

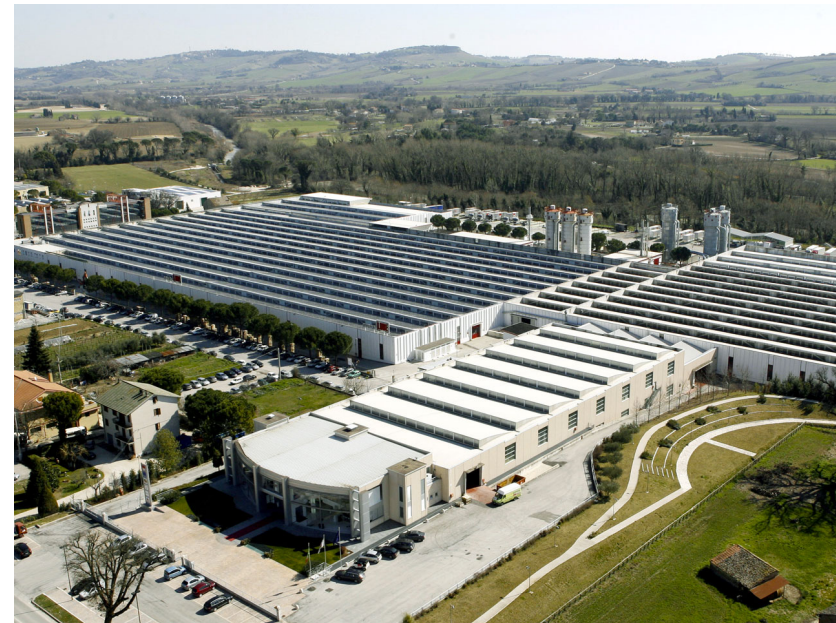


Introduction to Enterprise Architecture and Enterprise Modelling

Barbara Re

Are we speaking about buildings?

In the literature and community of practices, there are various **perspectives** in regards to the meaning of the term **enterprise architecture**



From a terminological point of view

- The term **enterprise** can be defined as describing an **organizational unit, organization, or collection of organizations** that share a set of **common goals** and **collaborate** to provide specific products or services to customers
 - The term enterprise covers **various types of organizations**, regardless of their size, ownership model, operational model, or geographical distribution
 - It includes those organizations' **complete socio-technical systems**, including **people, information, processes, and technologies**
- The term **architecture** refers to fundamental **concepts or properties of a system in its environment**, embodied in its elements, relationships, and in the principles of its design and evolution

Enterprise Architecture Definitions

- The **MIT Center for Information Systems Research** defined enterprise architecture as the **specific aspects of a business that are under examination**:
 - Enterprise architecture is the organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the company's operating model for delivering goods and services to customers
- The **Enterprise Architecture Body of Knowledge** defines enterprise architecture **as a practice**, which analyzes areas of common activity within or between organizations, where information and other resources are exchanged to guide future states from an integrated viewpoint of strategy, business, and technology
- **IT analysis firm Gartner** defines the term **as a discipline** where an enterprise is led through change
 - Enterprise architecture (EA) is a discipline for proactively and holistically leading enterprise responses to disruptive forces by identifying and analyzing the execution of change toward desired business vision and outcomes
 - Enterprise architecture is used to steer decision making toward the evolution of the future state architecture

ISO Definition

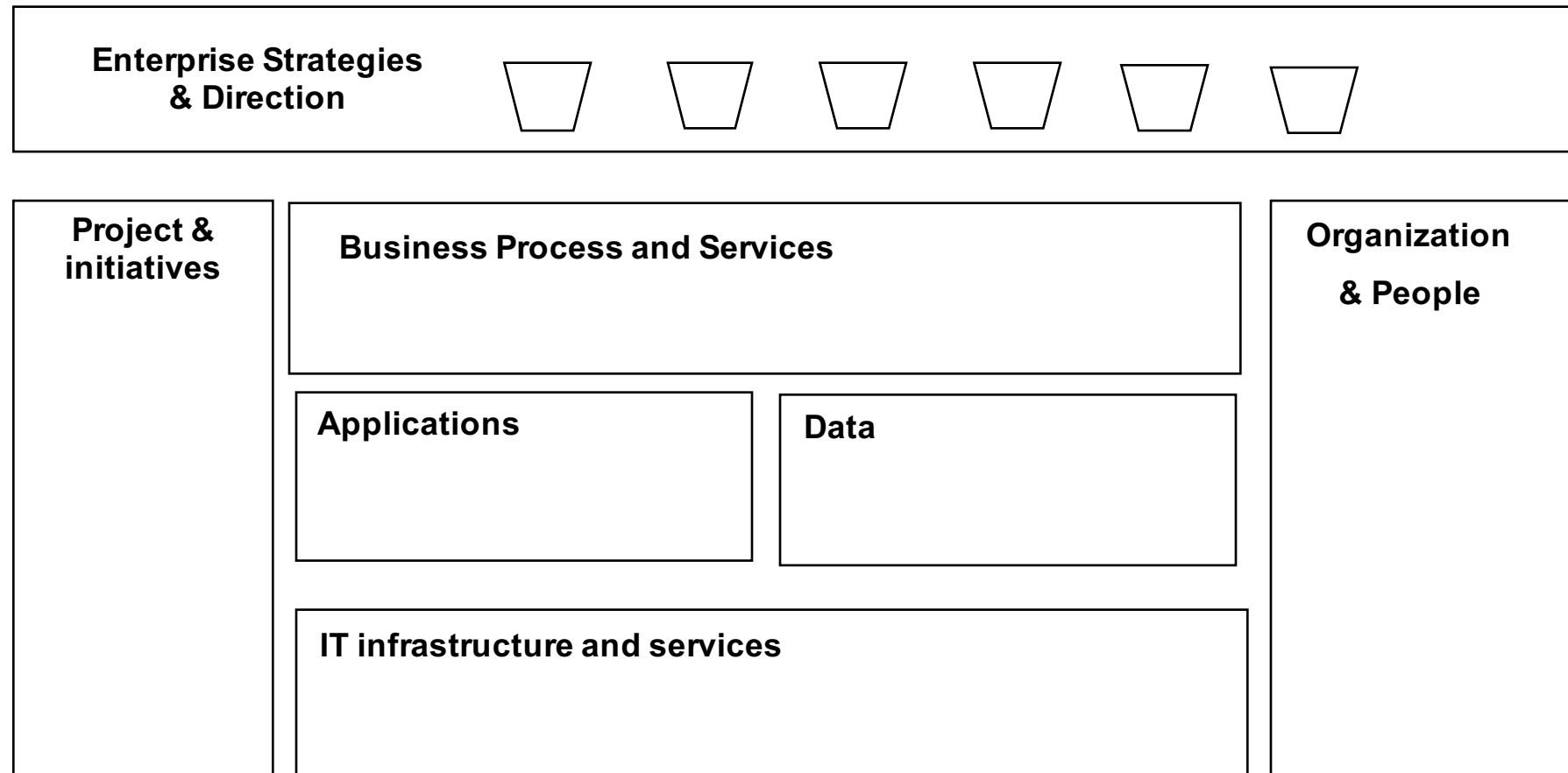
"Architecture" names that which is fundamental about a **system**; the set of essential **properties** of a system which determine its form, **function**, **value**, **cost**, and **risk**

That which is fundamental to a system takes several forms

- its **elements**: the constituents that make up the system
- the **relationships**: both internal and external to the system
- the **principles** of its design and evolution

ISO/IEC/IEEE 42010 - <http://www.iso-architecture.org/ieee-1471/cm>

Enterprise Architecture: Overall View





WHY ENTERPRISE ARCHITECTURE ?

Architecture and Architecture Description

- An **architecture** is a **conception of a system** – i.e., it is in the human mind. An architecture may exist without ever being written down
- An **architecture description (AD)** is an artifact that expresses an Architecture to share with others
- An **Architecture Description** consists of one or several Architecture Models
- A **Model** is a reproduction of a relevant part of reality which contains the essential aspects to be investigated.

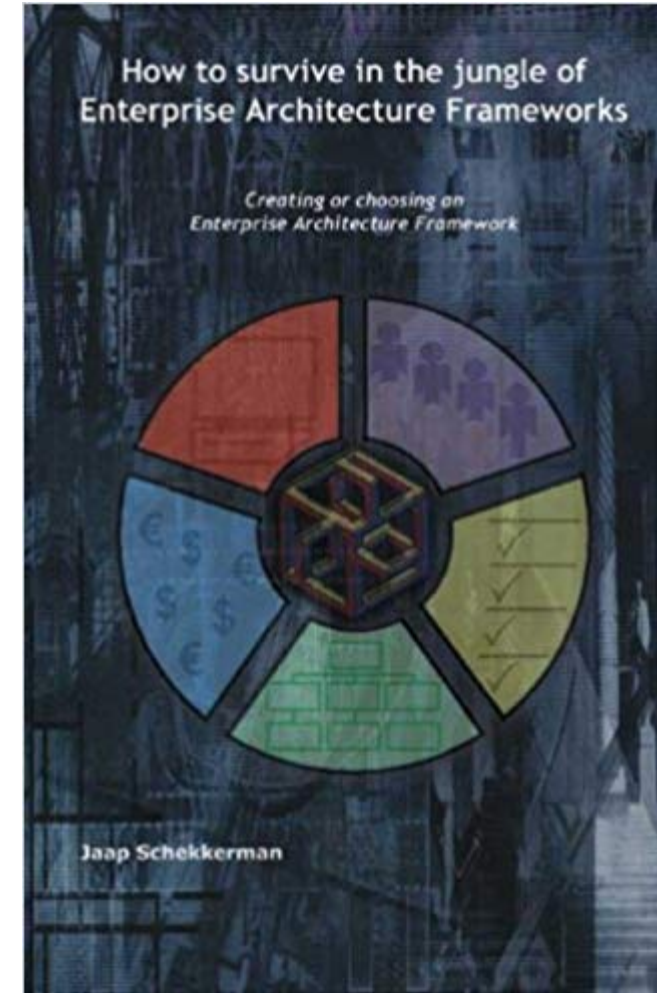
Enterprise Architecture (Description)

- An "**Architecture**" (for anything) would be the total **set of descriptive representations (models)** relevant for describing a complex object such that it can be created and that constitute a baseline for changing the object after it has been instantiated
- Therefore "**Enterprise Architecture**" would be the **total set of models relevant for describing an Enterprise**, that is, the descriptive representations required
 - to **create** a (coherent, optimal) enterprise
 - to **serve as a baseline for changing** the Enterprise once it is created

Architecture Framework

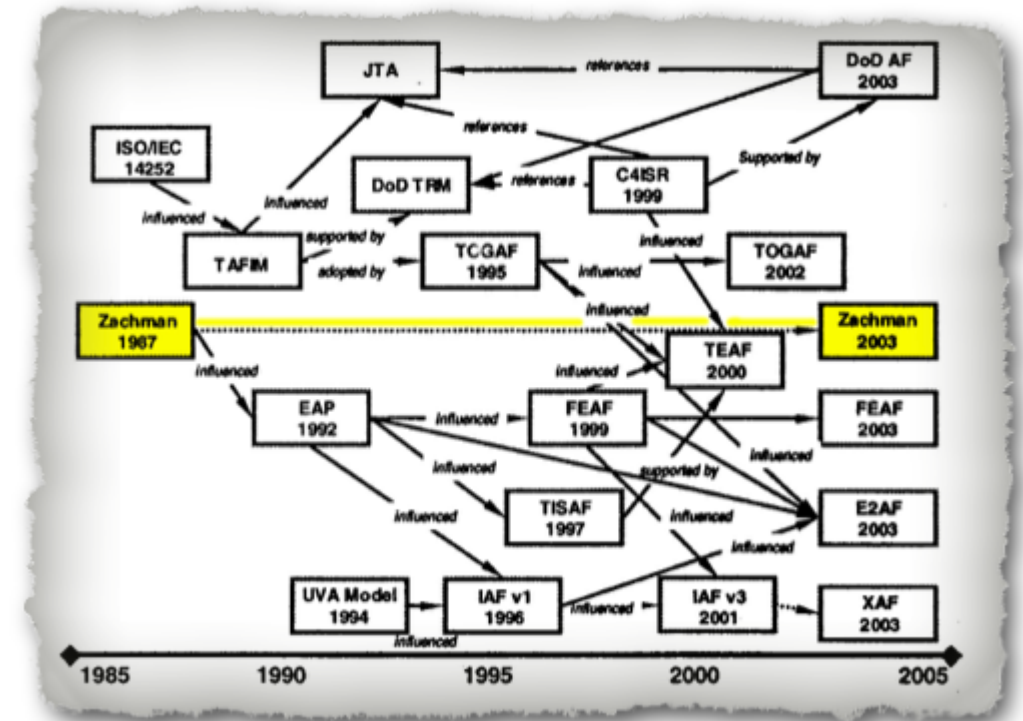
- An Architecture Framework establishes a common practice for **creating, interpreting, analyzing** and **using architecture descriptions**
- It is a **logical structure** for classifying and organizing the descriptive representations of a system

The Jungle of Enterprise Architecture Framework



A wide list of frameworks

- **Consortia-developed frameworks**
 - Generalised Enterprise Reference Architecture and Methodology
 - IDEAS Group – a four-nation effort to develop a common ontology for architecture interoperability
 - ISO 19439 Framework for enterprise modelling
 - TOGAF – The Open Group Architecture Framework – a widely used framework including an architectural Development Method and standards for describing various types of architecture
- **Defense industry frameworks**
 - AGATE – the France DGA Architecture Framework
 - DoDAF – the US Department of Defense Architecture Framework
 - MODAF – the UK Ministry of Defence Architecture Framework
 - NAF – the NATO Architecture Framework
- **Government frameworks**
 - European Space Agency Architectural Framework (ESA AF) - a framework for European space-based Systems of Systems
 - Government Enterprise Architecture (GEA) – a common framework legislated for use by departments of the Queensland Government
 - Treasury Enterprise Architecture Framework (TEAF) – a framework for treasury, published by the US Department of the Treasury in July 2000
- **Open-source framework**
 - MEGAF is an infrastructure for realizing architecture frameworks that conform to the definition of architecture framework provided in ISO/IEC/IEEE 42010
 - Praxeme, an open enterprise methodology, contains an enterprise architecture framework called the Enterprise System Topology
 - TRAK – a general systems-oriented framework based on MODAF 1.2 and released under GPL/GFDL
 - SABSAs is an open framework and methodology for Enterprise Security Architecture and Service Management, that is risk based and focuses on integrating security into business and IT management



Enterprise Architecture Frameworks

- We can distinguish two main types of structures for Enterprise Architecture Frameworks
 - **Matrix of aspects and perspectives**
 - e.g. -- Zachmann Enterprise Architecture Framework
 - **Layer architecture** with business, applications and technology
 - e.g. -- ArchiMate – A modeling language for EA



The Zachman Framework



John Zachman

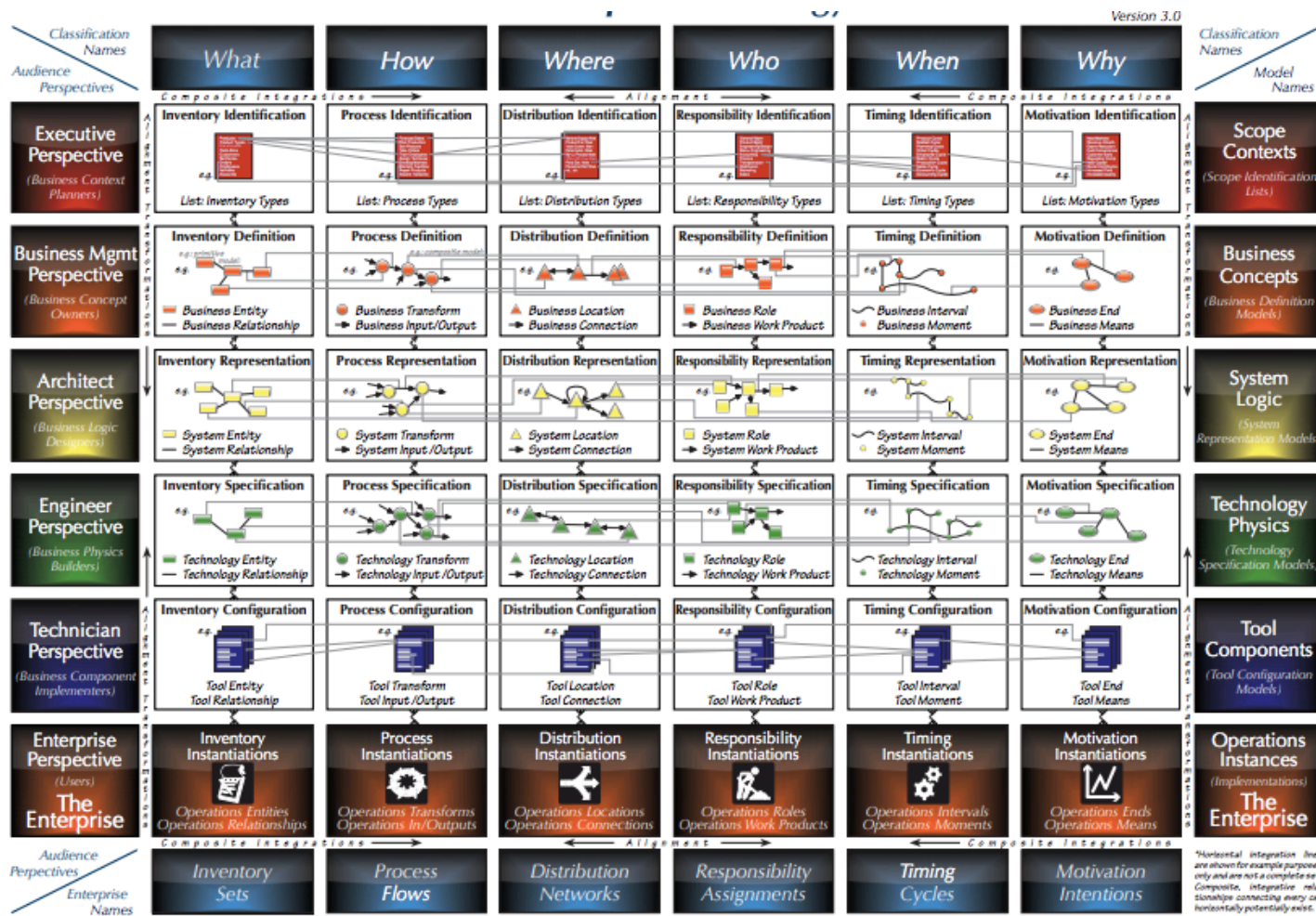
Zachman Framework

- 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

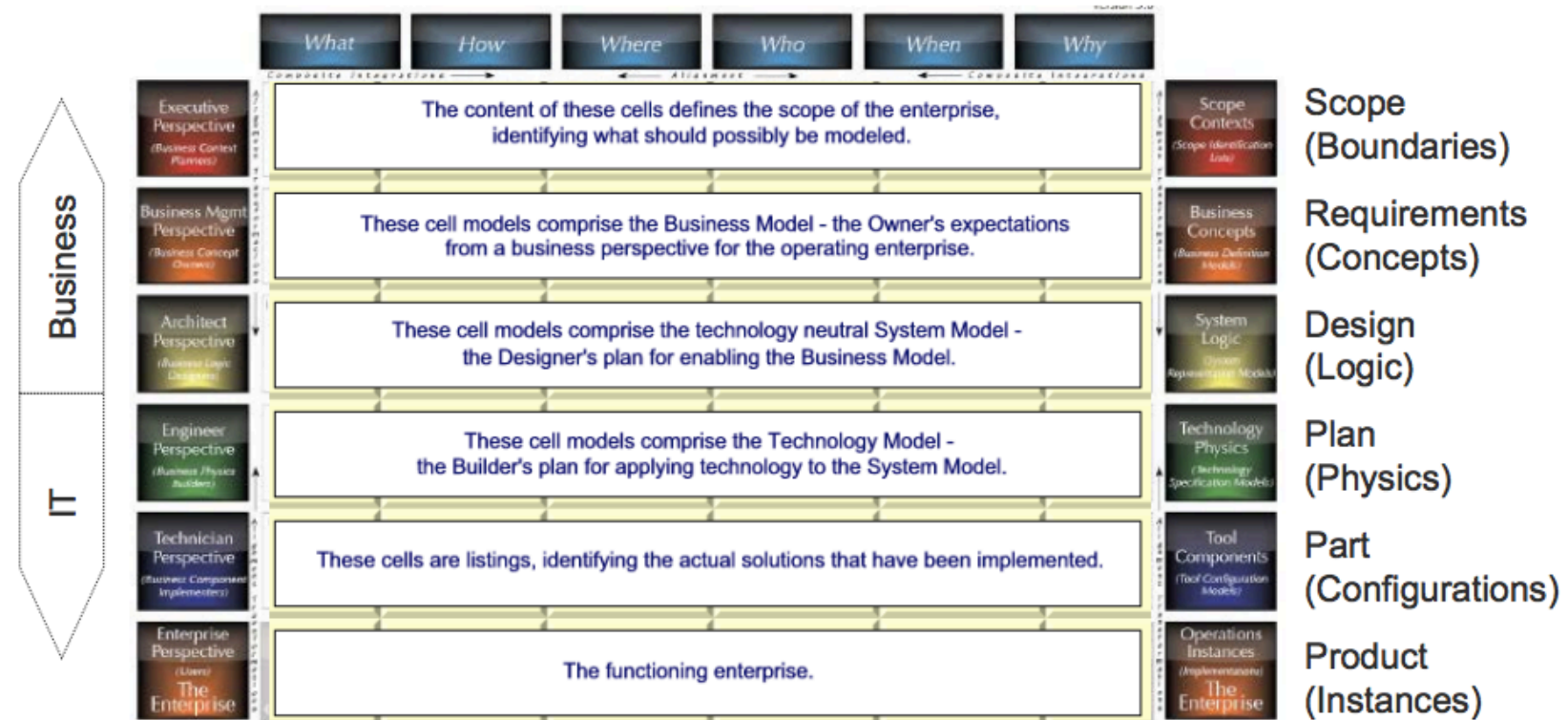
Zachman, J.A., 1987. A framework for information systems architecture. IBM Systems Journal, 26(3).

Abstractions

Perspectives



Perspectives



- 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

Abstractions

- 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

Framework Rules

Rule 1: The columns have no order

Order implies priorities and creates a bias toward one aspect at the expense of others. All columns are equally important because all are abstractions of the same enterprise.

Rule 2: Each column has a simple, basic model

Each column represents an abstraction from the real world for convenience of description. These models include: Data (what), Function (how), Network (where), People (who), Time (when), and Motivation (why)

Rule 3: The basic model of each column must be unique

The individual models may be related to one another because they are all abstractions of the same real-world enterprise, but each model represents a separate and unique concept.

Rule 4: Each row represents a distinct perspective

This rule is most easily demonstrated by the Business Model, System Model, and Technology Model rows, which represent the owner's, architect's, and builder's perspectives. Each perspective is different because it deals with a different set of constraints. For example, the owner deals with usability constraints, both aesthetic and functional, and the architect deals with design constraints, the laws of physics or nature, and the builder deals with construction constraints, the state of the art in methods and technologies.

Rule 5: Each cell is unique

Since each column has a unique basic model that makes each column unique and each row has a different perspective, each cell in the framework is unique.

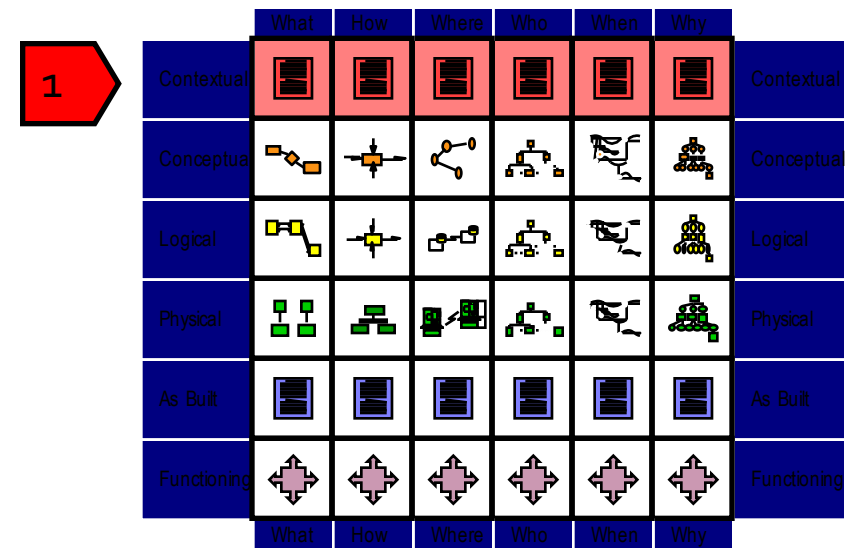
Rule 6: Combining the cells in one row forms a complete model.

The sum of all cells in a given row is the most complete depiction of reality from the perspective of that row. As new cells in a given row are defined each new cell description must be consistent with the perspective of that row. Each cell in a given row can be defined and is independent of any other cells in the row, yet each cell is but one abstraction of the same perspective of reality. Therefore, each cell is related to every other cell in the same row

Row 1

- **Motivation/Why**
Business goals, objectives and performance measures related to each function
- **Function/How**
High-level business functions
- **Data/What**
High-level data classes related to each function
- **People/Who**
Stakeholders related to each function
- **Network/Where**
VA locations related to each function
- **Time/When**
Cycles and events related to each function

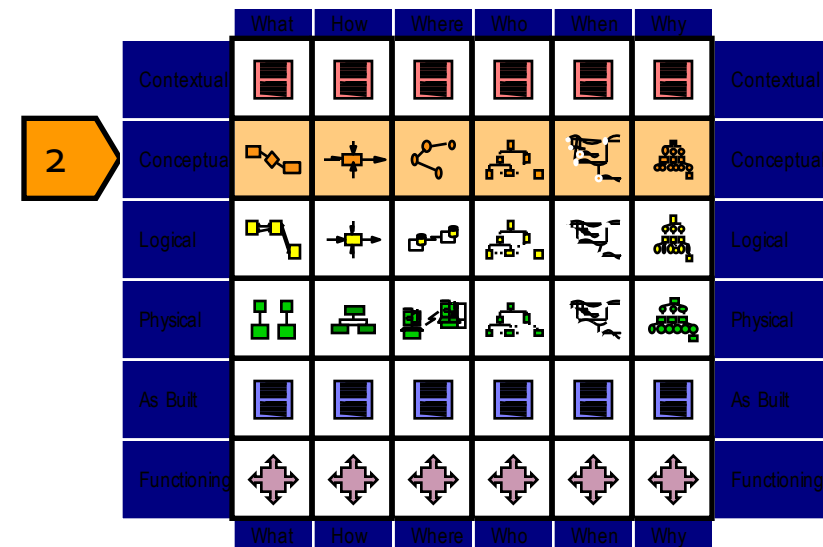
- Perspective: scope
- Role: planner



Row 2

- **Motivation/Why**
Policies, procedures and standards for each process
- **Function/How**
Business processes
- **Data/What**
Business data
- **People/Who**
VA roles and responsibilities in each process
- **Network/Where**
VA locations related to each process
- **Time/When**
Events for each process and sequencing of integration and process improvements

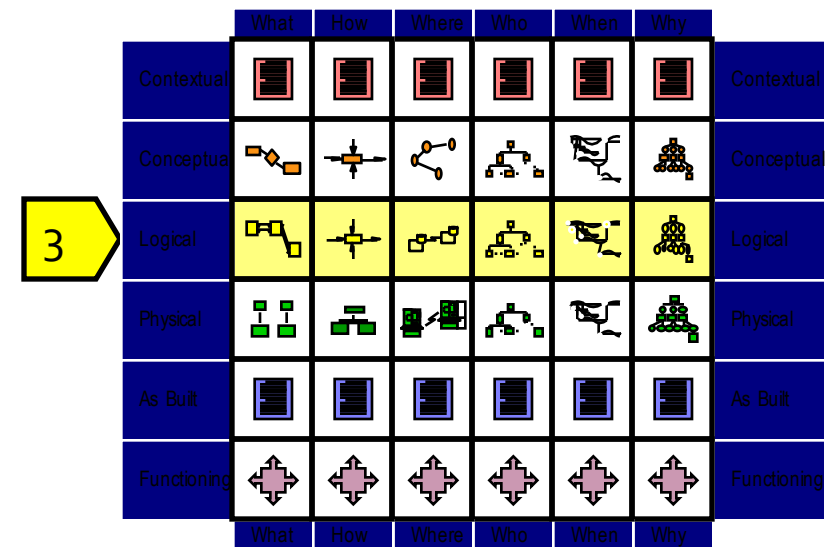
- Perspective: business model
- Role: owner



Row 3

- **Motivation/Why**
VA policies, standards and procedures associated with a business rule model
- **Function/How**
Logical representation of information systems and their relationships
- **Data/What**
Logical data models of data and data relationships underlying VA information
- **People/Who**
Logical representation of access privileges constrained by roles and responsibilities
- **Network/Where**
Logical representation of the distributed system architecture for VA locations
- **Time/When**
Logical events and their triggered responses constrained by business events and their responses

- Perspective: system model
- Role: designer



Row 4

- **Motivation/Why**
VA business rules constrained by information systems standards
- **Function/How**
Specifications of applications that operate on particular technology platforms
- **Data/What**
Database management system (DBMS) type requirements constrained by logical data models
- **People/Who**
Specification of access privileges to specific platforms and technologies
- **Network/Where**
Specification of network devices and their relationships within physical boundaries
- **Time/When**
Specification of triggers to respond to system events on specific platforms and technologies

- Perspective: Technology
- Role: builder





































	What	How	Where	Who	When	Why	
Contextual							Contextual
Conceptual							Conceptual
Logical							Logical
Physical							Physical
As Built							As Built
Functioning							Functioning
	What	How	Where	Who	When	Why	

4

Row 5

- **Motivation/Why**
VA business rules constrained by specific technology standards
- **Function/How**
Programs coded to operate on specific technology platforms
- **Data/What**
Data definitions constrained by physical data models
- **People/Who**
Access privileges coded to control access to specific platforms and technologies
- **Network/Where**
Network devices configured to conform to node specifications
- **Time/When**
Timing definitions coded to sequence activities on specific platforms and technologies

- Perspective: Detailed Representation
- Role: sub-contractor

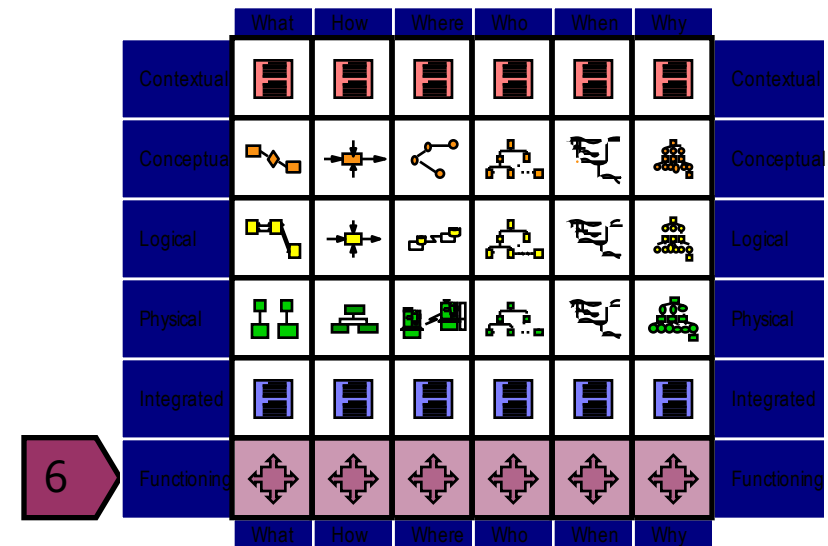
	What	How	Where	Who	When	Why	
Contextual							Contextual
Conceptual							Conceptual
Logical							Logical
Physical							Physical
As Built							As Built
Functioning							Functioning
	What	How	Where	Who	When	Why	

5

Row 6

- **Motivation/Why**
Operating characteristics of specific technologies constrained by standards
- **Function/How**
Functioning computer instructions
- **Data/What**
Data values stored in actual databases
- **People/Who**
VA personnel and key stakeholders working within their roles and responsibilities
- **Network/Where**
Sending and receiving messages
- **Time/When**
Timing definitions operating to sequence activities

- Perspective: Functioning Enterprise
- Role: user view



Relations between Models

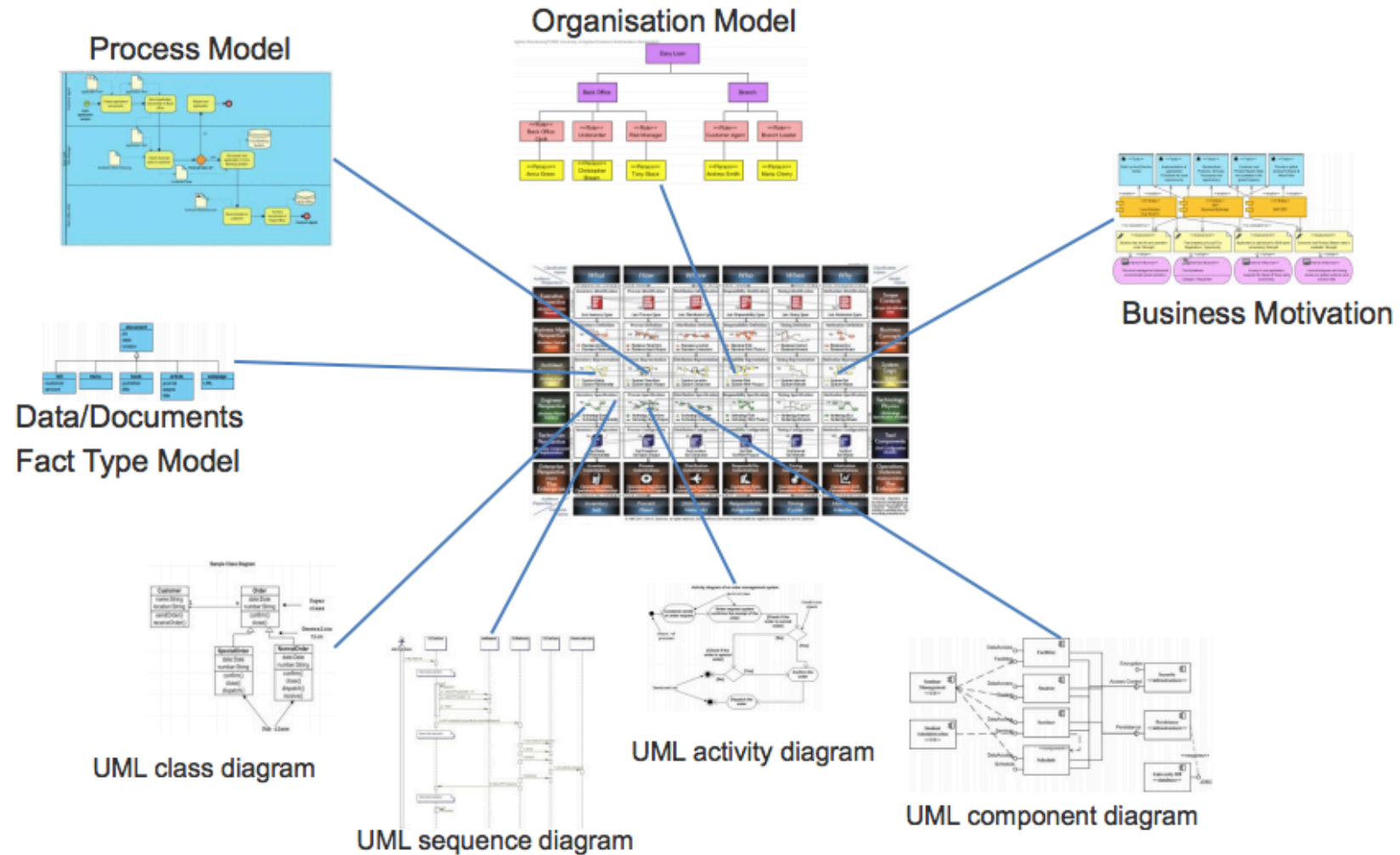
- There are **relations between** (elements of) the models
- Horizontal** Relations: In same perspective, e.g.
 - Data used in a process
 - Application implementing a process activity
- Vertical** relations: Between different perspectives
 - Implementation of an application
 - Database model for an entity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



Models and the Zachman Framework

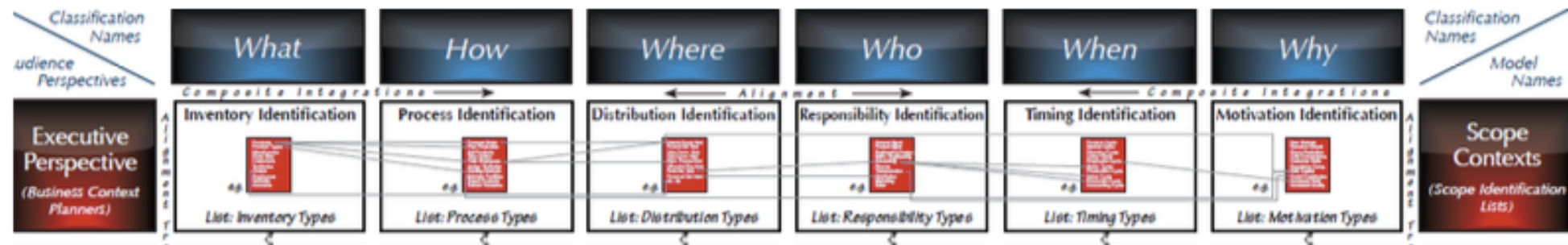


Examples of Models Kinds



Exercise - Executive Perspective of Alitalia Enterprise Architecture

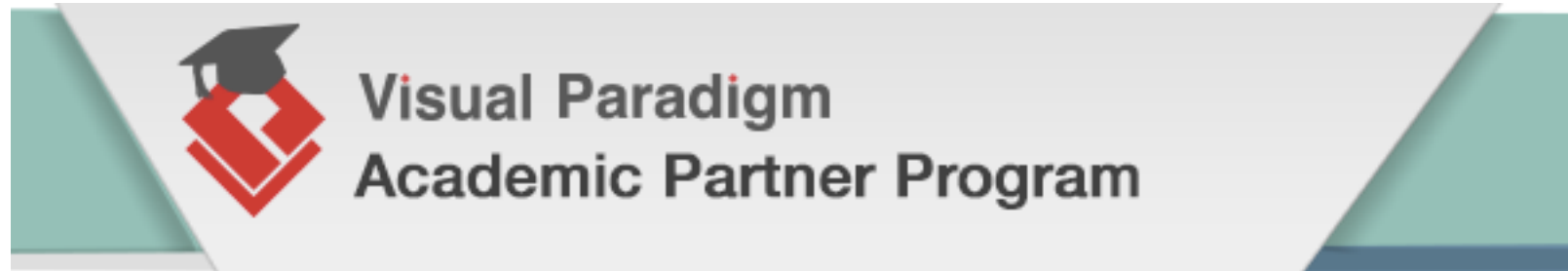
For the Alitalia Airlines, what information can you find to describe the enterprise architecture according to the Zachman Framework from the executive perspective (scope contexts).



- | | | | | | |
|--|---|---|---|---|---|
| <ul style="list-style-type: none"> • List of flies • Hour of flyies • List of destination | <ul style="list-style-type: none"> - Booking - Pilot - Selection/Control | <ul style="list-style-type: none"> - Airport - Fiumicino | <ul style="list-style-type: none"> - Director - Pilots - Crew - Disability Assistance Staff | <ul style="list-style-type: none"> - 6 years | <ul style="list-style-type: none"> - To serve the customer - Optimize the services - Safe time/money |
| <ul style="list-style-type: none"> • Budget constrains • Prize of tickets • Hot destinations • List of flyers • Lists of hotels | <ul style="list-style-type: none"> - Partnership management with hotels - Booking | <ul style="list-style-type: none"> - Website - Agencies - The financial department offices | <ul style="list-style-type: none"> - Director - The financial department | <ul style="list-style-type: none"> - 4 months | <ul style="list-style-type: none"> - Optimize the ticket prize to sell more |
| <ul style="list-style-type: none"> • List of airplanes • Types of airplanes • List of companies (suppliers) • List of staff number | <ul style="list-style-type: none"> - Airplane Maintenance - Rearrange seats - Booking seats - Booking | <ul style="list-style-type: none"> - Garage - Fiumicino - Malpensa | <ul style="list-style-type: none"> - Head of Plain Maintenance Division - Airport Staff - Maintainace Crew | <ul style="list-style-type: none"> - 10 months | <ul style="list-style-type: none"> - Rearrange the plain space |

Visual Paradigm

<https://ap.visual-paradigm.com/universita-di-camerino>





Questions?