



# Representation of collaborative Knowledge: from knowledge engineering to Knowledge Management

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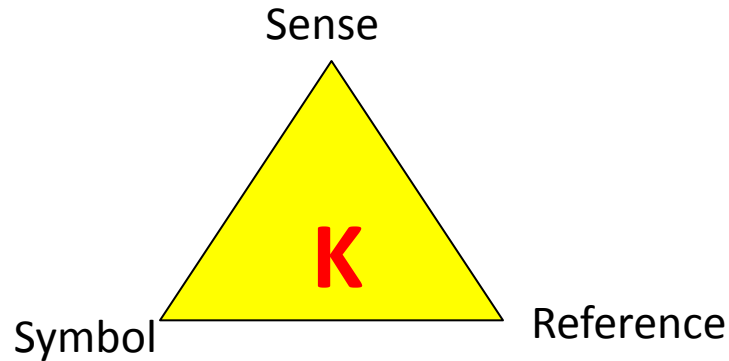


# Outline

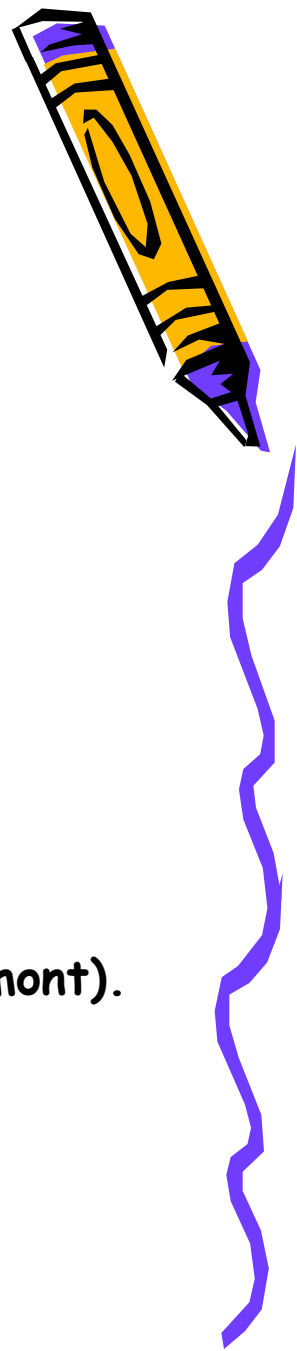


- Knowledge
- Knowledge management and Knowledge Engineering
  - Definitions
  - Process
  - Knowledge Capitalization approaches
  - Semantic web vs social semantic web
- Cooperative Knowledge
  - Definitions
  - Traceability and capitalization approaches
  - Knowledge from cooperative decision making
  - Knowledge from communication
  - Aggregation & classifications

# Knowledge

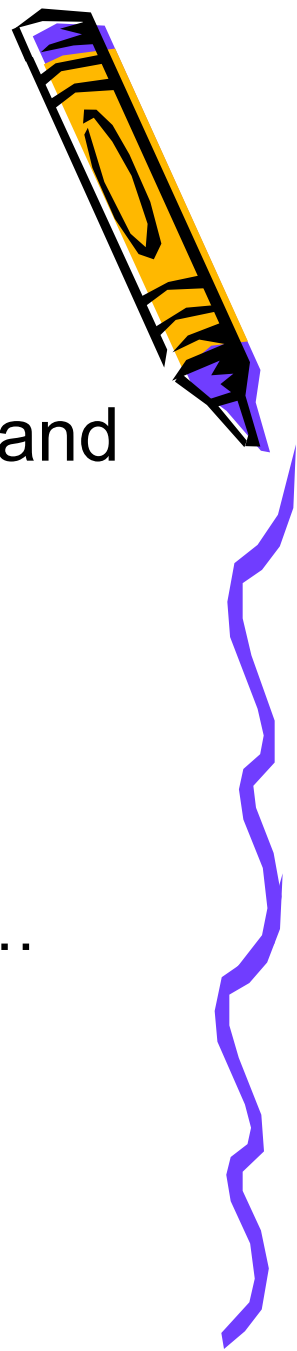


Knowledge is data, information **used** in a given **context** (Bachimont).  
**We can speak about tacit and explicit Knowledge (Polyani).**



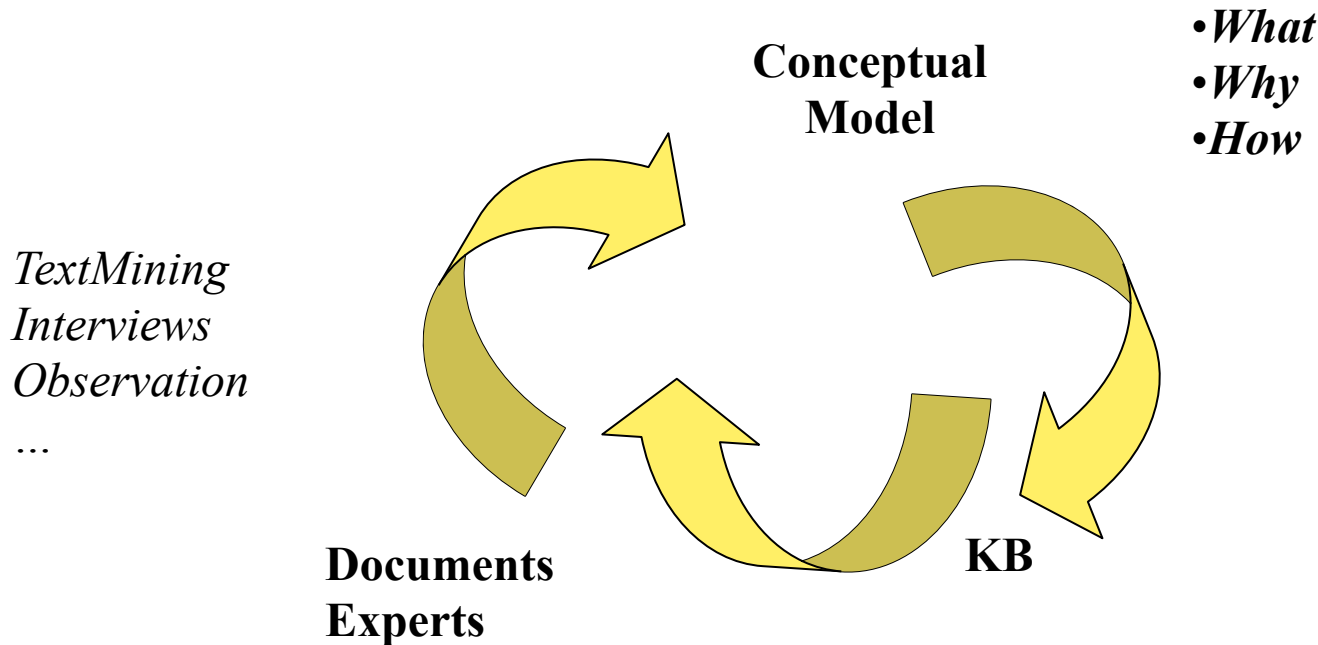
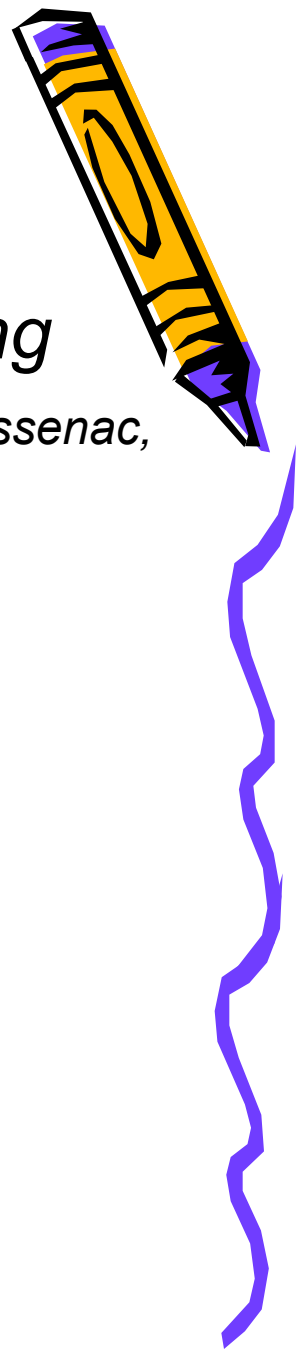
# Reference and Context

- How to keep track and represent Context and reference:
  - Objectives<->Subjectives
- How to organise Learning :
  - Communication : Forum, social network, Community of practices, ...
  - Training systems: Best Practices, examples, ...
- How to handle perenity of K Sharing:
  - Mobility, retirement, ...
  - Animation, ...

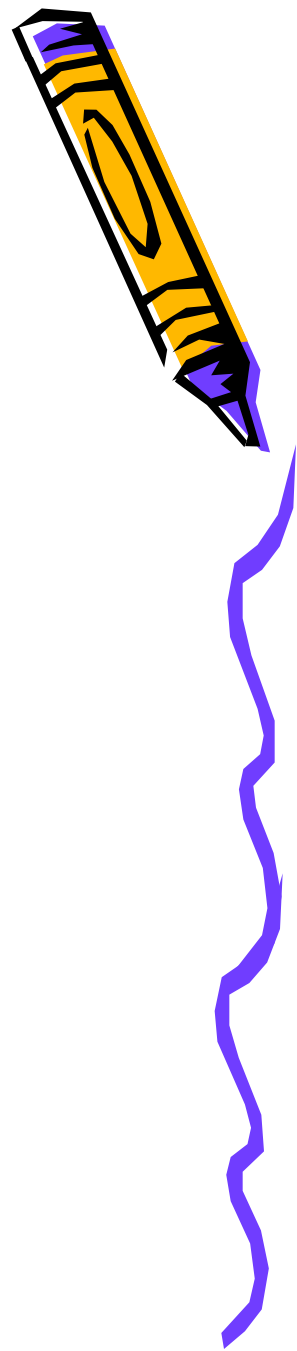
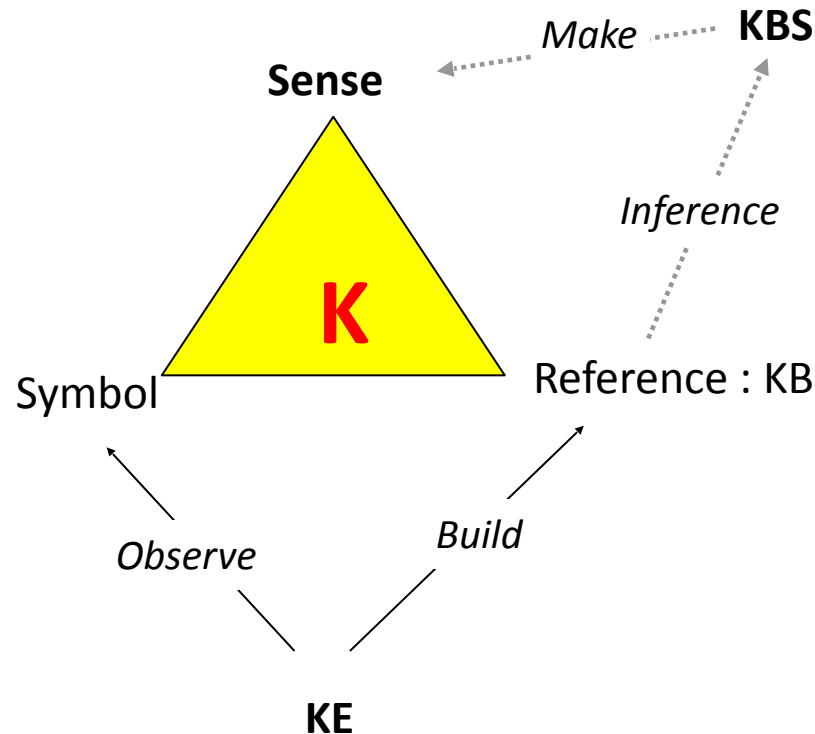


# Knowledge Engineering

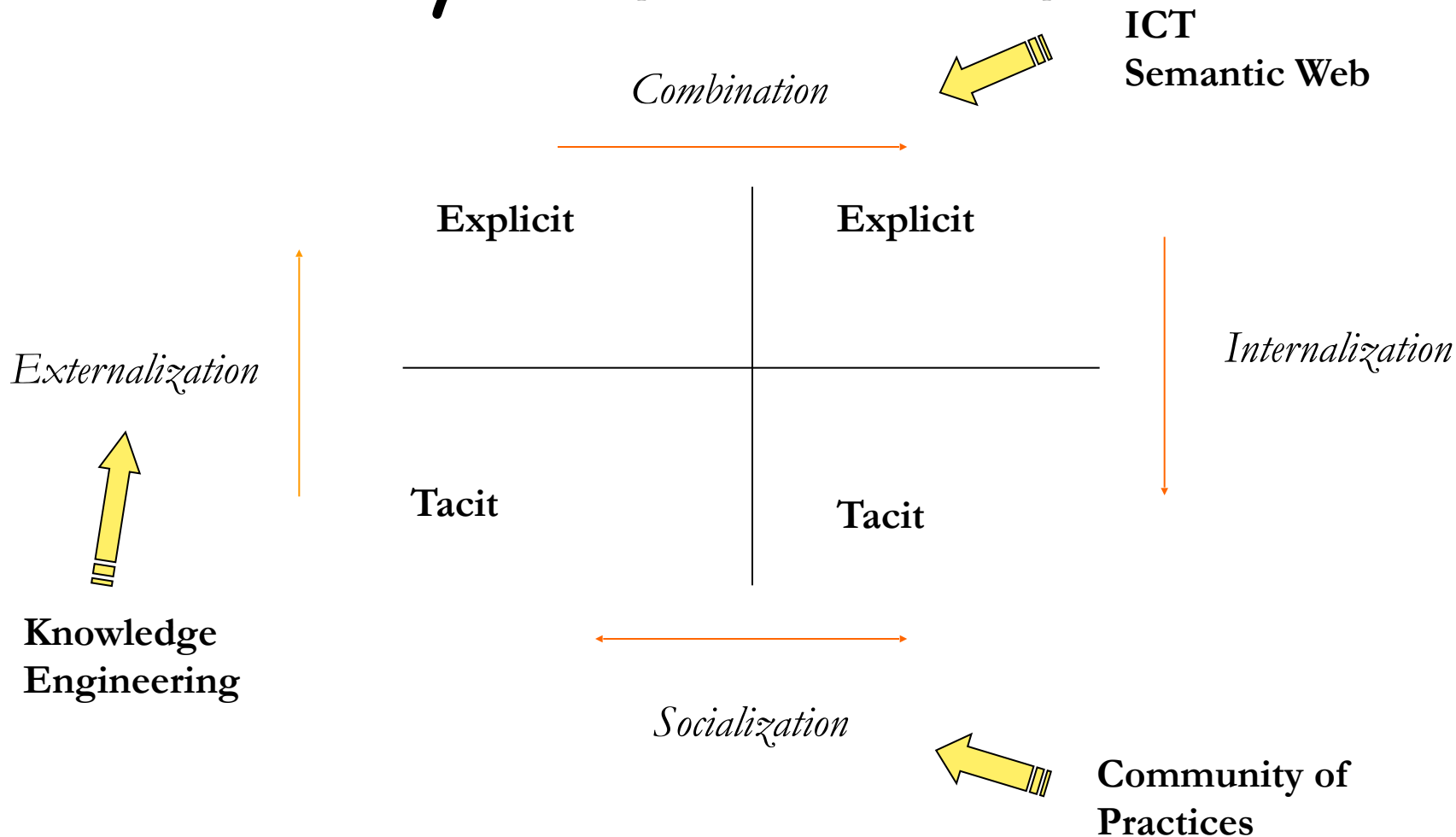
*Knowledge engineering is an approach allowing problem solving extracting and modelling [Aussenac, Bradshaw], [Newell]*



# Knowledge Engineering Principles

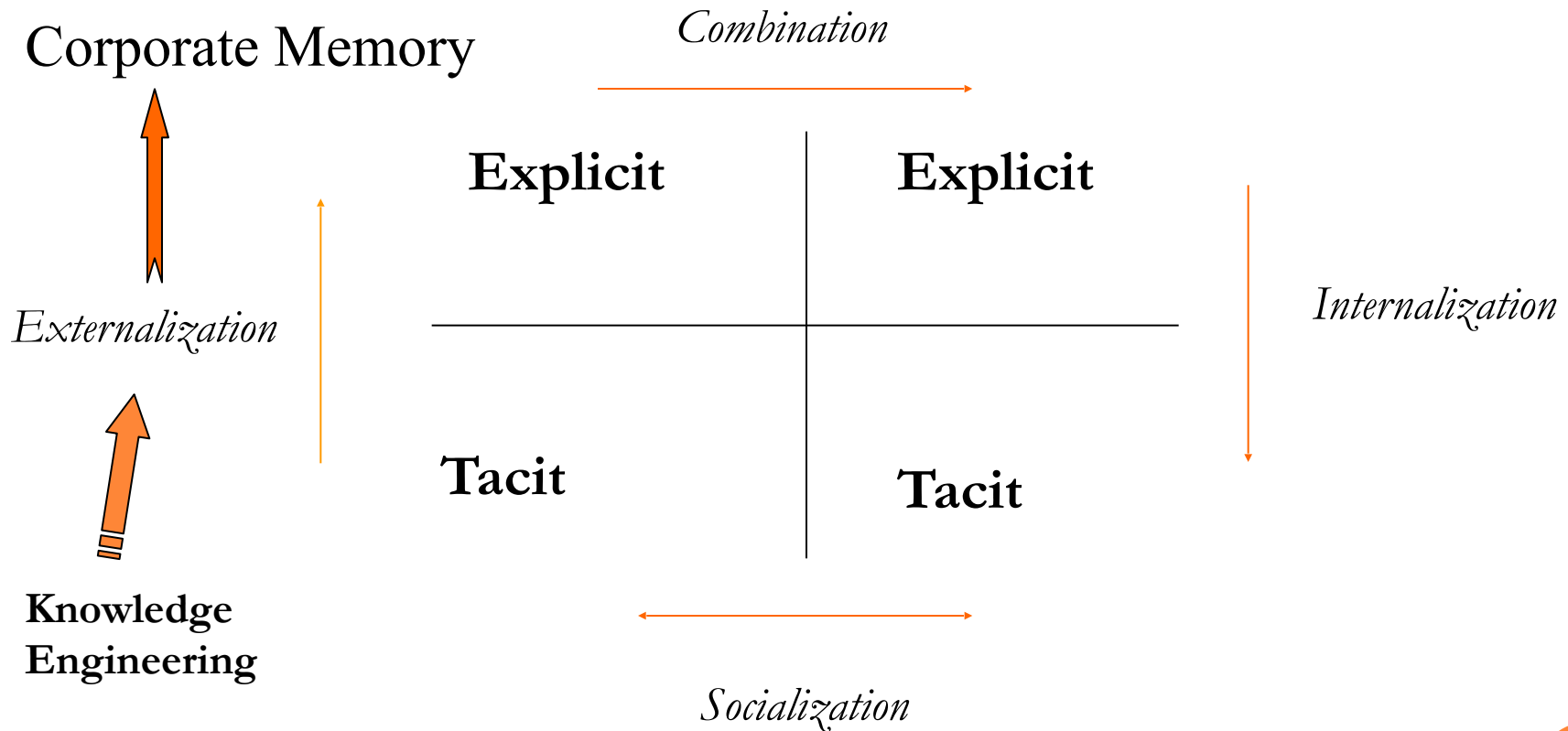


# Knowledge Management Cycle [Nonaka & Takeushi]



# KNOWLEDGE MANAGEMENT CYCLE

[NONAKA & TAKEUSHI]



# CORPORATE MEMORY

*« A corporate memory is a persistent and explicit representation of knowledge and information of an organization »* [Van Heijst, 96], [Dieng et al, 03]

Several memory types: Profession memory,  
project memory, management memory

# PROFESSION MEMORY

Profession memory is the externalization of the knowledge produced in and for a given domain

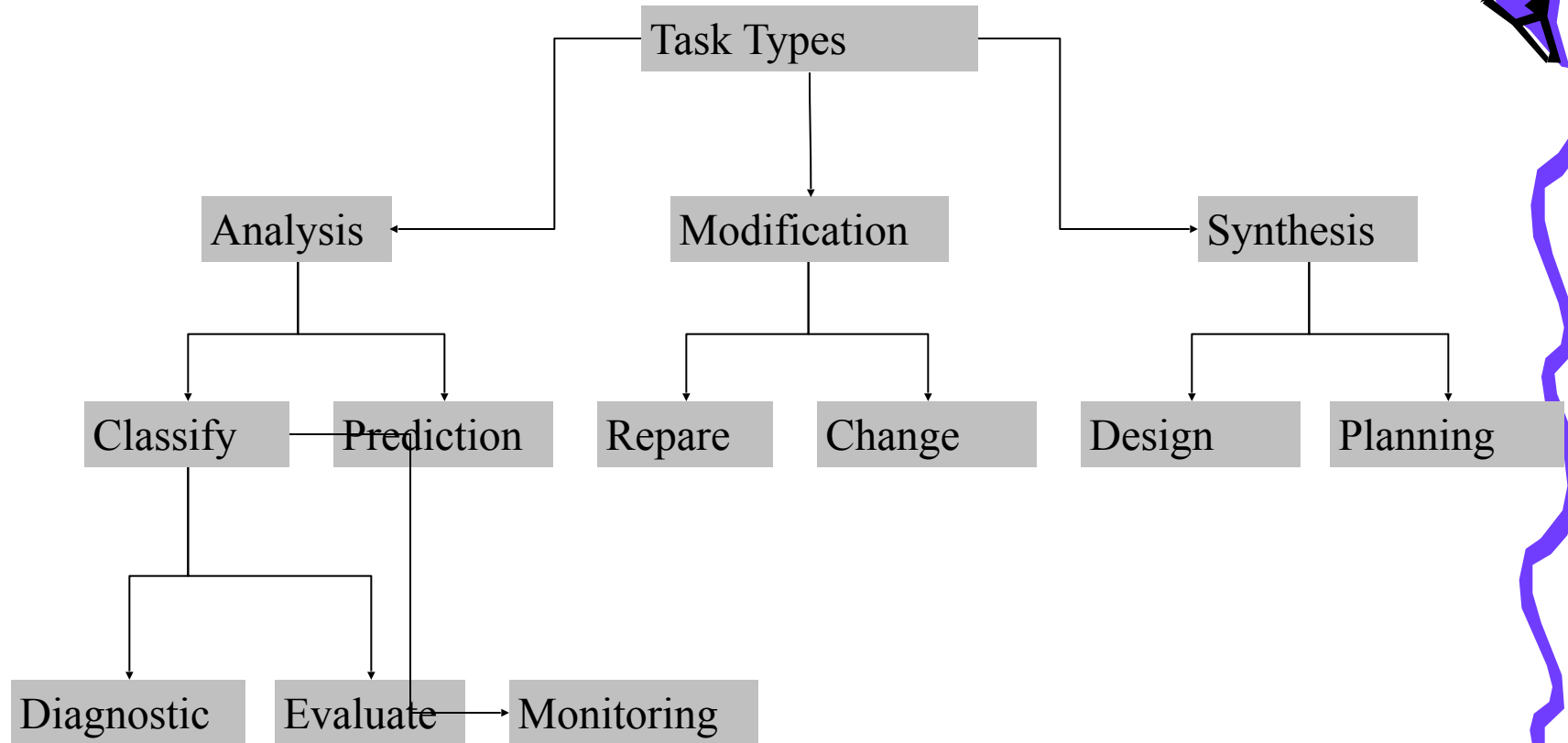
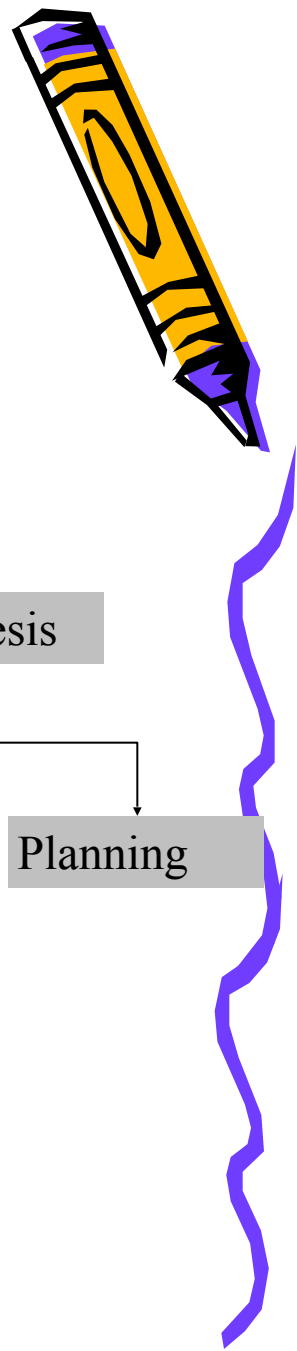
- Structure :
  - Definition of the problem (or the process)
  - Problem solving methods
  - Description of manipulated concepts

# Knowledge Engineering approaches

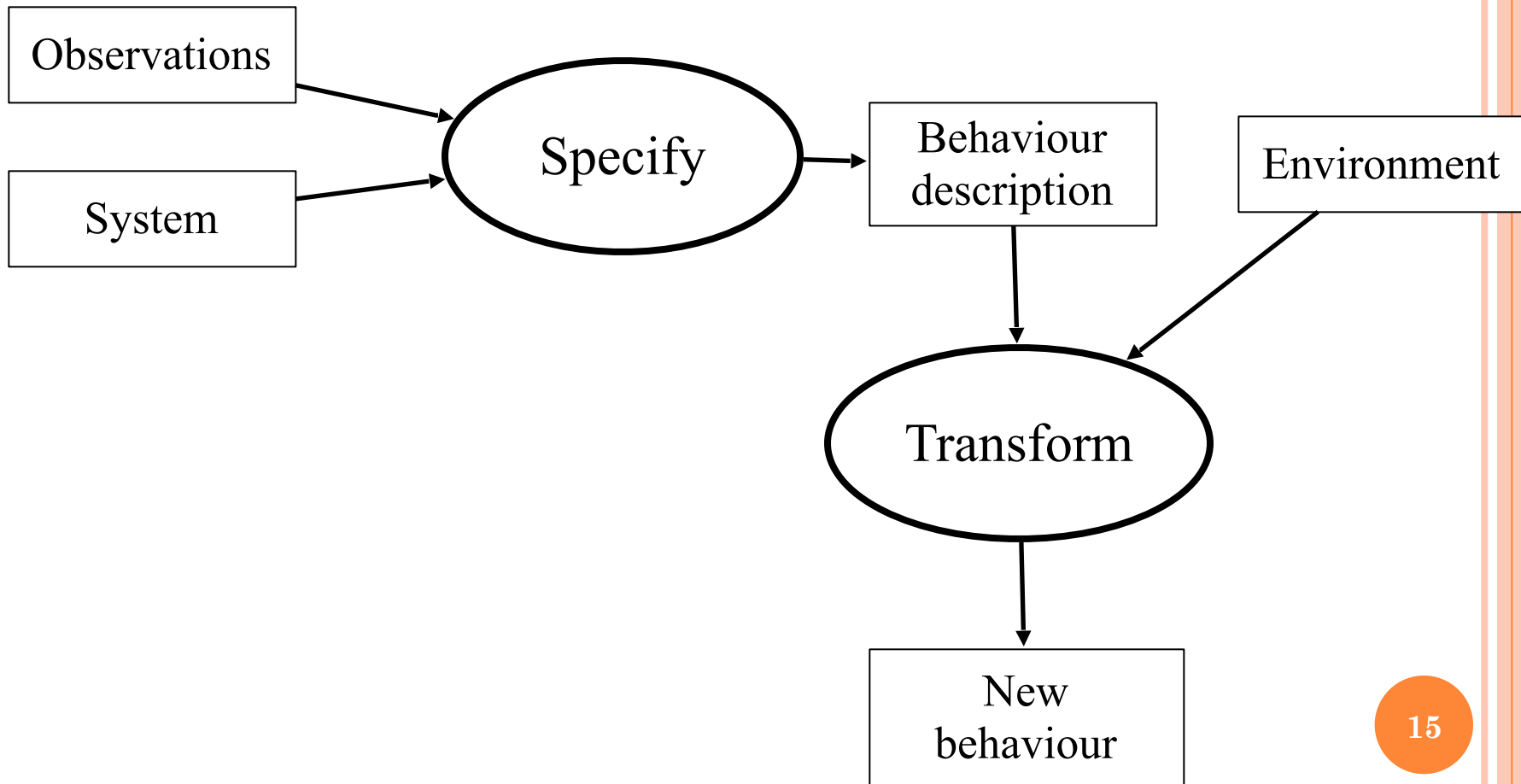


- CommonKADS (Breuker, Shreiber, Fensel)
  - Generic models as guides for modelling
- MASK (Ermine)
  - Graphic Presentation of models as guide for learning

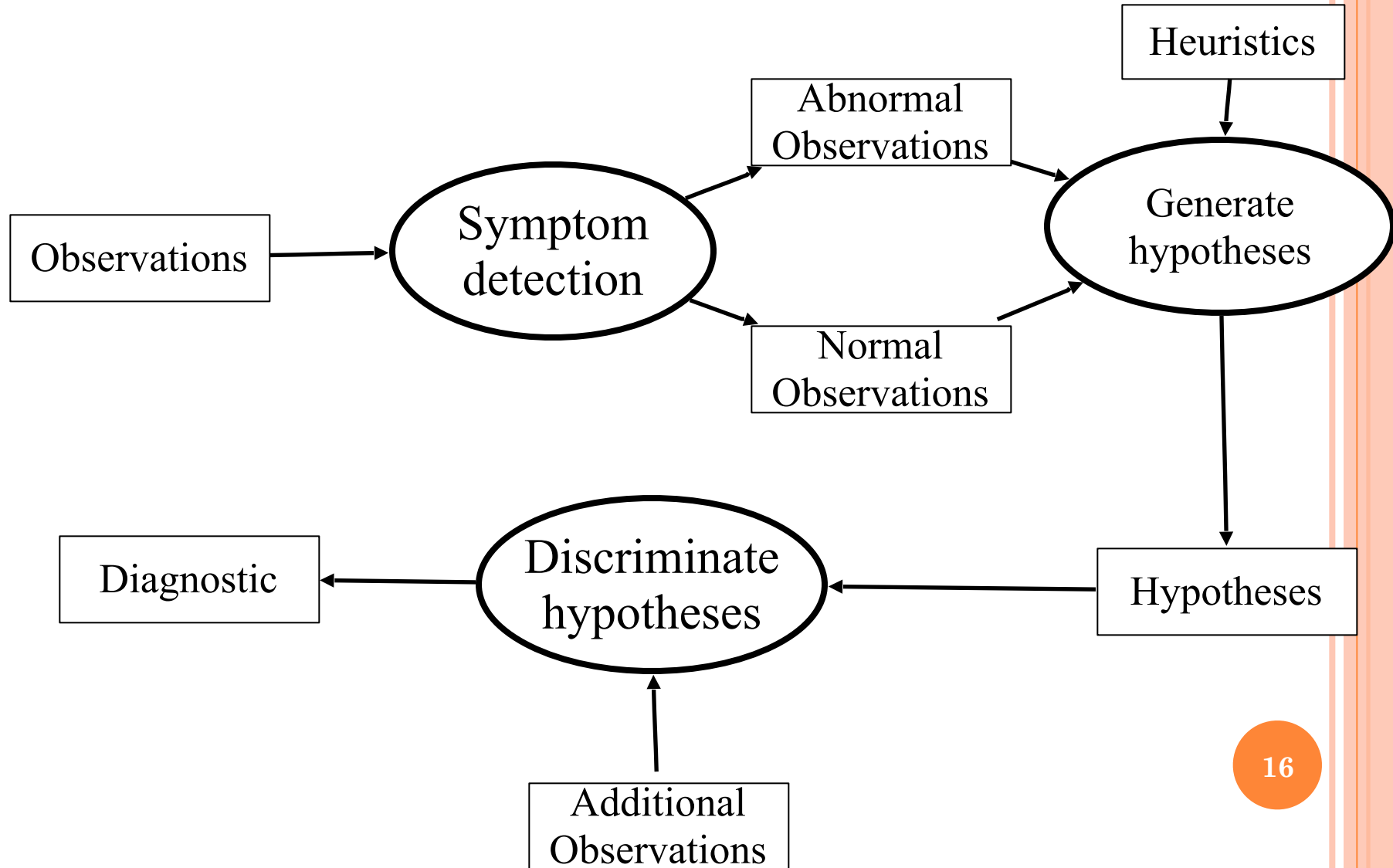
# CommonKADS: Task Types



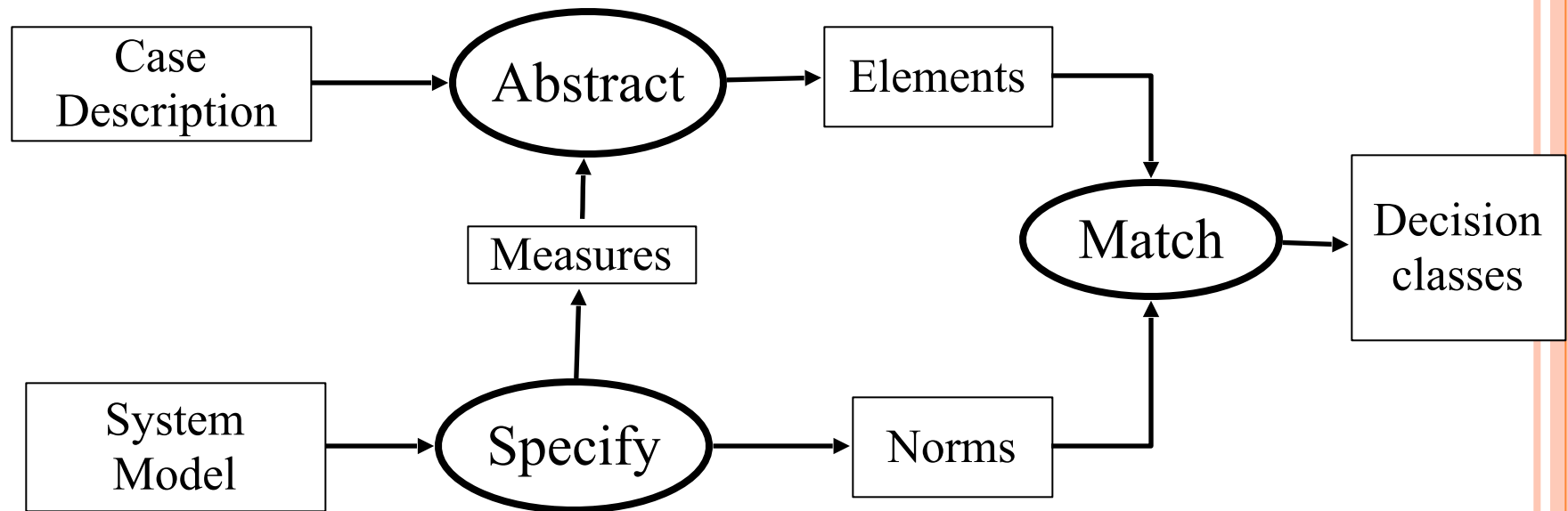
# Prediction



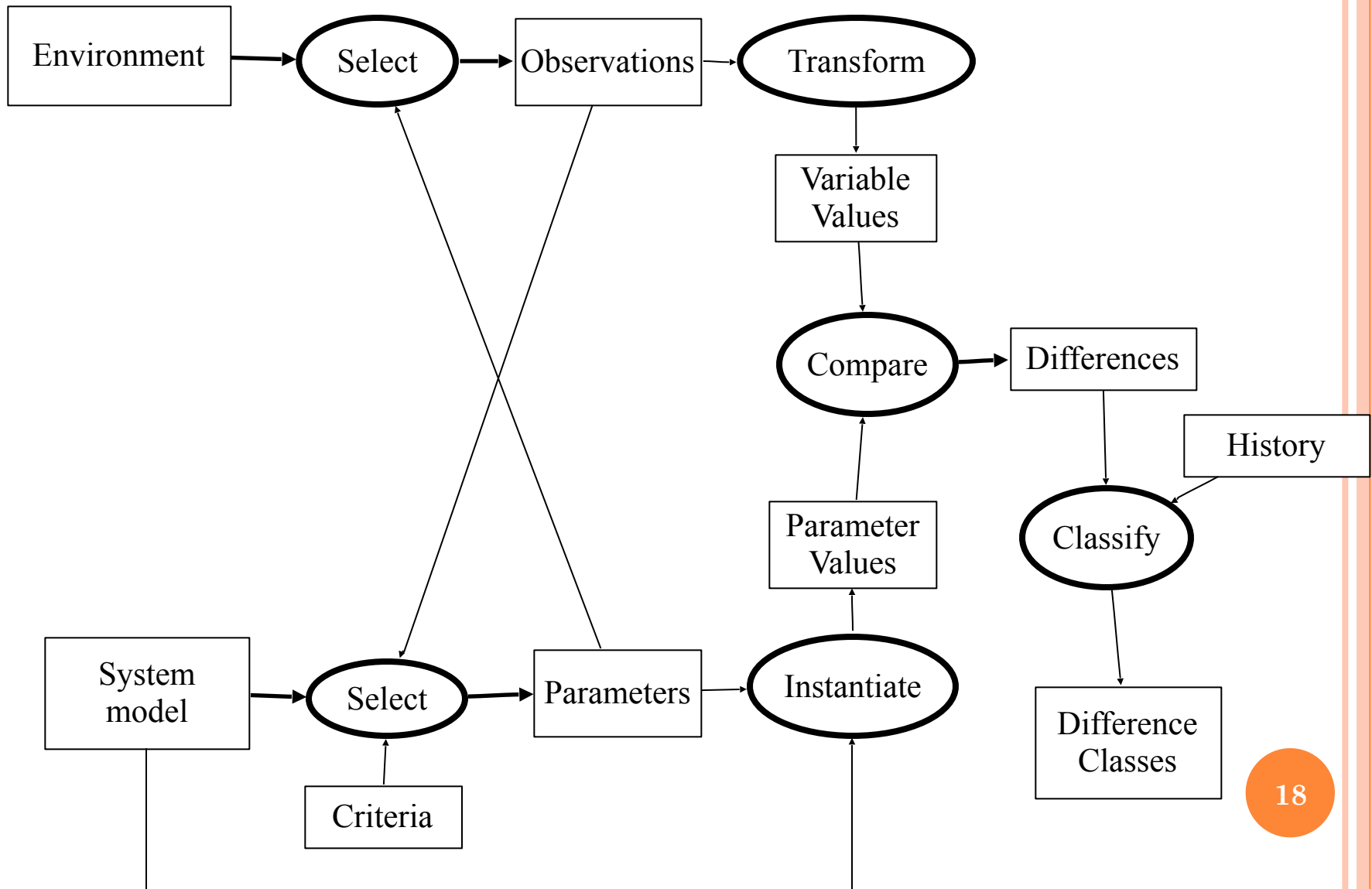
# Diagnostic



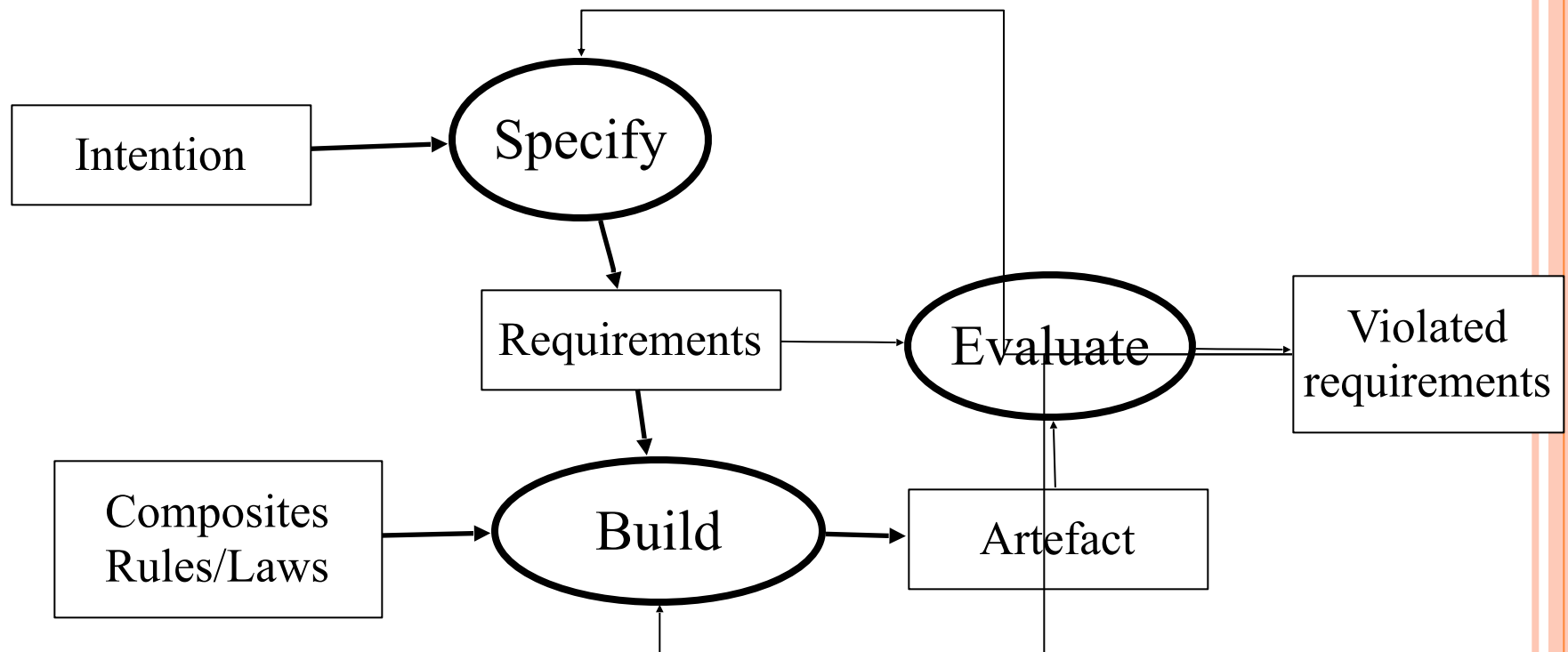
# Evaluate



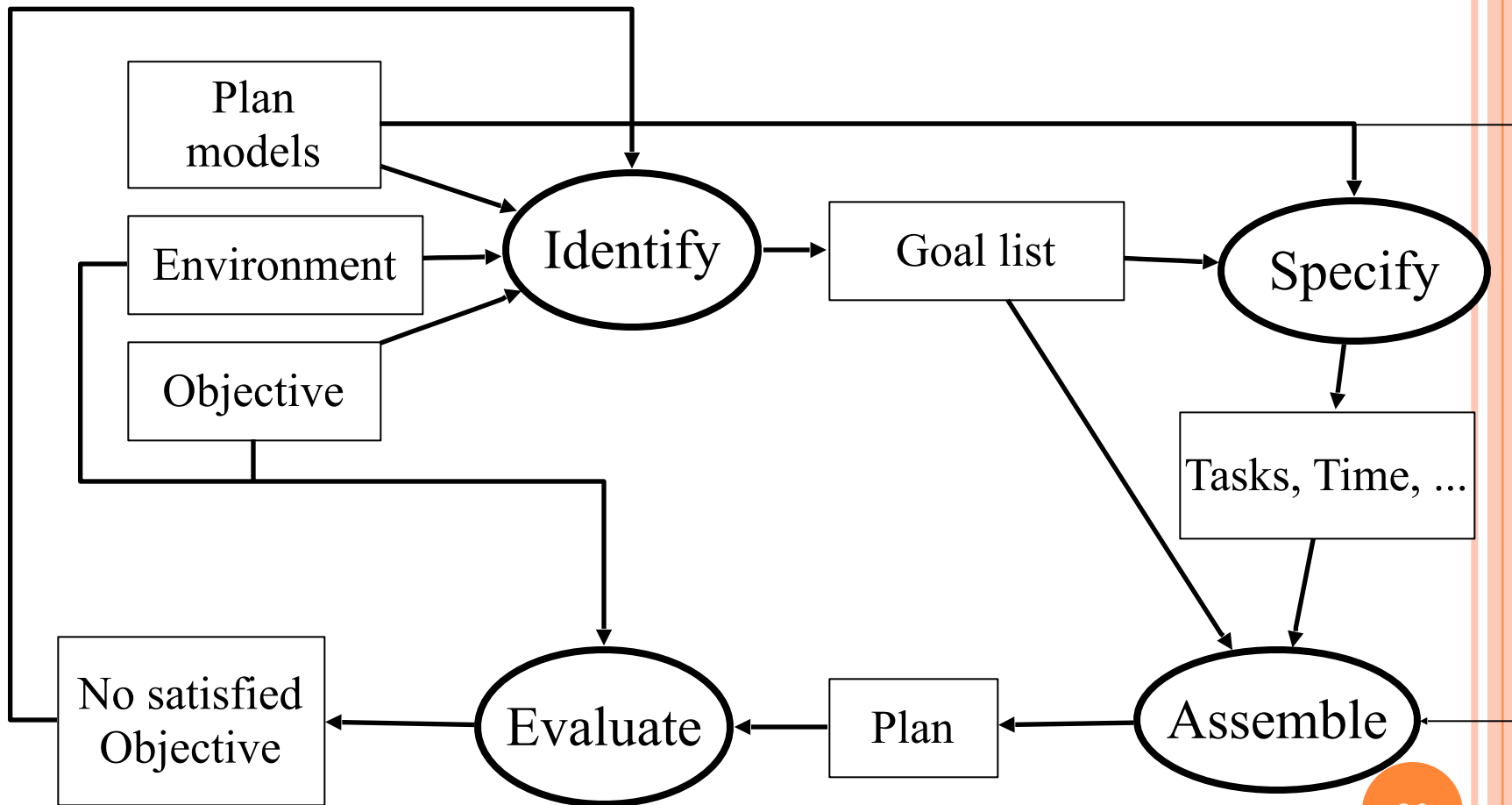
# Monitoring



# Design



# Planning



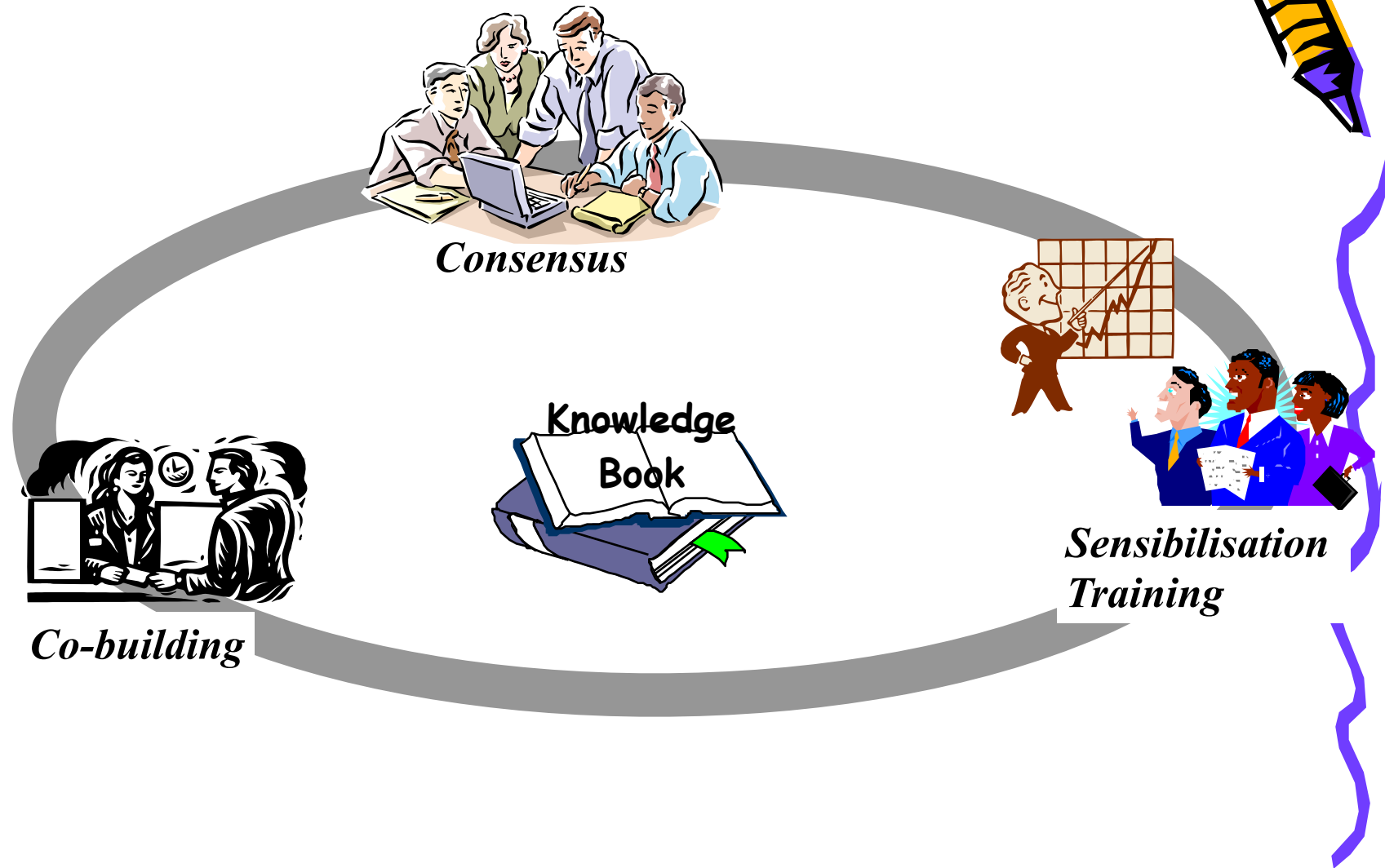
# CML : CONCEPTUAL MODELLING LANGUAGE

|                 | Level                   | Entity                                                         |
|-----------------|-------------------------|----------------------------------------------------------------|
| Problem solving | <b><i>Task</i></b>      | <b><i>Task,<br/>Task structure</i></b>                         |
|                 | <b><i>Inference</i></b> | <b><i>Inference,<br/>Inference structure</i></b>               |
| Domain          | <b><i>Domain</i></b>    | <b><i>Concept, relation,<br/>expression,<br/>attribute</i></b> |

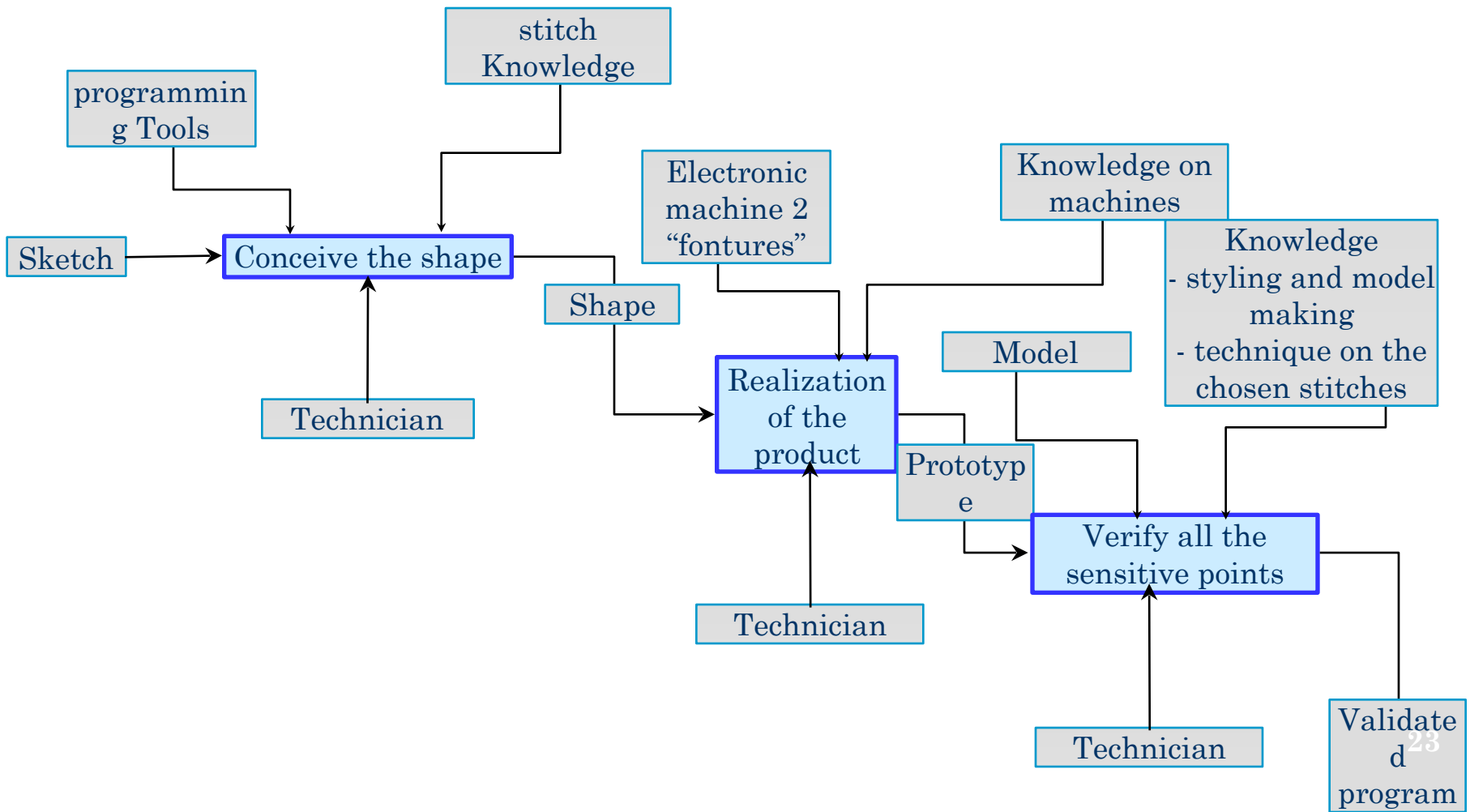
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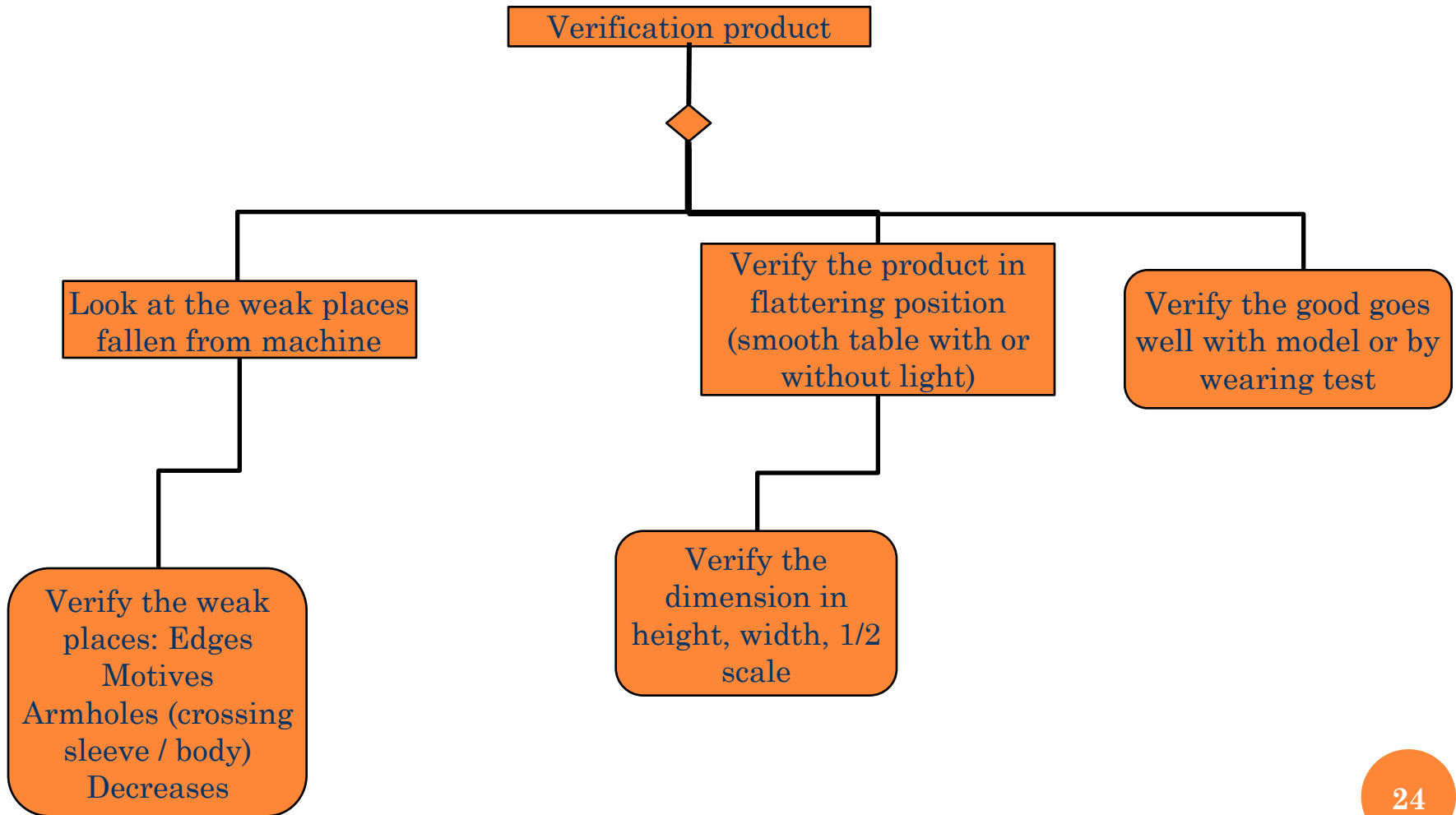
# The MASK Method



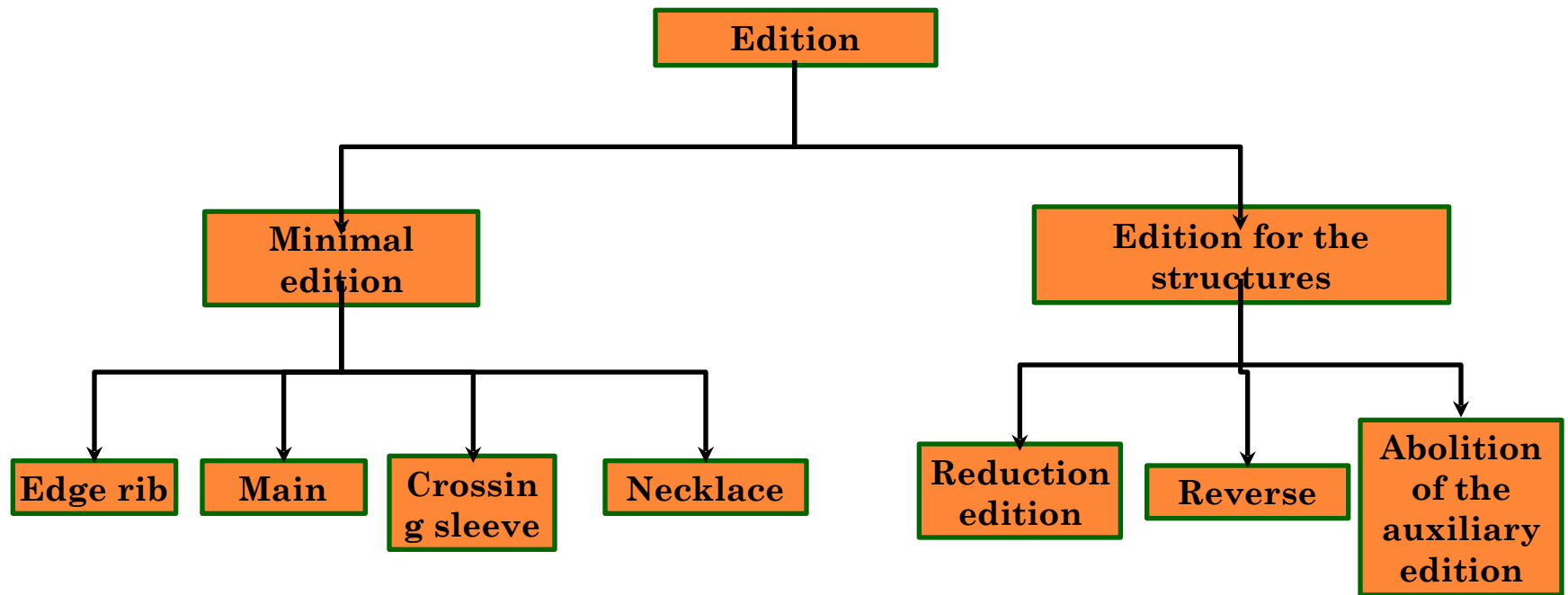
# PROCESS MODEL



# PB SOLVING MODEL



# CONCEPT MODEL



# REFERENCES

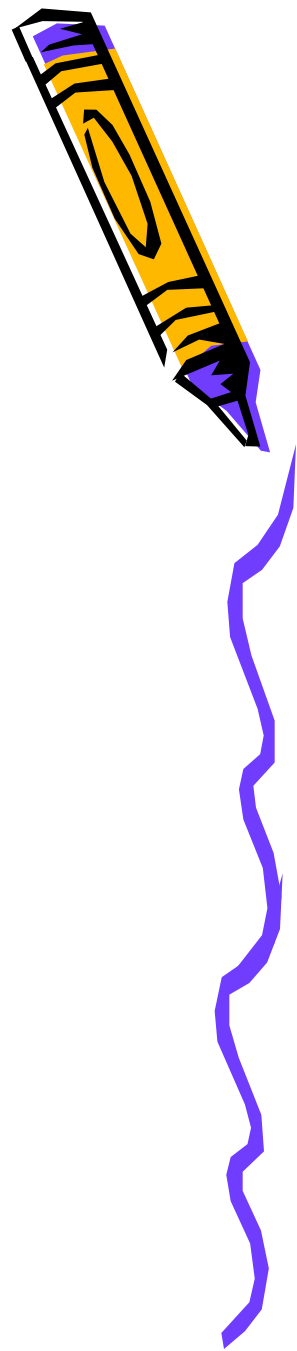
- Knowledge Acquisition as modelling, M. Ford, J.M. Bradshaw (Eds), 1993
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- [Nonaka et al, 95] Nonaka I., Takeuchi H.: *The knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press, 1995
- Ermine J.L. – *Les systèmes de connaissances*, Eds. Hermès 1996 (2nd Edition 2000)
- Méthodes et Outils pour la gestion des connaissances, R. Dieng, O. Corby, A. Giboin, J. Golebiowska, N. Matta, M. Ribière, Dunod, 2000
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- CASTILLO, O., et MATTA, N. A knowledge acquisition system for the French Textile and Apparel. Knowledge-Based Intelligent Information and Engineering Systems: 9th International Conference, KES 2005, 14-16 September 2005, Melbourne. 6 p.
- CASTILLO, O., et MATTA, N. An operational learning system definition. 19th International Joint Conference on Artificial Intelligence IJCAI 2005 – Workshop on knowledge Management and Organizational Memories, 1-5 August 2005, Edimbourg. 12 p.
- Polanyi M. (1958), *Personal knowledge*, Chicago : University of Chicago Press, 1958.

# Ontology and semantic web



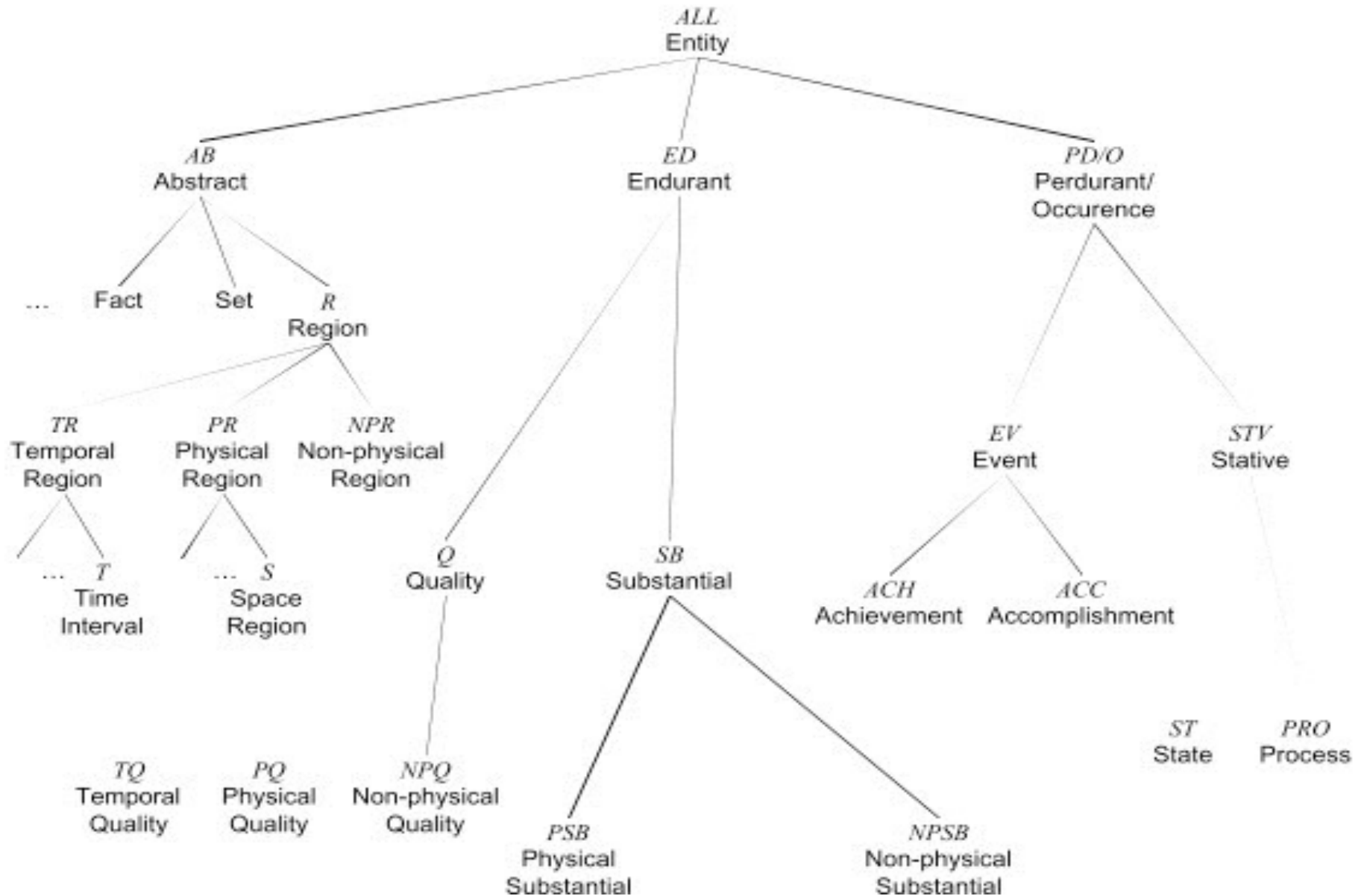
- Ontology as "Onto": Being, "logia": discourse, reasoning
- Ontology in philosophy : being study, his properties and modalities (Aristotle, Cohen, Meyer)

# Several levels of Ontology (Guarino)



- Ontology as *Guides* to model domain:
- top level, Domain level and Application level

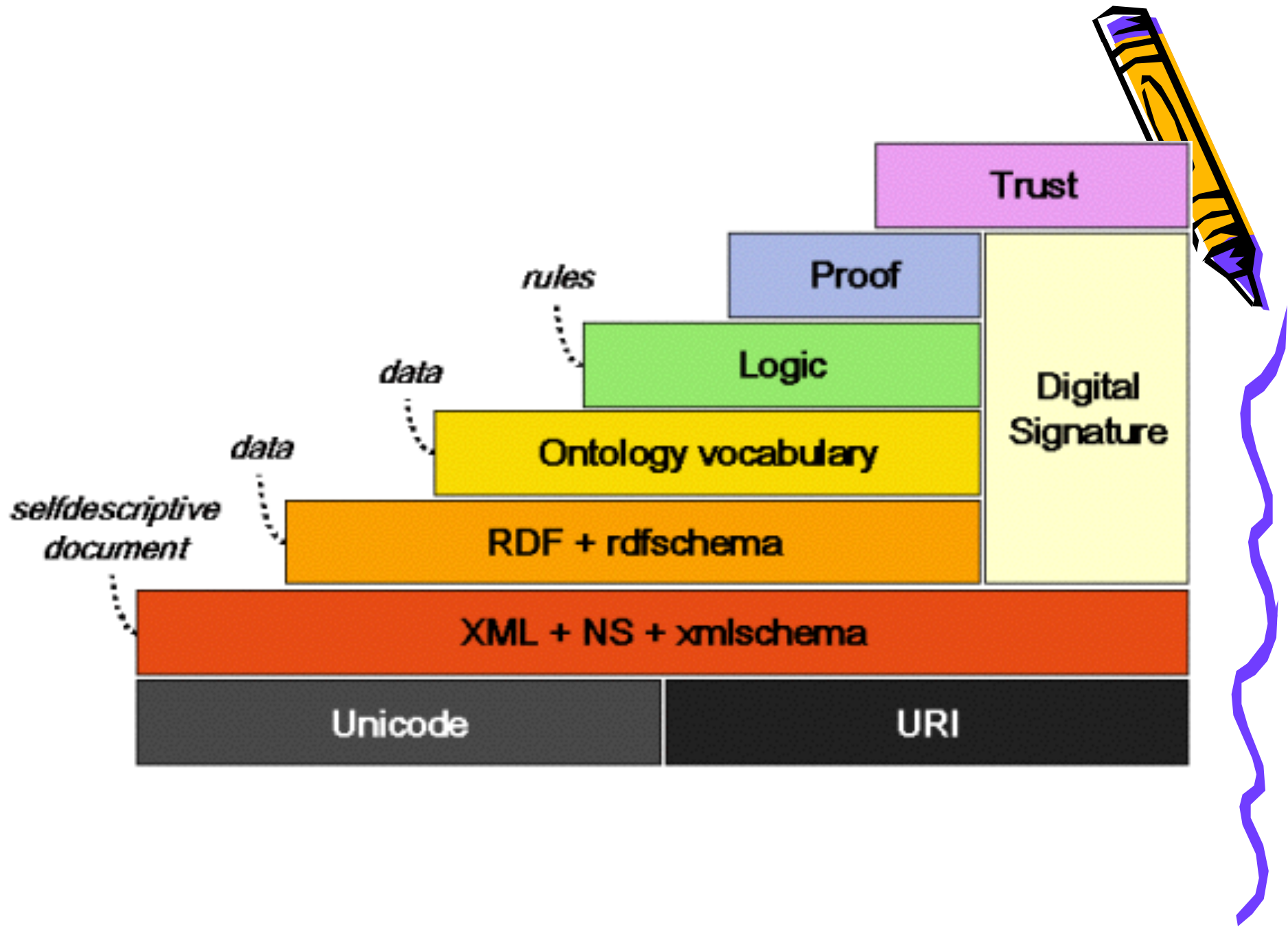
# Top level (Guarino)



# Semantic Web [Berners-Lee]

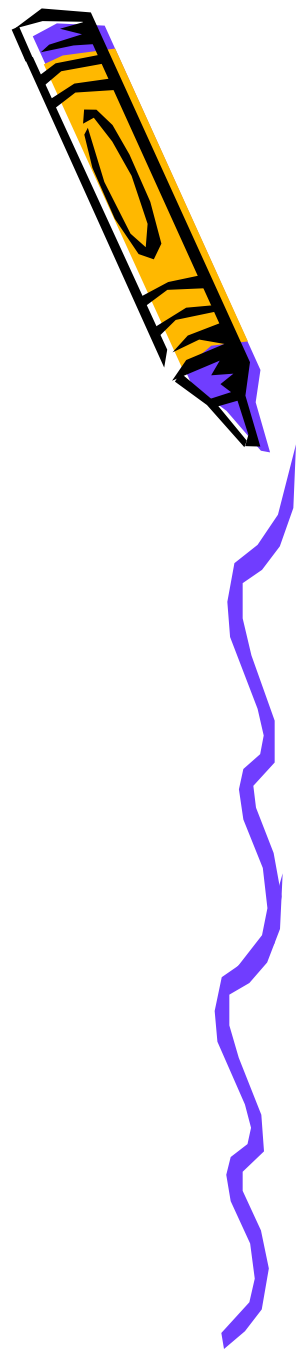
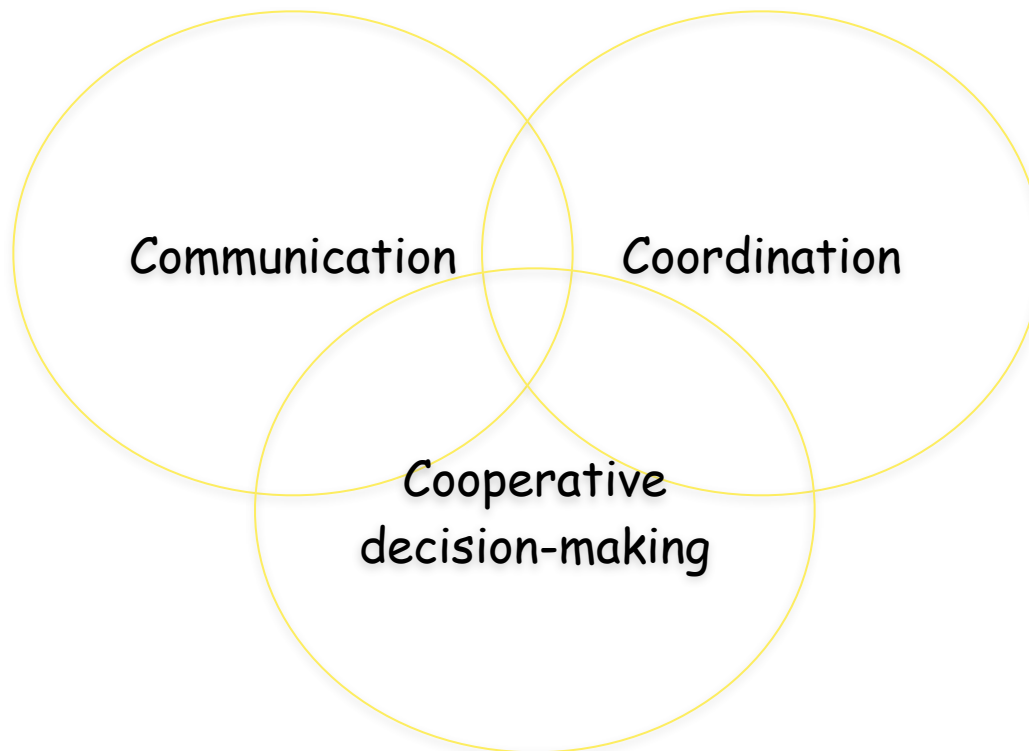


- The **Semantic Web** is an evolving extension of the World Wide Web in which the semantics of information and services on the web is defined, making it possible for the web to understand and satisfy the requests of people and machines to use the web content.

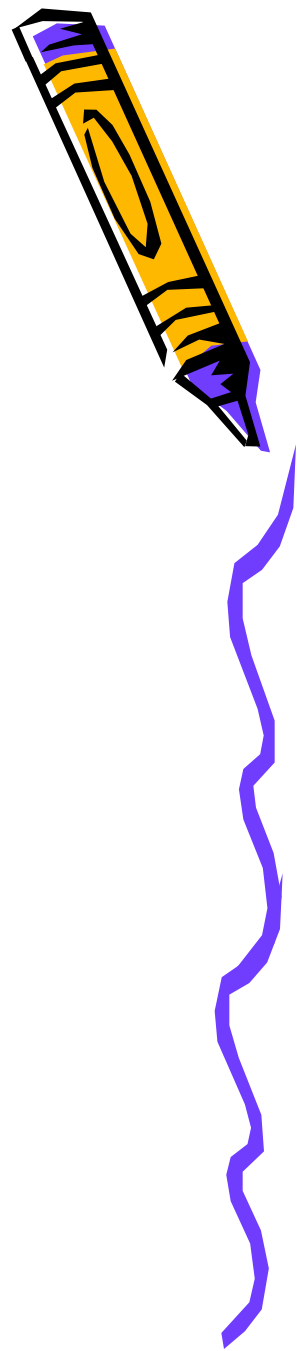


# Cooperative activity

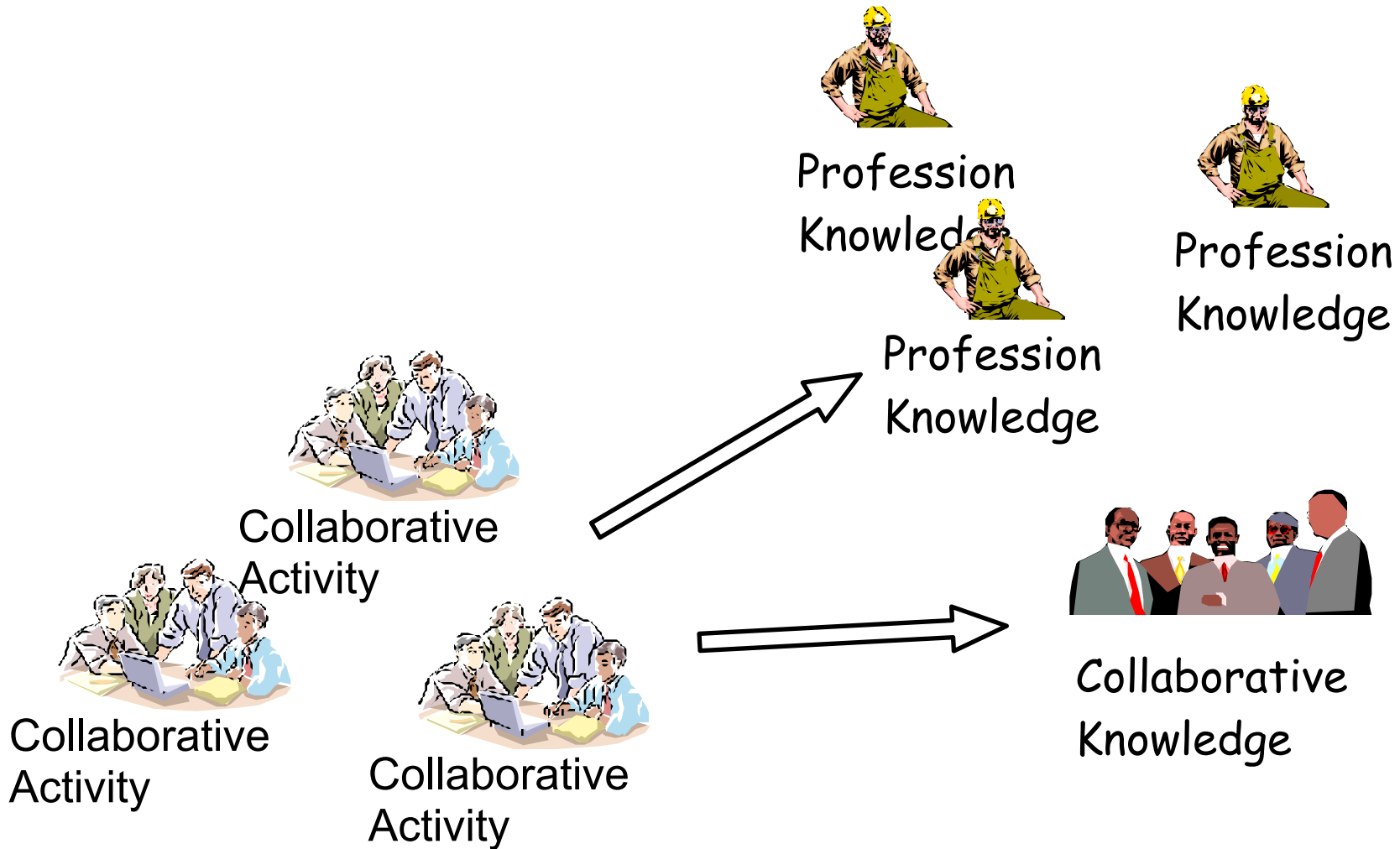
*A cooperative (collaborative) activity is an activity handling concurrently by a group of actors having the same goal (Schmidt et al)*

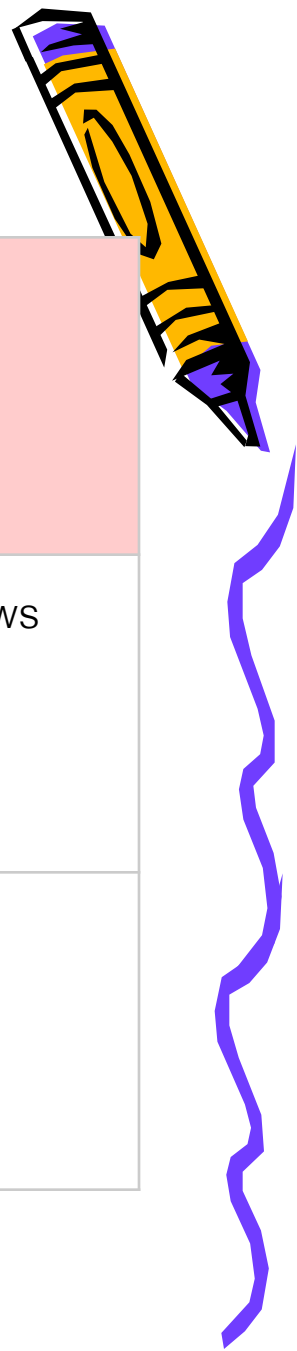


Knowledge from  
cooperative activity



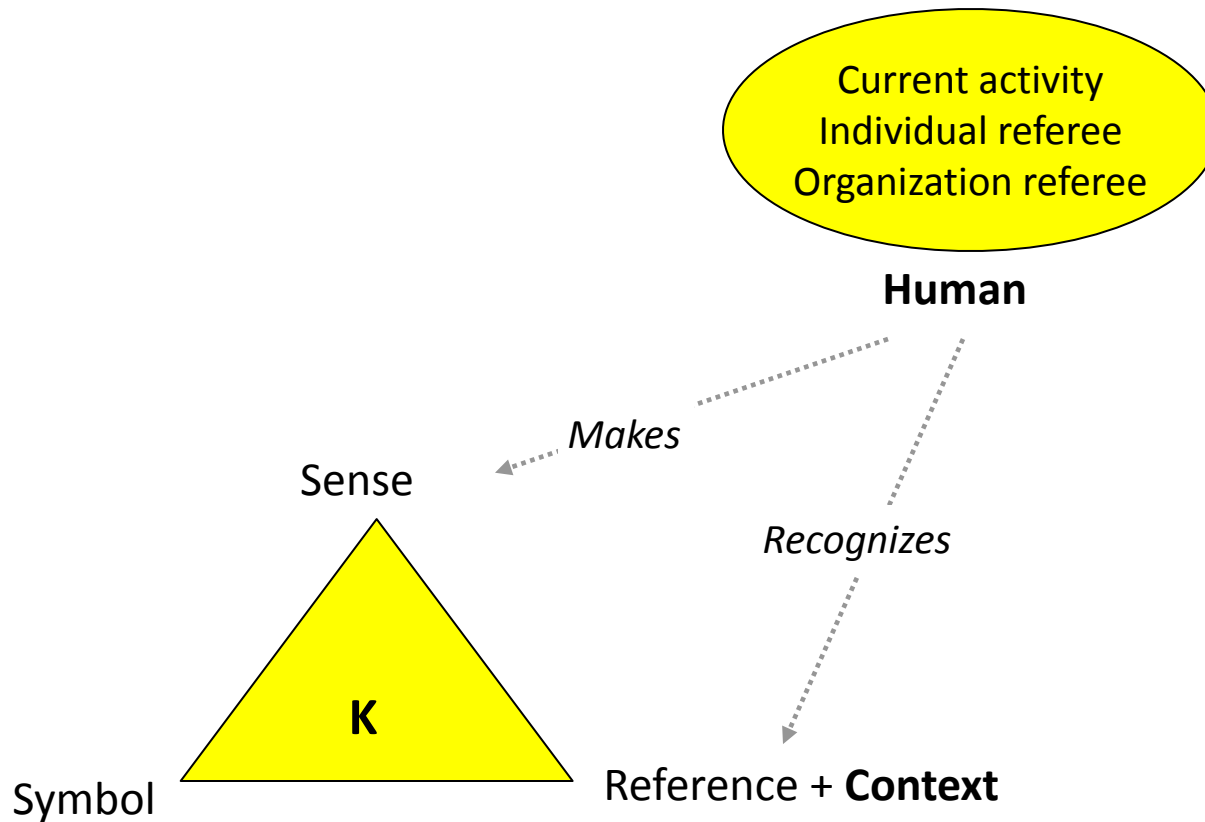
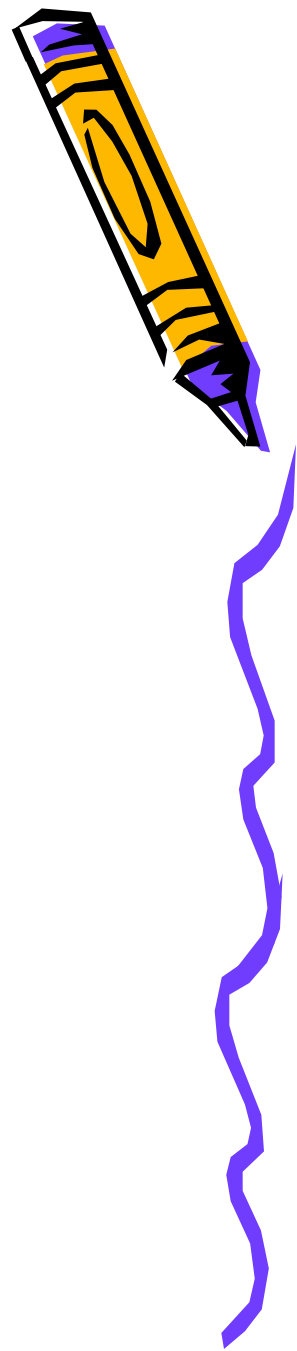
# Knowledge from collaborative activity



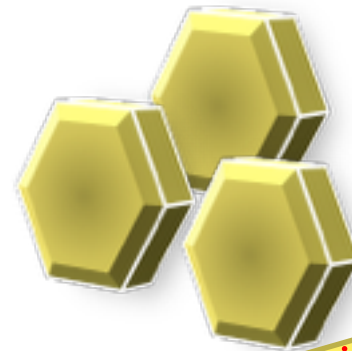
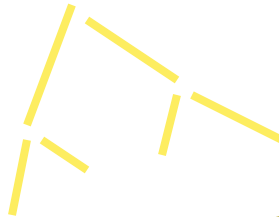


| Knowledge     | Nature                                                                           | Dimensions                                                                                                                                                                     | Capturing                                                                                                                                    |
|---------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Individual    | <ul style="list-style-type: none"><li>• Semantic</li><li>• Exeperience</li></ul> | <ul style="list-style-type: none"><li>• One domain</li><li>• Tasks, concepts, strategies</li></ul>                                                                             | <ul style="list-style-type: none"><li>• Expert Interviews</li><li>• Textmining</li><li>• DataMining</li><li>• Conceptual modelling</li></ul> |
| Collaborative | <ul style="list-style-type: none"><li>• Episodic</li><li>• Experiments</li></ul> | <ul style="list-style-type: none"><li>• Multi-domans</li><li>• process, roles, skills,</li><li>• Arguments, collaborative decision</li><li>• Directives, constraints</li></ul> | <ul style="list-style-type: none"><li>• Traceability</li><li>• Classification, agregation</li></ul>                                          |

# Challenge



# Traceability and capitalization of knowledge



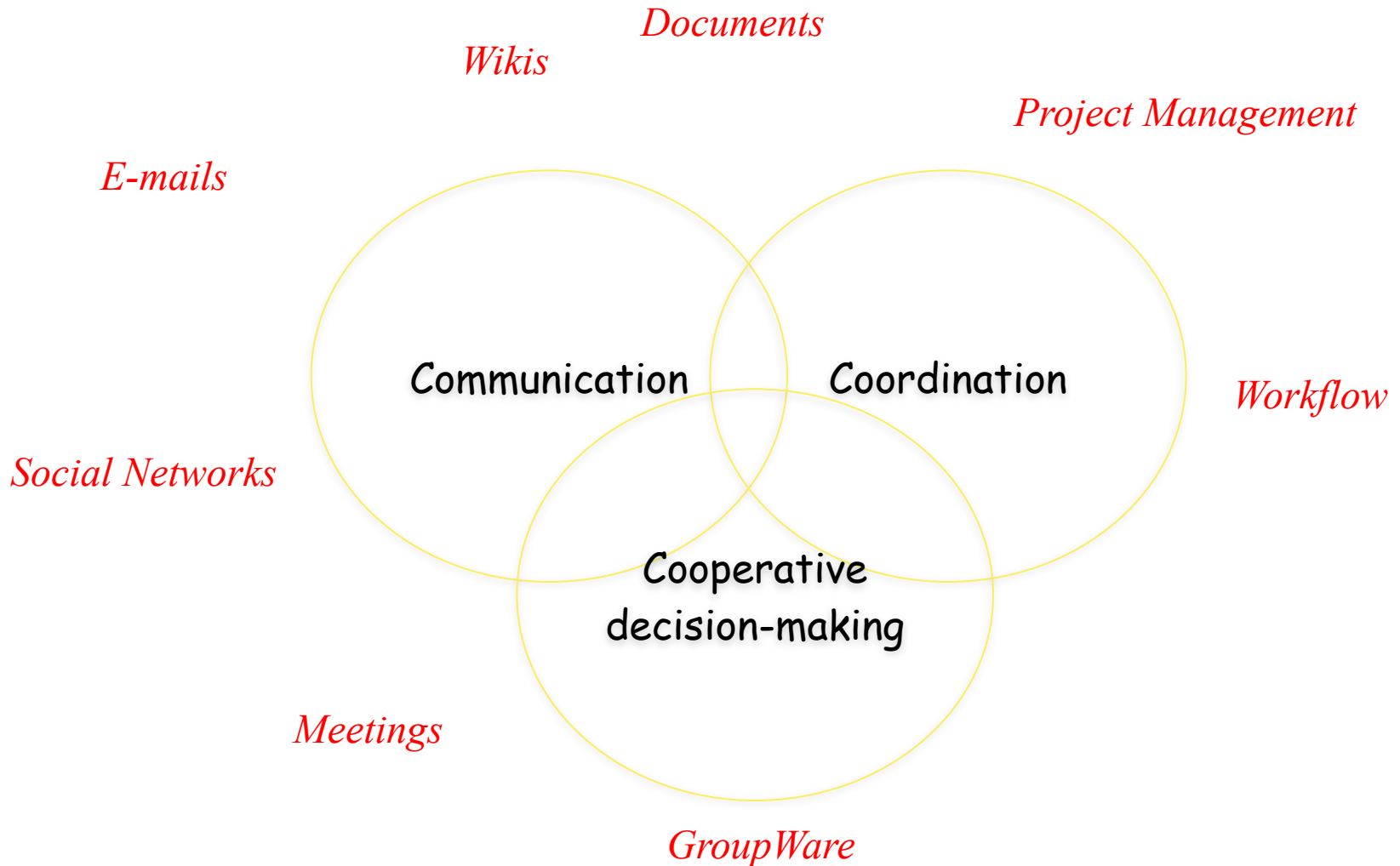
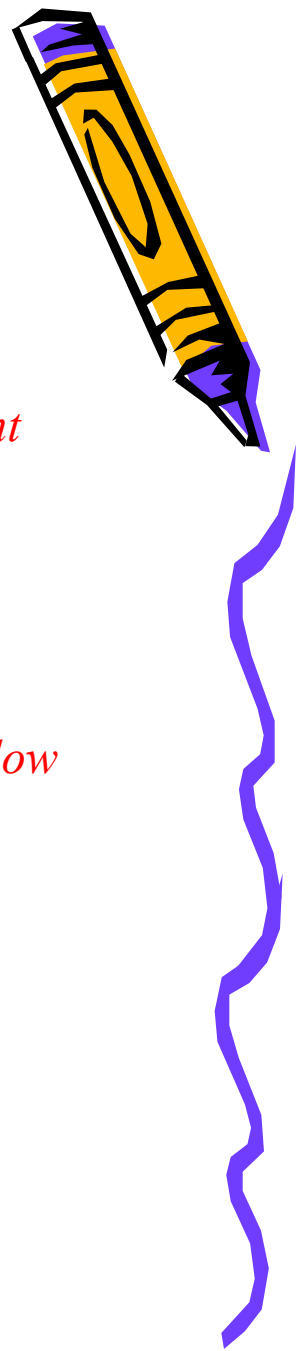
Keeping  
Track

Characterising  
concepts

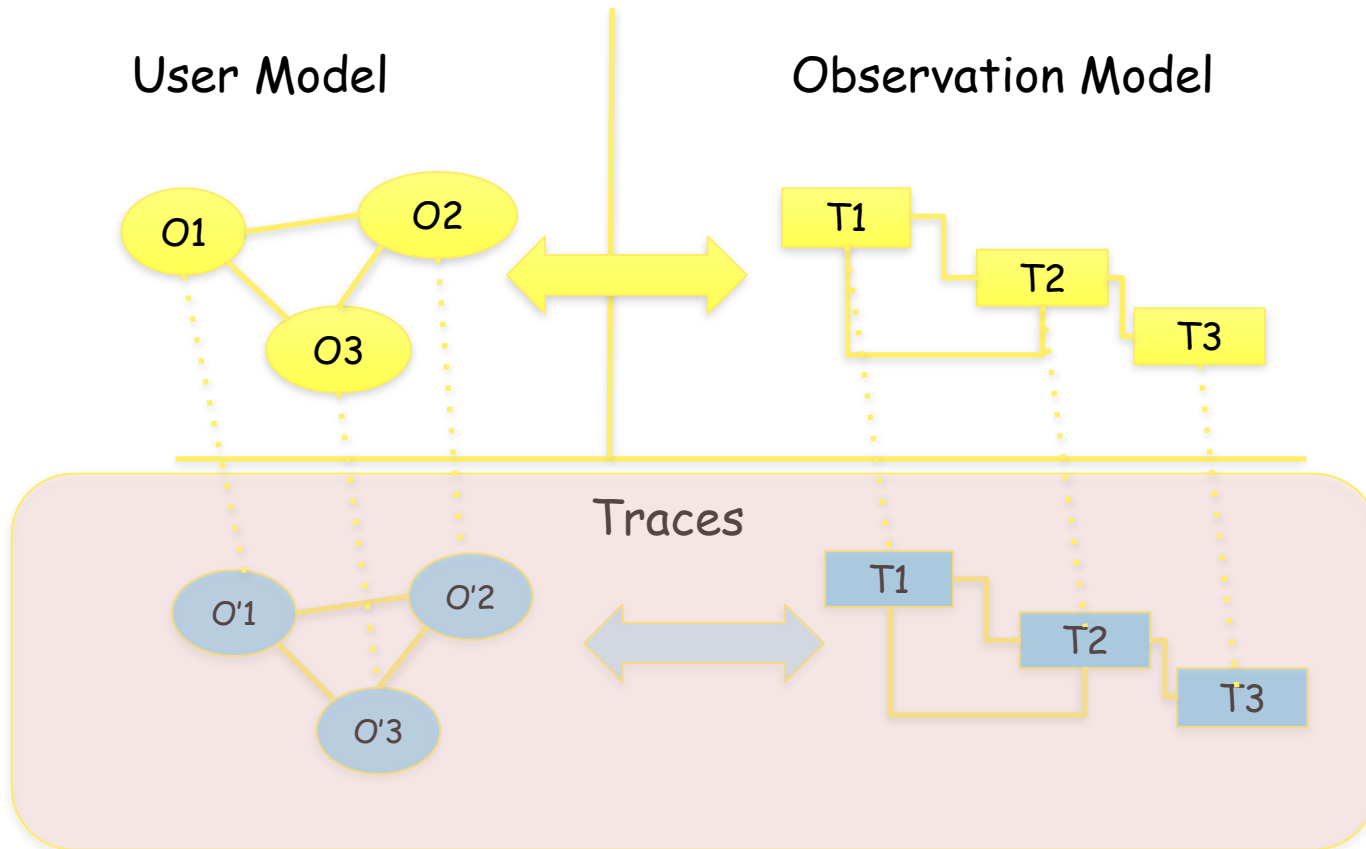
Aggregation and  
typing strategies



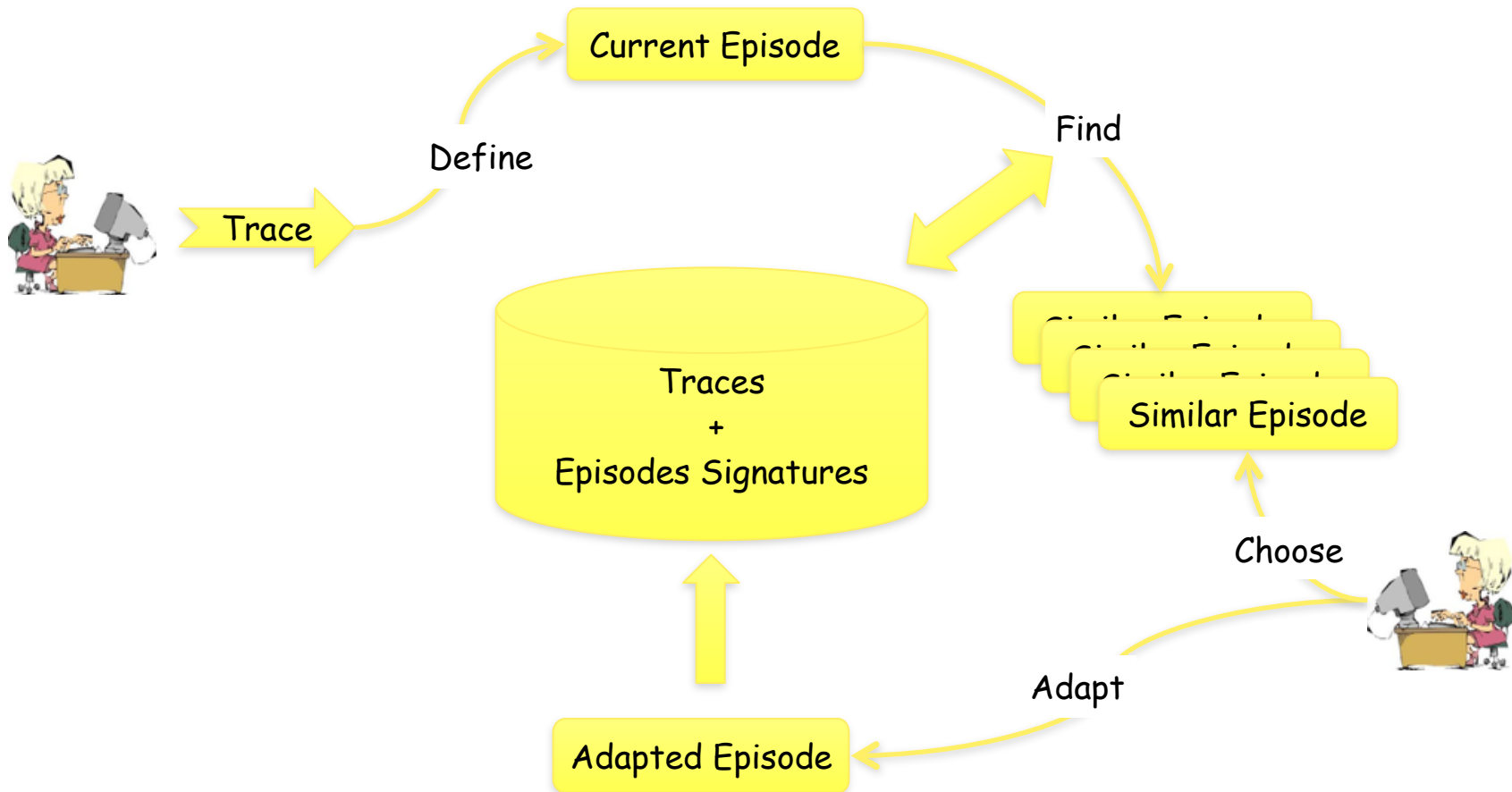
# Traceability



# Profiling



# Profiling: TREFLE System (Mille)

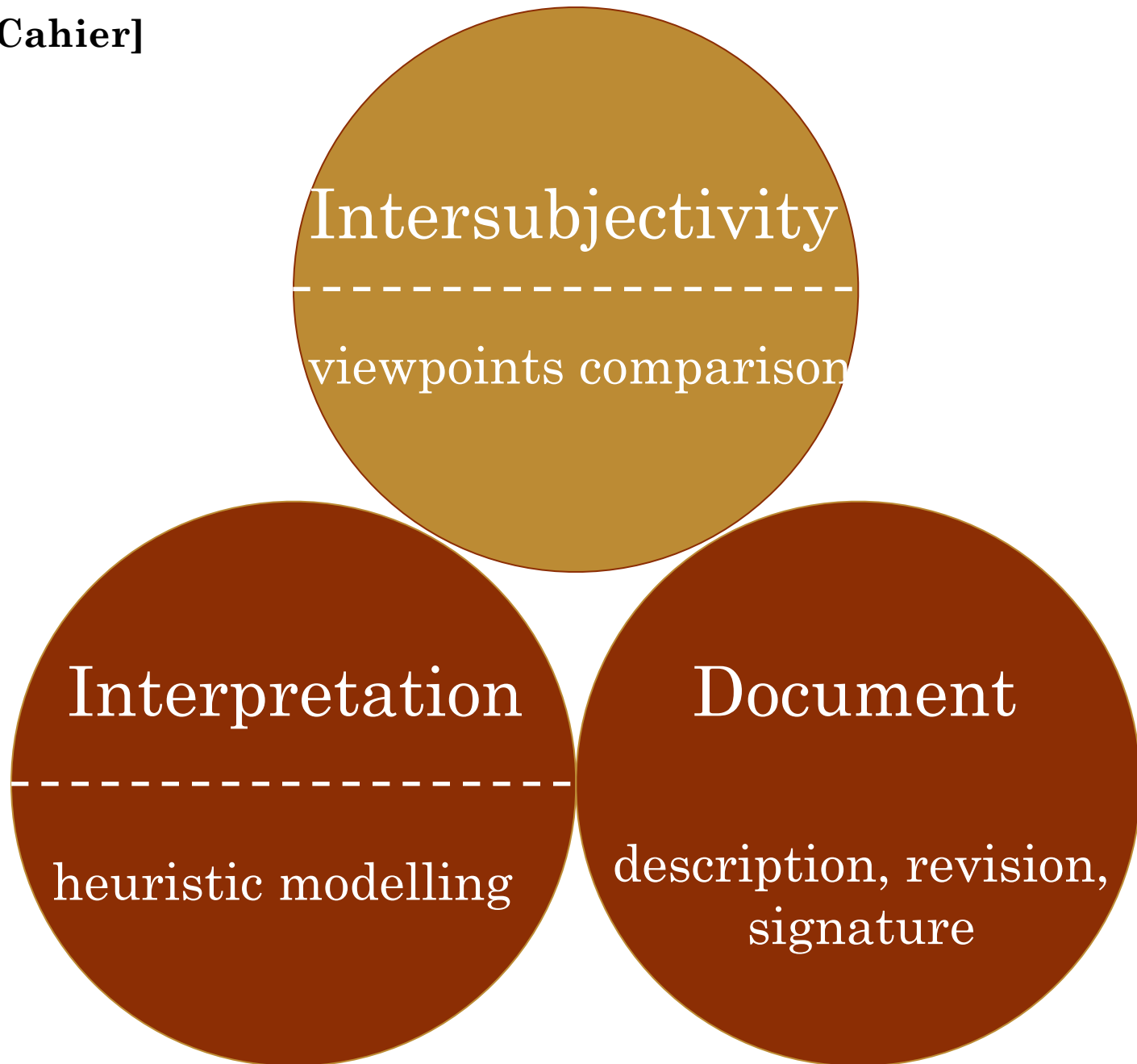


# SOCIO-SEMANTICWEB PRINCIPLES

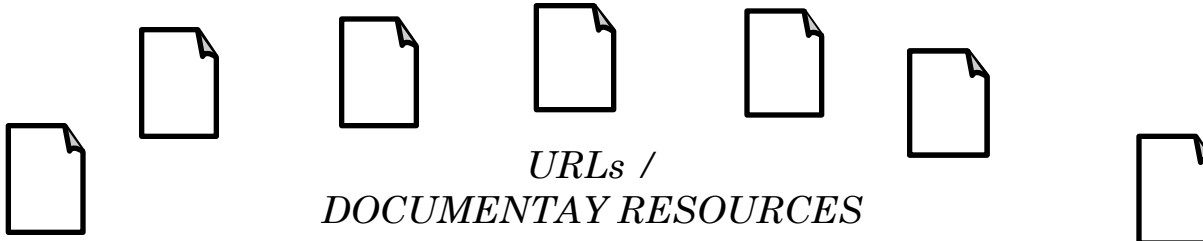
[ZACKLAD, CAHIER]

- *To co-build maps by users themselves*
- *Let the community imagine its own architecture of cooperation and its socio-semantic activity*

*Use CSCW and social approaches to handle Socio-SemanticWeb*

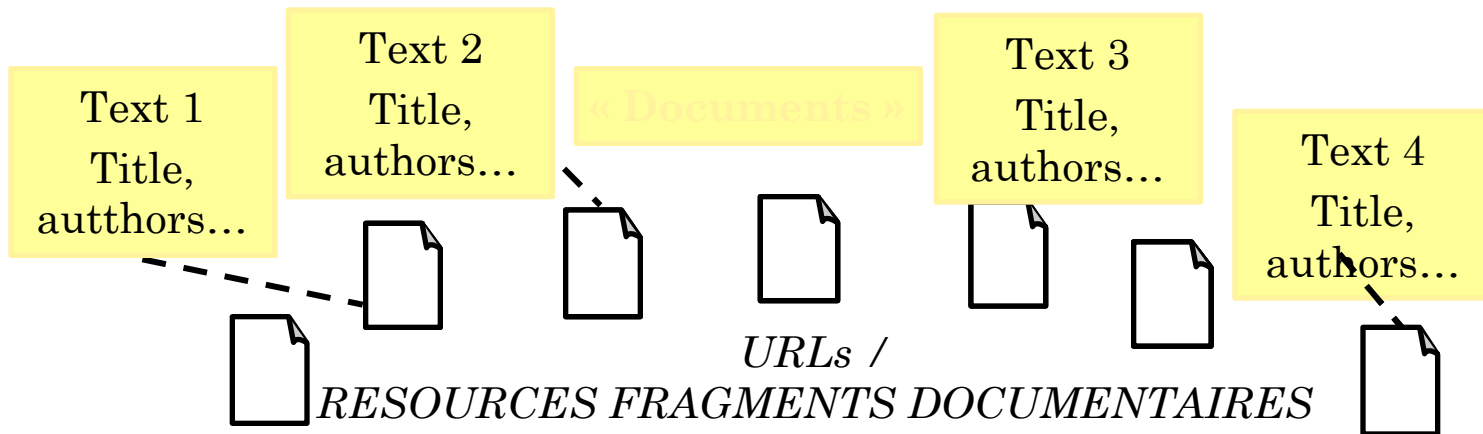


Adhikari, T. B., R. C. Basnyat, et al. 1999.  
"Virulence of Xanthomonas oryzae pv.  
oryzae on rice lines containing single  
resistance genes and gene combinations."  
Plant disease 83(1): 46-50.

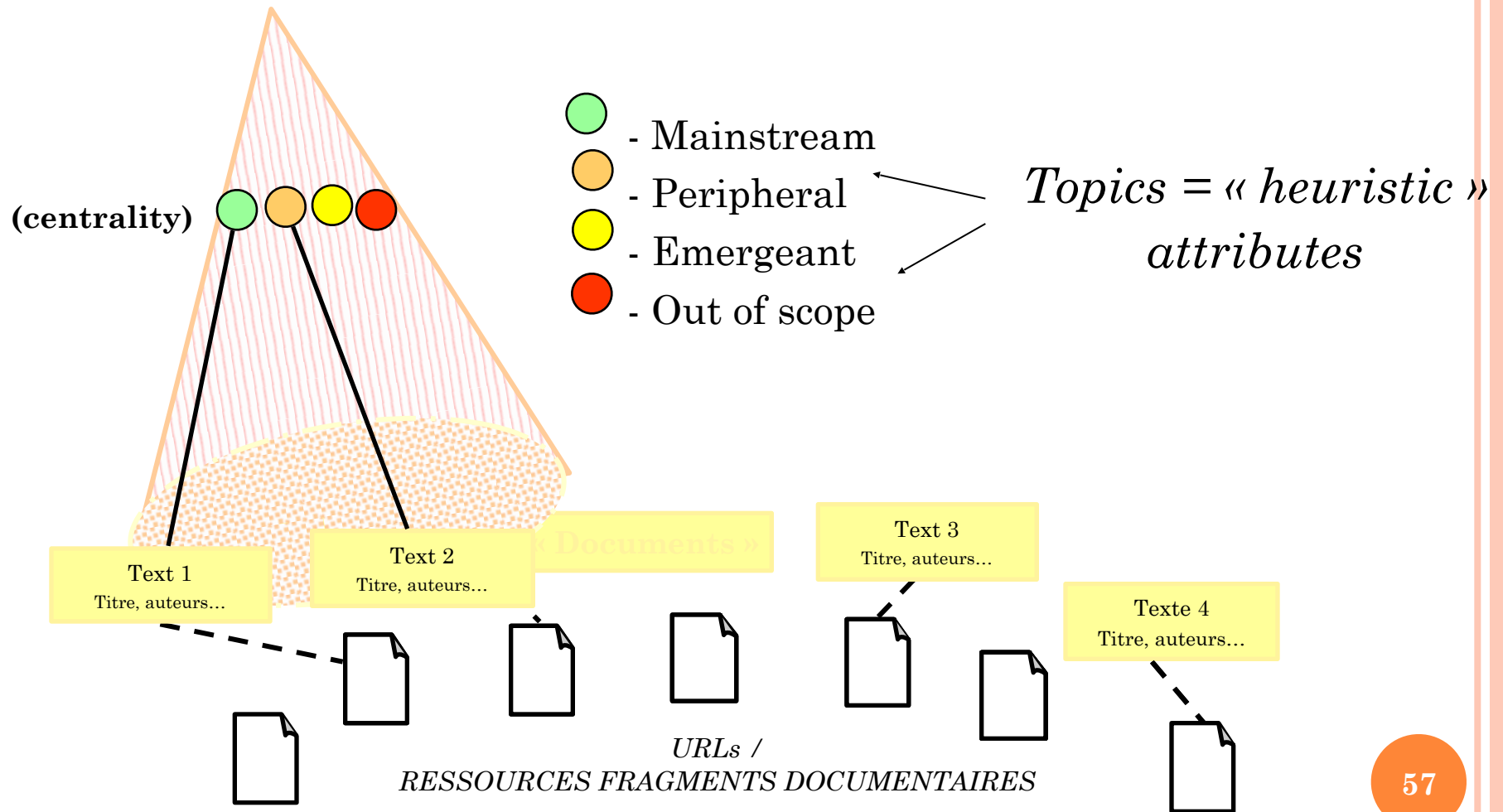


## *2) AGREEMENT IN THE GROUP ON DOCUMENTS CONSIDERED*

- NAMING OF EACH CONSIDERED DOCUMENT*
- STANDARD ATTRIBUTES (AUTHOR...)*

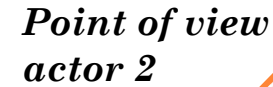


### 3) ***BUT*** POSSIBLE CONFLICTS WITHIN THE GROUP ON THE « CENTRALITY » OF THESE CONSIDERED DOCUMENTS

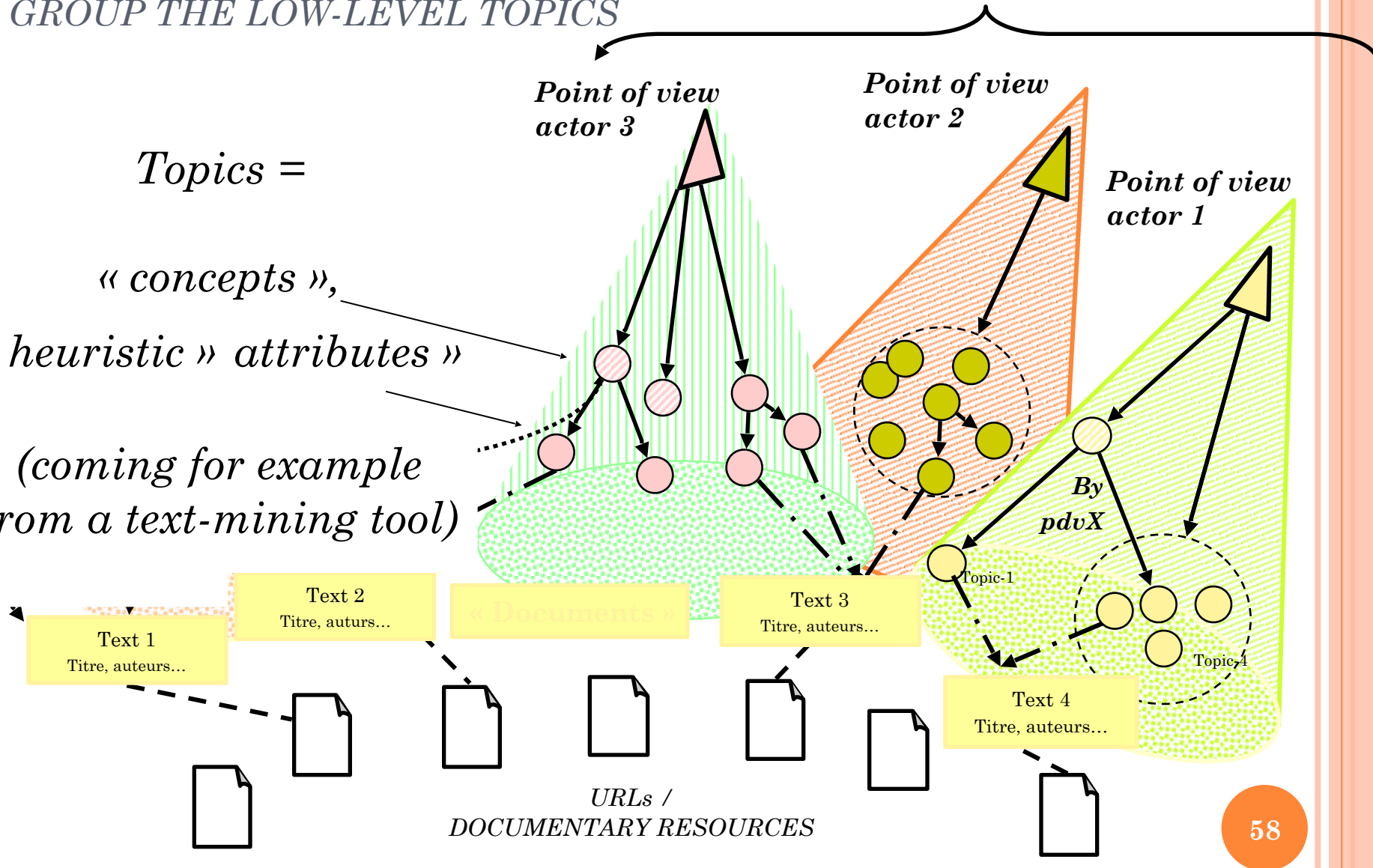


$$Topics =$$
« *heuristic* » attributes »

(coming for example  
from a text-mining tool)

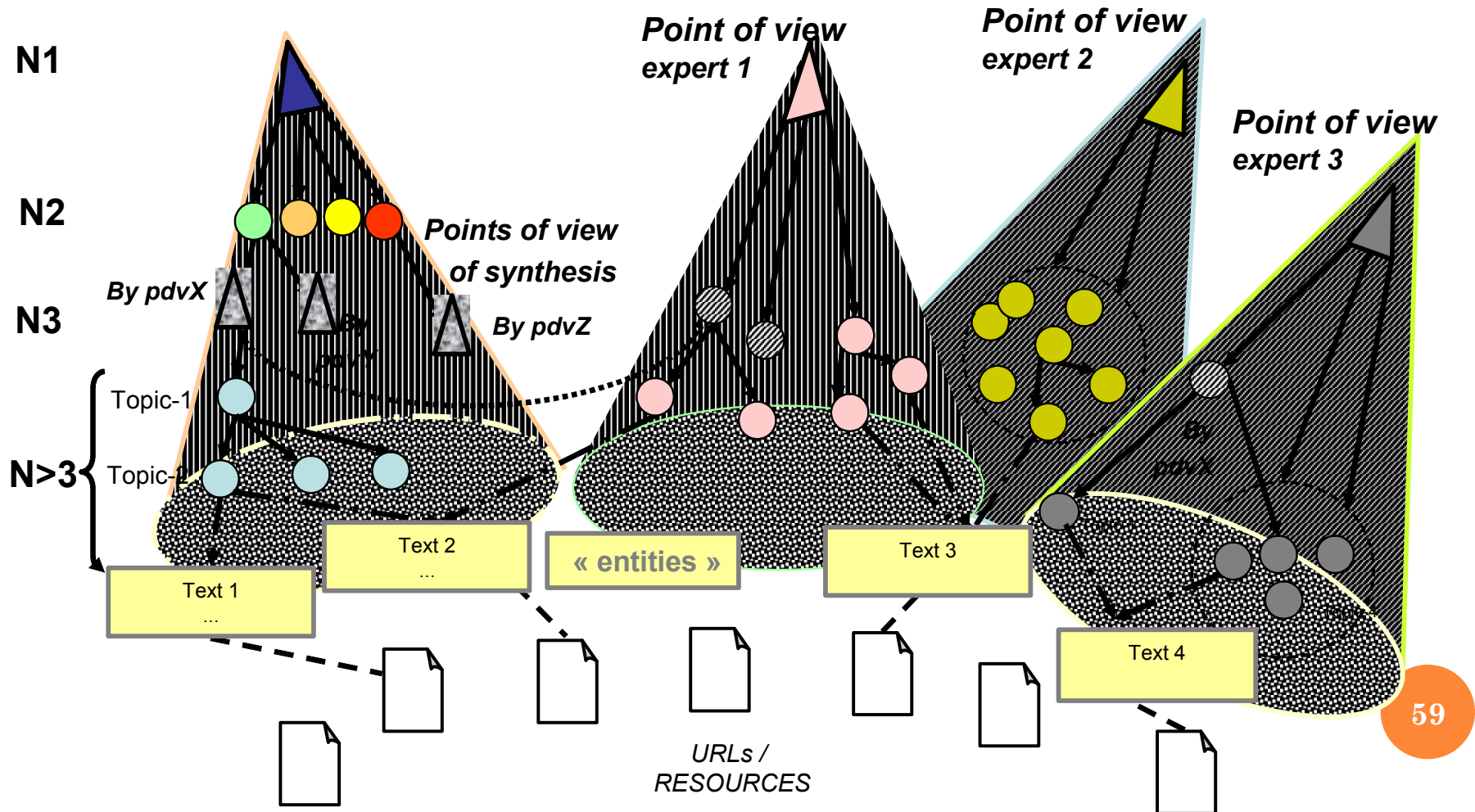


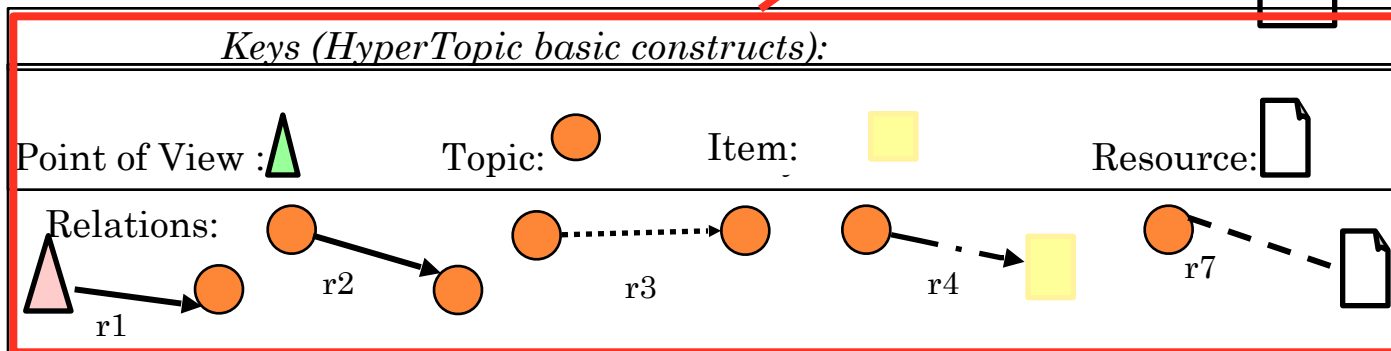
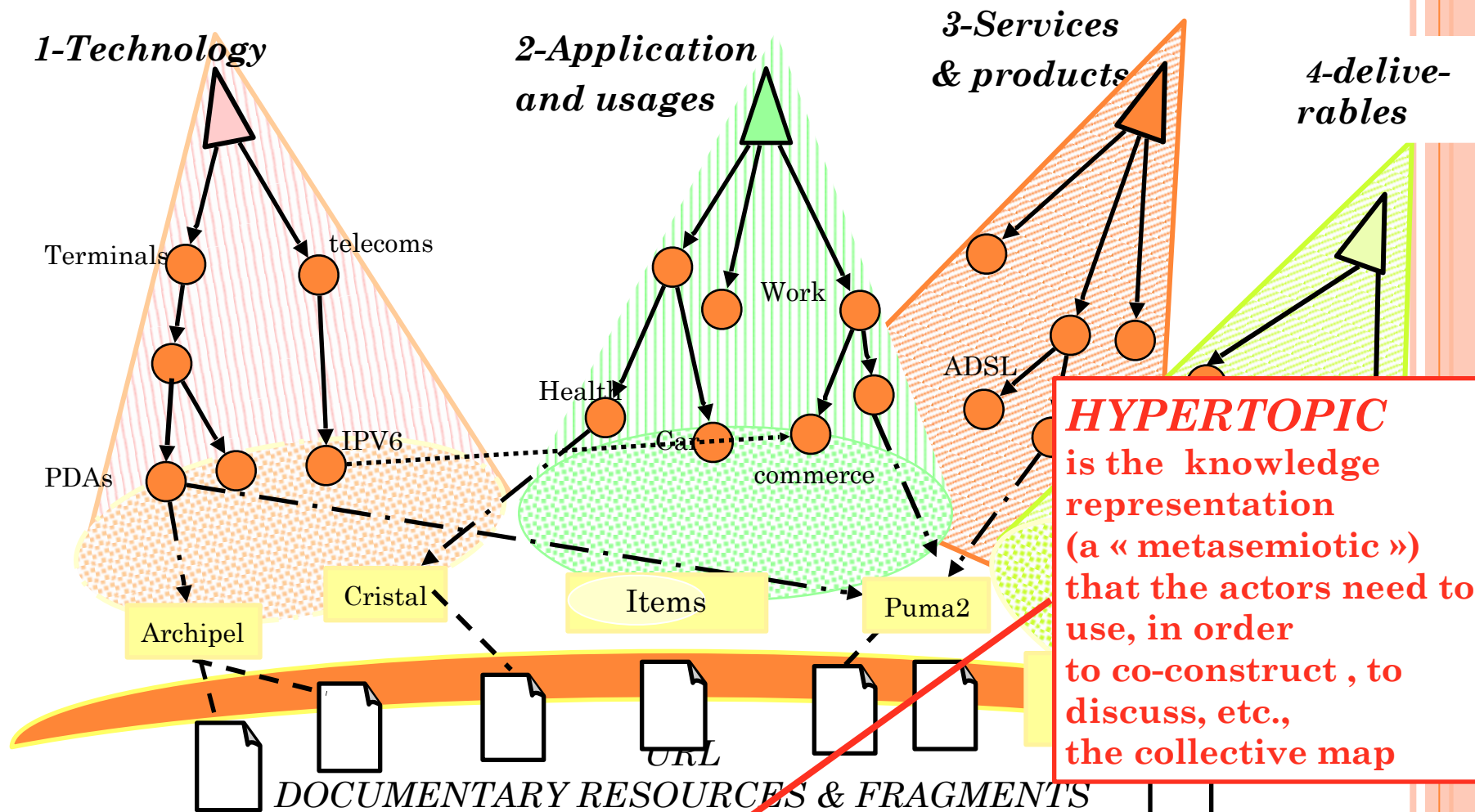
*Point of view*  
*actor 1*



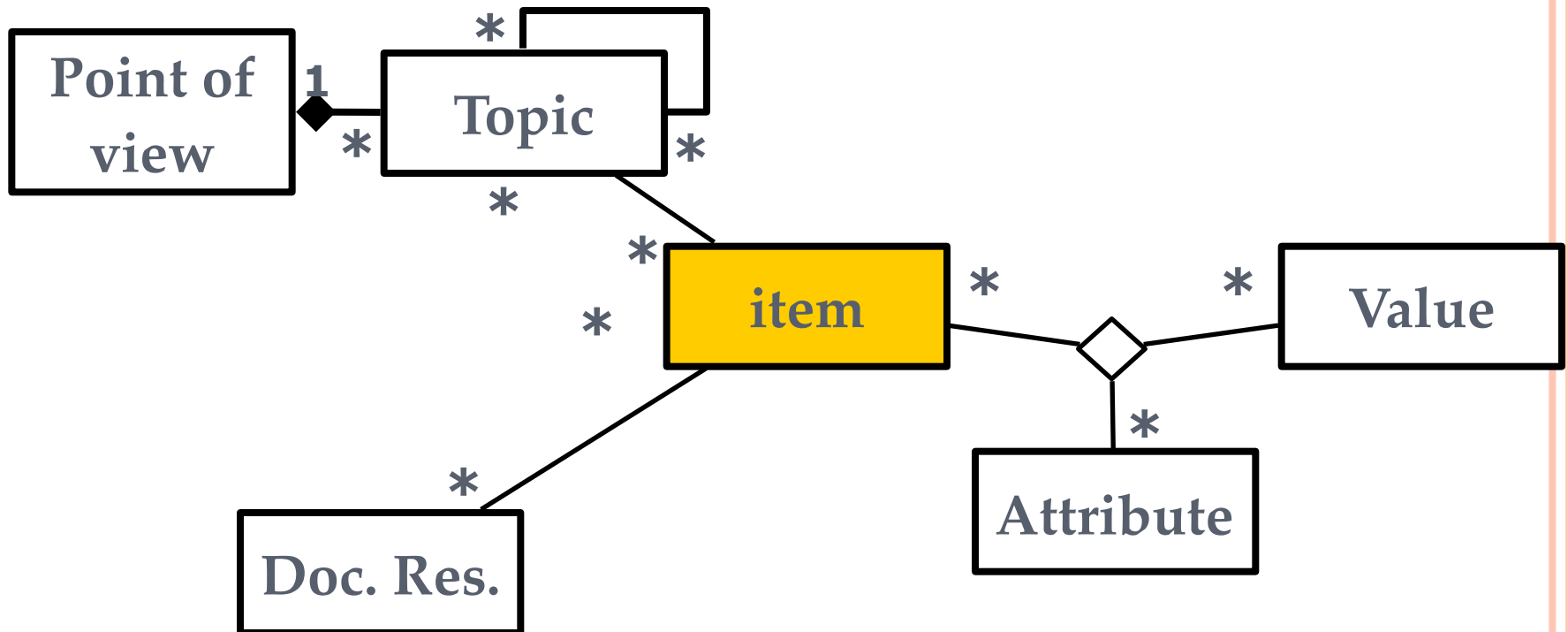
# Synthesis Map $\leftrightarrow$

# Design Points of view





# Hypertopic model (UML representation)



- Hypertopic is focused exclusively on *a very few* basic constructs (inspired by the Topis Map)
- It Gives to many end-users the ability to edit the map (items, topics) without any particular training
- It makes easier to deploy the co-building within large communities

# HYPERTOPIC

**Point of View:** concurrent characterisations of the item

2

**Item:** identifier of the situation /  
of the artefact object of the inquiry

1

# HYPERTOPIC

**Point of View:** concurrent characterisations of the item

2

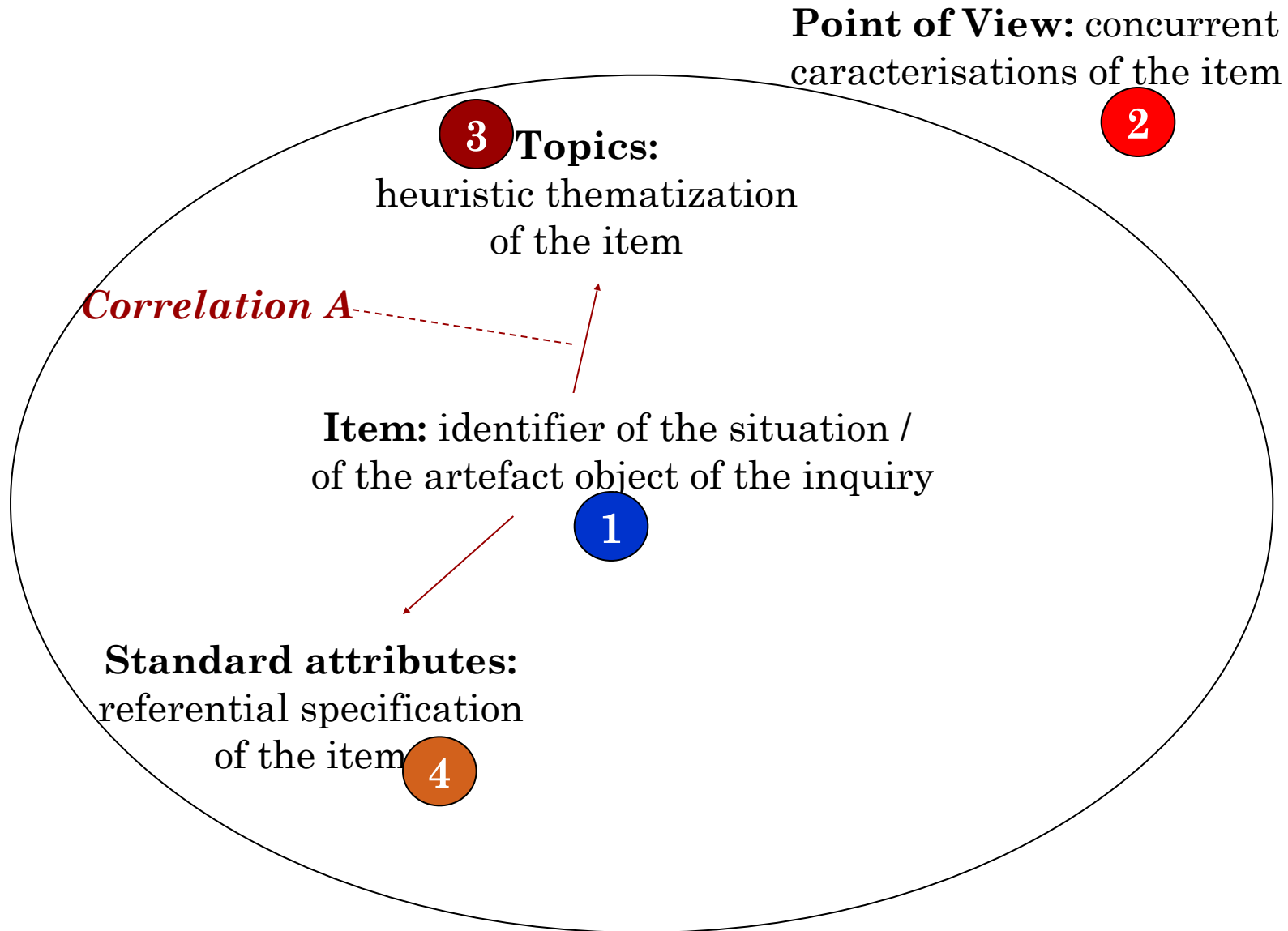
3

**Topics:**  
heuristic thematization  
of the item

**Item:** identifier of the situation /  
of the artefact object of the inquiry

1

# HYPERTOPIC



# HYPERTOPIC

**Point of View:** concurrent characterisations of the item

**3 Topics:**  
heuristic thematization  
of the item

**2**

*Correlation A*

**Item:** identifier of the situation /  
of the artefact object of the inquiry

**1**

*Correlation C*

**Standard attributes:**  
referential specification  
of the item

**4**

**Resources:**  
Documentation of the item

**5**

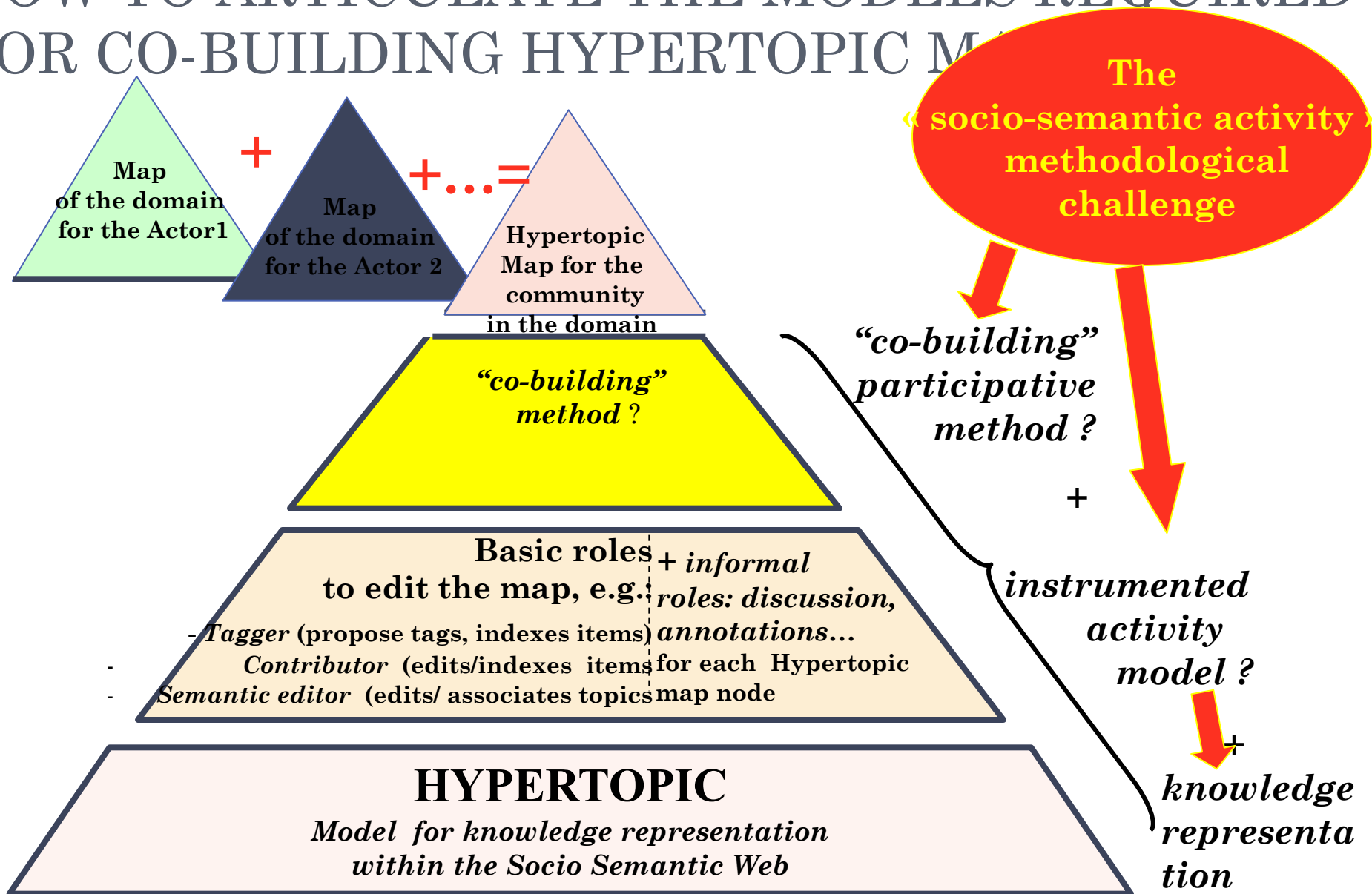
*Correlation B*

# HOW TO COLLECTIVELY CONSTRUCT AND MAINTAIN AN HYPERTOPIC MAP

*It is useful to distinguish:*

- - a « bootstrapping » phase
  - to define the item, to define the first set of « points of view »
  - based (eventually) on folksonomies or on the confrontation of actors' personal « design maps »
  - leading (eventually) to a « synthesis map » usable by the group
- - a phase of maintenance / evolution of the map

# HOW TO ARTICULATE THE MODELS REQUIRED FOR CO-BUILDING HYPERTOPIC MAPS



# AGORÆ EXAMPLE: « E-CATALOG » OF PROJECTS AND INITIATIVES IN THE FIELD OF SUSTAINABLE DEVELOPMENT

http://tech-web-n2.utt.fr/dd/?mod=navigation&resource=http://tech-ada.utt.fr/dd/viewpoint/13/

Démarrage Dernières nouvelles (...) Seeme jpc Tech-CICO CogDoc Arpenteurs Movable ICD DKN CCI cartodd

## CartoDD

Agoræ développement durable

### Espace personnel

Login :

Mot de passe :

### Historique

### Navigation

### Items

### Rechercher

### Effets du projet

- Effets environnementaux
- Effets symboliques
- Effets Sociaux
- Effets économiques
- Contre-effets

### Projets à voir

Sibylline Ile aux Oiseaux Tigres en Inde  
Mangrove Ouest Cansino Campus responsables  
Cartosolid Clem Ally Eoliennes  
EauSecours La brique verte Blouses roses La brique  
verte Biomasse La Brique Verte  
Lait-AlimenTerre Lozere-pilote

### Choix de thèmes

Champagne-Ardenne

- Effets Sociaux
- Effets symboliques
- France
  - animaux marins
  - culture et éducation
  - déforestation
  - eau
  - emploi vert
  - eoliennes
  - oiseaux
  - oiseaux de mer
- recyclage
- regions pauvres
- réduction ou optimisation de consommation d'énergie
- sécurité alimentaire
- tigres
- équipements déployés sur le terrain

space personnel

Login :

Mot de

passé :

se connecter

Historique

Navigation

Items

Effets du projet

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Rechercher

Chercher

Projets à voir

Sibylline Ile aux Oiseaux Tigres en Inde  
Mangrove Ouest Cansino Campus responsables  
Cartosolid Clem Ally Eoliennes  
EauSecours La brique verte Blouses roses La brique

La brique verte



Effets symboliques • Effets Sociaux •

Fiche descriptive

- Description : Réaoupération intelligente des jeux Lego inutilisés
- Lancement : 2007
- Localisation : Troyes

Ressource(s) documentaire(s)

- Revue de presse
- Site Web

Rechercher

Chercher

Nuage de thèmes

Effets Sociaux • Effets symboliques

Thèmes

campagne-Ardenes

ts Sociaux

Effets

oliques • France

x marins • culture et

• déforestation • eau

t • eoliennes • oiseaux

oiseaux de mer

yclage • regions

es • réduction ou

ion de consommation

• securite alimentaire

équipements déployés

ur le terrain •

# CartoDD

Agoræ développement durable

## Espace personnel

Login :

Mot de

passee :

se connecter

## Historique

## Navigation

## Items

### Effets du projet

- Effets environnementaux
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- Effets économiques
- Contre-effets

### Projets à voir

Sibylline Ile aux Oiseaux Tigres en Inde  
Mangrove Ouest Cansino Campus responsables  
Cartosolid Clem Ally Eoliennes  
EauSecours La brique verte Blouses roses La brique  
verte Biomass La Brique Verte  
Lait-AlimenTerre Lozere-pilote

## Rechercher

Chercher

## Usage de thèmes

Champagne-Ardenne

• Effets Sociaux

• Effets

symboliques • Fran

- animaux marins • culture et
- éducation • déforestation • ea
- emploi vert • eoliennes • oisea
- oiseaux de mer

• recyclage • region

- pauvres • réduction ou
- optimisation de consommation
- d'énergie • securite alimentaire
- tigres • équipements déployé
- sur le terrain •

# CartoDD

Agora développement durable

## Espace personnel

Bienvenue cahier

Ajouter  
utilisateur  
se  
déconnecter

## Historique

Effets du projet >

## Personnel

## Navigation

## Items

### Effets environnementaux

- ◆ Biodiversité
- ◆ déforestation
- ◆ réduction ou optimisation de consommation
- ◆ recyclage
- ◆ dépollution
- ◆ énergies renouvelables
- ◆ eau

### Projet(s) Pertinent(s)

### Projets à

Sibylline Ile aux Oiseaux  
Mangrove Ouest Camargue  
Campus responsables  
Cartosolid Clem Ally Eoliennes  
EauSecours

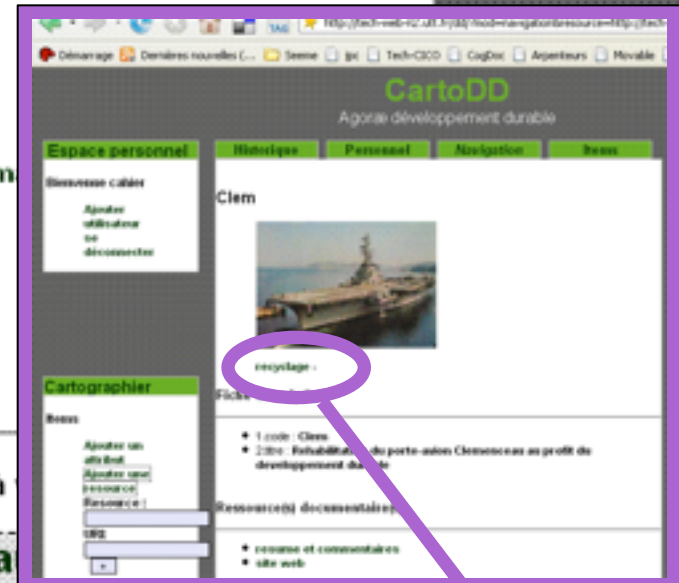
## Cartographeur

### Thèmes

Ajouter un  
thème  
Suppr.  
courant  
Copier  
courant  
Couper  
courant

### Items

Ajouter un  
item



Champagne-Ardenne • France  
• animaux marins • déforestation  
• eau • éoliennes • oiseaux  
• secours de mer

• recyclage • réduction  
ou optimisation de consommation  
d'énergie • tigres • équipements  
déployés sur le terrain •

# CartoDD

Agoræ développement durable

## Espace personnel

Bienvenue cahier

Ajouter  
utilisateur  
se  
déconnecter

## Historique

## Personnel

## Navigation

## Items

Effets du projet >

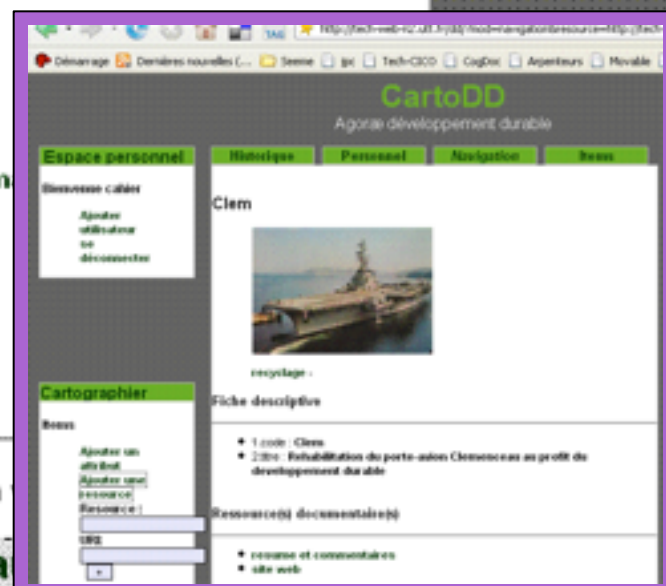
## Effets environnementaux

- ◆ Biodiversité
- ◆ déforestation
- ◆ réduction ou optimisation de consommation
- ◆ recyclage
- ◆ dépollution
- ◆ énergies renouvelables
- ◆ eau

Projet(s) Pertinent(s)

Projets à

Sibylline . Ile aux Oiseaux  
Mangrove Ouest Cansino . Campus responsables .  
Cartosolid . Clem . Ally Eoliennes .  
EauSecours .



Chercher

## Cartographeur

Thèmes

Ajouter un  
thème  
Suppr.  
courant  
Copier  
courant  
Couper  
courant

Items

Ajouter un  
item

Champagne-Ardenne • France  
• animaux marins • déforestation  
• eau • éoliennes • oiseaux  
• oiseaux de mer

• recyclage • réduction  
ou optimisation de consommation  
d'énergie • tigres • équipements  
déployés sur le terrain •

# Application

uses all Hypertopic concepts *points of view*,

Agoræ développement durable

**Espace personnel**

Bienvenue cahier

Ajouter utilisateur  
se  
déconnecter

**Historique** **Personnel** **Navigation** **Items**

Effets du projet >

**Effets environnementaux**

- ♦ Biodiversité
- ♦ déforestation
- ♦ réduction ou optimisation de consommation
- ♦ recyclage
- ♦ dépollution
- ♦ énergies renouvelables
- ♦ eau

**Projet(s) Pertinent(s)**

**Projets à**

**Sibylline** **Ile aux Oiseaux** **Mangrove Ouest** **Cansino** **Campus responsables** **Cartosolid** **Clem** **Ally Eoliennes** **EauSecours**

**Cartographeur**

Thèmes

Ajouter un thème  
Suppr. courant  
Copier courant  
Couper courant

**Items**

Ajouter un item

**CartoDD**  
Agoræ développement durable

**Espace personnel** **Historique** **Personnel** **Navigation** **Items**

Bienvenue cahier

Ajouter utilisateur  
se  
déconnecter

**Cartographeur**

Thèmes

Ajouter un thème  
Suppr. courant  
Copier courant  
Couper courant

**Items**

Ajouter un item

**Chercher**

**recyclage** • réduction ou optimisation de consommation d'énergie • tigres • équipements déployés sur le terrain •

# Application

*uses all Hypertopic concepts points of view, **topics***

The screenshot displays the 'Agoræ développement durable' application interface. A red arrow points from the word 'topics' in the text above to the 'recyclage' topic listed under 'Effets environnementaux'. Another red arrow points from the same word to the 'recyclage' topic in the 'Champagne-Ardenne' section at the bottom right.

**Espace personnel**

Bienvenue cahier

Ajouter utilisateur  
se connecter

**Historique** **Personnel** **Navigation** **Items**

Effets du projet >

**Effets environnementaux**

- ♦ Biodiversité
- ♦ déforestation
- ♦ réduction ou optimisation de consommation
- ♦ recyclage
- ♦ dépollution
- ♦ énergies renouvelables
- ♦ eau

**Projet(s) Pertinent(s)**

**Projets à**

**Sibylline** **Ile aux Oiseaux** **Mangrove Ouest** **Cansino** **Campus responsables** **Cartosolid** **Clem** **Ally Eoliennes** **EauSecours**

**Cartographe**

Thèmes

Ajouter un thème  
Suppr. courant  
Copier courant  
Couper courant

**Items**

Ajouter un item

**CartoDD**  
Agoræ développement durable

**Espace personnel** **Historique** **Personnel** **Navigation** **Items**

Bienvenue cahier

Ajouter utilisateur  
se connecter

**Cartographe**

Thèmes

Ajouter un thème  
Suppr. courant  
Copier courant  
Couper courant

**Items**

Ajouter un item

**Chercher**

**Champagne-Ardenne** • France

- ♦ animaux marins
- ♦ déforestation
- ♦ eau
- ♦ éoliennes
- ♦ oiseaux
- ♦ oiseaux de mer

**recyclage** • réduction ou optimisation de consommation d'énergie • tigres • équipements déployés sur le terrain •

# Application

*uses all Hypertopic concepts points of view, topics , items*

The screenshot displays the CartoDD application interface, which is titled "Agoræ développement durable". The interface is organized into several sections and a central content area.

**Navigation Bar:** Located at the top, it includes tabs for "Historique", "Personnel", "Navigation", and "Items".

**Left Sidebar:**

- Espace personnel:** Contains links for "Bienvenue cahier", "Ajouter utilisateur", "se", and "déconnecter".
- Cartographeur:** Contains a "Thèmes" section with links for "Ajouter un thème", "Suppr. courant", "Copier courant", "Couper courant", and "Ajouter un item".

**Central Content Area:**

- Effets du projet >** Section titled "Effets environnementaux" with a list of topics: Biodiversité, déforestation, réduction ou optimisation de consommation, recyclage, dépollution, énergies renouvelables, and eau.
- Projet(s) Pertinent(s):** A section listing various projects: Sibylline, Ile aux Oiseaux, Mangrove Ouest, Cansino, Campus responsables, Cartosolid, Clem, Ally Eoliennes, and EauSecours.

**Right Sidebar:**

- Chercher:** A search bar.
- Items:** A section titled "recyclage" with a descriptive text: "1. code - Clem. 2. site: Réhabilitation de porte-avion Clemenceau au profit du développement durable". It also lists "Ressource(s) documentaires" and "ressources et commentaires".

**Annotations:**

- A red arrow points from the word "items" in the introductory text to the "Items" tab in the navigation bar.
- A red arrow points from the word "topics" in the introductory text to the "Effets environnementaux" list.
- A red arrow points from the word "points of view" in the introductory text to the "Projet(s) Pertinent(s)" list.

# Application

uses all Hypertopic concepts points of view, topics , items, *attributes*

The screenshot displays the CartoDD application interface, which is a web-based platform for sustainable development. The interface is organized into several sections:

- Header:** "Agoræ développement durable".
- Navigation Bar:** Includes "Espace personnel", "Historique", "Personnel", "Navigation", and "Items".
- Left Sidebar:**
  - Espace personnel:** "Bienvenue cahier", "Ajouter utilisateur", "se déconnecter".
  - Cartographe:** "Thèmes", "Ajouter un thème", "Suppr. courant", "Copier courant", "Couper courant".
  - Items:** "Ajouter un item".
- Main Content Area:**
  - Effets du projet > Effets environnementaux:** A list of environmental impacts: Biodiversité, déforestation, réduction ou optimisation de consommation, recyclage, dépollution, énergies renouvelables, eau.
  - Projet(s) Pertinent(s):** A list of projects: Sibylline, Ile aux Oiseaux, Mangrove Ouest, Cansino, Campus responsables, Cartosolid, Clem, Ally Eoliennes, EauSecours.
- Right Sidebar:** A search bar labeled "Chercher".

Two red arrows highlight specific features:

- One arrow points from the text "attributes" in the top header to the "Chercher" search bar.
- Another arrow points from the same text to the "recyclage" item in the "Effets environnementaux" list.

The interface also includes a "Projet(s) Pertinent(s)" section with a list of projects: Sibylline, Ile aux Oiseaux, Mangrove Ouest, Cansino, Campus responsables, Cartosolid, Clem, Ally Eoliennes, EauSecours.

# Application

uses all Hypertopic concepts points of view, topics , items, attribut, **resources**

Agoræ développement durable

**Espace personnel**

Bienvenue cahier

Ajouter utilisateur  
se  
déconnecter

**Historique**

Effets du projet >

**Effets environnementaux**

- ♦ Biodiversité
- ♦ déforestation
- ♦ réduction ou optimisation de consommation
- ♦ recyclage
- ♦ dépollution
- ♦ énergies renouvelables
- ♦ eau

Projet(s) Pertinent(s)

Projets à

**Sibylline . Ile aux Oiseaux . Mangrove Ouest Cansino . Campus responsables . Cartosolid . Clem . Ally Eoliennes . EauSecours .**

**Navigation**

**Items**

**Cartographeur**

Thèmes

Ajouter un thème  
Suppr. courant  
Copier courant  
Couper courant

Items

Ajouter un item

**CartoDD**

Agoræ développement durable

**Espace personnel**

Bienvenue cahier

Ajouter utilisateur  
se  
déconnecter

**Historique**

Clem

**Navigation**

**Items**

**Cartographeur**

Thèmes

Ajouter un thème  
Suppr. courant  
Copier courant  
Couper courant

Items

Ajouter un item

**Chercher**

**recyclage** . réduction ou optimisation de consommation d'énergie . tigres . équipements déployés sur le terrain .

# Application

*uses all Hypertopic concepts points of view, topics , items, attribut , resources , and possibility to build the map within the inquiry activity*

The screenshot displays the CartoDD application interface, which is organized into several sections:

- Espace personnel**: Includes a welcome message, a list of users, and a button to add a user.
- Historique**: Shows a list of projects, including "Sibylline", "Ile aux Oiseaux", "Mangrove Ouest", "Cansino", "Campus responsables", "Cartosolid", "Clem", "Ally Eoliennes", and "EauSecours".
- Personnel**: A section for managing users.
- Navigation**: A section for navigating through the application.
- Items**: A section for managing items, including a button to add a new item.
- Effets du projet**: A section for managing project effects, including a list of effects like "Biodiversité", "déforestation", "réduction ou optimisation de consommation", "recyclage", "dépollution", "énergies renouvelables", and "eau".
- Projet(s) Pertinent(s)**: A section for managing relevant projects.
- Projets à**: A section for managing projects to be added.
- Cartographier**: A section for managing maps, including a button to add a new map.
- Thèmes**: A section for managing themes, including a button to add a new theme.
- Items**: A section for managing items, including a button to add a new item.

A red arrow points from the text "and possibility to build the map within the inquiry activity" to the "Ajouter un item" button in the "Items" section.

**CartoDD**  
Agora développement durable

**Espace personnel**  
Bienvenue cahier  
Ajouter utilisateur  
se déconnecter

**Historique**  
Effets du projet >  
Effets environnementaux  
• Biodiversité  
• déforestation  
• réduction ou optimisation de consommation  
• recyclage  
• dépollution  
• énergies renouvelables  
• eau

**Personnel**

**Navigation**

**Items**

**Chercher**

**Cartographier**  
Thèmes  
Ajouter un thème  
Suppr. courant  
Copier courant  
Couper courant

**Items**  
Ajouter un item

**Projet(s) Pertinent(s)**

**Projets à**

**Sibylline . Ile aux Oiseaux . Mangrove Ouest . Cansino . Campus responsables . Cartosolid . Clem . Ally Eoliennes . EauSecours .**

**Champagne-Ardenne • France**  
• animaux marins • déforestation  
• eau • éoliennes • oiseaux  
• oiseaux de mer  
• **recyclage** • réduction ou optimisation de consommation d'énergie • tigres • équipements déployés sur le terrain •

# Application

*uses all Hypertopic concepts points of view, topics , items, attribut , resources , and possibility to build the map within the inquiry activity*

## Espace personnel

Bienvenue cahier

Ajouter  
utilisateur  
se  
déconnecter

## Historique

Effets du projet >

## Effets environnementaux

- ♦ Biodiversité
- ♦ déforestation
- ♦ réduction ou optimisation de consommation
- ♦ recyclage
- ♦ dépollution
- ♦ énergies renouvelables
- ♦ eau

Projet(s) Pertinent(s)

Projets à

Sibylline . Ile aux Oiseaux  
Mangrove Ouest Cansino . Campus responsables .  
Cartosolid . Clem . Ally Eoliennes .  
EauSecours .

## Navigation

## Items



## Cartographier

Thèmes

Ajouter un  
thème  
Suppr.  
courant  
Copier  
courant  
Couper  
courant

Items

Ajouter un  
item

Champagne-Ardenne • France  
• animaux marins • déforestation  
• eau • éoliennes • oiseaux  
• oiseaux de mer

• recyclage • réduction  
ou optimisation de consommation  
d'énergie • tigres • équipements  
déployés sur le terrain •

# COG-DOC: LAB DOCUMENTS

CogDoc : Documents et connaissances

http://cogdoc.hypertopic.org/?mod=universities&resource=http://tech-a

## Documents et connaissance

Plateforme de partage de ressources pédagogiques sur les thèmes de recherche du RTP-Doc.

**Espace personnel**

Pseudonyme :  
Mot de passe :  
Se connecter

**Enseignants** **Universités**

### Qu'est-ce qu'un document ?

#### Fiche descriptive

- auteur : **Aurélien Bénél**
- dernière modification : **2007**

#### Ressource(s) documentaire(s)

- **Transparents (grand format)**
- **Transparents (petit format)**

**Nuage de mots**

accès • antilope • archive • conservation • description • destinataire • **document** • document numérique • documentation • dtd • définition document • feuille xml • folksonomie • indexation • information • méthodes • **preuve** • référence • shannon • support d'information • système documentaire • sélection • usages • version • xml •

benel\_IF09a\_07\_petit.pdf (page 1 de 4)  
Précédent Suivant Réduire/agrandir

**Qu'est-ce qu'un document ?**

**Remue-méninges**

**Shannon vs Ockham**

91



## VIEWPOINT

## Etude des représentations d'autels



## Etude des vases



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- <http://web-imtm.iaw.ruhr-uni-bochum.de/iug/projekte/seeme/>

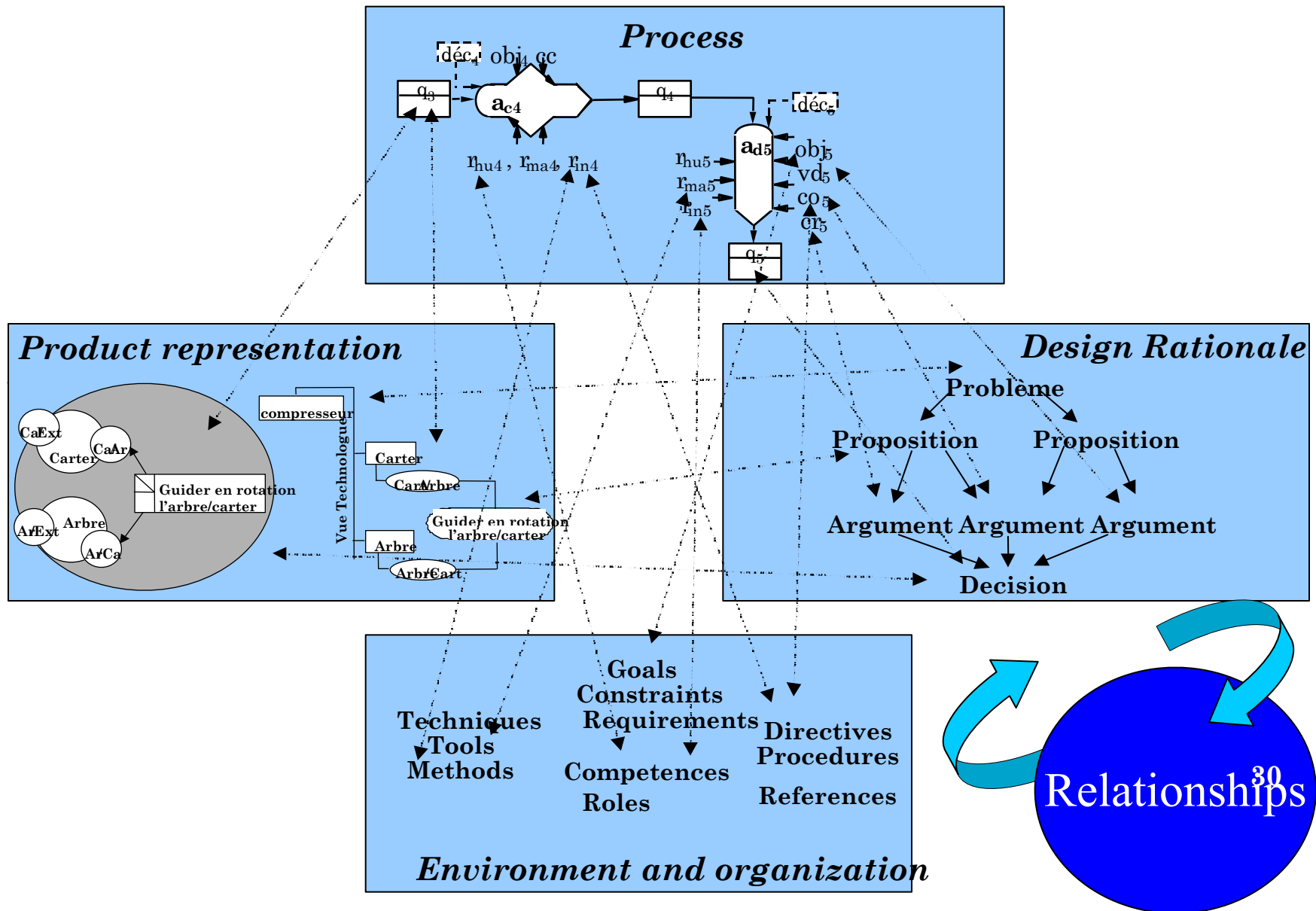
# CORPORATE MEMORY

*« A corporate memory is a persistent and explicit representation of knowledge and information of an organization »* [Van Heijst, 96], [Dieng et al, 03]

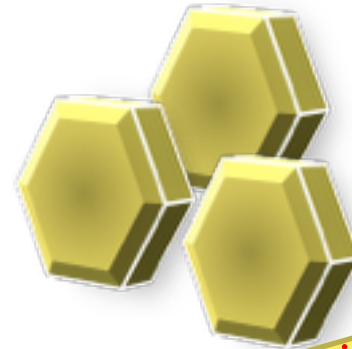
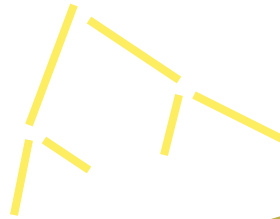
Several memory types: Profession memory,  
project memory, management memory

# PROJECT MEMORY

*Explicitation of the experience learned during project realization [Matta]*



# Traceability and capitalization of knowledge

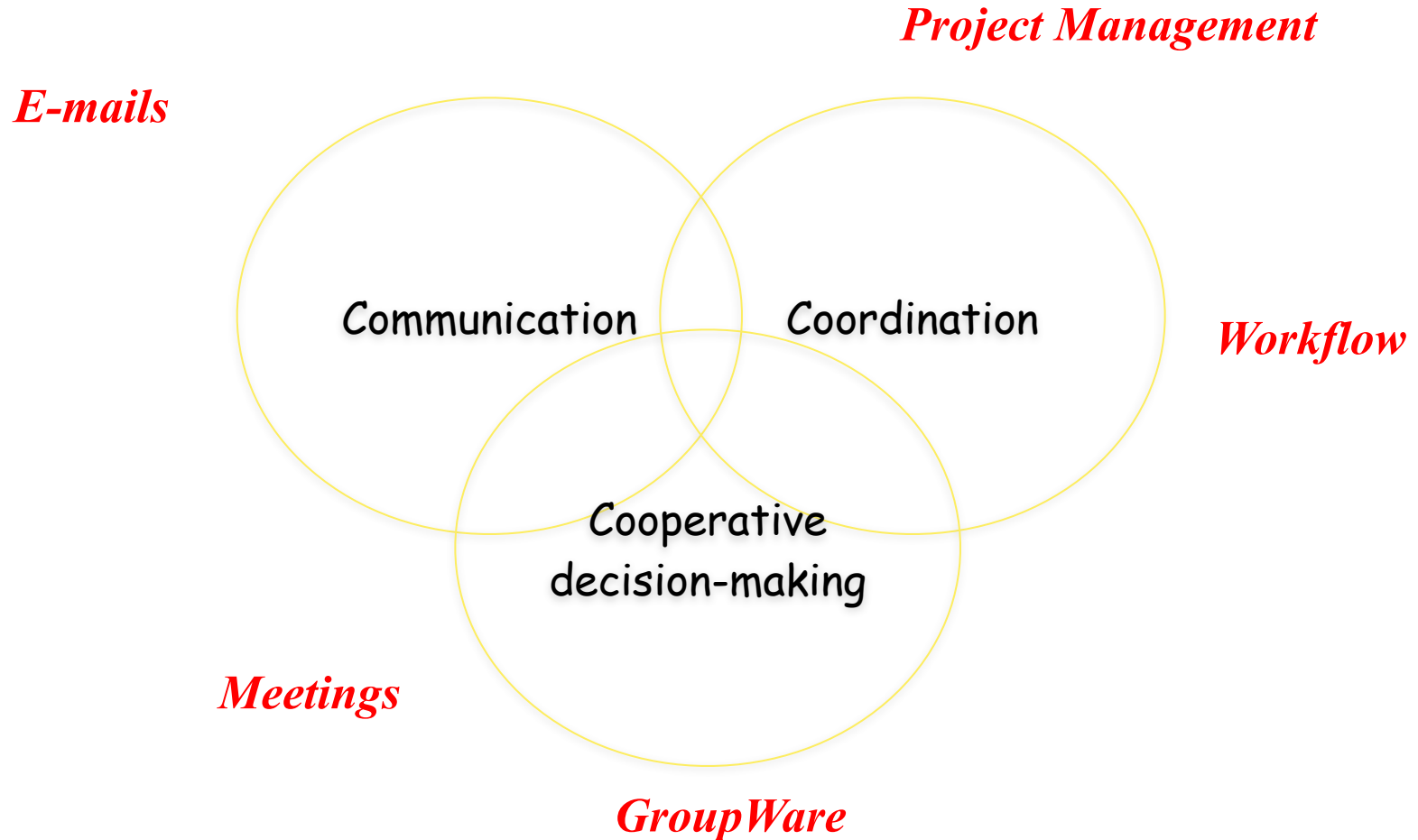
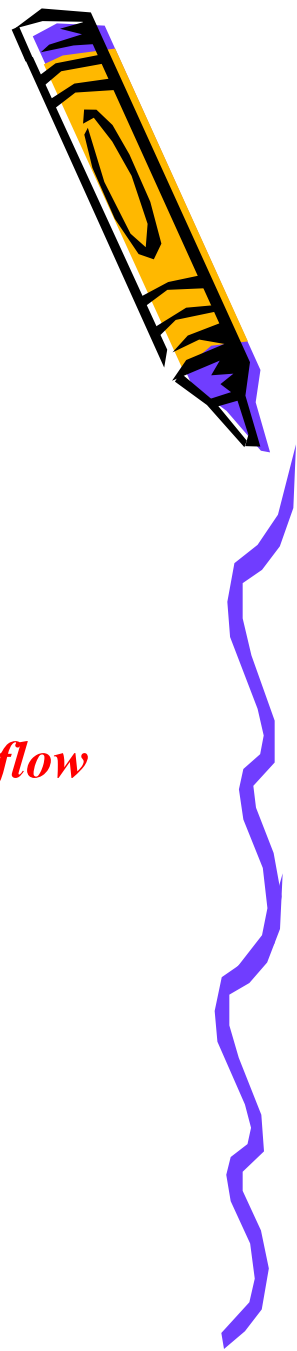


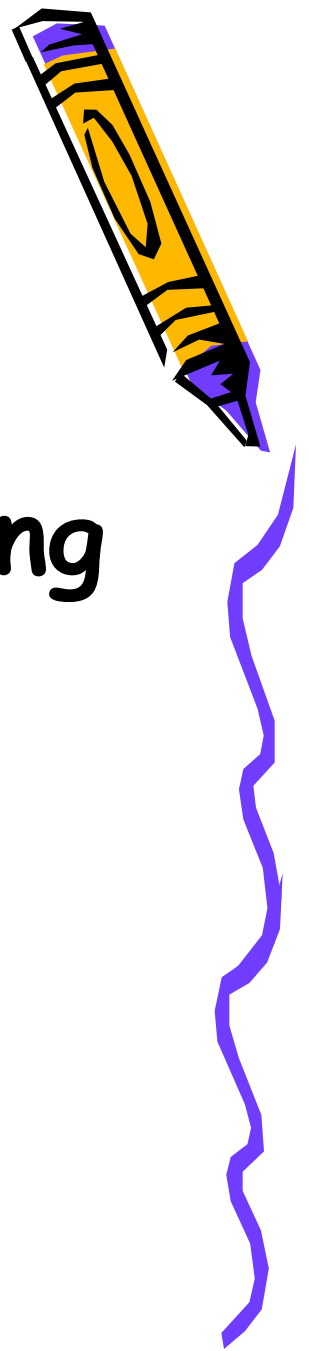
Aggregation and  
typing strategies

Keeping  
Track

Characterising  
concepts

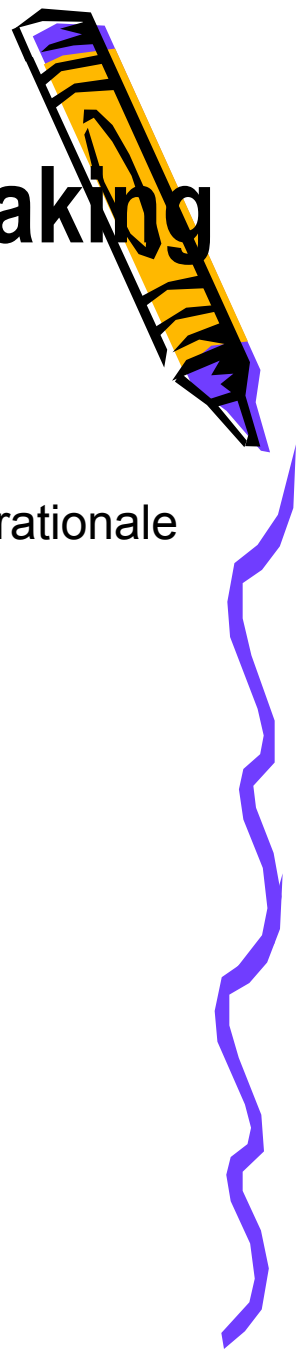
# Traceability of Projects





# Traceability of decision making

# Support for cooperative decision making



## ➤ **CSCW-Design rationale:**

- ◆ IBIS [Coklin, 98], QOC [McLean, 91] , DRAMA [Brice] (Design rationale tree)
- ◆ DIPA (Problem solving model) [Lewkowicz, 99]
- ◆ DRCS (Graphs : Concepts, Relations) [Klein, 93]

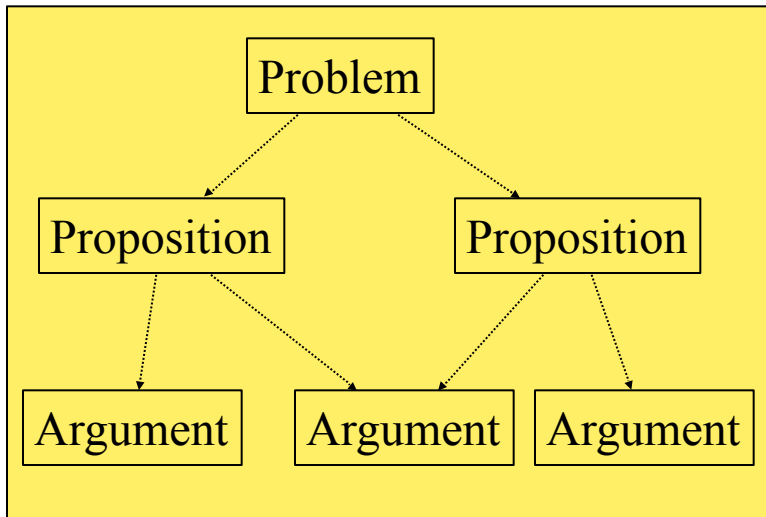
## ➤ **Project Management:**

- ◆ DRCS (Graphs : Concepts, Relations) [Klein, 93]

# Design Rationale methods

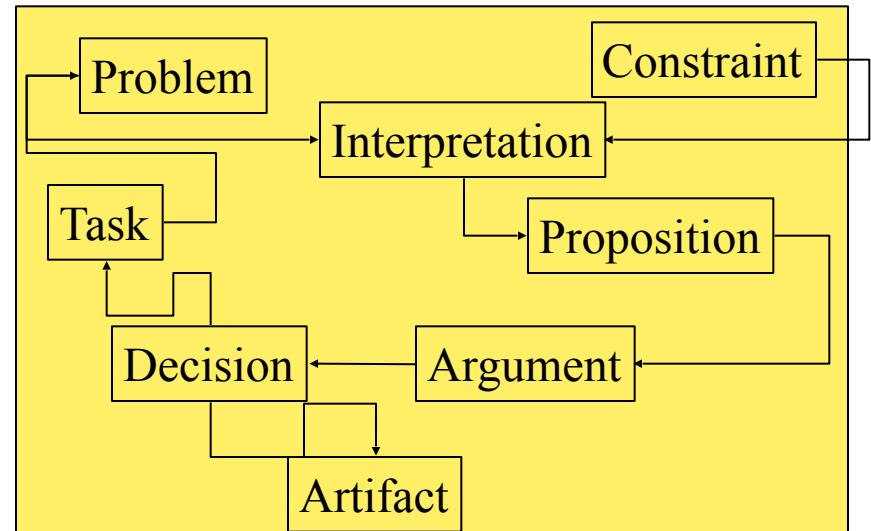


Representation guided by  
the decision-making



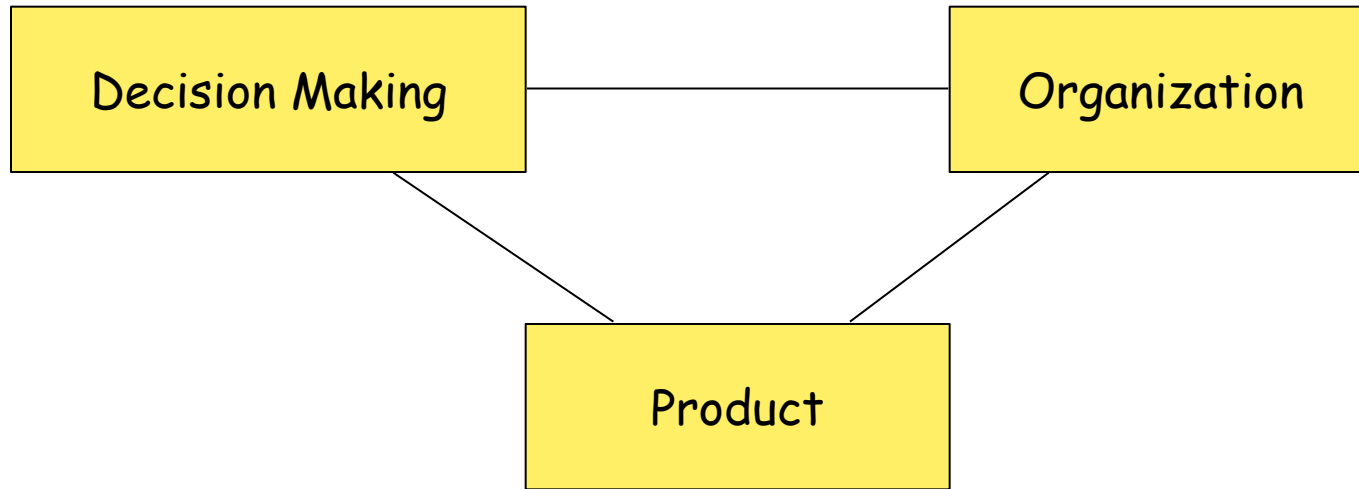
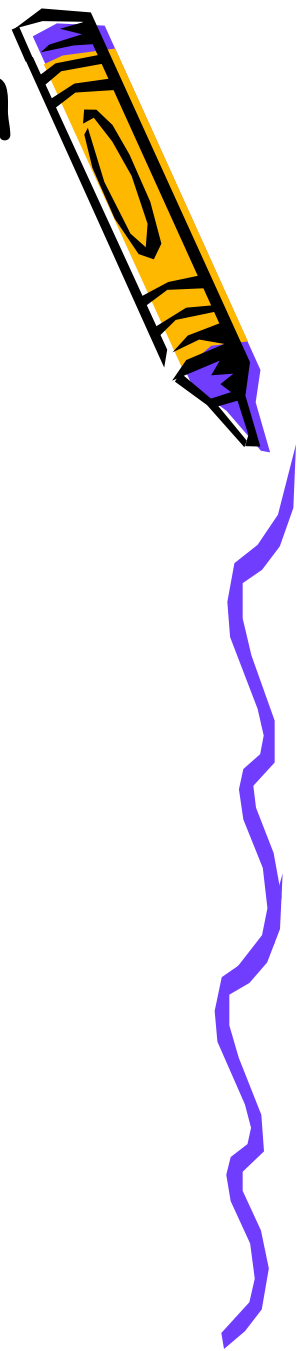
*IBIS, QOC, DRAMA*

Representation of the dynamics  
of problems solving



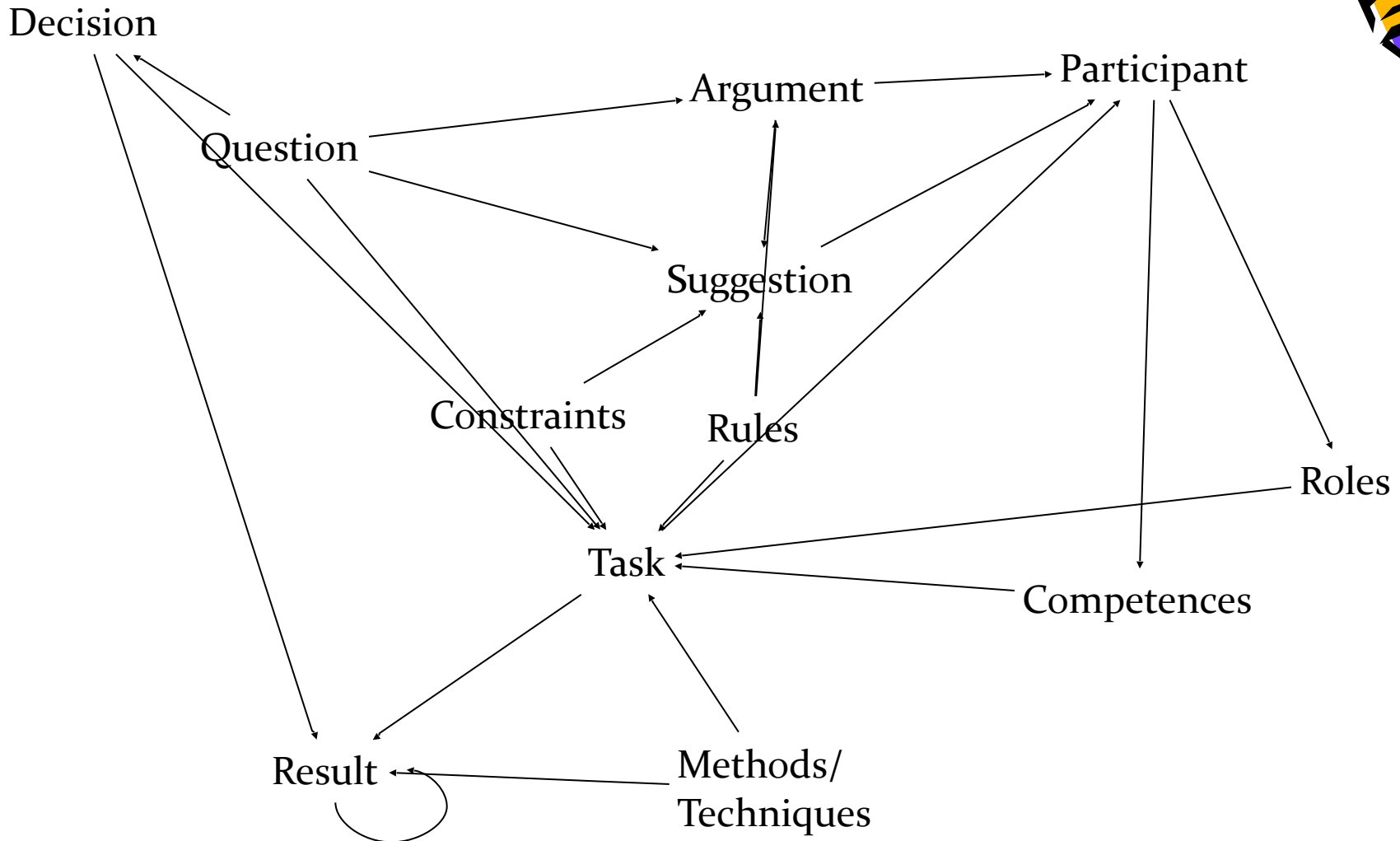
*DIPA, DRCS*

# Traceability and capitalization method

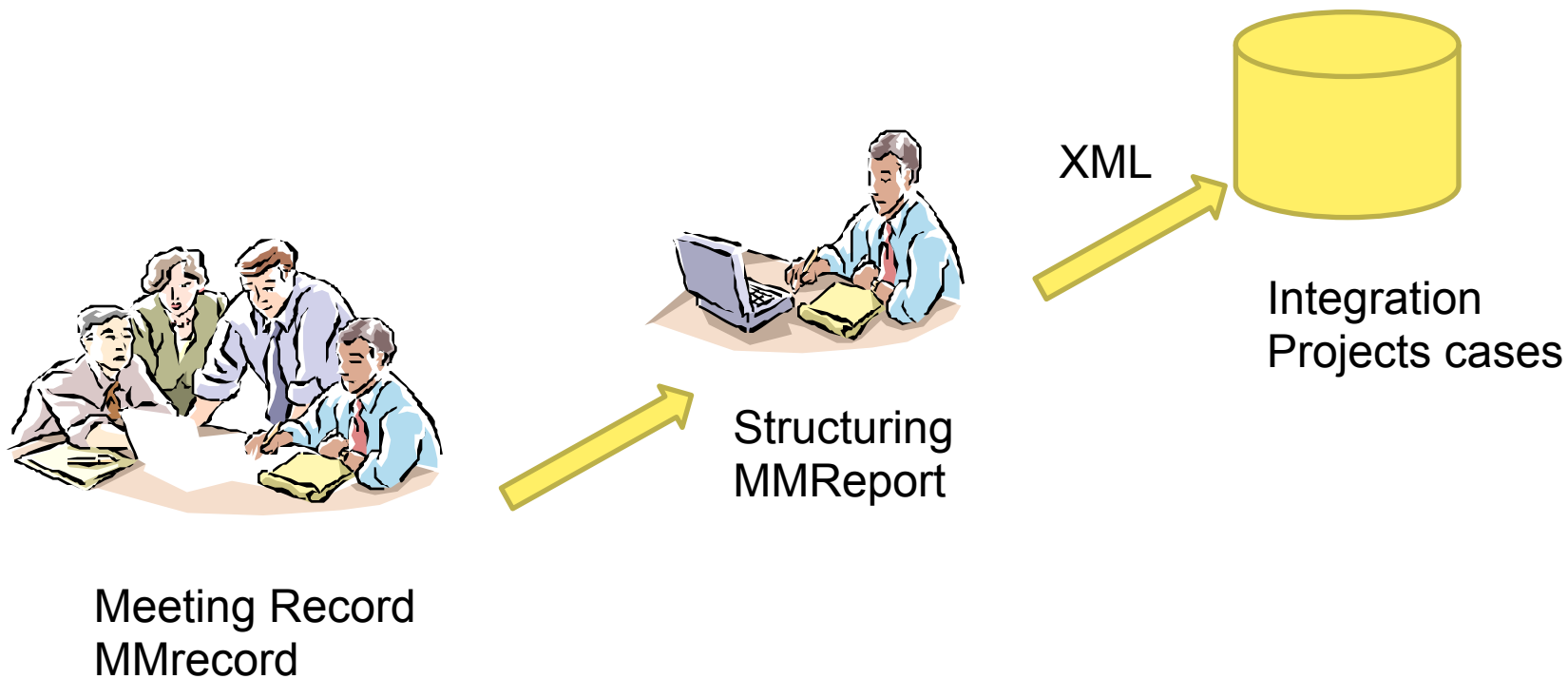


*DYPKM [Bekhti, Djaiz, Matta]*

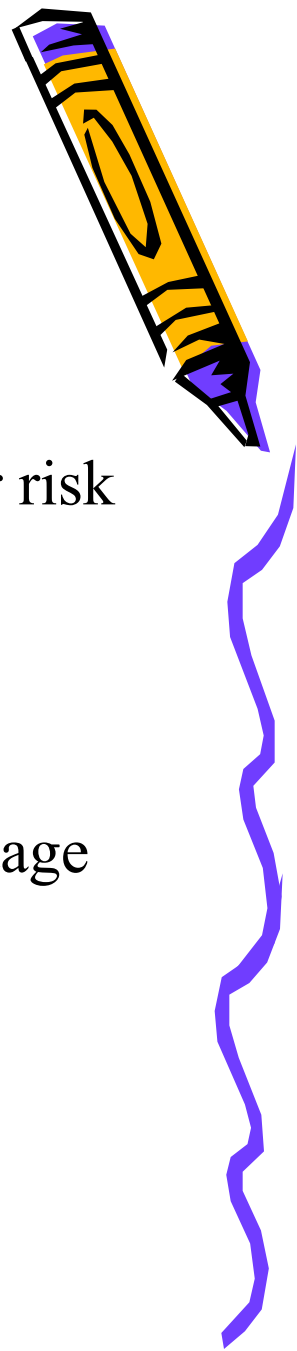
# Representing structure of PM



# Keeping track of Collaborative decision-making DYPKM



# Meeting Record Form



- Question 1: Autonomy of company
  - **Particip2:** Which type of competences needed for risk evaluation?
  - **Particip1:** We must allow company to ask sub-contractors to do analysis
- Question 2: Commitment
  - **Particip6:** Company need to recognize the advantage of risk evaluation
  - **Particip1:** Risk evaluation requirments must be in adequation with company objectives.

# MMRecord-Record Meeting



**Push Meeting Title**



**Choose Question**

**Choose Attendee**

**Record/Break**



Aucune SIM 13:55 64 %

Back MM Record + Save

| Question | Attendee |
|----------|----------|
| Q1       | P1       |
| Q2       |          |
| dfgg     |          |
|          |          |

Photos

Test Decision 00:00 Q1 - P1

A Z E R T Y U I O P ✕

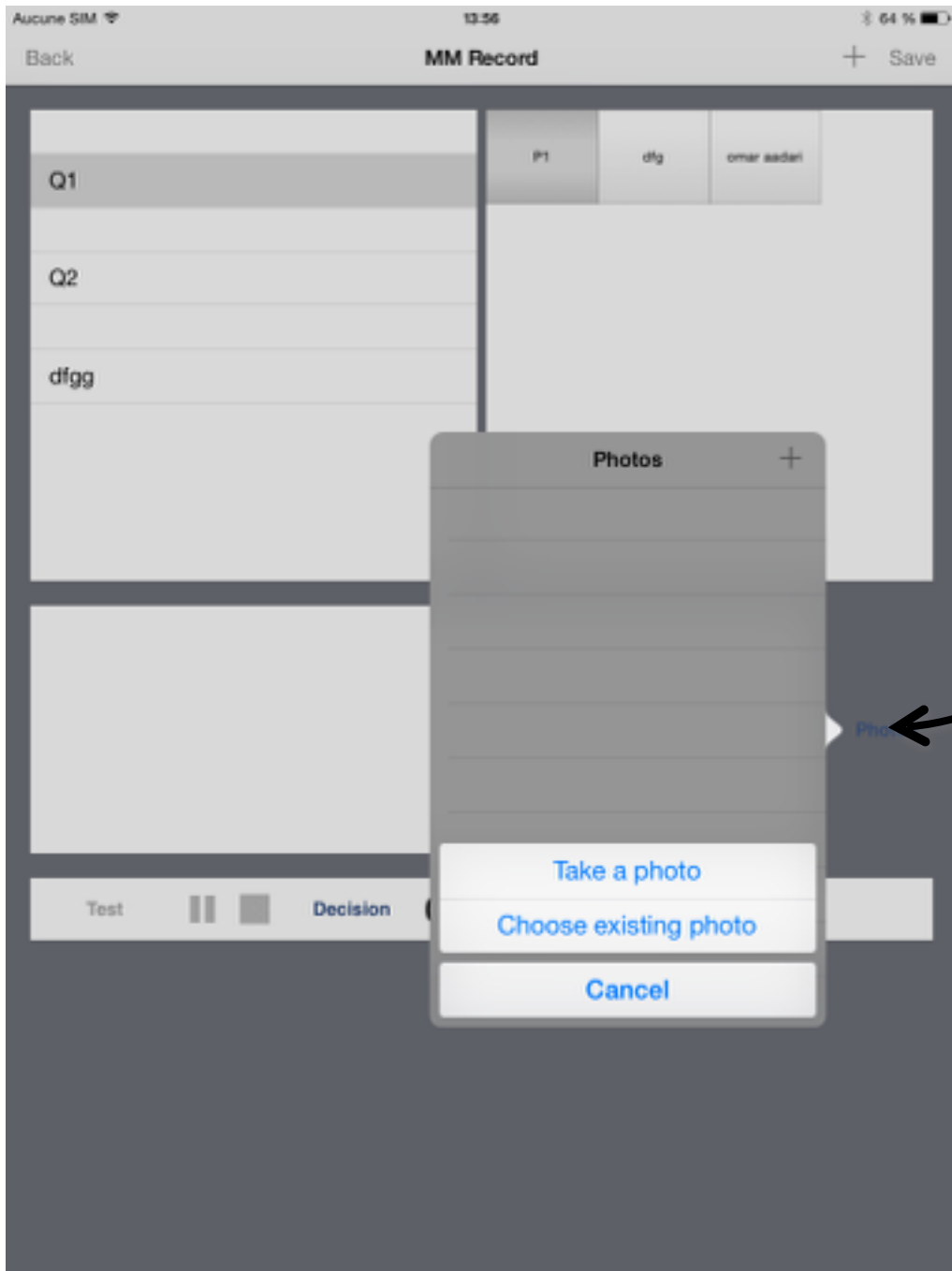
Q S D F G H J K L M retour

↑ W X C V B N ' ? ' . ↑

.?123 0 [ ] .?123

+ Add  
Question/Attendee





**Take Photo**



# Meeting report form

Question: Autonomy of the Company

## Suggestions

- **Human Ressources**: Need special competences
- **Control**: Company have to control its risk analysis

## Arguments

- **Flexibility**: methodology have to be in adequation with company

## Decision: **Flexibility , Control**

- **Modification of the autonomy principle text and**
- **Add a commitments principle**

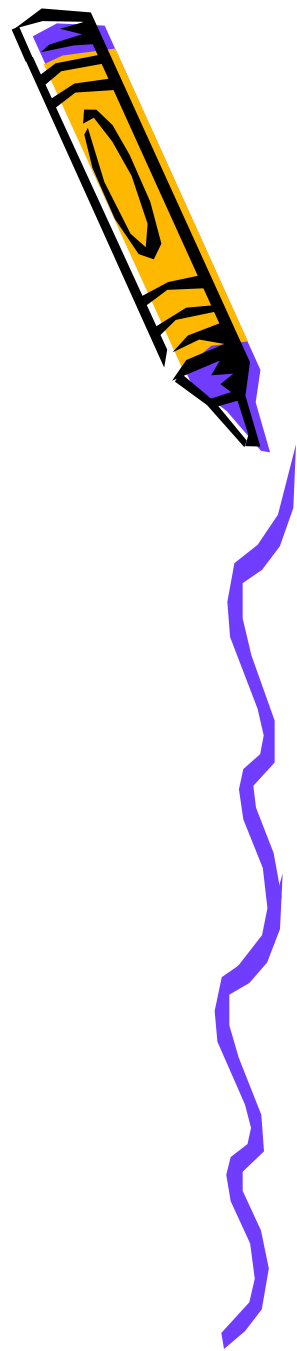
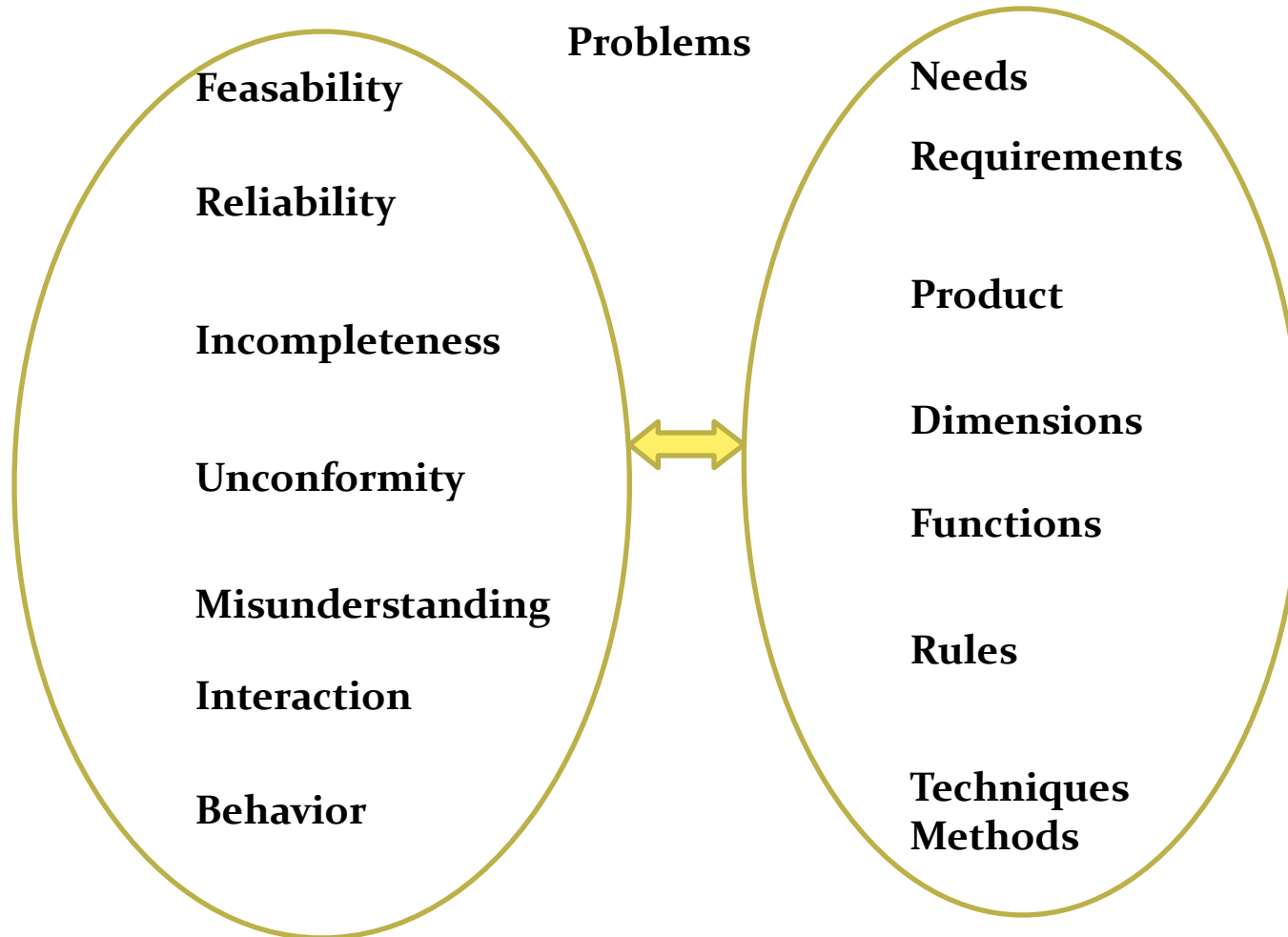


# MMReport-Annotate Speech

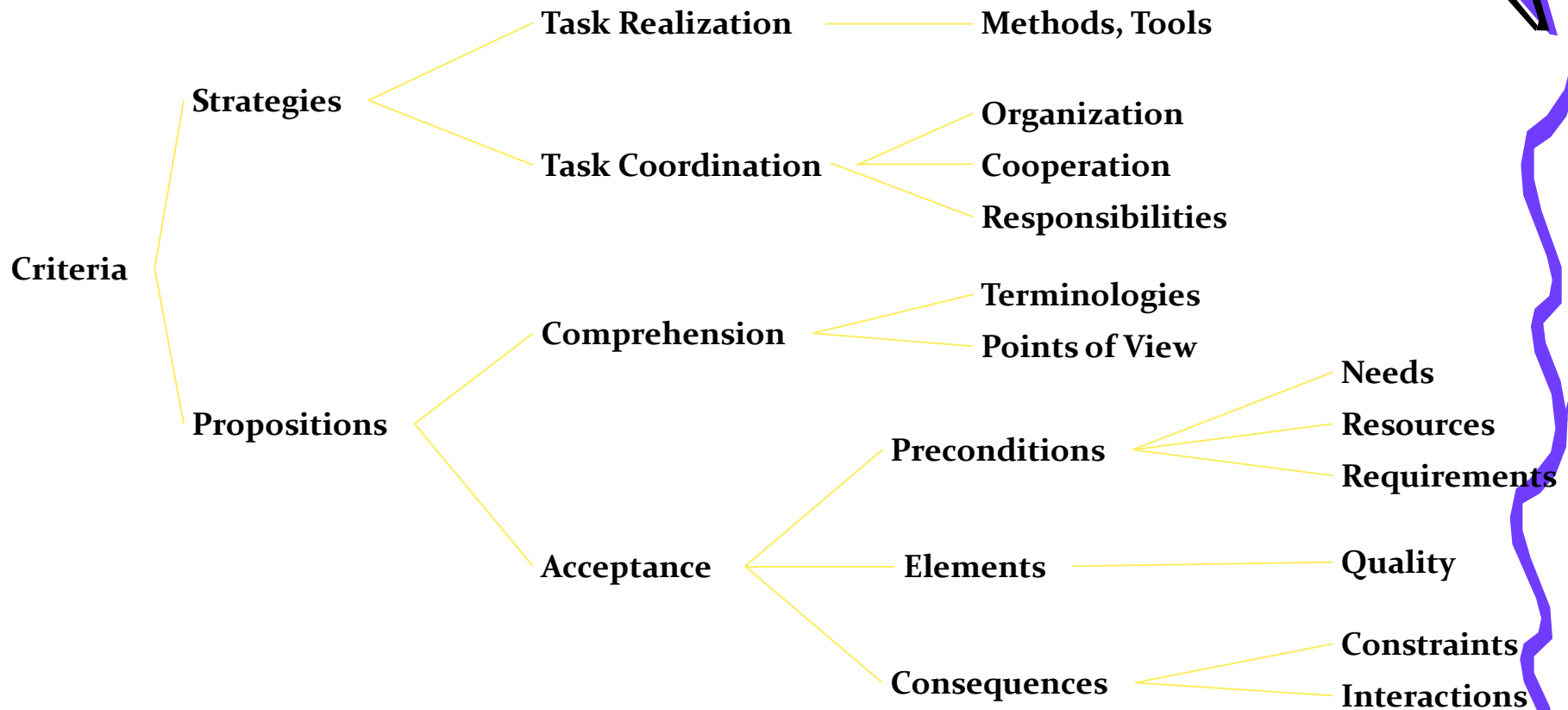
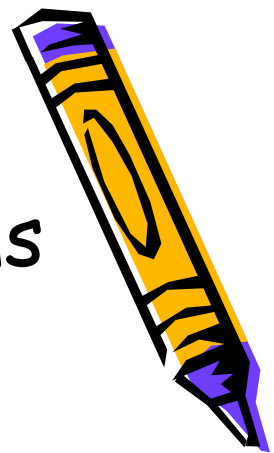
*Question/Attendee Speech*

The screenshot displays the MMReport-Annotate Speech application interface. At the top, a status bar shows 'Aucune SIM', signal strength, time '18:59', and battery '81%'. Below this is a header bar with 'Meetings list', a title 'best papers - 13:56 / 68:34 - wiebo', and 'Settings' and 'Save' buttons. The main area features a video player with a timeline from 13:45 to 14:05. A red vertical line marks the current position at 13:56. Speech annotations are shown as blue boxes with labels: 'best papers nada' (13:50-13:55), 'best papers wiebo' (13:55-14:00), and 'Argument' (14:00-14:05). Above the 'best papers wiebo' box are two smaller boxes labeled 'Formul...' and 'Applic...'. A black arrow points from the 'Formul...' box to the 'Formulation' category in the taxonomy. Another black arrow points from the 'Applic...' box to the 'Application pb' category. A third black arrow points from the 'Argument' box to the 'Argumentation' category. The taxonomy is organized into a grid of categories: Behavior, Application pb, Formulation, Communicati..., Dimension, Coherence, Misundersta..., Competence..., Function, Concordance, Points de vue, Coordination, Geometry, Elasticity, Materials, Interface, Requirements, and Planification. On the right side, there are five additional categories: Argumentation, Decision, Information, and Suggestion. A yellow pencil icon is visible in the top right corner, and a blue wavy line is on the far right.

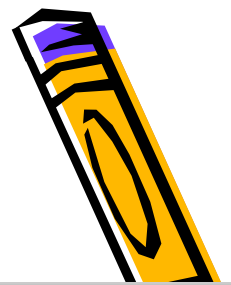
# Criteria guide / design problems



# Criteria Guides/design process problems



# MMReport: HTML Report



## Réunion Aidcrisis Project Review 1

UTT, dimanche avril 28, 2013

### Présents :

Eric, Jean Pierre, Alain, nada

### Excusés :

### Invités :

### Rapporteur :

Nada

#### • Interface functions

- nada : several types of functions: data actions - **Function** - **Decision**
- Alain : we need another functions related to alert - **Function** - **Proposition**
- Eric : good idea - **Communication** - **Argument**
- Jean Pierre : located to the accident site - **Formulation** - **Argument**

#### • Interface look

- Jean Pierre : - **Interface**
- nada : interface look: GIS ? - **Behavior** - **Question**
- Alain : Emergency actors use maps a lot: They have a map on their wall and they write a lot of things on it - **Requirements** - **Argument**
- Eric : the question is how to put data and functions on the Map? - **Behavior** - **Question**
- Jean Pierre : I have an idea they can put functions around the map and some functions can be put directly on the accident site - **Behavior**
- Alain : OK - **Behavior** - **Decision**

#### • Interface connections

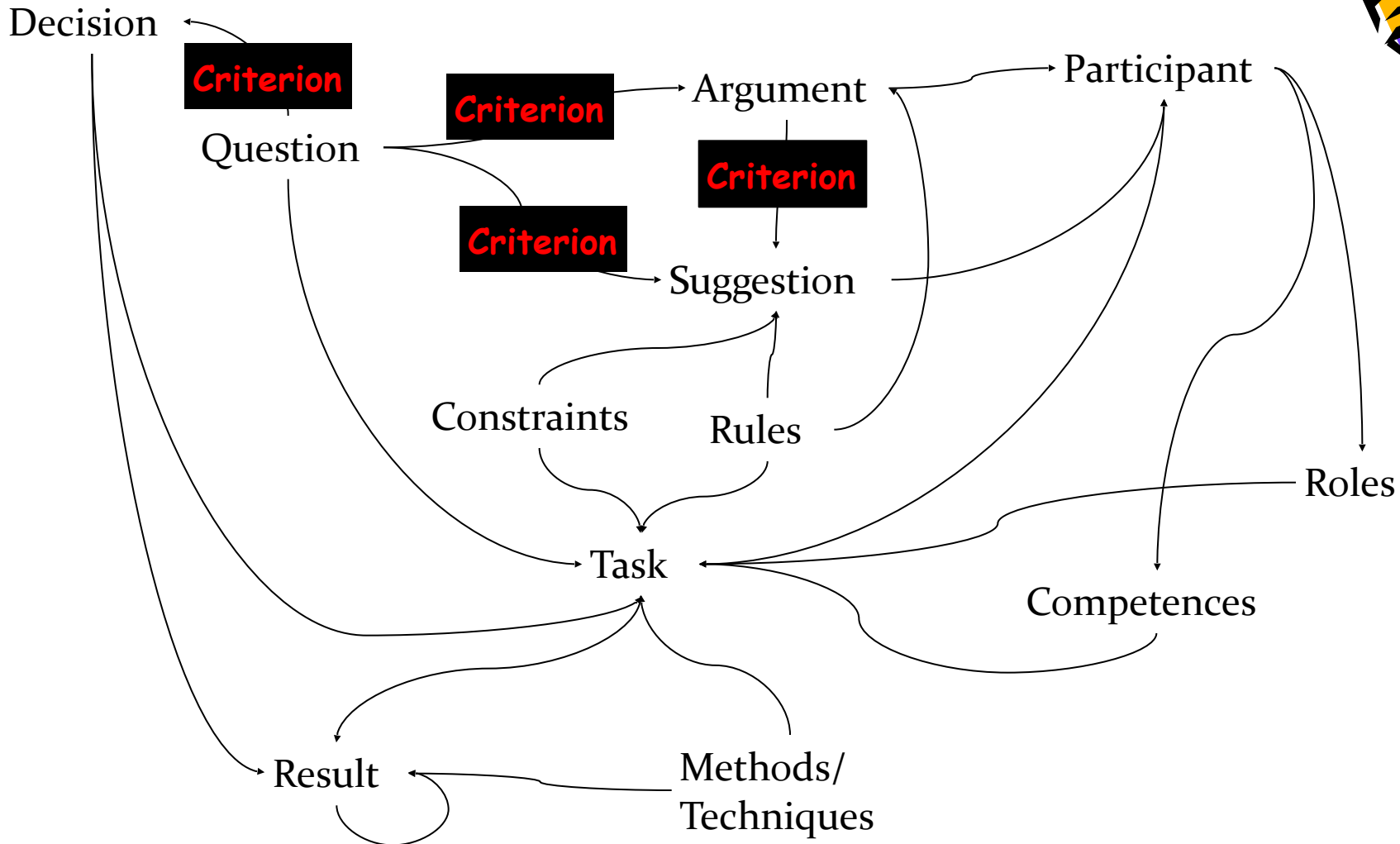
# MMReport - Result (XML file)



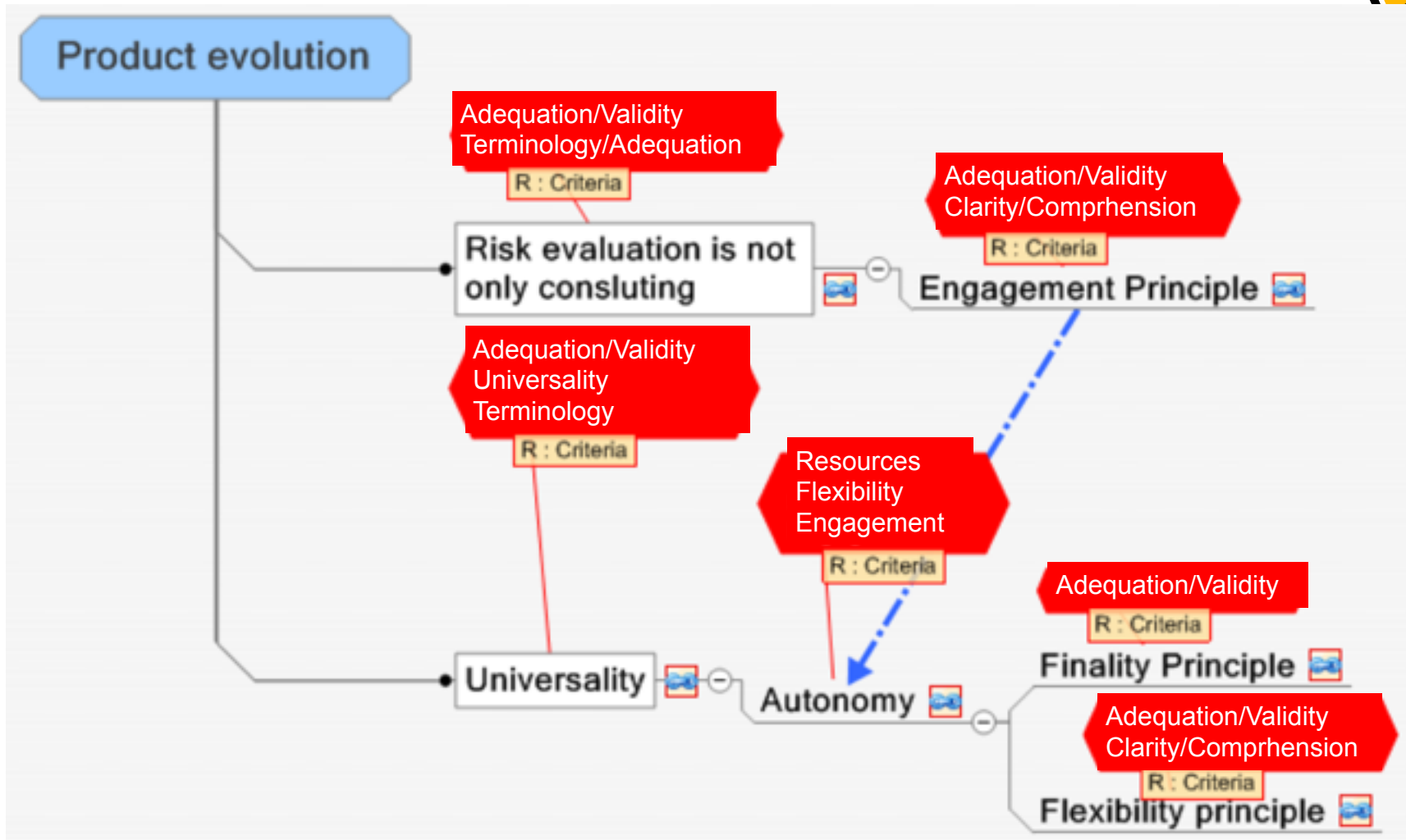
| title | date | place | attendee | attendees_excused | guests | rapporteur | question             |
|-------|------|-------|----------|-------------------|--------|------------|----------------------|
| Wisg  |      |       | Nada     |                   |        |            |                      |
| Wisg  |      |       | Patrick  |                   |        |            |                      |
| Wisg  |      |       | François |                   |        |            |                      |
| Wisg  |      |       | Emilie   |                   |        |            |                      |
| Wisg  |      |       | Wiebo    |                   |        |            |                      |
| Wisg  |      |       |          |                   |        |            | invited speaker      |
| Wisg  |      |       |          |                   |        |            | Poster Session       |
| Wisg  |      |       |          |                   |        |            | best papers          |
| Wisg  |      |       |          |                   |        |            | paper review process |
| Wisg  |      |       |          |                   |        |            | iother questions     |

| start      | attendee3 | question4            | comments                                                      | type       | decision | name          |
|------------|-----------|----------------------|---------------------------------------------------------------|------------|----------|---------------|
| 0          | Patrick   | best papers          | best papers can be proposed to a special issue                | suggestion |          | Communication |
| 80,472971  | Nada      | best papers          | a special issue on safety can be proposed                     | suggestion |          | Communication |
| 83,574195  | Francois  | best papers          | Good paper present good work on Safety                        | Argument   |          | Formulation   |
| 91,610091  | Nada      | best papers          | A good idea', so we contact journals to propose special issue | decision   |          | Communication |
| 105,505578 | Patrick   | paper review process | Who can evaluate Paper ?                                      |            |          | competences   |
| 328,678118 | Emilie    | paper review process | Evaluation of short paper                                     | suggestion |          | Planning      |
| 515,449433 | Wiebo     | paper review process | Short Paper evaluation is a good decision due to the time.    | Decision   |          | Planning      |
| 527,705669 | Nada      | paper review process | Long Paper can be asked for a book on Safety                  | suggestion |          | Communication |
| 597,115964 | François  | paper review process | Evaluation will be done by CS                                 | Decision   |          | Coordination  |

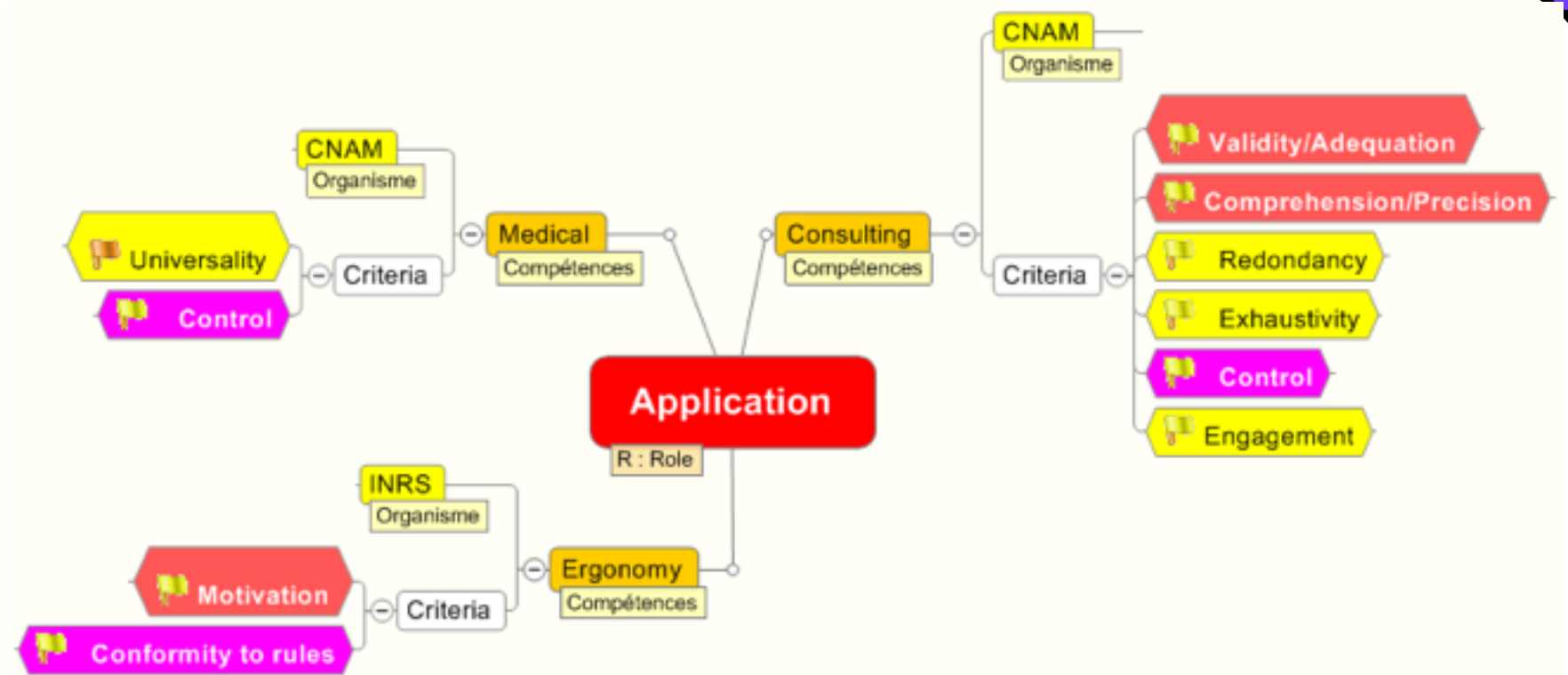
# Indexing PM using criteria



# Example of Results

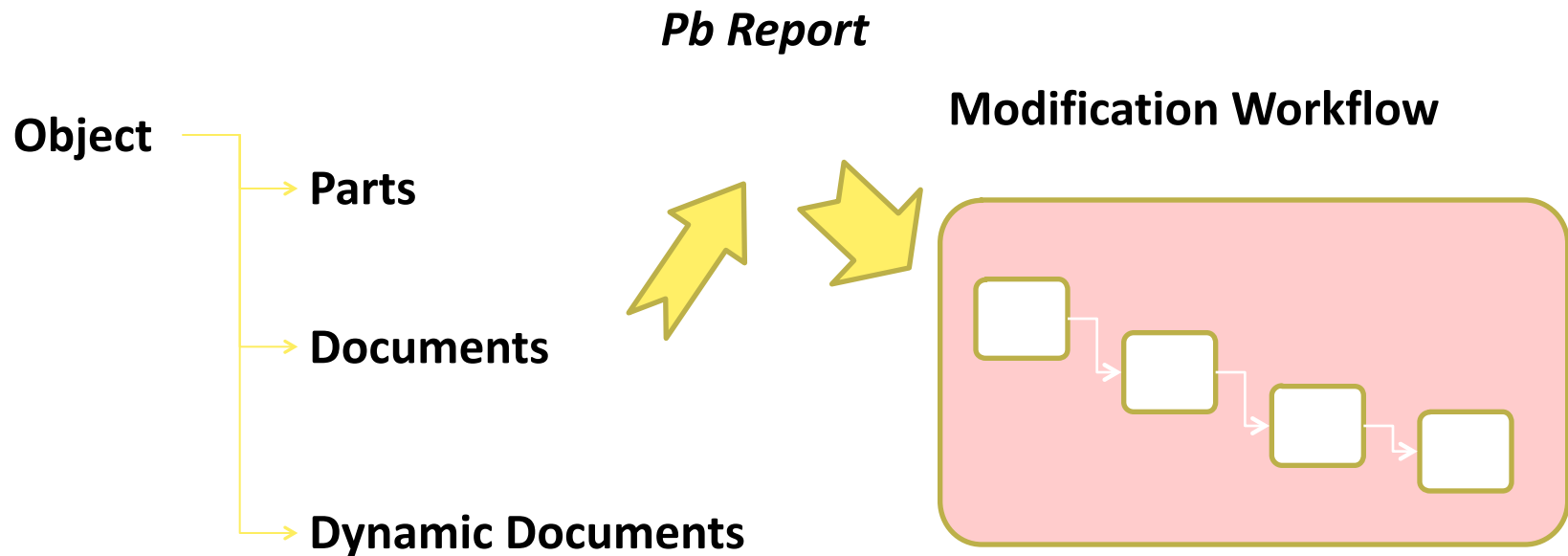
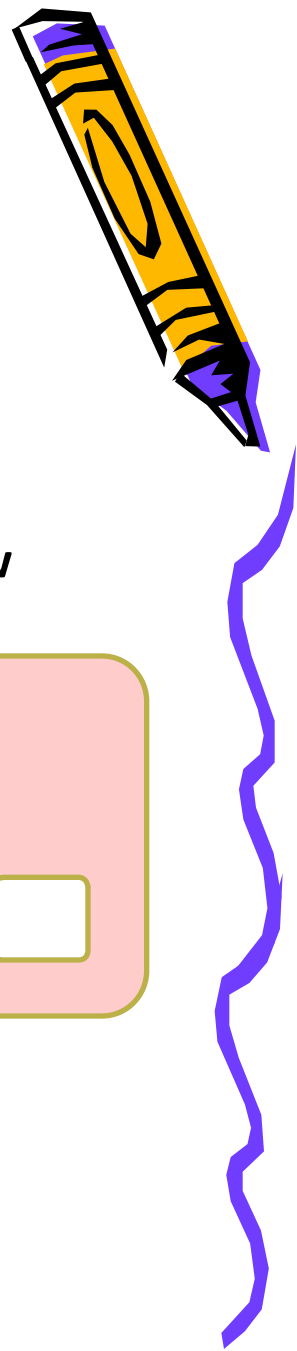


# Example of Results

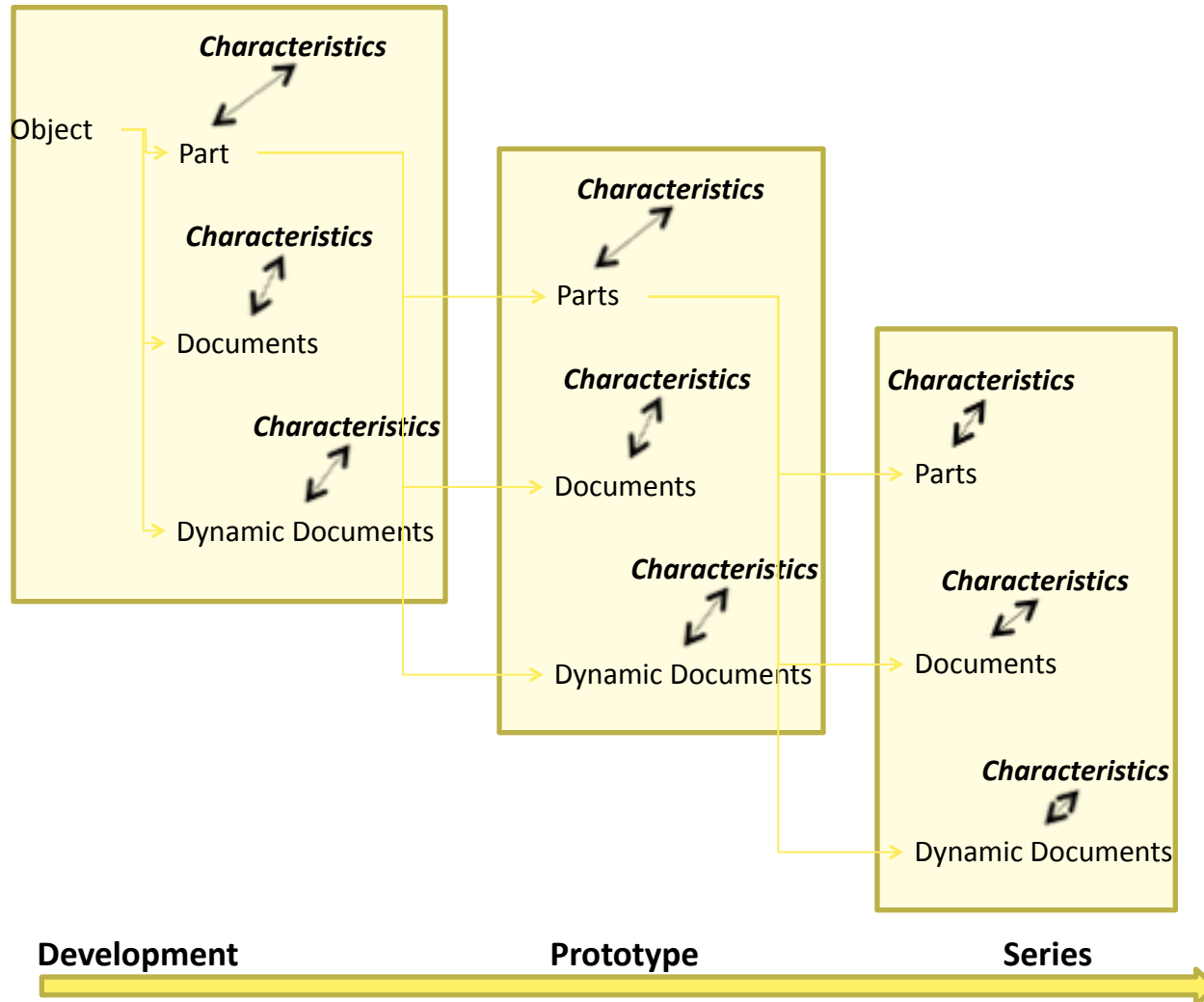


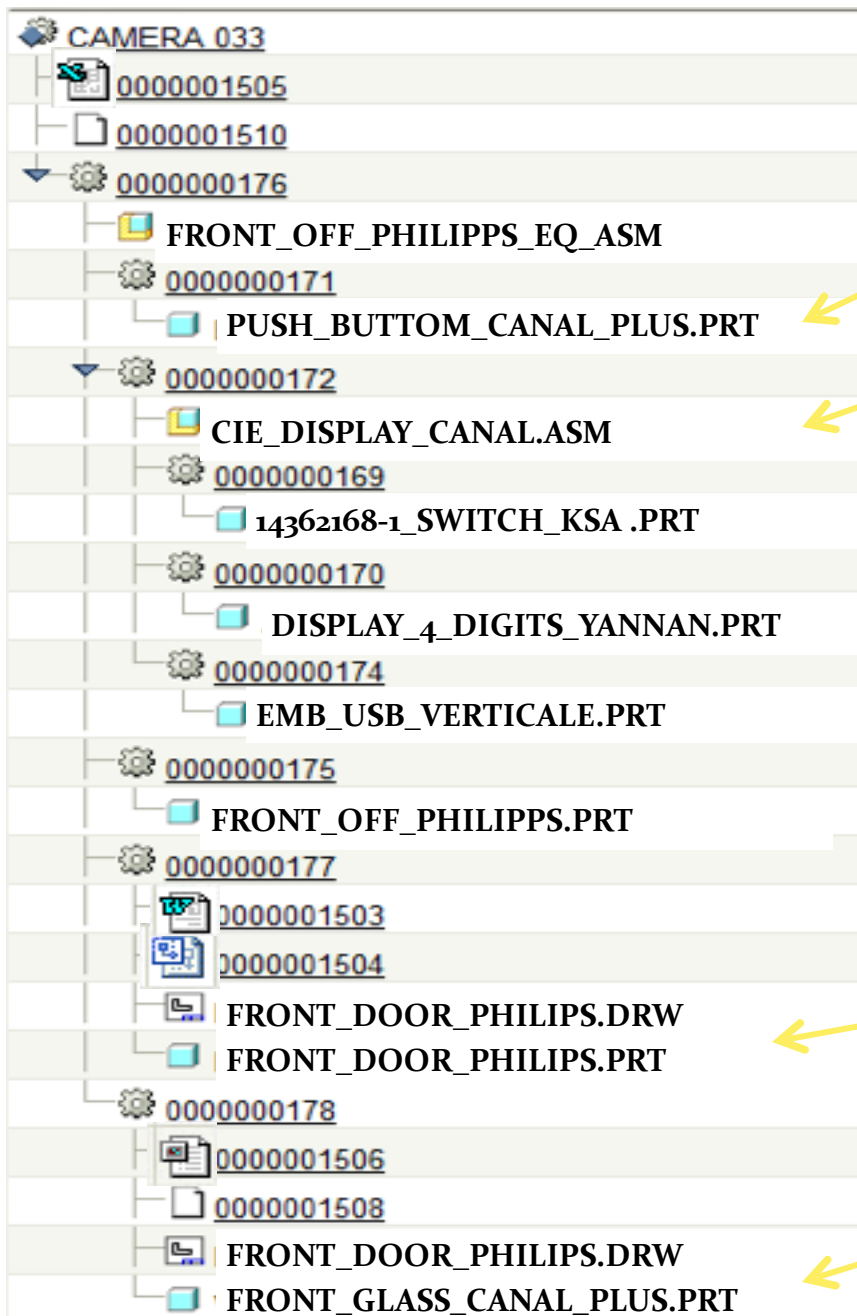
# Integration on PLM

## Representing Product in Windchill



## A yellow pencil with a purple eraser and a purple band is shown drawing a wavy purple line. The pencil is oriented diagonally, and the line it is drawing is a simple, wavy purple stroke.





*Interaction*

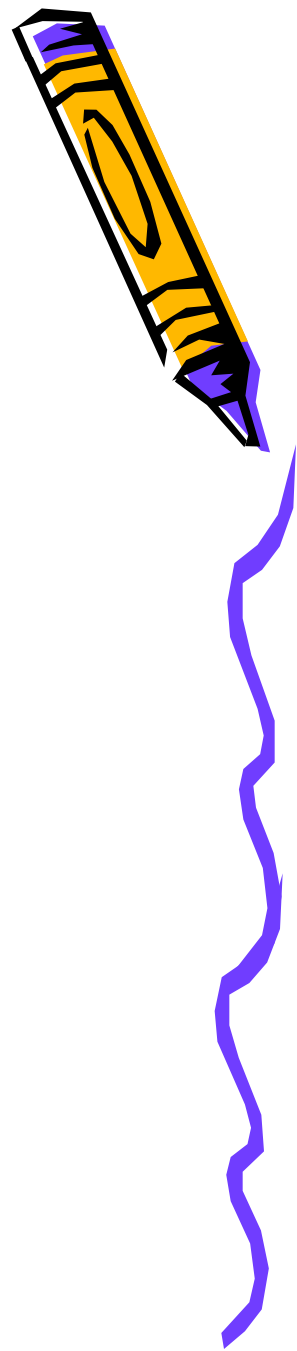
*Behavior*

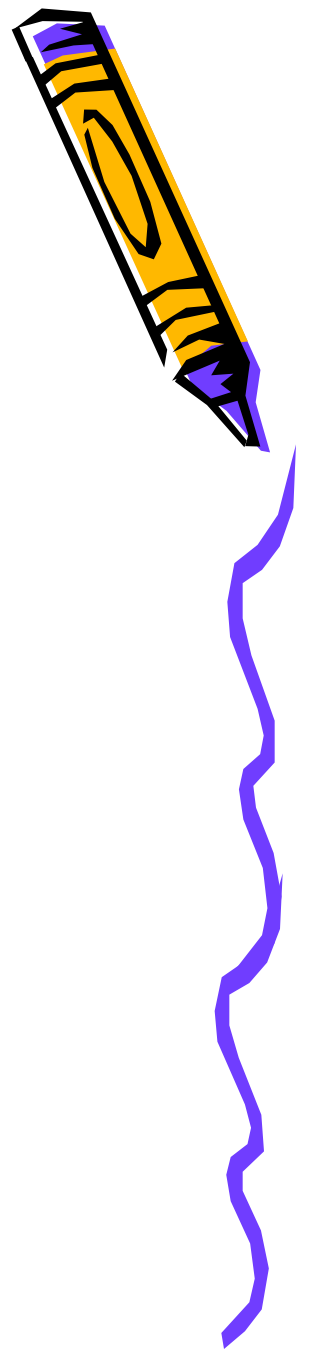
*Dimensions*

*Dimensions*

*Quality*

*Interaction*





# Traceability of communications

François Rausher

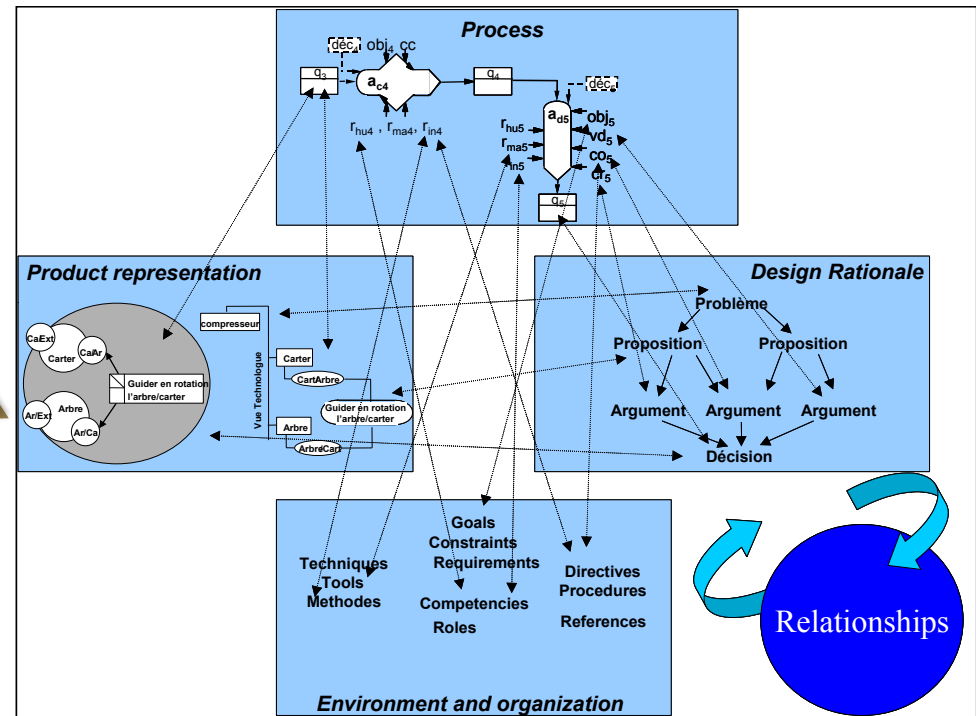
# TRACEABILITY OF COMMUNICATION

RAUSCHER, MATTA, ATIFI



Professional  
e-mails

*Analysis  
&  
Structuring*



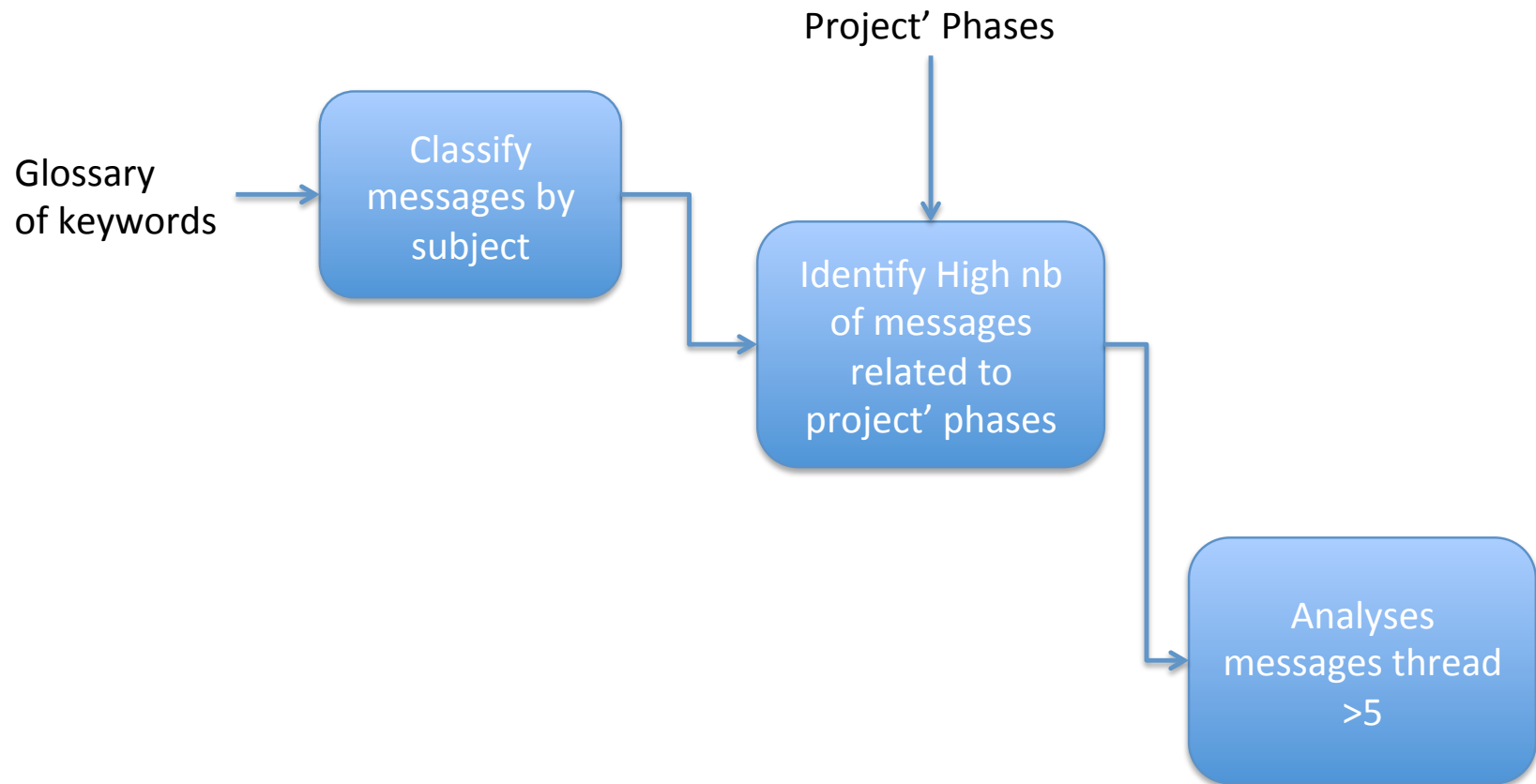
Project Memory  
*K. produced during a project*

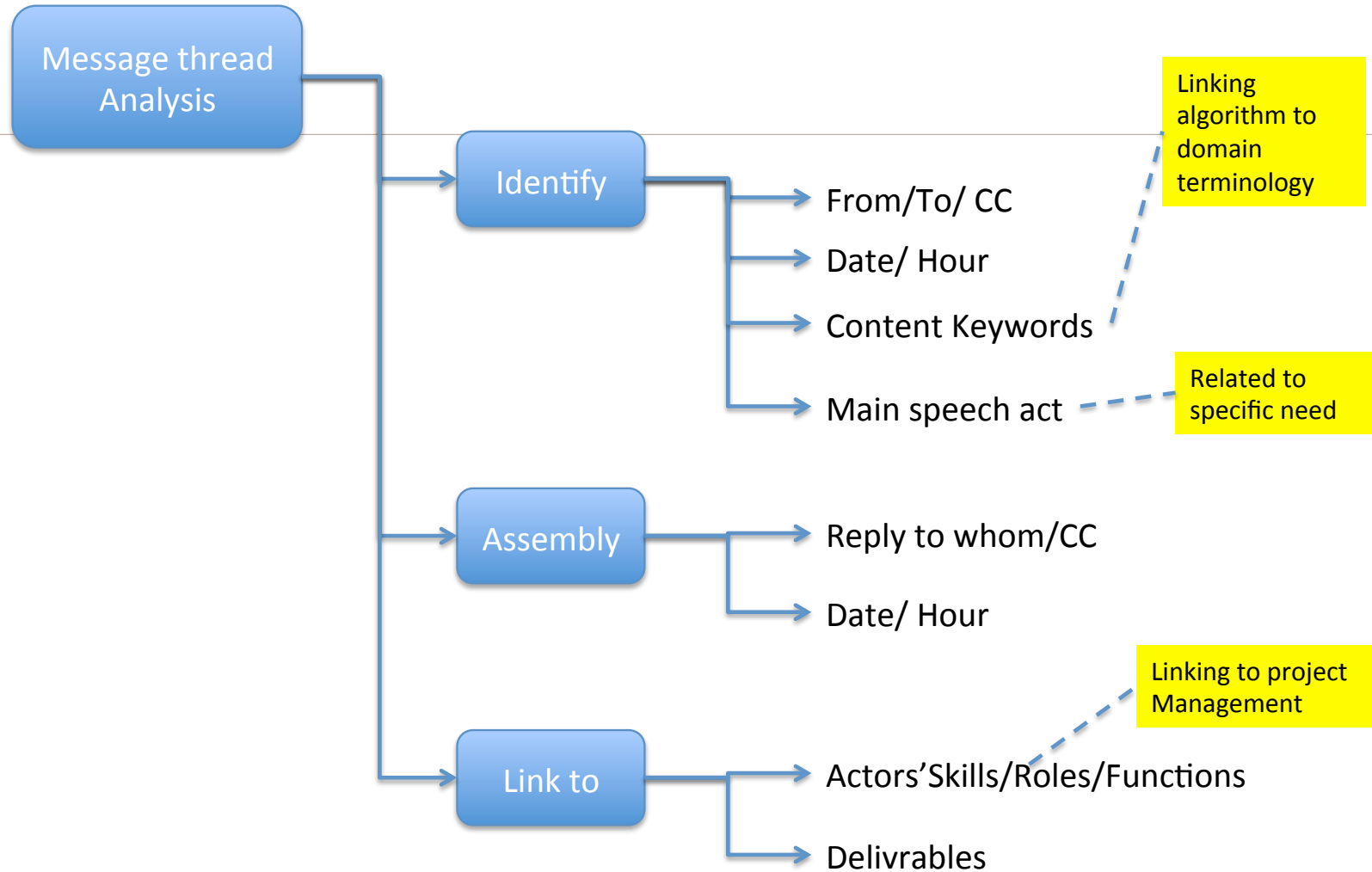
# ANALYSIS

---

- ❖ Tagging and identifying topics: (Yelati, S.; Sangal, R., 2011)
- ❖ Natural language processing to identify tasks and commitments (Kalia K.A, 2013)
- ❖ Pragmatics by studying dialogue to identify speech intention (Core et al, 1997), (Carvalho et al, 2006), (Lampert et al, 2006), De Felice et al, 2013)

***Our approach: mixing pragmatics analysis, to context reconstitution  
=> project knowledge***





# PRAGMATICS ANALYSIS

---

- ❖ REPRESENTATIVES: which commit the speaker to the truth of the expressed proposition
- ❖ DIRECTIVES: which are attempts by the speaker to get the addressee to do something
- ❖ COMMISIVES: which commit the speaker to some future course of action
- ❖ EXPRESSIVES: which express a psychological state
- ❖ DECLARATIONS: which affect immediate changes in the institutional state of affairs and which tend to rely on elaborate extra-linguistic institutions

# COORDINATION MESSAGES

---

| <b>Components of coordination</b> | <b>Associated coordination processes</b>                |
|-----------------------------------|---------------------------------------------------------|
| Goals                             | Identifying goals                                       |
| Activities                        | Mapping goals to activities. (e.g., goal decomposition) |
| Actors                            | Selecting actors, assigning activities to actors        |
| Interdependencies                 | “Managing” interdependencies                            |

[ Malone and Crowston ]

# COORDINATION ACTS GRID

---

- ❖ An informative act is an act which appoints, presents or explains a state, a role or a launch of the project.
- ❖ A descriptive act explicitly describes the achievement, changes and developments of the activity or task.
- ❖ An evaluative act contains positive or negative judgments on the implementation of the project or participants.
- ❖ A request act occurs when a participant asks another participant to accomplish a special task (action) or to give information (response). This request can be direct (order, you must, etc. or indirect (advice, proposal, suggestion, etc.).

# EXAMPLE: ANALYSIS OF DESIGN PROJECTS

---

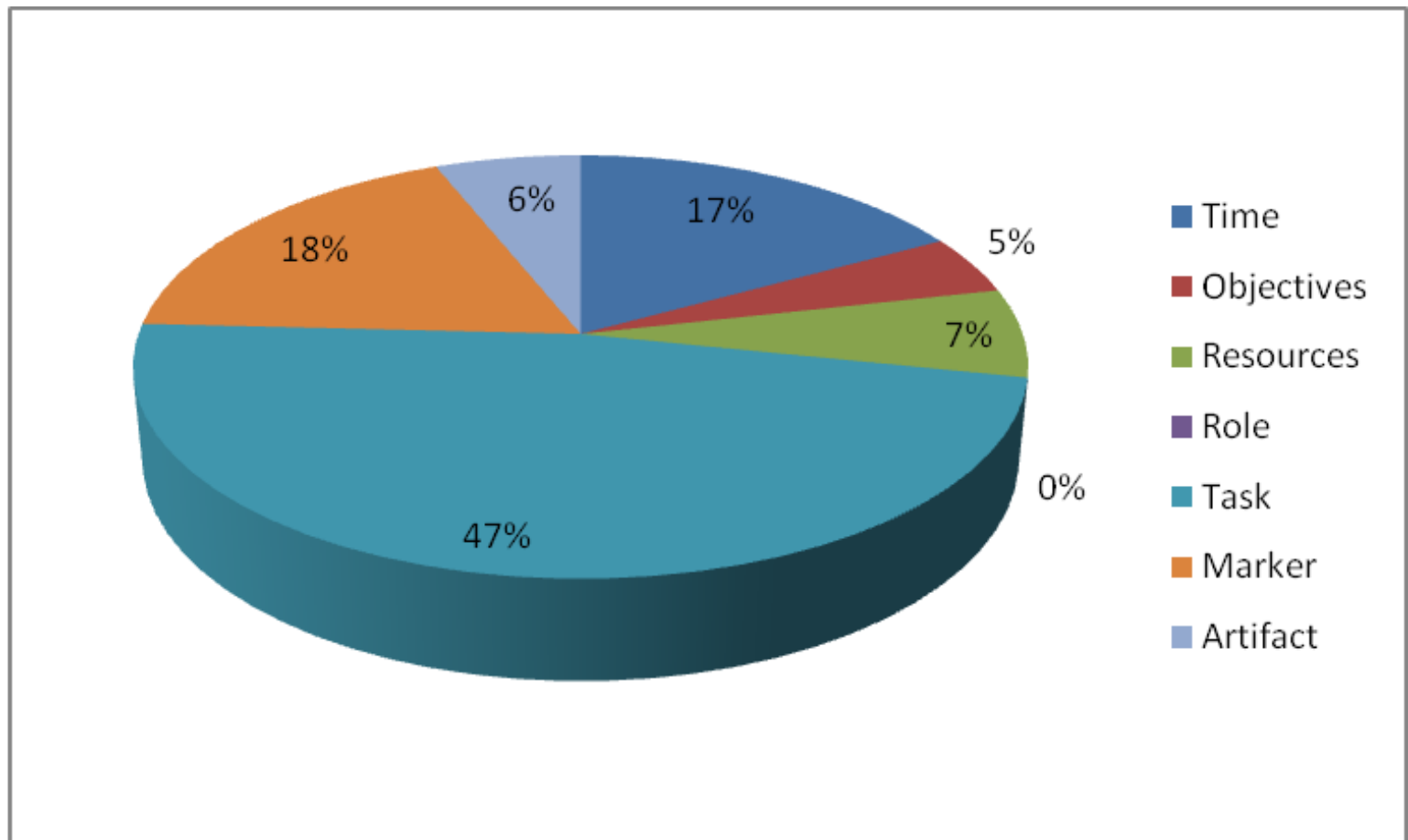
- ❖ Forum used by students in 2 engineering schools and 2 cities (UTBM and Ecole centrale Lyon)
- ❖ 4 projects: bobsleigh, a sports car, a cooker and a mobile telephone

|                          | Project messages |    |     |    |       |
|--------------------------|------------------|----|-----|----|-------|
|                          | P1               | P2 | P3  | P4 | Total |
| Number of messages       | 18               | 75 | 103 | 61 | 257   |
| Coordination messages    | 14               | 62 | 96  | 50 | 222   |
| Problem solving messages | 1                | 8  | 2   | 5  | 16    |
| Others                   | 3                | 5  | 5   | 6  | 19    |

# FIRST RESULTS

## 443 MESSAGES

---

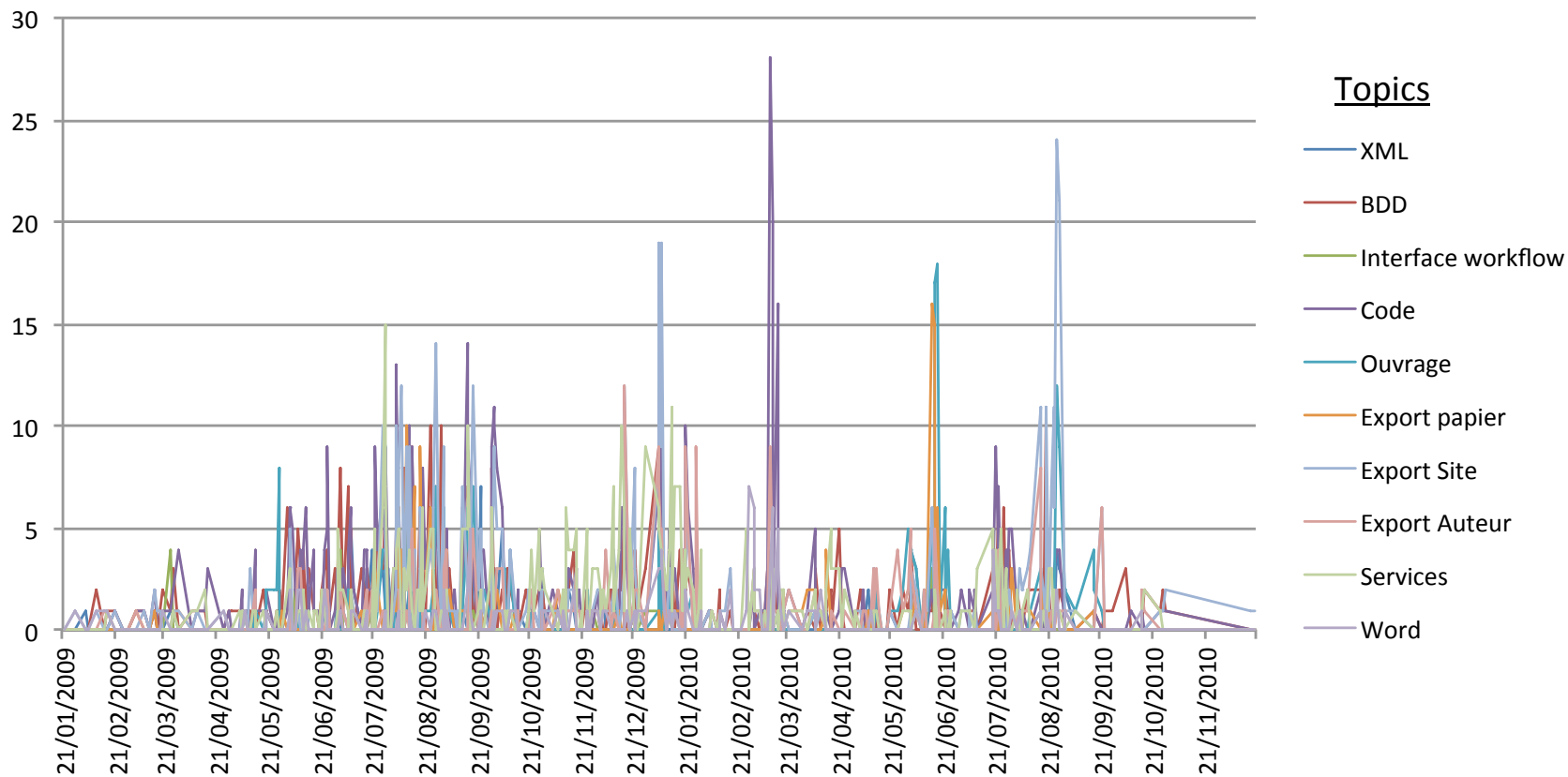


| Sentences                                                                                            | Time | Resources | Role | Task | Artifact | Action   |
|------------------------------------------------------------------------------------------------------|------|-----------|------|------|----------|----------|
| All of us are going to work on the Requirement Notebook of Souhayel ...                              |      |           | x    | x    |          | Request  |
| I just changed the file Bpwin. The PDF is a little longer to get, I'd do that soon.                  |      |           |      | X    | x        | Describe |
| I changed the 3D CAD to CAD 4D ..                                                                    |      |           |      | x    | x        | Describe |
| The file summarizing the manipulation of the ACSP is online.                                         |      | x         |      |      |          | Inform   |
| Note: The tasks in the ACSP are not really in order (creation order rather than order of execution). |      | x         |      | x    | x        | Inform   |

# ANALYSIS OF PB.SOLVING MESSAGES

---

- ❖ Request Acts -> Problem
- ❖ Linking to project organization



DB Importation

Document DB Specif & Dev

Workflow link Specif & Dev

HCI specif

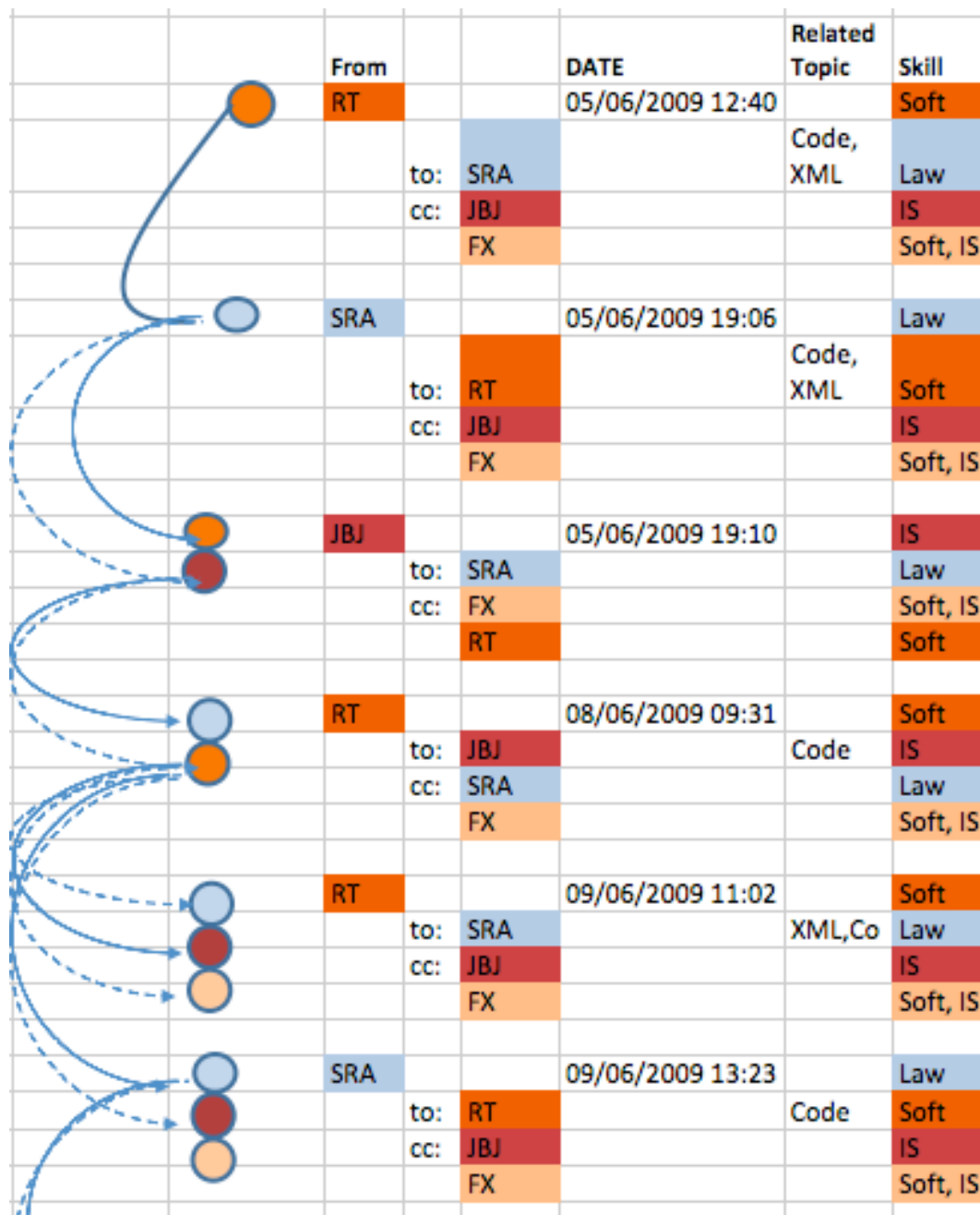
Export to Magazine and Website

Web service Dev

Test

Test

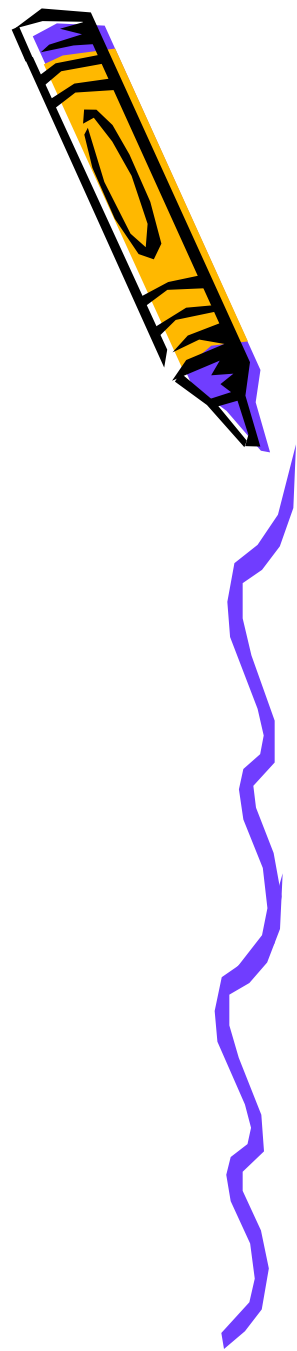
Phases



# PRAGMATICS ANALYSIS GRID

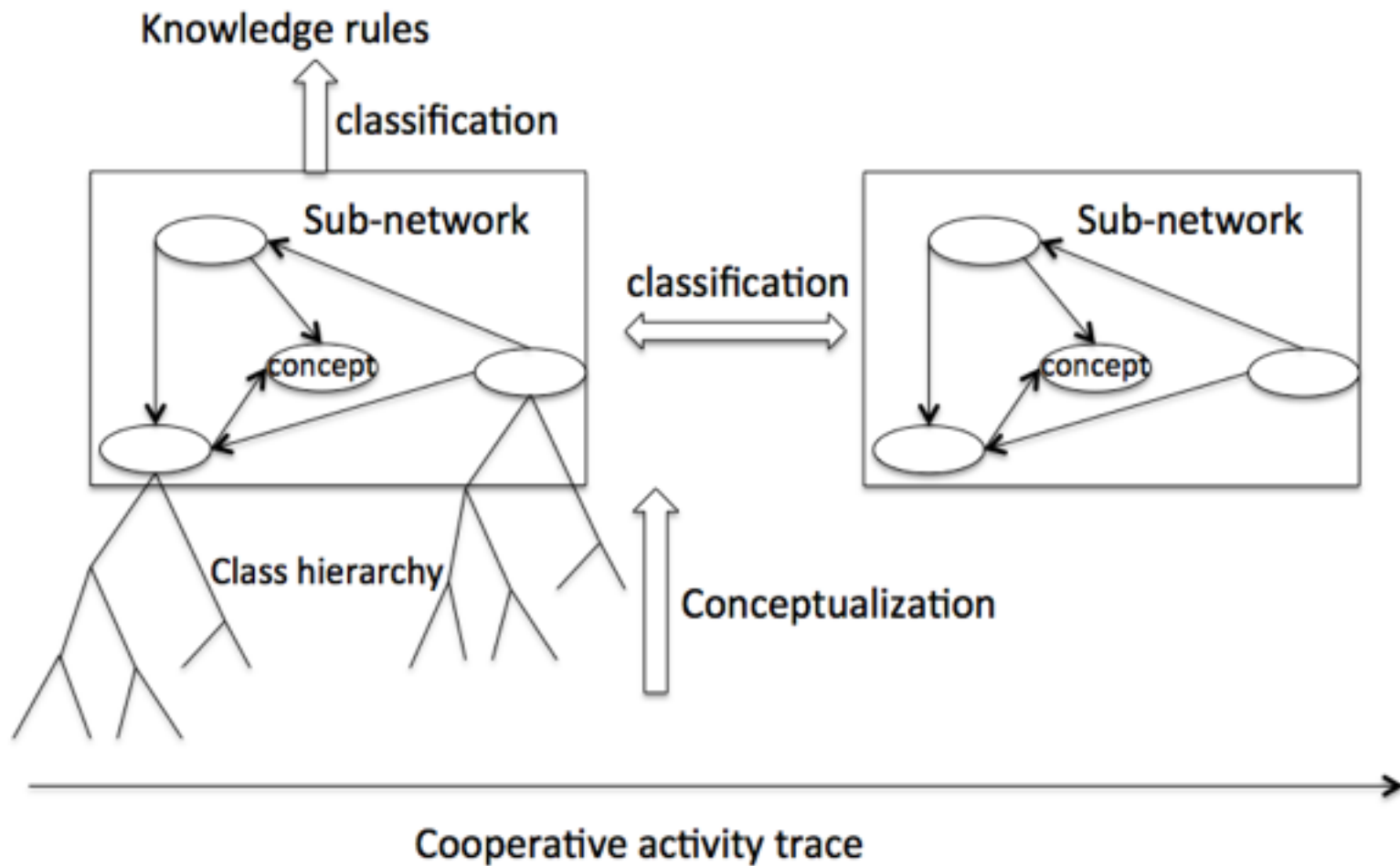
| Request Form     | Linguistic form                                          | Examples                 |
|------------------|----------------------------------------------------------|--------------------------|
| Direct request   | Imperative                                               | Do x                     |
|                  | Performative                                             | I am asking you to do x. |
|                  | Want or Need                                             | I need/want you to do x  |
|                  | Obligation statements                                    | You have to do x         |
| Indirect request | Query questions about ability of the hearer to           | Can you do x?            |
|                  |                                                          | Could you do x?          |
|                  | Query questions about Willingness of the                 | Would you like to do x?  |
|                  | Statements about the willingness (desire) of the speaker |                          |
|                  |                                                          | I would like if you can  |
|                  |                                                          | I would appreciate if    |

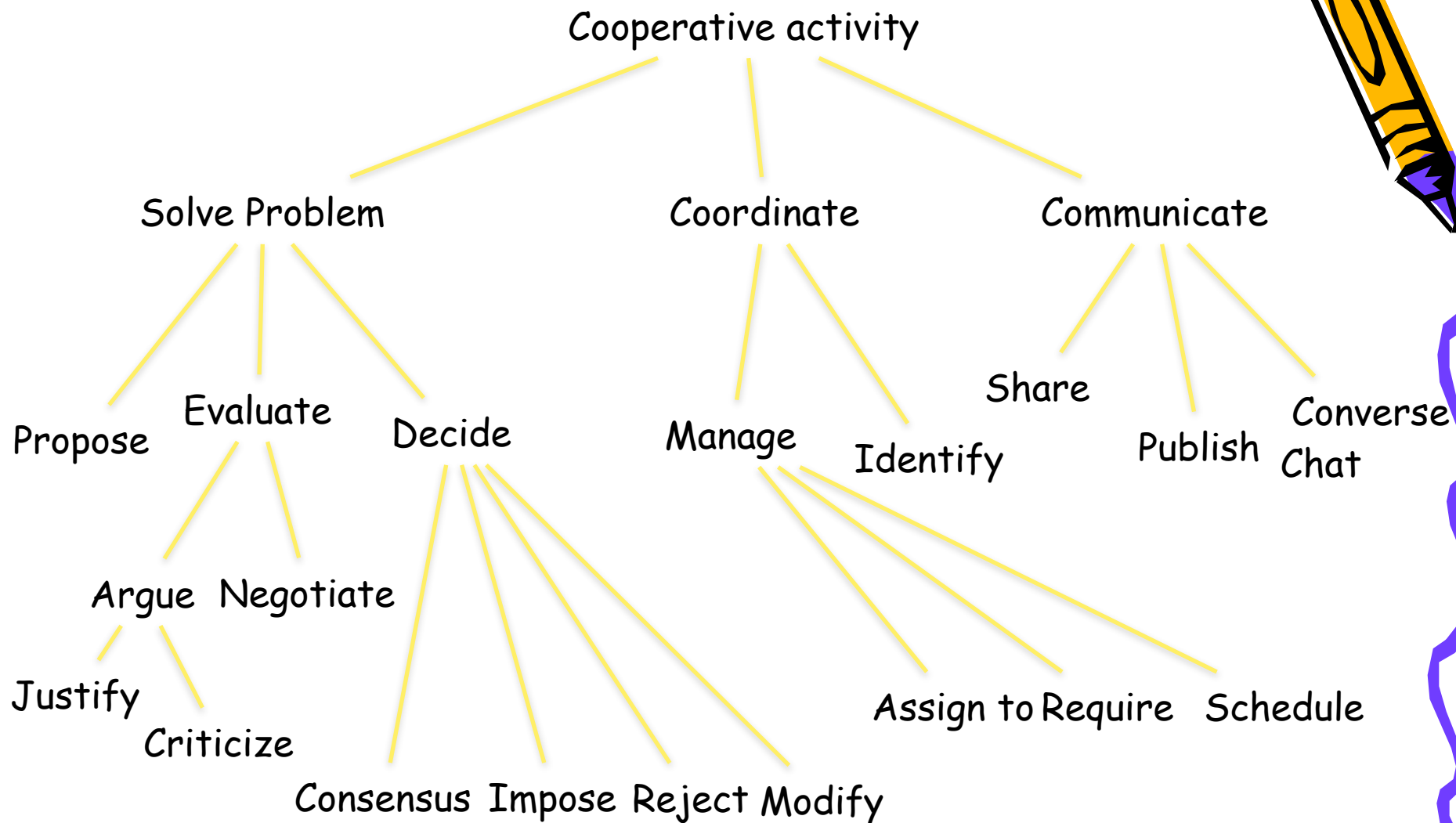
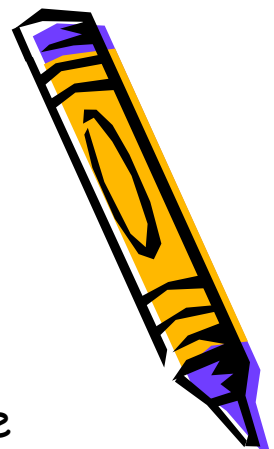
| From |     |     | Date                    | Sentence elements                                                           | Related Topic | Function |
|------|-----|-----|-------------------------|-----------------------------------------------------------------------------|---------------|----------|
| SRA  |     |     | 2009-06-05<br>12:40:46. | I put in "Bold", what <b>I need</b> :                                       |               | Request  |
|      | to: | FX  |                         | 1- *Inssurances*                                                            |               |          |
|      | cc: | JBJ |                         | 2- Text without tags Texte in XML files                                     | Code          |          |
|      |     | CV  |                         | 3- Tag Pb : Text outside tag in XML                                         | XML,<br>Code  |          |
|      |     | RT  |                         | 4- Tag Pb <b> is opened and not closed, as same as, tag is badly imbricated |               |          |
|      |     |     |                         |                                                                             |               |          |
| FX   |     |     | 2009-06-05<br>19:06:34. |                                                                             |               | Answer   |
|      | to: | SRA |                         | 1- *Inssurances*                                                            |               |          |
|      | cc: | JBJ |                         | I propose to convert: Xpress format in XML                                  | XML           |          |
|      |     | CV  |                         | Beware, the text will contain a lot of error blanc, "enter" and image       | Code          |          |
|      |     | RT  |                         | I can transform it on enriched XML                                          | XML           |          |
|      |     |     |                         |                                                                             |               |          |



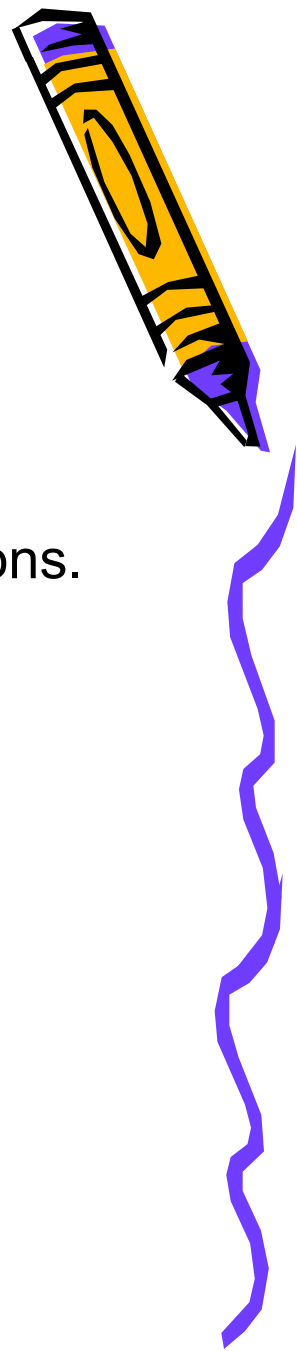
# Aggregation/Classification

Xinghang Dai





# PM Knowledge Classification



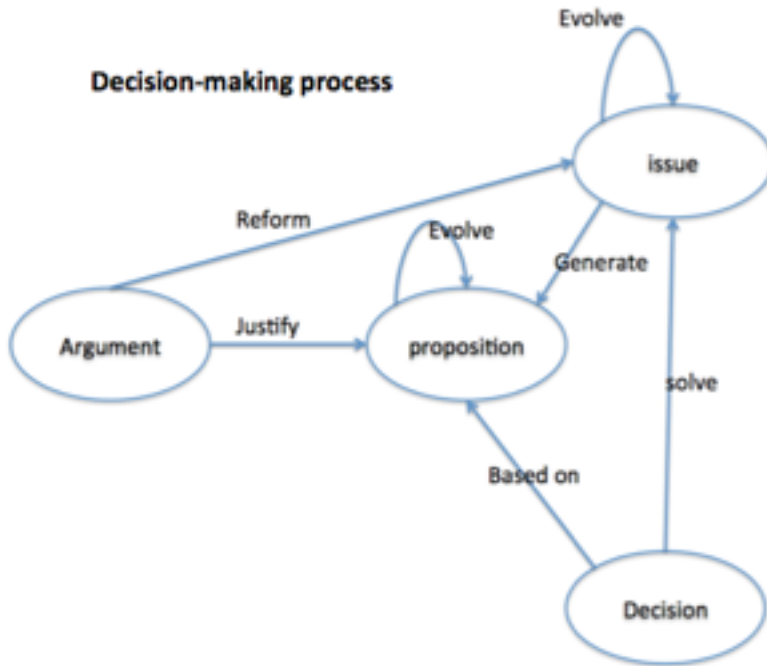
Classification based on PM knowledge structure.

Classification of networks, emphasise on concept interactions.

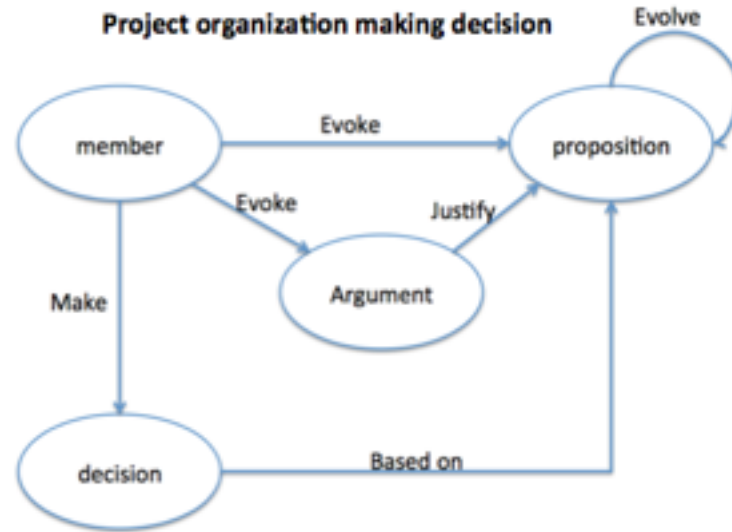
Classification of repetitive sub-network with a weight factor (probability), unique sub-network considered as explosive attempt .



**Decision-making process**



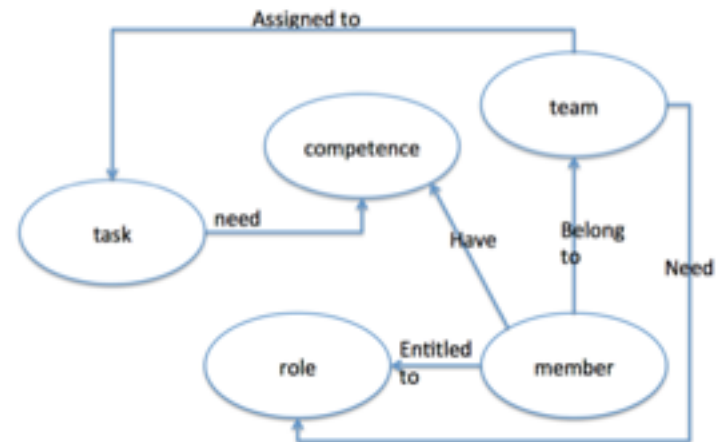
**Project organization making decision**



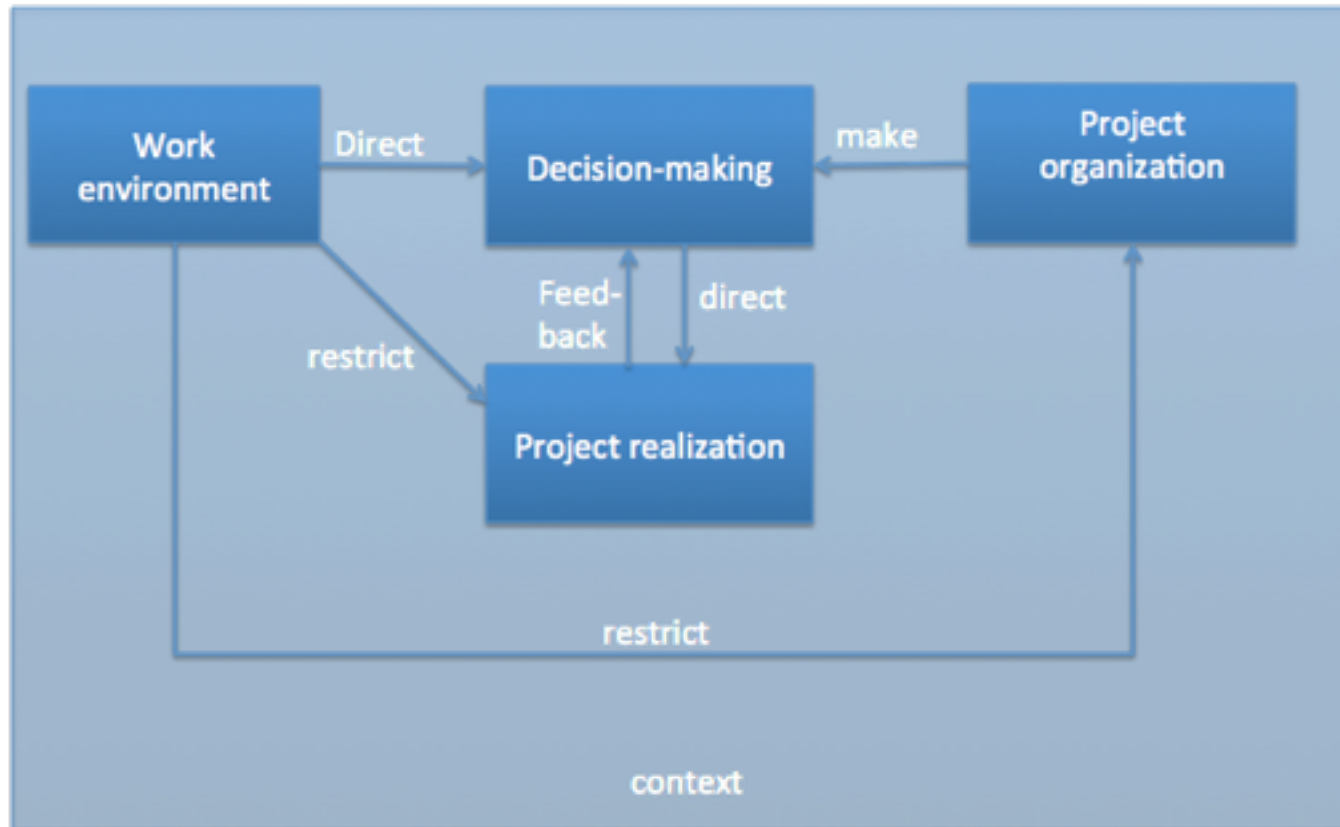
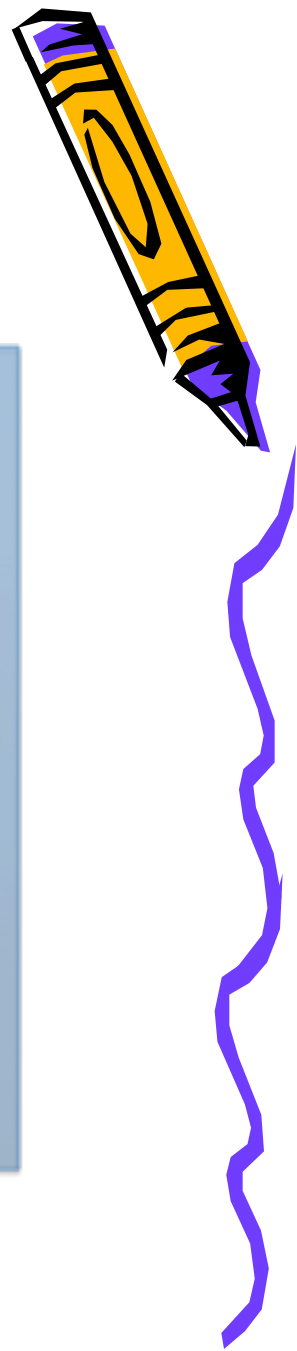
**Project realization and decision-making**



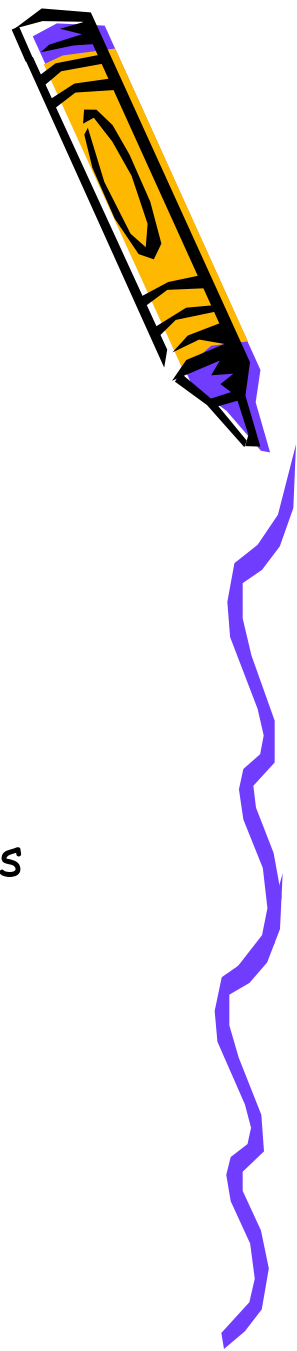
**Project organization realizing project**



Based on DRCS (Klein)



# Classification Angle Propositions



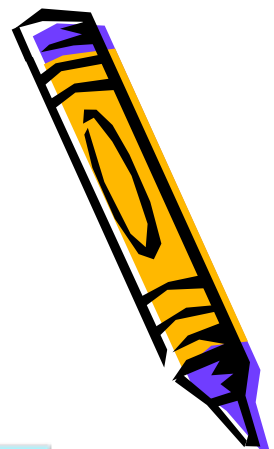
- Problem-solving rules, classification of sub-network decision-making:
- Cooperation rules, classification of project realisation and decision making :
- Management rules: organisational influence on different parts of design project.

# Exemple

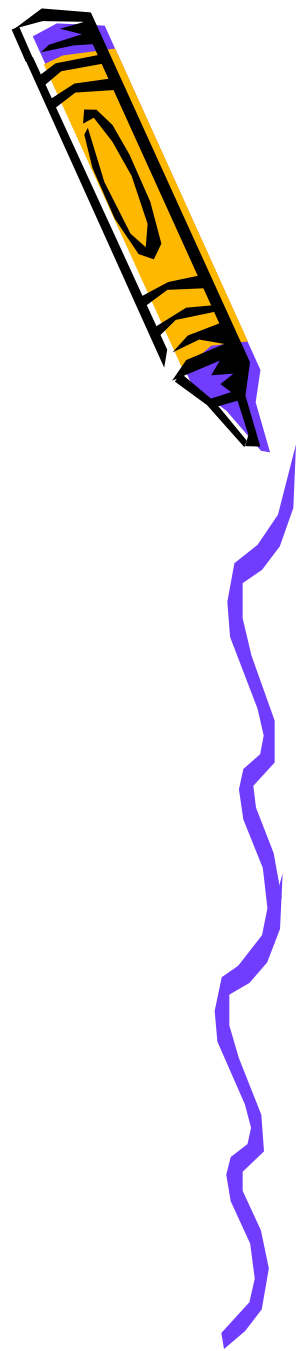
Two projects that are undertaken by two groups of students in the year 2012 and 2013, students came from major computer science and mechanical design. They are supposed to develop a tablet application for product maintenance.

MMrecord and MMreport are used to keep track of meetings, and all design documents produced during the project (diagrams, emails e.g. ) are saved for analysis.

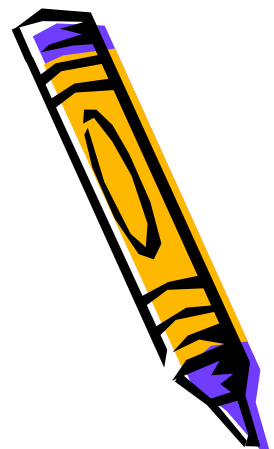




| Tablet application for product maintenance |                                                                            |          |                     |          |
|--------------------------------------------|----------------------------------------------------------------------------|----------|---------------------|----------|
| Year                                       | 2012                                                                       |          | 2013                |          |
| Issue                                      | Function definition                                                        |          | Function definition |          |
| Negotiation                                | Proposition                                                                | Argument | Proposition         | Argument |
|                                            | Tablet application for product maintenance                                 |          |                     |          |
| Issue                                      | Function definition                                                        |          |                     |          |
| Essential solutions                        | Tablet connection with PLM and ERP, object search with tablet applications |          |                     |          |
| Conditional solutions                      | Solution                                                                   |          | Condition           |          |
|                                            | Automatic object reconnaissance                                            |          | Enough budget       |          |
|                                            | PLM and ERP connection                                                     |          | Feasible technology |          |
|                                            |                                                                            |          | PLM                 |          |



| Tablet application for product maintenance |                                                                                                                                                                                                  |                                                                                                                                                    |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Year                                       | 2012                                                                                                                                                                                             | 2013                                                                                                                                               |
| Phase                                      | Project realization                                                                                                                                                                              | Project realization                                                                                                                                |
| Project organization                       | Three sub-groups for each application module (ERP, PLM, Object reconnaissance)                                                                                                                   | Three sub-groups for each application module (ERP, PLM, object search engine)                                                                      |
| Project planning                           | <ul style="list-style-type: none"><li>• 4 working meetings inside each sub-group to validate project specification</li><li>• A final meeting to simply collect each sub-group's work</li></ul>   | <ul style="list-style-type: none"><li>• 12 work meetings of whole project team</li><li>• Sub-group meetings are organized freely</li></ul>         |
| Result                                     | <ul style="list-style-type: none"><li>• Each module has its own database, the application has 3 databases in total</li><li>• Automatic image recognition increase the cost drastically</li></ul> | <ul style="list-style-type: none"><li>• Client-server architecture that requires only one database</li><li>• Centralized data management</li></ul> |



| Tablet application for product maintenance |                                                                                                                                                                                                     |                                                                                                                           |                                                                                                                                                       |                                                                                                                                   |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Year                                       | 2012                                                                                                                                                                                                |                                                                                                                           | 2013                                                                                                                                                  |                                                                                                                                   |
| Phase                                      | Project realization                                                                                                                                                                                 |                                                                                                                           | Project realization                                                                                                                                   |                                                                                                                                   |
| Project organization                       | Three sub-groups for each application module (ERP, PLM, Object reconnaissance)                                                                                                                      | Competence distribution:<br>ERP (computer science)<br>PLM (mechanical design)<br>Object reconnaissance (computer science) | Three sub-groups for each application module (ERP, PLM, object search engine)                                                                         | ERP (computer science)<br>PLM (computer science, mechanical design)<br>Object search engine (computer science, mechanical design) |
| Project planning                           | <ul style="list-style-type: none"> <li>• 4 working meetings inside each sub-group to validate project specification</li> <li>• A final meeting to simply collect each sub-group's work</li> </ul>   |                                                                                                                           | <ul style="list-style-type: none"> <li>• 12 work meetings of whole project team</li> <li>• Sub-group meetings are organized freely</li> </ul>         |                                                                                                                                   |
| Result                                     | <ul style="list-style-type: none"> <li>• Each module has its own database, the application has 3 databases in total</li> <li>• Automatic image recognition increase the cost drastically</li> </ul> |                                                                                                                           | <ul style="list-style-type: none"> <li>• Client-server architecture that requires only one database</li> <li>• Centralized data management</li> </ul> |                                                                                                                                   |

# Software Design

## Problem-solving Knowledge

The goal of this project is to design a tablet application, which aids a mechanical technician in product maintenance.

This application needs to provide pertinent knowledge concerning a certain problem of product, and enable the technician to order necessary parts to repair or replace the product; more importantly, the technician should be able to update information concerning product maintenance (e.g. report a design default, order a new product etc.)

### Project 2012

| Project 2012 on tablet application for product maintenance, issue: function definition |             |                           |                                                           |  |
|----------------------------------------------------------------------------------------|-------------|---------------------------|-----------------------------------------------------------|--|
| Proposition                                                                            | Argument    |                           | Decision                                                  |  |
| Automatic object recognition by image to detect product                                | (Defend)    | Improve efficiency        | Automatic object recognition by image                     |  |
|                                                                                        |             | Easy access               |                                                           |  |
|                                                                                        | (Criticize) | Increase budget           | Four databases                                            |  |
|                                                                                        |             | Complex development       |                                                           |  |
| Single database for all modules                                                        | (Criticize) | Need data synchronization | Information exchange between the application and ERP, PLM |  |
|                                                                                        |             | Create data redundancy    |                                                           |  |
|                                                                                        | (Defend)    | Easy administration       |                                                           |  |
| Four databases, one for each module                                                    | Null        |                           |                                                           |  |
| Information exchange between ERP and PLM                                               | (Defend)    | Reduce data redundancy    |                                                           |  |
|                                                                                        | (Criticize) | Technological obstacle    |                                                           |  |
| Information exchange between the application and ERP, PLM                              | Null        |                           |                                                           |  |

# Software Design

## *Problem-solving Knowledge*

The goal of this project is to design a tablet application, which aids a mechanical technician in product maintenance.

This application needs to provide pertinent knowledge concerning a certain problem of product, and enable the technician to order necessary parts to repair or replace the product; more importantly, the technician should be able to update information concerning product maintenance (e.g. report a design default, order a new product etc.)

### *Project 2013*

| Project 2013 on tablet application for product maintenance, issue: function definition |             |                                                     |                                                           |
|----------------------------------------------------------------------------------------|-------------|-----------------------------------------------------|-----------------------------------------------------------|
| Proposition                                                                            | Argument    |                                                     | Decision                                                  |
| Manuel search for concerning knowledge for problem                                     | (Defend)    | Easy implementation                                 | Manuel search for knowledge of concerning product         |
|                                                                                        | (Criticize) | Requires users to have certain mechanical knowledge | Single database                                           |
| Single database for all modules                                                        | (Defend)    | Centralized administration improve searching        | Information exchange between the application and ERP, PLM |
|                                                                                        |             | Secure information confidentiality                  |                                                           |
|                                                                                        |             | Evade frequent communication among the modules      |                                                           |
| Information exchange between the application and ERP, PLM                              | Null        |                                                     |                                                           |

# Software Design

## Problem-solving Knowledge

### Classification Result

| Project of tablet application design for product maintenance Issue: function definition |                                                                       |            |                                                                    |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------|--------------------------------------------------------------------|
|                                                                                         |                                                                       | Argument   |                                                                    |
| <b>Essential solutions</b>                                                              | Information exchange between the application and ERP, PLM ( $W_1=1$ ) | Null       |                                                                    |
| <b>Conditional solutions</b>                                                            | Automatic object recognition by image ( $W_2=0$ )                     | (Defend)   | Improve efficiency ( $W_{21}=0$ )                                  |
|                                                                                         |                                                                       |            | Easy access ( $W_{22}=0$ )                                         |
|                                                                                         |                                                                       | (Critique) | Increase budget ( $W_{23}=0$ )                                     |
|                                                                                         |                                                                       |            | Complex development ( $W_{24}=0$ )                                 |
|                                                                                         | Manual search for concerning knowledge for problem ( $W_3=0$ )        | (Defend)   | Easy implementation ( $W_{31}=0$ )                                 |
|                                                                                         |                                                                       | (Critique) | Requires users to have certain mechanical knowledge ( $W_{32}=0$ ) |
|                                                                                         | Single database for all modules ( $W_4=1$ )                           | (Defend)   | Centralized administration improve searching ( $W_{41}=1$ )        |
|                                                                                         |                                                                       |            | Secure information confidentiality ( $W_{42}=1$ )                  |
|                                                                                         |                                                                       |            | Evade frequent communication among the modules ( $W_{43}=1$ )      |
|                                                                                         |                                                                       | (Critique) | Need data synchronization ( $W_{44}=1$ )                           |
|                                                                                         |                                                                       |            | Create data redundancy ( $W_{44}=1$ )                              |
|                                                                                         | Four databases, one for each module ( $W_5=0$ )                       | Null       |                                                                    |
| <b>Explorative solutions</b>                                                            | Information exchange between ERP and PLM ( $W_6=0$ )                  | (Defend)   | Reduce data redundancy ( $W_{61}=0$ )                              |
|                                                                                         |                                                                       | (Critique) | Technological obstacle ( $W_{62}=0$ )                              |

# Software Design

## Management Knowledge

Project 2012

| Project 2012 on tablet application for product maintenance, issue: function definition                                                                                                                                         |            |                                                                               |                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Proposition                                                                                                                                                                                                                    | Argument   |                                                                               | Decision                                                                                                       |
| Automatic object recognition by image to detect product [Ar <sub>12</sub> , Computer_science, APP_division]                                                                                                                    | (Defend)   | Improve efficiency [Ar <sub>13</sub> , Computer_science, APP_division]        | Automatic object recognition by image [Ar <sub>12</sub> , Computer_science, APP_division]                      |
|                                                                                                                                                                                                                                |            | Easy access [Ar <sub>13</sub> , Computer_science, APP_division]               |                                                                                                                |
|                                                                                                                                                                                                                                | (Critique) | Increase budget [Ar <sub>13</sub> , Mechanical_design, ERP_division]          | Four databases [Ar <sub>12</sub> , Computer_science, APP_division]                                             |
|                                                                                                                                                                                                                                |            | Complex development [Ar <sub>13</sub> , Mechanical_design, ERP_division]      | Information exchange between the application and ERP, PLM [Ar <sub>13</sub> , Mechanical_design, ERP_division] |
| Single database for all modules [Ar <sub>12</sub> , Computer_science, APP_division]                                                                                                                                            | (Critique) | Need data synchronization [Ar <sub>13</sub> , Computer_science, APP_division] |                                                                                                                |
|                                                                                                                                                                                                                                |            | Create data redundancy [Ar <sub>13</sub> , Computer_science, APP_division]    |                                                                                                                |
|                                                                                                                                                                                                                                | (Defend)   | Easy administration [Ar <sub>13</sub> , Computer_science, APP_division]       |                                                                                                                |
| Four databases, one for each module [Ar <sub>12</sub> , Computer_science, APP_division]                                                                                                                                        | Null       |                                                                               |                                                                                                                |
| Information exchange between ERP and PLM [Ar <sub>13</sub> , Mechanical_design, ERP_division]                                                                                                                                  | (Defend)   | Reduce data redundancy [Ar <sub>13</sub> , Mechanical_design, ERP_division]   |                                                                                                                |
|                                                                                                                                                                                                                                | (Critique) | Technological obstacle [Ar <sub>13</sub> , Computer_science, APP_division]    |                                                                                                                |
| Information exchange between the application and ERP, PLM [Ar <sub>12</sub> , Mechanical_design, PLM_division]<br>[Ar <sub>12</sub> , Mechanical_design, ERP_division]<br>[Ar <sub>13</sub> , Mechanical_design, ERP_division] | Null       |                                                                               |                                                                                                                |

# Software Design

## Management Knowledge

Project 2013

| Project 2013 on tablet application for product maintenance, issue: function definition                                                                              |                                                                                                                      |                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Proposition                                                                                                                                                         | Argument                                                                                                             | Decision                                                                                                       |
| Manual search for concerning knowledge for problem<br>[Ar <sub>23</sub> ,Computer_science,APP_division]                                                             | (Defend)<br>Easy implementation<br>[Ar <sub>23</sub> ,Computer_science,ERP_division]                                 | Manual search for knowledge of concerning product<br>[Ar <sub>23</sub> ,Computer_science,APP_division]         |
|                                                                                                                                                                     | (Critique)<br>Requires users to have certain mechanical knowledge [Ar <sub>26</sub> ,Mechanical_design,APP_division] | Single database<br>[Ar <sub>23</sub> ,Computer_science,APP_division]                                           |
| Single database for all modules<br>[Ar <sub>23</sub> ,Computer_science,APP_division]                                                                                | (Defend)<br>Centralized administration improve searching<br>[Ar <sub>23</sub> ,Computer_science,APP_division]        | Information exchange between the application and ERP, PLM<br>[Ar <sub>23</sub> ,Computer_science,ERP_division] |
|                                                                                                                                                                     | Secure information confidentiality [Ar <sub>25</sub> ,Mechanical_design,PLM_division]                                |                                                                                                                |
|                                                                                                                                                                     | Evade frequent communication among the modules<br>[Ar <sub>23</sub> ,Computer_science,PLM_division]                  |                                                                                                                |
| Information exchange between the application and ERP, PLM<br>[Ar <sub>23</sub> ,Computer_science,PLM_division]<br>[Ar <sub>23</sub> ,Computer_science,ERP_division] | Null                                                                                                                 |                                                                                                                |

# Software Design

## *Management Knowledge*

### *Classification Result*

Actors with competence computer science make all the IT implementation propositions; all the usability-oriented arguments are from actors with competence mechanical design; decisions about a specific function are made by actors within the organizational division on the same function.

The variety of competences in a group can push ideas from different point of views to confront each other, which may lead to a balanced solution.

# PLM System Design

## *Problem-solving Knowledge*

This example involves two student projects in year 2014. Two groups of students majoring in mechanical design were asked to design a PLM system for a company named IRobot. The software Windchill is supposed to be used as the PLM system, but it were the students to decide how to implement this system in light of the company's situation.

### *Group 1*

| Project of PLM system design of group 1, issue: search for general solutions for PLM |             |                                                                     |                                |
|--------------------------------------------------------------------------------------|-------------|---------------------------------------------------------------------|--------------------------------|
| Proposition                                                                          | Argument    |                                                                     | Decision                       |
| Change the organization of company                                                   | (Defend)    | All possible solutions need to be proposed                          | 1. Implementation of Windchill |
|                                                                                      |             | Company's organization have to be the same as PLM system            |                                |
|                                                                                      | (Criticize) | The PLM system allows to assign different roles in the system       |                                |
|                                                                                      |             | PLM solution need to focus on technical aspect but not organization |                                |
| Implementation of Windchill                                                          | Null        |                                                                     |                                |

# PLM System Design

## *Problem-solving Knowledge*

This example involves two student projects in year 2014. Two groups of students majoring in mechanical design were asked to design a PLM system for a company named IRobot. The software Windchill is supposed to be used as the PLM system, but it were the students to decide how to implement this system in light of the company's situation.

### *Group 2*

| Project of PLM system design of group 2 , issue: search for general solutions for PLM |             |                                                                |                                                                                                                          |
|---------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Proposition                                                                           | Argument    |                                                                | Decision                                                                                                                 |
| Change the organization of the company from client oriented to product oriented       | (Defend)    | Product oriented organization is more compatible with PLM      | 1. Change the organization of the company from client oriented to product oriented<br><br>2. Implementation of Windchill |
|                                                                                       |             | The work mode of the company need to change in order to reduce |                                                                                                                          |
|                                                                                       | (Criticize) | Company needs long time to adjust to new organization change   |                                                                                                                          |
| Implementation of Windchill                                                           | Null        |                                                                |                                                                                                                          |

# PLM System Design

## *Problem-solving Knowledge*

This example involves two student projects in year 2014. Two groups of students majoring in mechanical design were asked to design a PLM system for a company named IRobot. The software Windchill is supposed to be used as the PLM system, but it were the students to decide how to implement this system in light of the company's situation.

### *Classification Result*

| Project of PLM system design , issue: search for general solutions for PLM |                                                                               |             |                                                                                           |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------|
|                                                                            |                                                                               | Argument    |                                                                                           |
| Essential solutions                                                        | Implementation of Windchill ( $W_1=1$ )                                       | Null        |                                                                                           |
| Conditional solutions                                                      | Change company's organization into product-oriented organization. ( $W_2=1$ ) | (Defend)    | All possible solution needs to be proposed ( $W_{21}=0$ )                                 |
|                                                                            |                                                                               |             | Work mode need to change completely in the face of fluctuant client demand ( $W_{22}=0$ ) |
|                                                                            |                                                                               |             | Company's organization should be adjusted to PLM system ( $W_{23}=1$ )                    |
|                                                                            |                                                                               | (Criticize) | The company needs long time to adjust to organization changes ( $W_{24}=0$ )              |
|                                                                            |                                                                               |             | PLM system allows to assign roles in the system ( $W_{25}=0$ )                            |
|                                                                            |                                                                               |             | PLM solution need to focus on technical solutions ( $W_{26}=0$ )                          |

# PLM System Design

## Management Knowledge

Group 1

| Project of PLM system design of group 1, issue: search for general solutions for PLM                                                  |             |                                                                                                                          |                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Proposition                                                                                                                           | Argument    |                                                                                                                          | Decision                                                                         |
| Change the organization of company [Ar <sub>15</sub> , Mechanical_system, Exterior_UTT]                                               | (Defend)    | All possible solutions need to be proposed [Ar <sub>15</sub> , Mechanical_system, Exterior_UTT]                          | Implementation of Windchill [Ar <sub>15</sub> , Mechanical_system, Interior_UTT] |
|                                                                                                                                       |             | Company's organization have to be the same as PLM system [Ar <sub>15</sub> , Mechanical_system, Interior_UTT]            |                                                                                  |
|                                                                                                                                       | (Criticize) | The PLM system allows to assign different roles in the system [Ar <sub>15</sub> , Mechanical_system, Interior_UTT]       |                                                                                  |
|                                                                                                                                       |             | PLM solution need to focus on technical aspect but not organization [Ar <sub>15</sub> , Mechanical_system, Interior_UTT] |                                                                                  |
| Implementation of Windchill [Ar <sub>15</sub> , Mechanical_system, Interior_UTT] [Ar <sub>15</sub> , Mechanical_system, Interior_UTT] | Null        |                                                                                                                          |                                                                                  |

# PLM System Design

## Management Knowledge

Group 2

| Project of PLM system design of group 2, issue: search for general solutions for PLM                                                                                                       |             |                                                                                                                                                                          |                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Proposition                                                                                                                                                                                | Argument    |                                                                                                                                                                          | Decision                                                                                                                                                                                                                       |
| Change the organization of the company from client oriented to product oriented [Ar <sub>25</sub> , Mechanical_system, Interior_UTT]                                                       | (Defend)    | Product oriented organization is more compatible with PLM [Ar <sub>25</sub> , Mechanical_system, Interior_UTT]                                                           | 1. Change the organization of the company from client oriented to product oriented [Ar <sub>26</sub> , Mechanical_system, Interior_UTT]<br>2. Implementation of Windchill [Ar <sub>26</sub> , Mechanical_system, Interior_UTT] |
|                                                                                                                                                                                            |             | The work mode of the company need to change in order to reduce [Ar <sub>25</sub> , Mechanical_system, Interior_UTT] [Ar <sub>25</sub> , Mechanical_system, Interior_UTT] |                                                                                                                                                                                                                                |
|                                                                                                                                                                                            | (Criticize) | Company needs long time to adjust to new organization change [Ar <sub>26</sub> , Mechanical_system, Interior_UTT]                                                        |                                                                                                                                                                                                                                |
| Implementation of Windchill [Ar <sub>25</sub> , Mechanical_system, Interior_UTT] [Ar <sub>26</sub> , Mechanical_system, Interior_UTT] [Ar <sub>26</sub> , Mechanical_system, Exterior_UTT] | Null        |                                                                                                                                                                          |                                                                                                                                                                                                                                |

# PLM System Design

## *Management Knowledge*

### *Classification Result*

The actor's organizational state may influence the decision-making: actors who are physically exterior of organization tends to be less important than actors who are physically present in a decision making process.

# Eco-Design

## Problem-solving Knowledge

### Group 1

This example evolves two master students projects. The project ask student to develop an eco-design mythology for a specific product. The first group work with a French light company Festlight, they are supposed to come up with certain design concepts in order to reduce the energy consumption of the product. The second group is asked to work on the lamp FACOM 779-CI, and the project team is supposed to offer design concepts to reduce the product's environmental consequence during.

| Project on eco-design for lights of group 1, issue: eco-innovation |             |                                             |                                                                                                                                                                 |
|--------------------------------------------------------------------|-------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Proposition                                                        | Argument    |                                             | Decision                                                                                                                                                        |
| Replace aluminium by recycled steel                                | (Defend)    | Less pollution in production                | 1. The structure can be in recycled aluminium<br><br>2. The structure can be rigid PVC material<br><br>3. The LED can be replaced by a less power-consuming LED |
|                                                                    | (Criticize) | Increase the weight of product              |                                                                                                                                                                 |
| Replace the primary aluminium by secondary aluminium               | (Defend)    | The property of material remains the same   |                                                                                                                                                                 |
|                                                                    |             | Reduce environmental effects                |                                                                                                                                                                 |
| Replace aluminium by PVC                                           | (Defend)    | The weight of product is reduced            |                                                                                                                                                                 |
| Replace aluminium by thermoplastic material                        | (Defend)    | The weight is reduced                       |                                                                                                                                                                 |
|                                                                    | (Criticize) | Complicated technology                      |                                                                                                                                                                 |
| Delete unnecessary power supply                                    | Null        |                                             |                                                                                                                                                                 |
| Replace present LED with less power-consuming LED                  | (Defend)    | Reduce power consumption                    |                                                                                                                                                                 |
|                                                                    | (Criticize) | The light will be darker                    |                                                                                                                                                                 |
| Reduce the number of LED                                           | Null        |                                             |                                                                                                                                                                 |
| Use a LED cable driven by solar power                              | (Criticize) | The solar panel is too big for installation |                                                                                                                                                                 |

# Eco-Design

## Problem-solving Knowledge

This example evolves two master students projects. The project ask student to develop an eco-design mythology for a specific product. The first group work with a French light company Festlight, they are supposed to come up with certain design concepts in order to reduce the energy consumption of the product. The second group is asked to work on the lamp FACOM 779-CI, and the project team is supposed to offer design concepts to reduce the product's environmental consequence during.

### Group 2

| Project on eco-design for lights of group 2, issue: eco-innovation |                      |      |                                |
|--------------------------------------------------------------------|----------------------|------|--------------------------------|
| Proposition                                                        | Argument             |      | Decision                       |
| Integrate a Peltier module with a Ceeback effect                   | Innovation           | 1.75 | 1. Auto-lighted working gloves |
|                                                                    | Feasibility          | 3.5  |                                |
|                                                                    | Environmental effect | 3.25 |                                |
|                                                                    | Cost                 | 2.5  |                                |
| Auto-lighted working gloves                                        | Innovation           | 2.66 |                                |
|                                                                    | Feasibility          | 3    |                                |
|                                                                    | Environmental effect | 2.66 |                                |
|                                                                    | Cost                 | 2.83 |                                |
| Integrate a O-LED                                                  | Innovation           | 2.88 |                                |
|                                                                    | Feasibility          | 3    |                                |
|                                                                    | Environmental effect | 3.22 |                                |
|                                                                    | Cost                 | 2.55 |                                |

# Eco-Design

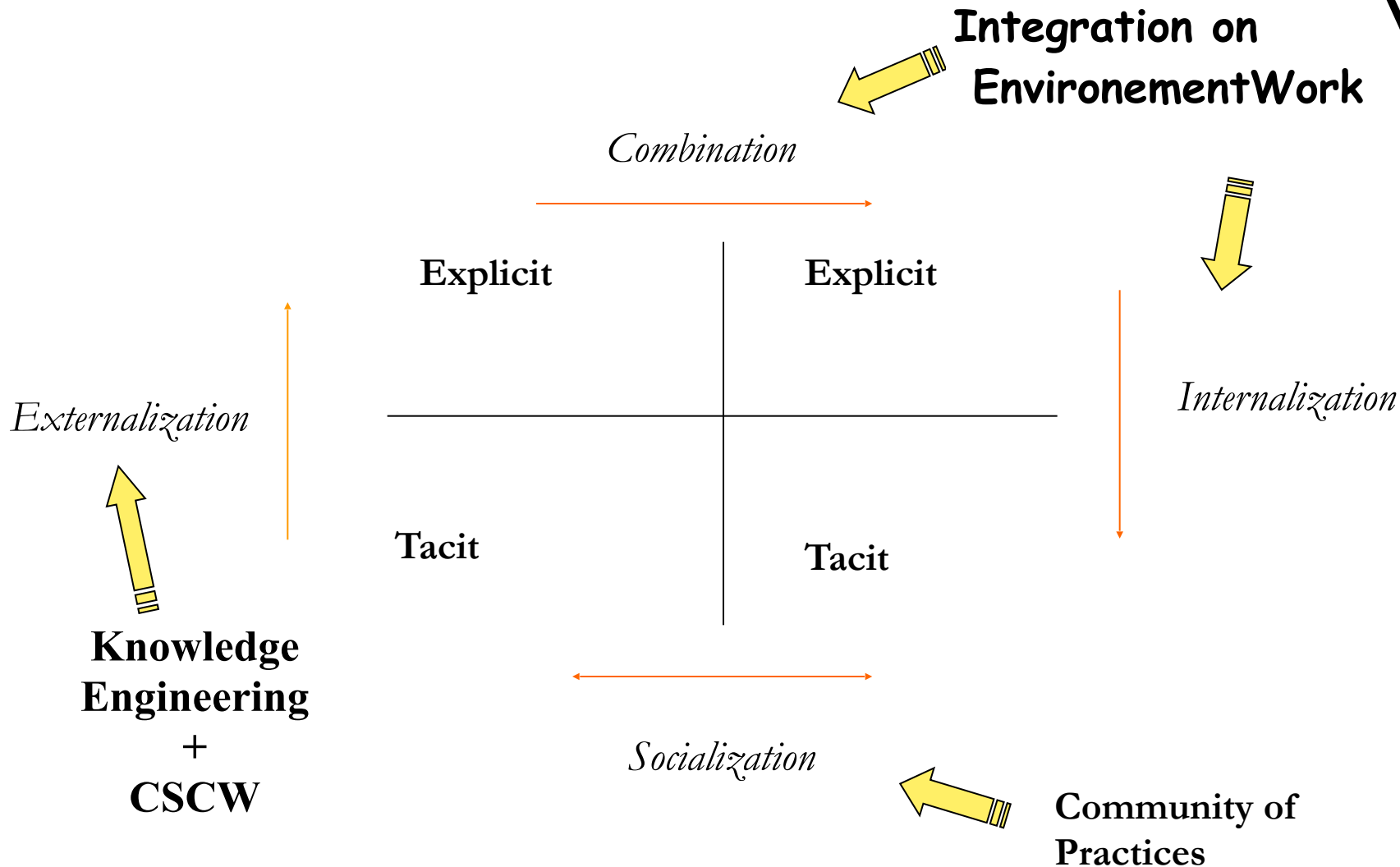
## Problem-solving Knowledge

### Classification Result

The second group's decision-making process remains incomprehensible and impossible to be learned without a semantic representation of arguments. The second case is considered noisy model instance and cannot be classified

| Project of eco-design for lights, Issue: eco-innovation |                                                                   |             |                                                            |
|---------------------------------------------------------|-------------------------------------------------------------------|-------------|------------------------------------------------------------|
|                                                         |                                                                   | Argument    |                                                            |
| Essential solutions                                     | The structure can be in recycled aluminium ( $W_1=0$ )            | (Defend)    | The property of material remains the same ( $W_{11}=0$ )   |
|                                                         |                                                                   |             | Reduce environmental effects ( $W_{12}=0$ )                |
|                                                         | The structure can be rigid PVC material ( $W_2=0$ )               | (Defend)    | The weight of product is reduced ( $W_{21}=0$ )            |
|                                                         | The LED can be replaced by a less power-consuming LED ( $W_3=0$ ) | (Defend)    | Reduce power consumption ( $W_{31}=0$ )                    |
|                                                         |                                                                   | (Criticize) | The light will be darker ( $W_{32}=0$ )                    |
|                                                         |                                                                   |             |                                                            |
| Conditional solutions                                   | Replace aluminium by recycled steel ( $W_4=0$ )                   | (Defend)    | Less pollution in production ( $W_{41}=0$ )                |
|                                                         |                                                                   | (Criticize) | Increase the weight of product ( $W_{42}=0$ )              |
|                                                         | Replace aluminium by thermoplastic material ( $W_5=0$ )           | (Defend)    | The weight is reduced ( $W_{51}=0$ )                       |
|                                                         |                                                                   | (Criticize) | Complicated technology ( $W_{52}=0$ )                      |
|                                                         | Delete unnecessary power supply ( $W_6=0$ )                       | Null        |                                                            |
|                                                         | Reduce the number of LED ( $W_7=0$ )                              | Null        |                                                            |
|                                                         | Use a LED cable driven by solar power ( $W_8=0$ )                 | (Criticize) | The solar panel is too big for installation ( $W_{81}=0$ ) |

# Conclusion: Cooperative Knowledge



# Conclusion

- Answer to : how to capitalize knowledge from cooperative daily work
  - Design projects
- Traceability and Aggregation techniques
- First integration on PLM and Agile



# Future work



- More tests: Communication, and decision making
- More integration in work environment
  - Learning: Develop actors search and guiding tools
  - Combining memory tools and project management
- Typing concepts in ontology

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