



# Using Ontologies and Soft Systems Methodology to Provide Multi-user Support in Problem Structuring

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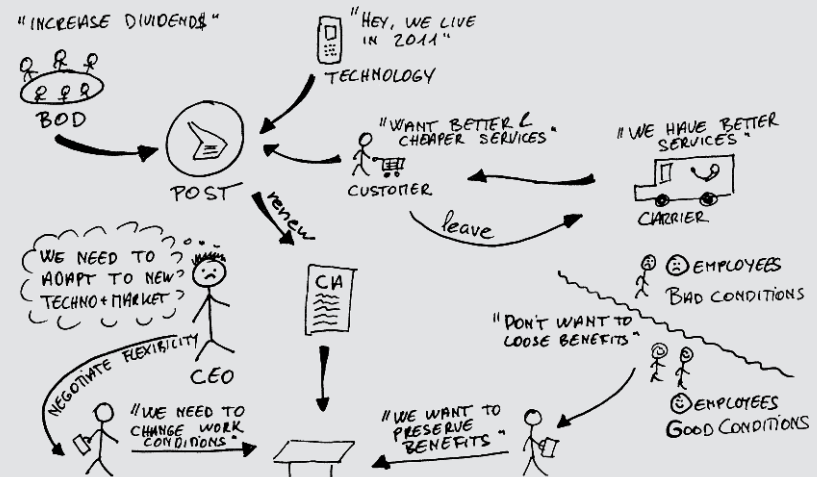
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# 1' Summary

Negotiation issues being increasingly complex, additional support in the form of ontologies is required to guarantee a shared domain understanding among stakeholders.

## Benefits of the approach

- Domain understanding
- Problem formulation
- Specification of issues and options
- Information identification



## Four kinds of issues impacting NSS users

1. Domain understanding
2. Problem formulation
3. Specification of issues and options
4. Information identification

### Principal causes

- Complexity of the business environment
- Fast rate of changes
- Wide dispersion of modern organizations
- Management interactions are conducted via the web
- Information is scattered and shared through the environment

## Supporting negotiations

Supporting stakeholders in formulating their representation of the negotiation problem including the specification of issues and options in an ENS context

### Negotiation process

1. Planning
2. Agenda setting and exploring the field
3. Exchanging offers and arguments
4. Reaching agreement
5. Concluding the negotiation

P. Braun et al. 2006

## Using Ontologies and SSM to Provide Multi-user Support in Problem Structuring

### Supporting negotiations

Issue area	Impacted ENS functionalities	Possible causes
Domain understanding	<ul style="list-style-type: none"><li>• Understand the problem</li><li>• Visualize different aspects of the problem</li></ul>	<ul style="list-style-type: none"><li>• Rapid changes happening in the domain</li><li>• Non-domain experts involved in the process</li></ul>
Problem formulation	<ul style="list-style-type: none"><li>• Separate the people from the problem</li><li>• Structure and analyze the negotiation case</li></ul>	<ul style="list-style-type: none"><li>• Dispersion of the actors</li><li>• Users from various areas of expertise</li><li>• Problems are ill-defined</li></ul>
Specification of issues and options	<ul style="list-style-type: none"><li>• Help negotiators identify their real interests</li></ul>	<ul style="list-style-type: none"><li>• Nature of wicked problems</li><li>• Users have various world views</li></ul>
Information identification	<ul style="list-style-type: none"><li>• Use objective criteria</li><li>• Assess and present arguments</li></ul>	<ul style="list-style-type: none"><li>• Dispersion of the information</li><li>• Quantity of information available</li></ul>

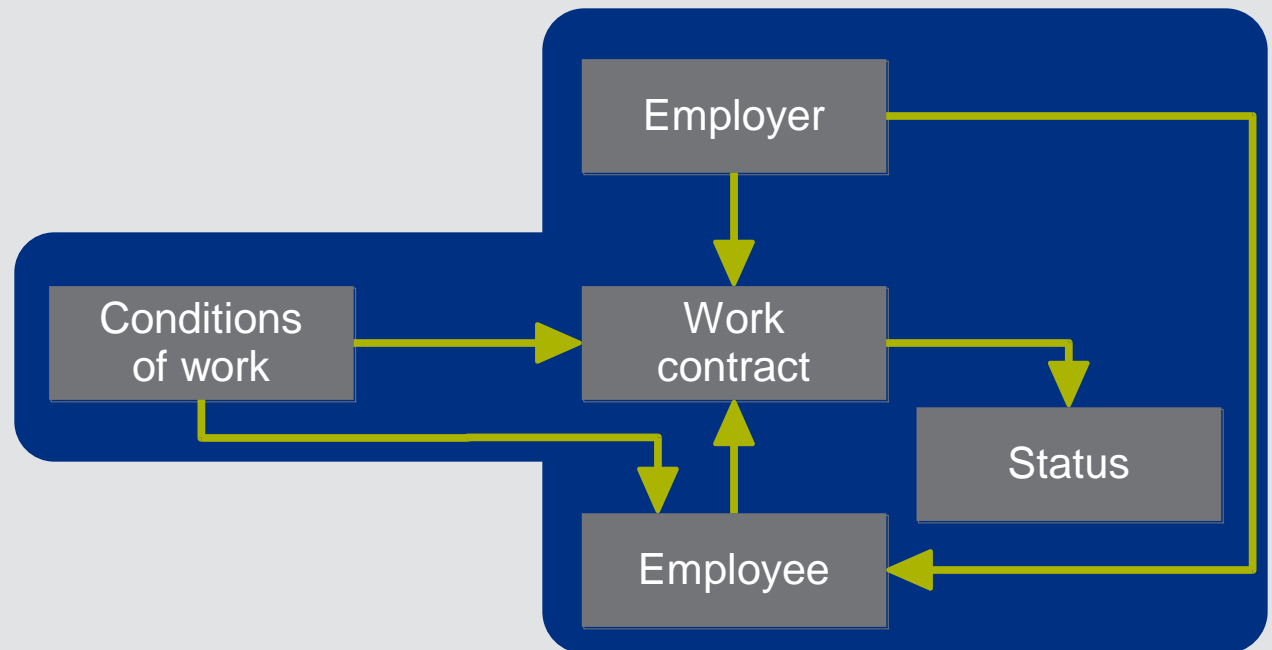
## Ontologies supporting shared understanding of problem domain

**We represent the problem domain knowledge as a web of ontologies providing conceptualizations of specific domains or parts of them**

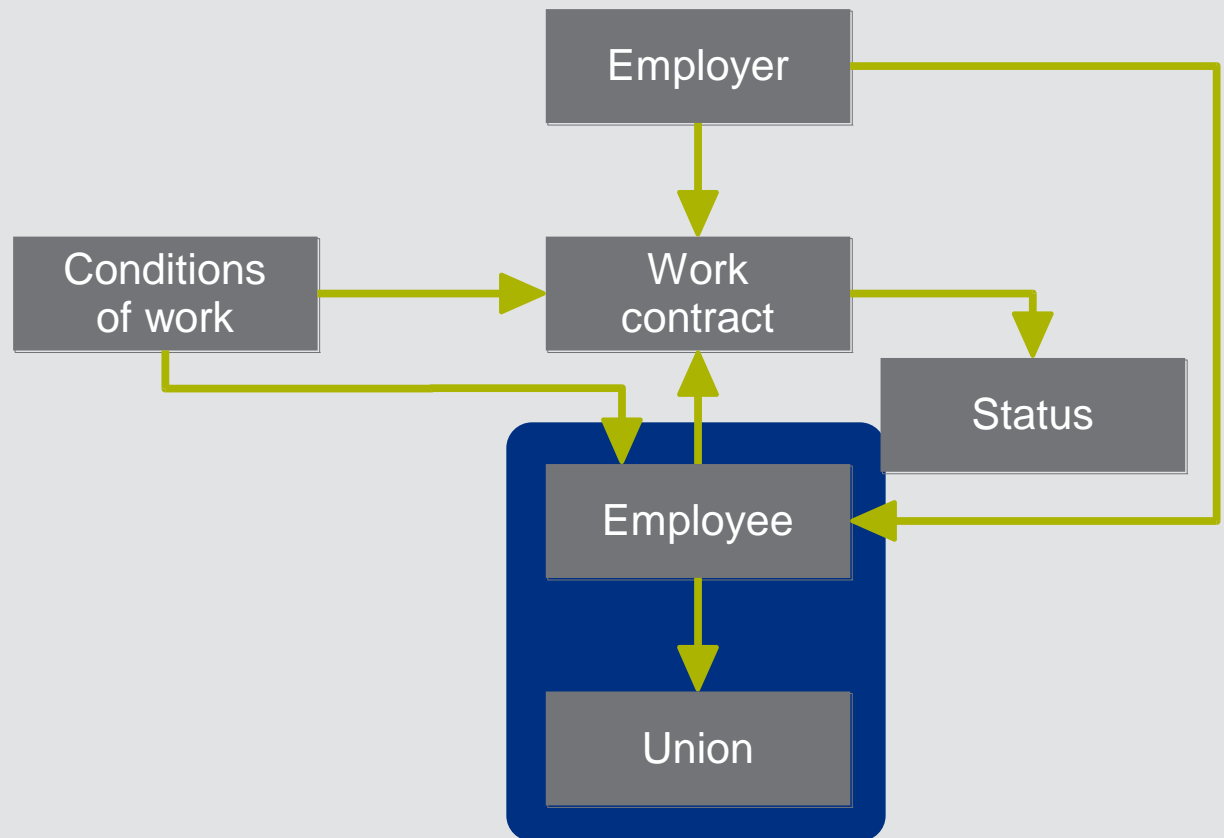
### **Benefits**

- Shared understanding of the concepts and their relations
- Support non-domain experts such as negotiation specialists, decision analysts or policy makers in the negotiation process

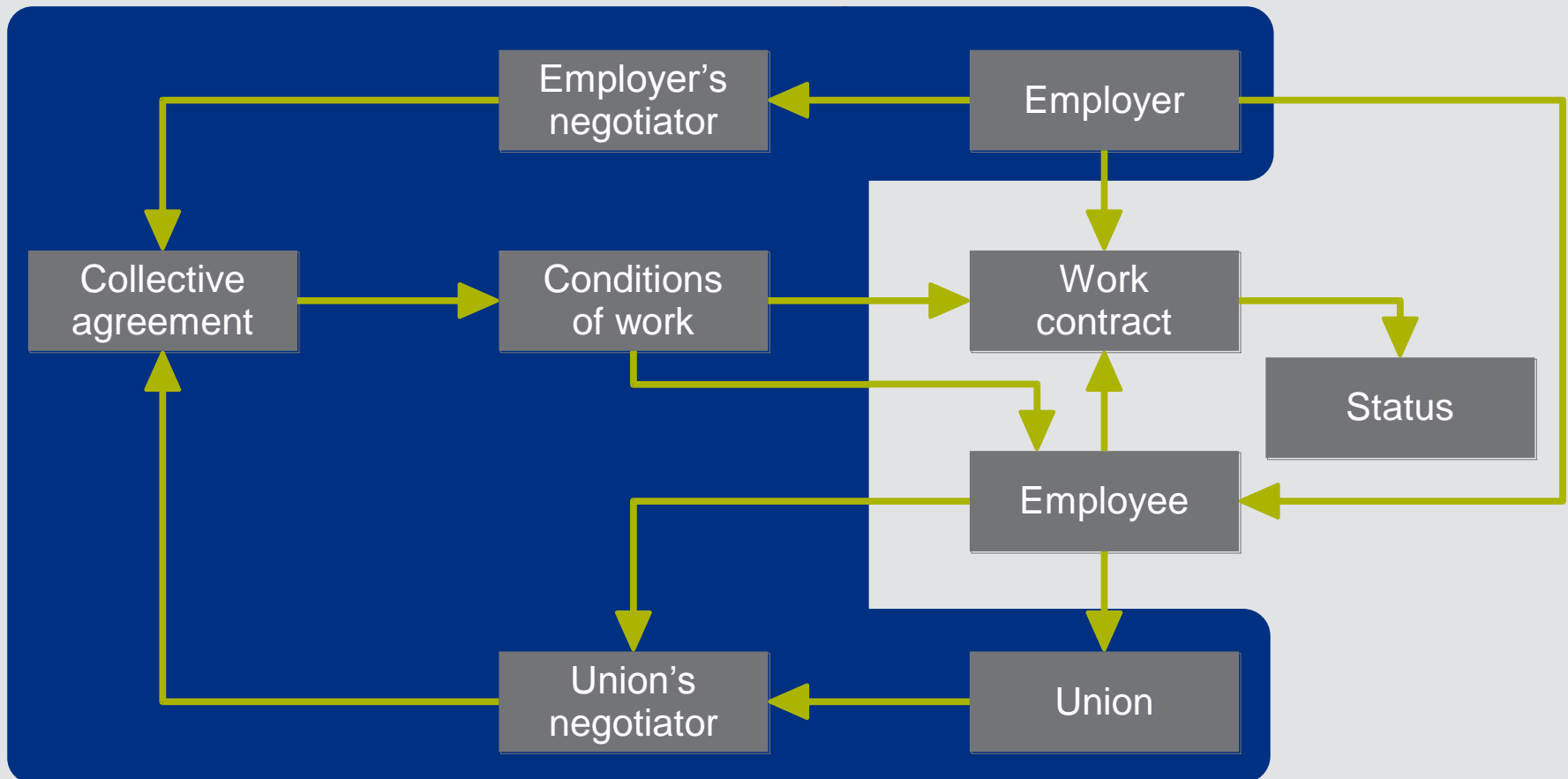
## Visual representation of the problem domain ontology



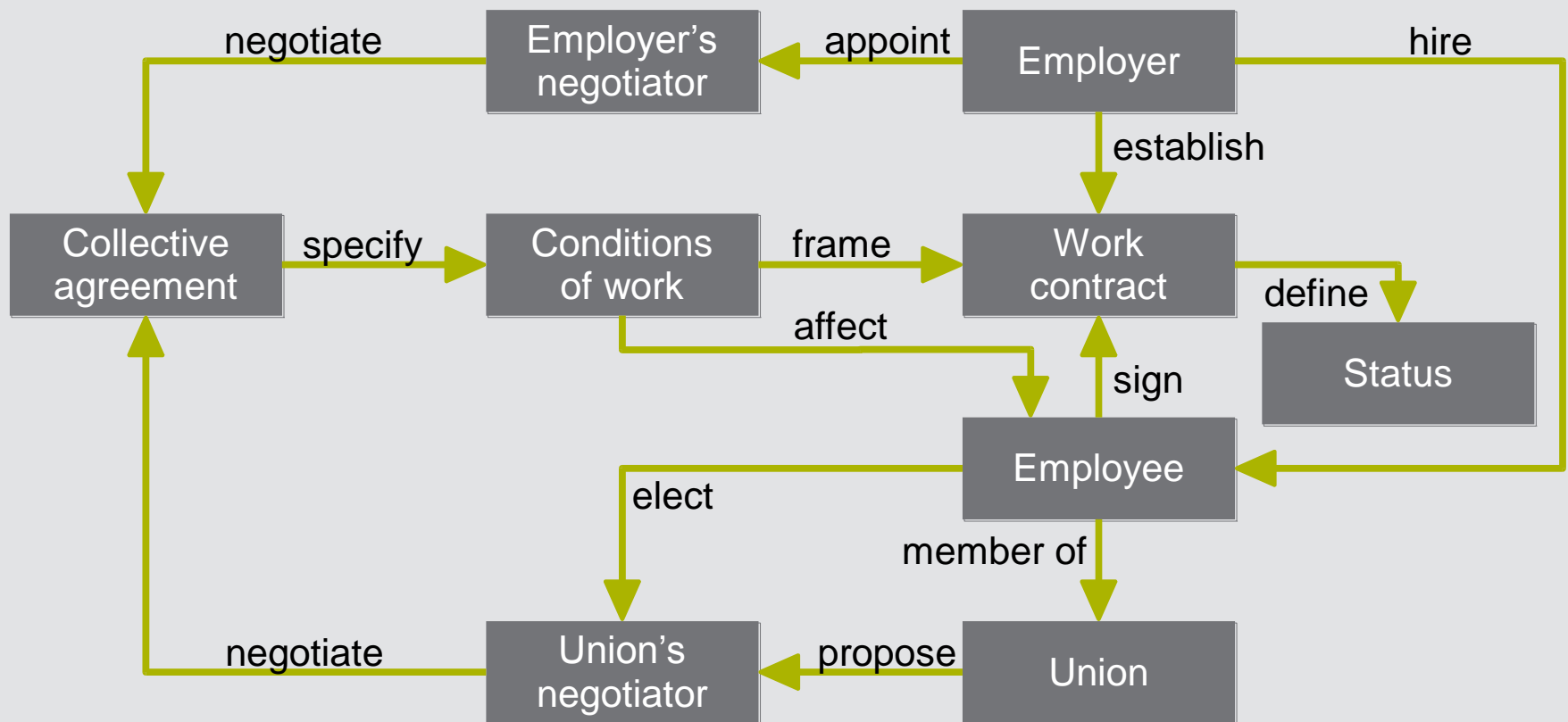
## Visual representation of the problem domain ontology



## Visual representation of the problem domain ontology



## Visual representation of the problem domain ontology



## Using problem structuring methods to elicit negotiation problems

**PSM support situations in which people perceive the world in their own way and make judgments using standards and values which may not be shared by others**

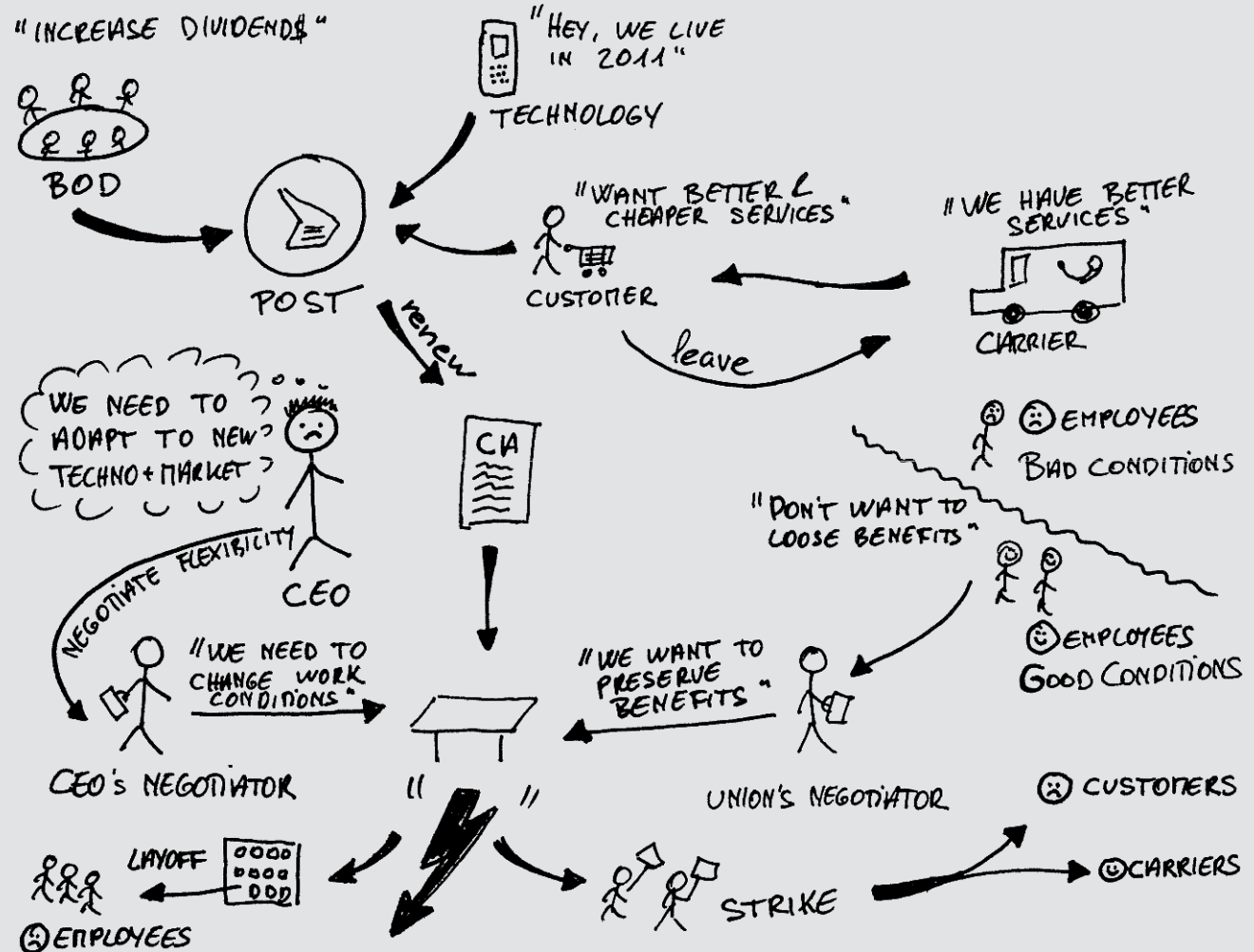
### **Tools**

- Rich picture
- CATWOE
- Conceptual model

# Using Ontologies and SSM to Provide Multi-user Support in Problem Structuring

## Using problem structuring methods to elicit negotiation problems

### Rich picture



## The CATWOE approach

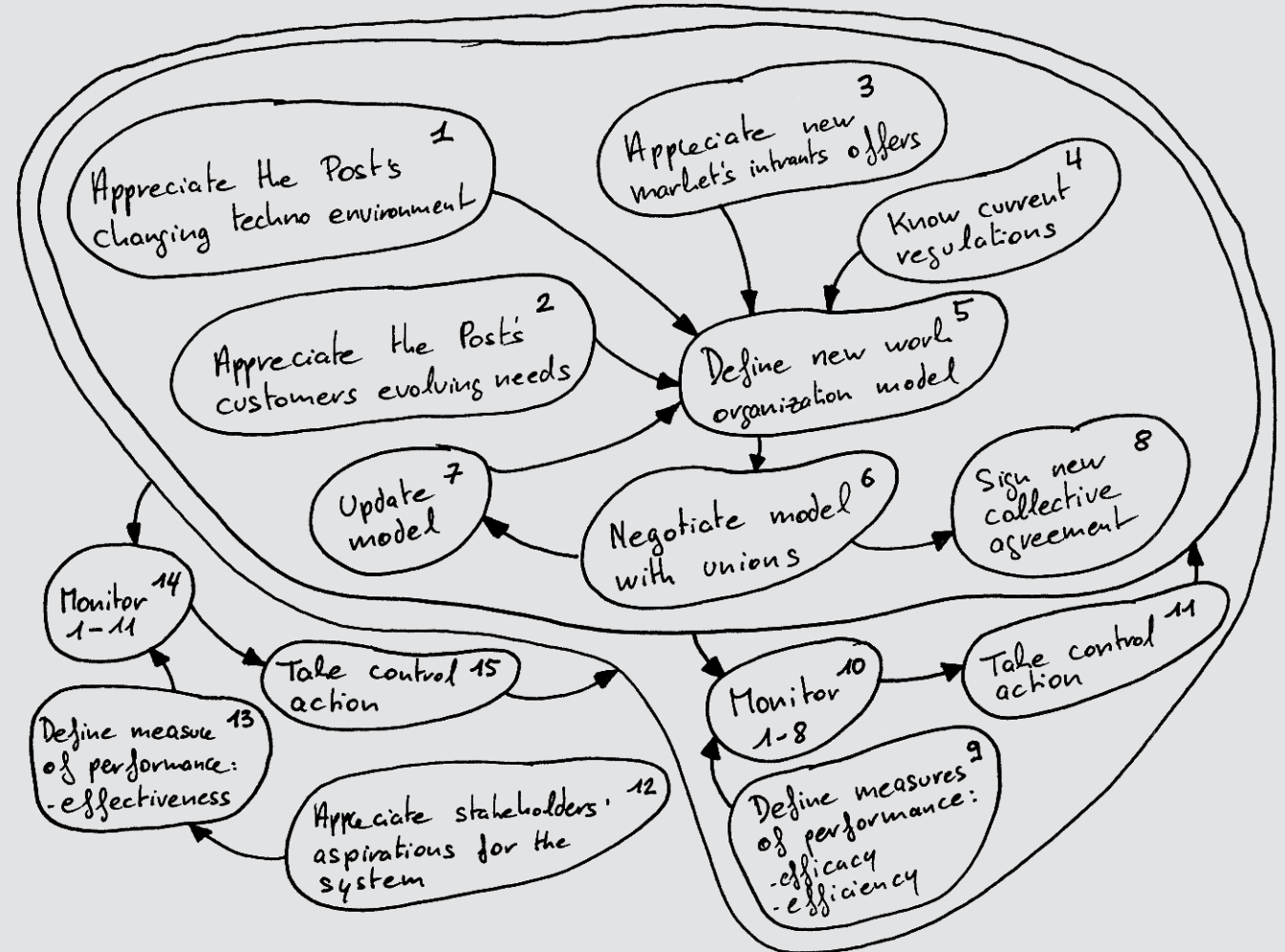
<b>C</b>	Customer	Who would be victims/beneficiaries of the purposeful activity?
<b>A</b>	Actors	Who would do the activities?
<b>T</b>	Transformation process	What is the purposeful activity expressed as: input → T → output?
<b>W</b>	Weltanschauung	What view of the world makes this definition meaningful?
<b>O</b>	Owner	Who could stop this activity?
<b>E</b>	Environmental constraints	What constraints in its environment does this system take as given?

## Using Ontologies and SSM to Provide Multi-user Support in Problem Structuring

### Using problem structuring methods to elicit negotiation problems

C	Employee, Shareholder, Stakeholder	
A	Union's negotiators and employer's negotiators	
T	Collective agreement → Collective agreement renewed by concluding the negotiation	Social benefits → social benefits preserved by concluding the negotiation
W	This adaptation to changing market conditions, increased competition and new technological environment is vital to the profitability of the company.	The long tradition of social benefits of the ex public enterprise should not be sacrificed just to increase profitability.
O	Employees, employer	
E	Governmental policies on collective agreement, collective layoffs and strike; wide unionization of employees; increased competition by privately owned carriers	

# Conceptual model



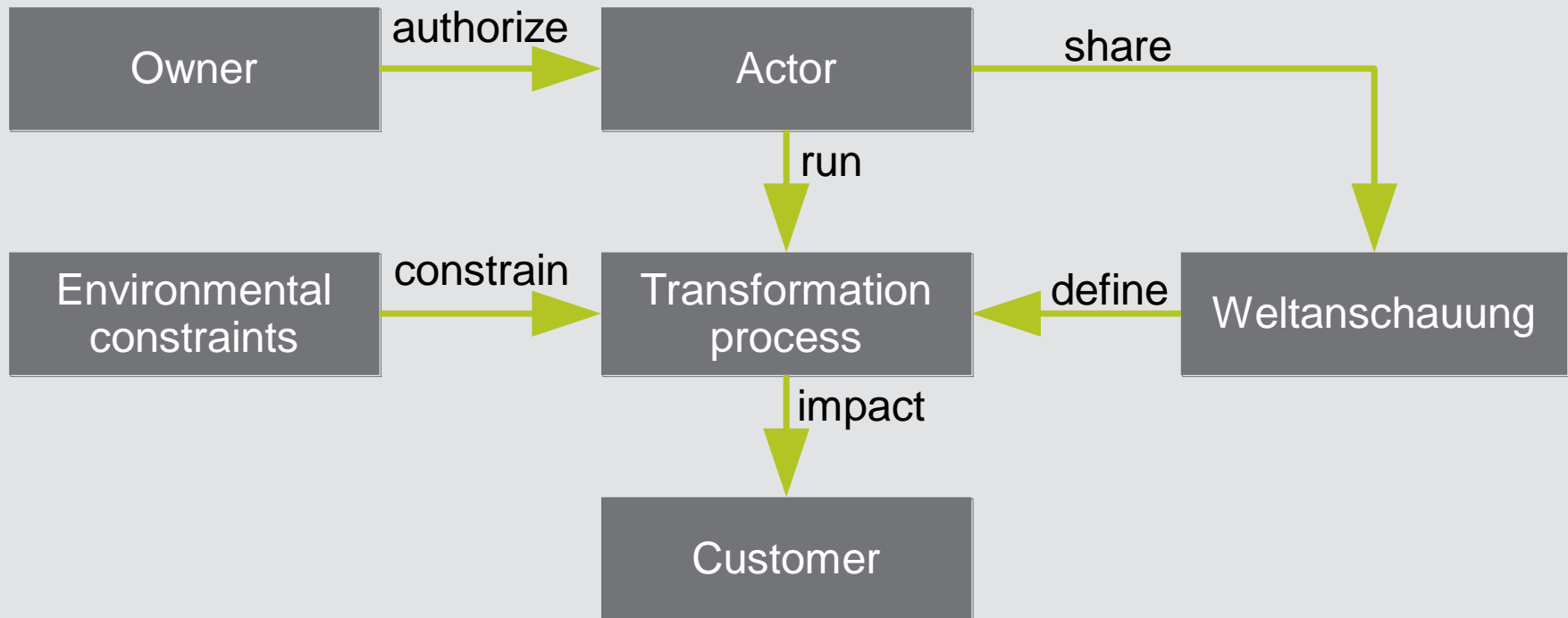
## A problem representation based on ontologies and CATWOE

Specializing a domain and a task ontology, we can support users in framing problems, identifying information sources and retrieving relevant information.

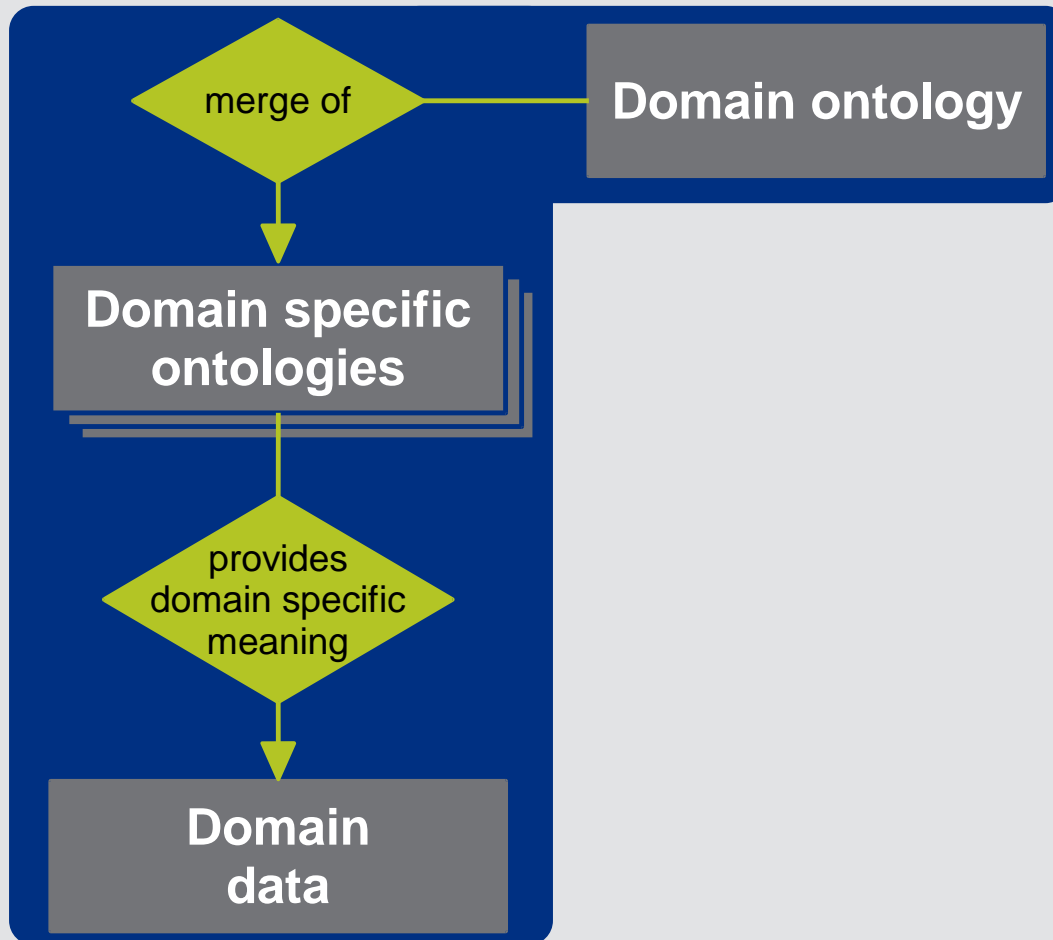
### Building the application ontology

- CATWOE ontology
- Model of ENS using ontologies

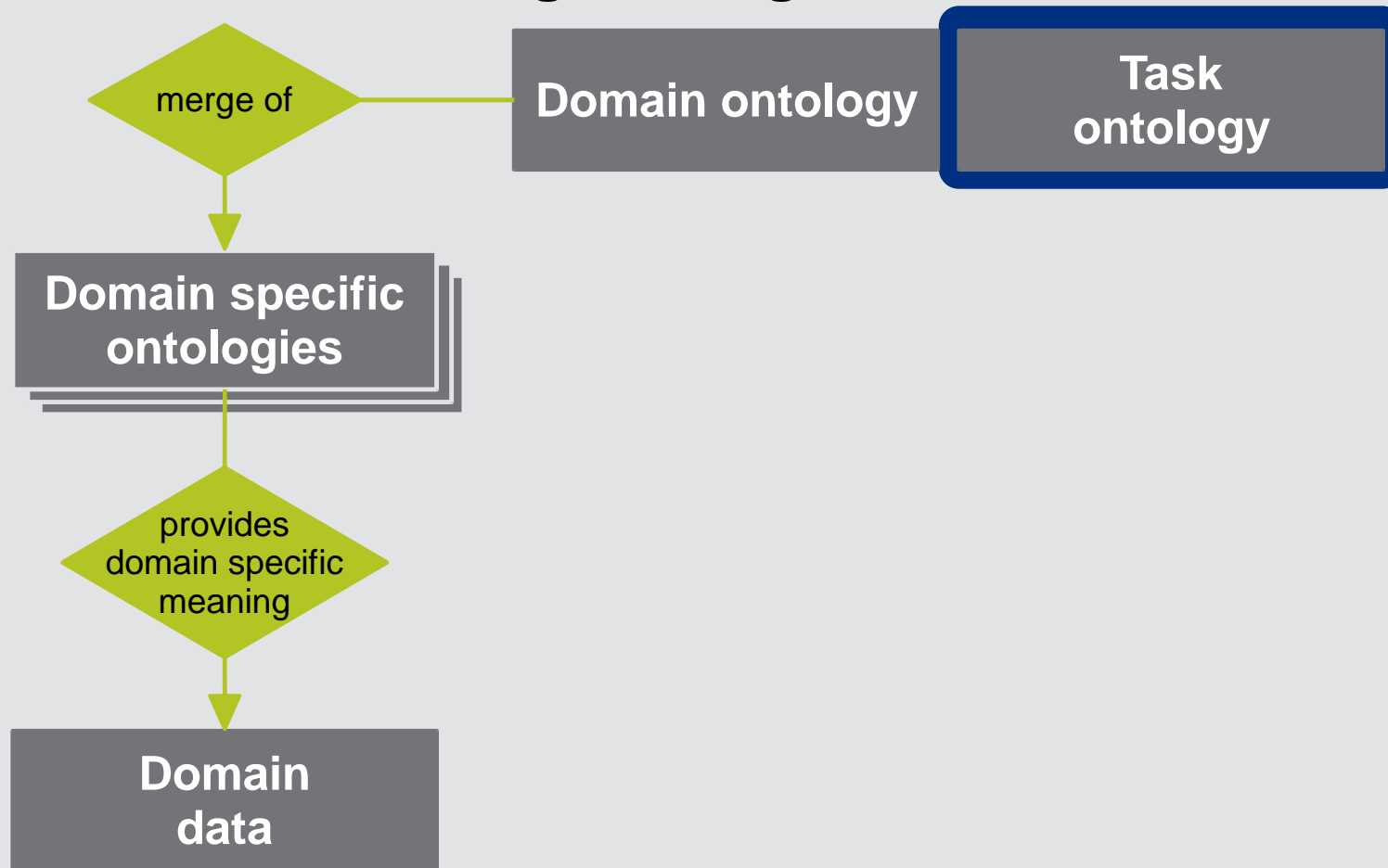
## CATWOE Ontology



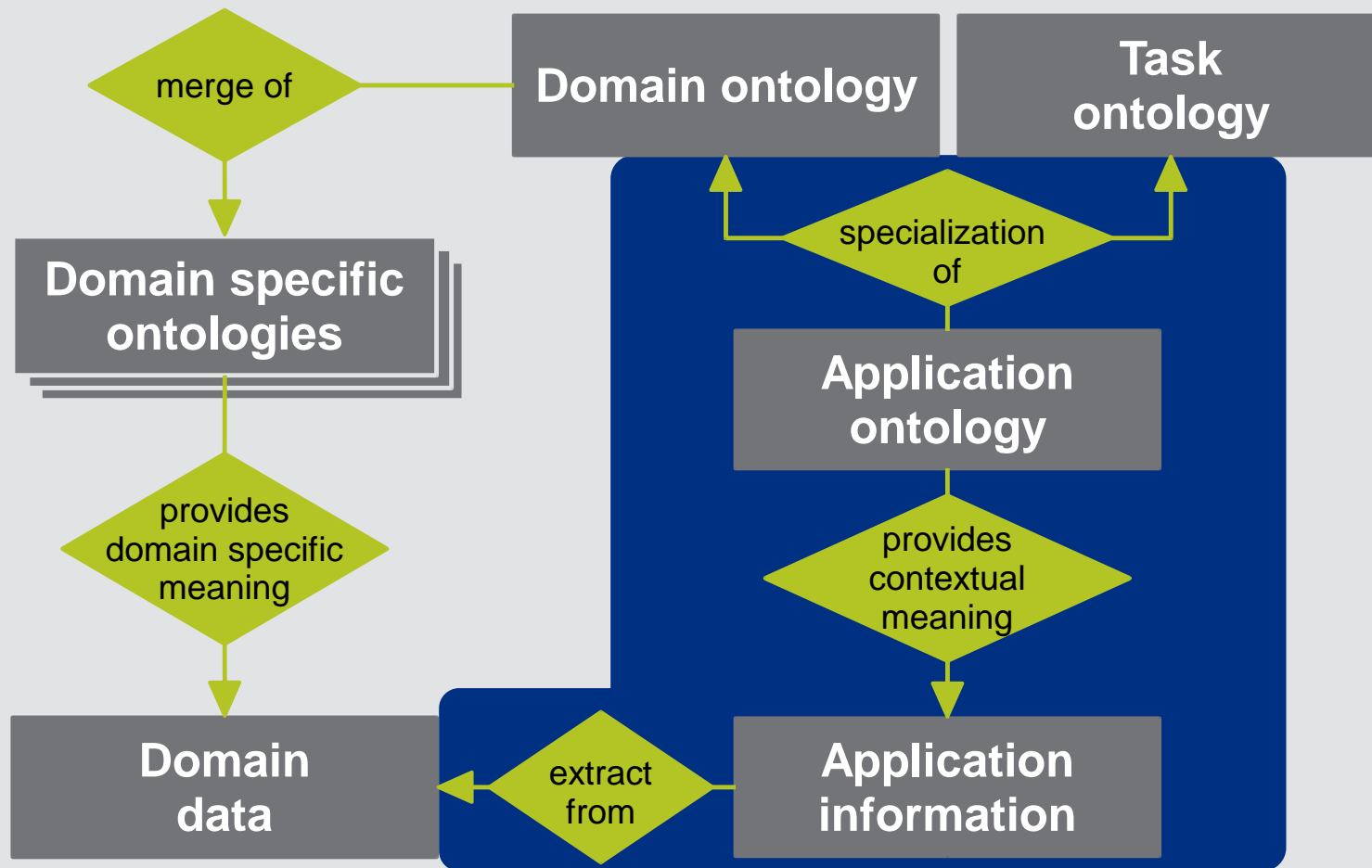
## Model of ENS using ontologies



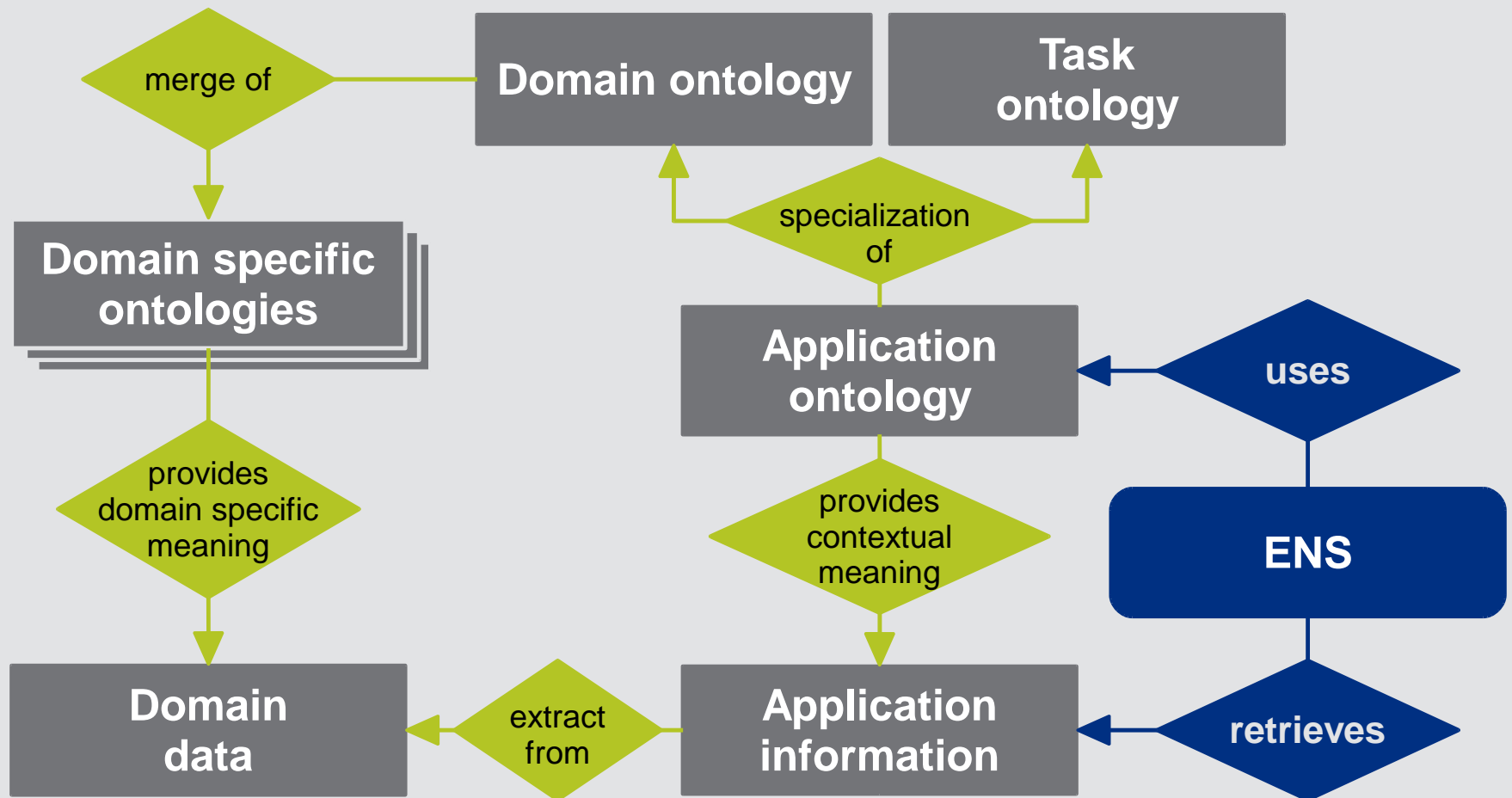
## Model of ENS using ontologies



## Model of ENS using ontologies



## Model of ENS using ontologies



## Exploring the ideas

**In order to validate our ideas, we will follow a twofold research agenda based on empirical and design work.**

### Research questions

- Can an application ontology support a user in framing a problem?
- Can an application ontology support a user in identifying relevant information sources related to a framed issue?
- Can an application ontology assist a user in retrieving problem-domain information during the negotiation process?
- How can an ontology-supported ENS be effectively designed?

### Reference

Cédric Gaspoz, Yair Wand, "Using Ontologies and SSM to Provide Multi-user Support in Problem Structuring," HICSS, p. 658-667, 2012 45th Hawaii International Conference on System Sciences, 2012

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### Abstract

Decision support systems (DSS) are aimed at helping decision makers in devising appropriate solutions to business problems while negotiation support systems (NSS) are aimed at assisting stakeholders in reaching mutually satisfactory decisions. The successful use of these systems involves a combination of human ability and computer support. An implicit assumption underlying their use is that the business problems for which they are deployed have been carefully defined by the stakeholders prior to their use. This includes, in particular, understanding of the problem variables and their possible impact on the decision outcomes and knowing which information is necessary for supporting it. However, this assumption might not hold in the modern business environment. This is due to the increasing complexity and rate of change of the environment, the geographical and temporal dispersion of modern organizations, and the diversity and quantity of information sources that is available. In this paper we propose the idea of extending the scope of these systems to include a step preceding the solution process: problem framing. We claim that new technologies such as Web 2.0 provide novel opportunities to add this facility to DSS and NSS. To achieve this, we propose a novel approach combining domain and task ontologies. The task ontology we propose employs concepts from soft systems methodology. Specifically, we suggest that a stakeholder can use the ontologies to understand the problem, frame the issue, and identify the information required for the task. The ontologies can support accessing the information sources when the system is being used by stakeholders.

# Opening Worlds

