Why Systems Work

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Why systems work, change, and last

- Shared values and ***principles***
- Clear and simple ***rules***
- Business IT alignment
- A framework for designing and building any system
  - Enterprise architecture
  - Knowledge engineering

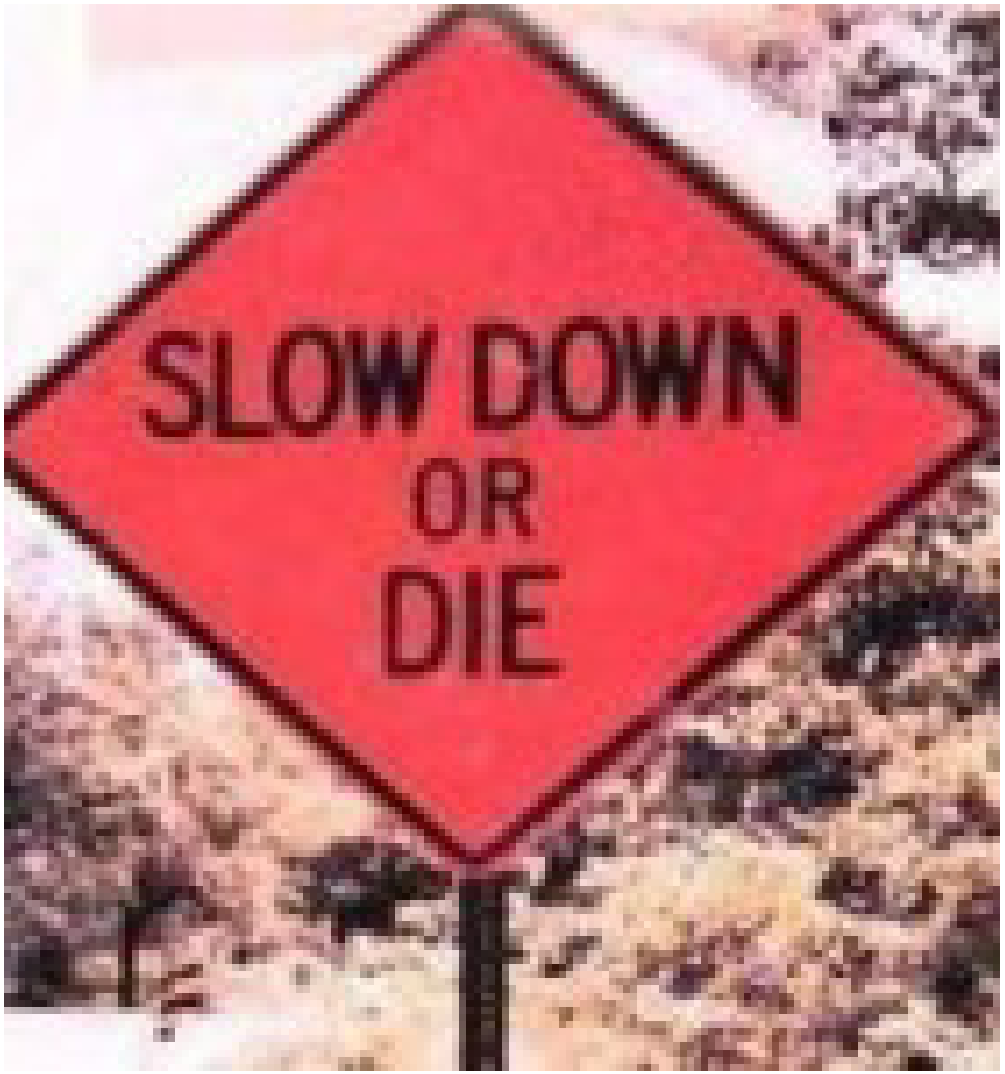
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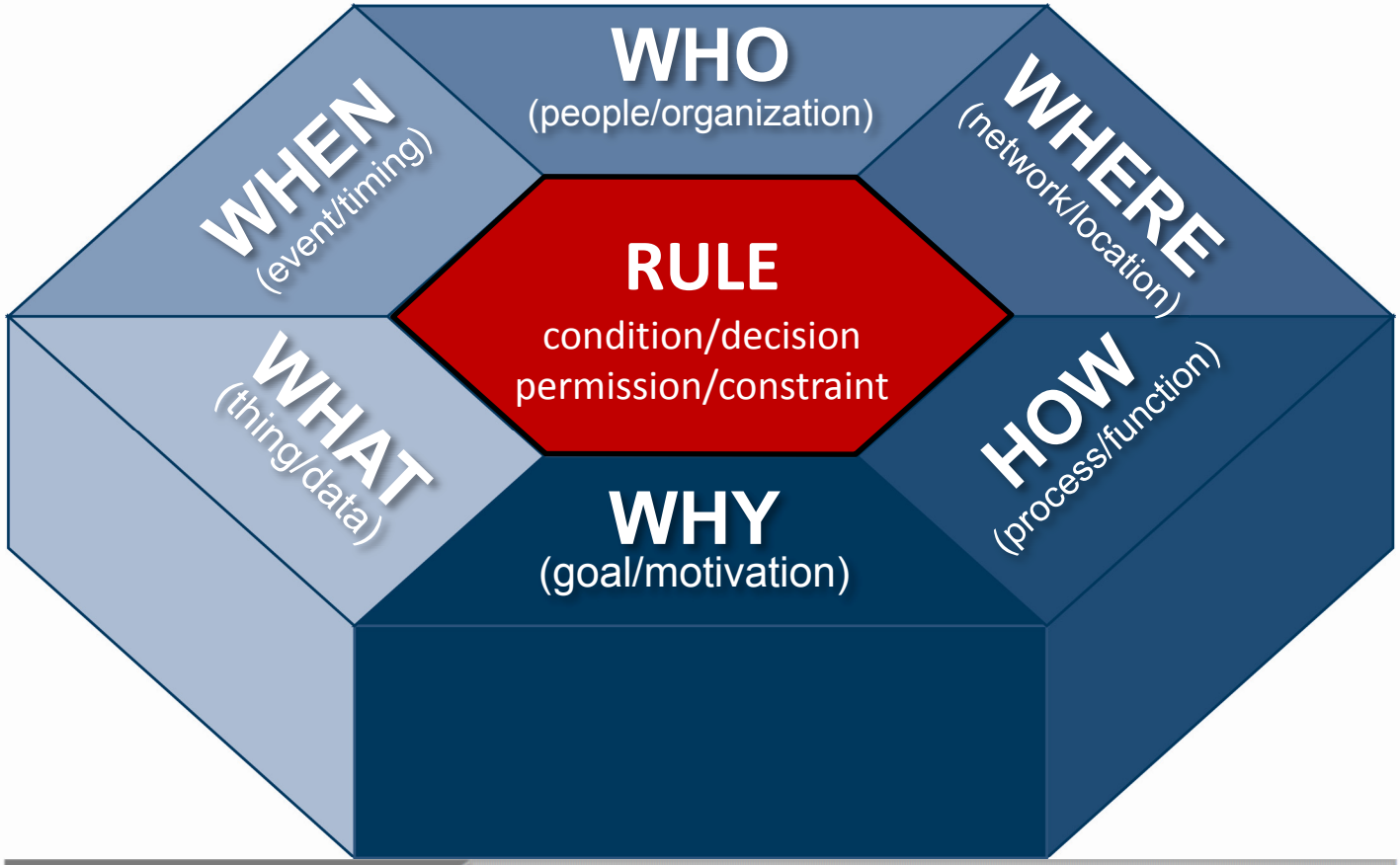
Shared values and *principles* that state what we <u>should</u> and <u>should not</u> do



Clear and simple *rules* that state
what you can and cannot do, must and must not do



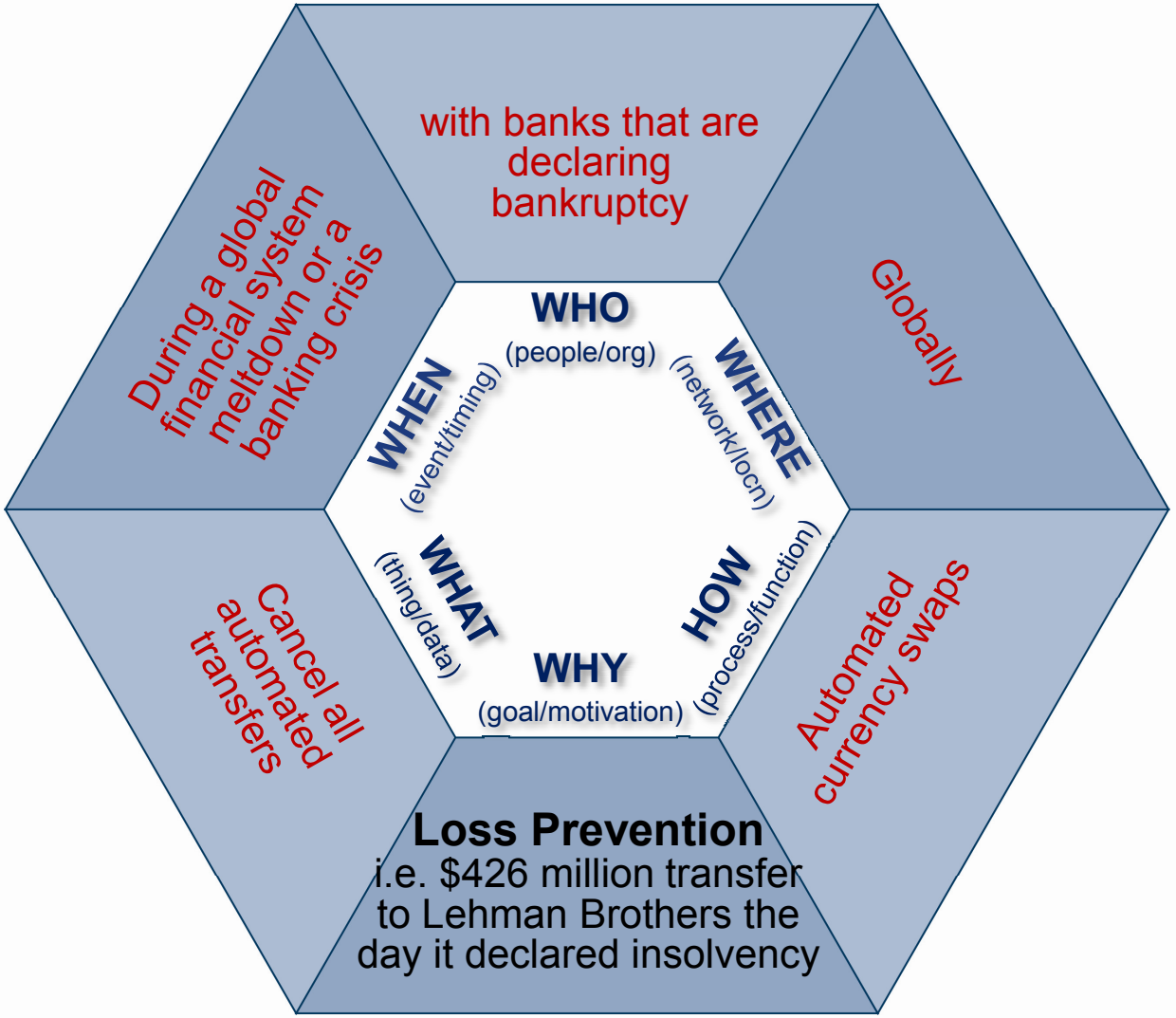
A general framework for designing rules



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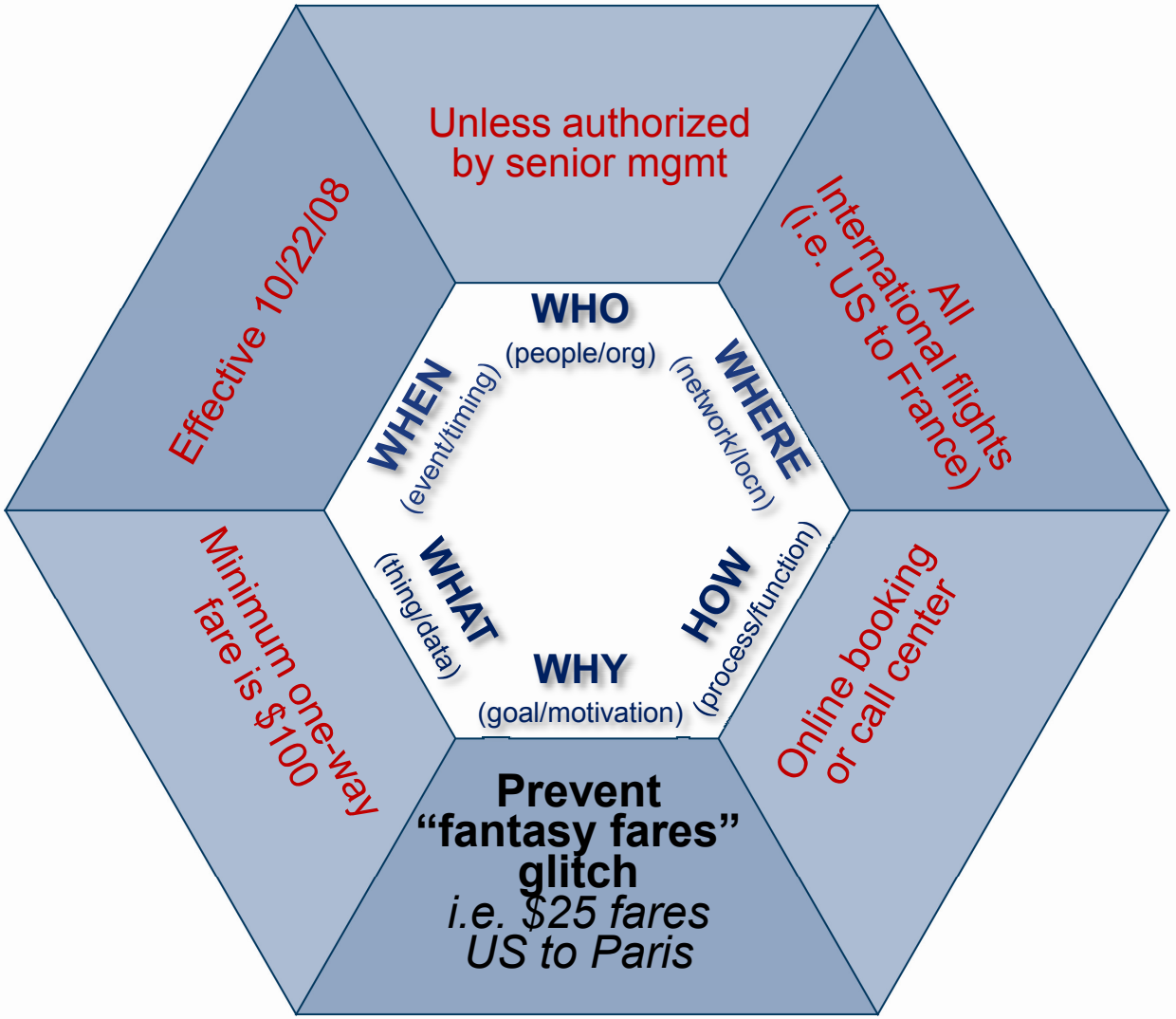
Prevent “World’s Dumbest Bank” transfer



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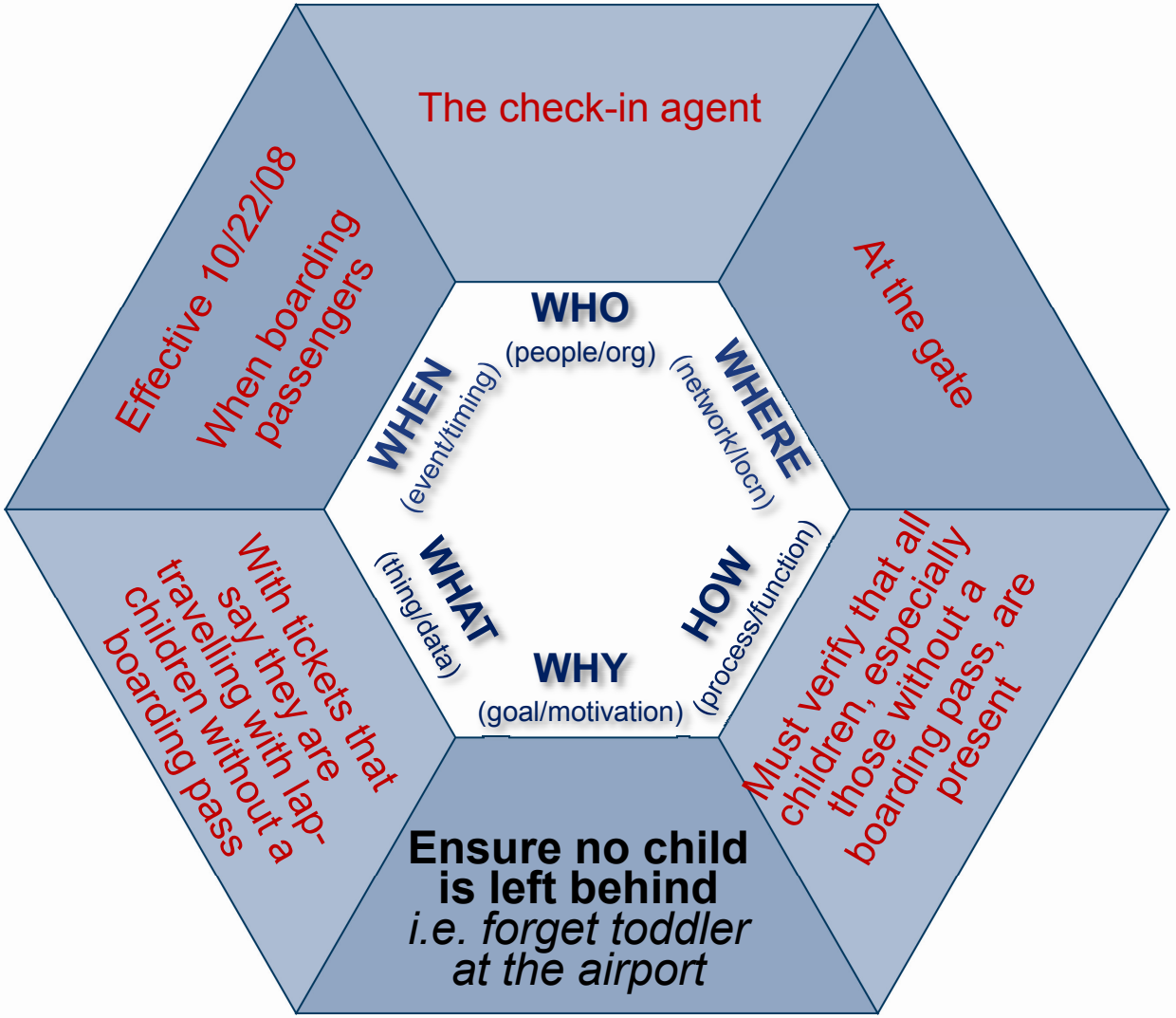
Prevent United Airlines $25 fare US to Paris



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Prevent parents boarding flight, forgetting children



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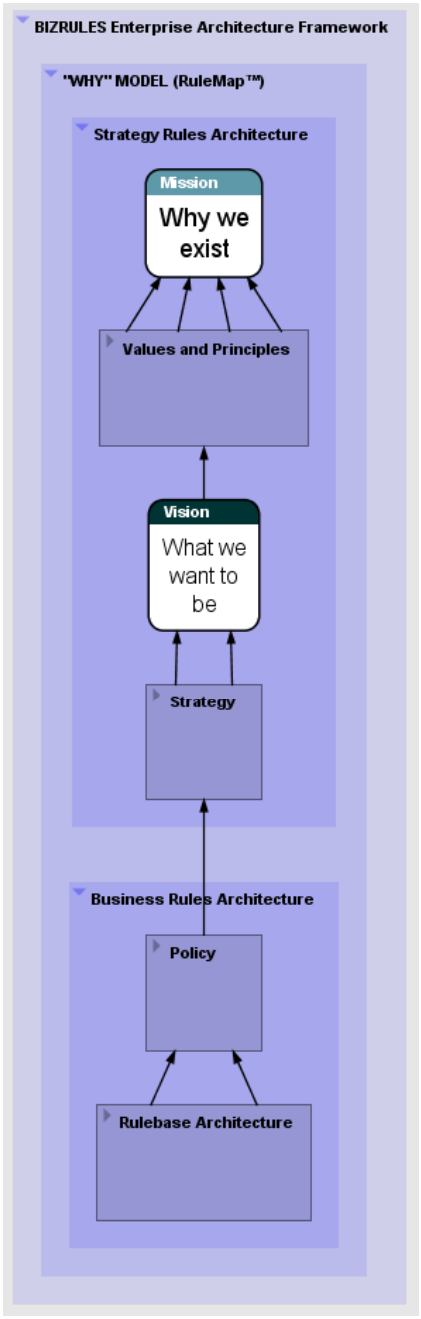
Business IT Alignment

Strategy Rules

- Mission
- Values
- Principles
- Vision
- Strategy

Business Rules

- Policy
- Rules
  - Rulebase
    - Rulesets
      - Rules



To see a Flash video of the "Rules EA Framework RuleMap", visit www.RuleMap.com

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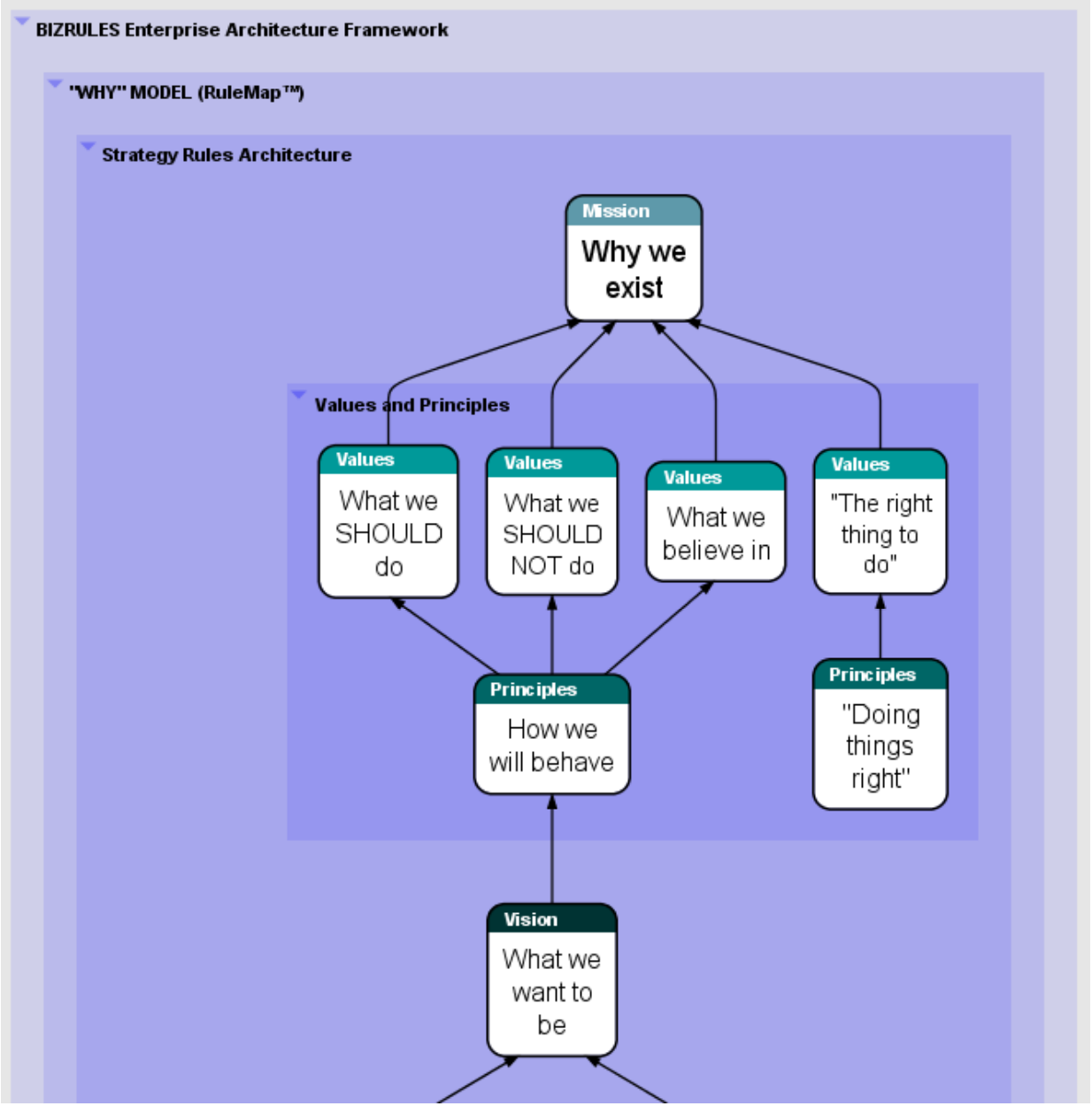
Enterprise Architecture

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- Strategy

Business Rules

- Policy
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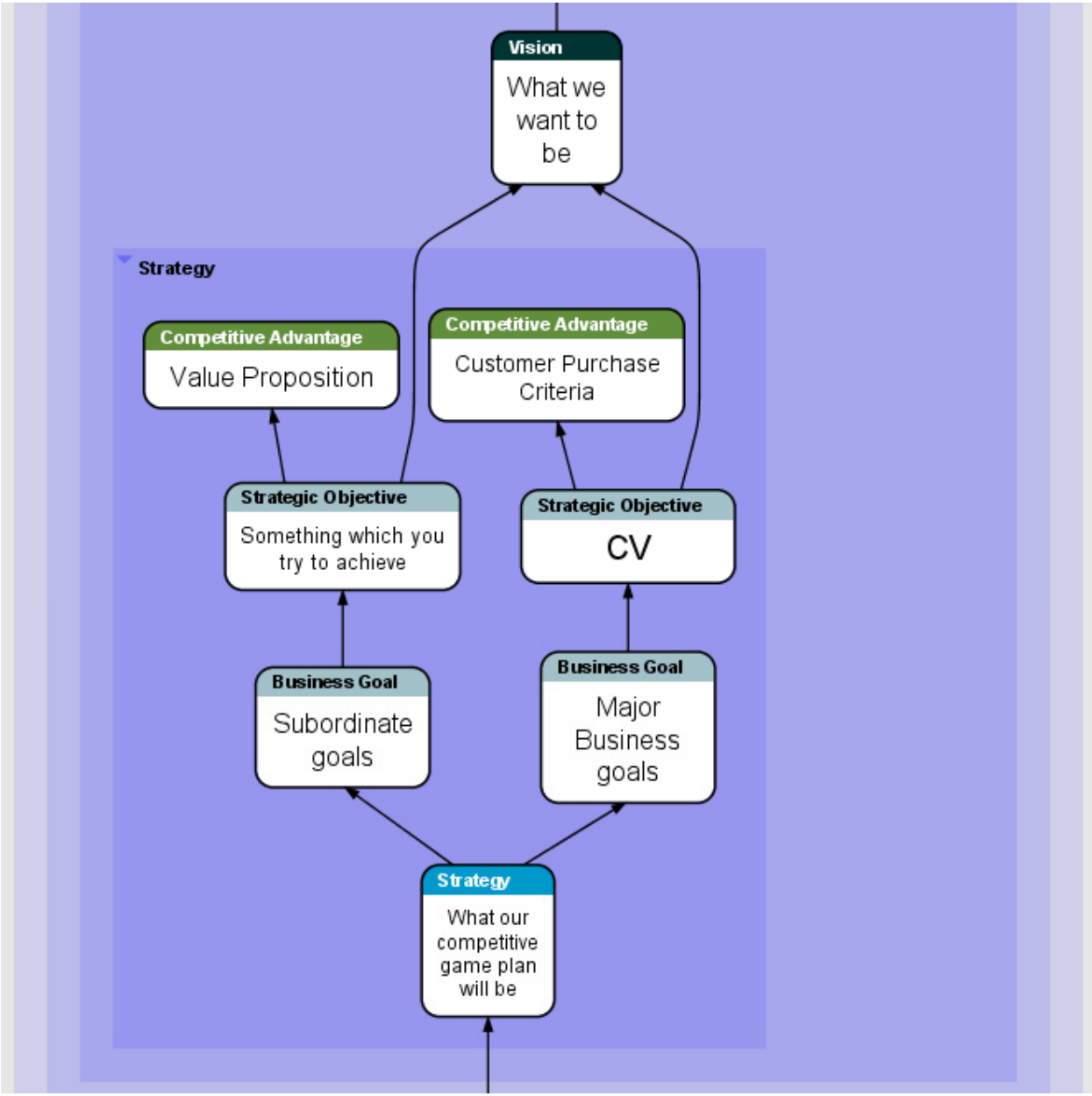
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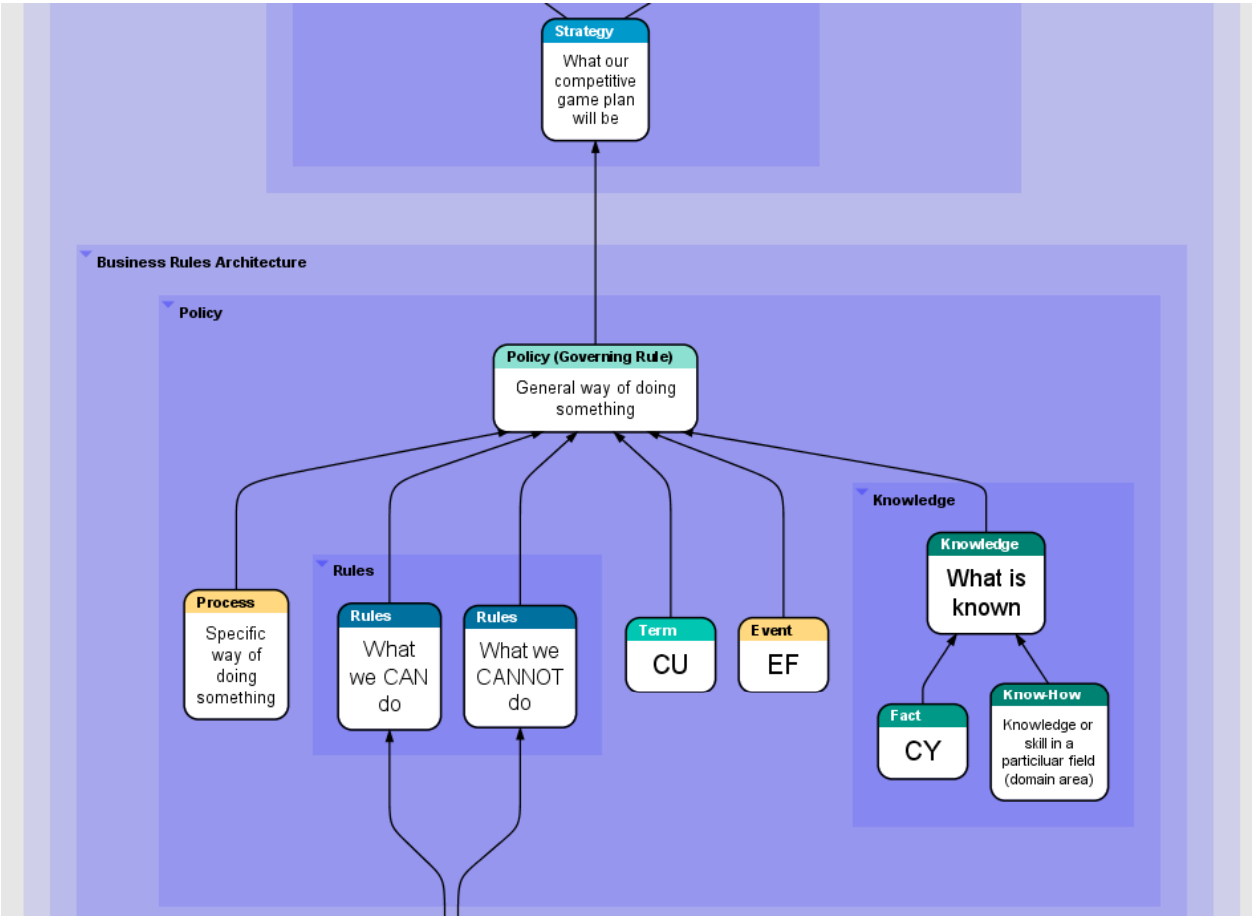
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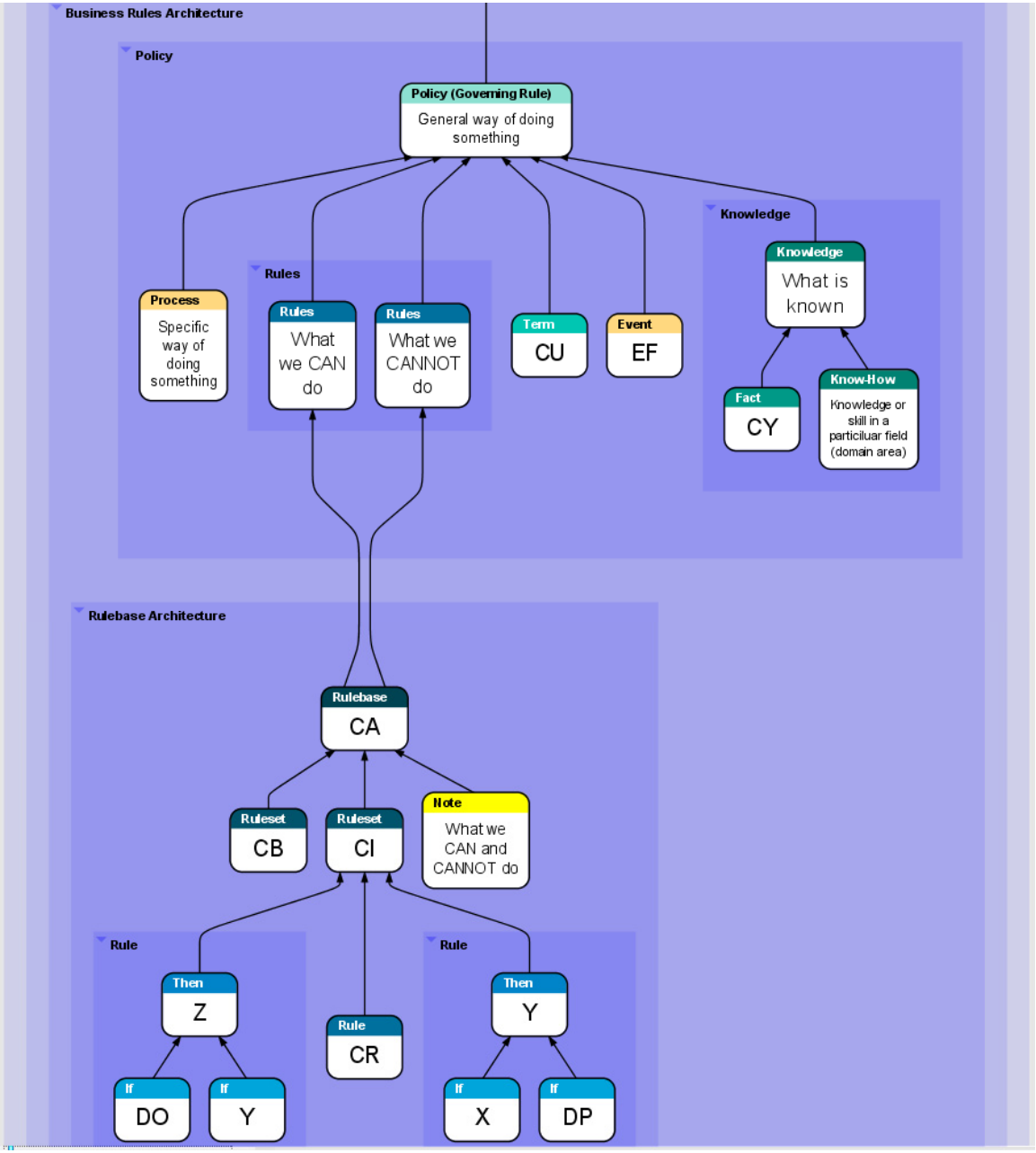
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The bridge between business and IT

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Business and IT are in different worlds

Business



Dollars



Technology

Data

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Rules and knowledge are the bridge between Business and IT



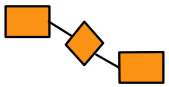
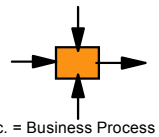
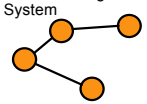
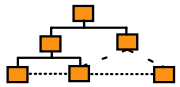
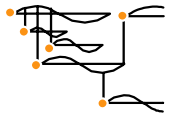
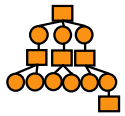
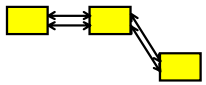
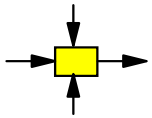
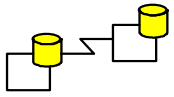
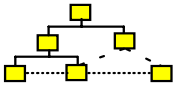
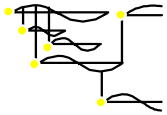
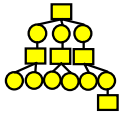
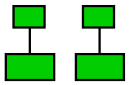
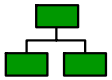
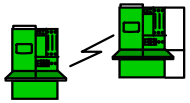
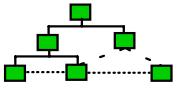
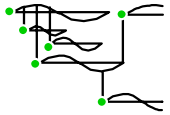
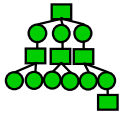
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Architecture is how to design systems
Engineering is how to build systems



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Enterprise Architecture – A Framework™

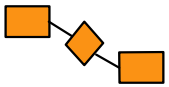
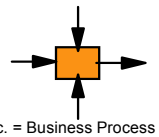
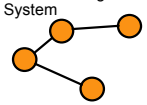
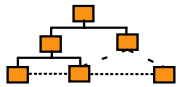
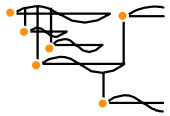
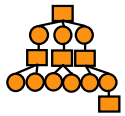
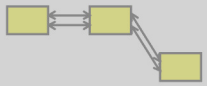
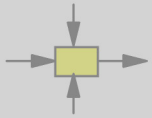
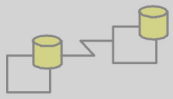
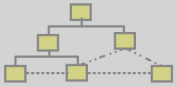
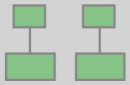
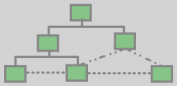
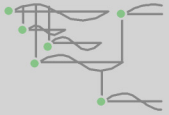
	DATA *What*	FUNCTION *How*	NETWORK *Where*	PEOPLE *Who*	TIME *When*	MOTIVATION *Why*	
SCOPE (CONTEXTUAL) *Planner*	List of Things Important to the Business  ENTITY = Class of Business Thing	List of Processes the Business Performs  Function = Class of Business Process	List of Locations in which the Business Operates  Node = Major Business Location	List of Organizations Important to the Business  People = Major Organizations	List of Events Significant to the Business  Time = Major Business Event	List of Business Goals/Strat  Ends/Means=Major Bus. Goal/ Critical Success Factor	SCOPE (CONTEXTUAL) *Planner*
ENTERPRISE MODEL (CONCEPTUAL) *Owner*	e.g. Semantic Model  Ent = Business Entity Reln = Business Relationship	e.g. Business Process Model  Proc. = Business Process I/O = Business Resources	e.g. Business Logistics System  Node = Business Location Link = Business Linkage	e.g. Work Flow Model  People = Organization Unit Work = Work Product	e.g. Master Schedule  Time = Business Event Cycle = Business Cycle	e.g. Business Plan  End = Business Objective Means = Business Strategy	ENTERPRISE MODEL (CONCEPTUAL) *Owner*
SYSTEM MODEL (LOGICAL) *Designer*	e.g. Logical Data Model  Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture  Proc .= Application Function I/O = User Views	e.g. Distributed System Architecture  Node = I/S Function (Processor, Storage, etc) Link = Line Characteristics	e.g. Human Interface Architecture  People = Role Work = Deliverable	e.g. Processing Structure  Time = System Event Cycle = Processing Cycle	e.g., Business Rule Model  End = Structural Assertion Means =Action Assertion	SYSTEM MODEL (LOGICAL) *Designer*
TECHNOLOGY MODEL (PHYSICAL) *Builder*	e.g. Physical Data Model  Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design  Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture  Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture  People = User Work = Screen Format	e.g. Control Structure  Time = Execute Cycle = Component Cycle	e.g. Rule Design  End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) *Builder*
DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*	e.g. Data Definition  Ent = Field Reln = Address	e.g. Program  Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture  Node = Addresses Link = Protocols	e.g. Security Architecture  People = Identity Work = Job	e.g. Timing Definition  Time = Interrupt Cycle = Machine Cycle	e.g. Rule Specification  End = Sub-condition Means = Step	DETAILED REPRESEN-TATIONS (OUT-OF CONTEXT) *Sub-Contractor*
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

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Complete "Business Model" Architecture

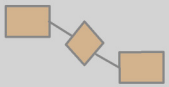
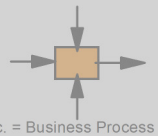
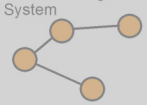
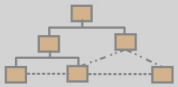
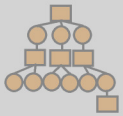
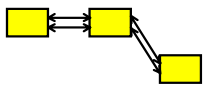
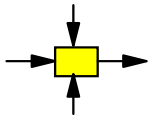
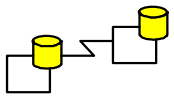
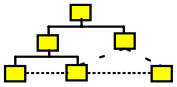
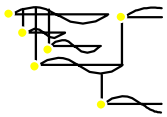
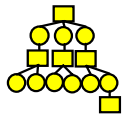
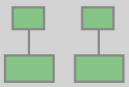
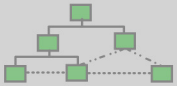
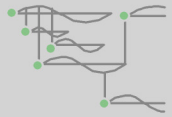
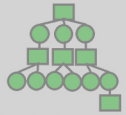
	DATA *What*	FUNCTION *How*	NETWORK *Where*	PEOPLE *Who*	TIME *When*	MOTIVATION *Why*	
SCOPE (CONTEXTUAL) *Planner*	List of Things Important to the Business  ENTITY = Class of Business Thing	List of Processes the Business Performs  Function = Class of Business Process	List of Locations in which the Business Operates  Node = Major Business Location	List of Organizations Important to the Business  People = Major Organizations	List of Events Significant to the Business  Time = Major Business Event	List of Business Goals/Strat  Ends/Means=Major Bus. Goal/ Critical Success Factor	SCOPE (CONTEXTUAL) *Planner*
ENTERPRISE MODEL (CONCEPTUAL) *Owner*	e.g. Semantic Model  Ent = Business Entity Reln = Business Relationship	e.g. Business Process Model  Proc. = Business Process I/O = Business Resources	e.g. Business Logistics System  Node = Business Location Link = Business Linkage	e.g. Work Flow Model  People = Organization Unit Work = Work Product	e.g. Master Schedule  Time = Business Event Cycle = Business Cycle	e.g. Business Plan  End = Business Objective Means = Business Strategy	ENTERPRISE MODEL (CONCEPTUAL) *Owner*
SYSTEM MODEL (LOGICAL) *Designer*	e.g. Logical Data Model  Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture  Proc .= Application Function I/O = User Views	e.g. Distributed System Architecture  Node = I/S Function (Processor, Storage, etc) Link = Line Characteristics	e.g. Human Interface Architecture  People = Role Work = Deliverable	e.g. Processing Structure  Time = System Event Cycle = Processing Cycle	e.g., Business Rule Model  End = Structural Assertion Means =Action Assertion	SYSTEM MODEL (LOGICAL) *Designer*
TECHNOLOGY MODEL (PHYSICAL) *Builder*	e.g. Physical Data Model  Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design  Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture  Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture  People = User Work = Screen Format	e.g. Control Structure  Time = Execute Cycle = Component Cycle	e.g. Rule Design  End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) *Builder*
DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*	e.g. Data Definition  Ent = Field Reln = Address	e.g. Program  Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture  Node = Addresses Link = Protocols	e.g. Security Architecture  People = Identity Work = Job	e.g. Timing Definition  Time = Interrupt Cycle = Machine Cycle	e.g. Rule Specification  End = Sub-condition Means = Step	DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

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Complete "System Model" Architecture

	DATA *What*	FUNCTION *How*	NETWORK *Where*	PEOPLE *Who*	TIME *When*	MOTIVATION *Why*	
SCOPE (CONTEXTUAL) *Planner*	List of Things Important to the Business  ENTITY = Class of Business Thing	List of Processes the Business Performs  Function = Class of Business Process	List of Locations in which the Business Operates  Node = Major Business Location	List of Organizations Important to the Business  People = Major Organizations	List of Events Significant to the Business  Time = Major Business Event	List of Business Goals/Strat  Ends/Means=Major Bus. Goal/ Critical Success Factor	SCOPE (CONTEXTUAL) *Planner*
ENTERPRISE MODEL (CONCEPTUAL) *Owner*	e.g. Semantic Model  Ent = Business Entity Reln = Business Relationship	e.g. Business Process Model  Proc. = Business Process I/O = Business Resources	e.g. Business Logistics System  Node = Business Location Link = Business Linkage	e.g. Work Flow Model  People = Organization Unit Work = Work Product	e.g. Master Schedule  Time = Business Event Cycle = Business Cycle	e.g. Business Plan  End = Business Objective Means = Business Strategy	ENTERPRISE MODEL (CONCEPTUAL) *Owner*
SYSTEM MODEL (LOGICAL) *Designer*	e.g. Logical Data Model  Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture  Proc .= Application Function I/O = User Views	e.g. Distributed System Architecture  Node = I/S Function (Processor, Storage, etc) Link = Line Characteristics	e.g. Human Interface Architecture  People = Role Work = Deliverable	e.g. Processing Structure  Time = System Event Cycle = Processing Cycle	e.g., Business Rule Model  End = Structural Assertion Means =Action Assertion	SYSTEM MODEL (LOGICAL) *Designer*
TECHNOLOGY MODEL (PHYSICAL) *Builder*	e.g. Physical Data Model  Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design  Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture  Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture  People = User Work = Screen Format	e.g. Control Structure  Time = Execute Cycle = Component Cycle	e.g. Rule Design  End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) *Builder*
DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*	e.g. Data Definition  Ent = Field Reln = Address	e.g. Program  Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture  Node = Addresses Link = Protocols	e.g. Security Architecture  People = Identity Work = Job	e.g. Timing Definition  Time = Interrupt Cycle = Machine Cycle	e.g. Rule Specification  End = Sub-condition Means = Step	DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

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Complete “Technology Model” Architecture

	DATA *What*	FUNCTION *How*	NETWORK *Where*	PEOPLE *Who*	TIME *When*	MOTIVATION *Why*	
SCOPE (CONTEXTUAL) *Planner*	List of Things Important to the Business ENTITY = Class of Business Thing	List of Processes the Business Performs Function = Class of Business Process	List of Locations in which the Business Operates Node = Major Business Location	List of Organizations Important to the Business People = Major Organizations	List of Events Significant to the Business Time = Major Business Event	List of Business Goals/Strat Ends/Means=Major Bus. Goal/ Critical Success Factor	SCOPE (CONTEXTUAL) *Planner*
ENTERPRISE MODEL (CONCEPTUAL) *Owner*	e.g. Semantic Model Ent = Business Entity Reln = Business Relationship	e.g. Business Process Model Proc. = Business Process I/O = Business Resources	e.g. Business Logistics System Node = Business Location Link = Business Linkage	e.g. Work Flow Model People = Organization Unit Work = Work Product	e.g. Master Schedule Time = Business Event Cycle = Business Cycle	e.g. Business Plan End = Business Objective Means = Business Strategy	ENTERPRISE MODEL (CONCEPTUAL) *Owner*
SYSTEM MODEL (LOGICAL) *Designer*	e.g. Logical Data Model Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture Proc .= Application Function I/O = User Views	e.g. Distributed System Architecture Node = I/S Function (Processor, Storage, etc) Link = Line Characteristics	e.g. Human Interface Architecture People = Role Work = Deliverable	e.g. Processing Structure Time = System Event Cycle = Processing Cycle	e.g., Business Rule Model End = Structural Assertion Means =Action Assertion	SYSTEM MODEL (LOGICAL) *Designer*
TECHNOLOGY MODEL (PHYSICAL) *Builder*	e.g. Physical Data Model Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture People = User Work = Screen Format	e.g. Control Structure Time = Execute Cycle = Component Cycle	e.g. Rule Design End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) *Builder*
DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*	e.g. Data Definition Ent = Field Reln = Address	e.g. Program Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture Node = Addresses Link = Protocols	e.g. Security Architecture People = Identity Work = Job	e.g. Timing Definition Time = Interrupt Cycle = Machine Cycle	e.g. Rule Specification End = Sub-condition Means = Step	DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

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Object Oriented Modeling (UML; Use Cases)

	DATA *What*	FUNCTION *How*	NETWORK *Where*	PEOPLE *Who*	TIME *When*	MOTIVATION *Why*	
SCOPE (CONTEXTUAL) *Planner*	List of Things Important to the Business ENTITY = Class of Business Thing	List of Processes the Business Performs Function = Class of Business Process	List of Locations in which the Business Operates Node = Major Business Location	List of Organizations Important to the Business People = Major Organizations	List of Events Significant to the Business Time = Major Business Event	List of Business Goals/Strat Ends/Means=Major Bus. Goal/ Critical Success Factor	SCOPE (CONTEXTUAL) *Planner*
ENTERPRISE MODEL (CONCEPTUAL) *Owner*	e.g. Semantic Model Ent = Business Entity Reln = Business Relationship	e.g. Business Process Model Proc. = Business Process I/O = Business Resources	e.g. Business Logistics System Node = Business Location link = Business Linkage	e.g. Work Flow Model People = Organization Unit Work = Work Product	e.g. Master Schedule Time = Business Event Cycle = Business Cycle	e.g. Business Plan End = Business Objective Means = Business Strategy	ENTERPRISE MODEL (CONCEPTUAL) *Owner*
SYSTEM MODEL (LOGICAL) *Designer*	e.g. Logical Data Model Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture Proc .= Application Function I/O = User Views	e.g. Distributed System Architecture Node = I/S Function (Processor, Storage, etc) Link = Line Characteristics	e.g. Human Interface Architecture People = Role Work = Deliverable	e.g. Processing Structure Time = System Event Cycle = Processing Cycle	g., Business Rule Model End = Structural Assertion Means =Action Assertion	SYSTEM MODEL (LOGICAL) *Designer*
TECHNOLOGY MODEL (PHYSICAL) *Builder*	e.g. Physical Data Model Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture People = User Work = Screen Format	e.g. Control Structure Time = Execute Cycle = Component Cycle	e.g. Rule Design End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) *Builder*
DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*	e.g. Data Definition Ent = Field Reln = Address	e.g. Program Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture Node = Addresses Link = Protocols	e.g. Security Architecture People = Identity Work = Job	e.g. Timing Definition Time = Interrupt Cycle = Machine Cycle	e.g. Rule Specification End = Sub-condition Means = Step	DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

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Structured Methods Modeling

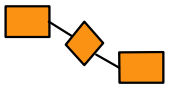
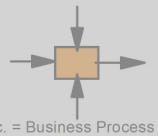
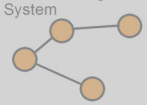
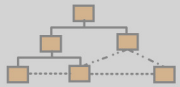
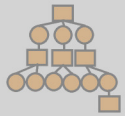
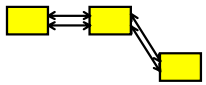
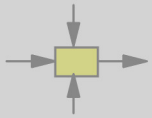
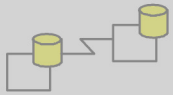
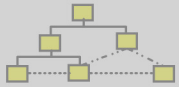
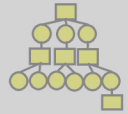
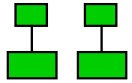
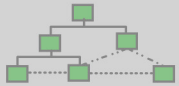
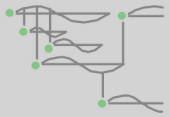
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FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

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Complete "Data Model" Architecture

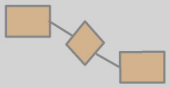
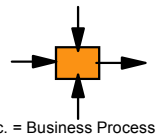
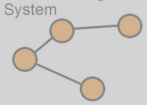
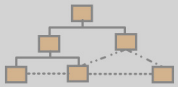
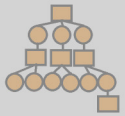
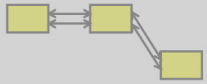
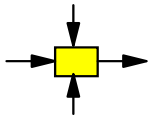
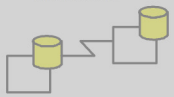
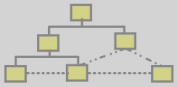
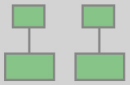
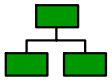
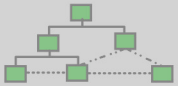
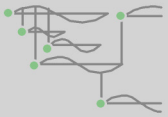
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Complete "Business Process Model" Architecture

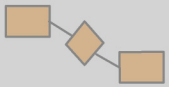
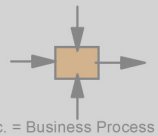
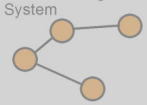
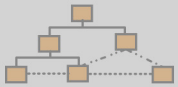
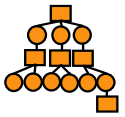
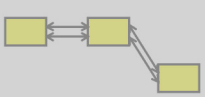
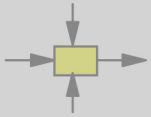
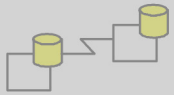
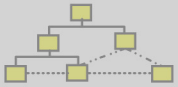
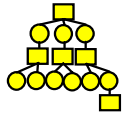
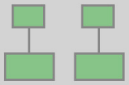
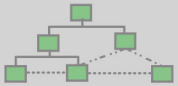
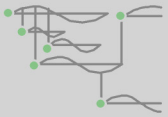
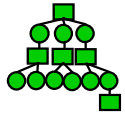
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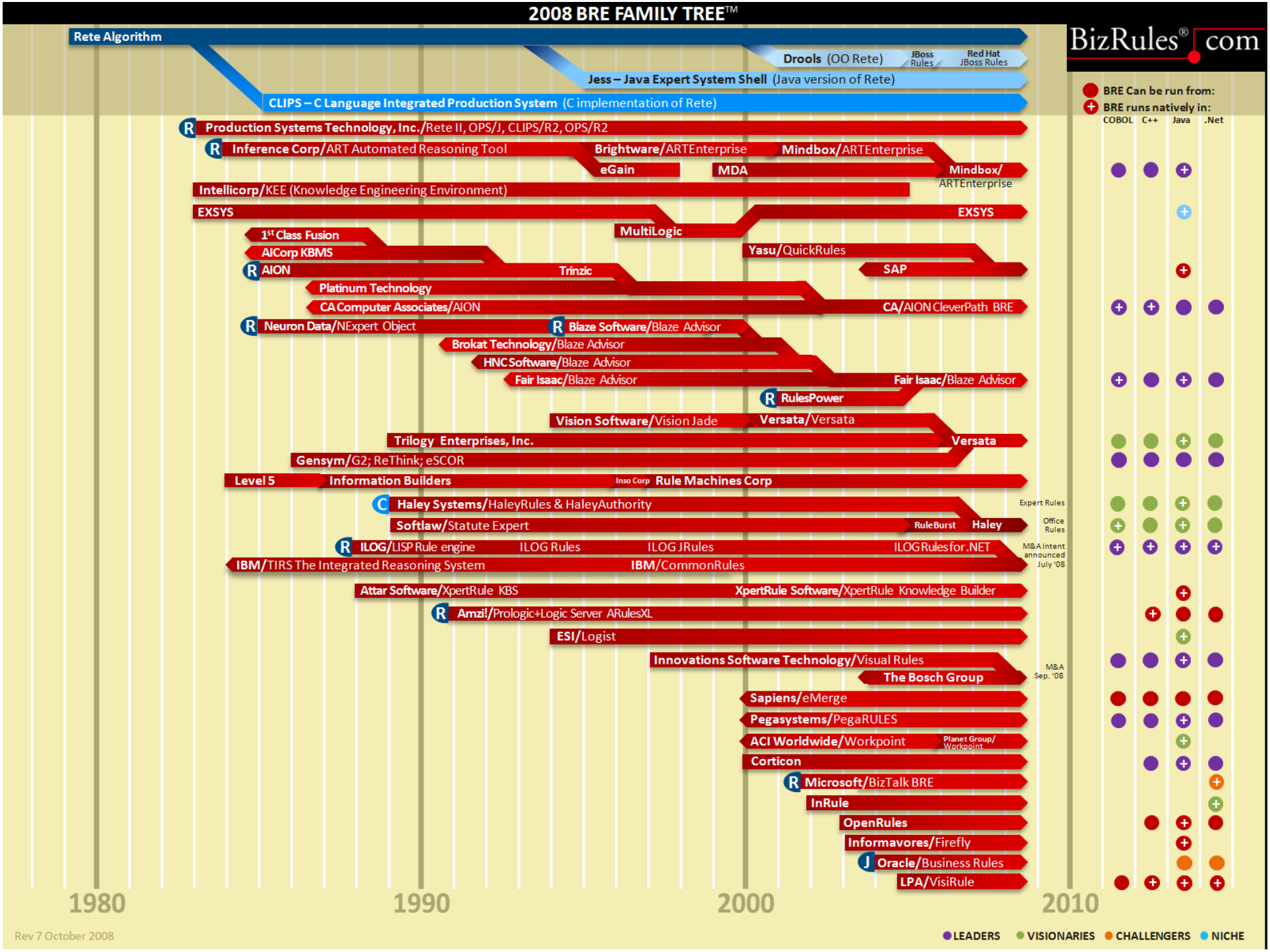
Complete "Business Rule Model" Architecture

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Drools (OO Rete)
JBoss Rules
Red Hat JBoss Rules
Jess – Java Expert System Shell (Java version of Rete)
CLIPS – C Language Integrated Production System (C implementation of Rete)
BRE Can be run from:
BRE runs natively in:
COBOL
C++
Java
.Net
Production Systems Technology, Inc./Rete II, OPS/J, CLIPS/R2, OPS/R2
Inference Corp/ART Automated Reasoning Tool
Brightware/ARTEnterprise
Mindbox/ARTEnterprise
eGain
MDA
Mindbox/ ARTEnterprise
Intellicorp/KEE (Knowledge Engineering Environment)
EXSYS
EXSYS
MultiLogic
1st Class Fusion
AICorp KBMS
Yasu/QuickRules
AION
Trinzic
SAP
Platinum Technology
CA Computer Associates/AION
CA/AION CleverPath BRE
Neuron Data/NExpert Object
Blaze Software/Blaze Advisor
Brokat Technology/Blaze Advisor
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RulesPower
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Trilogy Enterprises, Inc.
Versata
Gensym/G2; ReThink; eSCOR
Level 5
Information Builders
Inso Corp
Rule Machines Corp
Haley Systems/HaleyRules & HaleyAuthority
Expert Rules
Softlaw/Statute Expert
RuleBurst
Haley
Office Rules
ILOG/LISP Rule engine
ILOG Rules
ILOG JRules
ILOG Rules for .NET
M&A Intent announced July '08
IBM/TIRS The Integrated Reasoning System
IBM/CommonRules
Attar Software/XpertRule KBS
XpertRule Software/XpertRule Knowledge Builder
Amzi!/Prologic+Logic Server ARulesXL
ESI/Logist
Innovations Software Technology/Visual Rules
The Bosch Group
M&A Sep. '08
Sapiens/eMerge
Pegasystems/PegaRULES
ACI Worldwide/Workpoint
Planet Group/ Workpoint
Corticon
Microsoft/BizTalk BRE
InRule
OpenRules
Informavores/Firefly
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Traditional Procedural Language

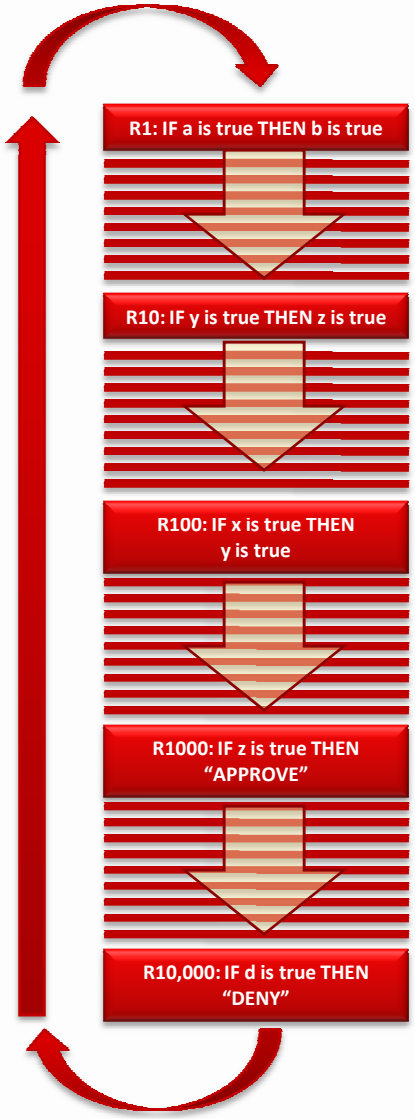
DATA:
X is TRUE

Loop #1
Ran 10,000 rules
1 rule fired
(R100)

Loop #2
Ran 10,000 rules
2 rules fired
(R10, R1000)

CONCLUSION:
Approve

Results
Ran 20,000 rules
Only 3 rules fired



Traditional Procedural language is sequential, forward only

Suppose your rules are out of order?
- Problems arise if sequence is incorrect

What if you have to add a new rule?
- Developer has to figure out what order to put it in
- Adding a new rule could break existing rules

Once you get an answer, the rest of the rules fire anyway

You have to loop a few times to get around sequence problem

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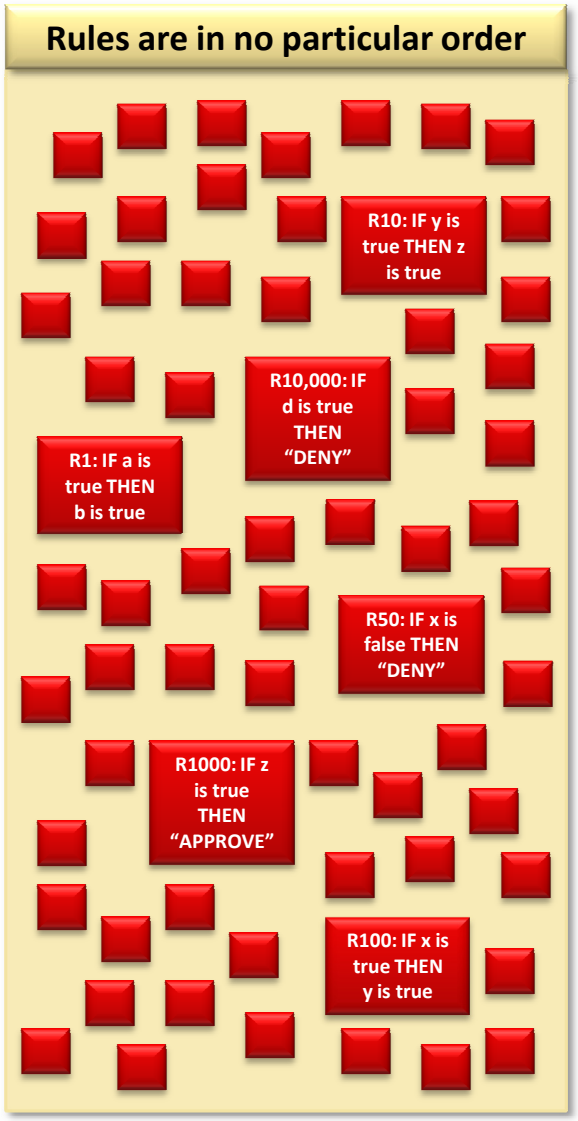
Declarative (Rule-based) Language

Cycle #1
Ran 2 rules
Fired 1 rule
(R100)

Cycle #2
Ran 1 rule
Fired 1 rule
(R10)

Cycle #3
Ran 1 rule
Fired 1 rule
(R1000)

Results
Search found
4 matching rules
Only 3 rules fired



DATA: X is TRUE

Search for rules that match the data
R50: IF x is false THEN "Deny"
R100: IF x is true THEN y is True
Execute those rules
R50 does not fire
R100 fires because x is true

DATA: X is TRUE
Y is TRUE

Search for rules that match the data
R10: IF y is true THEN z is True
Execute those rules
R10 fires because y is true

DATA: X is TRUE
Y is TRUE
Z is true

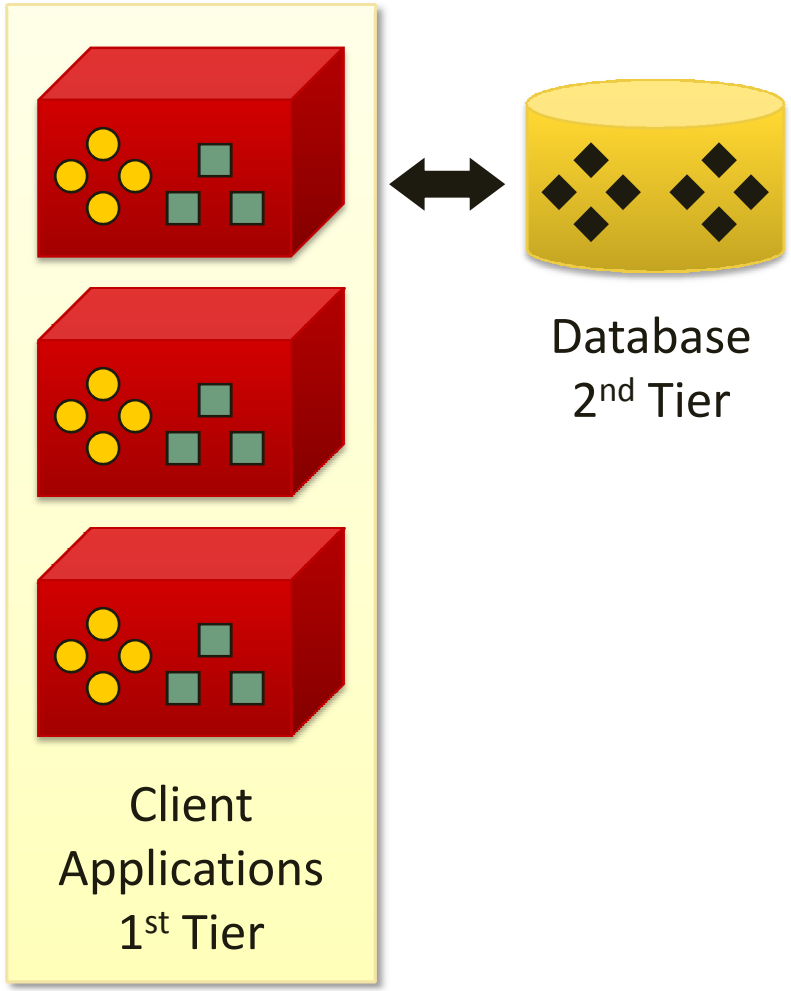
Search for rules that match the data
R1000: IF z is true THEN "APPROVE"
Execute those rules
R1000 fires because z is true

CONCLUSION: APPROVE

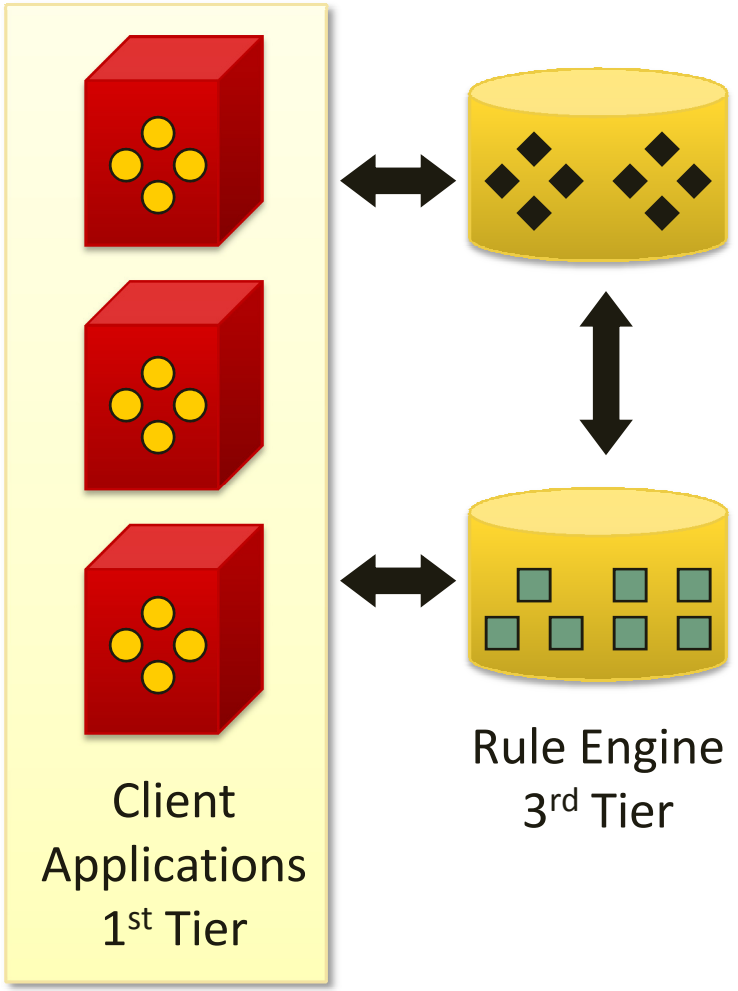
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Traditional approach using hard-coded rules



Modern approach using business rules



Code Business Rules Data

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Benefits of centralizing rules in one rulebase

- **Can take a broader view of the customer**
  - **If you just cancelled my policy…**
  - **If you just raised my premium…**
  - **If you just lost my luggage…**

  …stop sending me email or text messages with special offers for a while → I'm not happy with you right now

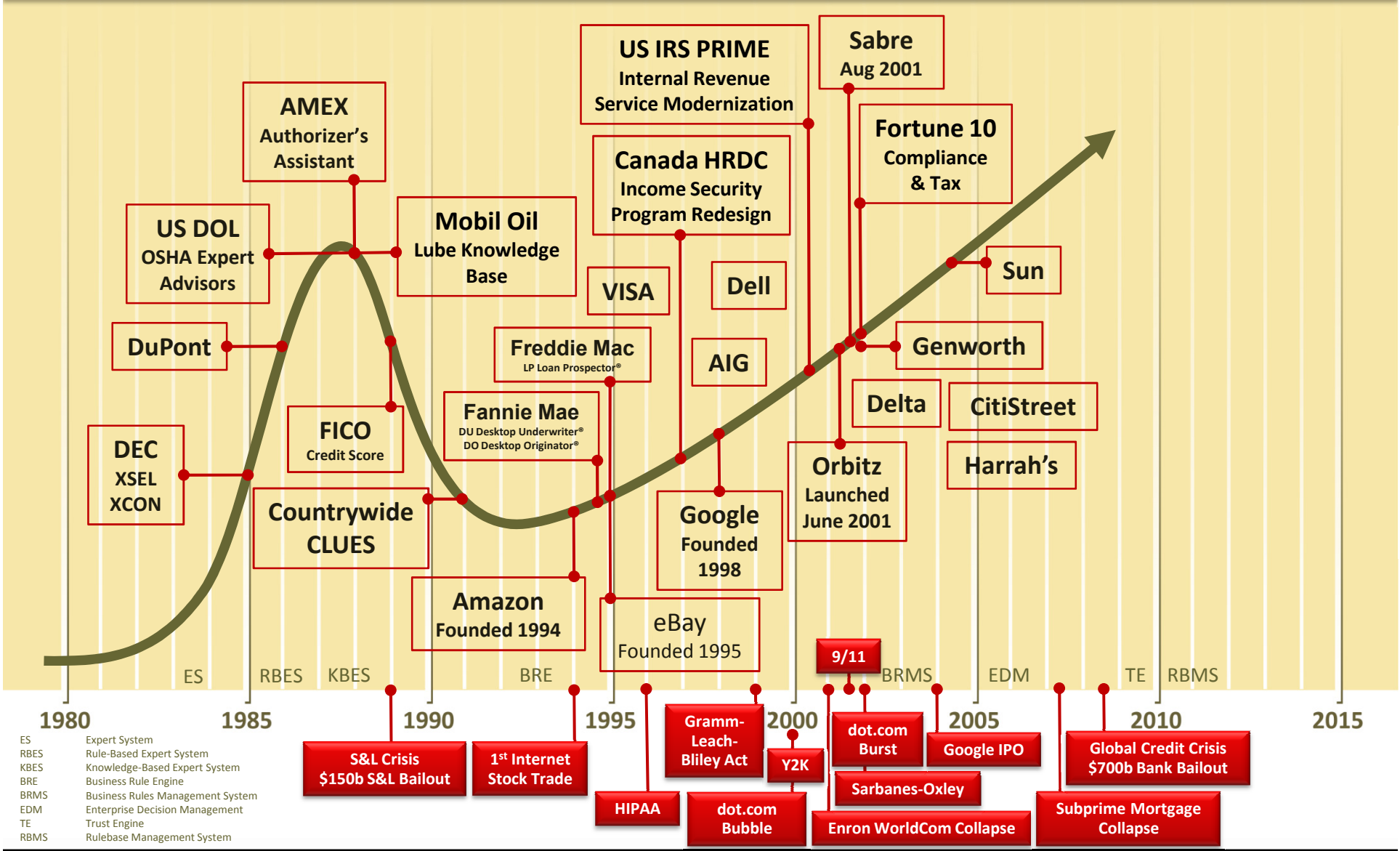
- Less code
- Easier maintenance ($6/$1)
- Faster time to market
- … etc…

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Who uses rules technology?

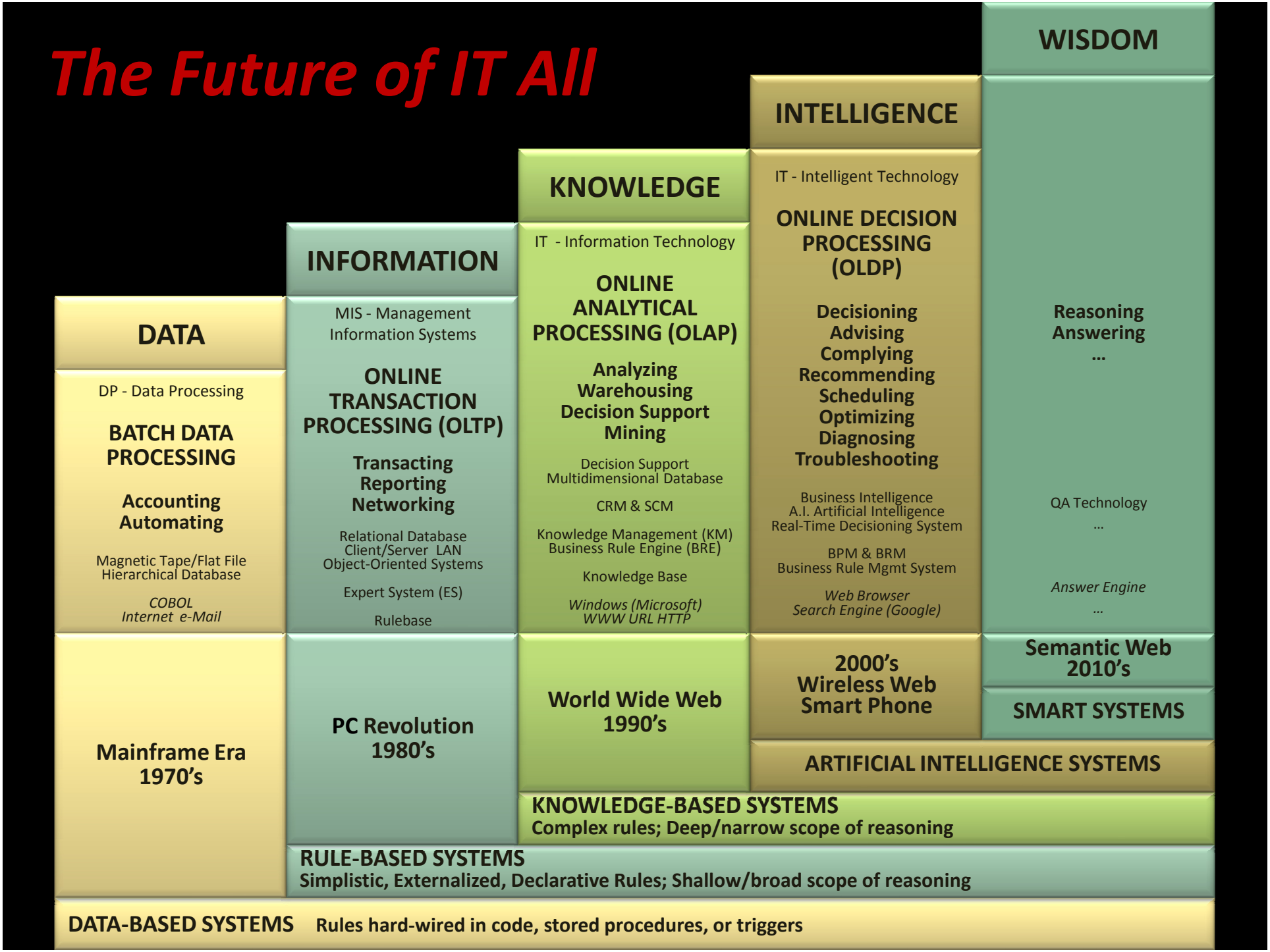
A.I. Expert Systems, Rulebase, and Knowledgebase Case Studies



ES	Expert System
RBES	Rule-Based Expert System
KBES	Knowledge-Based Expert System
BRE	Business Rule Engine
BRMS	Business Rules Management System
EDM	Enterprise Decision Management
TE	Trust Engine
RBMS	Rulebase Management System

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The Future of IT All



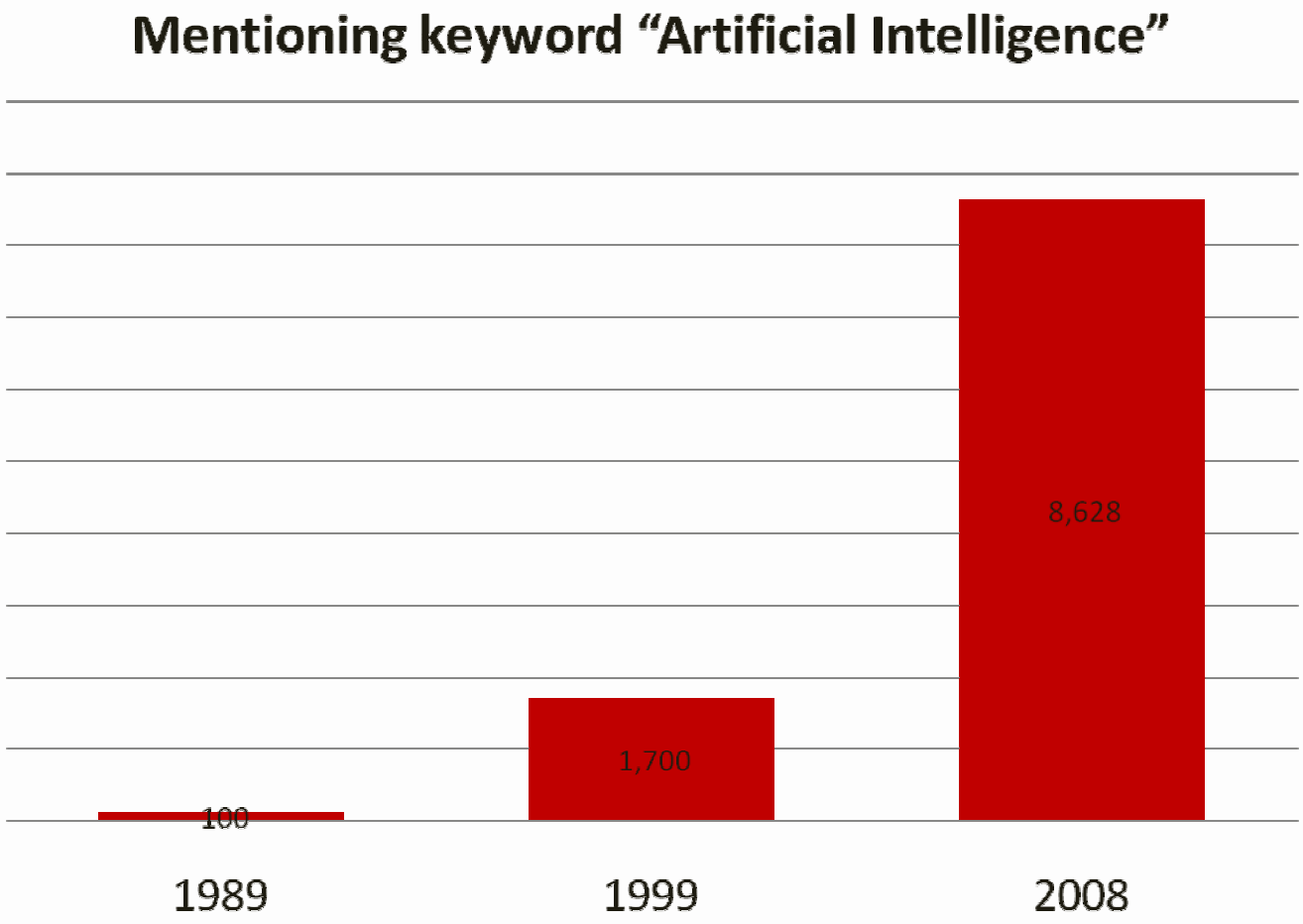
What is the difference between data-based, rule-based, and knowledge-based systems?

	Data-Based System	Rule-Based System	Knowledge-Based System
Can process	Data	Data Rules	Data Rules Knowledge
Can output	Information	Information Decisions Real-Time Decisions	Information Decisions Answers Expert Advice Recommendations
Commonly implemented using	"Hard-coded rules" Procedural languages	"Rule-based" Declarative languages Deterministic	Fuzzy Logic, CBR, Probabilistic reasoning, other AI/ES techniques
Ideal for	IT/System rules Application rules	Simplistic business rules	Complex business rules
Best for these types of applications	Transacting Reporting (Traditional information systems)	Decisioning Compliance	Advising Product selection Recommending Troubleshooting
Intelligence Capability	Not intelligent	Shallow logic Broad domains	Deep Logic Narrow domain

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Number of US Patents



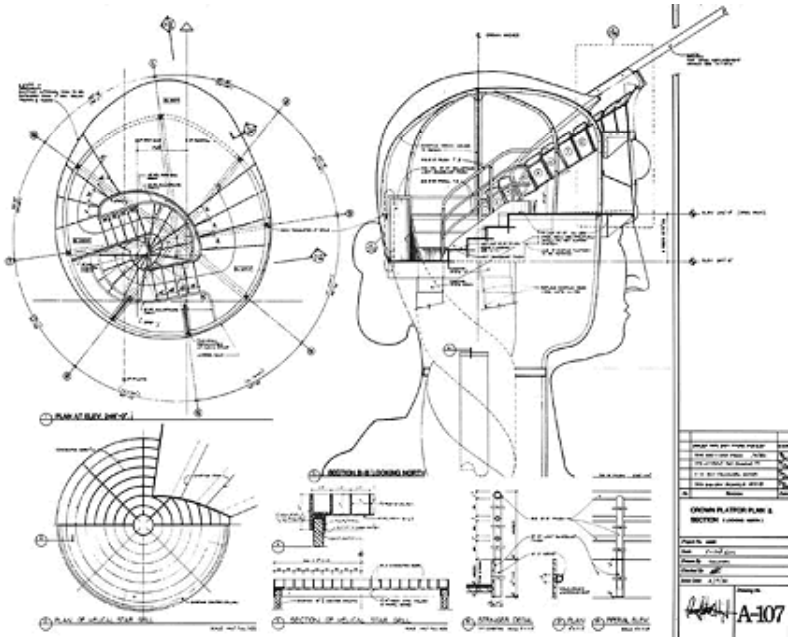
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Framework for building and designing systems that *work*, *change*, and *last*

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Architecture
Engineering
Idea
Logical
Representation



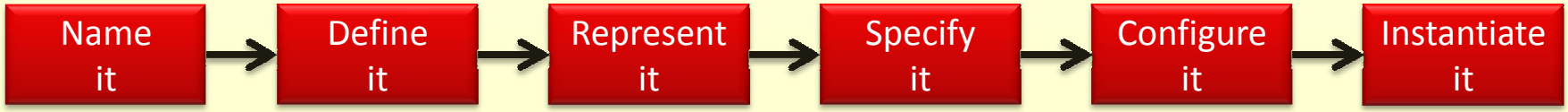
The result of architecture
Design & Build
Implementation
Physical
Instantiation



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A general framework for building any system

Architecture → Engineering → Design → Build



Lack of specificity in one step leads to ambiguity in the next steps…

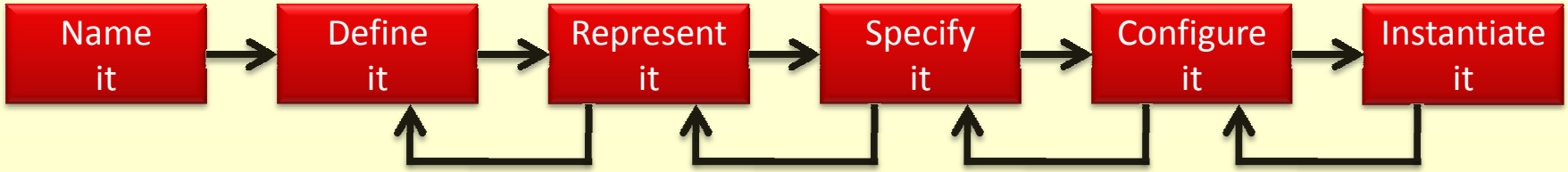
Lack of quality in one step leads to mistakes in the next steps…

Lack of completeness in one step leads to gaps in the next steps…

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A general framework for *building* any system

Architecture → Engineering → Design → Build



Lack of specificity in one step leads to ambiguity in the next steps…

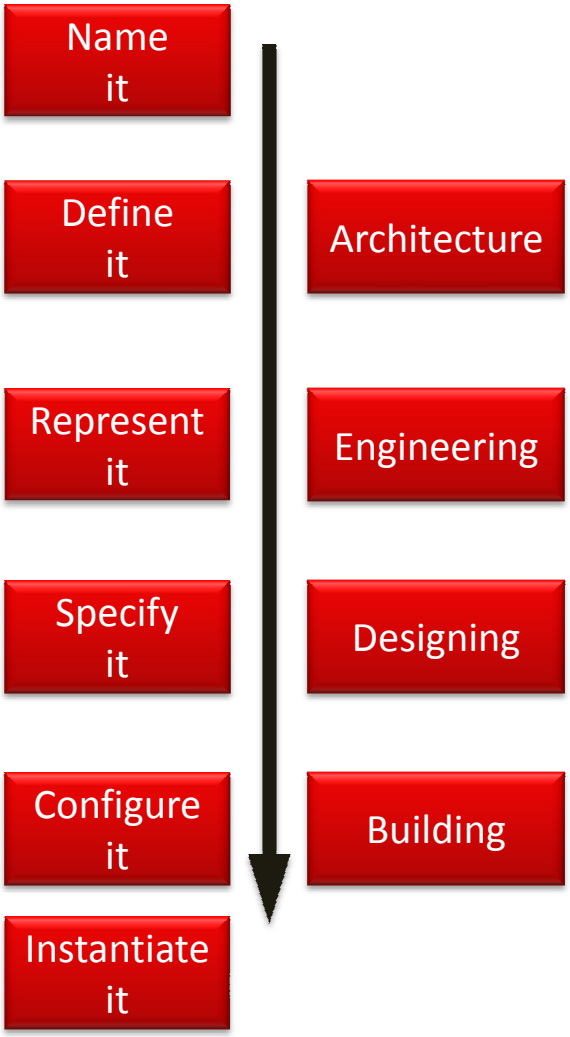
Lack of quality in one step leads to mistakes in the next steps…

Lack of completeness in one step leads to gaps in the next steps…

and thus the need for reiteration & rework in the process

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A general framework for *building* any system



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Enterprise Architecture – A Framework™

	DATA *What*	FUNCTION *How*	NETWORK *Where*	PEOPLE *Who*	TIME *When*	MOTIVATION *Why*	
SCOPE (CONTEXTUAL) *Planner*	List of Things Important to the Business ENTITY = Class of Business Thing	List of Processes the Business Performs Function = Class of Business Process	List of Locations in which the Business Operates Node = Major Business Location	List of Organizations Important to the Business People = Major Organizations	List of Events Significant to the Business Time = Major Business Event	List of Business Goals/Strat Ends/Means=Major Bus. Goal/ Critical Success Factor	SCOPE (CONTEXTUAL) *Planner*
ENTERPRISE MODEL (CONCEPTUAL) *Owner*	e.g. Semantic Model Ent = Business Entity Reln = Business Relationship	e.g. Business Process Model Proc. = Business Process I/O = Business Resources	e.g. Business Logistics Node = Business Location Link = Business Linkage	e.g. Work Flow Model People = Organization Unit Work = Work Product	e.g. Master Schedule Time = Business Event Cycle = Business Cycle	e.g. Business Plan End = Business Objective Means = Business Strategy	ENTERPRISE MODEL (CONCEPTUAL) *Owner*
SYSTEM MODEL (LOGICAL) *Designer*	e.g. Logical Data Model Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture Proc.= Application Function I/O = User Views	e.g. Distributed System Architecture Node = (Processor, Storage, etc) Link = Line Characteristics	e.g. Human Interface Architecture People = Role Work = Deliverable	e.g. Processing Structure Time = System Event Cycle = Processing Cycle	e.g., Business Rule Model End = Structural Assertion Means =Action Assertion	SYSTEM MODEL (LOGICAL) *Designer*
TECHNOLOGY MODEL (PHYSICAL) *Builder*	e.g. Physical Data Model Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture People = User Work = Screen Format	e.g. Control Structure Time = Execute Cycle = Component Cycle	e.g. Rule Design End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) *Builder*
DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*	e.g. Data Definition Ent = Field	e.g. Program Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture Node = Addresses Link = Protocols	e.g. Security Architecture People = Identity Work = Job	e.g. Timing Definition Time = Interrupt Cycle = Machine Cycle	e.g. Rule Specification End = Sub-condition Means = Step	DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*
FUNCTIONING ENTERPRISE		e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

Name it

Define it

Represent it

Specify it

Configure it

Instantiate it

Architecture

Engineering

Designing

Building

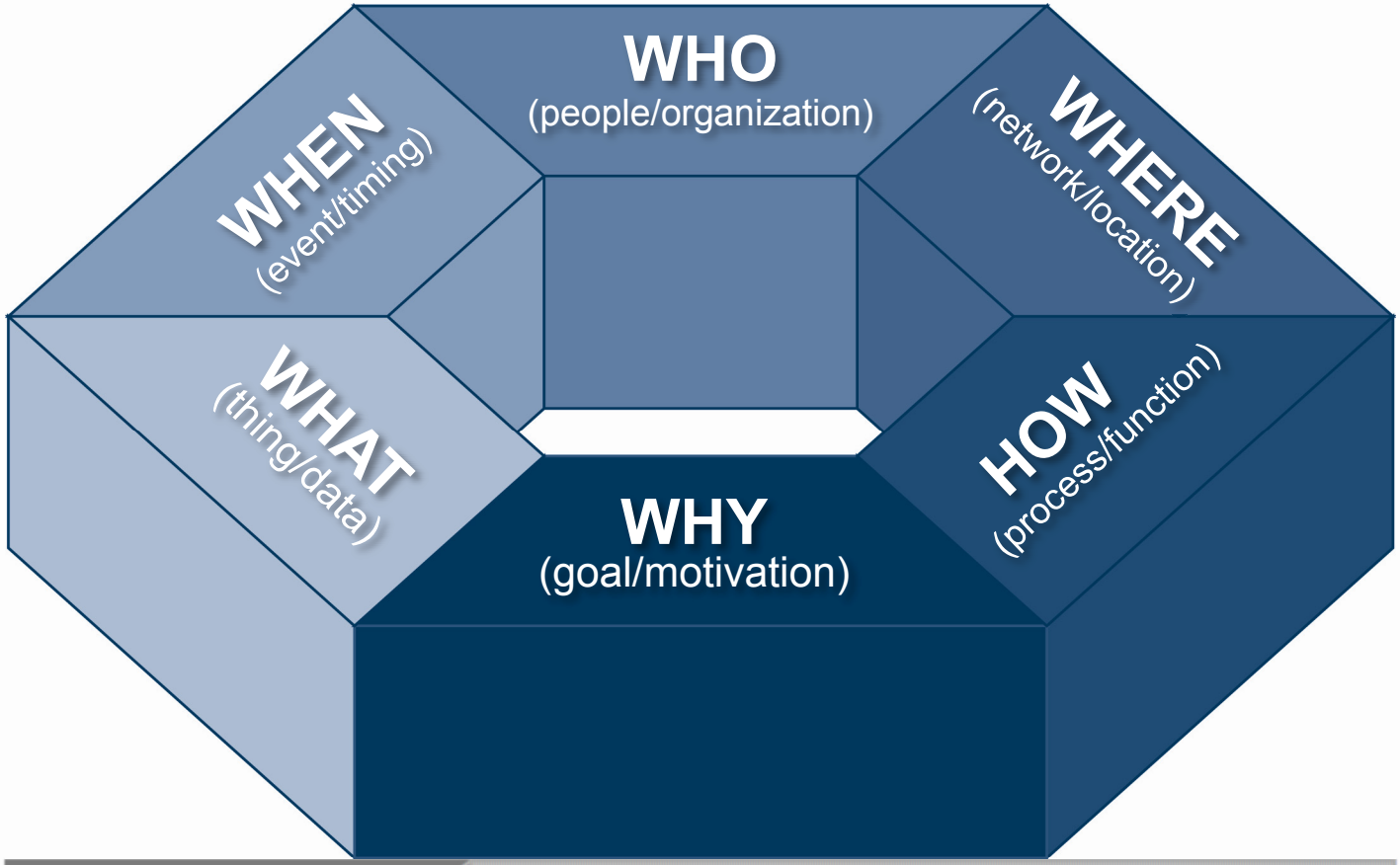
Enterprise Architecture – A Framework™

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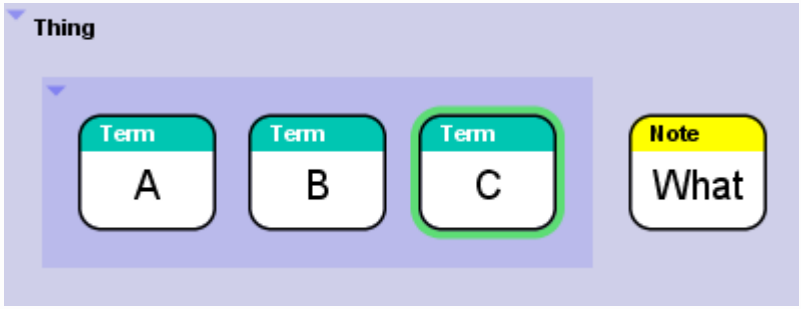
A general framework for *designing* any system



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Data / What

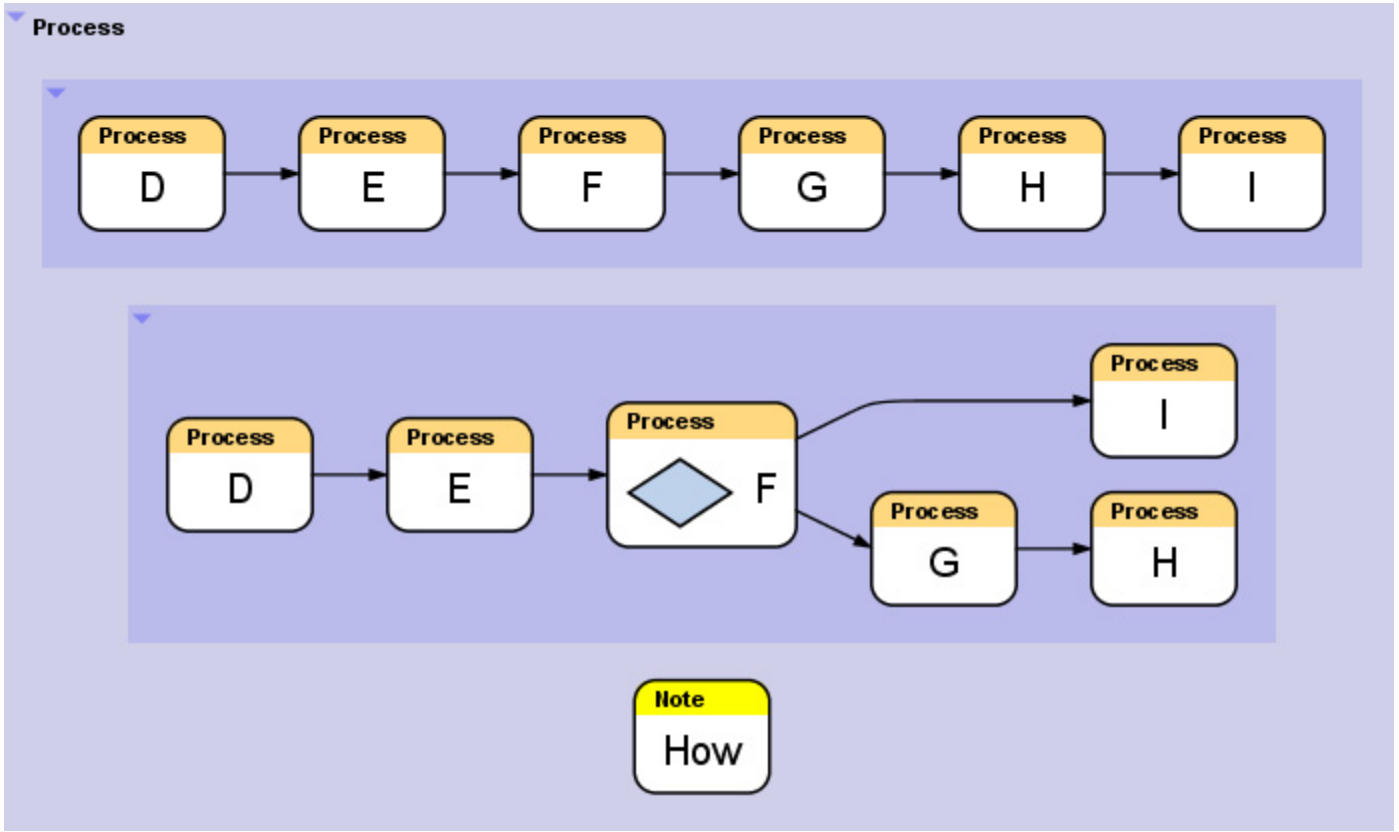
- Things
- Inventory sets



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Process / How

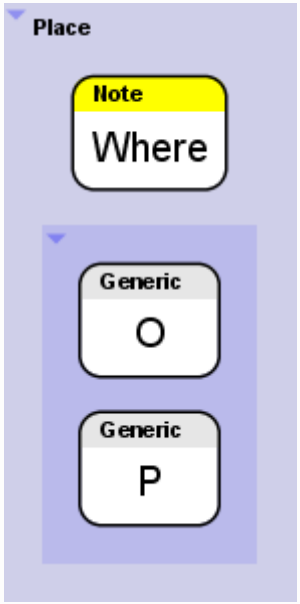
- Process transformations



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Place / Where

- Transportations
- Locations
- Network nodes

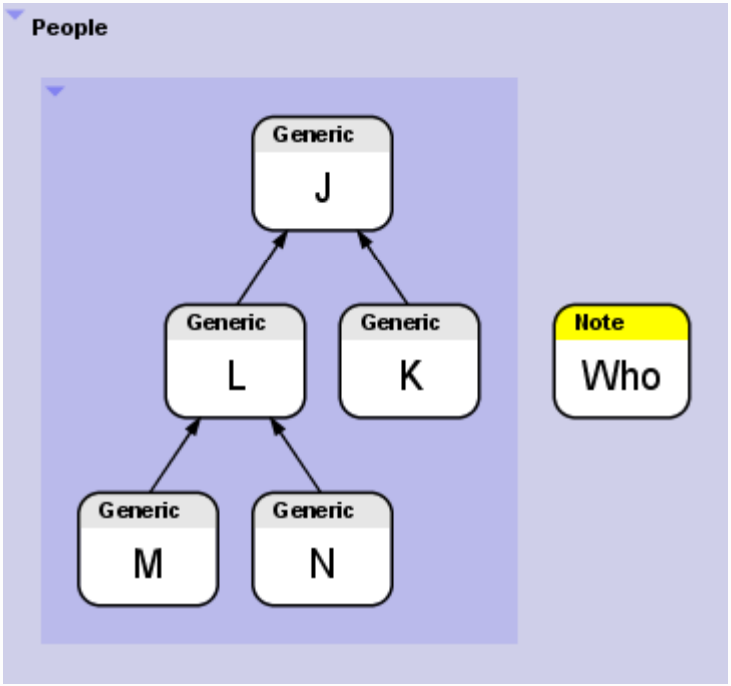


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People / Who

- Organization Groups



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Event / When

- Timing periods
- Master schedules
- Deadlines
- Due dates

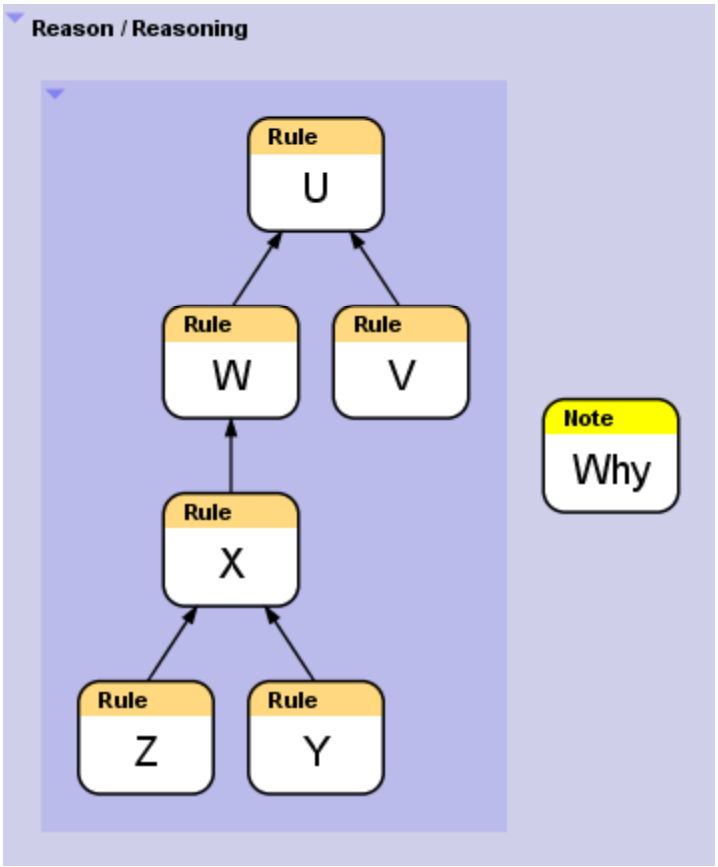


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Reasons / Why

- Motivation reasons
- Reasoning
- Strategy
- Mission
- Goals
- Objectives



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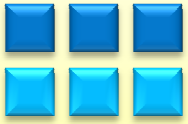
Enterprise architecture ensures that all the parts of the business system connect, fit, and work

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Data



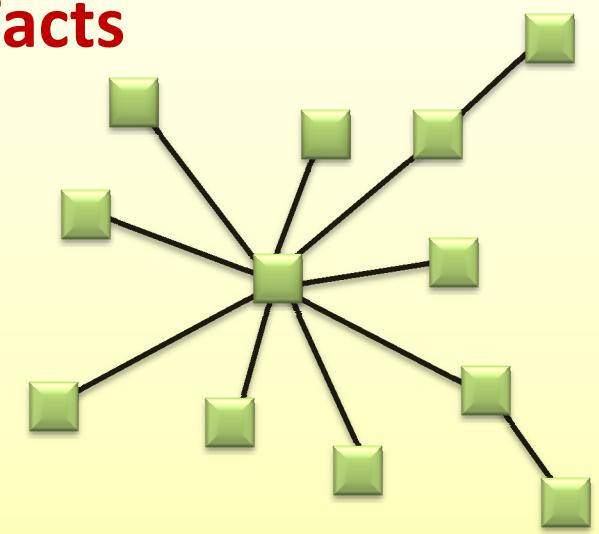
Rules



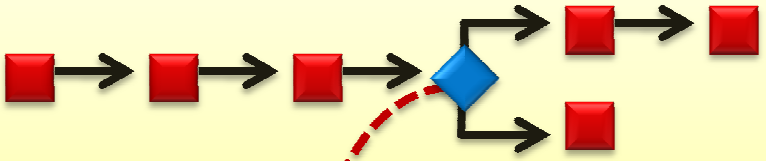
Terms



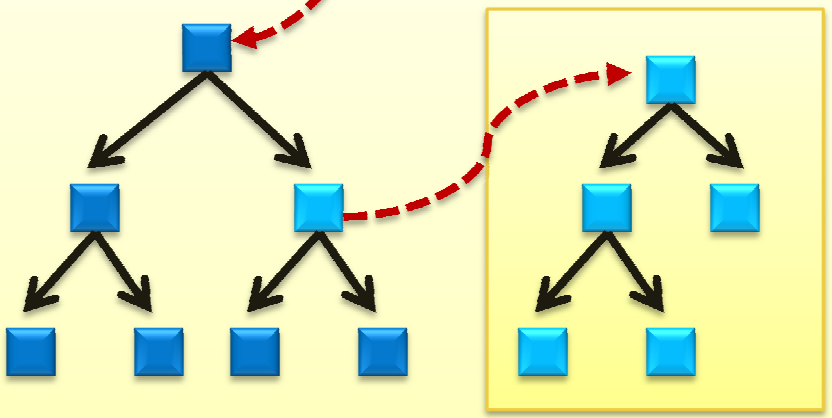
Facts



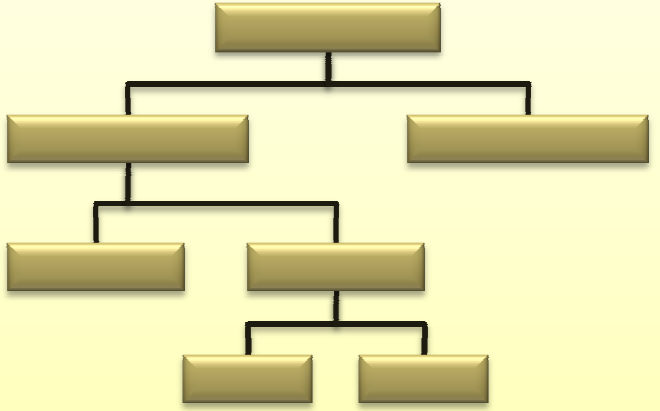
Process



Ruleset



Rulebase Hierarchy

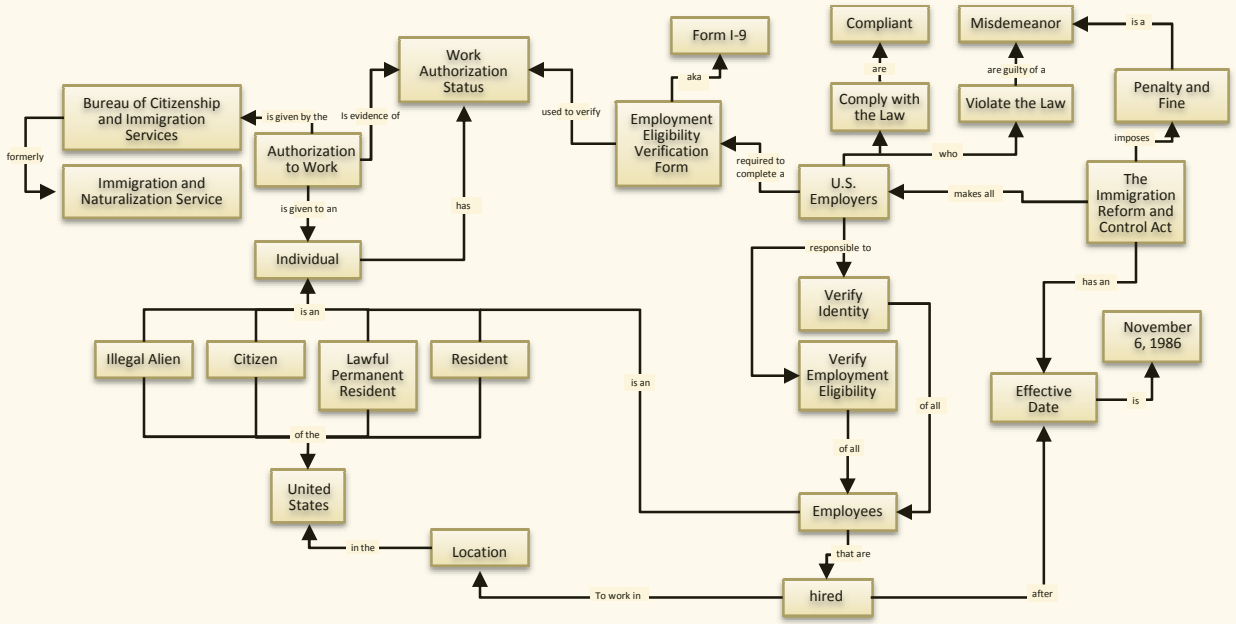


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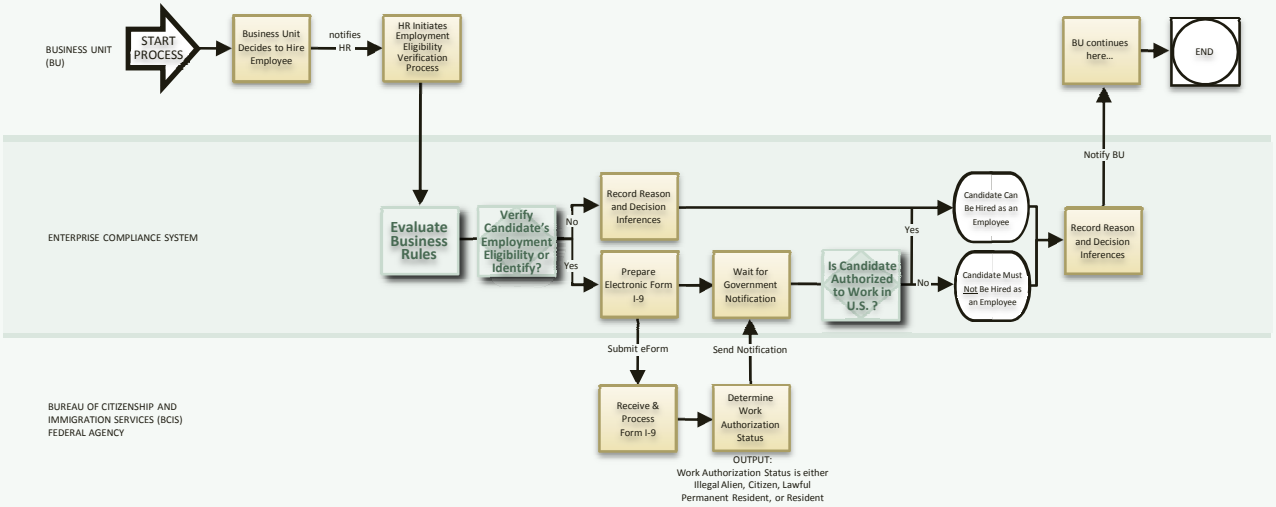
BIZRULES® RULEMAP™ EXAMPLE

GLOBAL ENTITY MANAGEMENT: U.S. EMPLOYER COMPLIANCE RULES

Employment Eligibility Verification BUSINESS MAP (FACT MODEL)



DIGITIZED PROCESS (BUSINESS PROCESS MODEL)



TERMS

Authorization To Work
Illegal Alien
Individual
U.S. Citizen
Lawful Permanent Resident
Bureau of Citizenship and Immigration Services
U.S. Employers
Employing
Employment Eligibility
Identify
Employees
Hired to Work
Employment Eligibility Verification Form (Form I-9)
Work Authorization Status
Guilty
Misdemeanor

FACTS

An Illegal Alien is an individual, who is not a Citizen or a Lawful Permanent Resident and who has not been given Authorization To Work by the Bureau of Citizenship and Immigration Services (formerly, the Immigration and Naturalization Service).

GOVERNING RULES

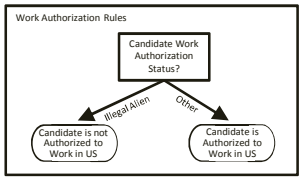
U.S. Employers must verify the Employment Eligibility and Identify of all Employees Hired to Work in the United States after November 6, 1986.

Employers are required to complete Employment Eligibility Verification Forms (Form I-9) for all Employees, including U.S. Citizens.

Anyone Employing an Illegal Alien without Verifying his or her Work Authorization Status is Guilty of a Misdemeanor.

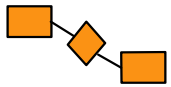
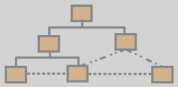
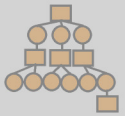
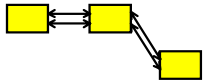
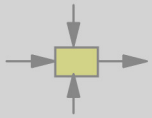
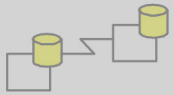
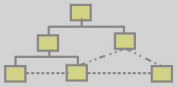
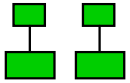
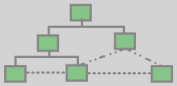
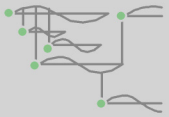
BUSINESS RULES

Corporate / External / Compliance Rules Business Rules for Employment Eligibility		RULE NO. 1	2	3	4	5
NOTES	IF					
	Company is _____	a US Employer	not a US Employer	-	-	-
	Company wants to hire an _____	Employee	-	Con-tractor	-	-
	Candidate Work Location is _____	In the US	-	-	Outside the US	-
	Candidate Hire Date is _____ Nov. 6, 1986	After	-	-	-	On or before
	THEN					
Submit I-9 form	Company must verify Candidate's Employment Eligibility	Yes	No	No	No	No
	Company must verify Candidate's Identity	Yes	No	No	No	No



Source: This is from a BIZRULES presentation archived on the Web at http://bizrules.info/files/bizrules-brf2005orl.pdf.

Terms and Facts

	DATA *What*	FUNCTION *How*	NETWORK *Where*	PEOPLE *Who*	TIME *When*	MOTIVATION *Why*	
SCOPE (CONTEXTUAL) *Planner*	List of Things Important to the Business  ENTITY = Class of Business Thing	List of Pro… Busines… Function = Business Process	Location	List of Organizations Important to the Business  People = Major Organizations	List of Events Significant to the Business  Time = Major Business Event	List of Business Goals/Strat  Ends/Means=Major Bus. Goal/ Critical Success Factor	SCOPE (CONTEXTUAL) *Planner*
ENTERPRISE MODEL (CONCEPTUAL) *Owner*	e.g. Semantic Model  Ent = Business Entity Reln = Business Relationship	e.g. Busi… Proc. = B… I/O = Business Resources	Link = Business Linkage	e.g. Work Flow Model  People = Organization Unit Work = Work Product	e.g. Master Schedule  Time = Business Event Cycle = Business Cycle	e.g. Business Plan  End = Business Objective Means = Business Strategy	ENTERPRISE MODEL (CONCEPTUAL) *Owner*
SYSTEM MODEL (LOGICAL) *Designer*	e.g. Logical Data Model  Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture  Proc .= Application Function I/O = User Views	e.g. Distributed System Architecture  Node = I/S Function (Processor, Storage, etc) Link = Line Characteristics	e.g. Human Interface Architecture  People = Role Work = Deliverable	e.g. Processing Structure  Time = System Event Cycle = Processing Cycle	e.g., Business Rule Model  End = Structural Assertion Means =Action Assertion	SYSTEM MODEL (LOGICAL) *Designer*
TECHNOLOGY MODEL (PHYSICAL) *Builder*	e.g. Physical Data Model  Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design  Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture  Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture  People = User Work = Screen Format	e.g. Control Structure  Time = Execute Cycle = Component Cycle	e.g. Rule Design  End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) *Builder*
DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*	e.g. Data Definition  Ent = Field Reln = Address	e.g. Program  Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture  Node = Addresses Link = Protocols	e.g. Security Architecture  People = Identity Work = Job	e.g. Timing Definition  Time = Interrupt Cycle = Machine Cycle	e.g. Rule Specification  End = Sub-condition Means = Step	DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

Terms

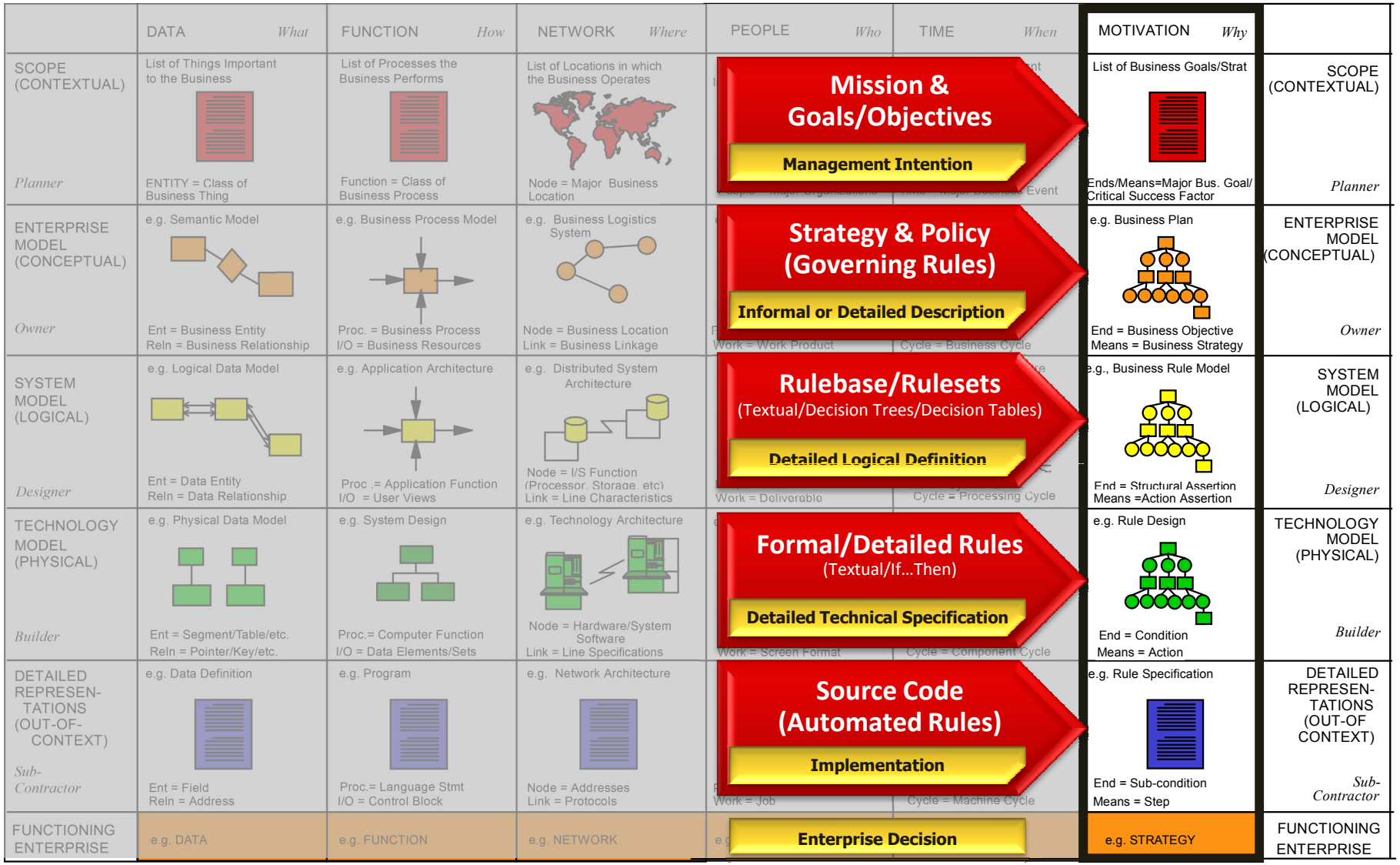
Facts & Fact Models

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Goals, Rules and Decisions

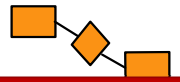
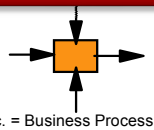
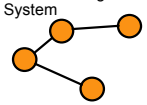
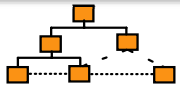
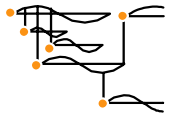
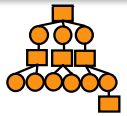
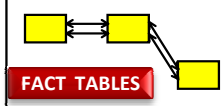
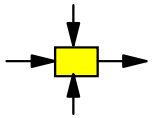
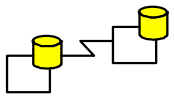
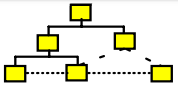
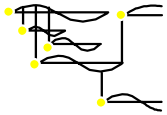
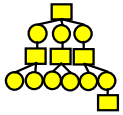
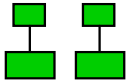
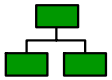
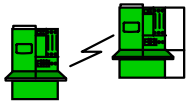
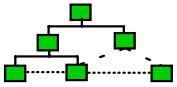
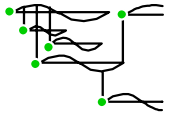
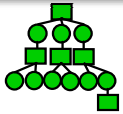


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How do business rules fit into the Enterprise Architecture?

	DATA *What*	FUNCTION *How*	NETWORK *Where*	PEOPLE *Who*	TIME *When*	MOTIVATION *Why*	
SCOPE (CONTEXTUAL) *Planner*	**TERMS**  ENTITY = Class of Business Thing	List of Processes the Business Performs  Function = Class of Business Process	List of Locations in which the Business Operates  Node = Major Business Location	List of Organizations Important to the Business  People = Major Organizations	List of Events Significant to the Business  Time = Major Business Event	**MISSION & GOALS**  Ends/Means=Major Bus. Goal/ Critical Success Factor	SCOPE (CONTEXTUAL) *Planner*
ENTERPRISE MODEL (CONCEPTUAL) *Owner*	e.g. Semantic Model  **FACT MODELS** Ent = Business Entity Reln = Business Relationship	**BUSINESS PROCESS MODELS**  Proc. = Business Process I/O = Business Resources	e.g. Business Logistics System  Node = Business Location Link = Business Linkage	**WORK FLOW MODELS**  People = Organization Unit Work = Work Product	e.g. Master Schedule  Time = Business Event Cycle = Business Cycle	**GOVERNING RULES**  End = Business Objective Means = Business Strategy	ENTERPRISE MODEL (CONCEPTUAL) *Owner*
SYSTEM MODEL (LOGICAL) *Designer*	e.g. Logical Data Model  **FACT TABLES** Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture  Proc .= Application Function I/O = User Views	e.g. Distributed System Architecture  Node = I/S Function (Processor, Storage, etc) Link = Line Characteristics	**USER INTERFACE ARCHITECTURE**  People = Role Work = Deliverable	e.g. Processing Structure  Time = System Event Cycle = Processing Cycle	**BUSINESS RULE MODELS**  End = Structural Assertion Means =Action Assertion	SYSTEM MODEL (LOGICAL) *Designer*
TECHNOLOGY MODEL (PHYSICAL) *Builder*	e.g. Physical Data Model  Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design  Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture  Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture  People = User Work = Screen Format	e.g. Control Structure  Time = Execute Cycle = Component Cycle	**RULE DESIGNS**  End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) *Builder*
DETAILED REPRESEN-TATIONS (OUT-OF-CONTEXT) *Sub-Contractor*	e.g. Data Definition  Ent = Field Reln = Address	e.g. Program  Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture  Node = Addresses Link = Protocols	e.g. Security Architecture  People = Identity Work = Job	e.g. Timing Definition  Time = Interrupt Cycle = Machine Cycle	**RULE SPECIFICATIONS**  End = Sub-condition Means = Step	DETAILED REPRESEN-TATIONS (OUT-OF CONTEXT) *Sub-Contractor*
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

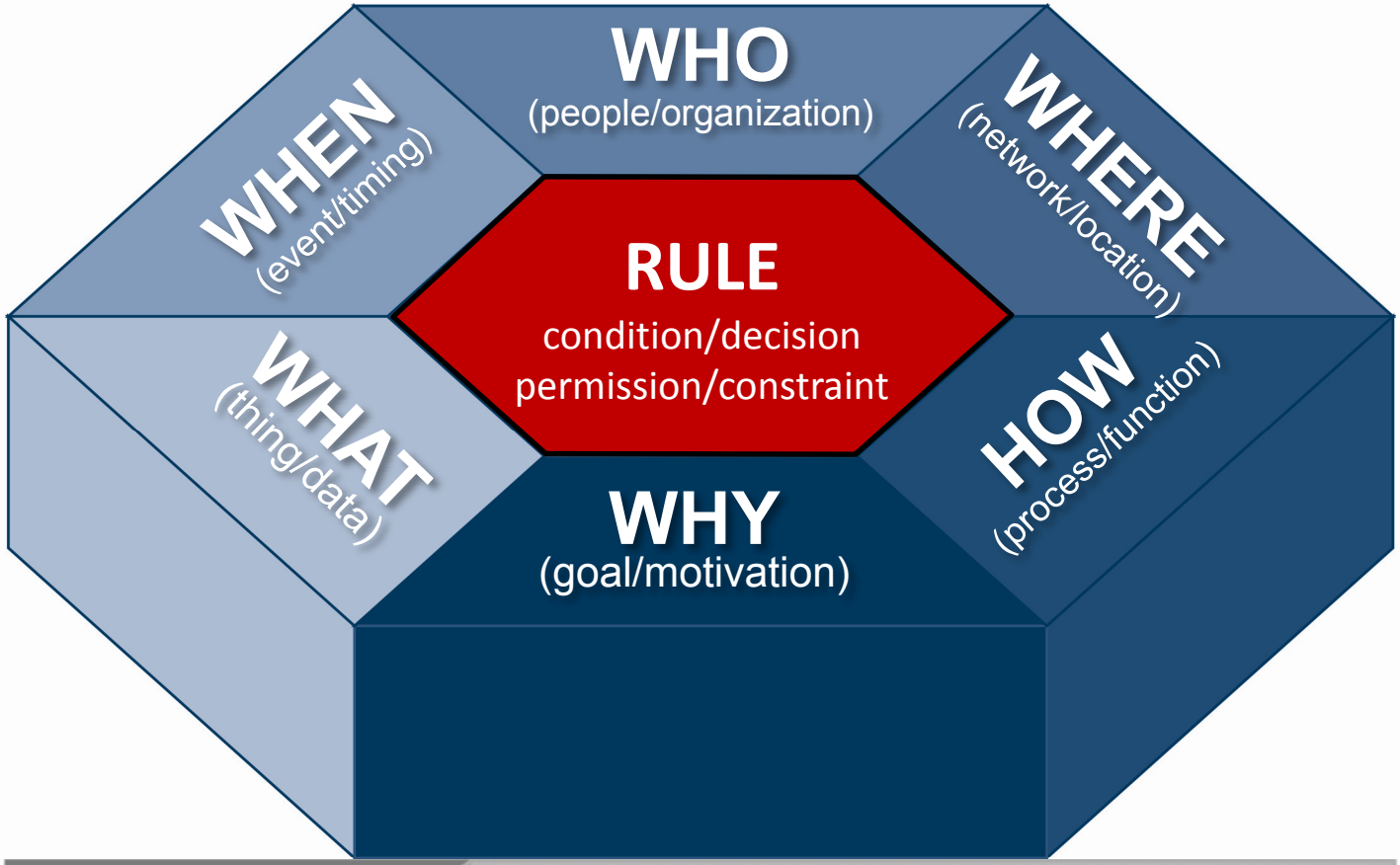
If [Conditions] Then [Actions] [Goals]

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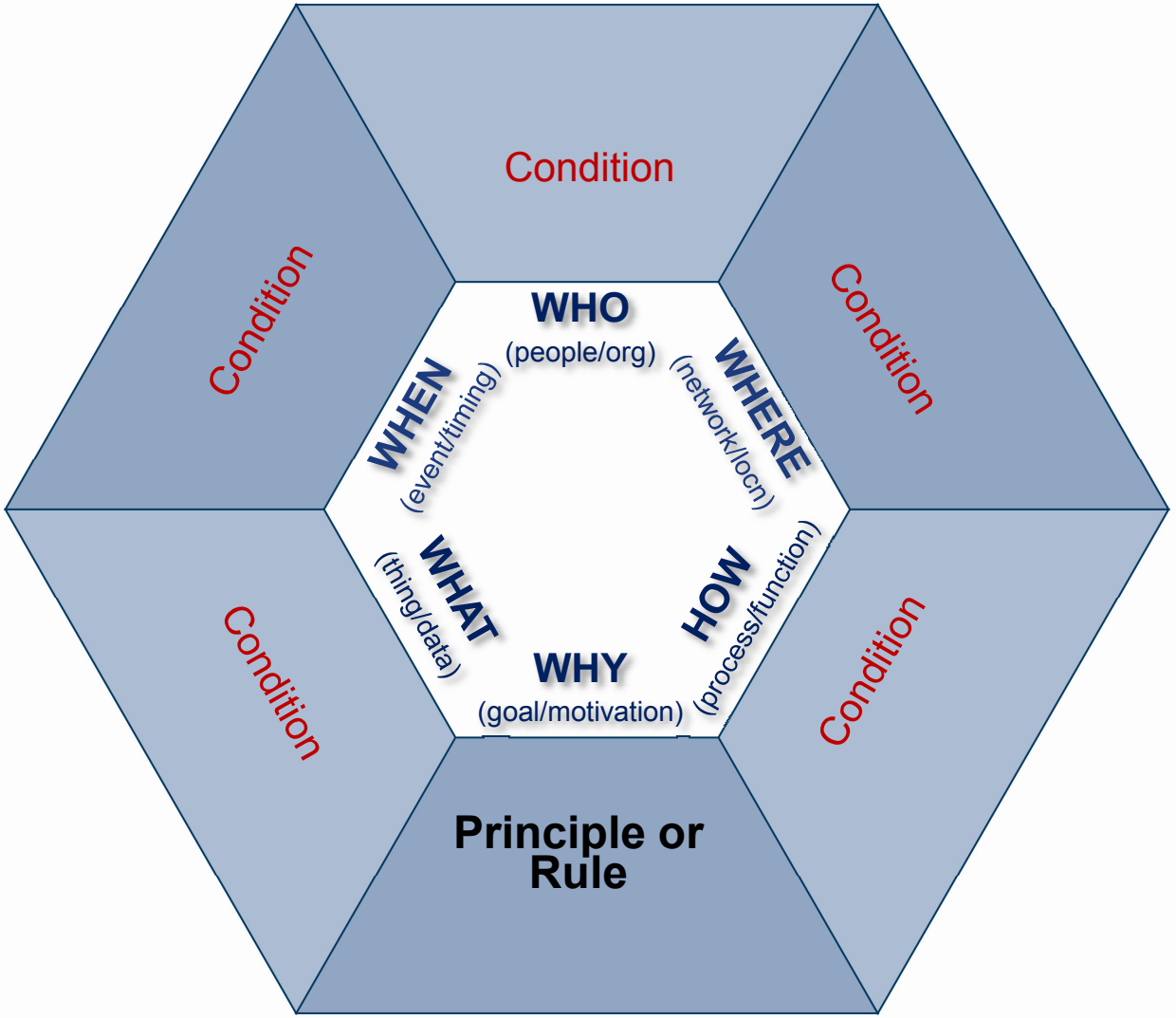
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A general framework for designing rules



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General Rule Pattern



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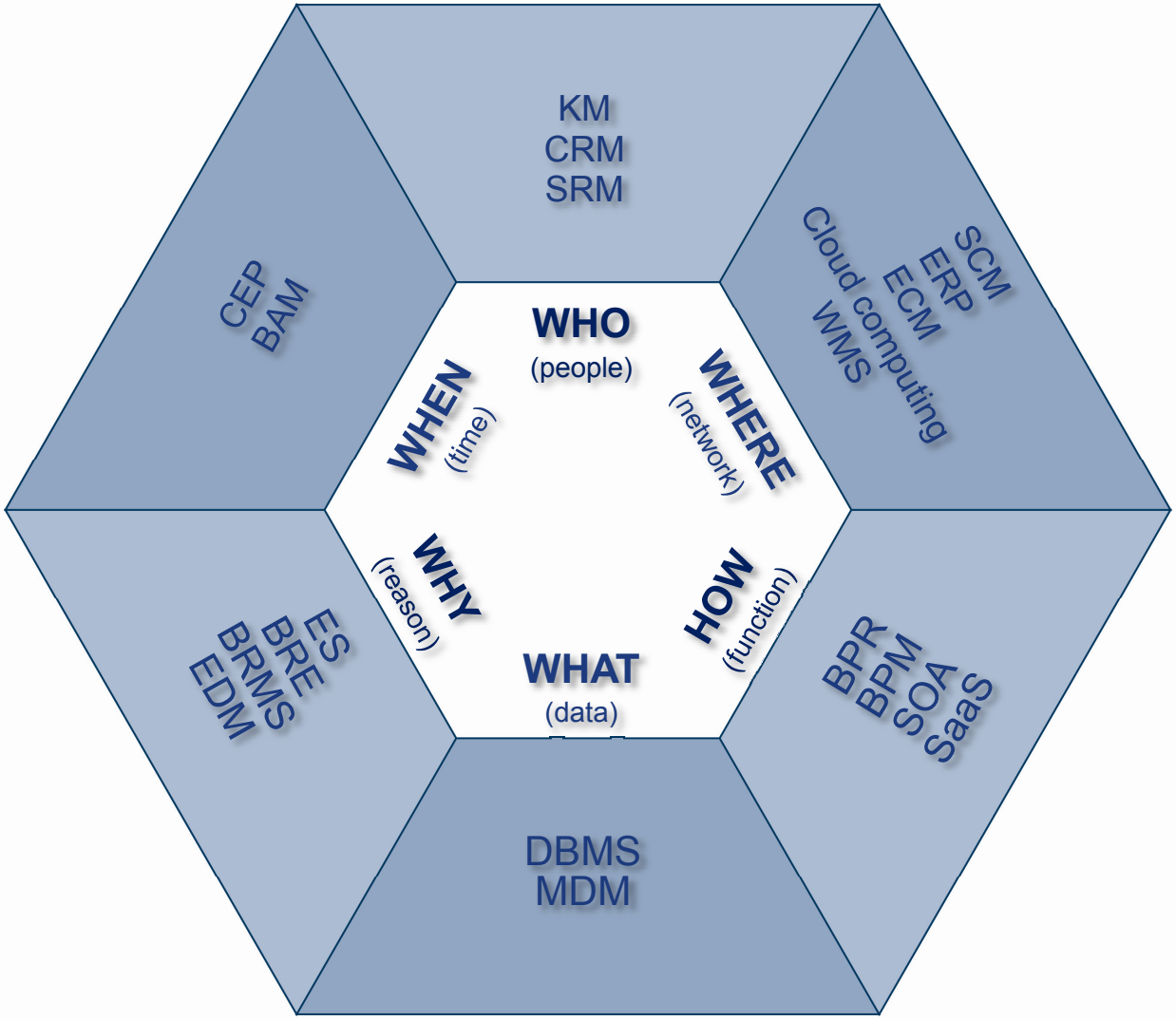
Security Rule Pattern



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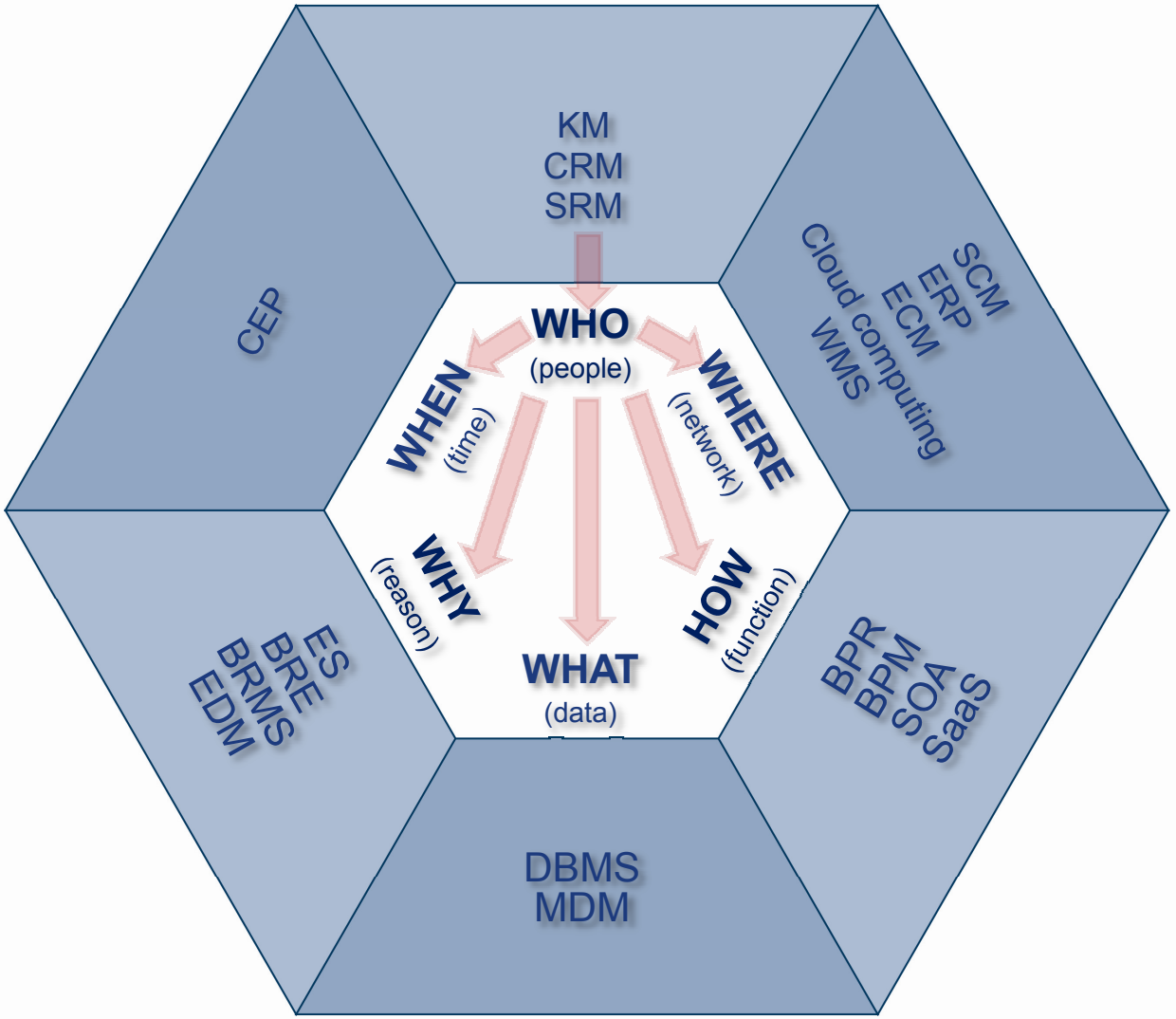
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Technology Integration and Architecture™



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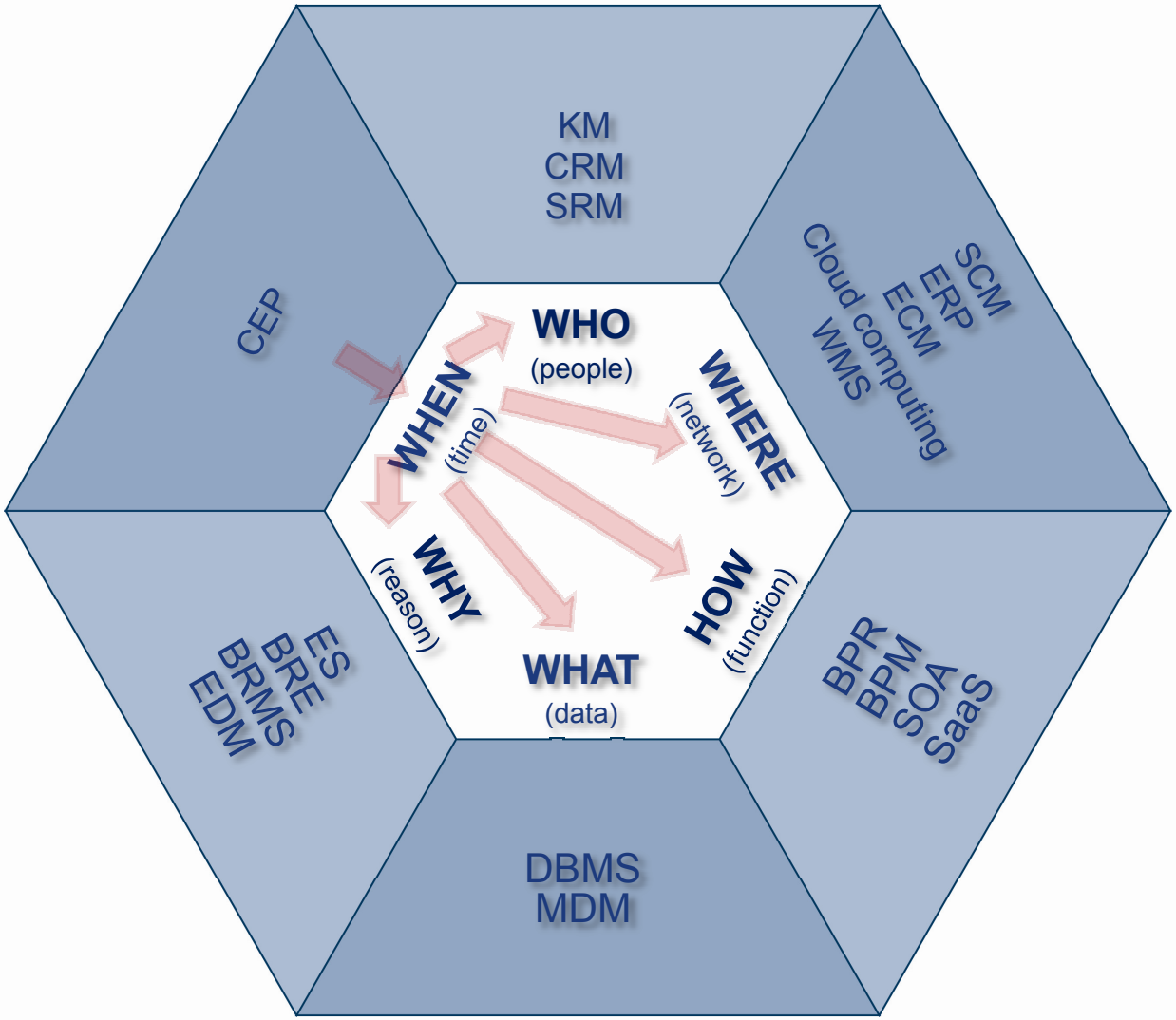
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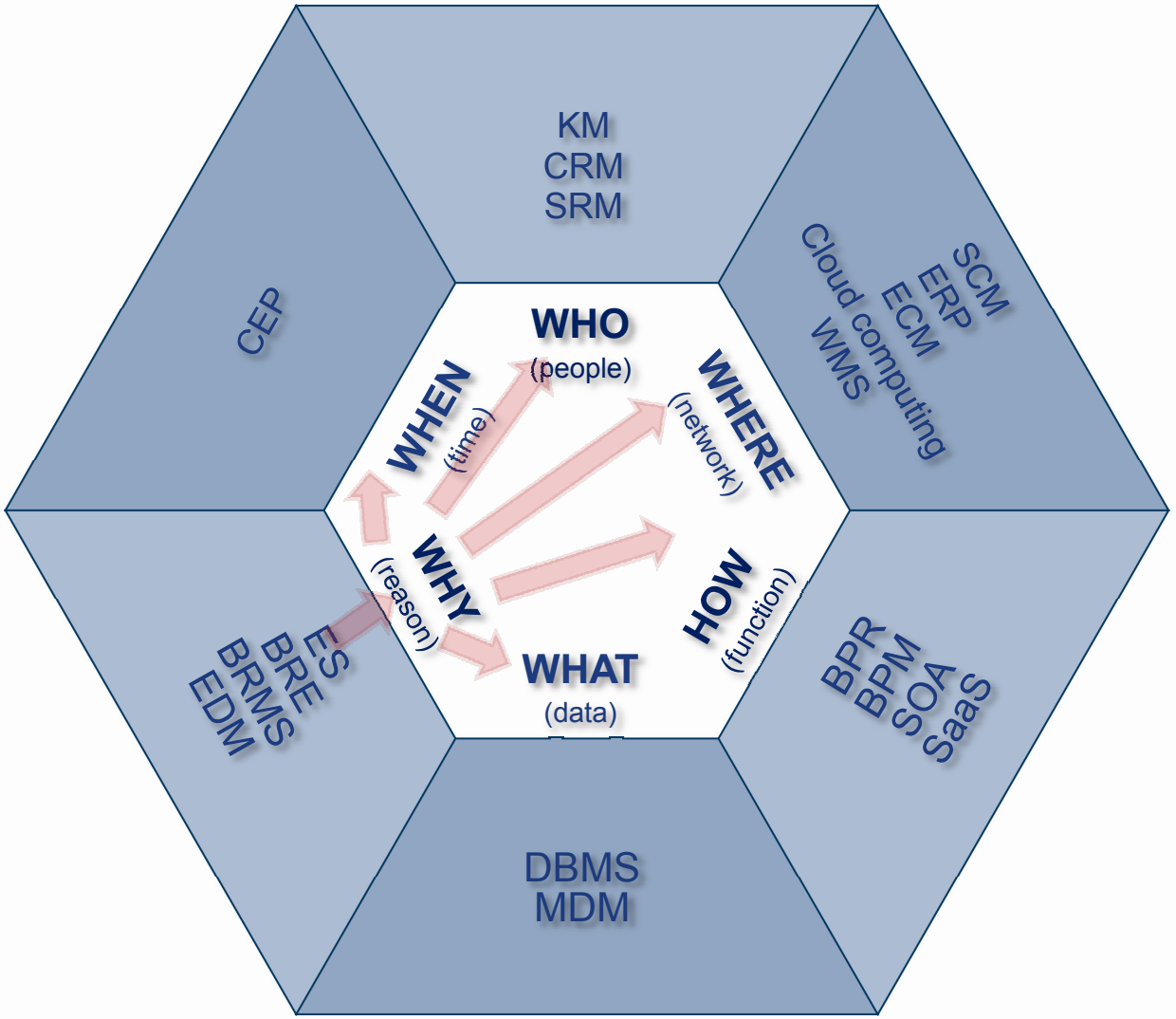
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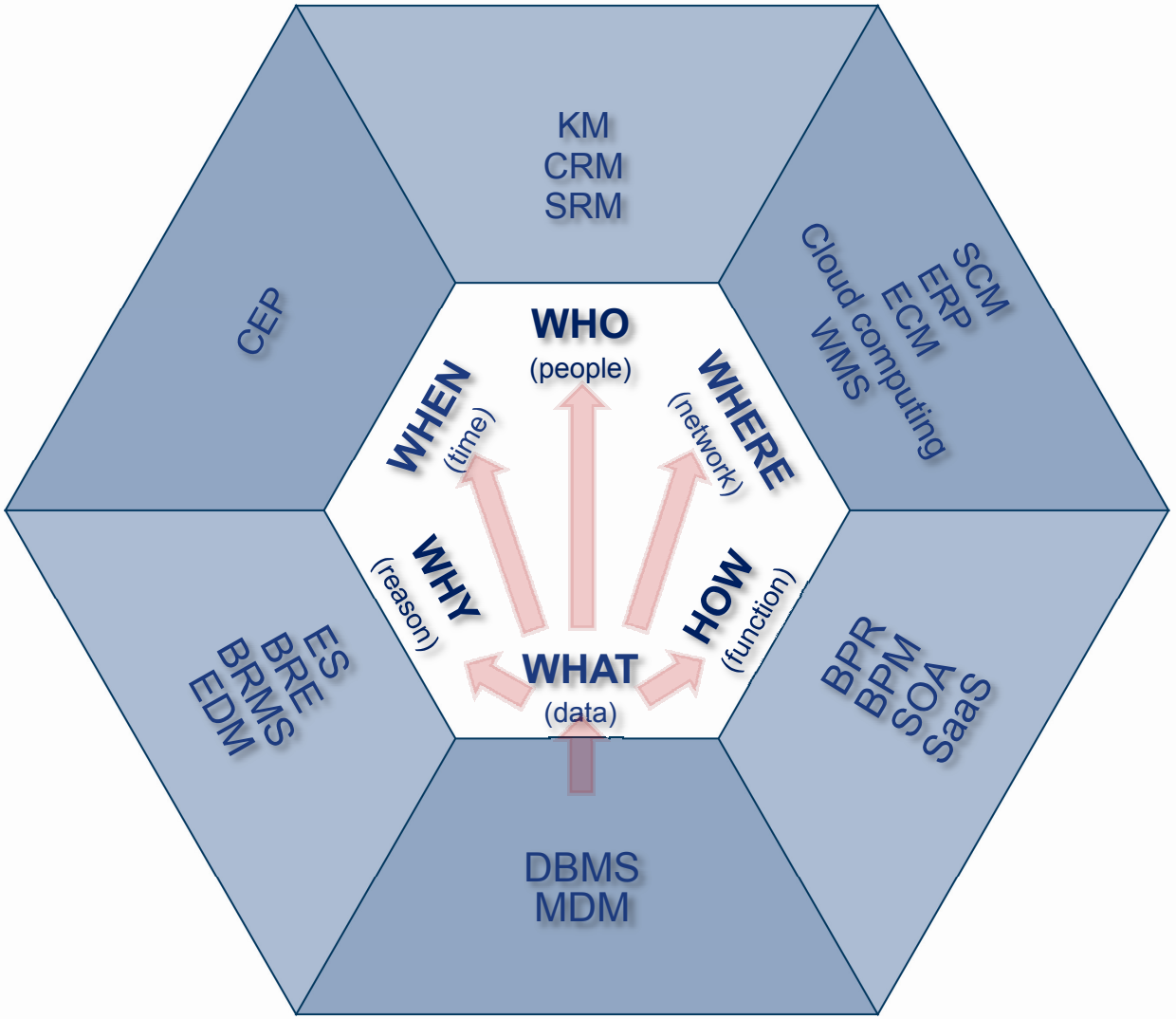
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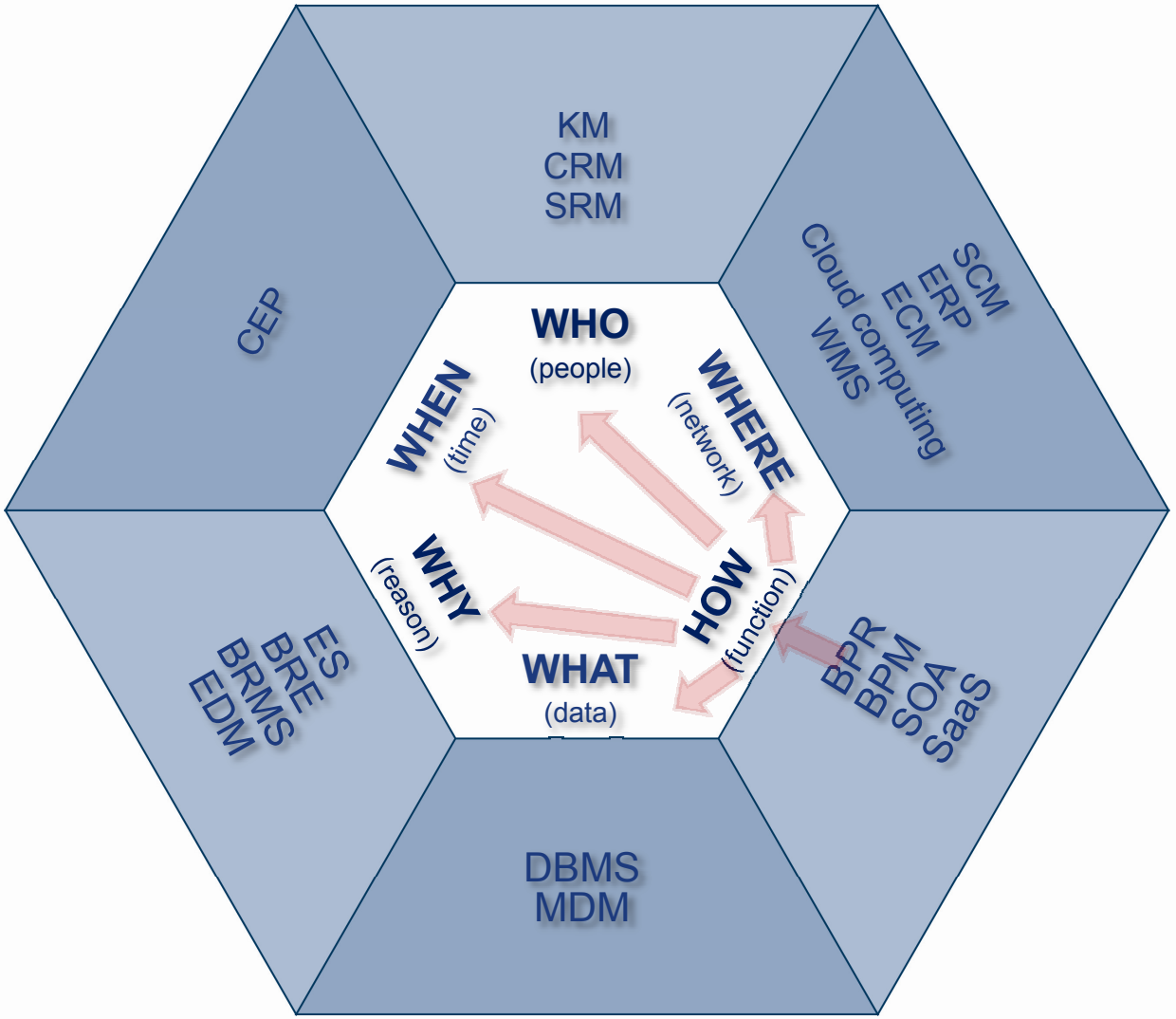
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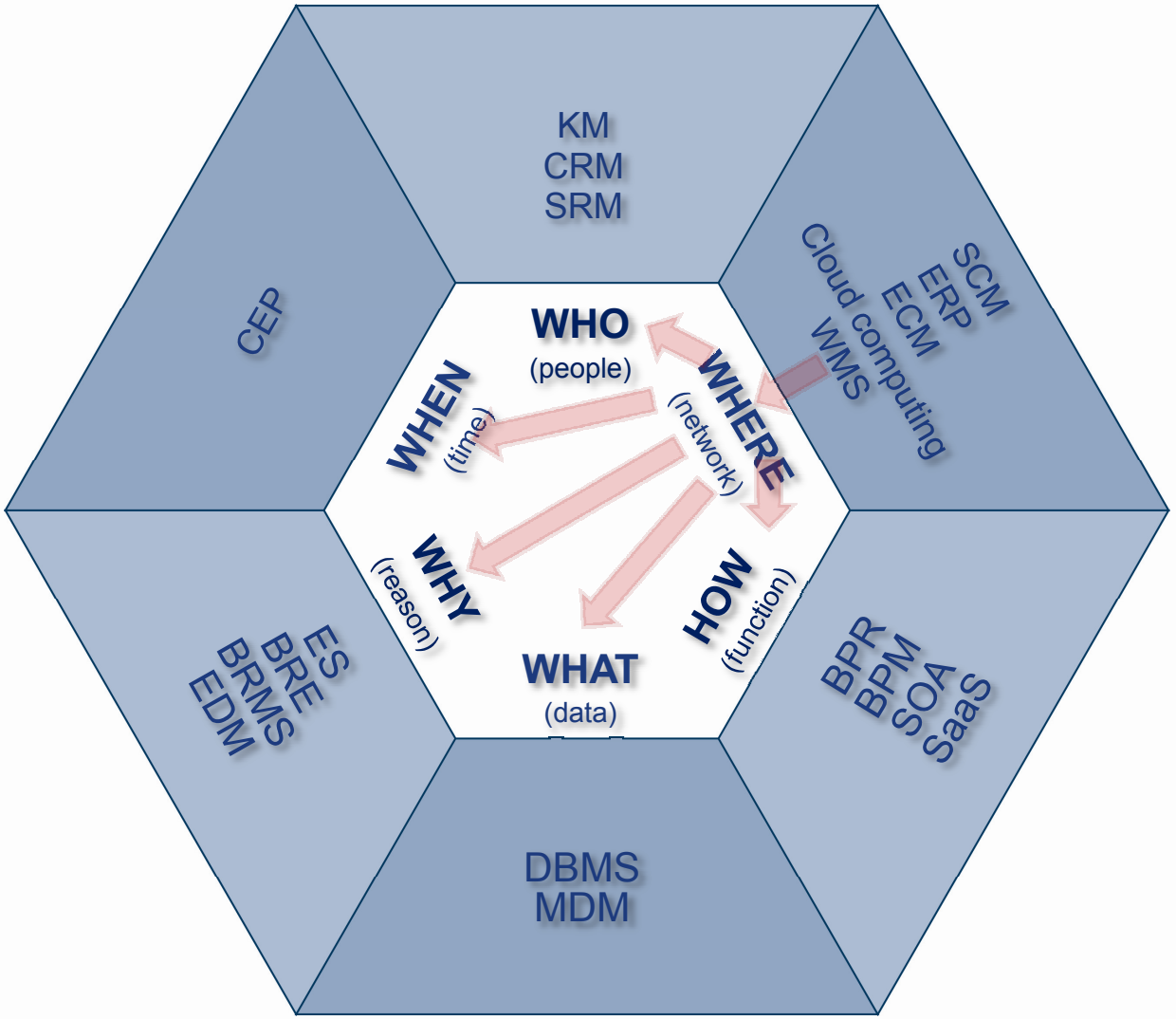
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Thank you

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