



Centro de Investigación
en Métodos de
Producción de Software

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

Óscar Pastor López



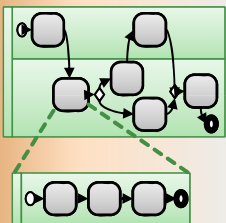
UNIVERSIDAD
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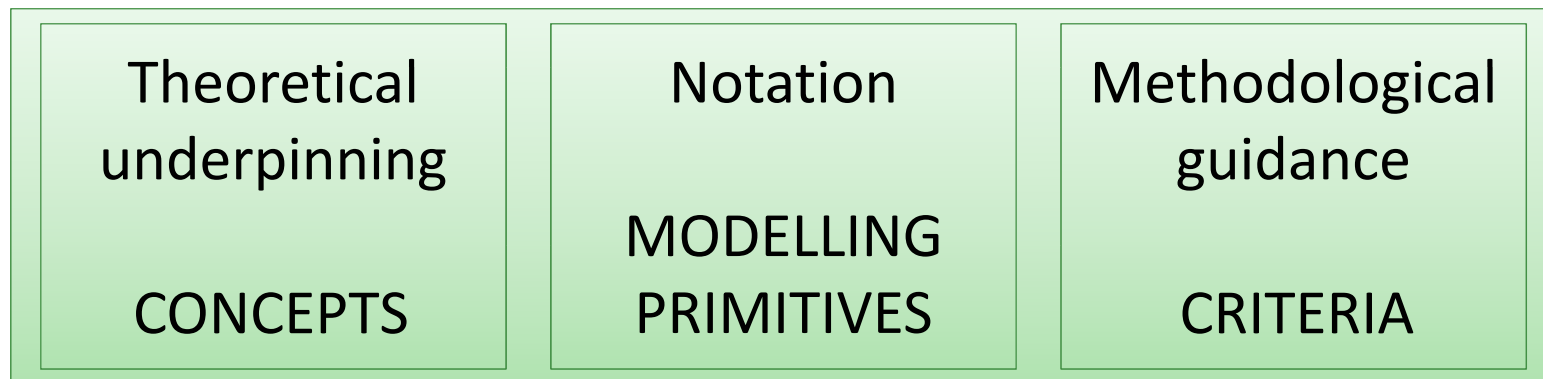
MODELLING TECHNIQUES OFFER!!!
TAKE 3, PAY 2

NOTATION

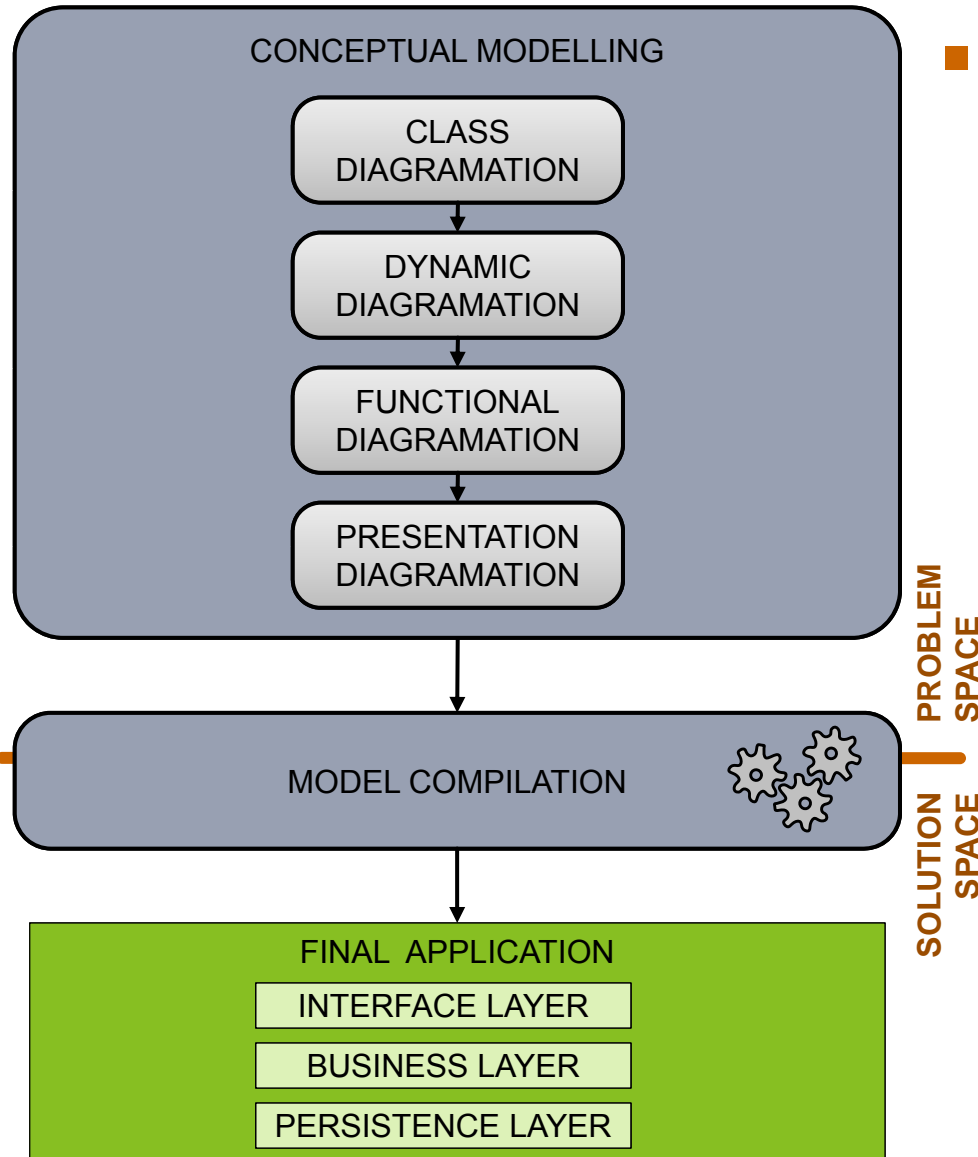


YET ANOTHER
METHOD
NICE & CHEAP

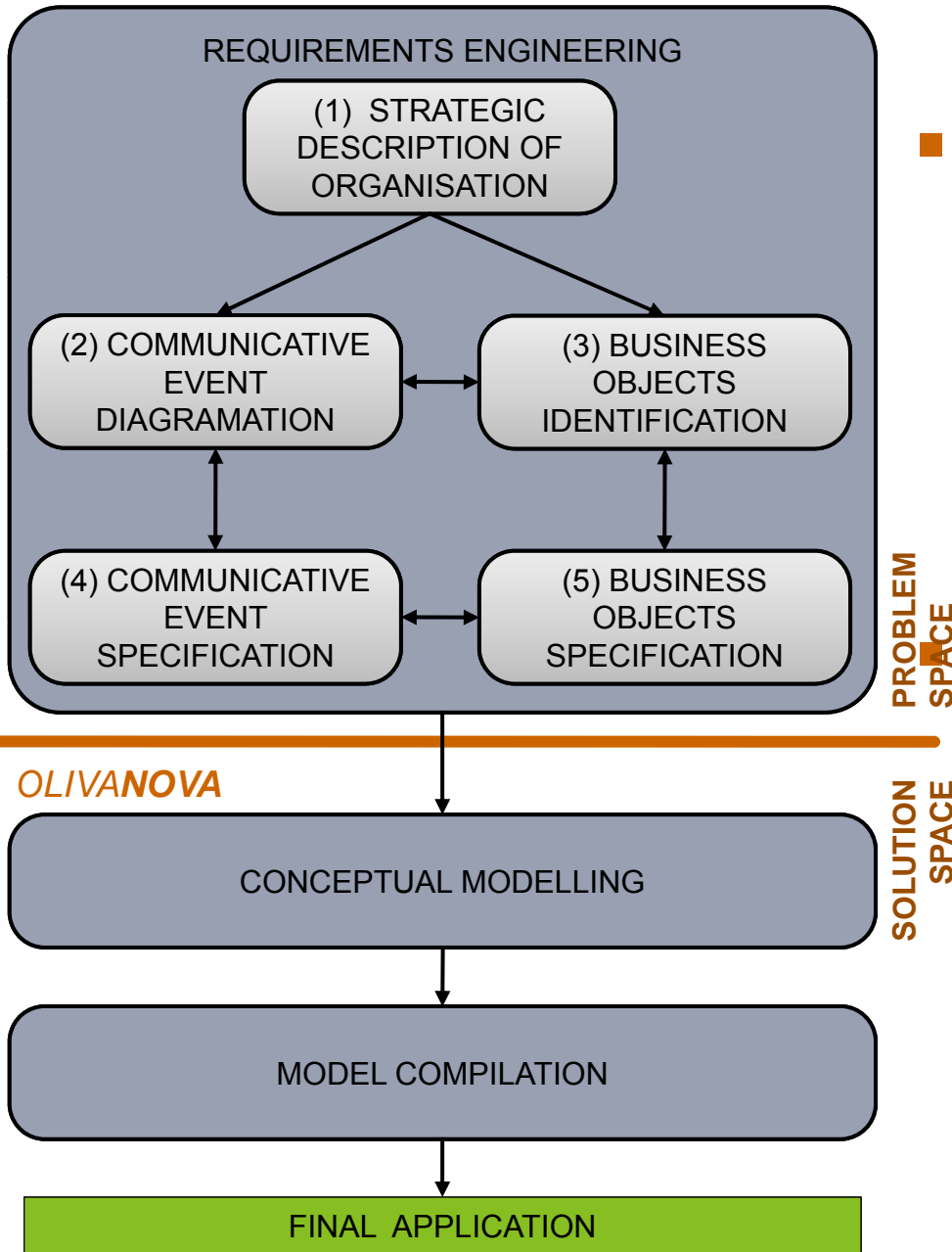
- **Business process modelling (BPM)**
 - Specification of the (current and/or proposed) enterprise processes.
 - Important practice in Requirements Engineering and Software Engineering
 - Multiple BPM techniques



OLIVANOVA



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

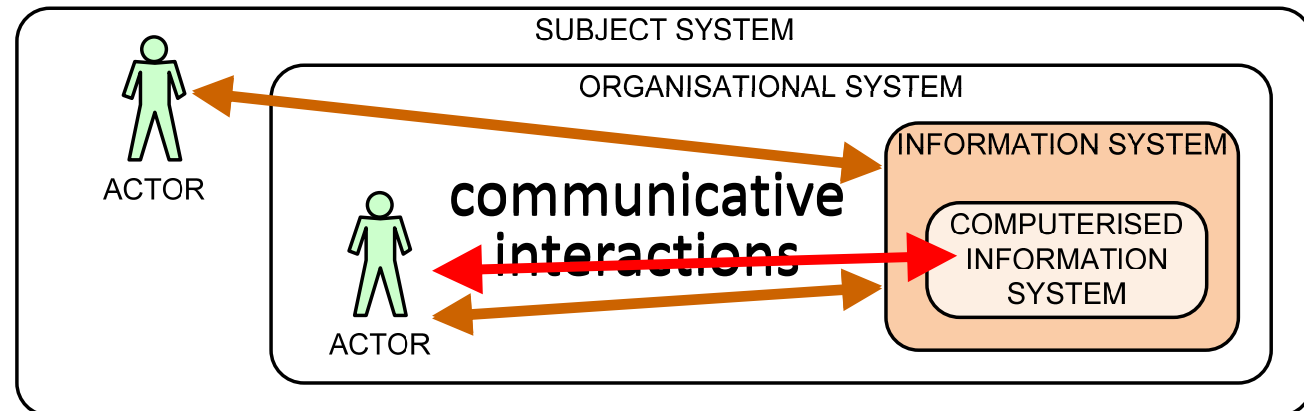


- Communication Analysis:
 - Requirements engineering approach for information systems
 - Provides a **requirements structure**
 - Provides a **flow of activities**

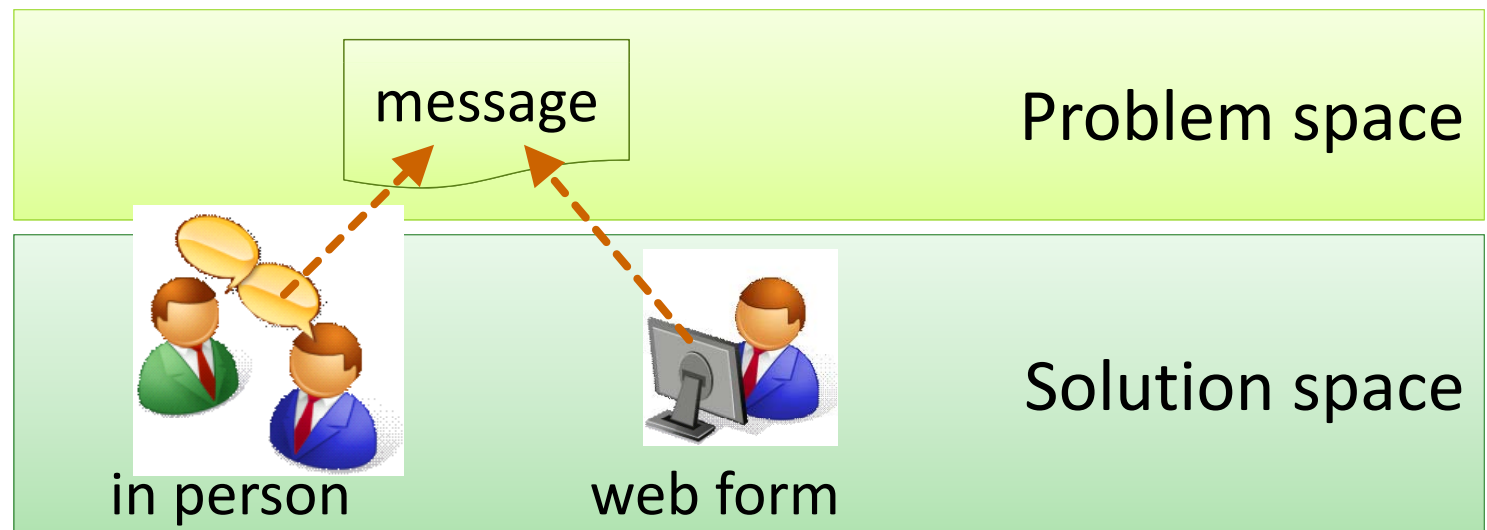
The OLIVANOVA approach:

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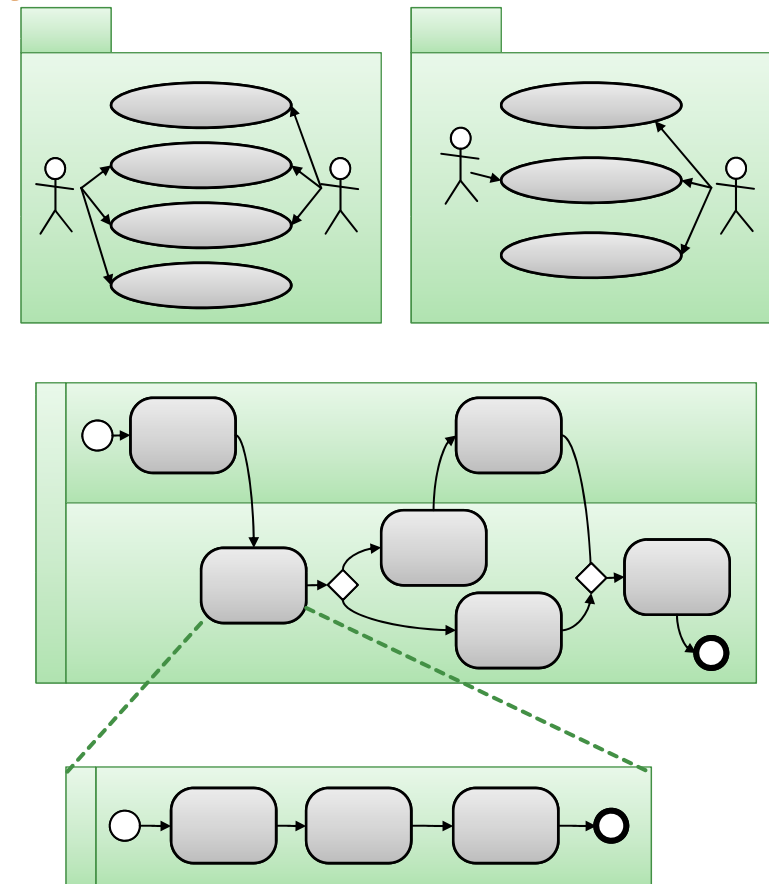
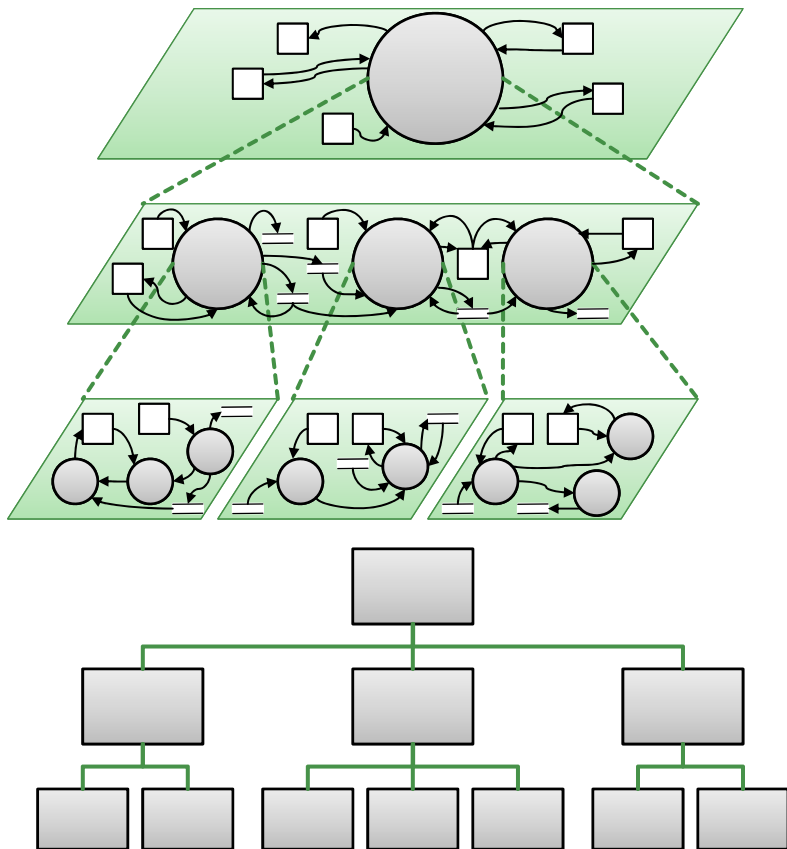
- Good practices in IS requirements Engineering:
 - Offer external view of the IS.
 - A communicational approach to IS analysis.



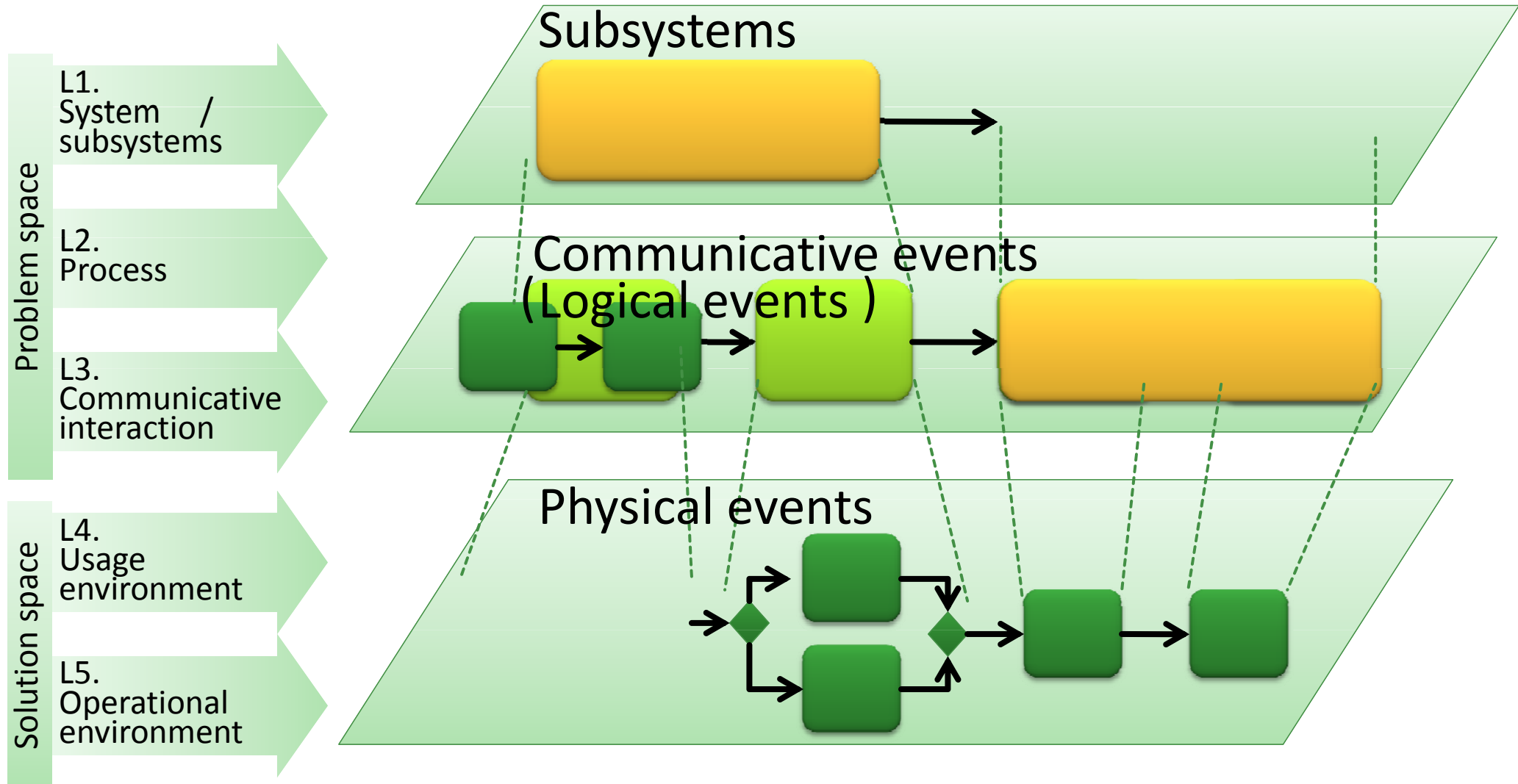
- Good practices in IS requirements Engineering:
 - Offer external view of the IS.
 - A communicational approach to IS analysis.
 - **Differentiate problem space vs. solution space.**



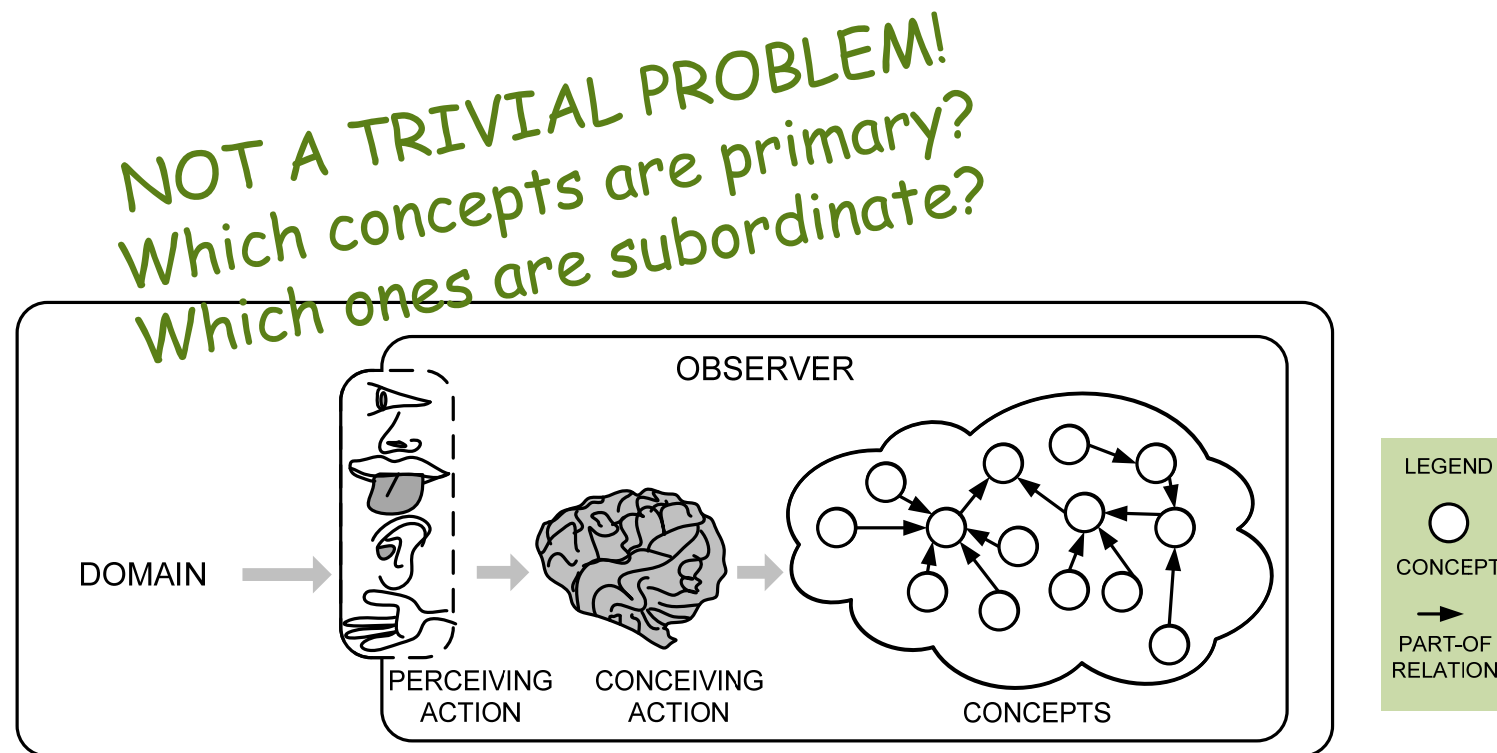
- Good practices in IS requirements Engineering:
 - Offer external view of the IS.
 - A communicational approach to IS analysis.
 - Differentiate problem space vs. solution space.
 - **(Stepwise) refinement of complex systems.**



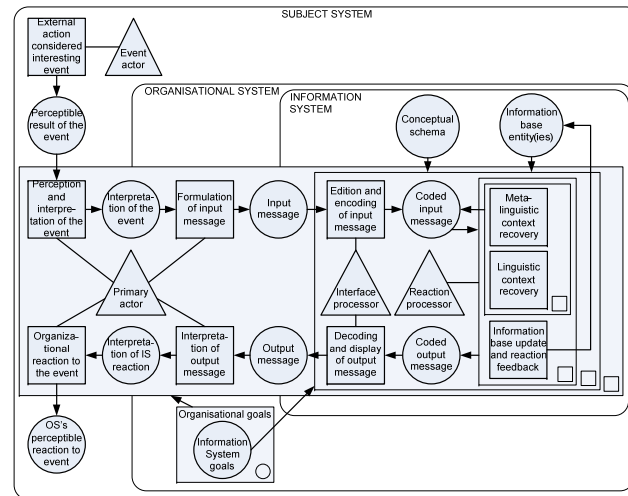
- **Wise** (stepwise) refinement of complex systems



- 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).

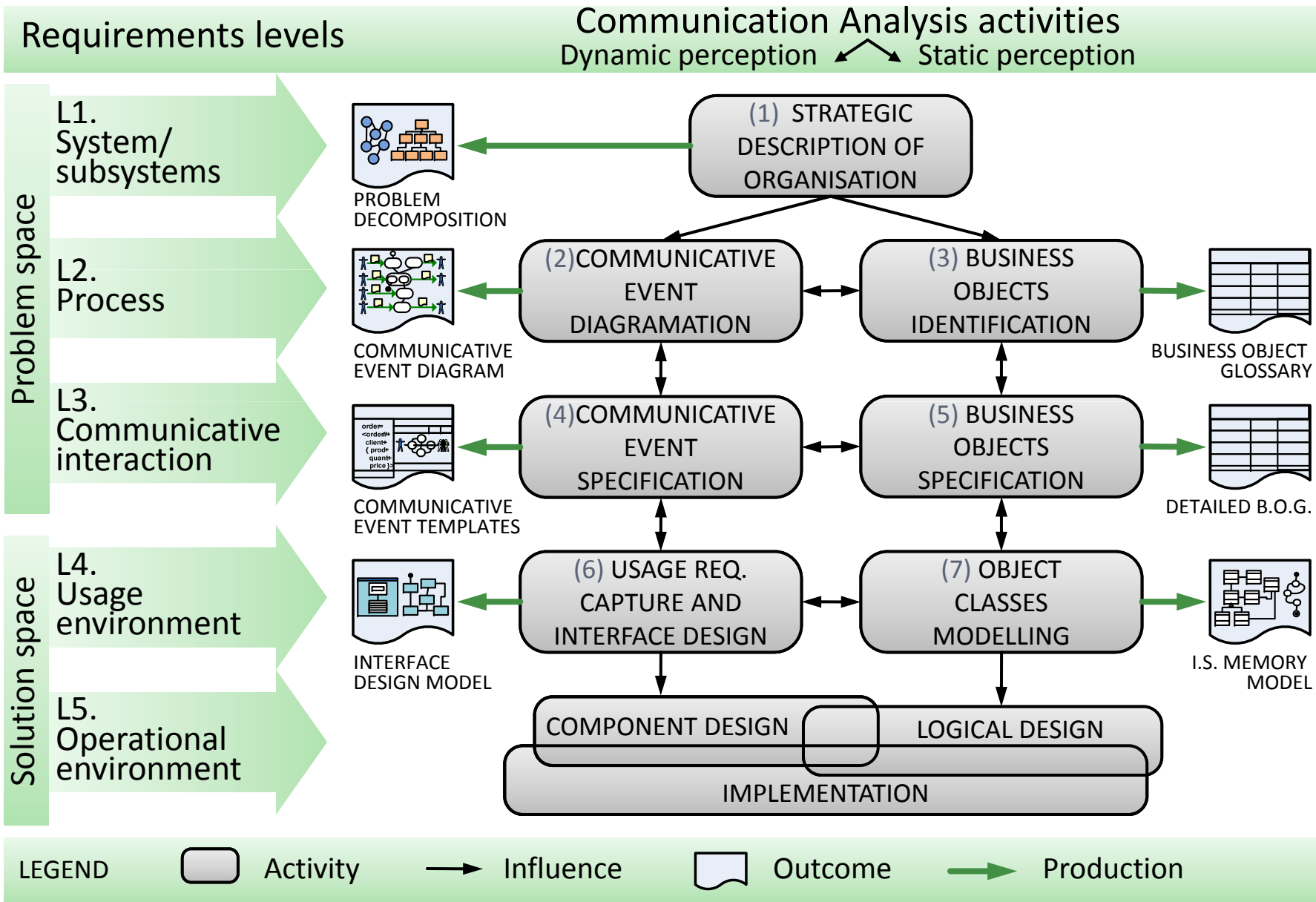


- Conception of Communication Analysis
 - Stems from research on IS fundamental concepts
 - Extension of the FRISCO report.



- 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



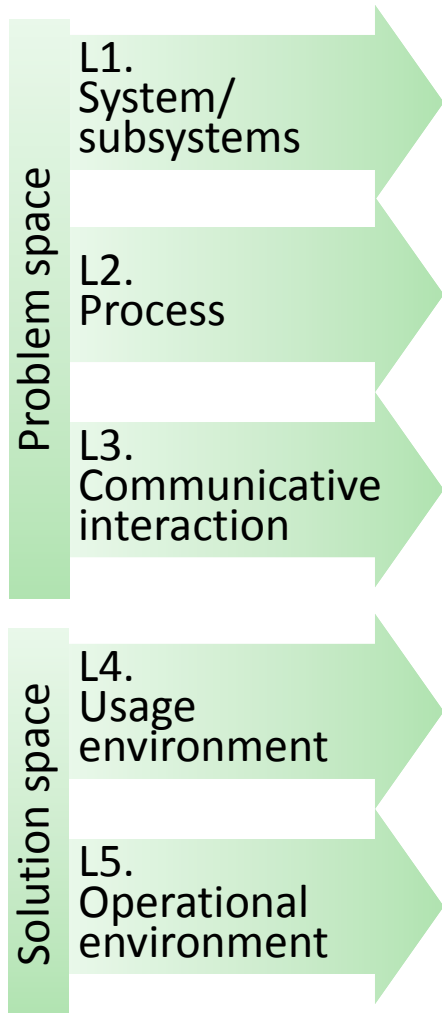
■ Activity 1. Strategic description of organisation.

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

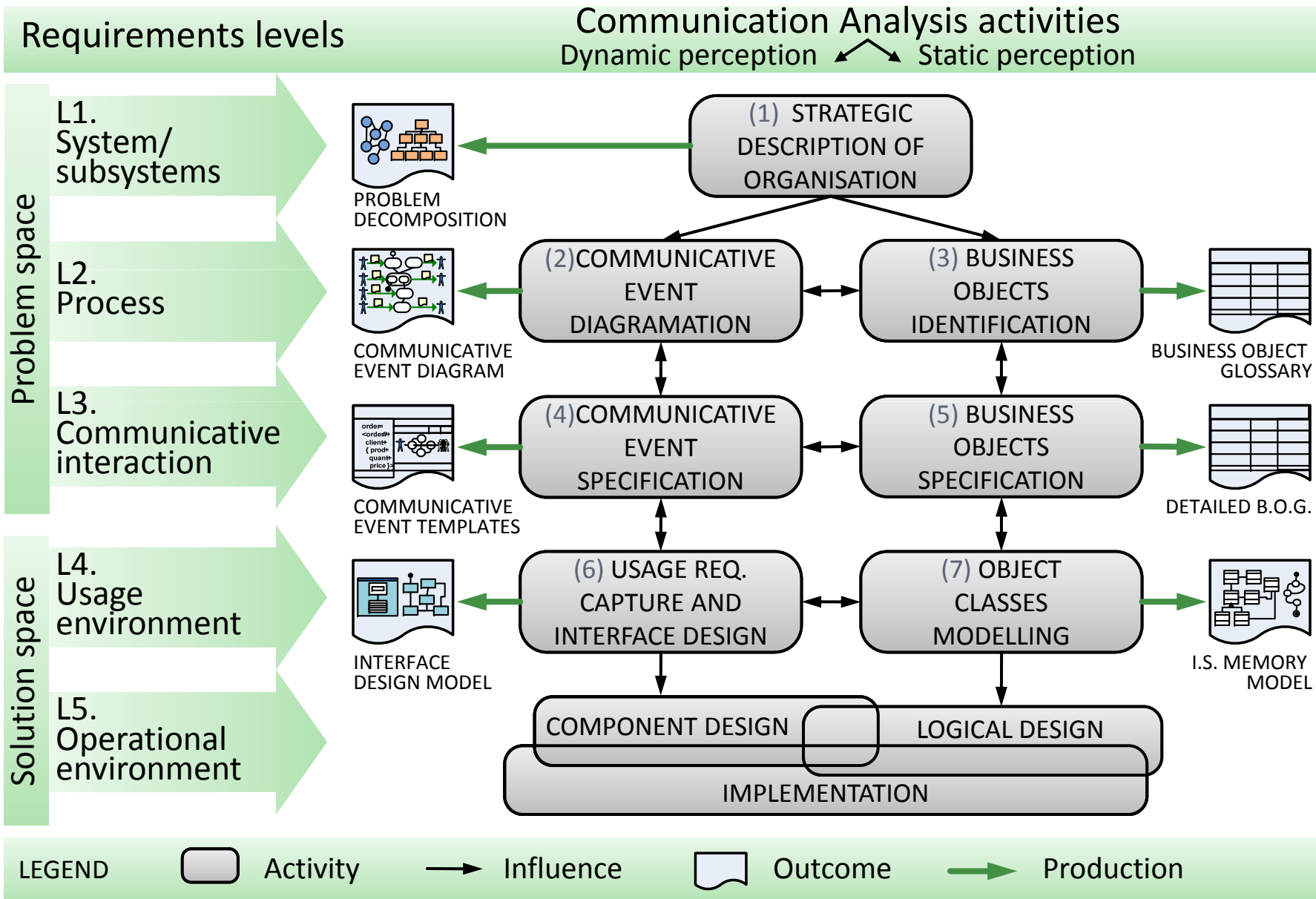
- Customer Service Departments (salesmen)
- Production Department (clerks)
- Accounting Department (accountant)
- Management Board

- Strategic business indicators

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

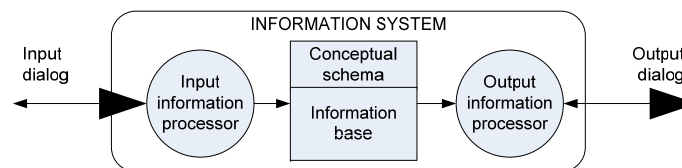
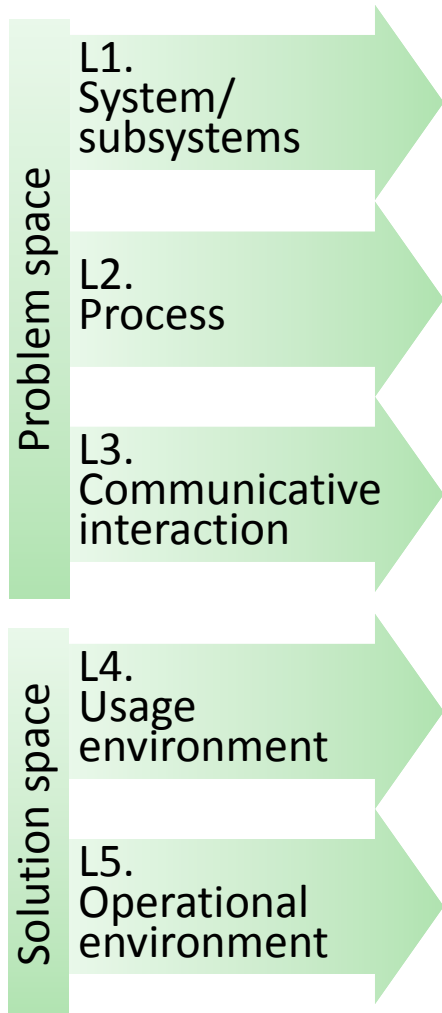


Requirements structure and method activities

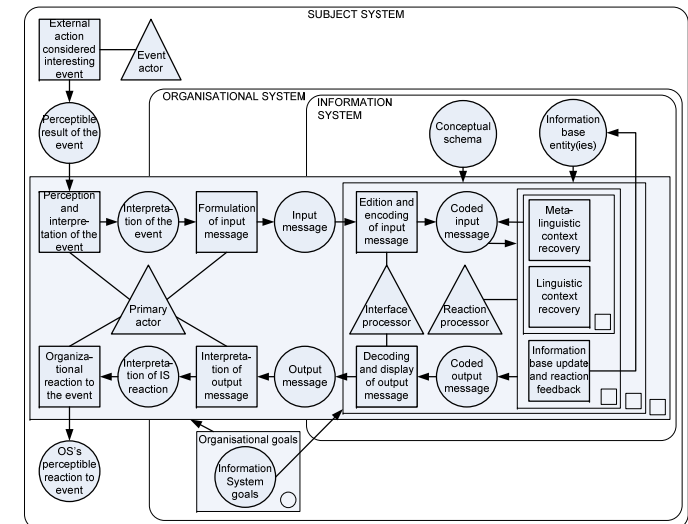


Activity 2. Communicative event diagramation

- 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.



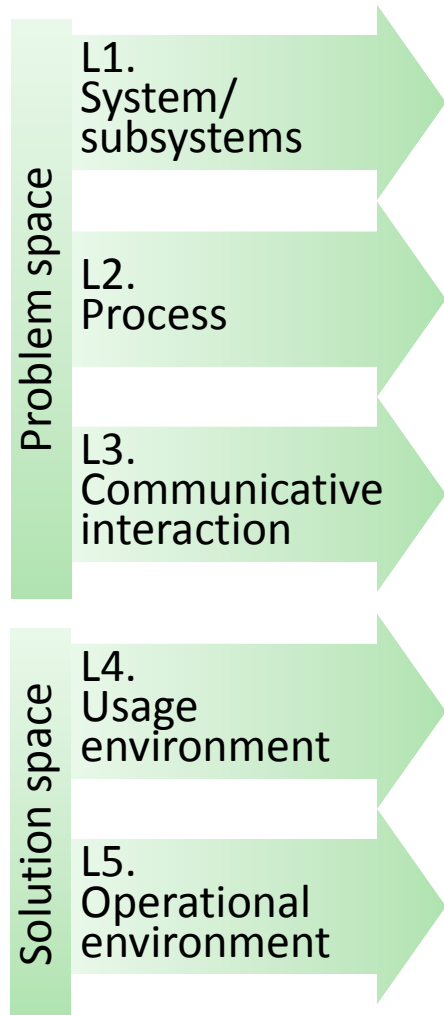
[ISO 1982]



Extended from [FRISCO 1998]

- Activity 2. Communicative event diagramation

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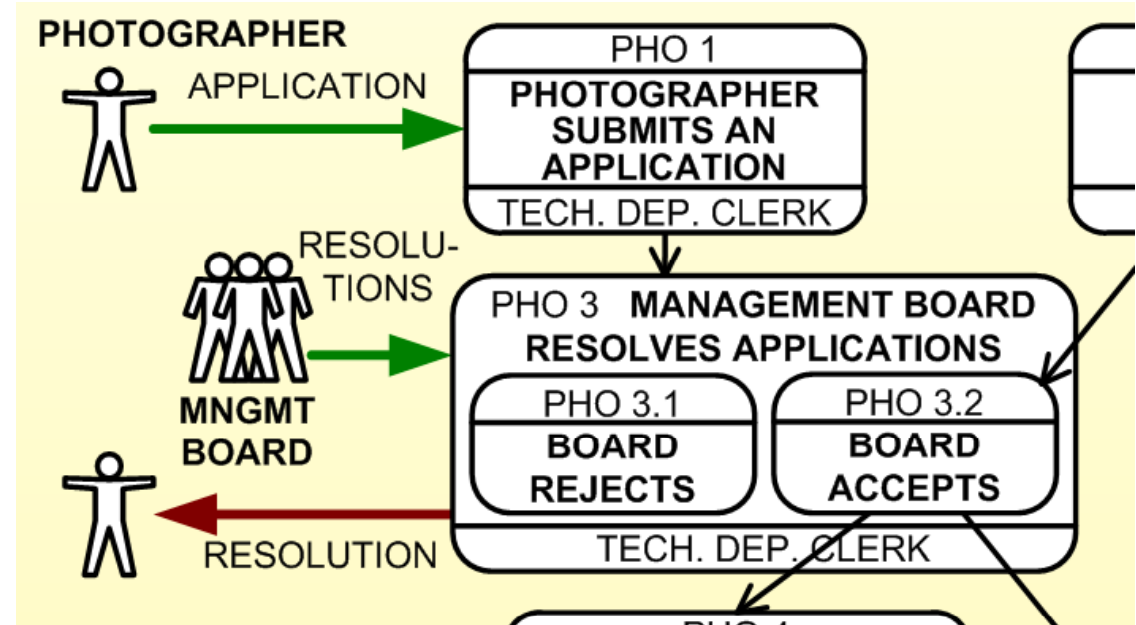
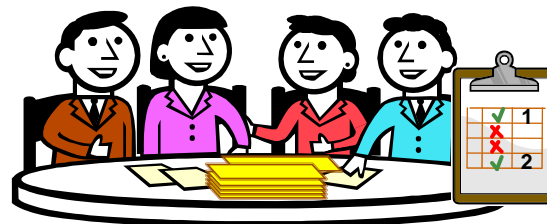
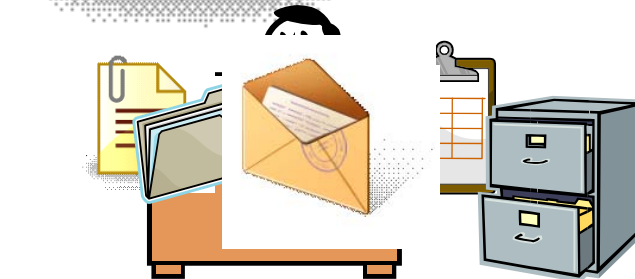


UNITY CRITERIA FOR BUSINESS PROCESS MODELLING	
TRIGGER UNITY	<p>Trigger responsibility is external.</p> <p>The event occurs as a response to an external interaction.</p> <p>Some actor establishes contact with the IS and triggers organisational reaction.</p>
COMMUNICATION UNITY	<p>Each and every event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

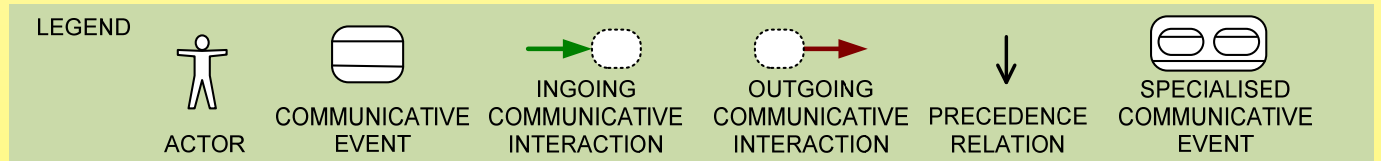
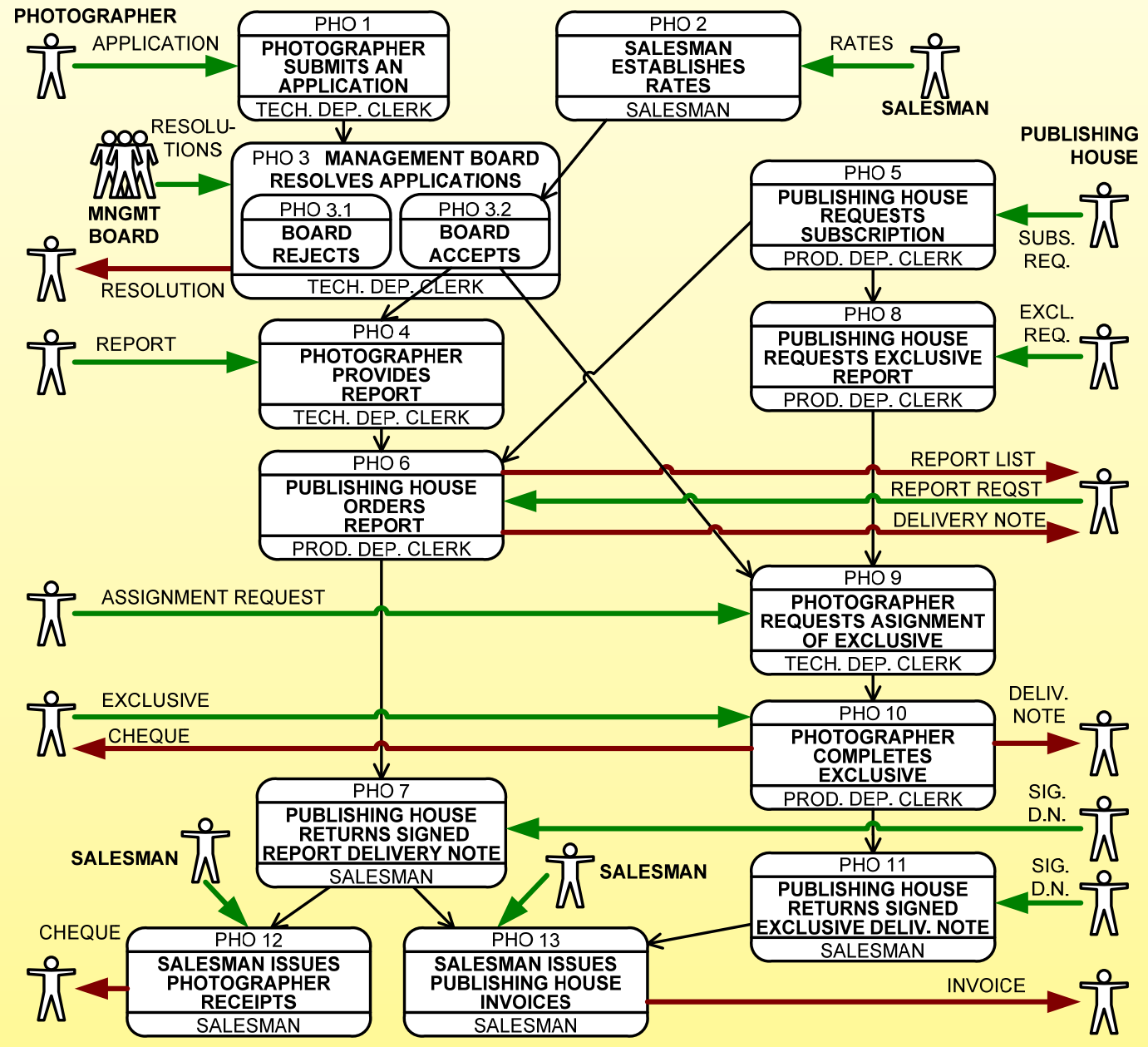
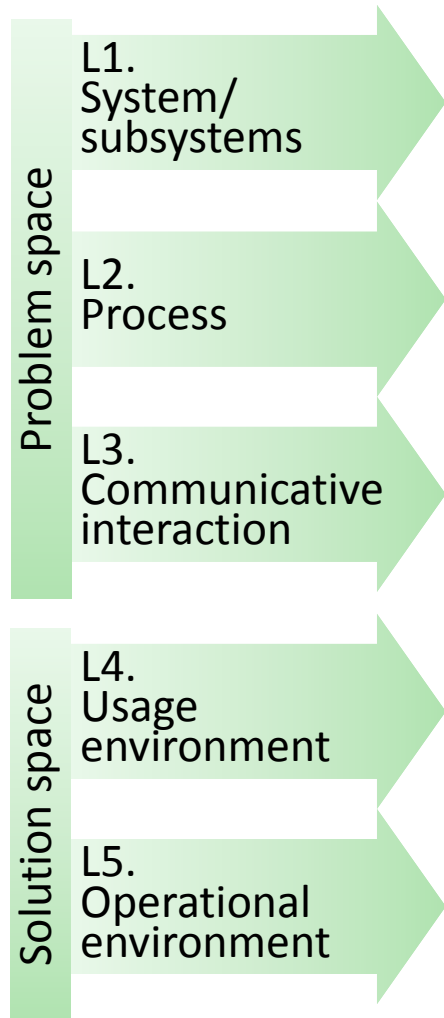
- Illustrative example

Photographer

Photography Agency, Inc



Communicative event diagram of *Photography Agency, Inc.*



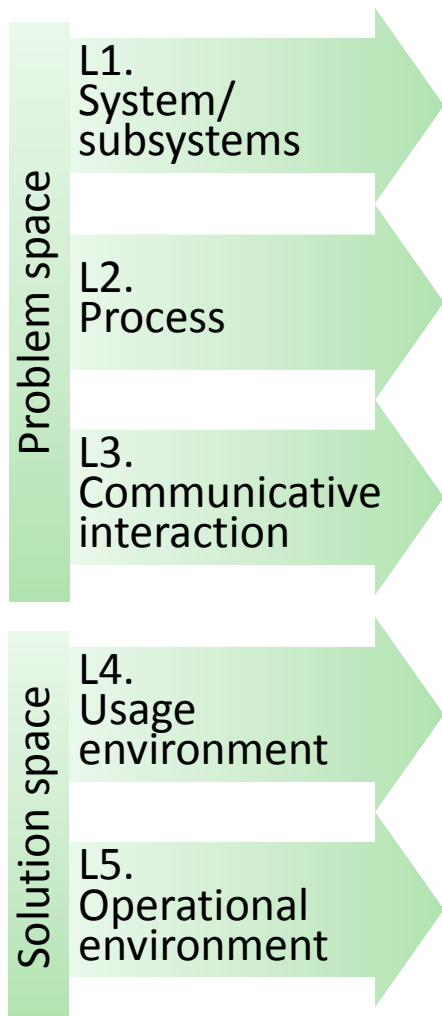
■ Activity 3. Business objects identification.

■ **Business Object Glossary.** Structure that specifies business objects.

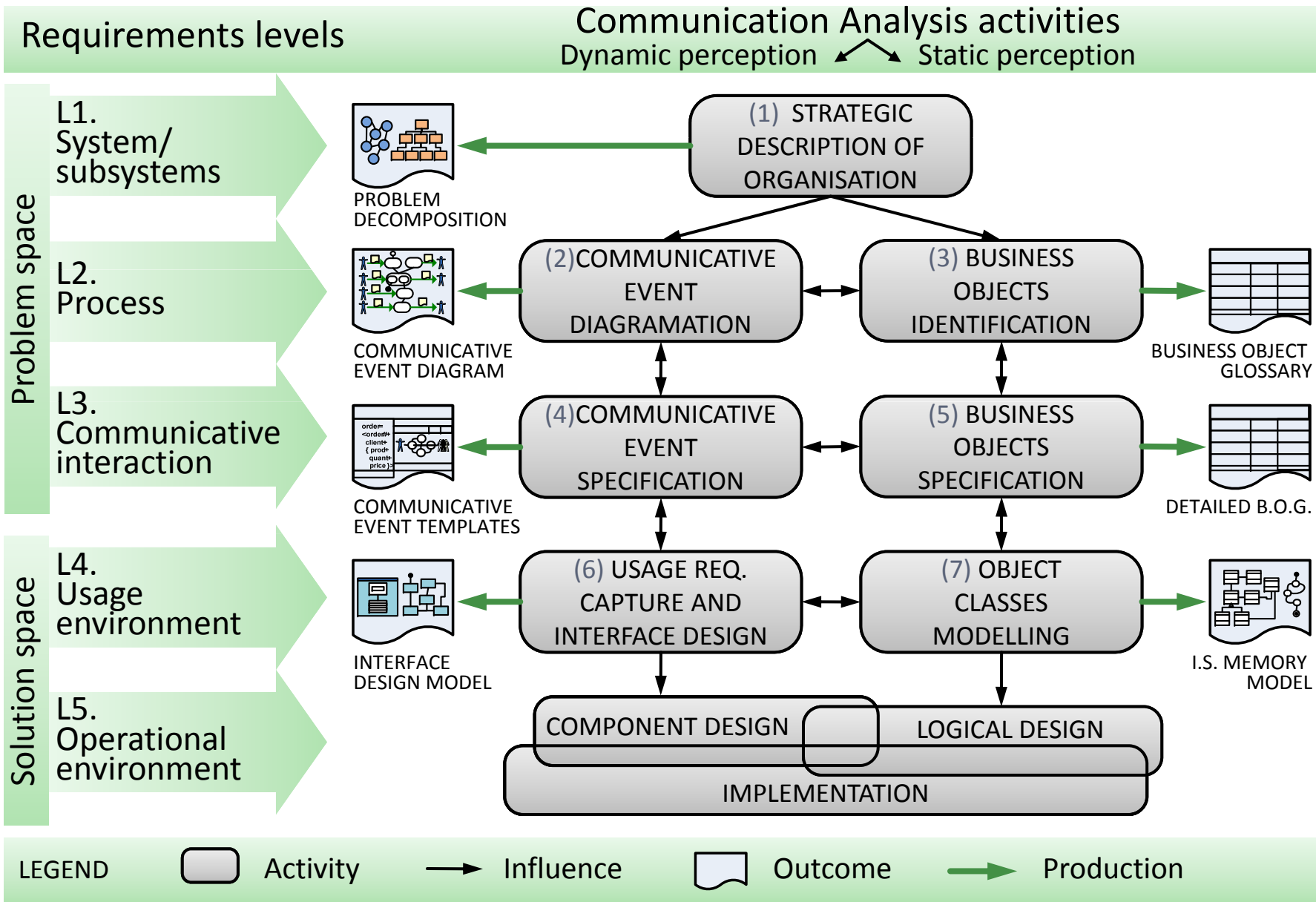
- Business objects are conceptions of entities of the Subject System in which the Organisational System is interested.
 - Complex aggregates of properties (not o-o fragmentation)
 - Report record
 - Photographer record
 - Report delivery note
- Business forms are catalogued.

■ Business indicators at the process level.

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

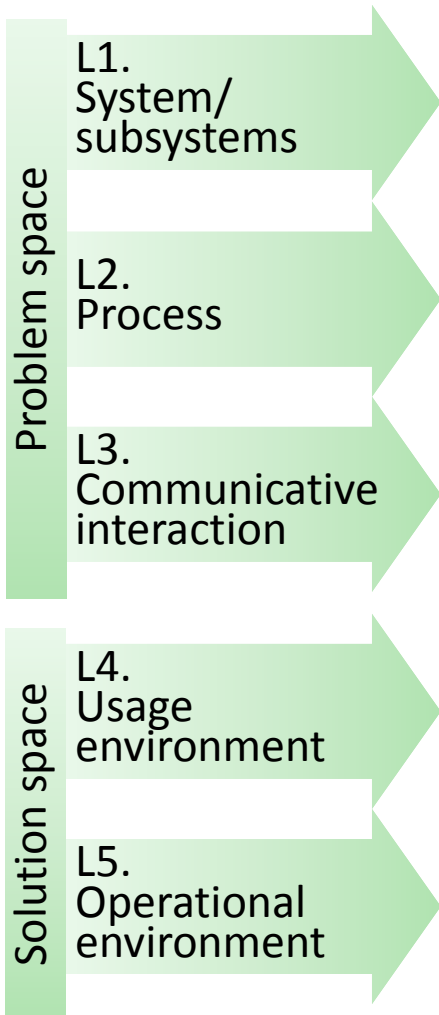


Requirements structure and method activities



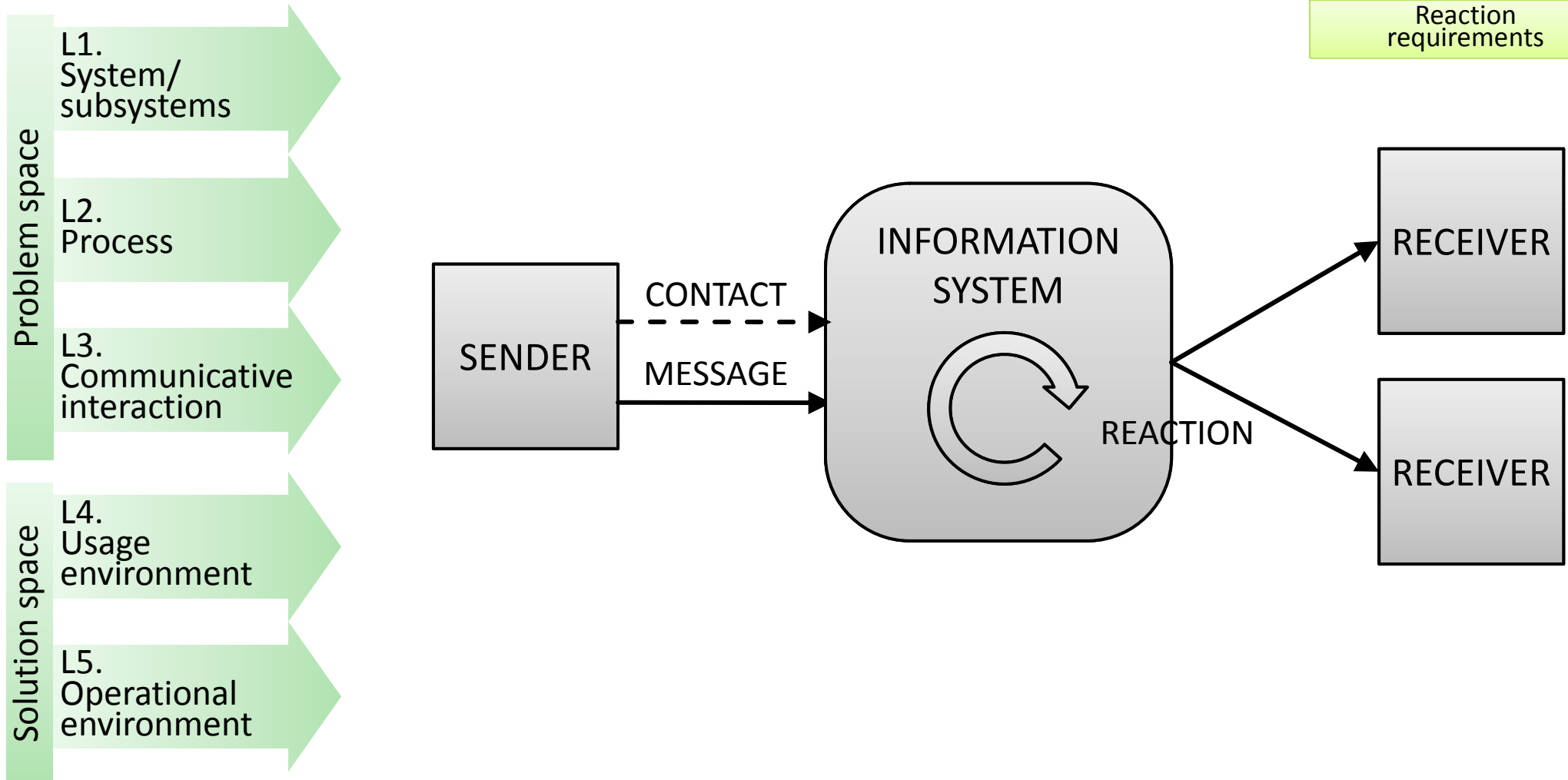
- Activity 4. Communicative event specification.
 - Template structure

Header
Contact requirements
Communicational content requirements
Reaction requirements



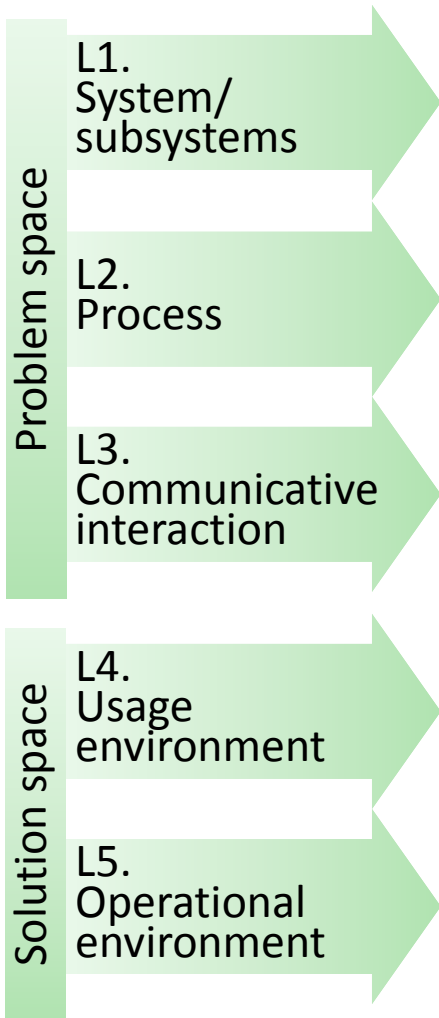
Activity 4. Communicative event specification.

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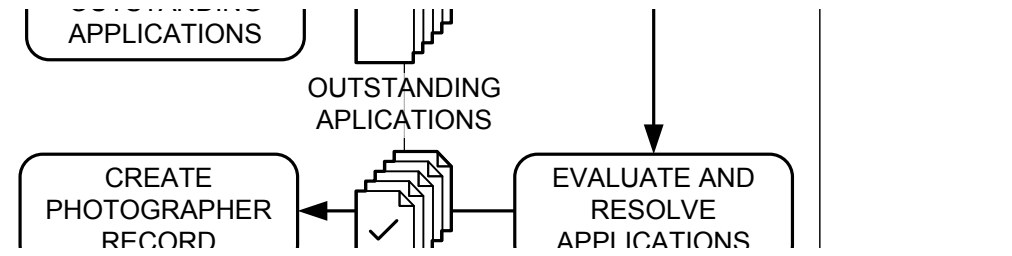
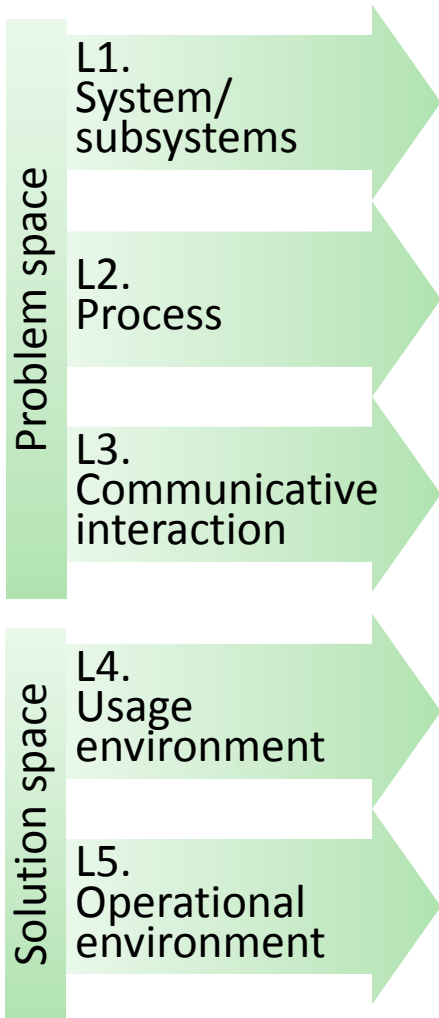
PHO 3. Management board resolves applications

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.

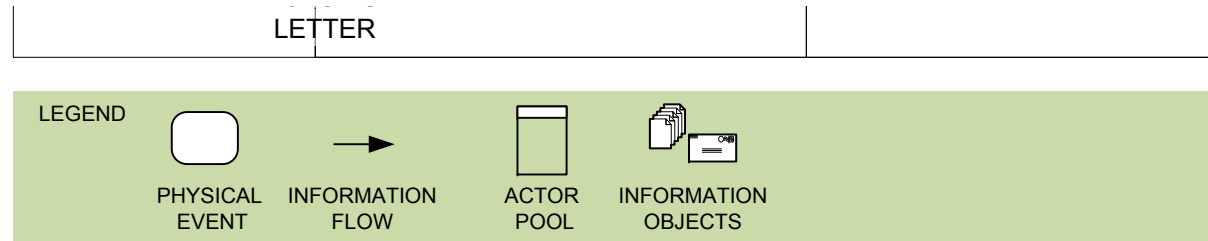
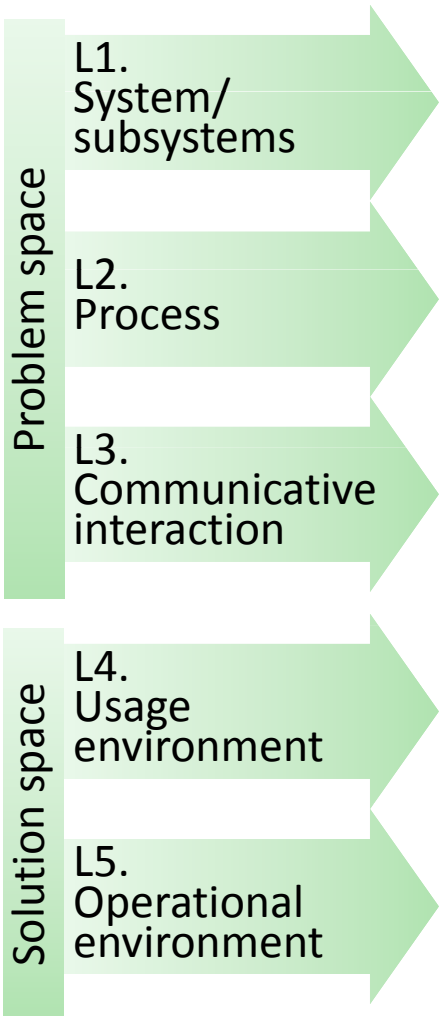
Activity 4

Header
Contact requirements
Communicational content requirements
Reaction requirements



Activity 4

Header
Contact requirements
Communicational content requirements
Reaction requirements



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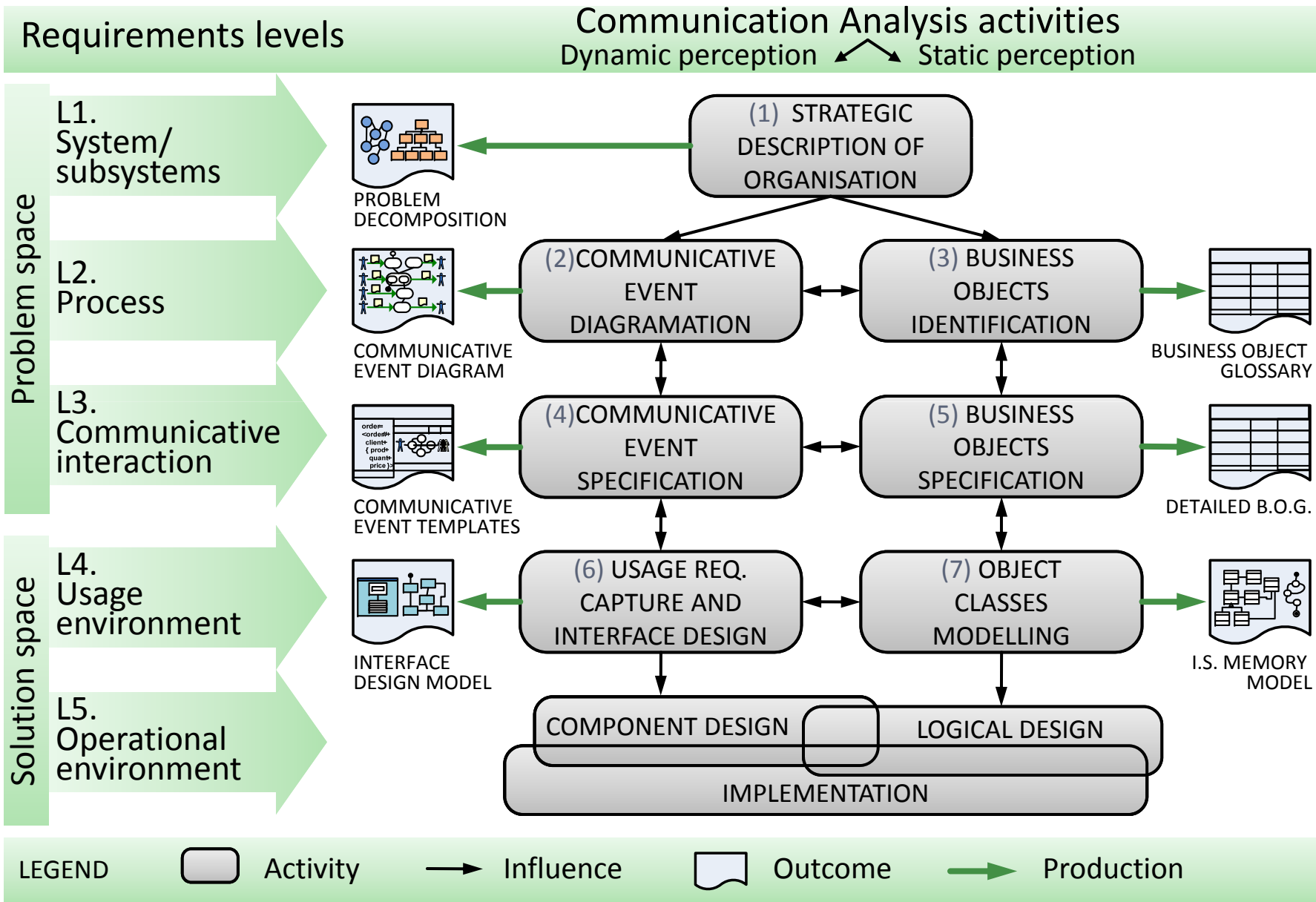
- Activity 4. Communicative event specification.
 - Communication Structure of event PHO 3

Header
Contact requirements
Communicational content requirements
Reaction requirements

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

LEGEND
<u>CSs Primitives</u>
<+> aggregation
{ } iteration
[] alternative
() selection
<u>Information</u>
<u>aquisition</u>
<u>operations</u>
d derivation
i input

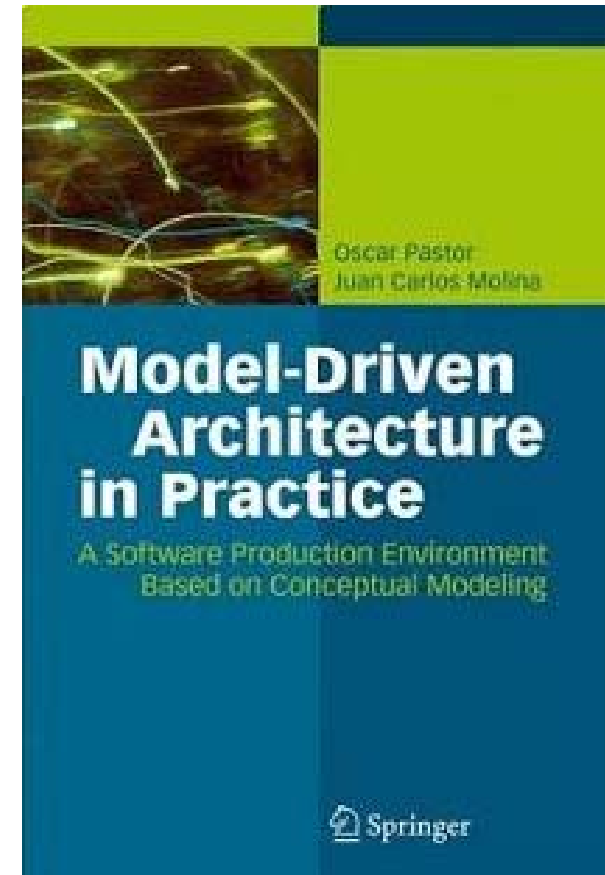
Requirements structure and method activities



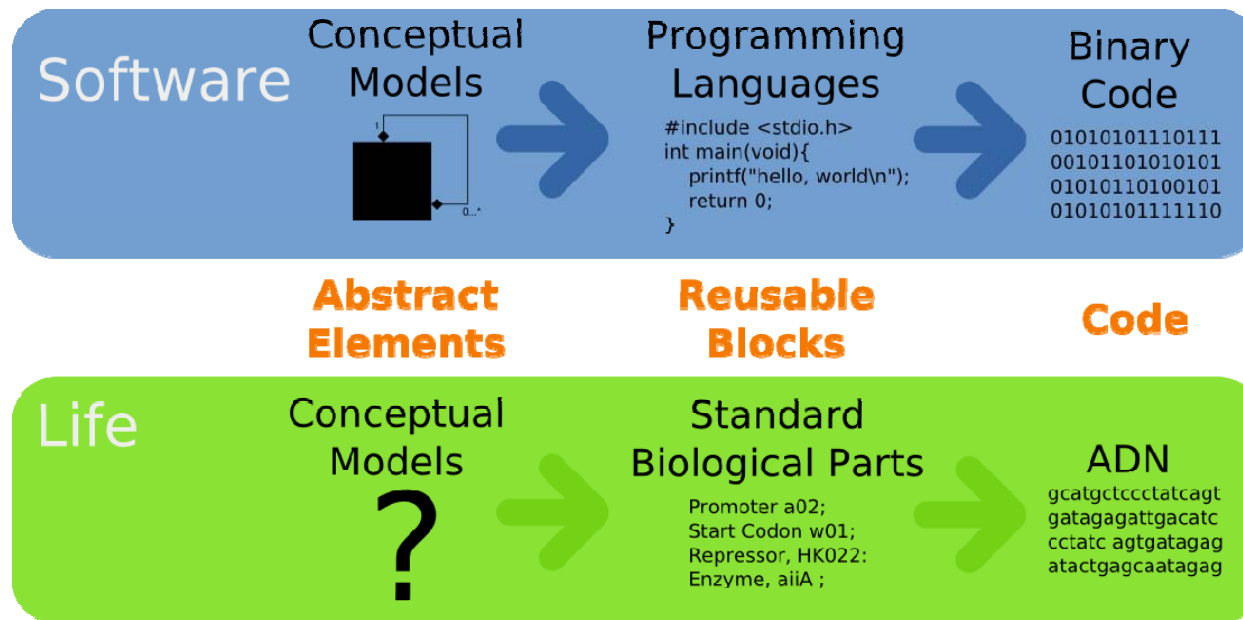
- Communication Analysis offers a systemic way to structure requirements
- Specific techniques for IS analysis
 - Communicative Event Diagram.
 - Communicational perspective on business process modelling
 - Unity criteria to deal with encapsulation (granularity of processes)
 - Communication Structures
 - 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...

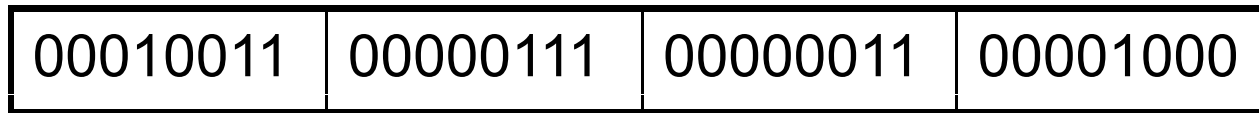
- Model Driven Development permits
 - Reason about the system prior to its construction
 - You can simulate the behavior to foresee the consequences of a system
 - Derivate the final system in an automatic way
 - Obtaining a consistent result

- We have been building
 - Traditional Information Systems
 - Web-based Information Systems
 - SOA-based systems
 - Pervasive Systems
- ... but, **what is next?**



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



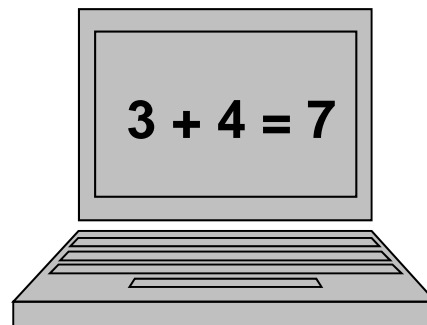


Physical Level

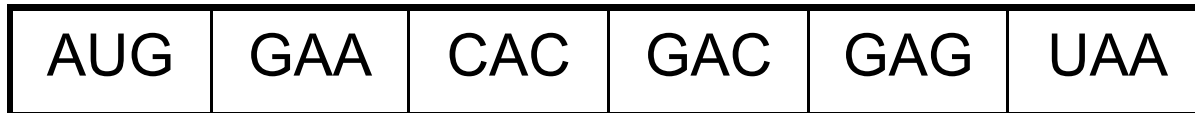
ADD \$7 \$3 \$8

Instruction Level

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



Representation Level



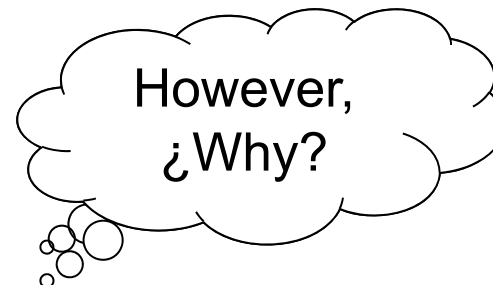
Physical Level



START Glu His Asp Glu STOP

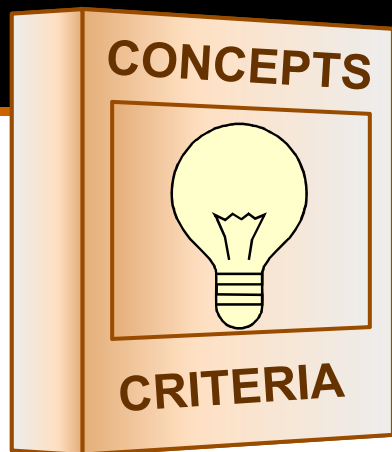
Instruction Level

Semantics: Process a protein with the four selected aminoacids



Representation Level

Thanks for your attention!



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