Elicitation Awareness in Conceptual Modeling: The Role of Transparency

i*'15

Julio Cesar Sampaio do Prado Leite
Departamento de Informática
Pontifícia Universidade Católica do Rio de Janeiro
(PUC-Rio)

Support from

Main Goal

Bring elicitation to the front

Main Premise

Elicitation is taken for granted

Facts

- Bias towards Modeling
  - “However, in our educational system it is institutionalized that students get a ‘perfect’ problem description and don’t have to align with anyone in order to solve the problem (other than the odd question of clarification to the instructor).” (Sikkel, Klaas and Daneva, Maya (2011) *Getting the client into the loop in information systems modelling courses*. In: REET 2011)
- Elicitation through Modeling
  - "In requirements acquisition a preliminary model for the specification of the entire composite system is elaborated and expressed in a “rich” language. This language needs a variety of built-in concepts to structure requirements about the composite system in terms of the kind of abstractions usually found in requirements documents, such as objectives and constraints to be met by the composite system, entities, relationships, events, and actions taking place in it, agents controlling the actions, responsibilities assigned, possible scenarios of system behavior, and so forth." (Dardenne, van Lamsweerde, Fickas, *Goal-directed requirements acquisition*, In Science of Computer Programming 20 (1993) 3-50 Elsevier (*2063* citations)

The role of Transparency

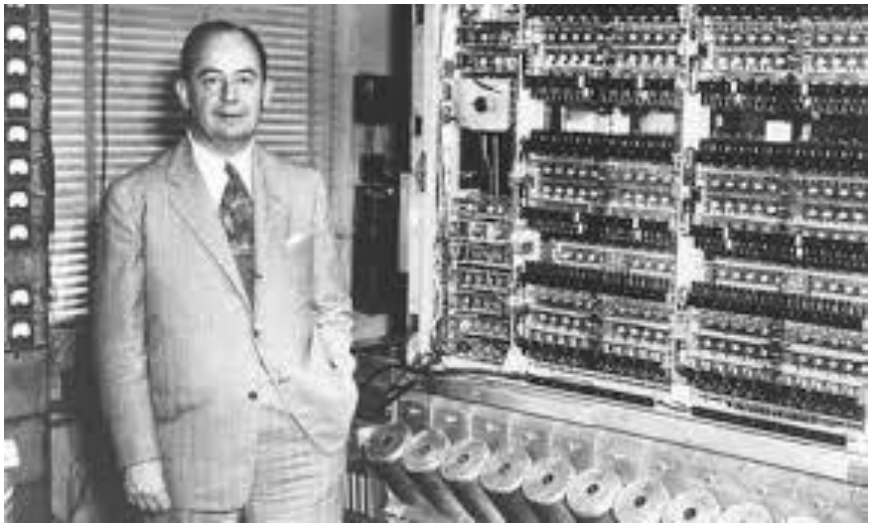
"Transparency is an interesting quality because it makes it necessary to attach requirements models to software"

John Mylopoulos

The role of Elicitation

“There's no sense in being precise when you don't even know what you're talking about.”

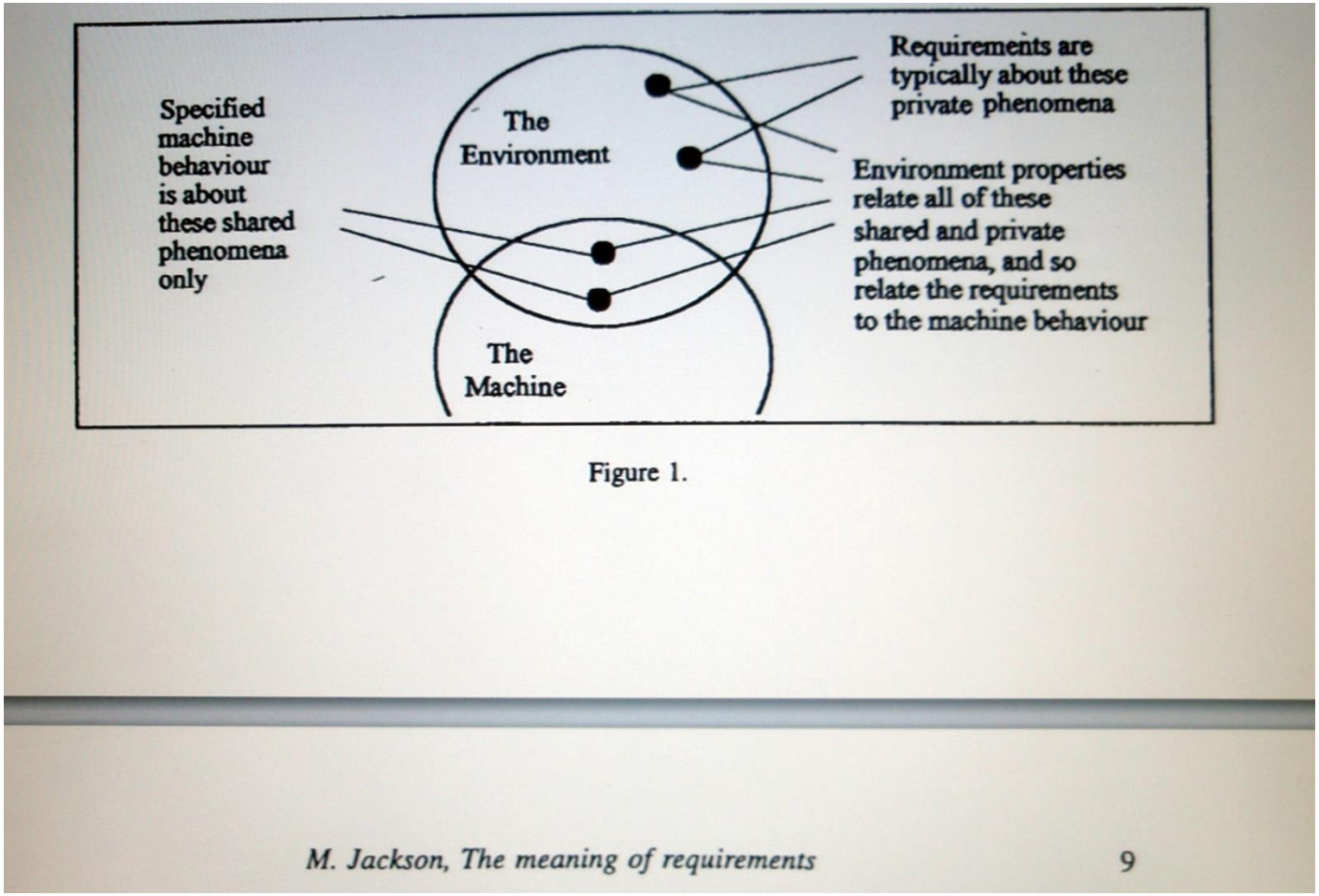
John von Neumann



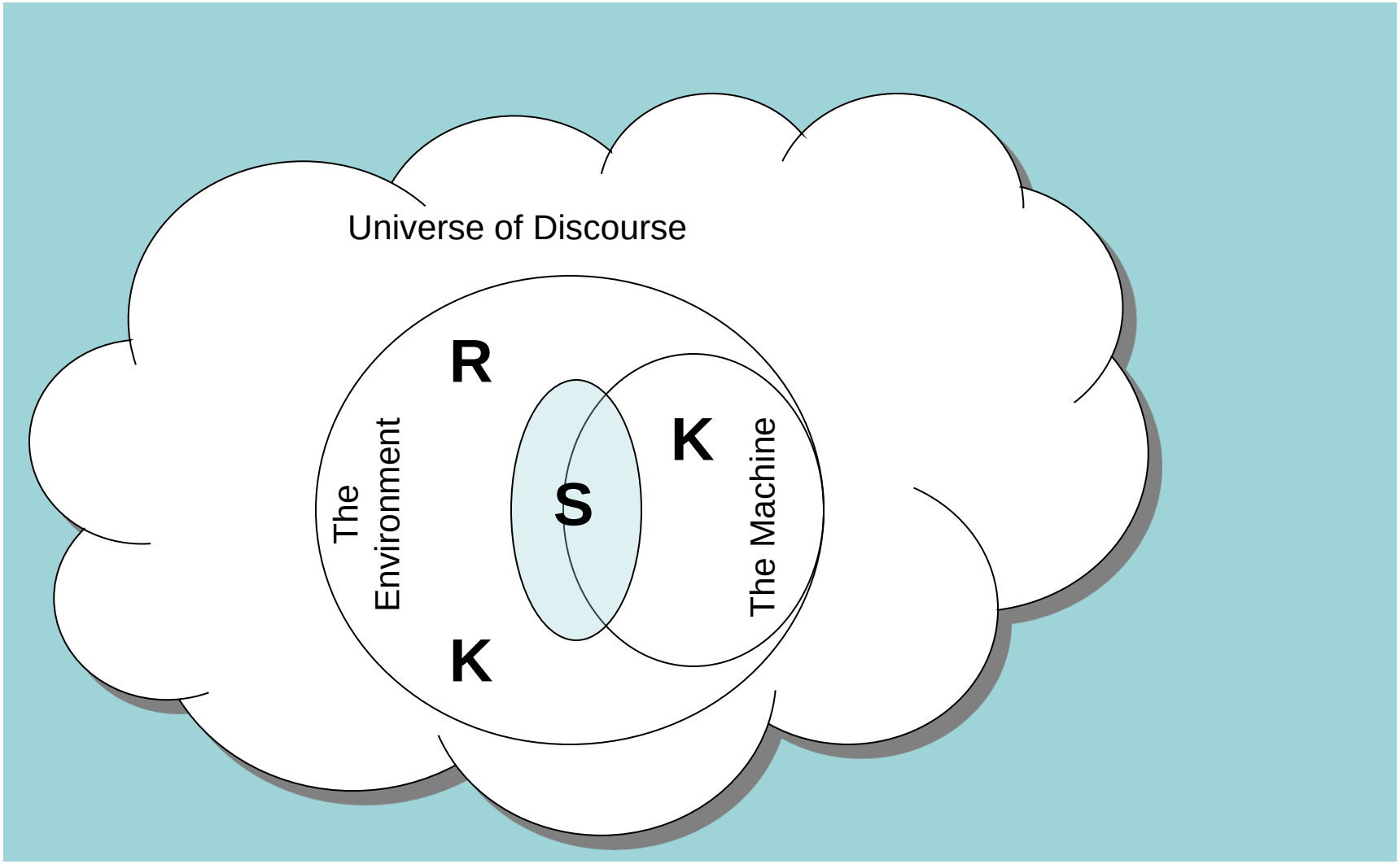
The RE Formula

$$S, K \vdash R$$

Jackson View



Reinterpretation of Jackson View



Time

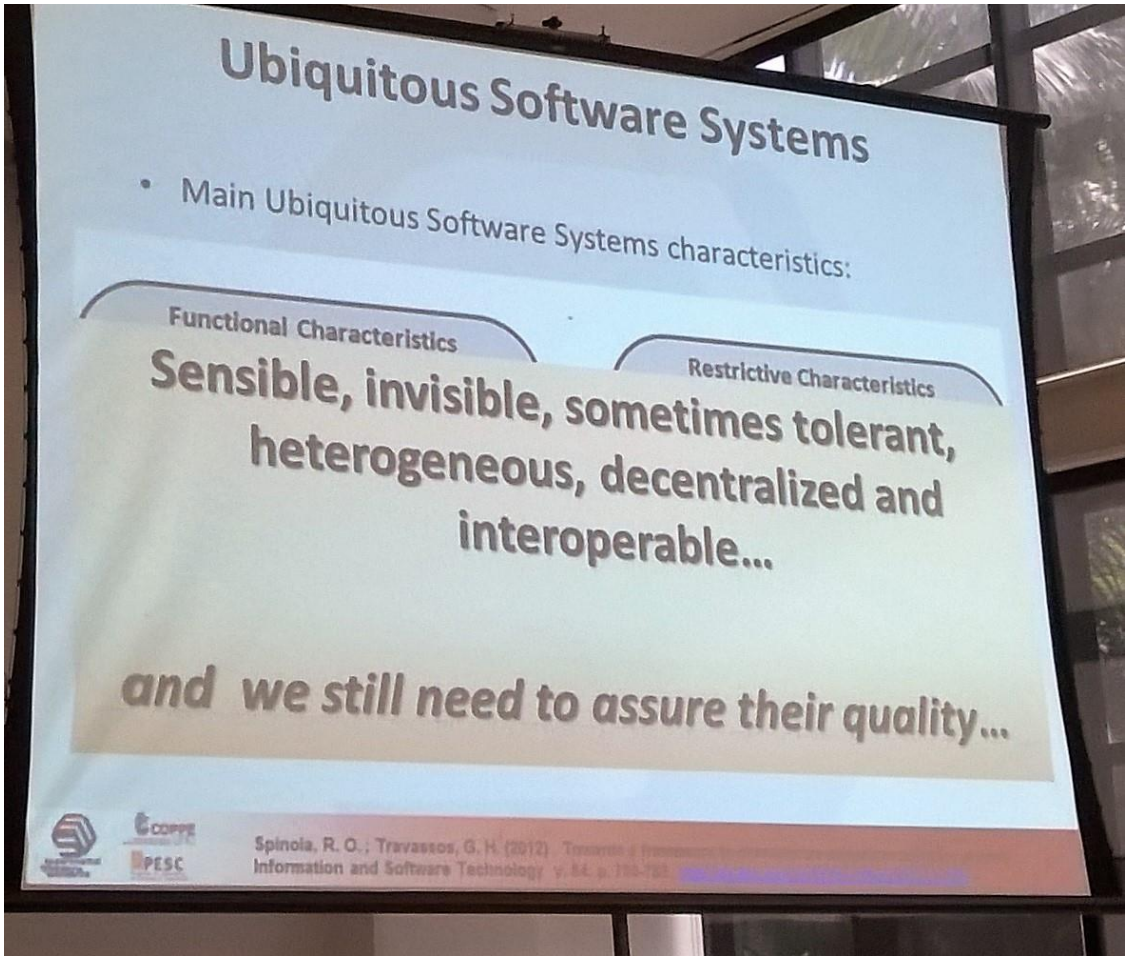
The Elicitation Task

Elicit K and R in order to write S

Well ... Problems...

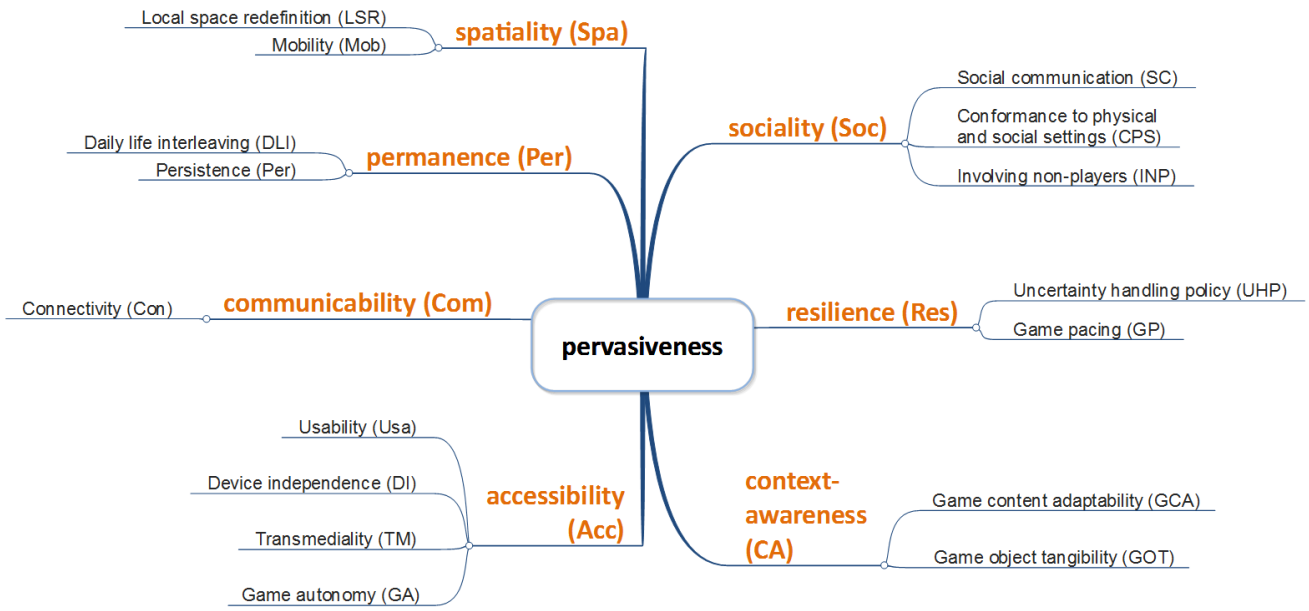
- The complexity of the Requirements Problem (Finding a "suitable" **S** given R and K)
- Qualitative versus Quantitative
- "The Problem is not at the Interface"
- The mappings of NAT and REQ (R and K)

Problems ...Ubiquity



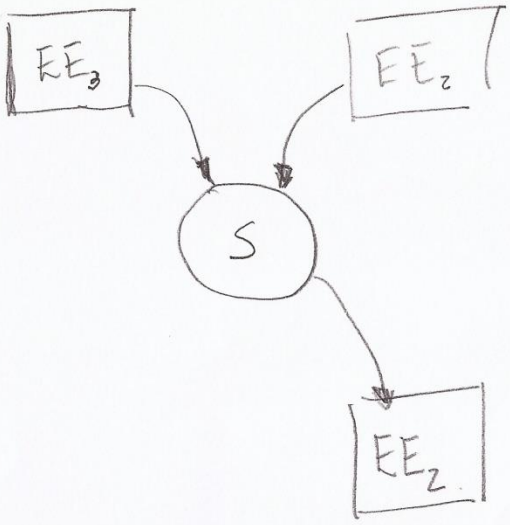
G. Travassos's keynote at SBQS 2015, Manaus

Problems ... An instance of Ubiquity



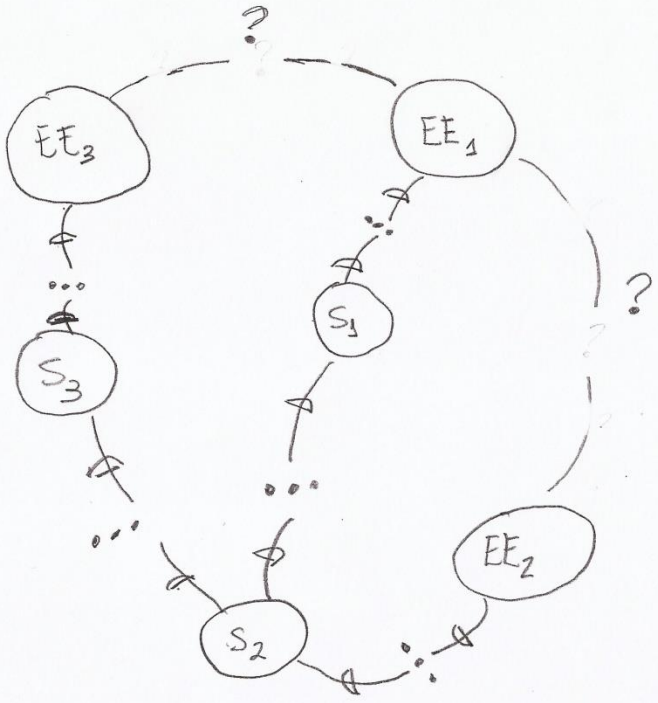
Mapping quality requirements for pervasive mobile games
Luis Valente • Bruno Feijó • Julio Cesar Sampaio do Prado Leite

Problems ... The Interface Problem



DFD

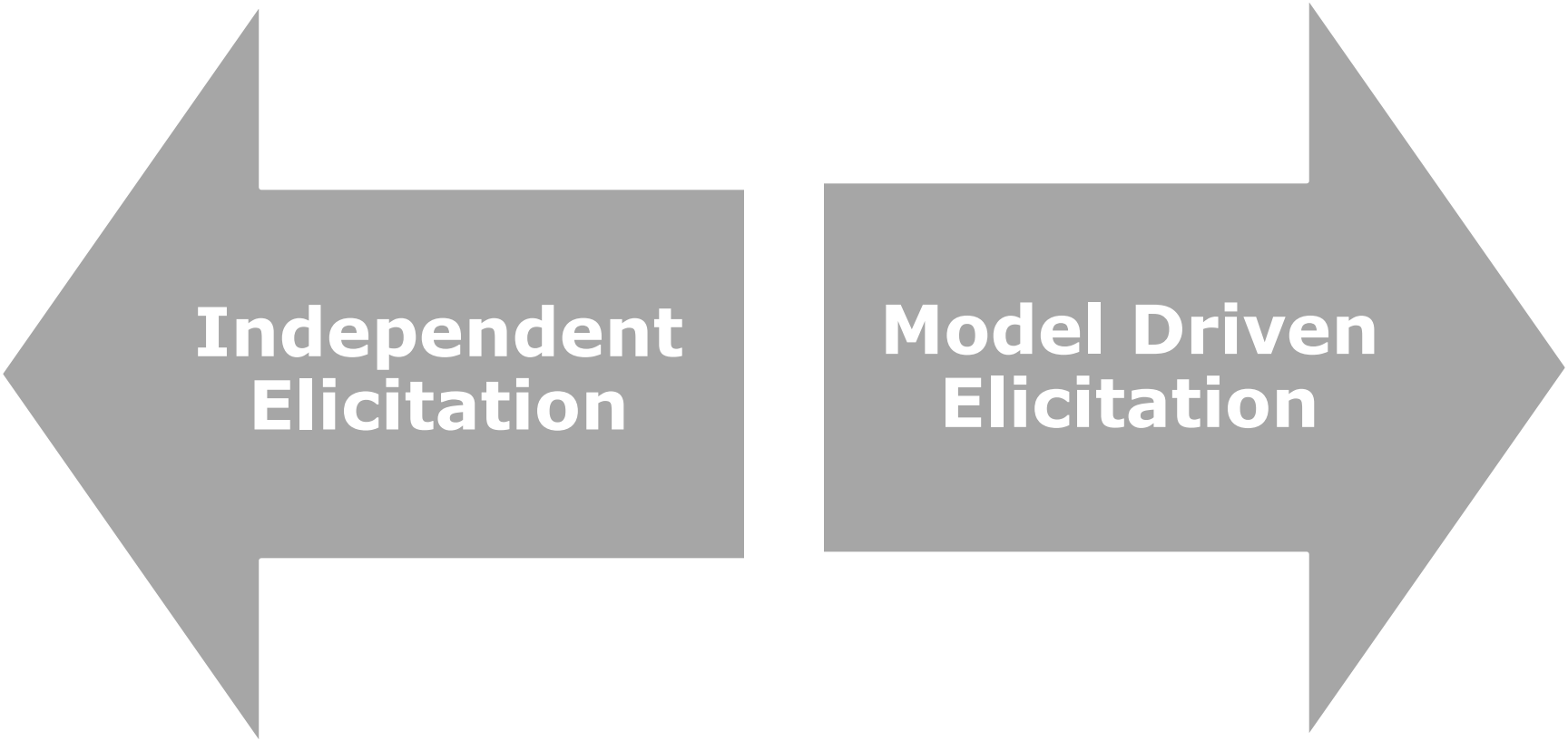
(the "problem" at the interface) M.S.



i*

(the "problem" is not at the interface) M.S.

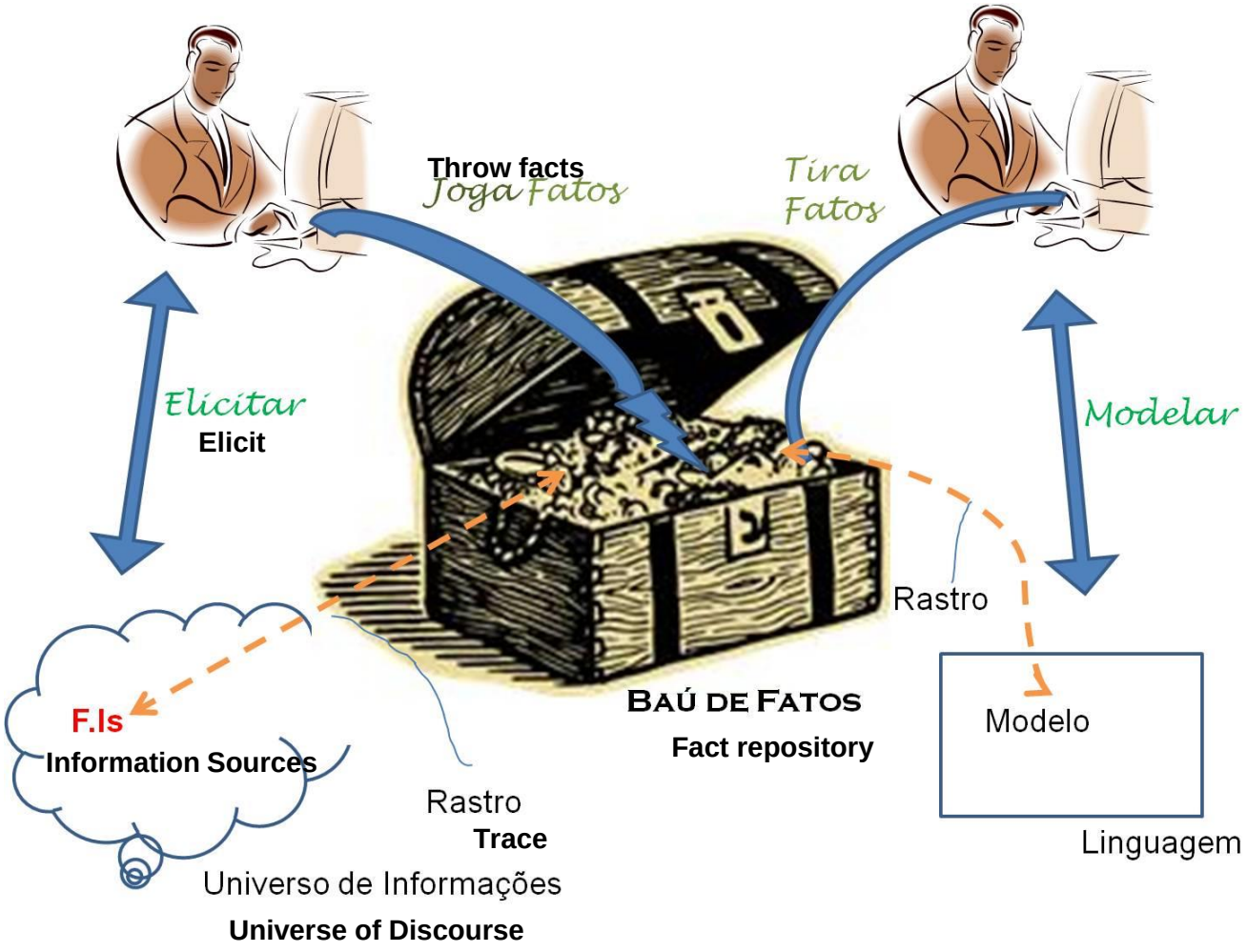
Opposite Poles



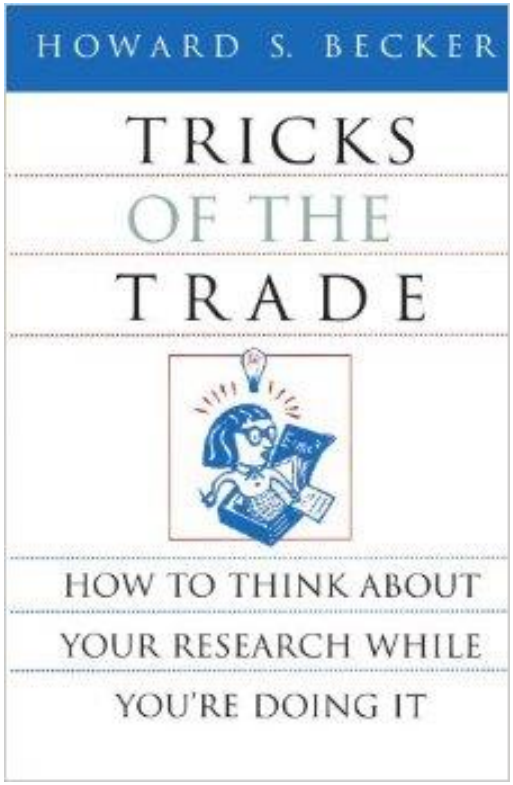
Independent Elicitation

- Use of several MTT to gather information about the Universe of Discourse. Examples: Interviews, Questionnaires, Document Reading, Observation, Ethnography, Reverse Engineering, Reuse ..
- Universe of Discourse has different information sources, ranging from humans to devices.
- Repository for K and R: making the distinction.
- The Completeness Fallacy

Repository for Independent Elicitation



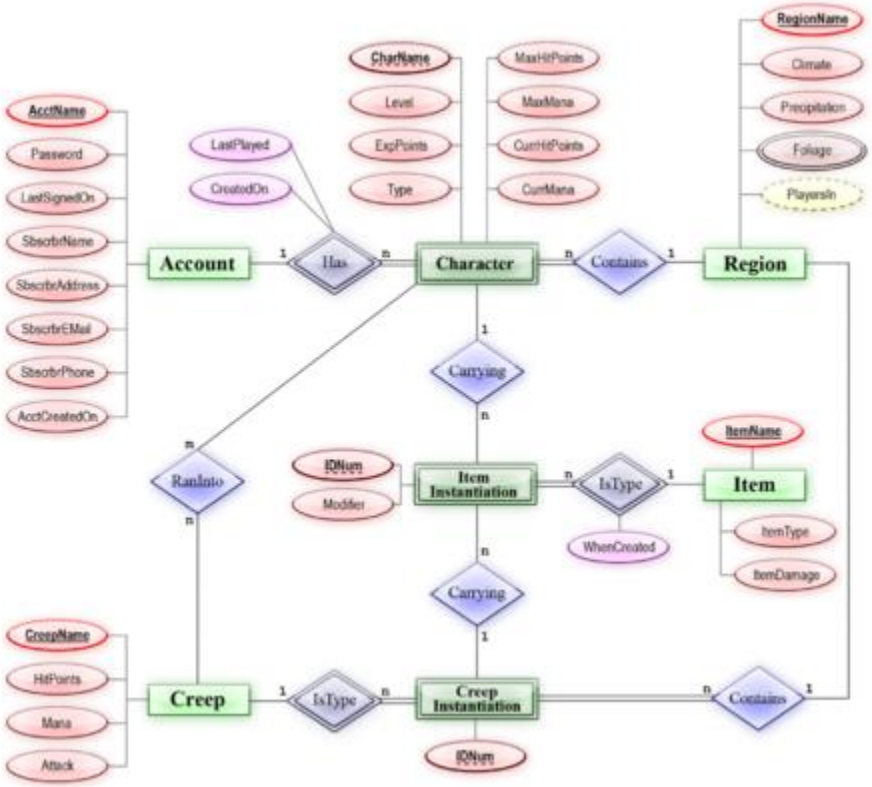
Elicitation Tricks



Model Driven Elicitation

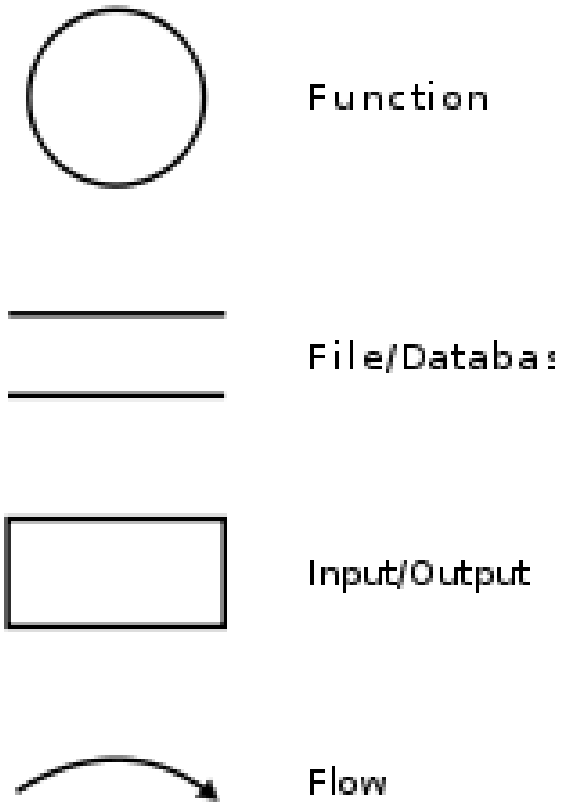
- Use of MTT to fill in the model
- The model operators and operands / nodes and edges are the “things” to elicit.
- K and R are implicit, since S is the target
- Depends on the richness of the model: MER, Use Case Diagram, KAOS, …. Each has a different set of operands and operators / nodes and edges.
- Usually there is more than one model (language) per S.

ER Diagram



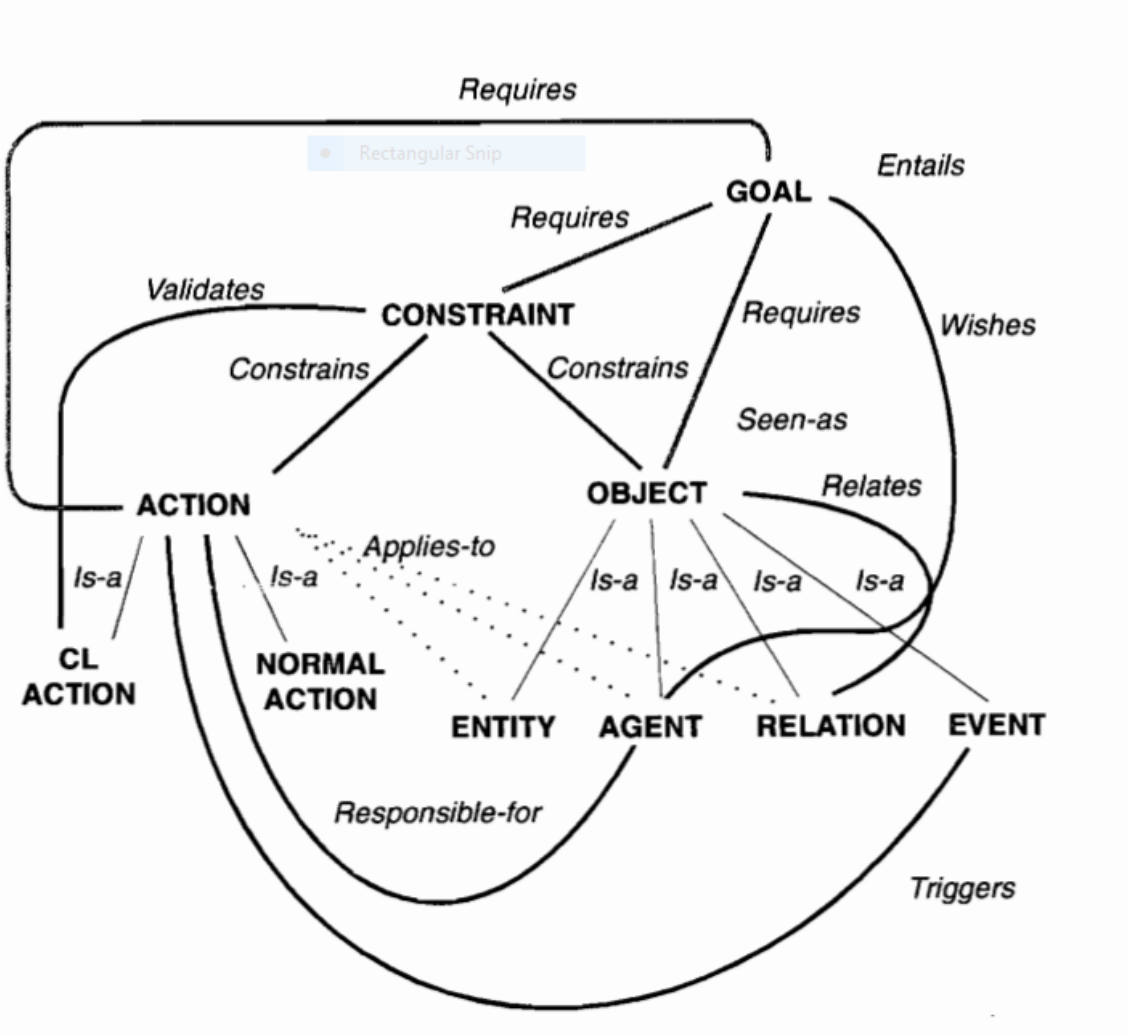
https://en.wikipedia.org/wiki/Entity%E2%80%93relationship_model

DFD Diagram



https://en.wikipedia.org/wiki/Data_flow_diagram

KAOS



Dardenne, van Lamsweerde, Fickas, *Goal-directed requirements acquisition*,

Opposite Poles

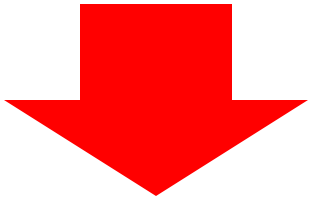
- No one is best
- Pros and Cons
  - Time
  - Previous Knowledge Available
  - Another team’s task
  - Coverage
  - Multiple languages for S
- Possible compromise policies
  - Evolution driven
  - Concurrent Engineering
  - Learning Organization

However ...

How to maintain the focus on the triplet K, S, R?

That is: If S is seen as the primary "object" how to avoid loosing contact with both K and R?

Is this just a traceability issue?

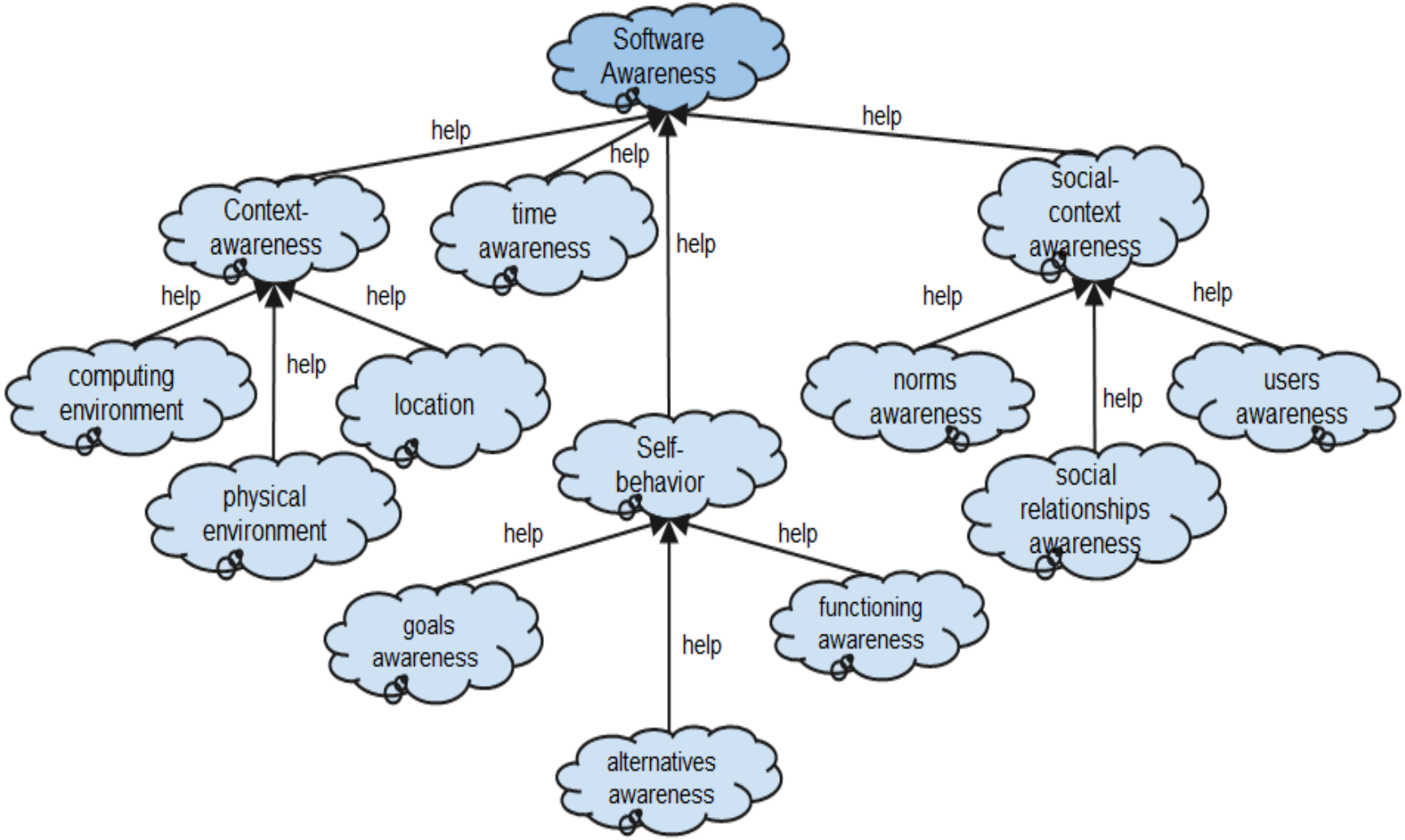


We need more.
How to be aware of K and R in S?

Definitions

- "Awareness is the ability to perceive, to feel, or to be conscious of events, objects, thoughts, emotions, or sensory patterns." (merriam-webster)
- Awareness is a fundamental requirement for software that needs to adapt itself to some degree.
  - Self-adapting provides to software the ability to deal with changes in the environment in which the software is inserted.
- The requirement of awareness, in its turn, provides the software the abilities to perceive what is happening in the environment, and "understand" how the environment changes, and how changes in the environment affect its proper functioning.
- Actors playing the role of a modeler needs to be aware about elicitation.

SIG for Awareness



[3] CUNHA, H. . Desenvolvimento de software consciente com base em requisites. Ph.D. Dissertation. Pontifícia Universidade Católica do Rio de Janeiro, Rio de Janeiro, RJ, Brazil. 2014.

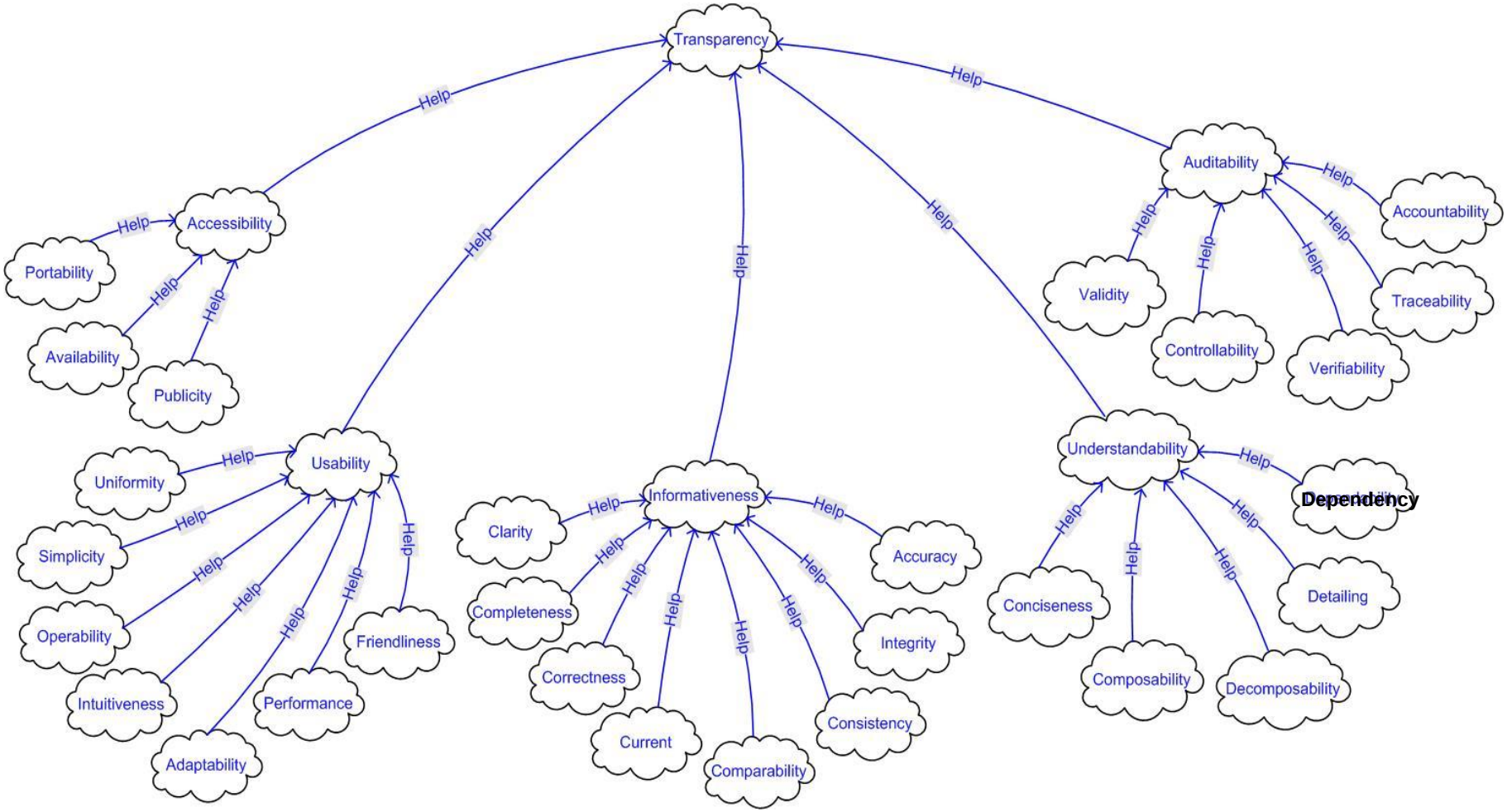
Elicitation Awareness

- Elicitation Awareness by the modeler
- Elicitation Awareness by the model
- Question: how to bring this awareness to the process as well as to the models?

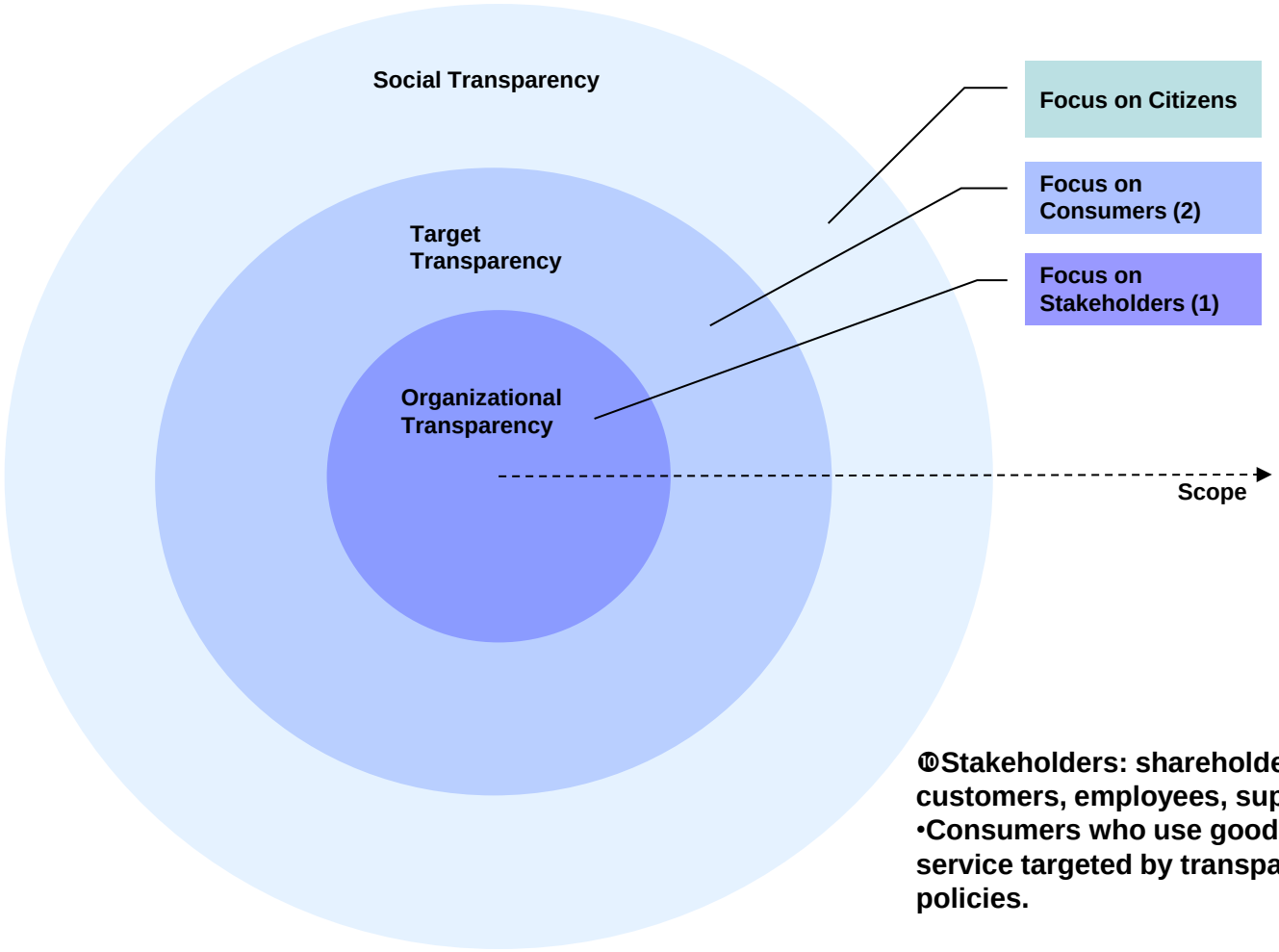
How Transparency may be of Help?

- Quality related to information access
- To be aware: there is a need to be informed
- Transparency improves efficacy of communication, thus helping sensing by humans and tagging the models
- Processes need to be more transparent as to improve human / agent awareness about elicitation
- S needs to be more transparent as to improve its awareness towards K, and R.

Transparency Network

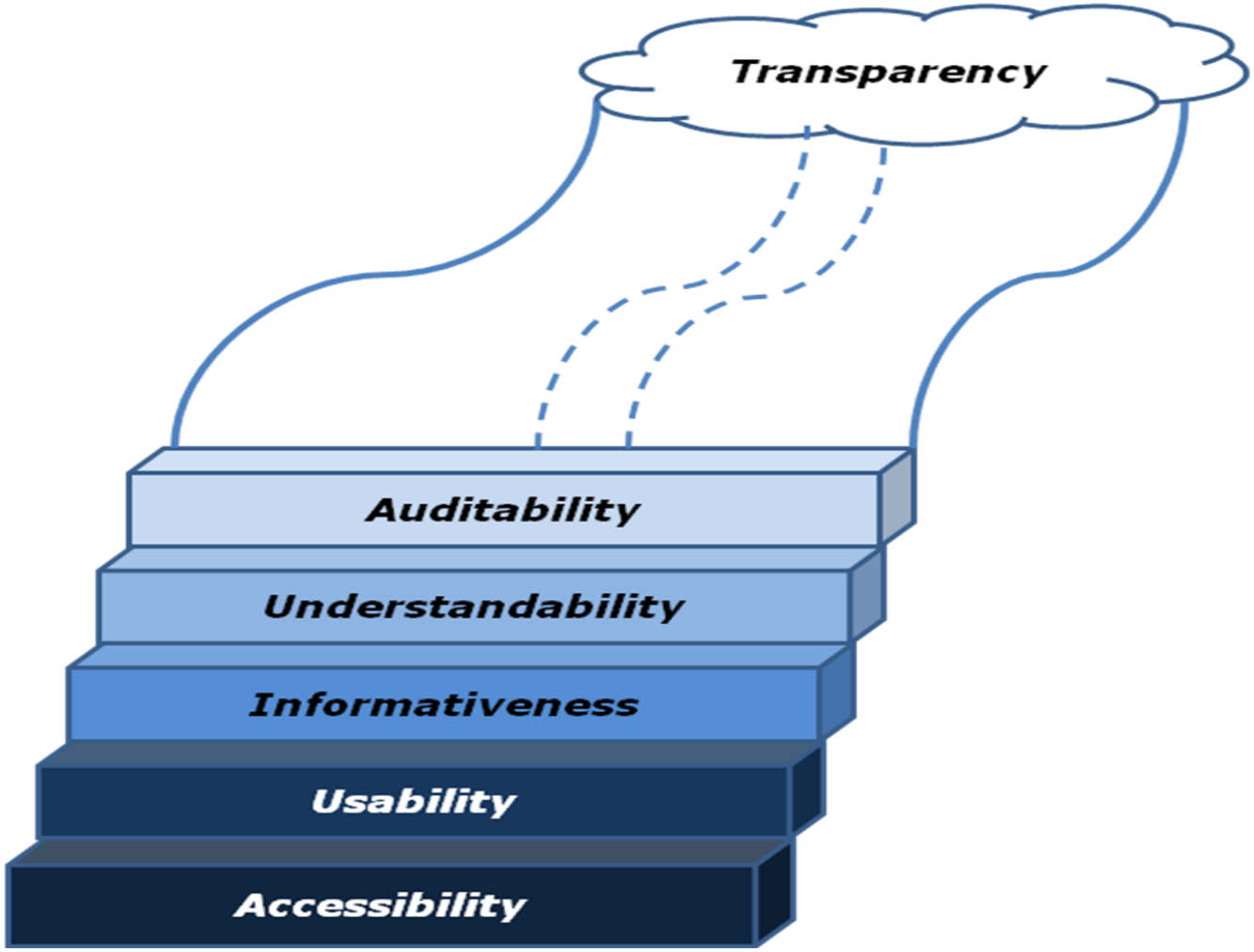


Citizens



⑩Stakeholders: shareholders, customers, employees, suppliers.
•Consumers who use goods or service targeted by transparency policies.

Transparency Ladder

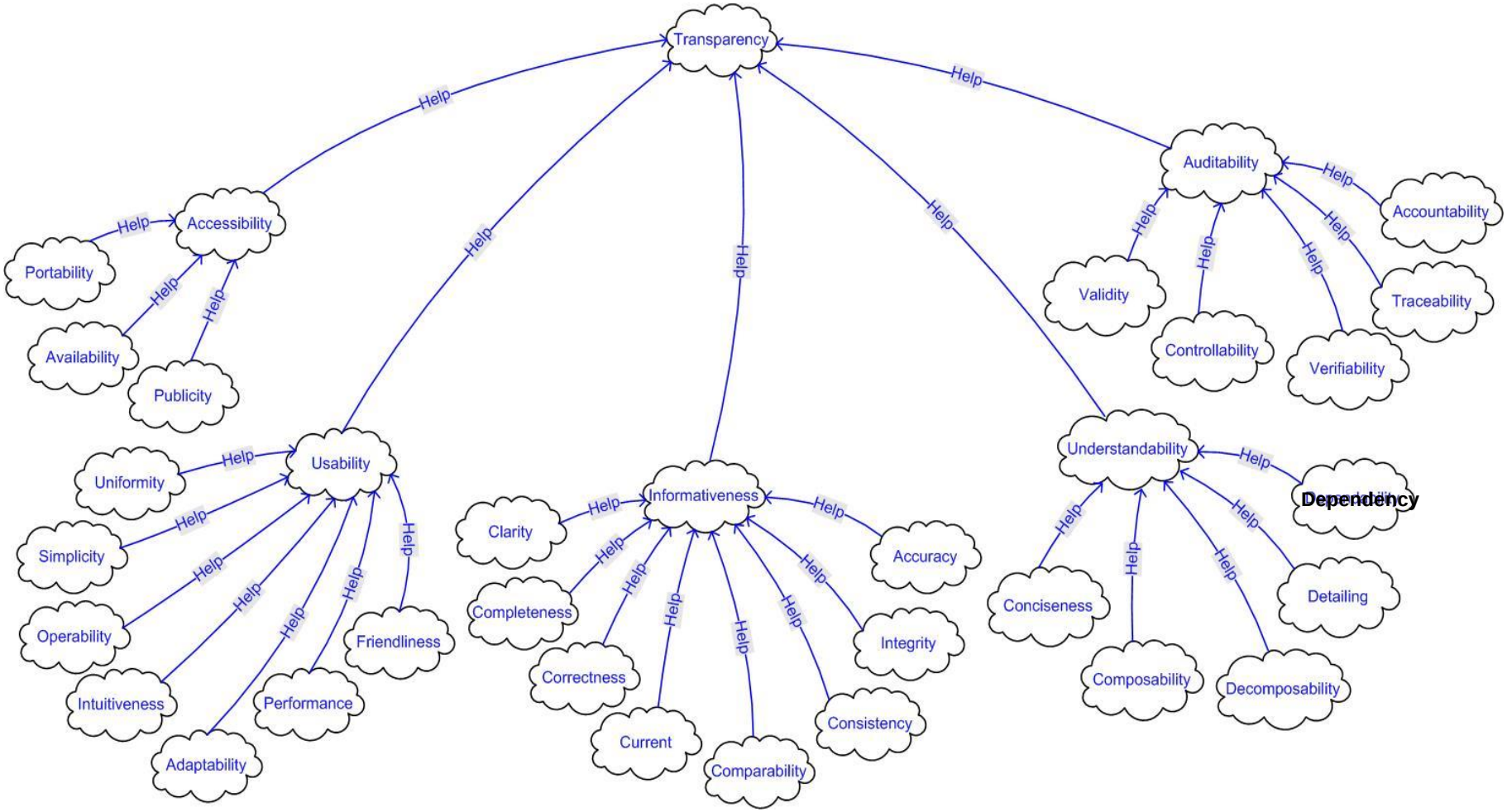


Transparency Maturity Model

Transparency SIG		Maturity Levels			
SIG		Level 2	Level 3	Level 4	Level 5
Accessibility	publicity	CW	CW	CW	CW
	availablity	CW	CW	CW	CW
	portability	CW	CW	CW	CW
Usability	Operability	CW	CW	CW	CW
	Uniformity	WC	CW	CW	CW
	Simplicity	WC	CW	CW	CW
	Intuitiveness	WC	AM	CW	CW
	Adaptability	WC	AM	AM	CW
	Perfomability	WC	AP	AM	CW
	User-friendliness	WC	AM	CW	CW
Informativeness	Correctness	WC	AM	CW	CW
	Integrity	AM	AM	CW	CW
	Accuracy	WC	AP	AM	CW
	Completeness	WC	AP	AM	CW
	Clarity	AM	CW	CW	CW
	Comparable	WC	AP	AM	CW
	Consistency	WC	AM	CW	CW
	Current	AP	AM	CW	CW
Understandability	Dependancy	WC	AM	CW	CW
	Composability	WC	AM	CW	CW
	Extensiability	AP	AM	CW	CW
	Decomposability	WC	AM	AM	CW
	Conciseness	WC	AM	CW	CW
Auditability	Validity	WC	WC	CW	CW
	Controlability	WC	WC	WC	CW
	Verifiability	AP	AM	CW	CW
	Traceability	AM	CW	CW	CW
	Accountability	WC	WC	WC	CW
Legend:	Weakly Comply (WC)	Partially Comply (PC)	Averagely Comply (AC)	Comply (C)	Comply Well (CW)

Based on Cappelli C, Engiel P, Araujo R M, Leite J C S P, Managing Transparency Guided by a Maturity Model, The Third Global Conference on Transparency Research, HEC Paris , 2013 http://campus.hec.fr/global-transparency/wp-content/uploads/2013/10/hsec-paris-final-bib.pdf

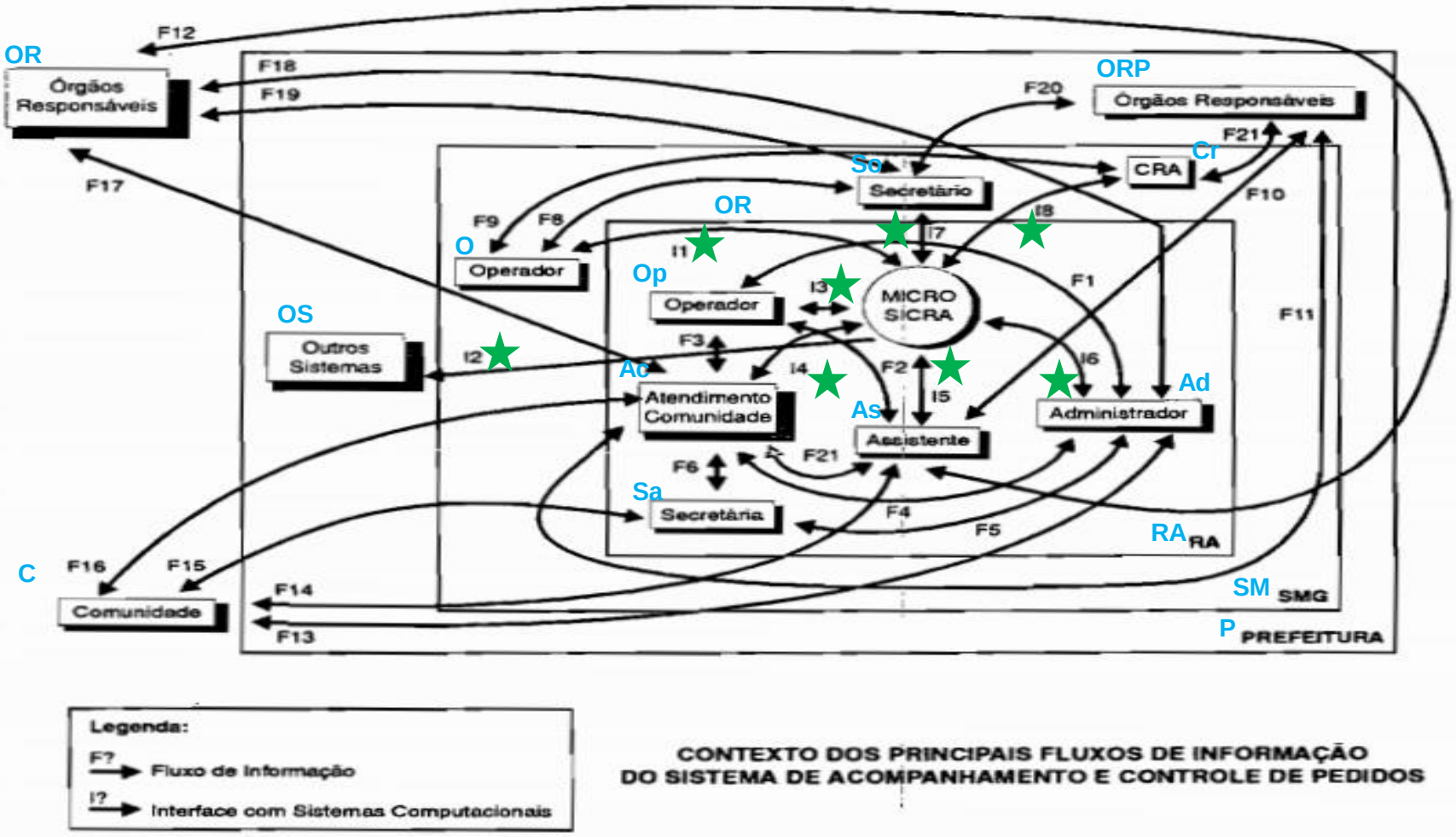
Transparency Network



So What?

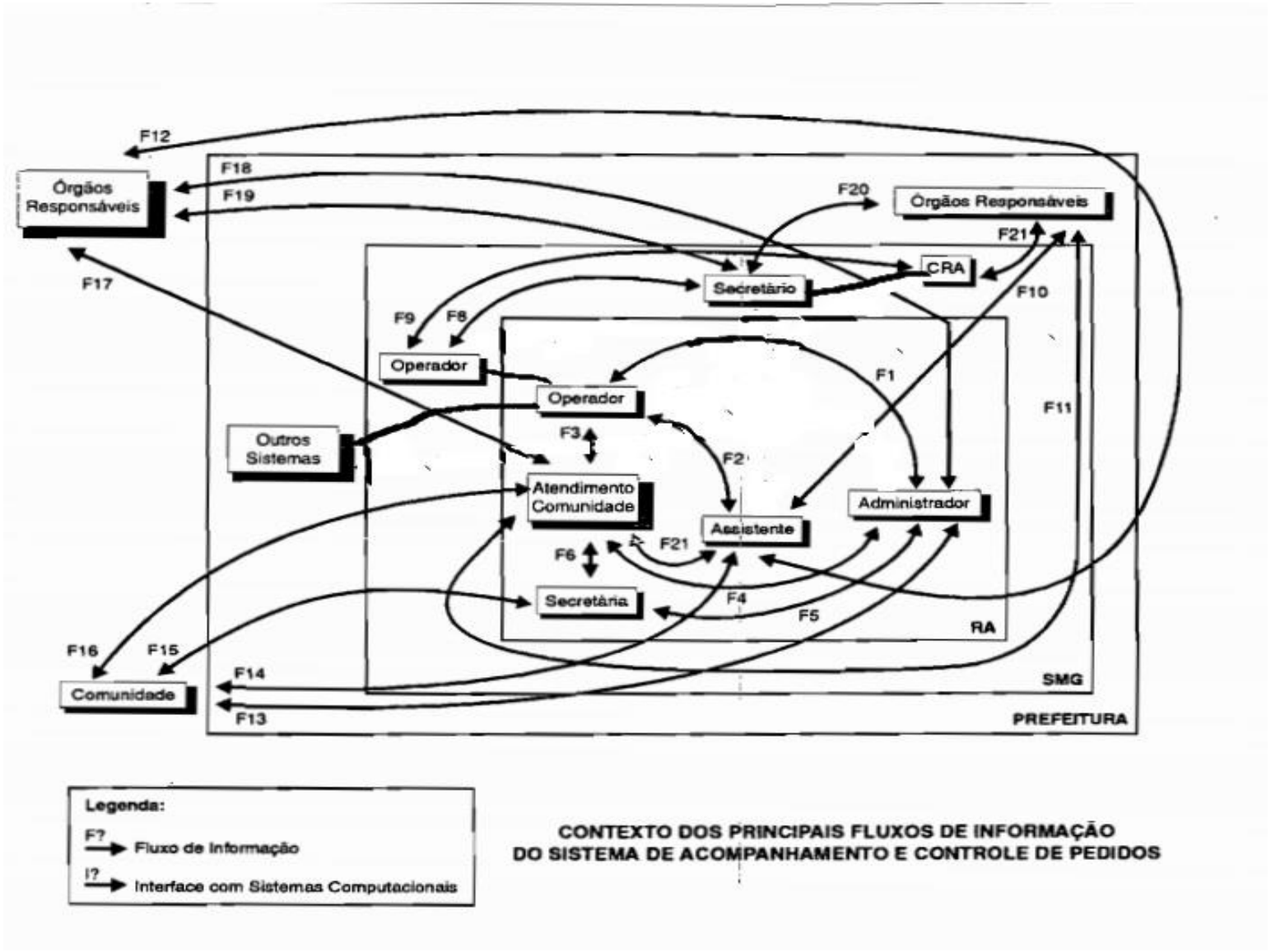
- “Software Engineering is Big Science” V. Basili
- Several of you here have been working in ways to promote more elicitation awareness.
- More is needed, both on the modeling side as well as on the process side.
- I will go over some ideas we have been working.

Software Oriented



CONTEXTO DOS PRINCIPAIS FLUXOS DE INFORMAÇÃO
DO SISTEMA DE ACOMPANHAMENTO E CONTROLE DE PEDIDOS

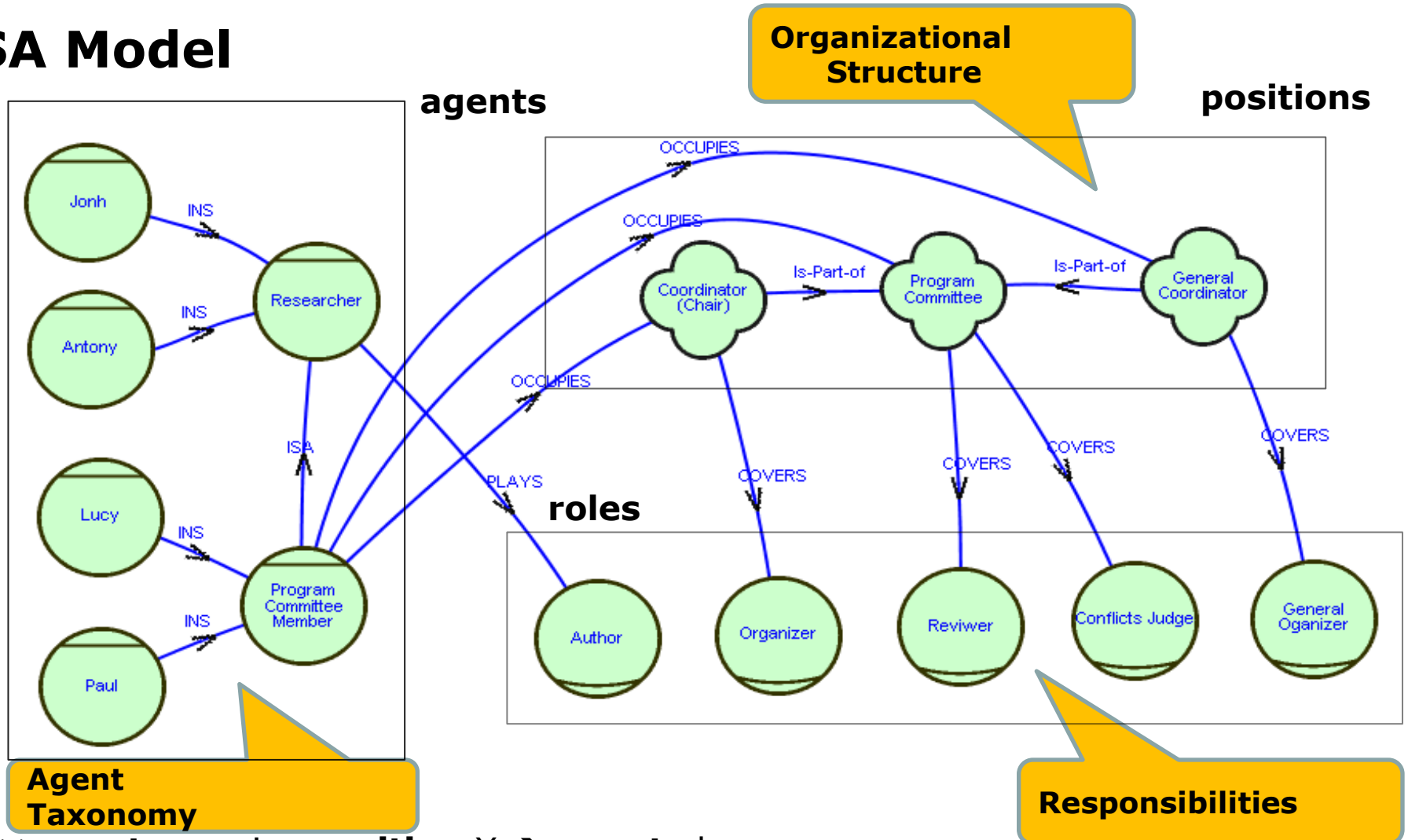
Actor Oriented



CONTEXTO DOS PRINCIPAIS FLUXOS DE INFORMAÇÃO
DO SISTEMA DE ACOMPANHAMENTO E CONTROLE DE PEDIDOS

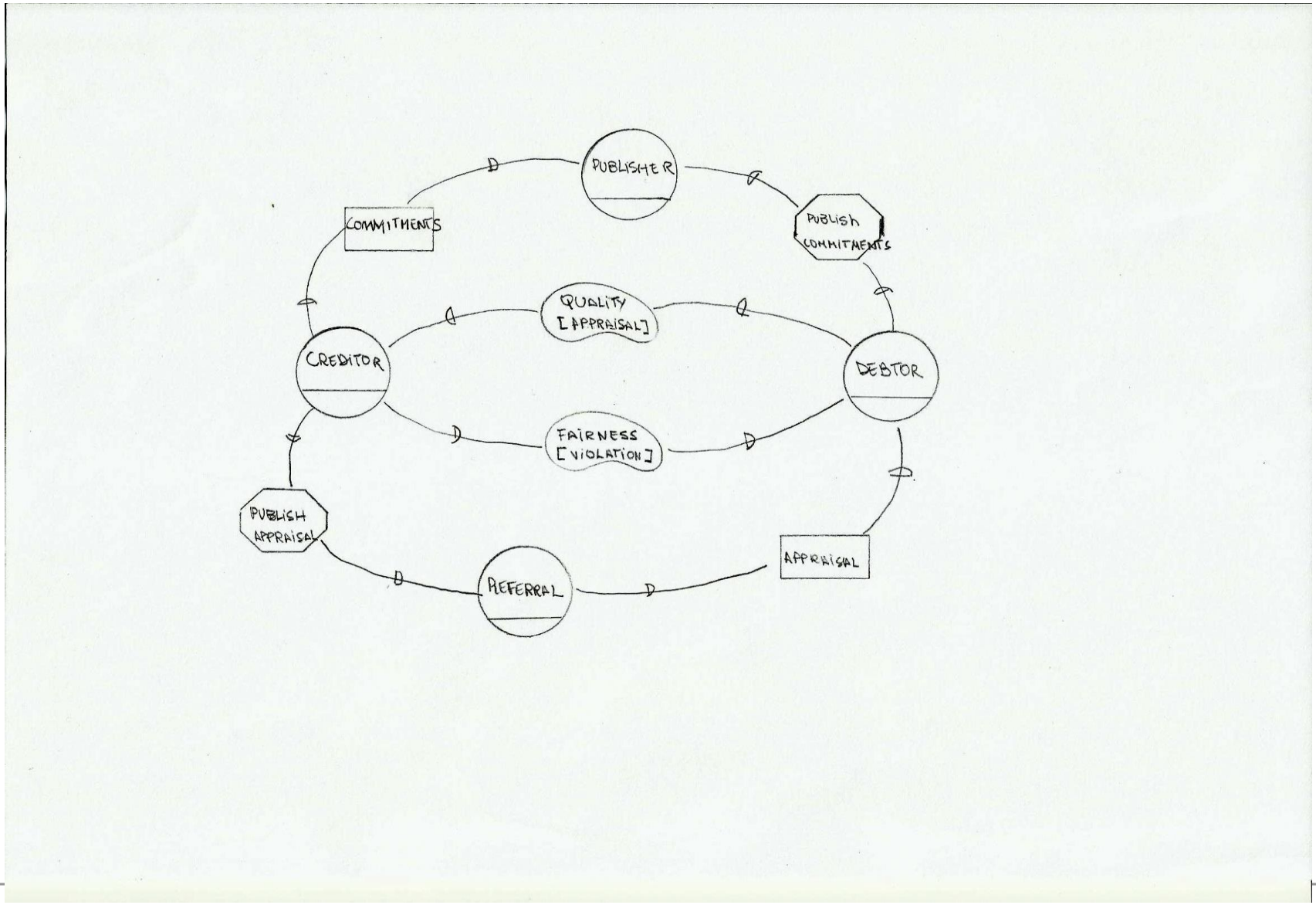
The Strategic Actor Model

SA Model

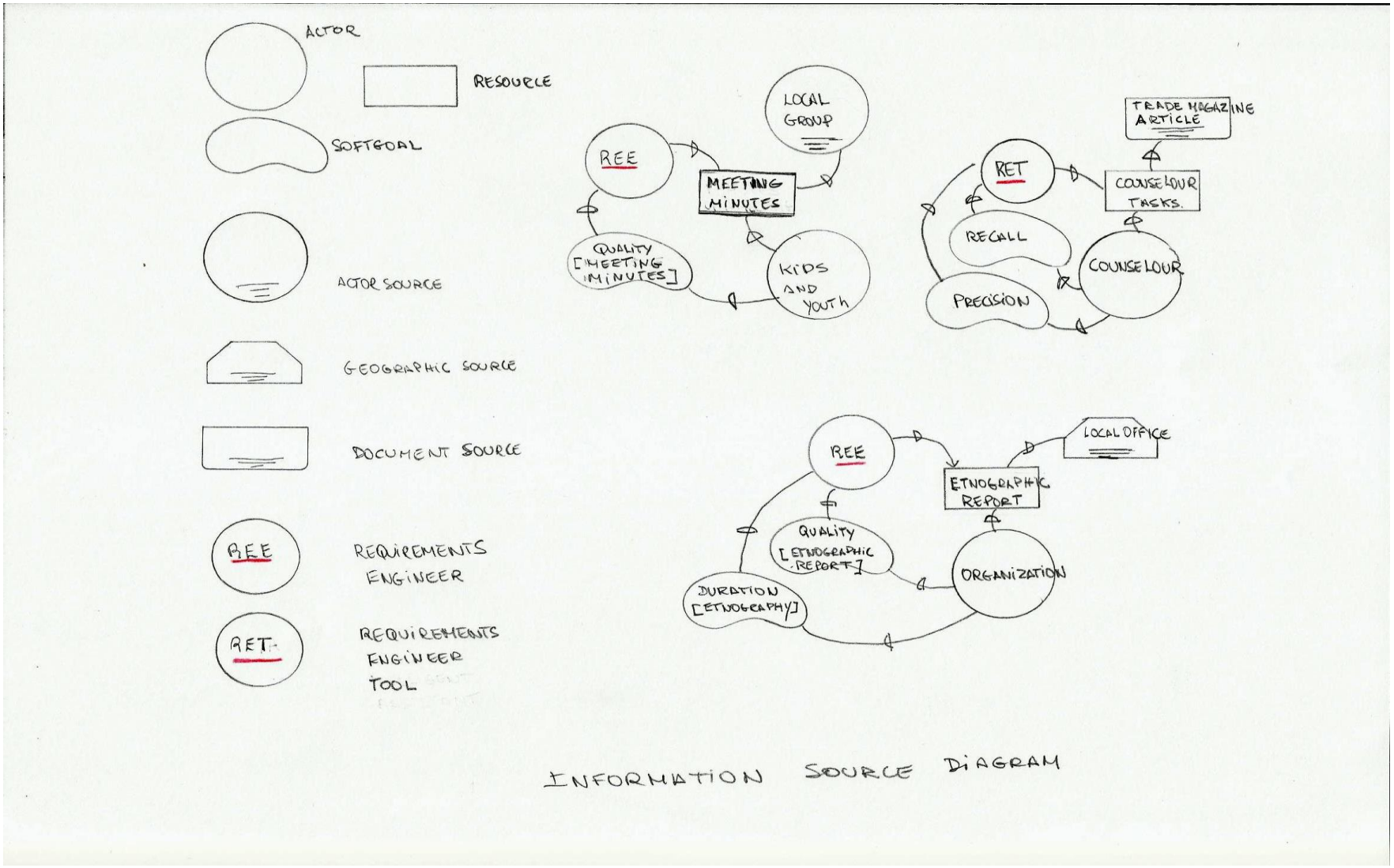


∀ **agent** occupies **position** X ➔ **agent** plays ∀ **role** covered by **position** X.

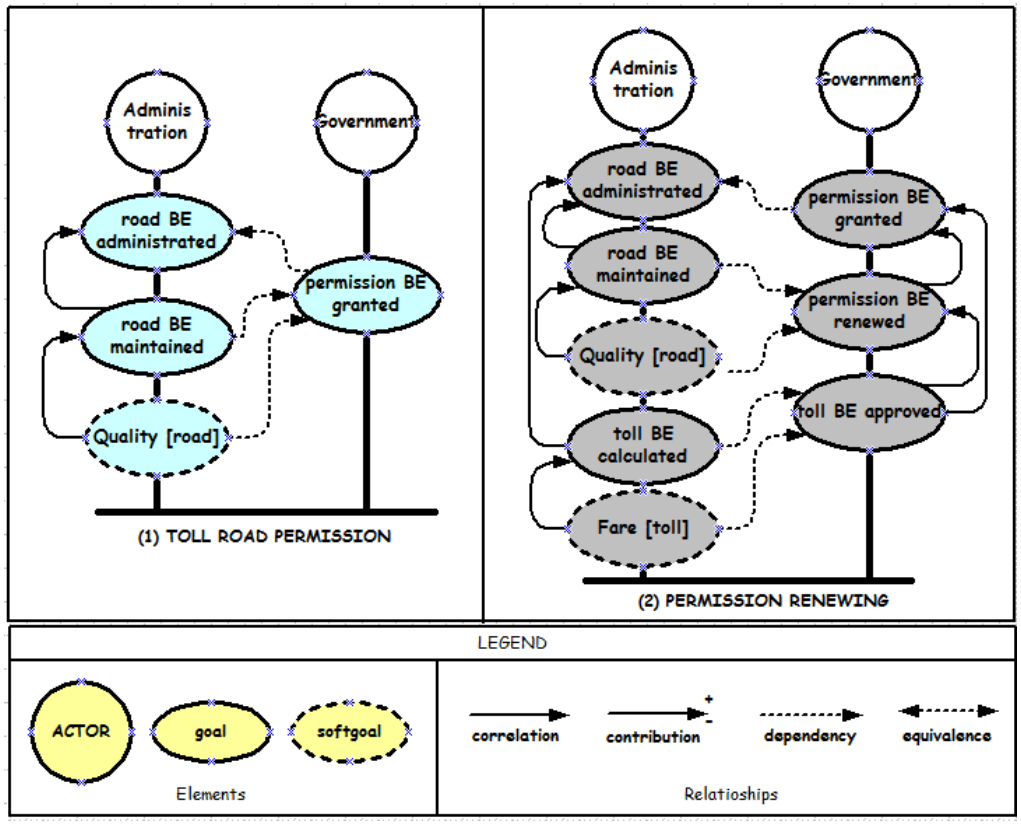
Out-of-Bounds Feedback



Information Source Diagram

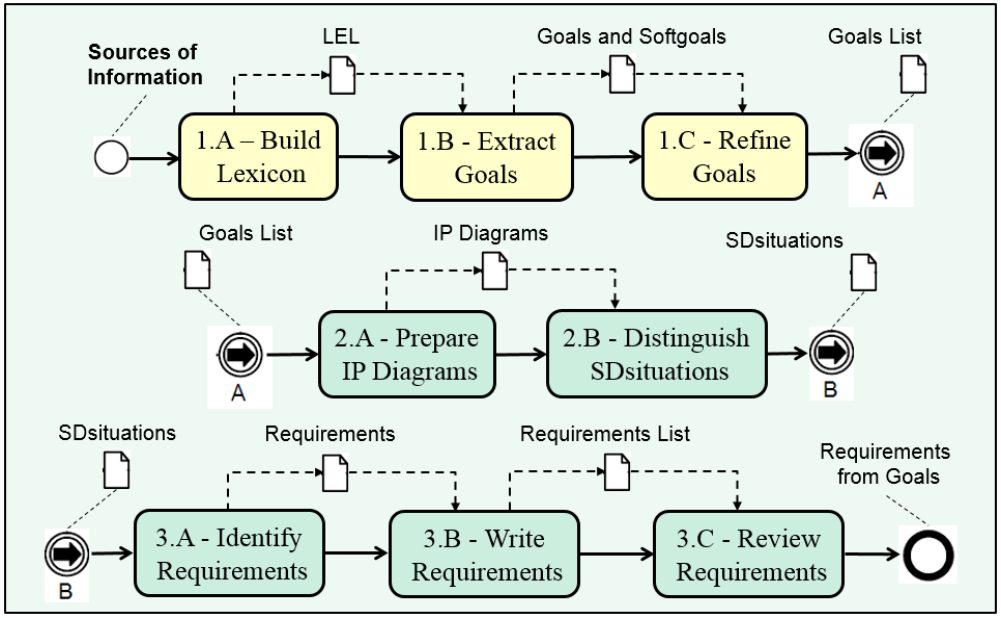


Intentionality Panel



Antonio de Padua Albuquerque Oliveira: Engenharia Intencional: Um Método de Elicitação, Modelagem e Análise de Requisitos

An Example of Process



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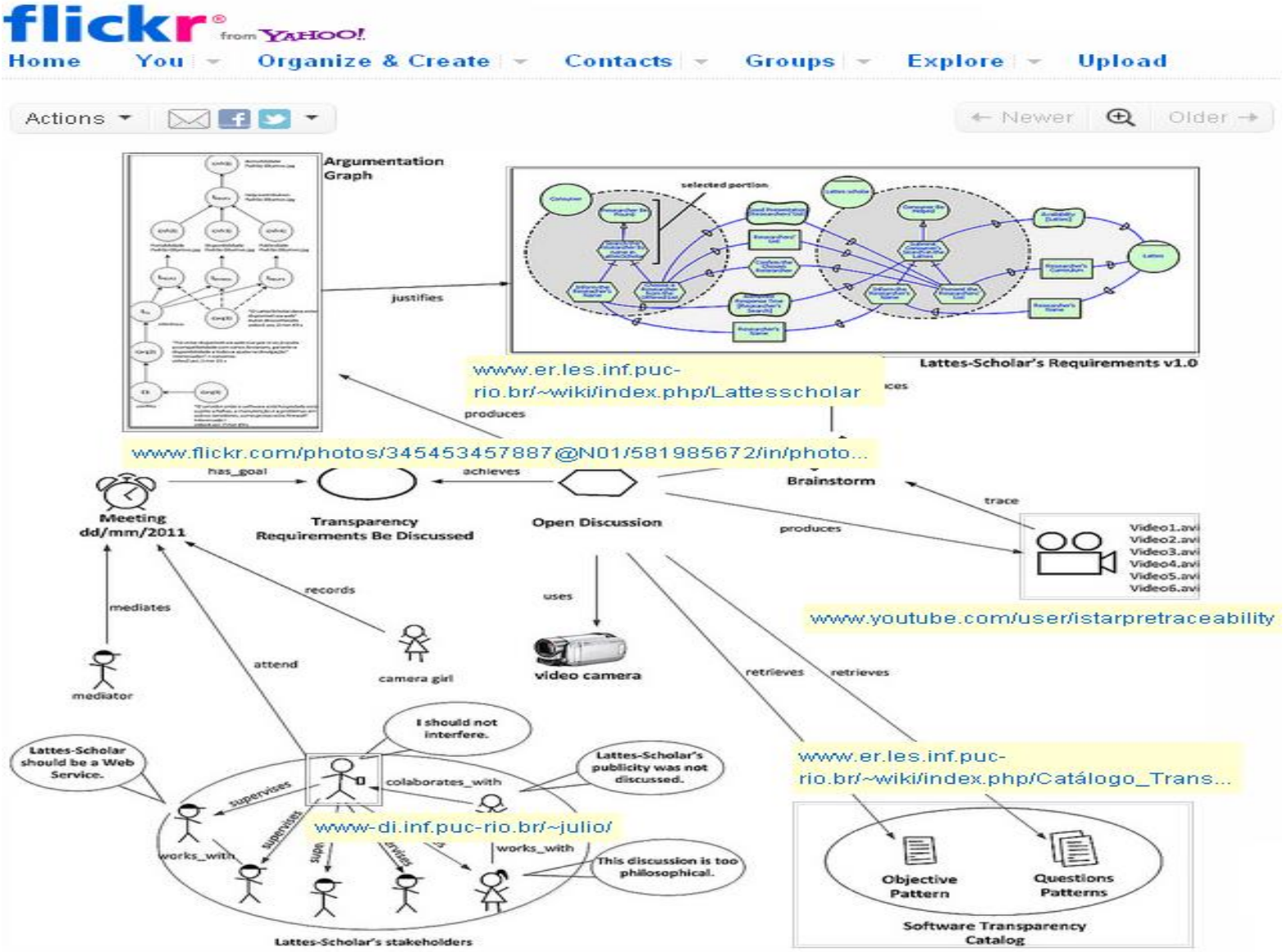
Another Process



iTrace of meeting dd-mm-2011

Maurício Serrano and Julio Cesar Sampaio do Prado Leite. 2011. A rich traceability model for social interactions. In *Proceedings of the 6th International Workshop on Traceability in Emerging Forms of Software Engineering* (TEFSE '11). ACM,

Extending i* with Awareness Modeling Constructs

- Our proposal is to add, to i* models, abstractions that help software to perceive the environment with its inherent changes and to relate these new abstractions to other elements in the models that determine the software behavior:

Situation - is "the state of the real world at a certain moment or during an interval in time at a certain location"[12].

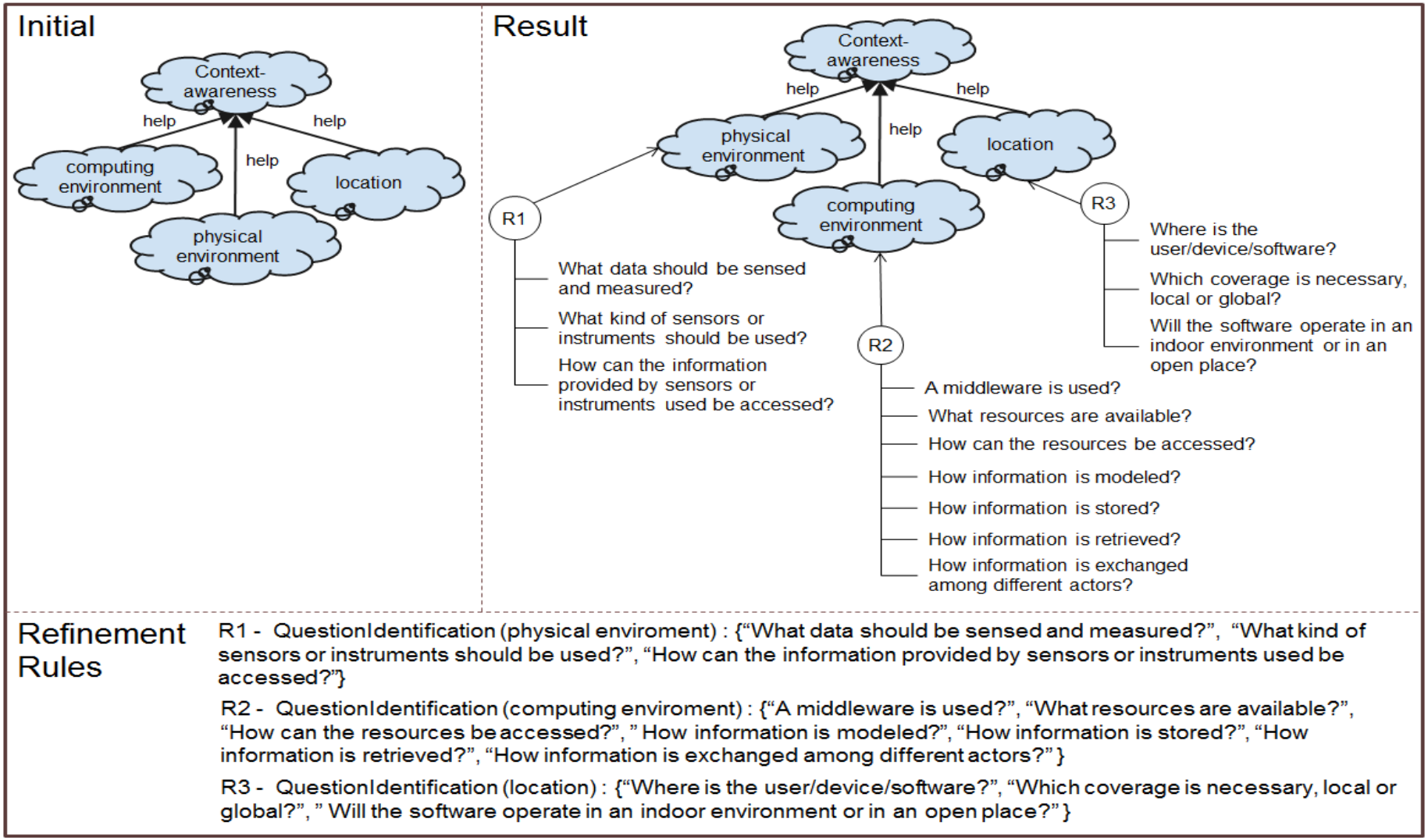
Context - is "a mechanism to describe situations by their defining features and group them into one unit" or in other words: "a context is a description of the current situation on an abstract level that can be matched against previously specified situations"[12].

  - A description can be constituted by "a number of conditions that can be evaluated to true or false, possibly with an assigned certainty"

[12] SCHMIDT, A. Ubiquitous Computing - Computing in Context. PhD dissertation, Lancaster University. 2002.

Reusing non-functional patterns in i∗ modeling; H Cunha, JC Sampaio do Prado Leite Requirements Patterns (RePa), 2014 IEEE 4th International Workshop on, 25-32

Example of a Question Pattern for Context-Awareness



Refinement Rules

R1 - QuestionIdentification (physical enviroment) : {"What data should be sensed and measured?", "What kind of sensors or instruments should be used?", "How can the information provided by sensors or instruments used be accessed?"}

R2 - QuestionIdentification (computing enviroment) : {"A middleware is used?", "What resources are available?", "How can the resources be accessed?", " How information is modeled?", "How information is stored?", "How information is retrieved?", "How information is exchanged among different actors?" }

R3 - QuestionIdentification (location) : {"Where is the user/device/software?", "Which coverage is necessary, local or global?", " Will the software operate in an indoor environment or in an open place?" }

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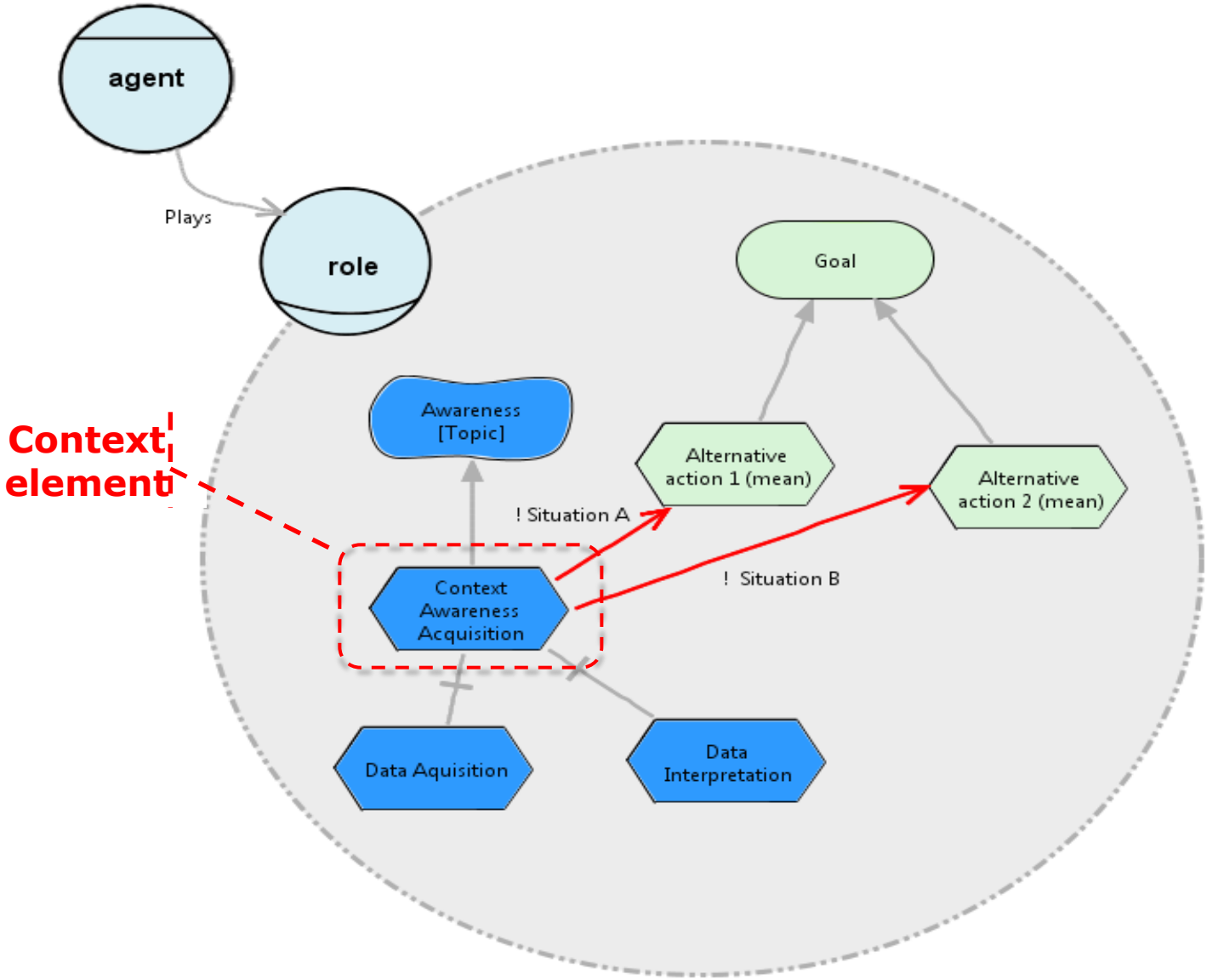
Extending i* with Awareness Modeling Constructs



SRConstruct for the Awareness Requirement

The Pattern Language

Awareness requirement name <The name should follow the rule: Awareness [Topic] >		
Topic description:	<Brief description of the topic (problem domain) related to the awareness requirement>	
Goal:	<The goal impacted by the context>	
Awareness subtype:	<The awareness subtype (from awareness catalog) which is related to this requirement>	
Suggested operationalization	<Suggested operationalization to this requirement. Some of them can be found in awareness catalog >	
Alternative actions:	<The alternative means to achieve the goal impacted by the context>	
Entity:	<The entity in which the context awareness element is anchored (what the context is about)>	
Source of entity data:	<The source from where the entity data will be acquired>	
Context description	<List of variables that enables the situations identification>	
Domains of variable <domain definition section for variables in context description>		
Variable name	Domain	
Context situations specification <specification section for the context situations>		
Situation name	Specification	
Alternative action choice <specification of relations among situations and alternative actions>		
Situation	Alternative action	Impact

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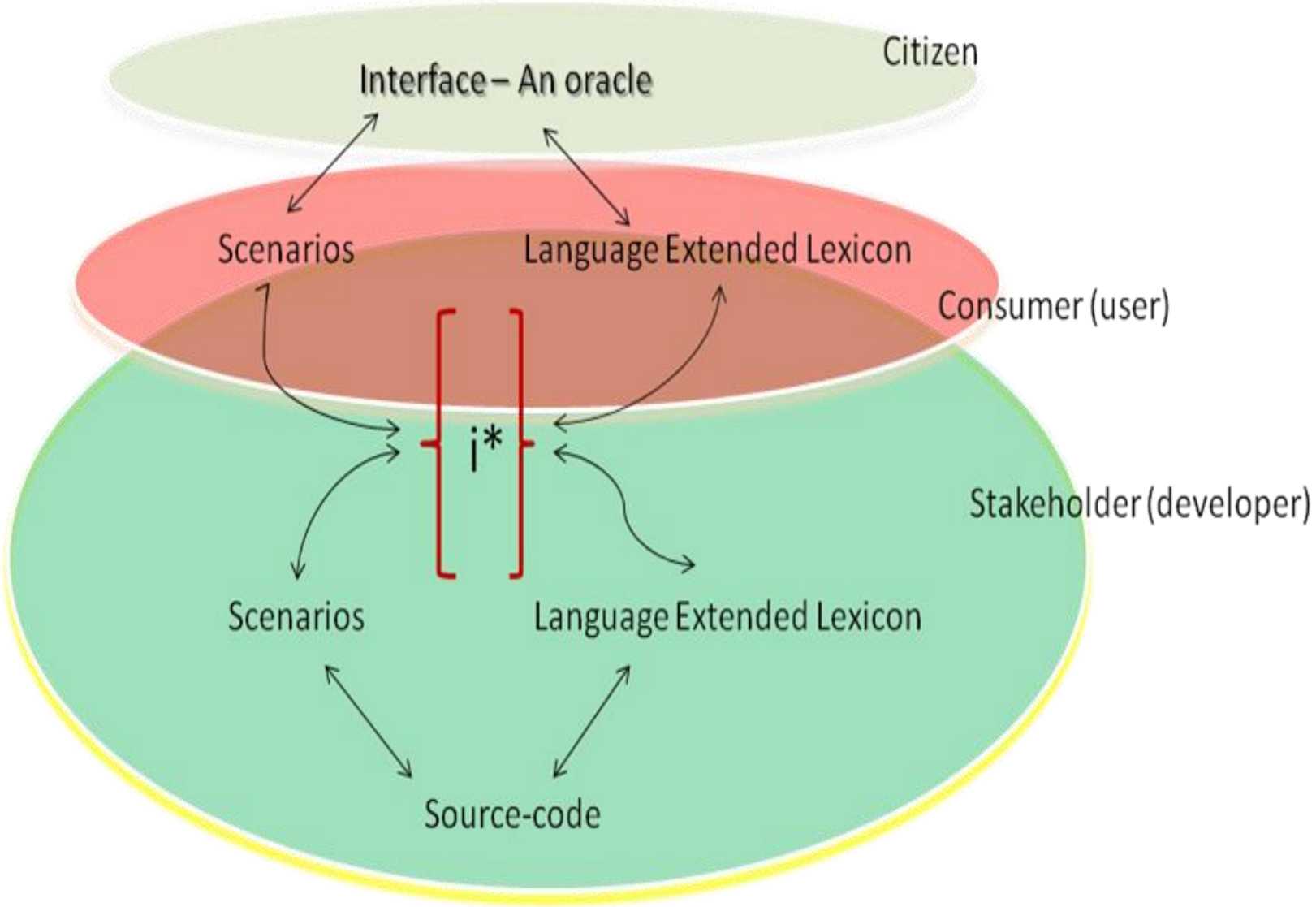
Transparency Architecture



Thanks

- This is a team work
- Several present and past collaborators
- Special thanks to the i* community
- www.inf.puc-rio.br/~julio
- http://transparencia.inf.puc-rio.br/wiki/index.php/Integrantes