Centro de Investigación
en Métodos de
Producción de Software

From Requirements to Code: A Full Model-Driven Development Perspective

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MODELLING TECHNIQUES OFFER!!!
TAKE 3, PAY 2
NOTATION
YET ANOTHER
METHOD
NICE & CHEAP

Introduction

- **Business process modelling** (BPM)
  - Specification of the (current and/or proposed) enterprise processes.
  - Important practice in Requirements Engineering and Software Engineering
  - Multiple BPM techniques

BPMN
Merode
Petri Nets
SADT
Taxis
IDEF0
Use Cases
PSL/PSA
DFD
Merise
Workflow
REVS
NIAM
ISACS
UML Activity Diagrams

- **Business process modelling** (BPM)
  - Specification of the (current and/or proposed) enterprise processes.
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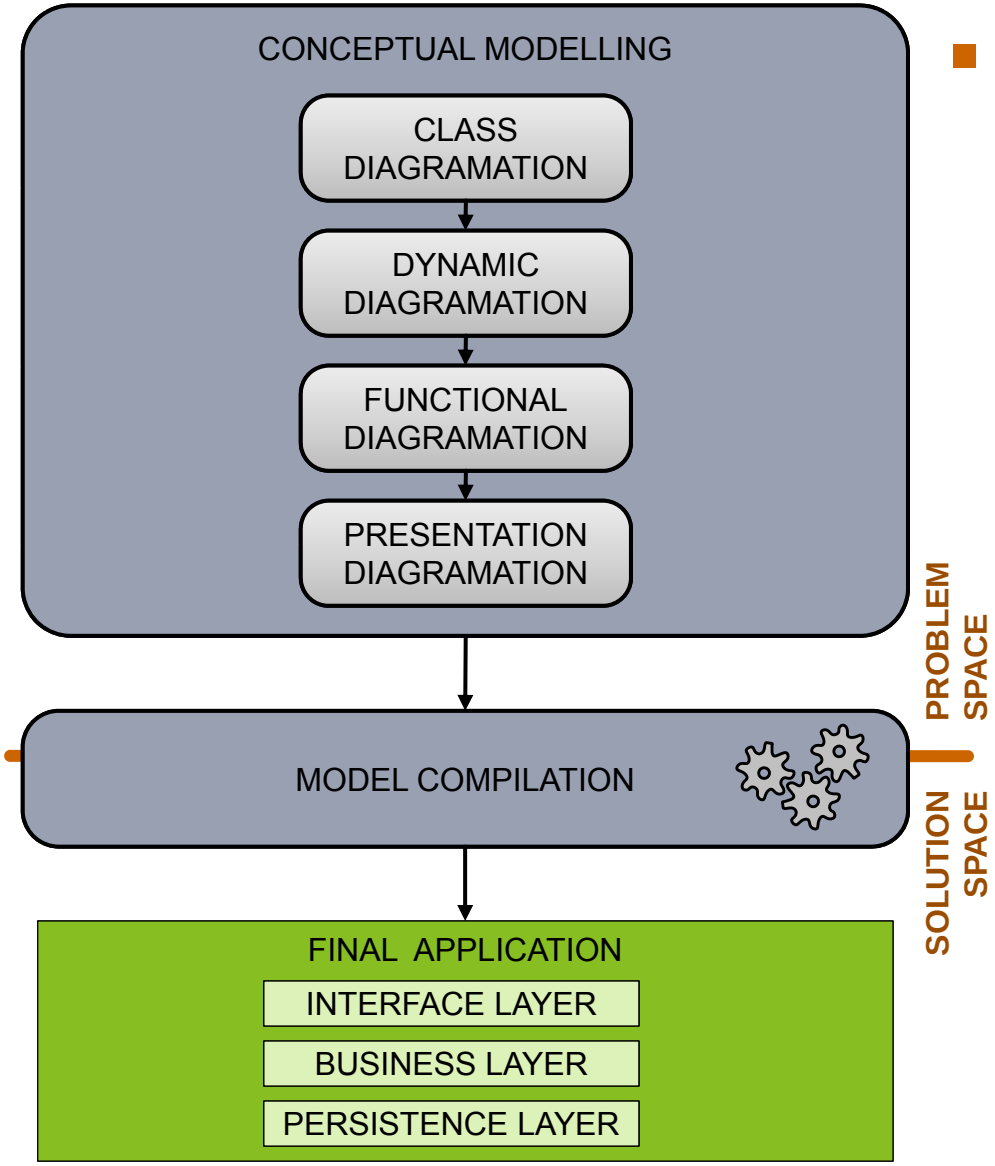
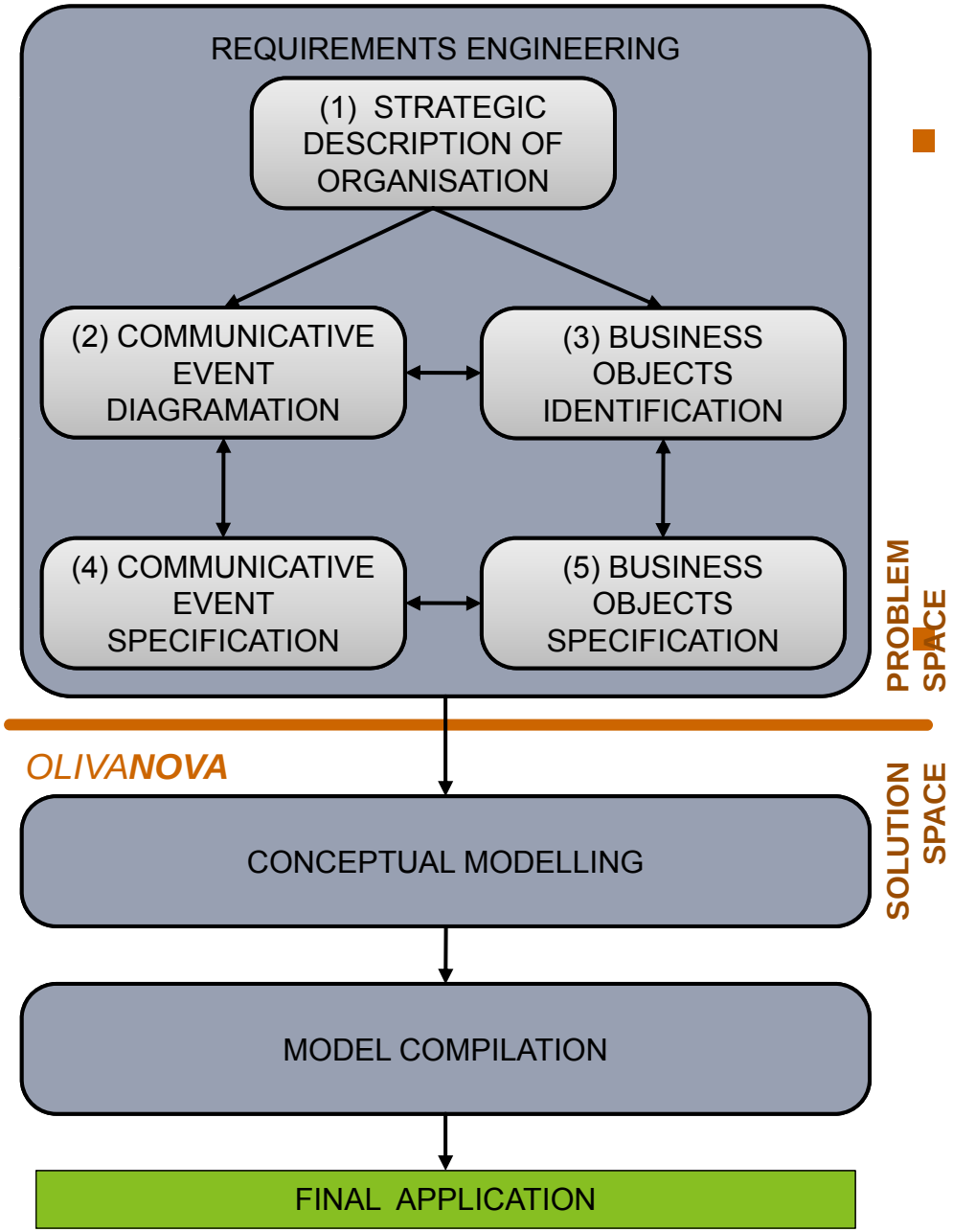
Theoretical underpinning	Notation	Methodological guidance
CONCEPTS	MODELLING PRIMITIVES	CRITERIA

*OLIVA**NOVA***



- The OLIVANOVA approach:
  - Conceptual modelling
    - Object Model
    - Dynamic Model
    - Functional Model
    - Presentation Model
  - Model compilation



- Communication Analysis:
  - Requirements engineering approach for information systems
  - Provides a **requirements structure**
  - Provides a **flow of activities**

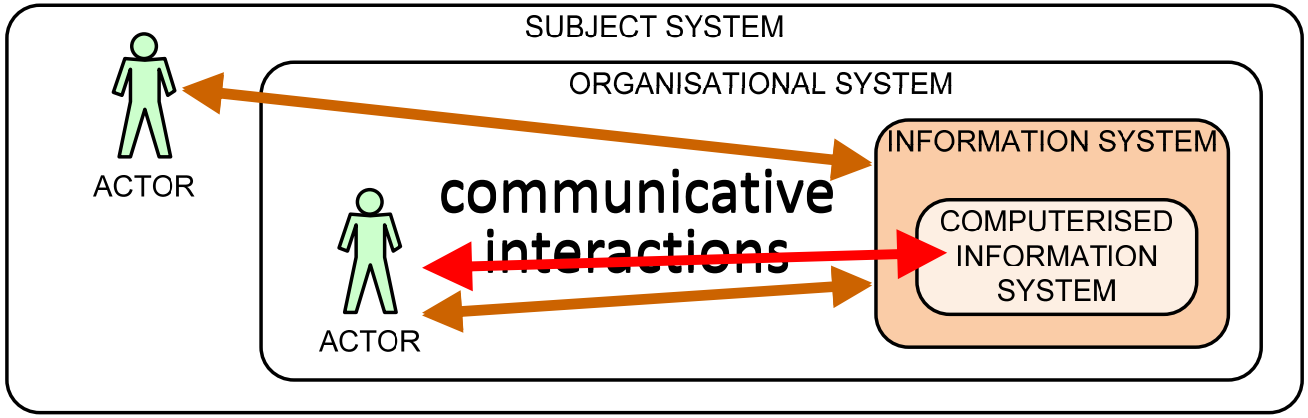
The OLIVANOVA approach:

- Conceptual modelling
  - Object Model
  - Dynamic Model
  - Functional Model
  - Presentation Model
- Model compilation

Motivation

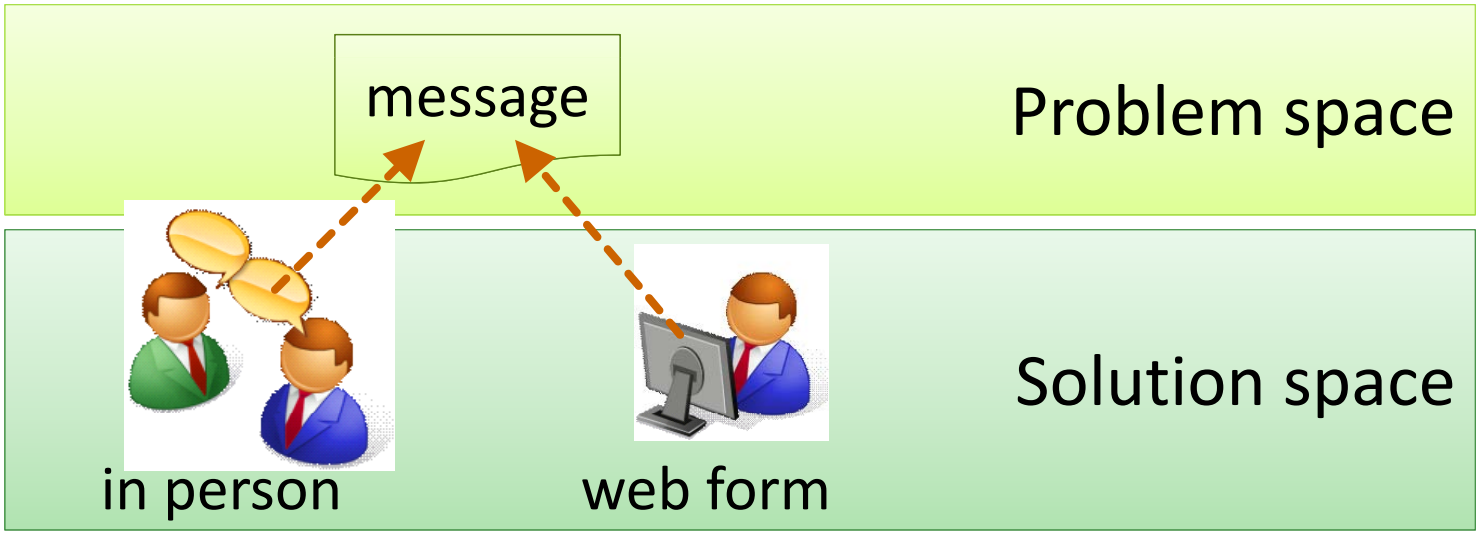
- Good practices in IS requirements Engineering:
  - Offer external view of the IS.
  - **A communicational approach to IS analysis.**

requirements specification



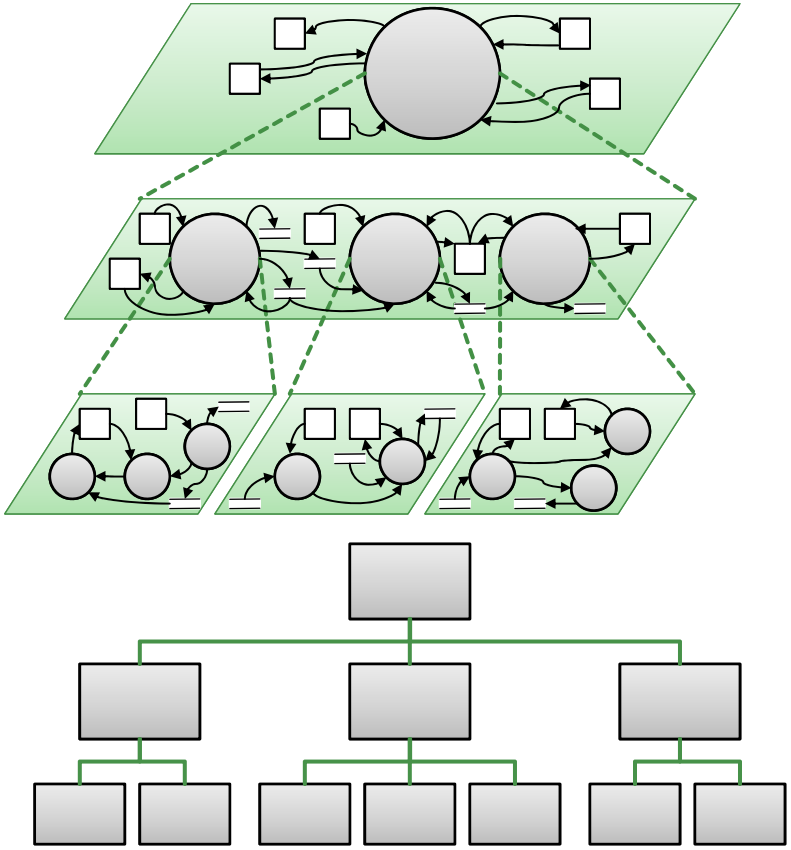
Motivation

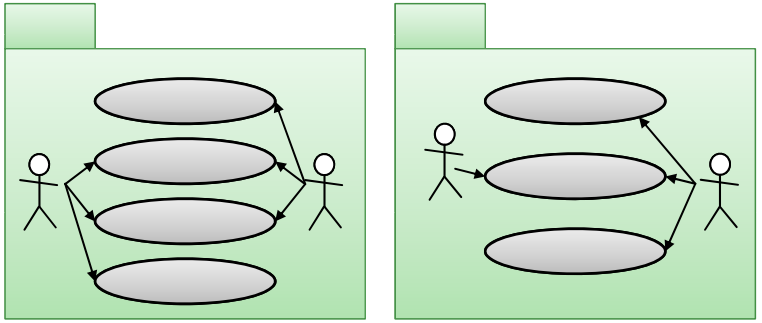
- Good practices in IS requirements Engineering:
  - Offer external view of the IS.
  - A communicational approach to IS analysis.
  - **Differentiate problem space vs. solution space.**

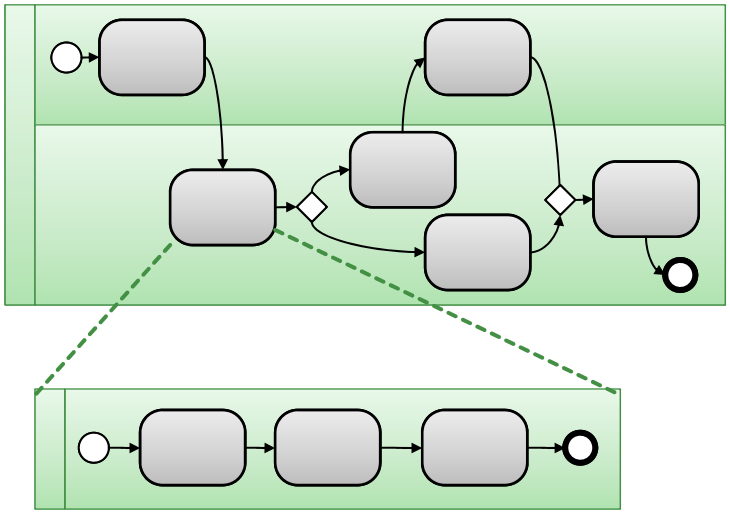


Motivation

- Good practices in IS requirements Engineering:
  - Offer external view of the IS.
  - A communicational approach to IS analysis.
  - Differentiate problem space vs. solution space.
  - **(Stepwise) refinement of complex systems.**

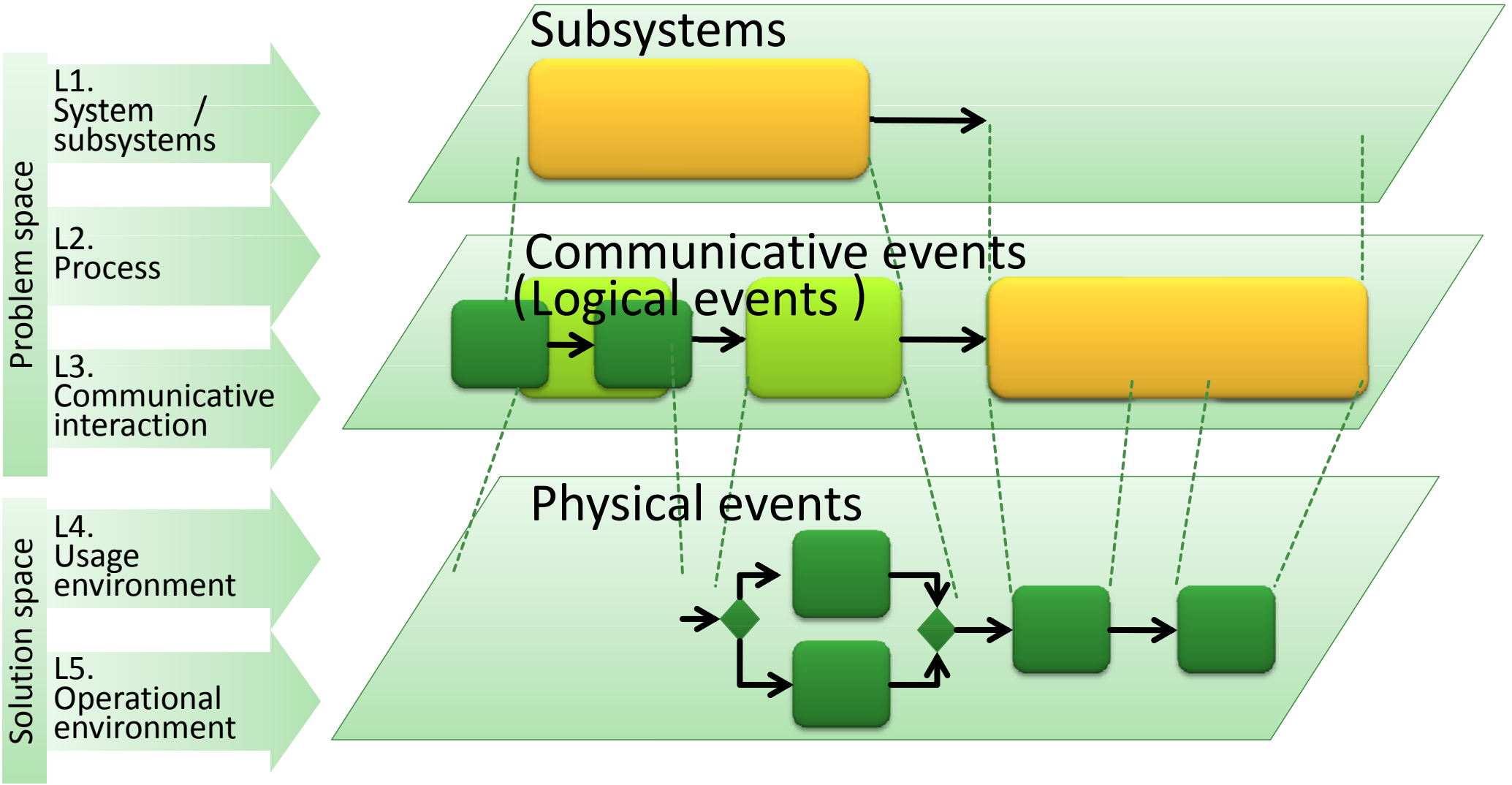






Motivation

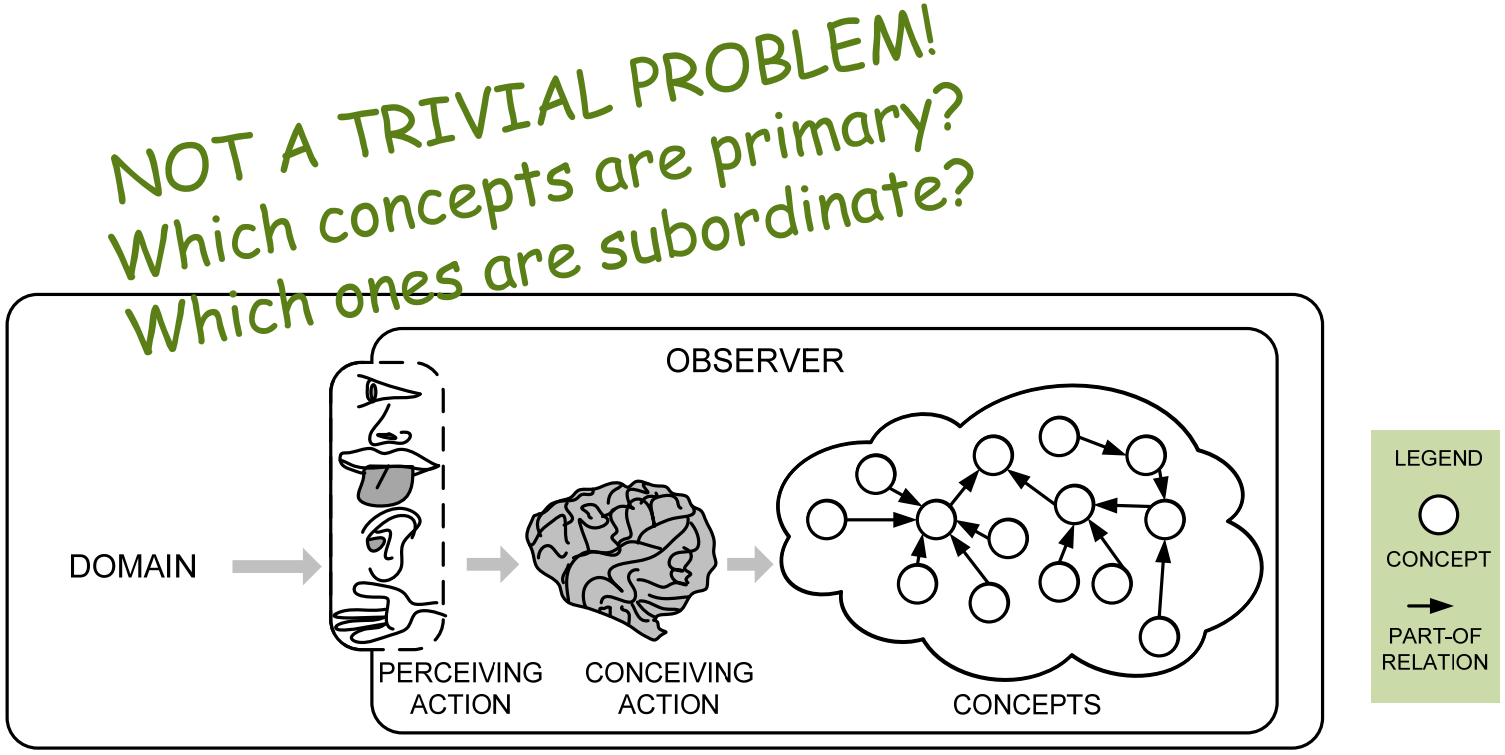
- **Wise** (stepwise) refinement of complex systems



Unfolding the notion of unity

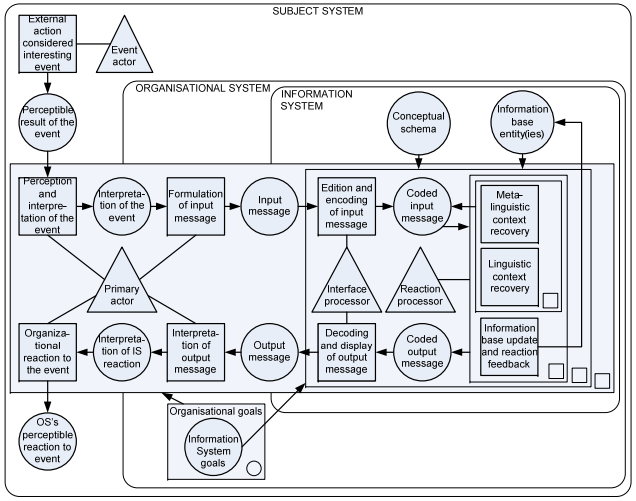
- An **observer** wants to interpret a **domain**.

  (e.g. an analyst wants to understand and model organisational processes)
- A set of **concepts** is the result of the interpreting action.
- Concepts are structured by **composition** relations (part-of).



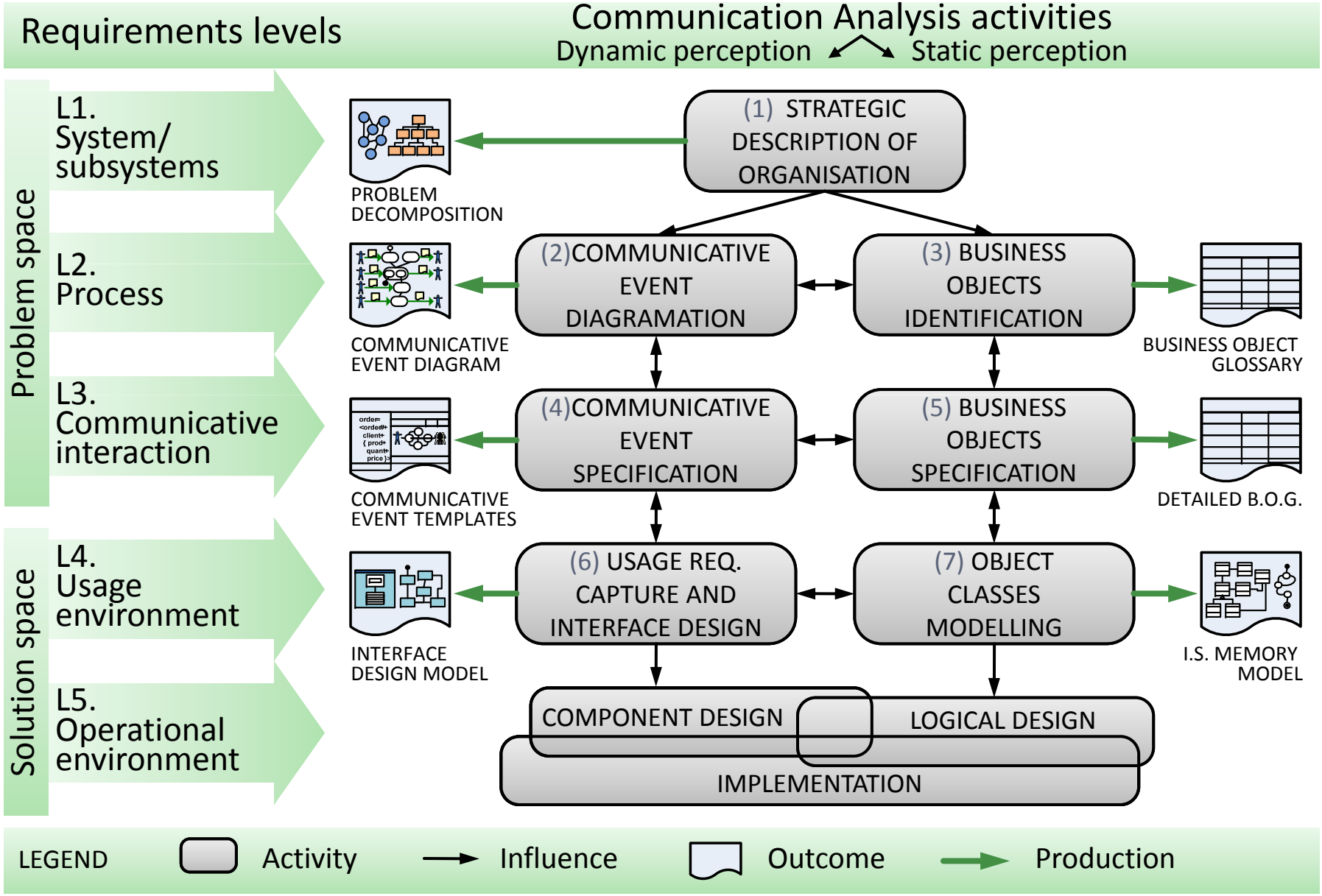
Proposal

- Conception of Communication Analysis
  - Stems from research on IS fundamental concepts
    - Extension of the FRISCO report.

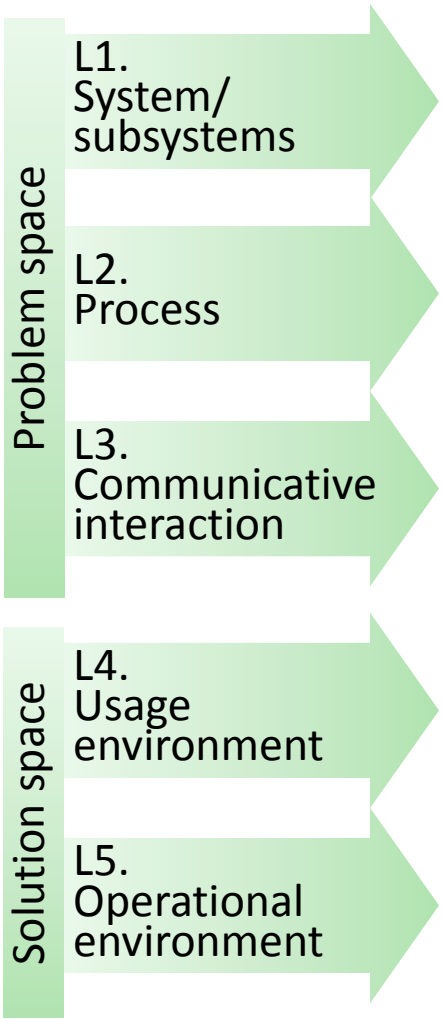


  - Evolves in collaboration with industry
    - Valencia Port Authority
    - Infrastructure and Transport Ministry of the Valencian Regional Government
    - Anecoop S. Coop. (2nd grade cooperative that aggregates +100 agricultural cooperatives)

- Requirements structure and method activities



- Activity 1. Strategic description of organisation.



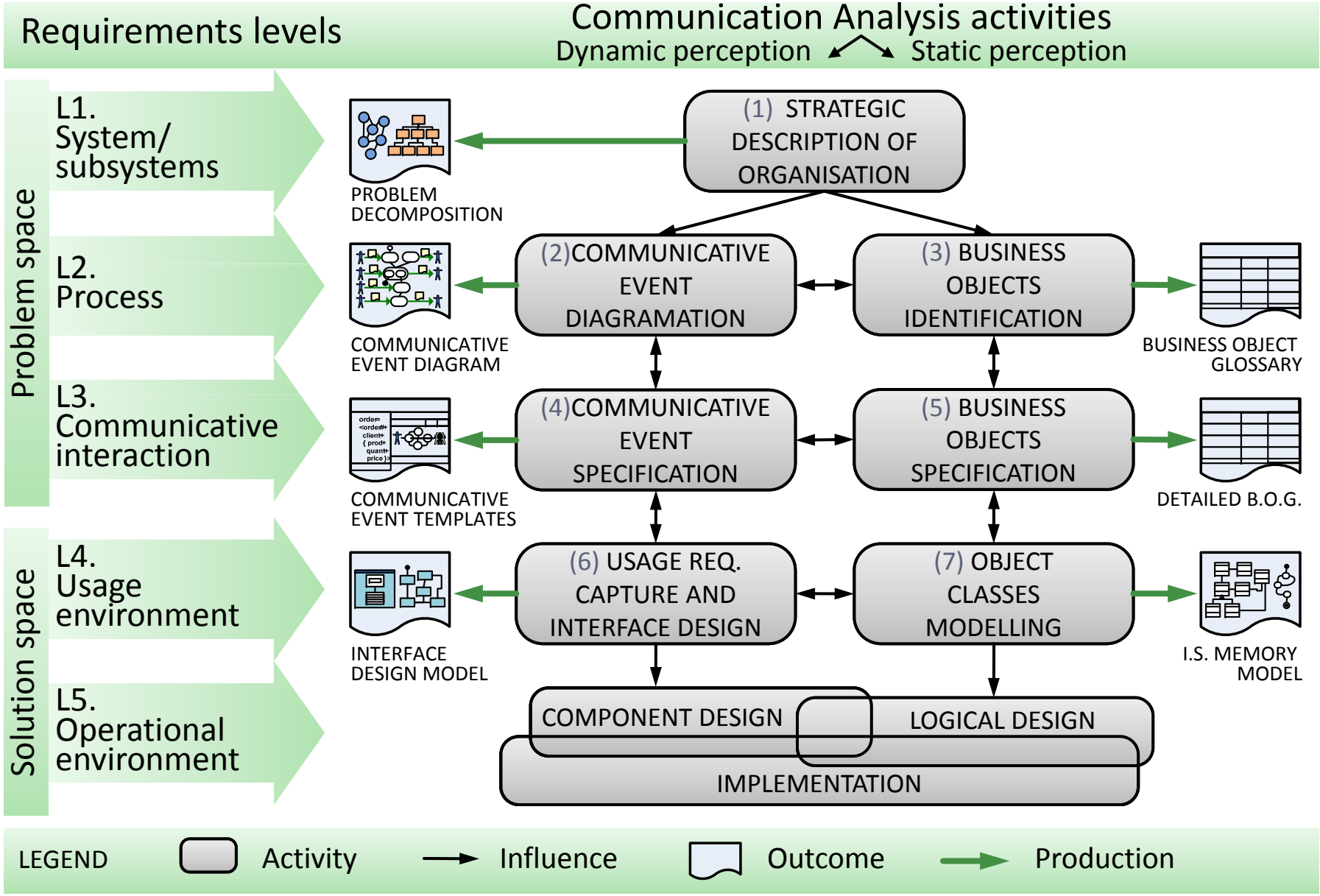
- Describe the Organisational System from a strategic p.o.v
- Decompose the problem

  - Customer Service Departments (salesmen)
  - Production Department (clerks)
  - Accounting Department (accountant)
  - Management Board

- Strategic business indicators

  - Increase in the number of photographers
  - Increase in the number of exclusives
  - Cash flow
  - etc.

- Requirements structure and method activities

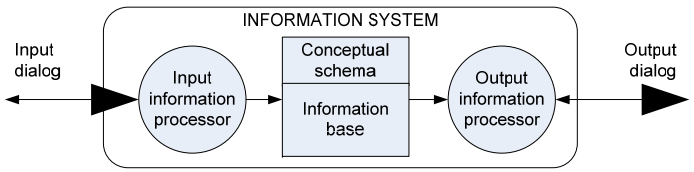


- Activity 2. Communicative event diagramation

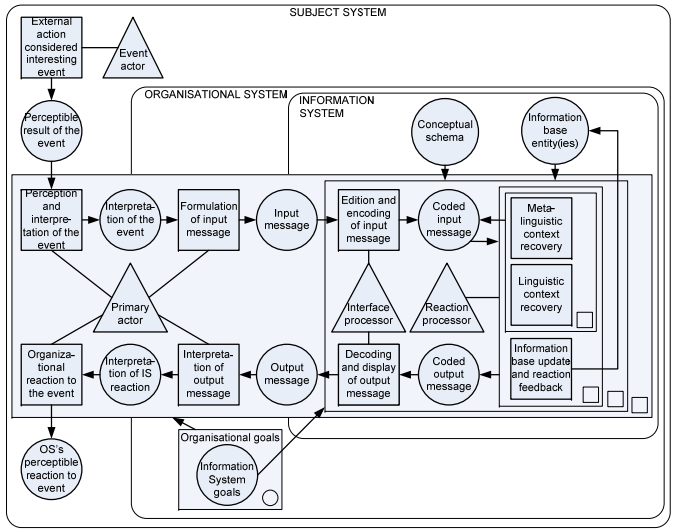
Problem space
- L1. System/ subsystems
- L2. Process
- L3. Communicative interaction

Solution space
- L4. Usage environment
- L5. Operational environment

- **Communicative interaction**. Interaction between actors in order to exchange information.
  - **Ingoing communicative interaction** primarily feed the IS memory with new meaningful information.
  - **Outgoing communicative interaction** primarily consult IS memory.
- **Communicative event**. An ingoing communicative interaction that fulfils the following unity criteria.

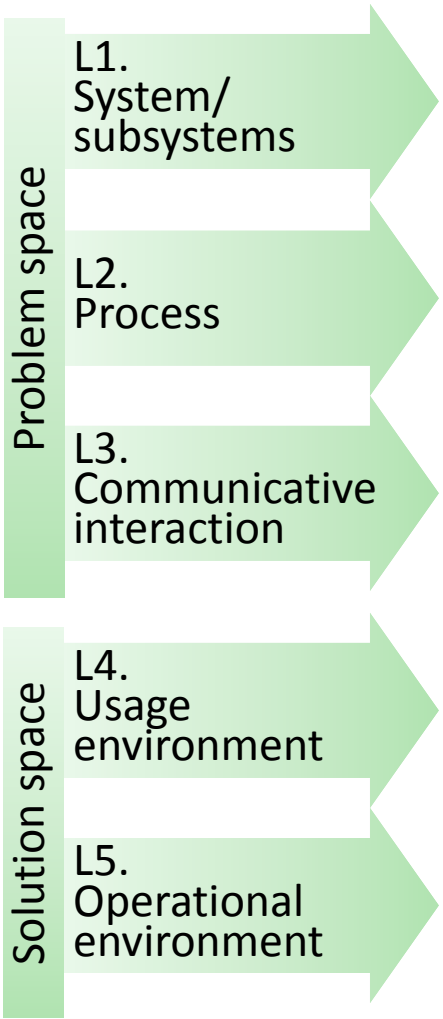


[ISO 1982]



Extended from [FRISCO 1998]

- Activity 2. Communicative event diagramation



- **Communicative event**. An ingoing communicative interaction that fulfils the following unity criteria.

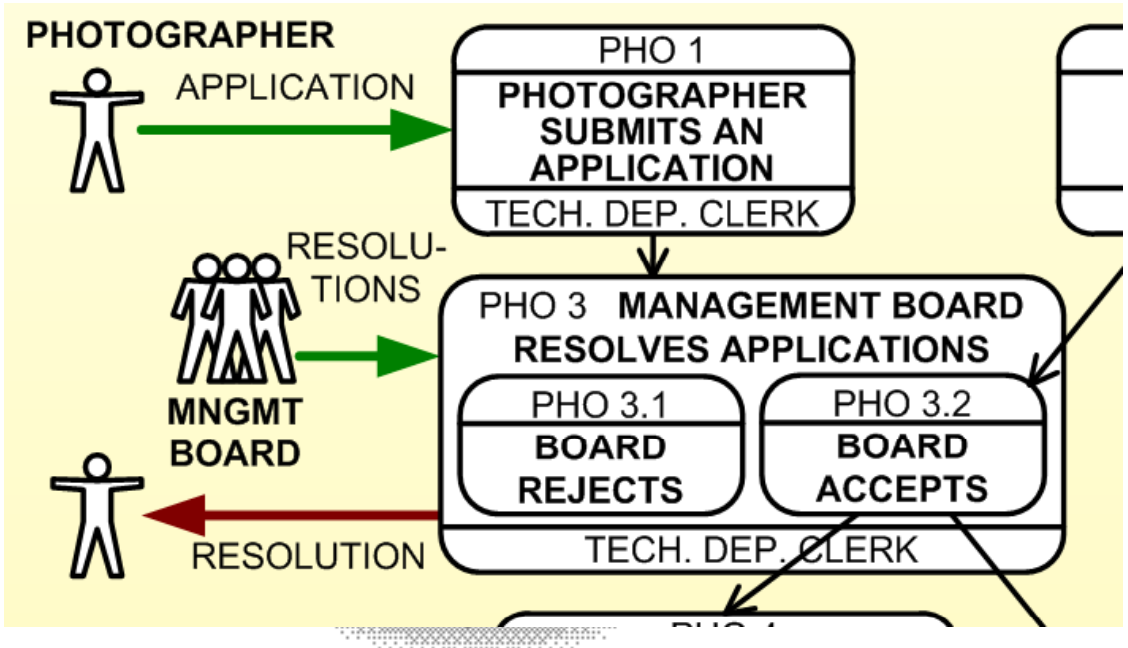
UNITY CRITERIA FOR BUSINESS PROCESS MODELLING	
TRIGGER UNITY	Trigger responsibility is external. The event occurs as a response to an **external interaction.** Some actor establishes contact with the IS and triggers organisational reaction.
COMMUNICATION UNITY	Each and every event involves providing **new meaningful information**. Input messages are representations of something that happens in the IS environment.
REACTION UNITY	The event triggers IS reaction, which is **a composition of synchronous activities**. Events are asynchronous among each other.

Proposal

- Illustrative example

Photographer

Photography Agency, Inc



- Communicative event diagram of *Photography Agency, Inc.*

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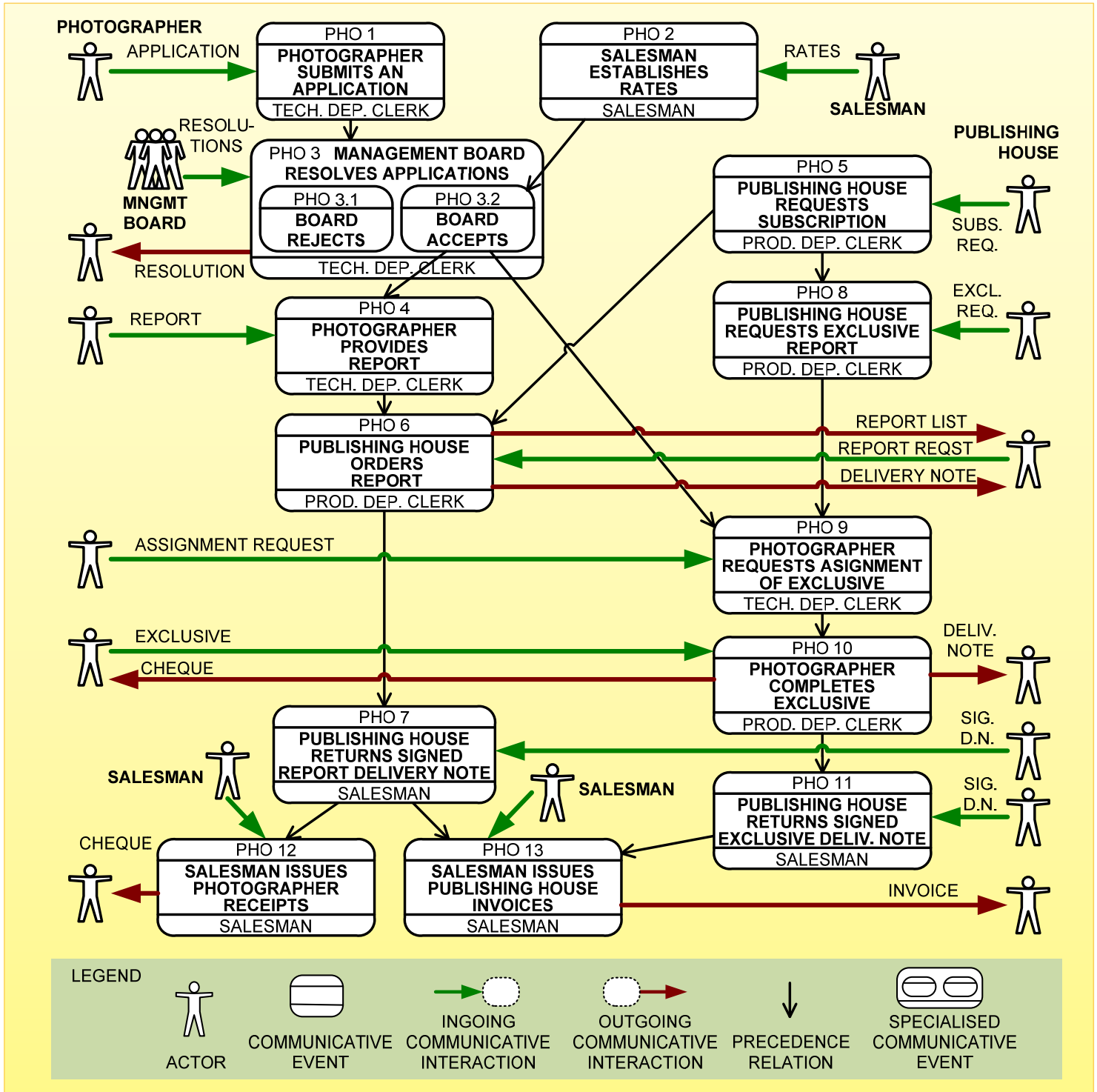


- Activity 3. Business objects identification.
  - **Business Object Glossary**. Structure that specifies business objects.
    - Business objects are conceptions of entities of the Subject System in which the Organisational System is interested.
      - Complex aggregates of properties (not o-o fragmentation)

      • Report record
      • Photographer record
      • Report delivery note
    - Business forms are catalogued.

Problem space

L1. System/ subsystems

L2. Process

L3. Communicative interaction

Solution space

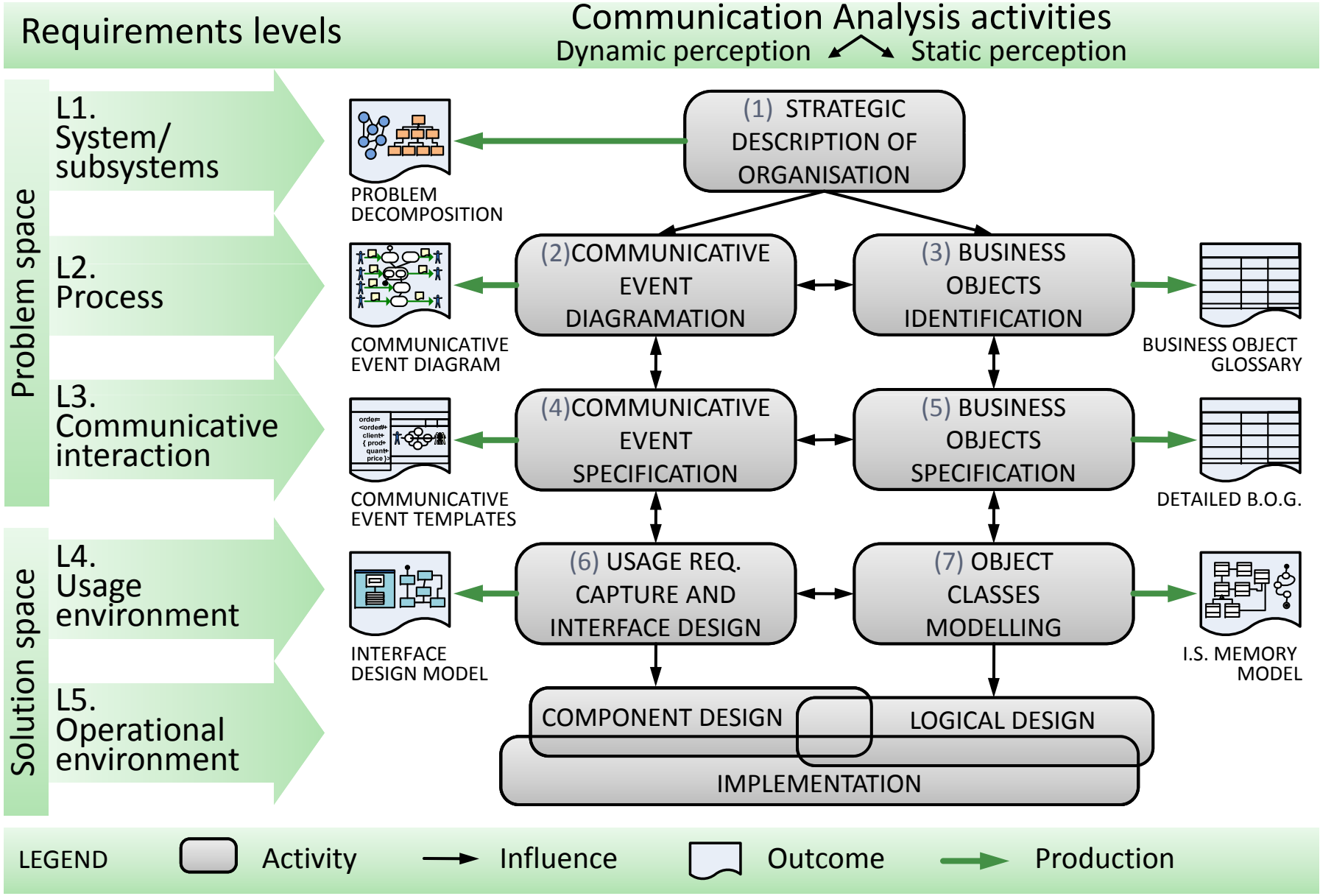
L4. Usage environment

L5. Operational environment

  - Business indicators at the process level.

    •Production department: productivity and profitability indicators
      • Delivery performance to customer
      • Photographer productivity

- Requirements structure and method activities



- Activity 4. Communicative event specification.
  - Template structure

Header
Contact requirements
Communicational content requirements
Reaction requirements

Problem space

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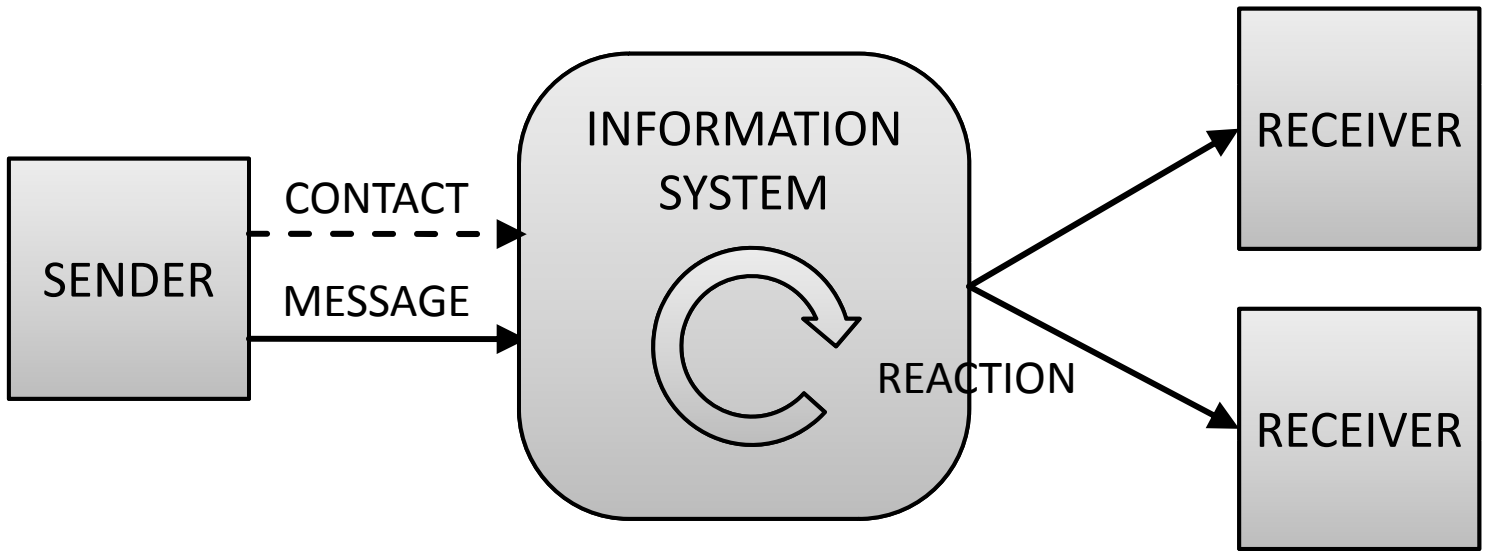

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PHO 3. Management board resolves applications

Goals: The IS aims to obtain a response to outstanding photographer applications.

Description: Monday mornings, the management board holds a meeting. A member of each department is present. A Production Department clerk has prepared a list of outstanding (pending) photographer applications and a résumé of each applicant. Management board proceeds to evaluate and resolve each application. Depending on the documentation, a photographer is either accepted or rejected. Accepted photographers are classified into a quality level (this level will determine their rates). After the meeting, the list of resolved applications is returned to Production Department.

- Activity 4

Header
Contact requirements
Communicational content requirements
Reaction requirements

Problem space

L1. System/ subsystems

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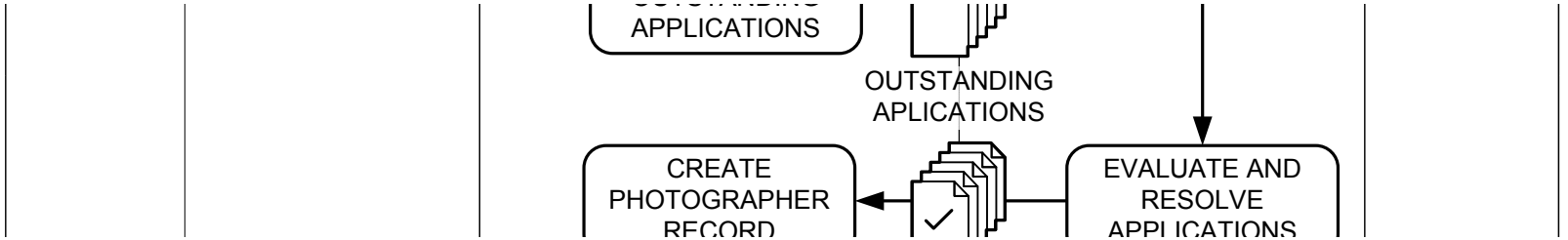

- Activity 4

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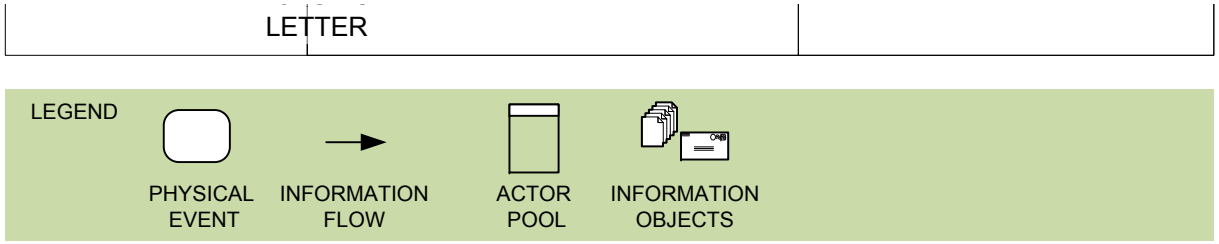

Contact requirements

Primary actor: Management board. **Communication channel**: In person.
Temporal restrictions: This communicative event occurs Monday mornings.
Frequency: Of the 10-20 monthly applications, around 5 are accepted.

Communicational content requirements

Support actor: Production Department clerk
Communication Structure:

FIELD	OP	DOMAIN	BUSINESS OBJ.	EXAMPLE VALUE

LEGEND

- Activity 4. Communicative event specification.
  - Communication Structure of event PHO 3

Header
Contact requirements
Communicational content requirements
Reaction requirements

FIELD	OP	DOMAIN	BUSINESS OBJ.	EXAMPLE VALUE
RESOLUTIONS =			PHOTOGRAPHER	
{ Application()=			(ID card #)=	
< ID card # +	i	text	<	19.345.631-Q
Name +	d	text		Sergio Pastor González
Address +	d	text		Camino de Vera s/n
Postcode +	d	text		46022
City +	d	text		Valencia
Phone # +	d	text		9638700000 ext 83534
Equipment +	d	text		Canon A1 w. telemacro
Experience +	d	text		Worked for Mangum Ph
Portfolio +	d	document		N/A (sample of work)
Resol. date +	i	date	resol date +	November 21, 2008
Decision +	i	[acc|rej]	decision +	acc
[Accepted =		Decision=acc		
< Level >]	i	Rate<level>	level	1 (highest quality level)
>			>	
}				

LEGEND

CSs Primitives

<+> aggregation
{ } iteration
[|] alternative
( ) selection

Information aquisition operations

d derivation
i input

- Activity 4

Header
Contact requirements
Communicational content requirements
Reaction requirements

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>			>	
>				

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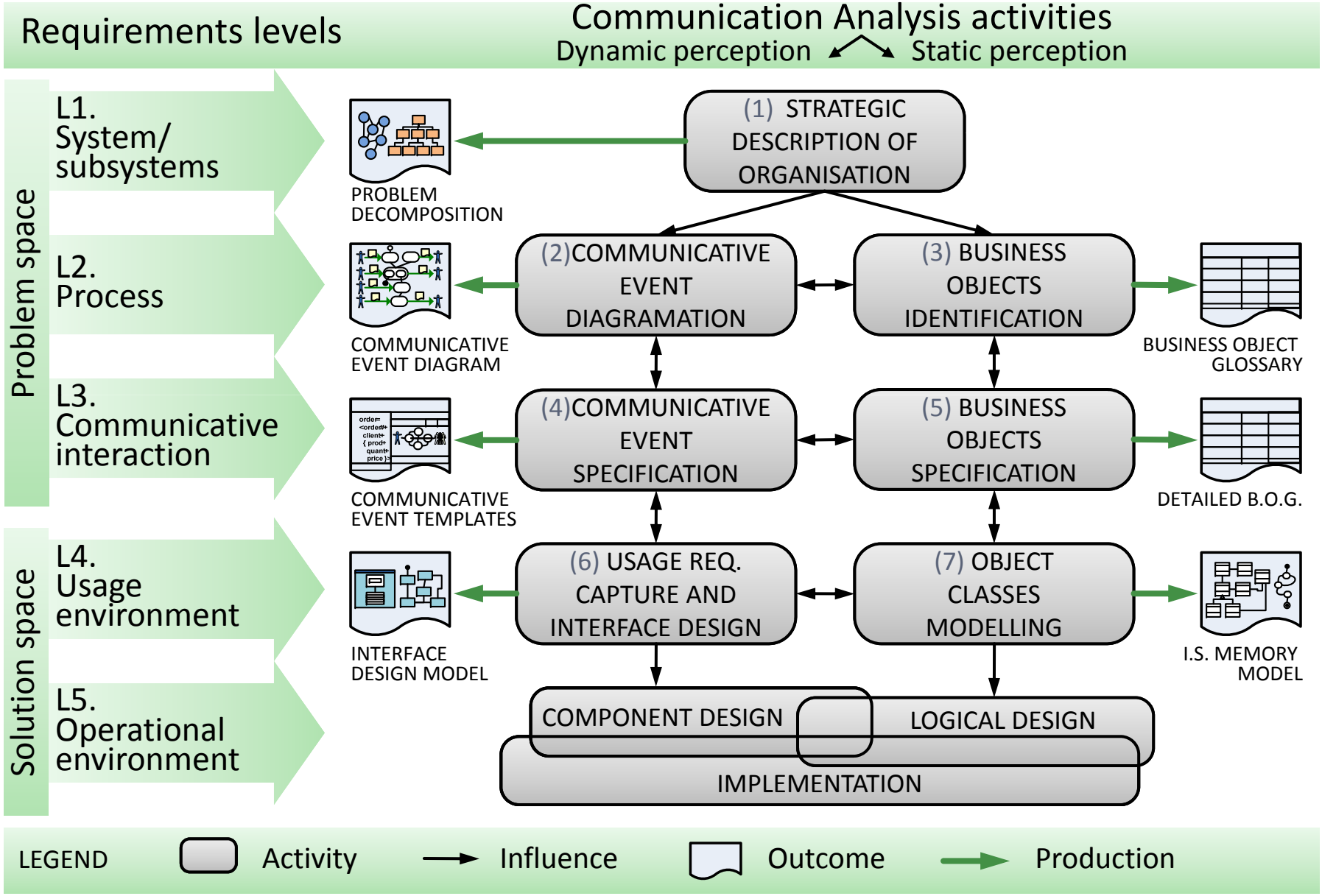
Motivation

- Requirements structure and method activities



Conclusions and future work

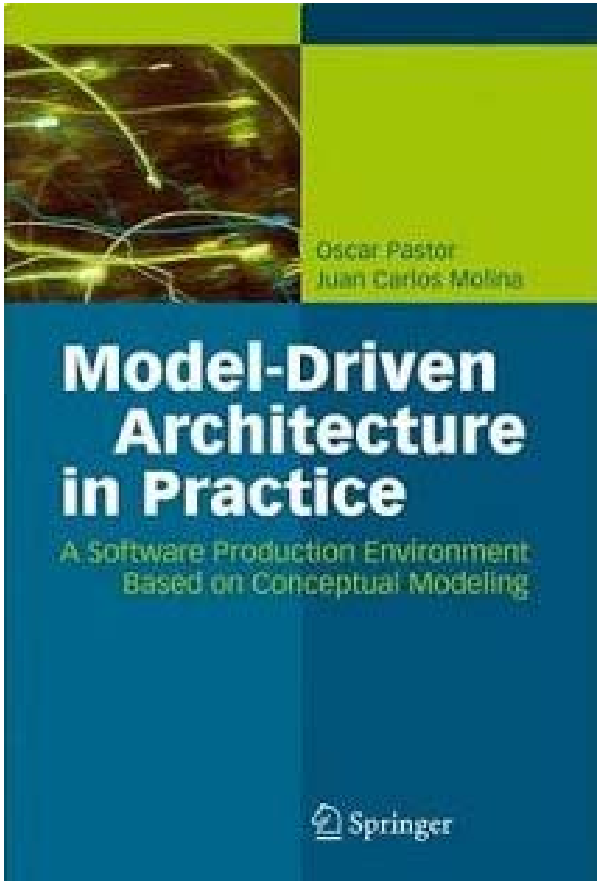
- Communication Analysis offers a systemic way to structure requirements
- Specific techniques for IS analysis
  - Communicative Event Diagram.
    - Communicational perspective on business process modelling
    - Unity criteria to deal with encapsulation (granularity of processes)
  - Communication Structures
    - Specifies messages related to communicative events
    - Derivation of IS memory from communication structures
- Future work
  - Propose precise guidelines to derive IS memory
  - Design user interface from communication structures
  - Report industrial case studies in the use of Communication Analysis
  - Take advantage of MDD and code generation frameworks
  - Extremely long etcetera under the proposed “full MDD” perspective…

Abstraction as a solution

- Model Driven Development permits
  - Reason about the system prior to its construction
    - You can simulate the behavior to foresee the consequences of a system
  - Derivate the final system in an automatic way
    - Obtaining a consistent result

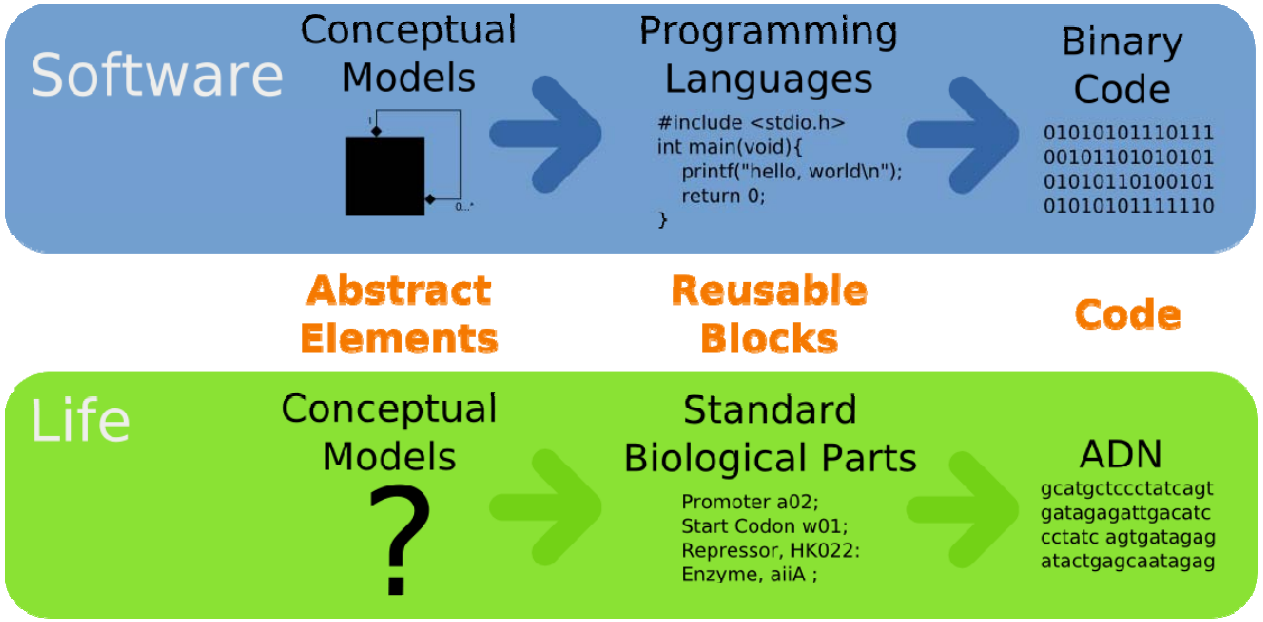
- We have been building
  - Traditional Information Systems
  - Web-based Information Systems
  - SOA-based systems
  - Pervasive Systems

  - … but, what is next?



One step further: Modeling

- Conceptual models are needed for a systematic development of biological systems

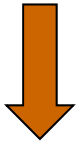


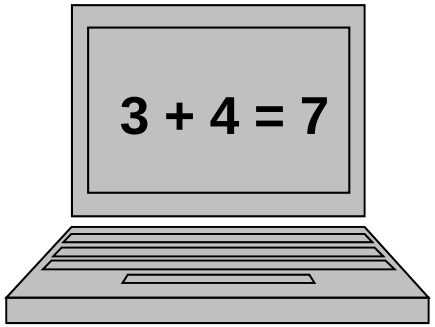
00010011	00000111	00000011	00001000

Physical Level

ADD $7 $3 $8 ***Instruction Level***

Semantics: Add the values from the processor registers '3' and store the result in the register '8'





Representation Level

AUG	GAA	CAC	GAC	GAG	UAA

Physical Level

START Glu His Asp Glu STOP

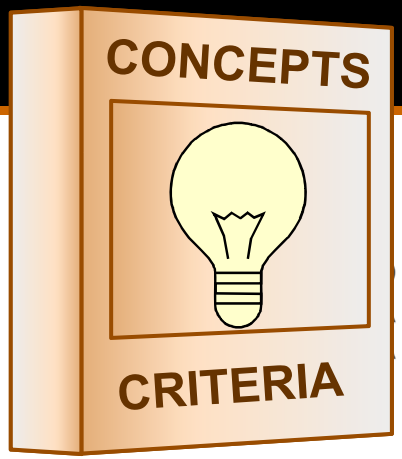
Instruction Level

Semantics: Process a protein with the four selected aminoacids

However, ¿Why?

Representation Level

Thanks for your attention!



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