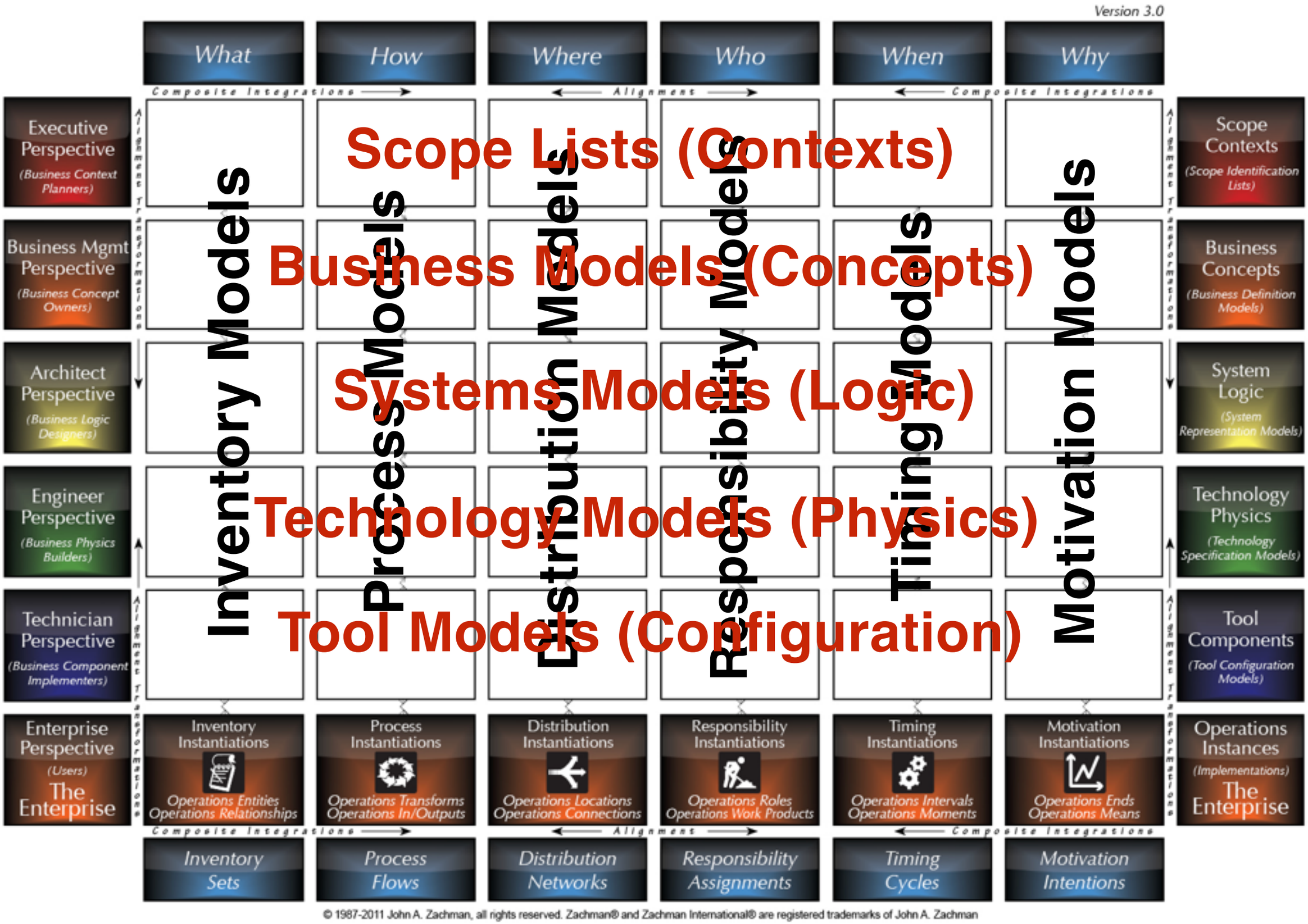
The Framework for Enterprise Architecture



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The Zachman Framework for Enterprise Architecture™

The Enterprise Ontology ™

Version 3.0

Classification Names / Audience Perspectives	What	How	Where	Who	When	Why	Classification Names / Model Names
	Composite Integrations →		*Alignment* →		← *Composite Integrations*		
Executive Perspective *(Business Context Planners)*	Inventory Identification	Process Identification	Distribution Identification	Responsibility Identification	Timing Identification	Motivation Identification	Scope Contexts *(Scope Identification Lists)*
	Identification		**Scope Contexts**		**Boundaries**		
Business Mgmt Perspective *(Business Concept Owners)*	Inventory Definition	Process Definition	Distribution Definition	Responsibility Definition	Timing Definition	Motivation Definition	Business Concepts *(Business Definition Models)*
	Definition		**Business Concepts**		**Semantics**		
Architect Perspective *(Business Logic Designers)*	Inventory Representation	Process Representation	Distribution Representation	Responsibility Representation	Timing Representation	Motivation Representation	System Logic *(System Representation Models)*
	Representation		**System Logic**		**Records**		
Engineer Perspective *(Business Physics Builders)*	Inventory Specification	Process Specification	Distribution Specification	Responsibility Specification	Timing Specification	Motivation Specification	Technology Physics *(Technology Specification Models)*
	Specification		**Technology Physics**		**Files**		
Technician Perspective *(Business Component Implementers)*	Inventory Configuration	Process Configuration	Distribution Configuration	Responsibility Configuration	Timing Configuration	Motivation Configuration	Tool Components *(Tool Configuration Models)*
	Configuration		**Tool Components**		**Vendors**		
Enterprise Perspective *(Users)* The Enterprise	Inventory Instantiations *Operations Entities Operations Relationships*	Process Instantiations *Operations Transforms Operations In/Outputs*	Distribution Instantiations *Operations Locations Operations Connections*	Responsibility Instantiations *Operations Roles Operations Work Products*	Timing Instantiations *Operations Intervals Operations Moments*	Motivation Instantiations *Operations Ends Operations Means*	Operations Instances *(Implementations)* The Enterprise
	Composite Integrations →		*Alignment* →		← *Composite Integrations*		
Audience Perspectives / Enterprise Names	*Inventory Sets*	*Process Flows*	*Distribution Networks*	*Responsibility Assignments*	*Timing Cycles*	*Motivation Intentions*	

Alignment Transformations (between adjacent rows)

**Horizontal integration lines are shown for example purposes only and are not a complete set. Composite, integrative relationships connecting every cell horizontally potentially exist.*

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Classification Names / Audience Perspectives	What	How	Where	Who	When	Why	Classification Names / Model Names
	Composite Integrations →		← Alignment →		← Composite Integrations		
Executive Perspective *(Business Context Planners)*	Inventory Identification **Inventory Scope**	Process Identification **Process Scope**	Distribution Identification **Distrib Scope**	Responsibility Identification **Respon Scope**	Timing Identification **Timing Scope**	Motivation Identification **Motive Scope**	Scope Contexts *(Scope Identification Lists)*
Business Mgmt Perspective *(Business Concept Owners)*	Inventory Definition **Inventory Concepts**	Process Definition **Inventory Process**	Distribution Definition **Business Distrib**	Responsibility Definition **Business Respon**	Timing Definition **Business Timing**	Motivation Definition **Business Motive**	Business Concepts *(Business Definition Models)*
Architect Perspective *(Business Logic Designers)*	Inventory Representation **Record Logic**	Process Representation **Record Process**	Distribution Representation **System Distrib**	Responsibility Representation **System Respon**	Timing Representation **System Timing**	Motivation Representation **System Motive**	System Logic *(System Representation Models)*
Engineer Perspective *(Business Physics Builders)*	Inventory Specification **File Storage**	Process Specification **File Process**	Distribution Specification **Tech Distrib**	Responsibility Specification **Tech Respon**	Timing Specification **Tech Timing**	Motivation Specification **Tech Motive**	Technology Physics *(Technology Specification Models)*
Technician Perspective *(Business Component Implementers)*	Inventory Configuration **Vendor Defin**	Process Configuration **Vendor Instruct**	Distribution Configuration **Vendor Address**	Responsibility Configuration **Vendor Format**	Timing Configuration **Vendor Timing**	Motivation Configuration **Vendor Constrnt**	Tool Components *(Tool Configuration Models)*
Enterprise Perspective *(Users)* **The Enterprise**	Inventory Instantiations *Operations Entities Operations Relationships*	Process Instantiations *Operations Transforms Operations In/Outputs*	Distribution Instantiations *Operations Locations Operations Connections*	Responsibility Instantiations *Operations Roles Operations Work Products*	Timing Instantiations *Operations Intervals Operations Moments*	Motivation Instantiations *Operations Ends Operations Means*	Operations Instances *(Implementations)* **The Enterprise**
	Composite Integrations →		← Alignment →		← Composite Integrations		
Audience Perspectives / Enterprise Names	*Inventory Sets*	*Process Flows*	*Distribution Networks*	*Responsibility Assignments*	*Timing Cycles*	*Motivation Intentions*	

Alignment Transformations

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