DEMO Workshop 2009

State Model and Action Model

Enterprise Engineering

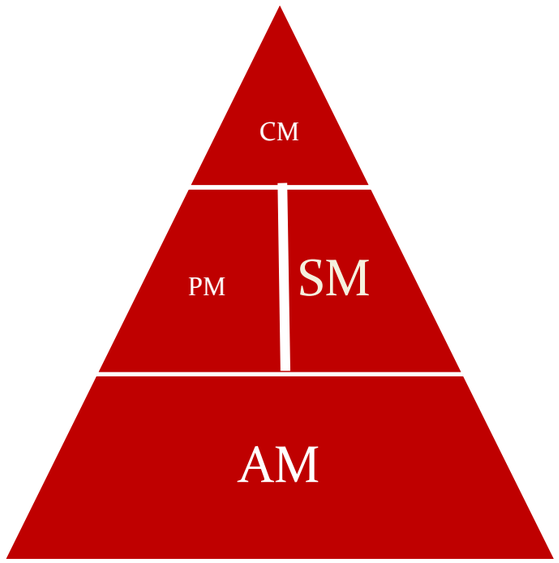
Modeling Design Change

DEMO Workshop Nov/2009

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

Contents

- Organization Theorem
- What are we talking about?
  the State Model (SM)
  - Objects
  - Attributes
  - Life time aspects
- How does everything fit together ?
  - the Action Model (AM)



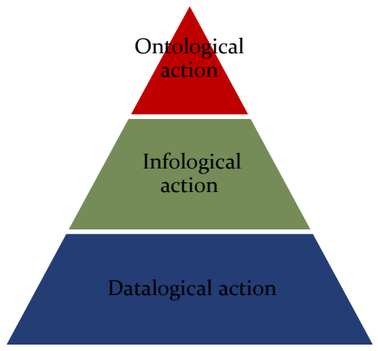
ORGANIZATION THEOREM

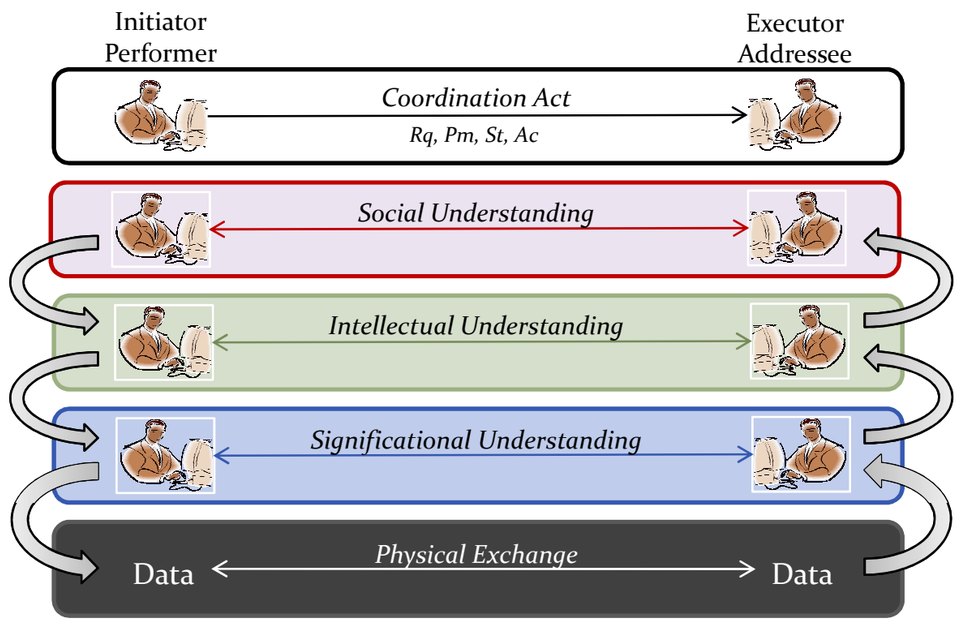
Enterprise Engineering
Modeling Design Change

DEMO Workshop Nov/2009

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

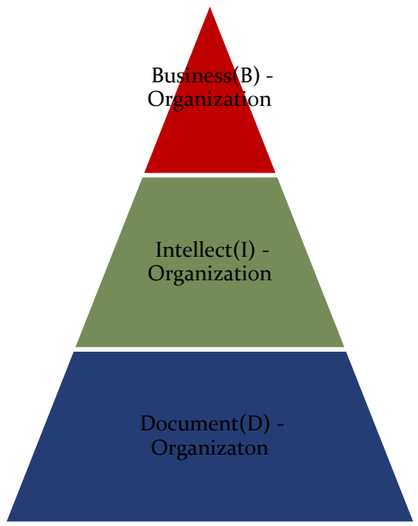
Human communication





The three human abilities are present in every (successful) communication

A layered approach



Ontological Production

Infological Production

Datalogical Production

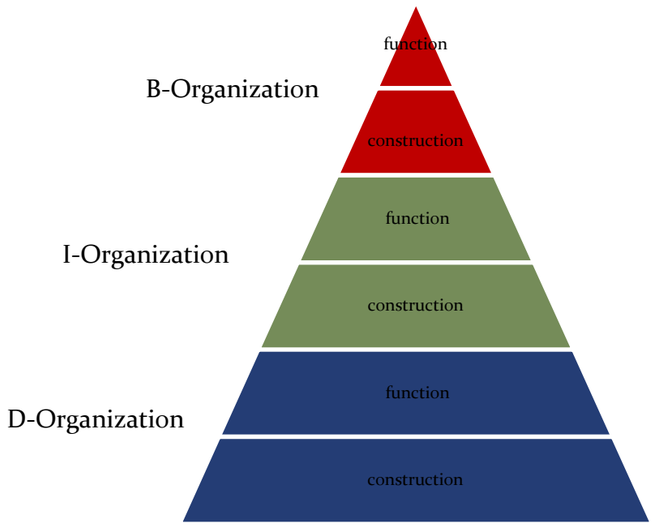
- ✓ The organization of an enterprise is a heterogeneous system that is constituted as the layered integration of 3 homogeneous systems
  - o B-Organization
  - o I-Organization
  - o D-Organization
- ✓ Relationships
  - o The D-Organization supports the I-Organization
  - o The I-Organization supports the B-Organization
  - o There is nothing above the B-Organization
- ✓ Integration: through the human being
  - o As in every communication, the human being switches between B, I and D abilities
    - ❑ B-actor wants to know daily turnover
    - ❑ I-actor knows how to calculate the turnover as a sum of something
    - ❑ D-actor knows how to get a document that contains the underlying information

Function and Construction

B-Organization

I-Organization

D-Organization



Enterprise
- function: realization of business goals
- construction: ontological transactions and actors

USES the accounting system

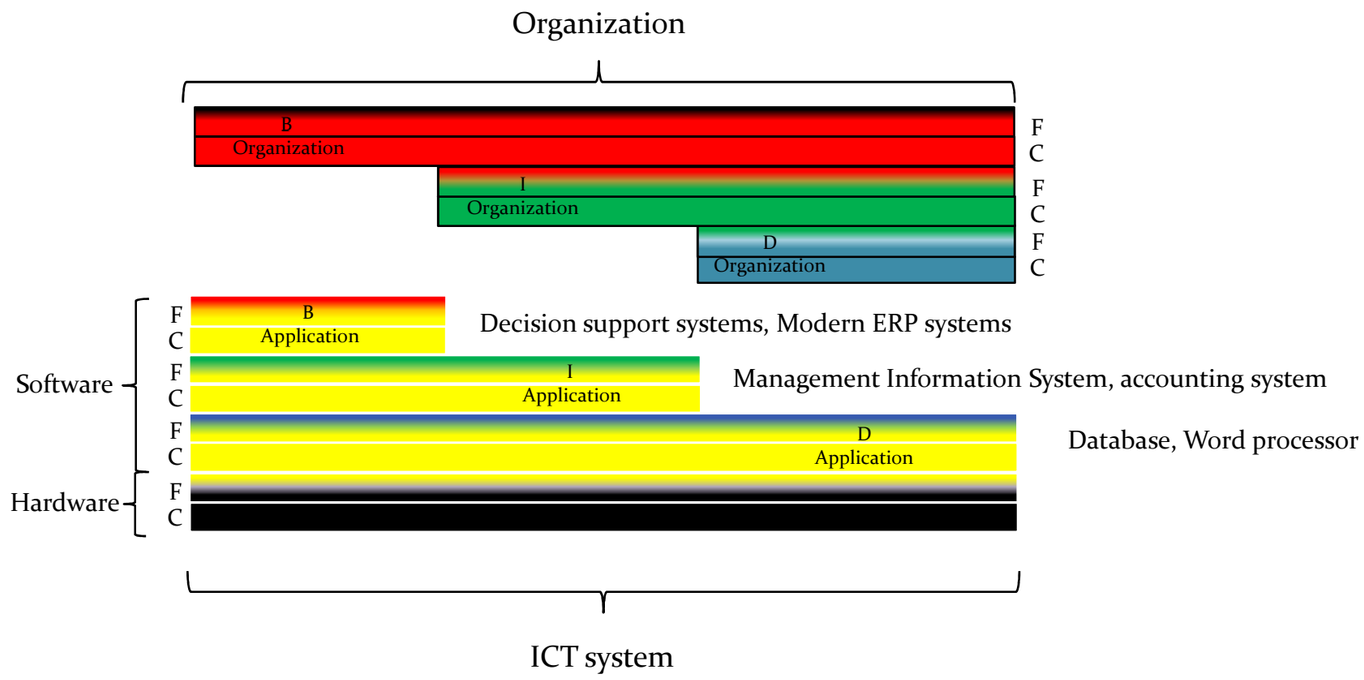
Accounting system
- function: secure entry of accounting data + reporting
- construction: objects, functions, ...

USES the function of the Database to store/access data

Database
- function: management of data, access to data
- construction: set of files (data, indexes)

Organization and ICT

Organization Theorem

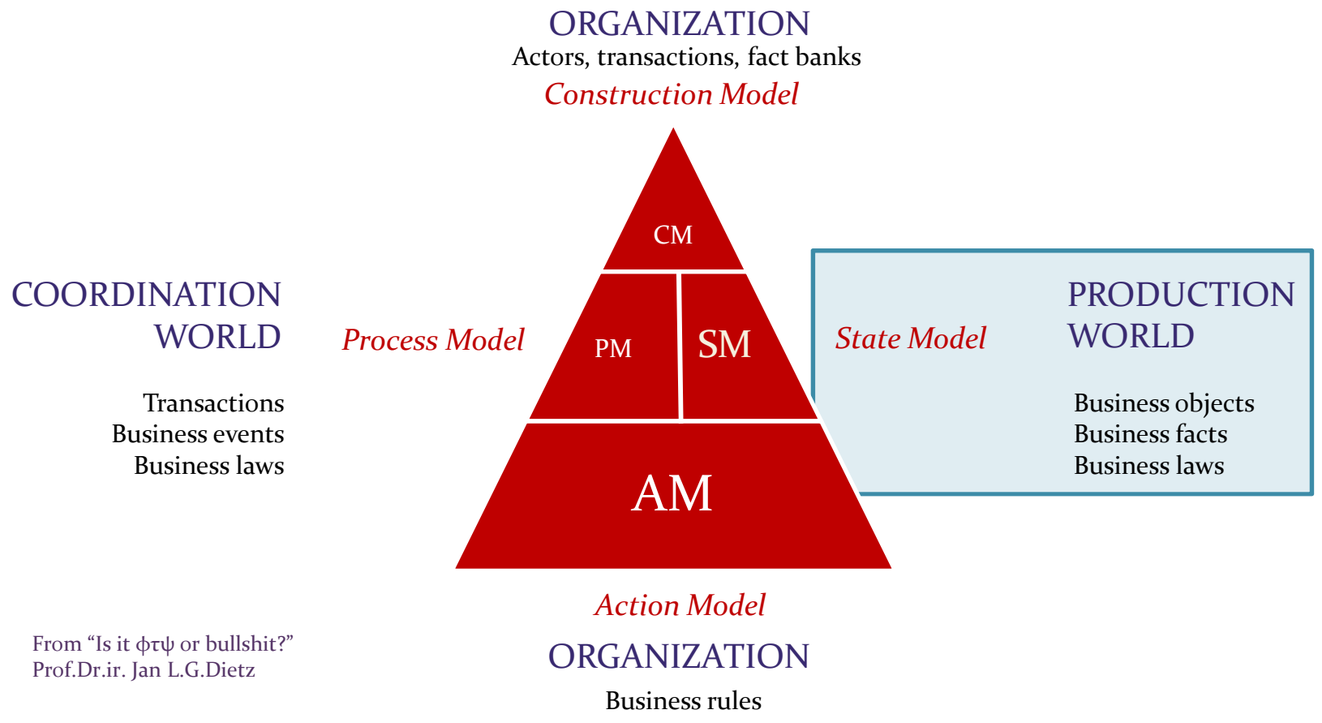


ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

STATE MODEL

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

State Model



From "Is it φτψ or bullshit?"
Prof.Dr.ir. Jan L.G.Dietz

Business rules

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

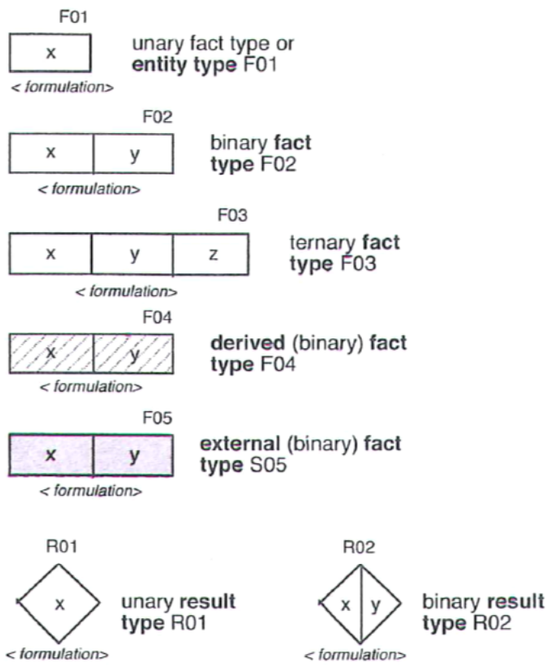
From TRT to the State Model

	Transaction	Result
T01	Deliver order	Customer order O has been delivered to customer
T10	Transport order	Customer order O has been transported to customer
T07	Deliver container	Container C has been delivered at IES
T08	Clear container	Container C has been cleared by customs
T09	Transport container	Container C has been transported
T05	Ship transport	Ship S has arrived in Rotterdam
T06	Unload ship	Ship S has been unloaded
T12	Manage shipments	Shipments for period P have been done
T02	Deliver shipment	Shipment Z is delivered to IES
T03	Load shipment	Shipment Z is loaded in containers

- ✓ The transaction results provide an indication of what we are talking about in the production world
  - Material and/or Immaterial production

  => **Business Objects**
  - Customer Order
  - Container
  - Ship
  - Shipment
- ✓ The State Model describes the relationships between the business objects that must be fulfilled in order to a create a valid "state" of the world.
- ✓ Notation based on Object Role Modeling (ORM)
  - Based on Nijssen's NIAM (Natural language Information Analysis Method)
- ✓ *We believe that this part of the methodology can still be improved.*

Notation (1)



Facts that express relationship between business objects.

Example of a binary fact
Container *C* contains items from shipment *S*

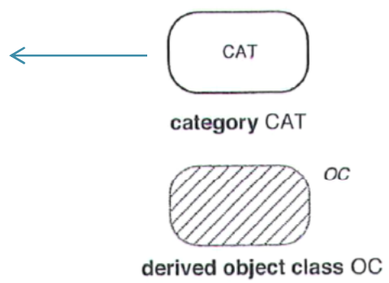
All results from the TRT must be added to the SM

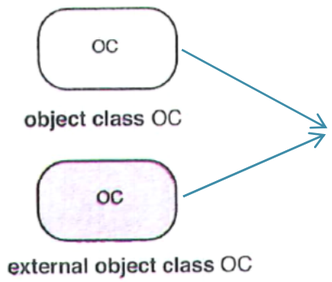
Fig. 19.1 Legend of the Object Fact Diagram (first part)

Notation (2)

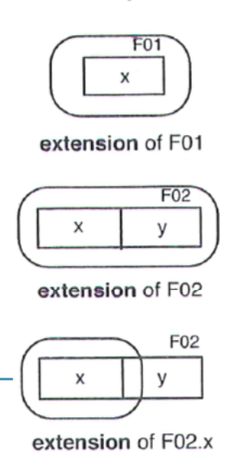
Sate Model

The "primary types" to which objects belong, e.g. Person

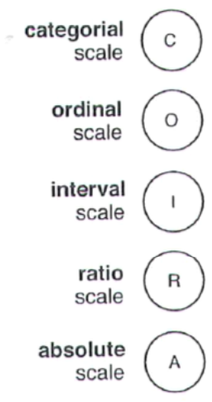




the business objects in our model



A Business Object is defined by means of relation between other objects e.g. a member is the set of all persons that have a membership card



Measurements that are relevant in the model

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

Notation(3)

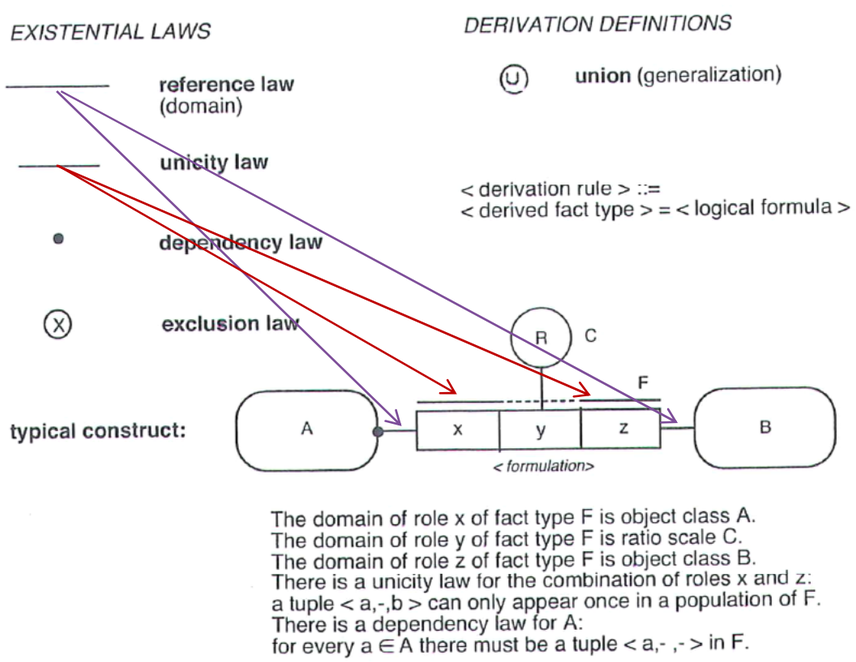
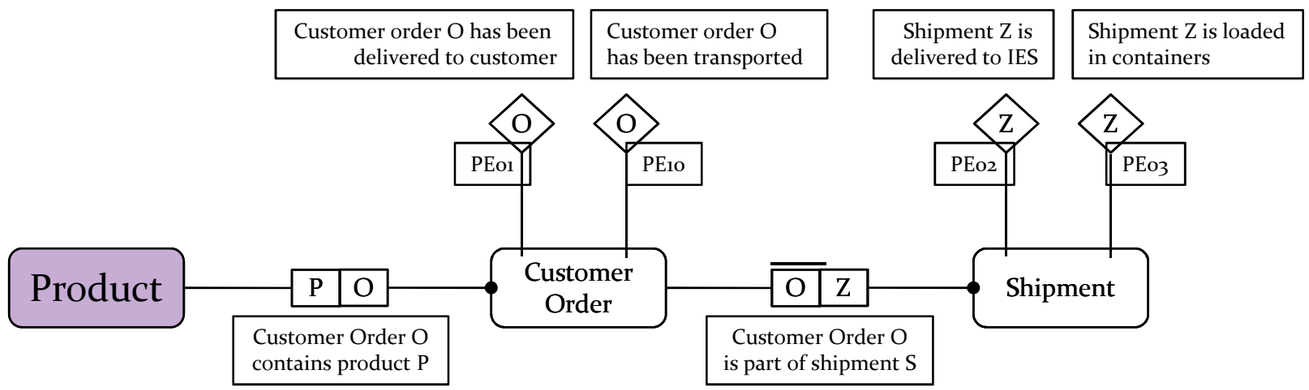


Fig. 19.2 Legend of the Object Fact Diagram (second part)

Example: Products, Order, Shipment

State Model



P1 O1
P1 O2
P2 O1

An order can contain different products, any product can be part of multiple orders

Dependency: every customer order contains at least one product, products do not have to appear on orders

O1 Z1
~~O1 Z2~~
O2 Z1

Unicity: an order can be part of one and only one shipment

Dependency: every shipment is related to at least on order, orders do not have to be related to Shipments (e.g. stock)

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

What are Business Objects?

- ✓ DEMO helps with the identification of the business objects.
  - Part of the Production world (<> Coordination)
  - Produced by ontological transactions (<> information, documents, …)
- ✓ How to build the State Model?

  Analysis of and careful reflection on the case at hand
- ✓ Building a State Model requires "some" experience.
  - The objects orginnaly identified may not be suited to express the facts one wants to model.
  - The MERODE Methodology from K.U.Leuven does not help as well as DEMO with the identification of the business objects, but it helps with the selection and definition of the correct business objects.

<u>Business objects must satisfy all of the following requirements:</u>

- ✓ An object can be described by a number of properties
  - Depending on the world one is modeling something can be property or object, e.g. Country
- ✓ An object has an identity, this may be invisible or implicit for the user (<> database modeling)
- ✓ An object corresponds to a real world concept: it has a real world counterpart (material or immaterial)
- ✓ An object exists for a certain period of time
  - An object is always involved in at least two events: its creation and its end (implementation requirement, not ontological)
  - Cloded Model

Source: Object-Oriented Enterprise Modeling with MERODE, Prof.Dr. M.Snoeck, K.U.Leuven

Issue: Find the Business Objects

		
Is a real world concept	Yes	Yes
Has an identity	Registration of the ship	Container Id painted on the side
Described by number of properties	Capacity, …	Size
Exists for a certain Period of time	Build ship Demolish ship	Build container Demolish container

- Ship and Container are potential business objects.
- In the State Model "the fact" that describes the relationship between the objects must be stated (unary, binary, tertiary,…)

What we want to express:

The container C is part of the cargo load of the ship S

But

- Container can be put on the same ship many times
- The container can be put on many ships

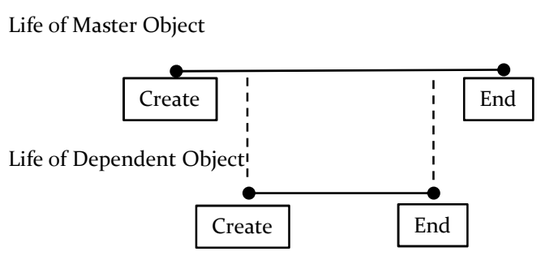
How to accurately state the relation between container and ship?

What is the problem?

- The lifecycle of ship and the container are not related.
- Maybe we are not talking about the physical ship and container!

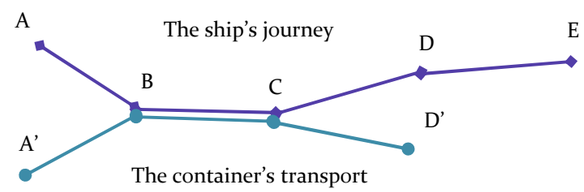
Existence Dependency

- ✓ MERODE: the relationship between business objects must be based on existence dependency
  - o If not the case: define "derived" business objects to comply to this rule
- ✓ What is existence dependency?

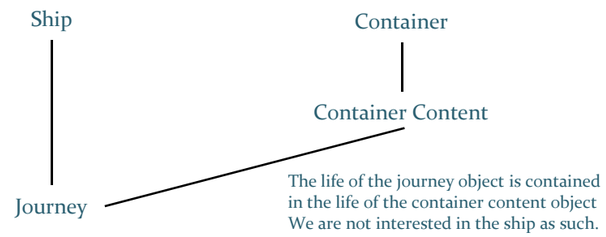


Based on the notion of the "life" of an object.

- ✓ Our case is not about ships and containers but about a specific journey of the ship and the contents of the container.
- ✓ The most general case

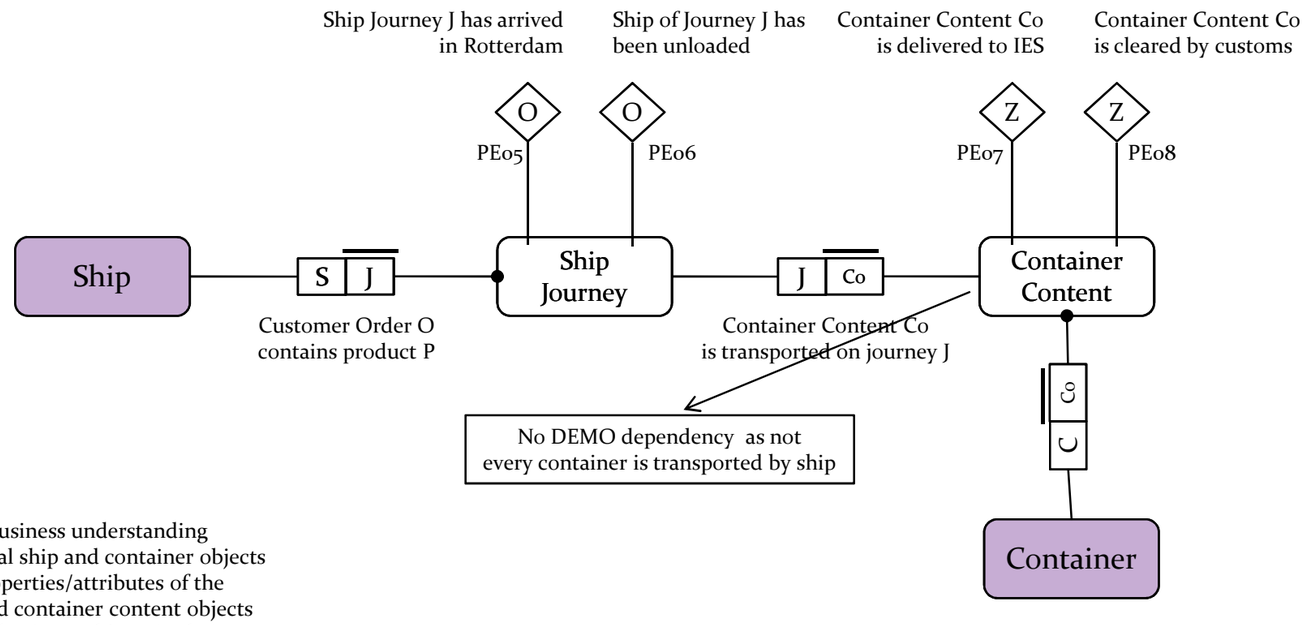


- ✓ In the IES case, the journey is from 1 harbor to Rotterdam, while the container transport may consists of different stages



Object Fact Diagram

State Model



Based on business understanding the physical ship and container objects may be properties/attributes of the journey and container content objects instead of business objects in their own right.

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

Object Property List

What?

Representation of fact types that are pure properties, i.e. mathematical functions mapping from an object class to a scale

Can be represented in the Object Fact Diagram using the  symbol

Scale Types

- Ordinal: defines binary relation only
  - x > y , x > z
  - e.g. hardness of rocks: relative indication (harder than)
- Interval: free measurement unit & free zero point
  - e.g. time, temperature
- Ratio: free measurement unit & fixed zero point
  - e.g. length, mass
- Absolute: fixed measurement unit & fixed zero point
  - All cases of counting
- Categorial (nominal)
  - All items are labeled

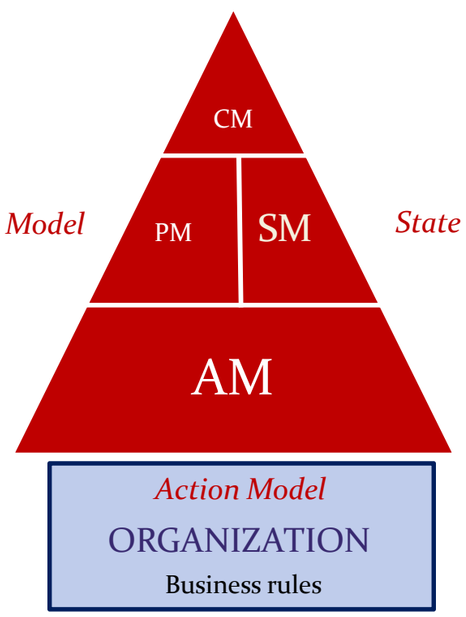
Property type	Object Class	Scale
Is ship name	Journey	Categorial
Is container Id	Container Content	Categorial
Departure date	Journey	Julian Calendar
Arrival date	Journey	Julian Calendar
Date release by customs	Container Content	Julian Calendar
Date release by shipping agent	Container Content	Julian Calendar
Delivery date	Container Content	Julian Calendar
Weight	*Container Content*	*Mass*

ACTION MODEL

Action Model

ORGANIZATION
Actors, transactions, fact banks

Construction Model



COORDINATION WORLD

Transactions
Business events
Business laws

Process Model

State Model

PRODUCTION WORLD

Business objects
Business facts
Business laws

Action Model

ORGANIZATION

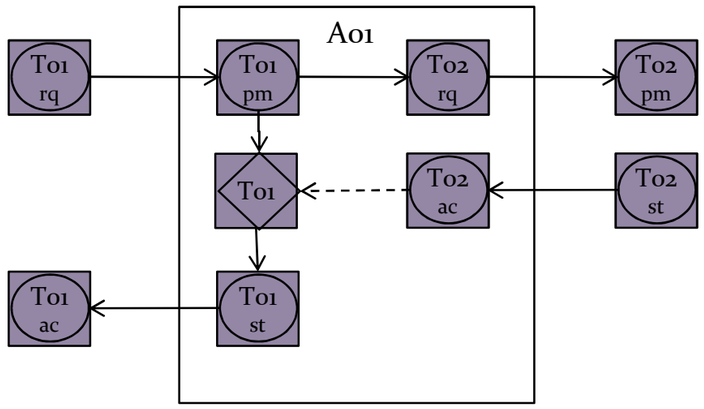
Business rules

From "Is it φτψ or bullshit?"
Prof.Dr.ir. Jan L.G.Dietz

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

Action Model

- ✓ Most detailed and comprehensive aspect model, describes **per actor role** the action rules in a pseudo-algorithmic language.
  - The other models can be derived from (a complete) action model
    - Validate consistency!!!
  - Actors are responsible and can deviate from the action rules, these are only guide lines



Action rules **for actor role** A01

- The action rule describes what the actor should do and what the (pre)conditions for its action are

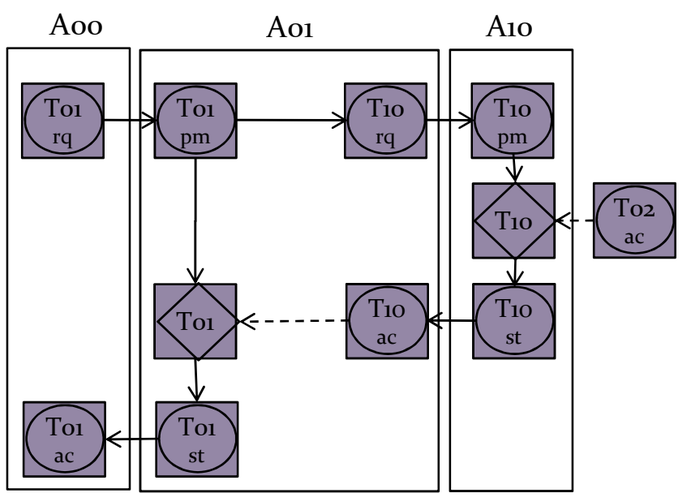
Step 1: Create an action rule for every coordination act that invokes a C-act that A01 has to perform

on requested T01
no
on promised T01
no
on stated T02
no
on accepted T02
execute T01
state T01
no

Example - IES Case

Action Model

	Transaction	Result
T01	Deliver order	Customer order O has been delivered to customer
T02	Deliver shipment	Shipment Z is delivered to IES
T10	Transport order	Customer order O has been transported to customer



For actor role A10 (Order Transporter)
on accepted T02 (Z)
-- A11 has accepted delivery of shipment Z
do for all O in Z
-- Shipment Z contains many Customer orders (see State Model)
execute T10(O) -- Transport O to the customer
state T10(O) -- State transportation of O
od
no

For actor role A00 (Customer)
on stated T01 (O)
-- A01 states that order O has been delivered
If <delivery is acceptable> → accept T01(O)
else not <delivery is acceptable> → reject T01(O)
fi
no

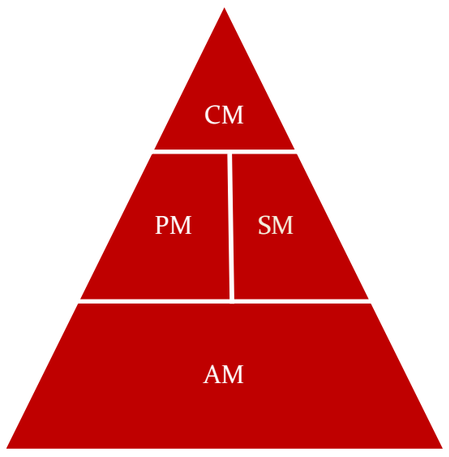
A10 and A01 are both IES may be different "departments", action rule is required to handle e.g. cases where order is not on the correct truck
- state e.g. by person that loaded the truck
- accept e.g. by person that physically delivers the order

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

DEMO – the 5 Aspect Models

Summary

- ✓ CM (IAM + ISM), PM, SM and AM have to be consistent
  - Interstriction: actor needs information about a transaction, this results in conditions/calculations in AM
  - Property types in the OPL (Object Property List) of the State Model are used in the AM



- ✓ Example – Library
  - Max 5 book loans at the same time then
    - Nr of book loans is property type in the OPL
    - This property is checked in the transaction where the library member wants to borrow an additional book
- ✓ Example – IES

For actor role A10 (Order Transporter)

on accepted T02 (Z)
-- A10 has accepted delivery of shipment Z
do for all O in Z
-- Shipment Z contains many Customer orders (see State Model)
execute T10(O) -- Transport O to the customer
state T10(O) -- State transportation of O
od
no

A10 must know about the results of T02 (which shipments have been delivered)

- Interstriction to be added in model
- A10 is not involved in execution of T02, therefore no interaction

ICT & Financial Consulting
Wim.Ploegaerts@pwcs.eu

From DEMO to ICT