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Palette

Pedagogically sustained Adaptive LEarning Through the exploitation of Tacit and Explicit knowledge

Instrument: Integrated Project

Thematic Priority: Technology-enhanced learning

D.KNO.05 – Extensions of O'CoP Ontology

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Deliverable manager

- Rose Dieng-Kuntz, INRIA

List of Contributors

- Brigitte Denis, ULg
- Rose Dieng-Kuntz, INRIA
- Adil El Ghali, INRIA
- Benjamin Gateau, CRP-HT
- Jean-David Labails, CRP-HT
- Bassem Makni, INRIA
- Yannick Naudet, CRP-HT
- Robert Peeters, ULg
- Stéphane Rieppi, ULg
- Amira Tifous, INRIA
- Étienne Vandeput, ULg.
- Géraldine Vidou, CRP HT

List of Evaluators

- Amaury Daele, UFR
- Luc Vandenabeele, CRP-HT

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Summary
This deliverable first analyzes some integration problems encountered during the integration of the O'CoP ontology that was developed by several ontologists. Then, we describe several experiments of development of CoP-specific ontologies

- Natural Language processing (NLP) tools were used by Knowledge Management (KM) service developers for analyzing a corpus of e-mails of the @pretic CoP, so as to develop a *"Technical Problem"* ontology. We also reused an existing hierarchy in order to build the *Ontopedia* ontology. Last, the development of the ontologies *"Human Problems"* and *"Learning and Teaching"* for the @pretic CoP relied on brainstormings between the CoP mediator and the CoP members.
- For the Form@Hetice CoP, the ontology was aimed at being used by the BayFac system offering service of document classification, and was developed by the service developers, with a validation by the Form@Hetice CoP mediator.
- For Learn-Nett CoP, the ontology was also aimed at being used by the BayFac system, and was developed by the service developers and the CoP mediator (who was also a member of the CoP), with a continuous validation by a CoP focus group.
- For the TFT CoP, tbe ontology was developed manually by the CoP mediator through a folksonomy obtained using tags on the CoP documents, according to social tagging approach.

At the end of the deliverable, we compare these different ontologies with related work and we analyze them from reusability viewpoint.

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Learn-Nett Ontology	Geraldine Vidou, Yannick Naudet, Benjamin Gateau, Jean-David Labails
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1 – Chapter 1: Introduction

In D.KNO.01 [Vidou et al, 2006a], and in [Vidou et al, 2006b], we had proposed generic models useful for modeling CoPs. In D.KNO.02 [Tifous et al, 2007a] and in [Tifous et al,2007b, 2007c], we had proposed the O'CoP ontology, aimed both at modeling a CoP and at annotating its resources. This ontology had a structure based on several layers: a high-level, generic layer (based on the generic models proposed in [Vidou et al, 2006], a middle-layer and a specific layer.
Moreover, the O'CoP ontology relied on several semantic axes corresponding mainly to our generic models (e.g. Community, Actor, Competency, Resource, Activity, Collaboration, Learner-profile, Decision-making, etc), and each of the ontologists was responsible for the development of one or 2 sub-ontologies corresponding to such semantic axes. Therefore once the different sub-ontologies were available, we needed a work of integration so as to obtain a unique ontology, the so-called O'CoP.

Moreover, several Palette CoPs needed to develop their own specific ontologies, since the O'CoP ontology did not include concepts very specific to some CoP's domain Indeed, for some Palette CoPs, in addition to the specific concepts already modeled in the specific layer of O'CoP ontology, some specific domain concepts can be useful for annotating the CoP's resources. The deliverable will report several experiments of development of such CoP-specific ontologies. For each CoP considered, the methods used for developing the CoP-dedicated ontology, the ontology itself and the lessons learnt form its building or from its use are reported in this deliverable.

Chapter 2 analyzes some integration problems encountered during the integration of the sub-ontologies developed by several ontologists, so as to obtain an integrated O'CoP ontology.

Chapter 3 describes the ontologies developed for @pretic CoP. We used Natural Language processing (NLP) tools for analyzing a corpus of e-mails of the @pretic CoP, so as to develop a *"Technical Problem"* ontology. We also reused an existing hierarchy in order to build the *Ontopedia* ontology. ontologies Last, the development of the ontologies *"Human Problems"* and *"Learning and Teaching"* for the @pretic CoP relied on brainstormings between the CoP mediator and the CoP members.

Chapter 4 describes the Form@Hetice ontology, developed for enabling the classification of Form@Hetice documents through the Bayfac service.

By the same way, chapter 5 presents the Learn-Nett ontology aimed at being used by the Bayfac system offering service of document classification,

Then chapter 6 describes the new TFT CoP, and its ontology developed manually by the CoP mediator by relying on a folksonomy-based approach.

Chapter 7 emphasizes the variety of the approaches thus used, compares the ontologies thus developed with related work and analyzes them from reusability viewpoint, in order to determine which part of them may be reusable and could be integrated in the official O'CoP ontology so as to be available for other CoPs.

2 – Chapter 2: O'CoP Ontology

2.1 Integration of the O'CoP ontology

In this deliverable, we will present the current achievements on the integration of the different sub-ontologies built in the context of the task 2 of WP3, by explaining the difficulties encountered during the integration and illustrating them with some examples.
As a reminder, the O'CoP ontology building approach was both bottom-up (it relied on a deep analysis of the corpora on the CoPs), and top-down (it was guided by our generic models). The reader can see D.KNO.02 and [Tifous et al, 2007a, 2007b] for more details. It was also a distributed, cooperative process between:

- Six ontologists focusing on different parts of the ontology since each one was guided by one or several generics models, corresponding to the different semantic axes of the ontology (e.g. Community, Actor, Competency, Resource, Activity, Collaboration, Learner-profile, Decision-making)
- Eleven CoP mediators playing the role of validation from the CoPs viewpoints.

This led to the need of integration of different viewpoints since the different ontologists had various ways of modeling knowledge.
First, we had to introduce some relations between the concepts identified in each sub-ontology. Indeed, some high-level relations have been identified between the top-level concepts, when building the generic models. These relations have been refined, and some others added so as to link the concepts structured by each ontologist. Then, the integration of different sub-ontologies led sometimes to perform a deeper analysis of them, and consequently refine them when some views had not been considered by the ontologist responsible for building the sub-ontology.

2.1.1 Introduction of new relations

Fig. 2.1 shows a part of the high level ontology, constituted of the generic models linked altogether. It illustrates the definition of a *Competency*, linked to the high-level concepts of *Actor* and *Role*.

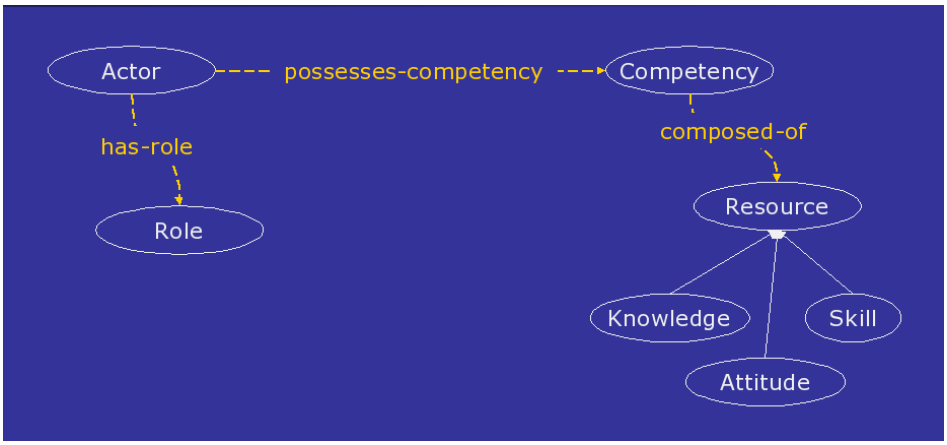

Fig. 2.1: Link between Actor and Competency (Version 1)

The sub-ontologies related respectively to the concepts of *Competency* and *Role* have been built by two different ontologists, resulting in the sub-ontologies illustrated by Fig. 2.2, where two kinds of Roles are distinguished (*Governance Roles*, amongst which we define the role of *Facilitator*, and *Peripheral Roles*) and the *Competency* hierarchy is refined (where the *Leadership* is considered as being a kind of *Attitude*).

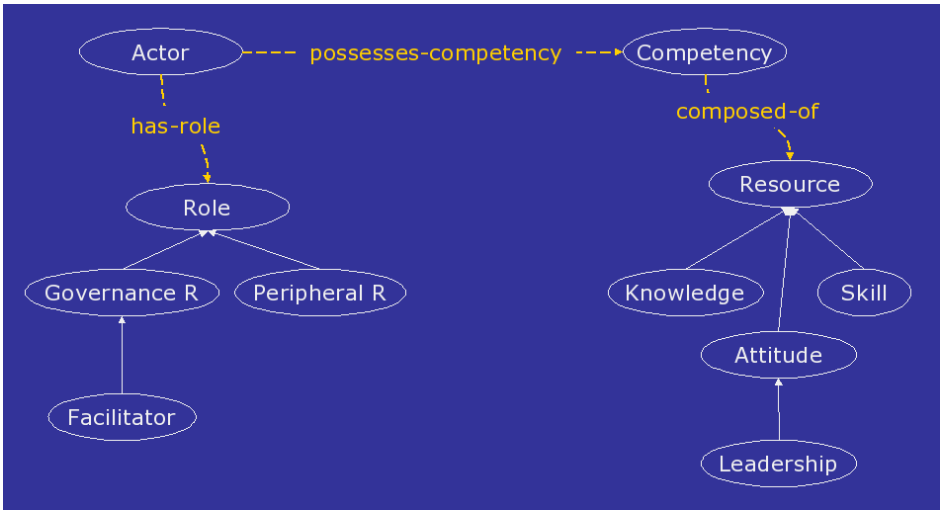

Fig. 2.2: Link between Actor and Competency (Version 2)

However, defining the hierarchies and relations between the concepts of each hierarchy is not sufficient to describe a CoP. Thus, we needed to investigate whether there exists any relation between the concepts identified in each of the sub-ontologies.
In the excerpts of the sub-ontologies related to *Actor* and *Competency*, illustrated in this example, we clearly identify the *Role* of *Facilitato*r as being a *Governance Role* that encourages the participation of the members of the CoP and facilitates their interactions. A *Facilitator* thus needs to have an *Attitude* of *Leadership* to play this role.
This is how the "*has-attitude*" relation is identified between these two concepts belonging to two different sub-ontologies (Fig. 2.3).

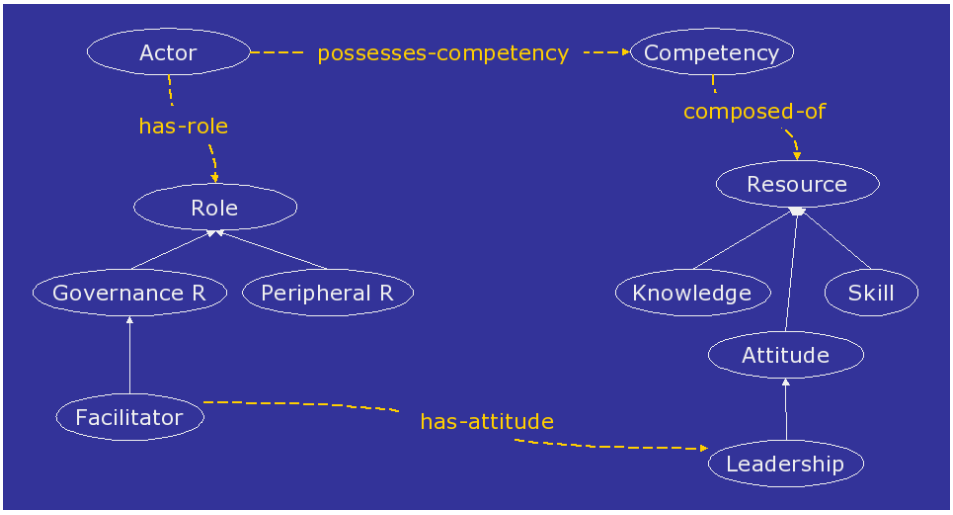

Fig. 2.3: Link between Actor and Competency (Version 3)

2.1.2 Relations and hierarchy refinement

When identifying the hierarchy inherent to the concept of *Actor*, the ontologist in charge of it also identified some high-level relations, linking the *Members* of a CoP to the *Resources* that they use and/or produce, through an ownership relation, as illustrated in the Fig. 2.4.

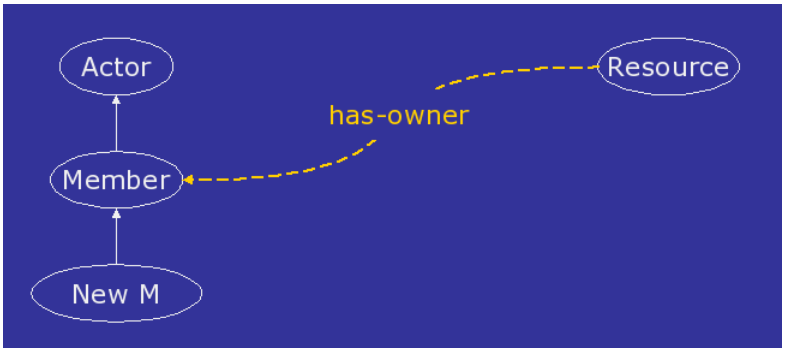

Fig. 2.4: Link between Actor and Resource (Version 1)

Then, the hierarchy related to the concept of *Resource* has been refined, and one of the dimensions considered to refine it was the ownership dimension. Thus, we distinguished the *Owned resources* from the *Orphan* ones.

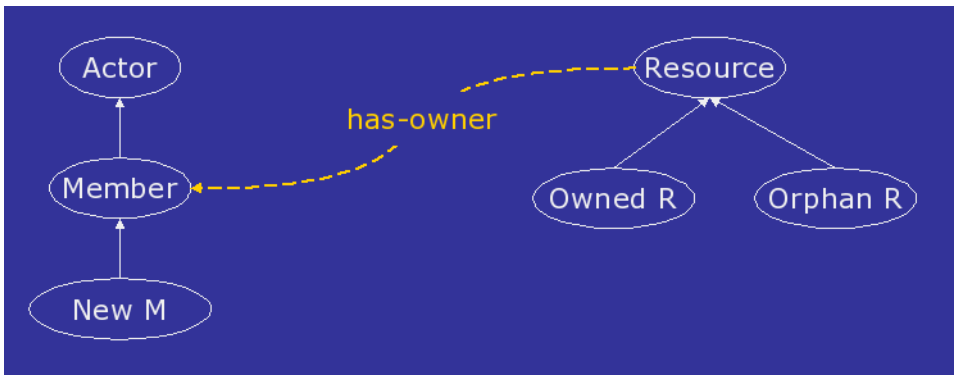

Fig. 2.5: Link between Actor and Resource (Version 2)

An *Orphan resource* being a *Resource* that is owned by someone who was but is no longer a *Member* of the CoP, this concept of *Orphan resource* has to be linked to the concept of *Former member*, not considered in the hierarchy of the *Members* of a CoP, but necessary to characterize the *Orphan resources*.
Therefore, the hierarchy of the *Members* has been refined so as to enable to provide some more precision to the definition of the *Resources* of the CoP. This was performed by introducing the concept of *Former member* as being a kind of *Member*, and adding the relation *"had-owner"* as a specialization of the relation *"has-owner"* between a *Member* and a *Resource* (see Fig. 2.6).

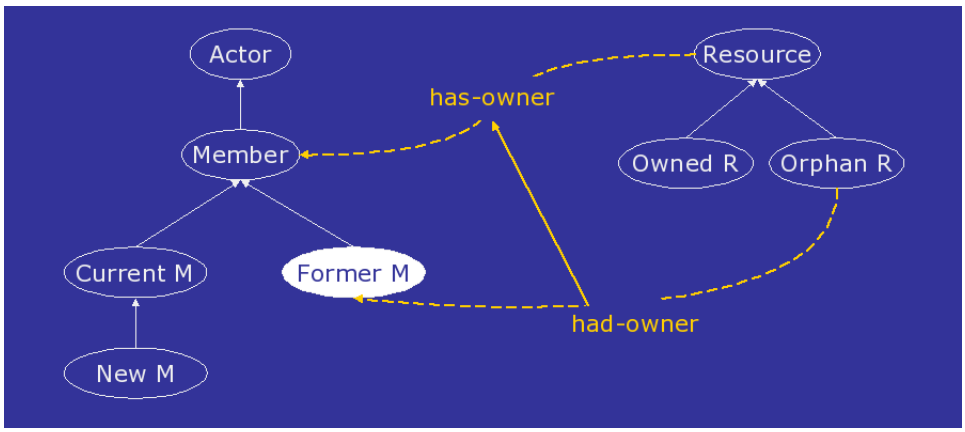

Fig. 2.6: Link between Actor and Resource (Version 3)

Remarks:

- As defined above, in our terminology, an orphan resource is a resource owned by somebody that is no longer member of the CoP. This definition does not take into account the degree of usefulness or of use of the resource. If they appear interesting in CoPs scenarios, O'CoP could be extended by modeling such notions of resource usefulness or use through relations having *Resource* as domain.
- So far, in O'CoP, there is no relation modeled between the concepts *Resource* and *Objective*. But such an extension of O'CoP can be interesting.

2.1.3 Other possible integration conflicts

In addition to the previous examples, let us cite typical possibilities of integration conflicts:

- The same name of concept may be used in the different sub-ontologies, but with different meanings for the concepts, which correspond to a terminology conflict.
- Two concepts appearing in two different sub-ontologies may in fact correspond to the same concept, but denoted by different terms by the different ontologists.
- The same concept may appear in different sub-ontologies, but with different sub-hierarchies stemming from this concept: either the sub-hierarchies can be merged if they correspond to the same viewpoint, or intermediate structuring concepts can be introduced in order to make explicit the different viewpoints adopted by the different ontologists for modeling the concept.
- Relations with the same label but with incompatible domains or ranges may appear in different sub-ontologies, requiring their renaming

2.2 Towards a methodology for cooperative building of an ontology

The method for cooperative building of the O'CoP ontology relies on the following steps:

1) *Proposition of generic models* enabling to define multiple semantic axes corresponding to the key notions of the O'CoP ontology [Vidou et al, 2006]. Each semantic axis will be undertaken by an ontologist through a sub-ontology.
2) *Information source collection:* (a) corpora mainly constituted of transcriptions, minutes or syntheses of CoPs' interviews; the interviews were performed by Palette members who played the role of mediators between some specific CoP and the knowledge engineers) and used to pick out candidate terms; (b) our generic models and existing ontologies or thesaurus (e.g. the structured dictionary WordNet [12]), used as grids to guide the selection of candidate terms within corpora. For cooperative building of the ontology, the different ontologists analyzed the same information sources for performing steps 3) to 6), but each one focusing on his/her generic model so as to build the corresponding sub-ontology.
3) *Contextualized lexicon construction*, by selecting, from the corpora, terms possibly relevant for describing the CoPs, w.r.t. the interpretation grids, and by keeping the trace of the context of use of these terms (i.e. the text surrounding the terms) so as to help understand them.
4) *Vocabulary identification* by refining the contextualized lexicon once validated by the CoPs' mediators and by producing, for each term, a definition and some examples of use.
5) *Hierarchy building* by first identifying the terminological concepts and relations (i.e concepts and relations corresponding to terms attested in the textual corpus), and then structuring them, with possible addition of new concepts for structuring purposes.
6) *Formalization of the sub-ontologies in RDF(S),* the language agreed by the Palette partners for ontology representation.
7) *Integration of the sub-ontologies* by solving the conflicts among them and by integrating them into a single, coherent ontology.

2.3 Validation

The Palette project being a user-centered design project, besides a classical validation/evaluation of the ontology from the technical point of view, we planned a validation/evaluation from the use(r) point of view.

2.3.1 Validation/evaluation of the ontology for use

It was performed by user representatives, the CoPs' mediators, having in mind the future use of the ontology by CoP members, a use transcribed in the different usage scenarios defined in the Palette project. It was planned to be performed at the level of the terminology, and at the level of the hierarchies of concepts and relations. The terminology validation was done successfully: the mediators assessed, for each term, if it was relevant (i.e. representative of a CoP, or useful for becoming a concept or a relation of a CoP-dedicated ontology, or useful for annotating CoP resources or persons). The hierarchy validation is under progress. In addition to these planned validations, we noticed two "spontaneous" validations from the CoPs' mediators, showing the importance of the evaluation of "the pre-processed material an ontologist has at his/her disposal for building the actual ontology" [8]. They were related to our information sources (corpora and grids):

- *Validation of the corpora.*− By using transcriptions of interviews of the CoPs, we supposed implicitly that they were representative of the terms used by the CoPs. But the CoPs' mediators judged afterwards that these transcriptions were appropriate only for extracting terms related to the organization of CoPs: they had scarcely asked questions about CoPs' practices, which leads to an ontology with very few concepts related to practices. They suggested using complementary corpora (e.g., forum discussions, exchanged documents) to find terms related to practices. Some ontologists also noticed a lack of documents describing the CoPs' collaboration or decision making activities.
- *Validation of the grids*.− Some mediators also brought a critical glance to the generic models used as interpretation grids.

2.3.2 Validation/evaluation of the ontology in use

It will be performed (a) through the testing, by usability specialists, of competency questions related to the Palette scenarios, (b) through usability evaluations of the Palette ontology-based services by usability specialists unrolling the Palette scenarios, and (c) through CoP members' direct testing of the Palette ontology-based services.

2.4 Conclusions

O'CoP is an original ontology composed of more than 800 concepts and 80 relations, dedicated to CoPs, and more precisely aimed at enabling to annotate the CoP's members and the CoP's resources. The three-layered structure of this ontology is generic and should be useful for other researchers, as well as the content of the ontology itself. The high-level ontology and the middle-layer aim to be reusable for any CoP. The specific layer is typical to Palette CoPs but any external CoP having similar characteristics to a given Palette CoP could take inspiration of the corresponding sub-ontology. Moreover, if an external CoP is interested in extending the O'CoP ontology specific layer with the concepts relevant for this CoP, it can reuse our ontology development method provided that it relies on relevant information sources. The main challenge is to enable a CoP to evolve itself its own ontology (without needing to rely on an external ontologist). This deliverable will show various experiments of development of specific ontologies for Palette CoPs, these ontologies being developed by various kinds of ontologists (e.g. KM developers, CoP mediators, etc), from various information sources and using various methodological approaches.

3 – Chapter 3: @pretic Ontology

3.1 Introduction

@pretic is a community of teachers in Belgian secondary schools who are responsible for the management of computer labs (CCM) in their schools. They have been exchanging information for ten years through a mailing-list. The topics addressed in this mailing-list have a large focus. There are complaints about people and organizations, pedagogical talks and technical advice.

When the PALETTE project started, @pretic was in pretty bad shape, mostly due to budgetary reasons. These are not the subject of this document, so it suffices to say that the equipment was on the way to obsolescence and that more and more schools relied on volunteer work from their CCM managers: most schools ceased to pay managers to do their work.
@pretic, from a 'simple' community, became a CoP, in the aim of loosening the membership entry formalities.
In order to boost @pretic's members interest in the CoP, the idea was formulated that some kind of FAQ based on the mailing-list archives would make its members more interested in the CoP. This idea came after the CoP's mediator tried to help them by giving them access to PALETTE's tools and services. The feedback informed him that @pretic needed a tool that is tailored to their needs more than general tools (such as web editors and wikis).

3.1.1 The actors/experts brainstorming session

ULg organized a work session (one complete day) with a few @pretic members and a few CRIFA researchers. As for the tools, ULg went back to the basics: a whiteboard and color markers. ULg began by explaining @pretic members what exactly were ontologies, what they were about and how they could help them.

Then, ULg decided to split the @pretic ontology into three separate topics, after ULg reckoned that it would be helpful to have this first classification for the next steps of the working session.

To reflect our tryptic 'complaints about people and organizations, pedagogical and technical advise', ULg settled for three separate ontologies:

- @pretic 'Human Problem' Ontology: problems related to persons and groups;
- @pretic 'Learning and Teaching' Ontology;
- @pretic 'Technical Problem' Ontology: problems related to usage of computers.

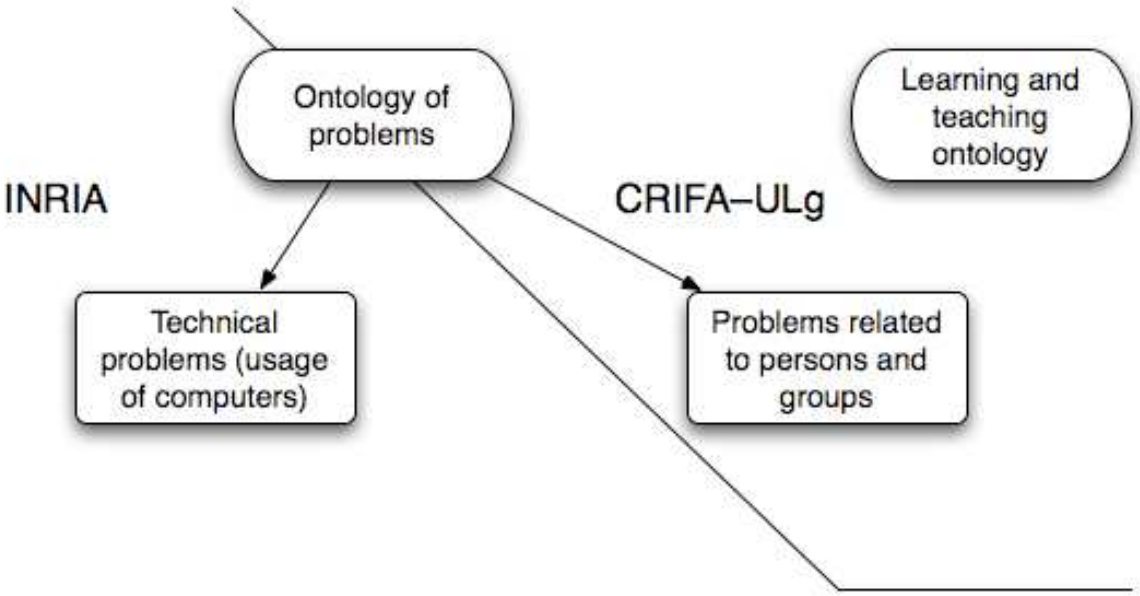

Fig. 3.1: Initial split of the ontology

In the future, we can easily imagine these three ontologies to be merged into one, with each of them becoming top-level keywords (persons and groups/learning and teaching/technical). But it helped, at the stage of the initial creation, to have them separated like this.

The *Technical Problem* ontology was built by INRIA using a semi-automatic extraction system from the corpus of @pretic e-mails, while ULg focused on *'Human Problems'* and *'Teaching and Learning'* ontologies.

3.2 Ontology building from texts

As @pretic members are interested in exploiting Information and Communication Technologies (ICT) in their classrooms, some of their mails on the email list describe the ICT encountered problems while other mails suggest solutions for solving such problems.

In order to facilitate navigation among past mails to find solutions to problems previously resolved, INRIA proposed an approach for creating @PRETIC ontology to allow ontology-based navigation. The semantic annotation of emails based on @PRETIC ontology is described in D. KNO.06.

[Habert et Nazarenko, 1996] noted that the acquisition of knowledge from corpora is based on the assumption that the concepts and relationships between concepts can be identified by examination of linguistic structures expressing these concepts in the text.
The Terminology and Artificial Intelligence (TIA) group has conceived a methodology for building semi-automatically ontologies from texts.
This method, described in [Aussenac-Gilles et al, 2000], is based on the use of natural language processing (NLP) tools and consists of the following processes:

- *Construction of a corpus of texts* relevant for the considered domain.
- *Linguistic analysis*: extracting candidate terms and candidate relationships between these terms by NLP tools. Candidate terms are then grouped to form semantic classes.
- *Normalization*: filtering the terms and relationships to keep only the so-called terminological concepts and relationships.
- *Formalization*: construction, structuring of the ontology (possibly by adding structuring concepts in case of need and by linking this ontology to high-level ontologies), formalization

in the chosen representation formalism and validation of the final ontology. Each process is parameterized by the referred application and requires experts' validation as shown in Fig. 3.1.

INRIA followed this methodology to build @PRETIC ontology.

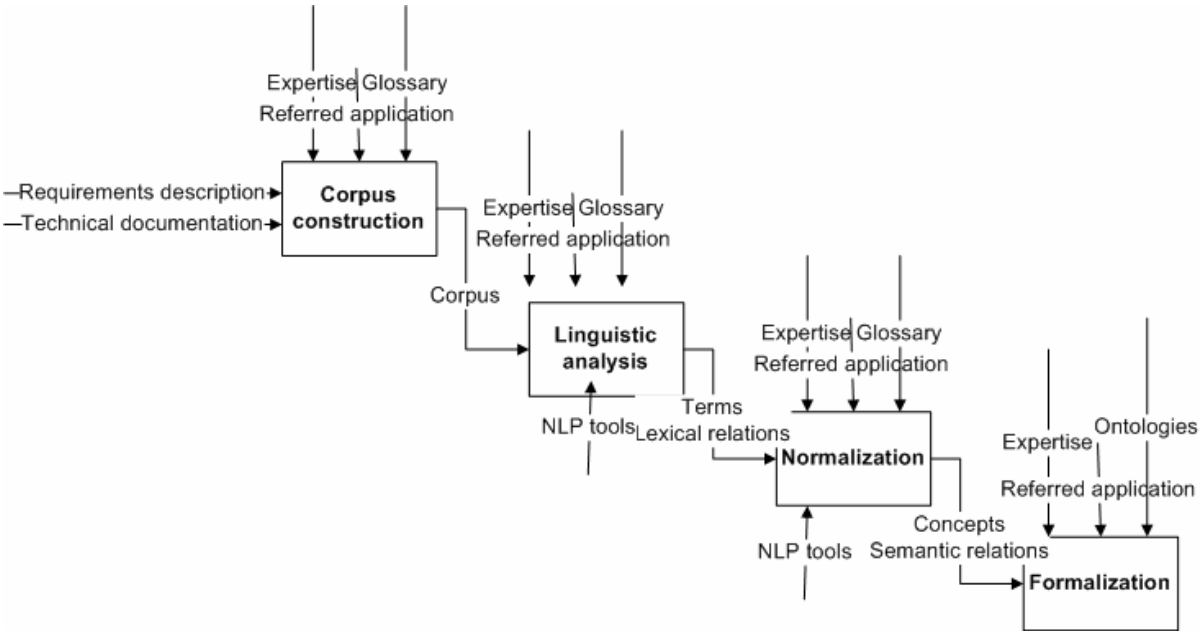

Fig. 3.2: TIA methodology for ontology building

3.3 Description of the 'Technical Problem' ontology

The @pretic *'Technical Problem'* ontology, as detailed in [Makni et al, 2007, 2008] is composed of three ontologies, each dedicated to a specific task: (i) an ontology describing computer components, (ii) an ontology for describing e-mails, and (iii) an ontology for describing computer problems. As shown in Fig. 3.3, the link between these different modules of the ontologies has been usage-driven.

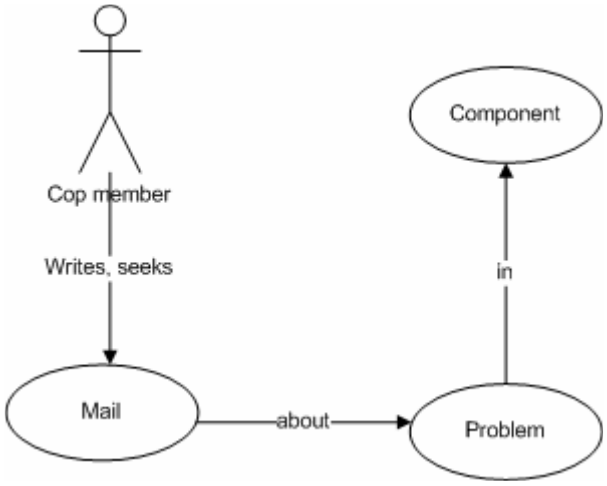

Fig. 3.3: Ontology modules

The @pretic *'Technical Problem'* ontology consists of the following sub-ontologies.

3.3.1 OntoPedia

As all possible computer components on which problems may occur are not necessarily mentioned in the e-mails, relying on a linguistic analysis of the email corpus would have lead to an incomplete ontology. Therefore, we preferred to reuse an existing hierarchy (WeboPedia) by developing a program that automatically retrieves this on line encyclopaedia, in order to extract the hierarchy of terms and to generate an ontology in RDFS. The obtained *Component* ontology, called Ontopedia, contains 196 concepts and 294 relations. It was created initially in English but we translated it semi-automatically to French; so its current version is bilingual.

3.3.2 OEmail

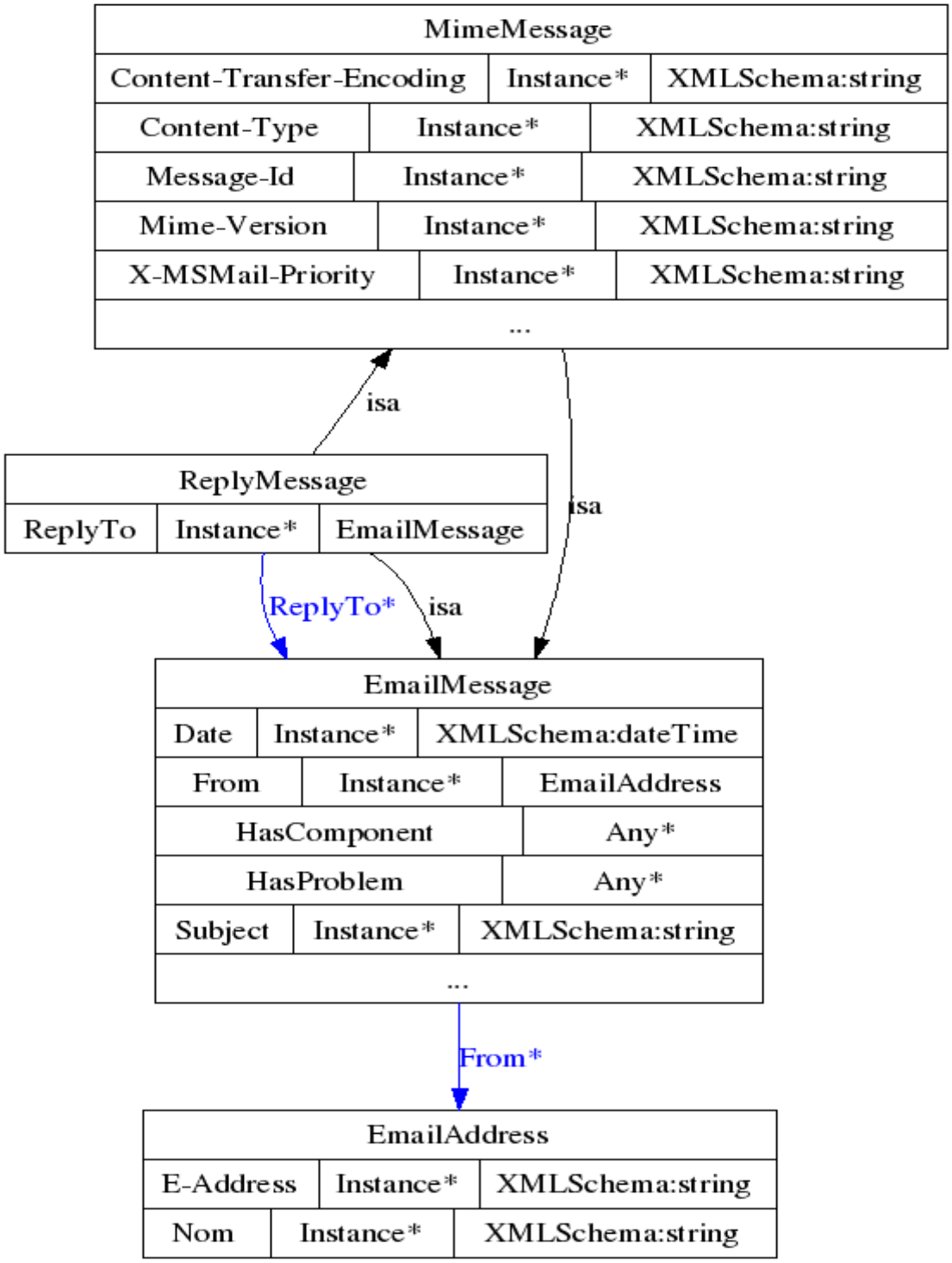

Fig. 3.4: OEmail diagram

The *Oemail* ontology describes metadata on e-mails by defining generic concepts (e.g. EmailMessage), more specific concepts (e.g. ReplyMessage) and the semantic relationships (author, date, recipient, etc.) as shown in Oemail diagram (cf. Fig. 3.4).
The OEmail ontology contains 4 concepts and 18 relations and is in English.

3.3.3 Technical Problem ontology

The *Technical Problem* ontology is the main module of @pretic ontology obtained from the corpus of emails and it aims to provide concepts and properties enabling to describe the computer problems faced by CoP members. To build this ontology, we relied on the corpus of e-mails exchanged by the CoP and we applied NLP techniques to initiate the ontology and then enrich it. Fig. 3.5 shows an overview of the Problem ontology.

The *Technical Problem* ontology contains 35 concepts and 38 relations and is bilingual (English and French).

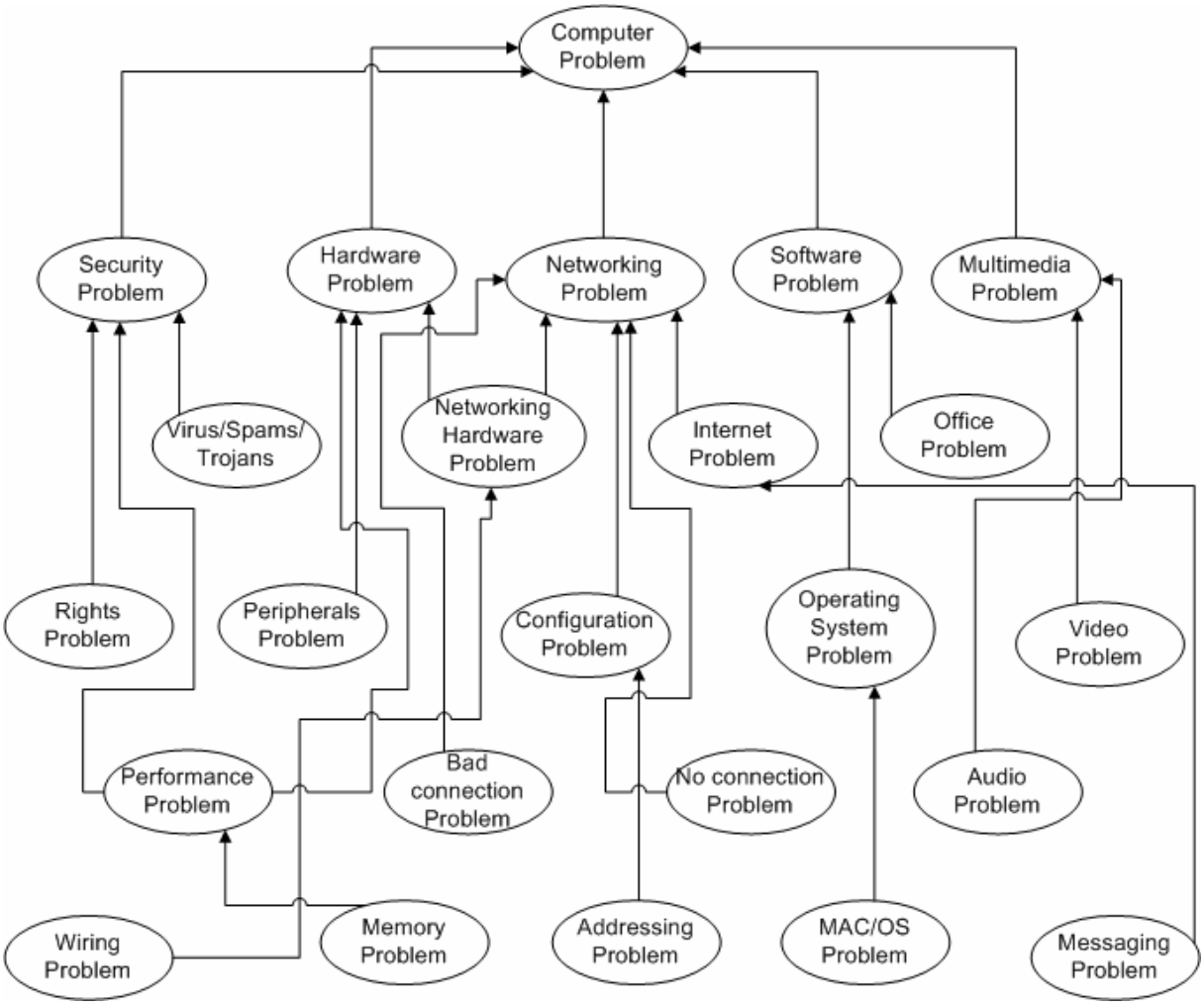

Fig. 3.5: Technical Problem ontology

3.4 Method for semi-automatic construction

The general method for semi-automatic construction is summarized in Figure 3.6.

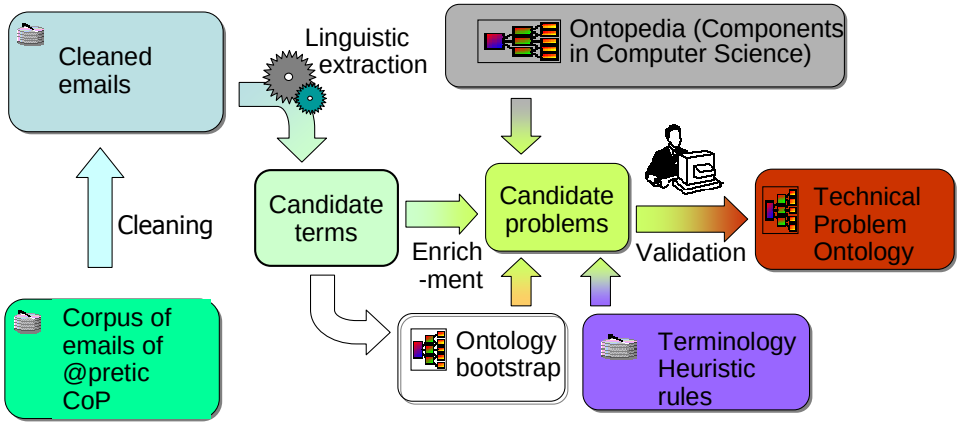

Fig 3.6: Method for semi-automatic construction of Technical Problem Ontology

Due to the very low quality of the e-mail corpus, a significant cleanup phase was needed to obtain texts in quality acceptable for NLP tools.

3.4.1 Corpus cleaning

This phase consists of five steps:

- *Preliminary cleaning:* mailing list archives are usually saved in a "dump" of a relational database. The first phase of cleanup consists of exporting the e-mails in XML format, deleting "spams" (detected by headers), deleting attachments ((as they are usually in multimedia formats that cannot be easily processed by NLP tools) and restoring the links between the origin messages and their responses (this link will be helpful then for the construction of the FAQ). This preliminary cleaning is performed by a module that we developed, based on JavaMail API[1].
- *Filtering signatures:* according to MIME[2] standards, the digital signature must be delimited by the "-" delimiter except that the sender does not respect this standard (the signatures are stuck in the body, for example). To filter signatures we have implemented an algorithm which detects signatures: during a first pass on the corpus, it compares feet of messages sent by each author and marks a foot that is repeated more than three times as a signature.
- *Language detection:* Although the e-mail corpus comes from a French- speaking community, it was trilingual (several messages were written in English and Flemish). We used the TextCat tool [Cavnar et Trenkle, 1994] for detecting the language so as to keep only the messages written in French, since our NLP tools were monolingual.
- *Reaccentuation:* A major source of degradation of e-mails texts was the absence of accentuation. This kind of spelling error has a negative impact on the candidate term

[1] http://java.sun.com/products/javamail/

[2] Multipurpose Internet Mail Extensions

extraction. To solve this problem, we used the REACC [Simard, 1988] [Simard & Deslauriers, 2001] tool.

- *Repetitive cleaning:* In contrast to a high-quality textual corpus where cleaning provides clean text, the bodies of e-mails contain a lot of noise even after cleaning. This noise is very varied: greetings, thanks, not filtered signatures, and so on. Writing filters to eliminate such noise requires to browse the corpus, to locate areas of degradation and to generate a filter for each detected zone. This manual method is slow and written filters can be valid only for examined areas. Therefore, we adopted a method of semi-automatic cleaning in order to speed up the detection of noise. In this approach, the NLP network is fastened by return on text. Indeed, we browse the extracted candidate terms to detect the candidate terms that are not meaningful or that correspond to private messages ("thank you in advance", "happy holidays", etc.). We use occurrences of these candidates in the text to generate new filters. To illustrate this approach, we developed a tool for cleaning assistance (cf. Fig. 3.7), which applies the FASTR tool [Jacquemin, 1997], keeps the link with the text and allows the user to browse the occurrences of each candidate term and generate filters from these occurrences.

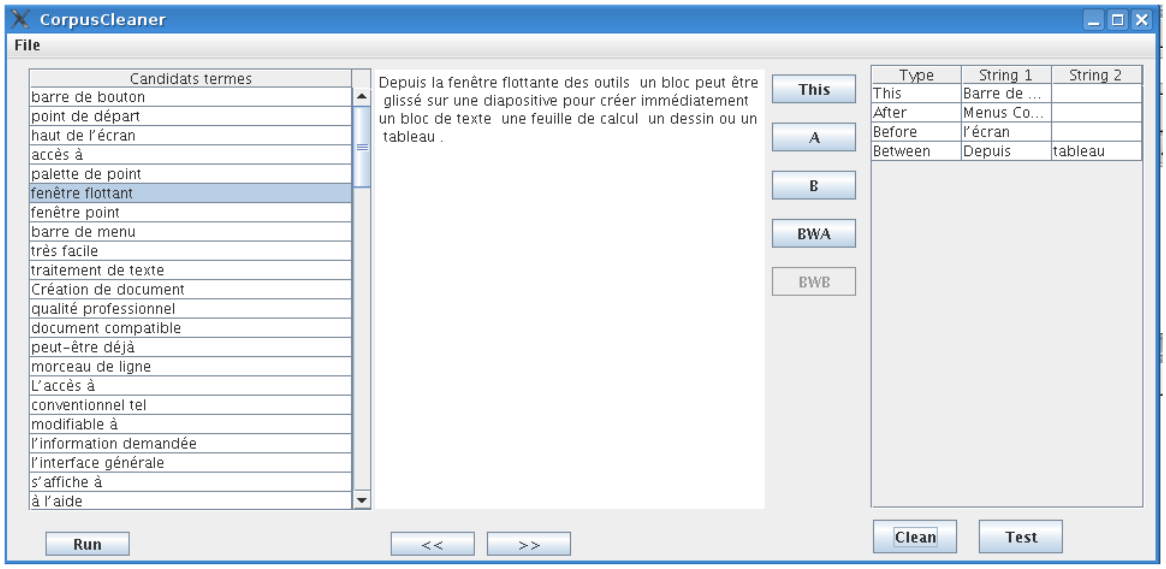

Fig. 3.7: Repetitive cleaning assistant

3.4.2 Candidate term extraction

The extraction of candidate terms aims at extracting meaningful terms enabling to build an ontology quite rich and covering most of computer problems. For this, we used two NLP approaches, namely: syntactic approach through FASTR [Jacquemin, 1997] and syntactico-statistical approach implemented in ACABIT [Daille, 1994].

3.4.3 Bootstrap and improvement of ontology

To bootstrap the *Technical Problem* ontology, we consider candidate terms stemming from "initial messages", i.e. messages that open a discussion and that are likely to raise a technical problem. These messages share a syntactic regularity through the terms used to express a problem. This regularity consists of the use of the word "problem" followed by the computer component concerned by this problem. Use of such regularities allowed us to start the ontology building process by selecting the candidate terms headed by the word "problem". Notice that the French translation of such terms always contains the word *"Problème"* in head.

Problems with reception - Port problem - Network Problem Wiring Problem - Connection problem - Speed Problem

```
Hotmail Problem - Problem on disk
```

The formalization of a set of these terms enabled us to obtain an initial version of ontology which has been validated by the mediators of @pretic CoP. However, the embryo of ontology, albeit interesting for covering most of the encountered problems, is fairly generic and may induce an ambiguity when generating annotations.
In order to improve our ontology and make it more specific, we conducted a manual analysis of all candidate terms generated by the NLP tools FASTR and ACABIT. The following list shows examples of terms extracted by both tools and used for the enrichment of ontology.

```
"Slow connection", "lack of memory", "loss of data",
 "Delayed response", "computer contaminated,"
Insufficient memory", "lack of effectiveness".
```

The study of this list of terms allowed us to:

- Detect new meaningful terms to directly enrich ontology («lack of memory", "slow connection", etc.).
- Detect synonymy relationships between some significant terms ("insufficient memory" and "memory insufficiency", "infected message" and "message infection", etc.). These terms will result in synonym terms used as labels for the same concept of ontology.
- Determine structural regularities (i.e. syntactic patterns) for numerous terms ("slow X," "loss of X," "difficulty in X", "delay of X", "lack X ", etc., where X is a concept in Computer Component ontology.

In a second stage, we took inspiration from [Golebiowska et al., 2002] to propose heuristic rules supporting semi-automatic building of the ontology. These rules detect predefined structures in the text and enrich ontology terms by candidates which were not necessarily detected by NLP tools. These rules are written in JAPE [Cunningham, 2002] syntax and plugged in the annotation process by OntoPedia.

```
{ term1.string == 'lenteur' }
    { term2.string == 'de' }
    { term3.cpt == 'Composant' } =>
    { term = term1+term2+term3; term.cpt = 'Problème'}
```

3.4.4 Semi-automatic building of relationships among concepts

After the phase of detection of terms expressing problems, the *Technical Problem* ontology has no hierarchical relationship between concepts. Therefore, we developed an algorithm for automatic matching edges to a generic concept of Problem ontology (*Hardware Problem*, *Software Problem*, etc.). For each concept in *Technical Problem* ontology, we generate a list of neighbor concepts appearing in the same e-mail and annotated by concepts of the Component ontology. We choose then a set of core concepts from *Componen*t ontology and that are detected in the majority of discussions. For each obtained list, we calculate the sum of the semantic distance between the concepts of this list and the core concepts. We calculate these distances using the semantic distance offered by the semantic search engine CORESE [Corby et al., 2004]. The chosen category for a term is the one that has the smallest semantic distance. For example, the term *"slow network"* is attached to *"modem problem"* and the term *"infringement cases"* is linked to *"security problem"*.

Term	Slow network	Signal loss	Infringement Case	Slow connections
Networking Hardware	8.35	**8.04**	9.04	**8.13**
Modems	**7.98**	8.44	9.08	**8.02**

Printers	9.28	8.75	10.65	8.69
Browsers	9.19	8.87	8.1	8.32
Databases	10.14	9.55	9.86	9.86
Telecommunications	9.91	9.55	9.86	9.48
Video	8.53	9.55	8.65	9.86
Audio	9.91	9.55	10.37	10.24
Word Processing	9.12	8.6	10.37	8.57
Videoconferencing	9.08	9.55	8.53	9.86
Security	8.51	9.55	**5.47**	8.96

Table 3.1: Semi-automatic building of relationships among concepts

3.5 "Human Problem" and "Teaching and Learning" ontology built by ULg

3.5.1 @pretic 'Human Problem' Ontology

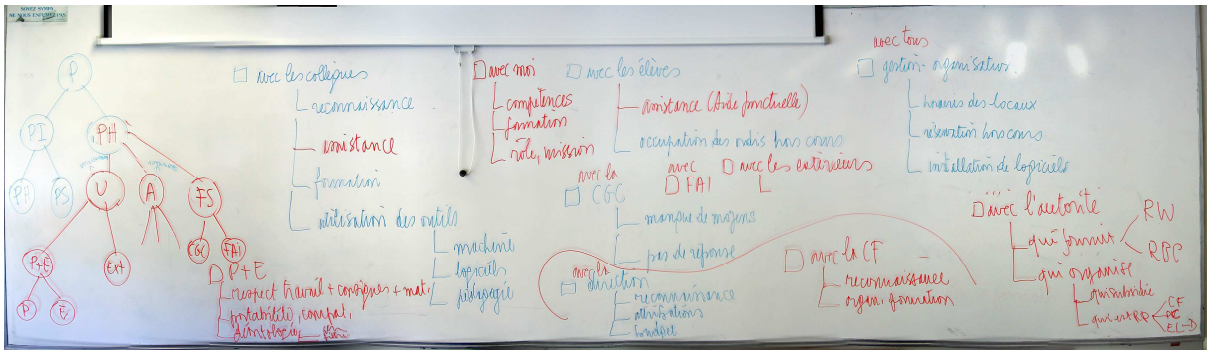

Fig. 3.8: Whiteboard on 'Human Problems'

This first brainstorming was relatively easy to bring to fruition. Basically, one researcher was at the blackboard while asking first 'what kind, what category of people do you have to deal with, or have problems with?'. He then wrote the names of people or organizations with who the CoP members (and attending researchers) thought they had/could have problems with. It gave us a first level for our draft ontology. We then asked them, for each of these people or organizations, what kind of problems they could encounter.

For instance, if we explore the 'colleagues' branch, they thought they could have talks about recognition, help, training, tools usage, computers, software and pedagogy.

Or, in a more visual way:

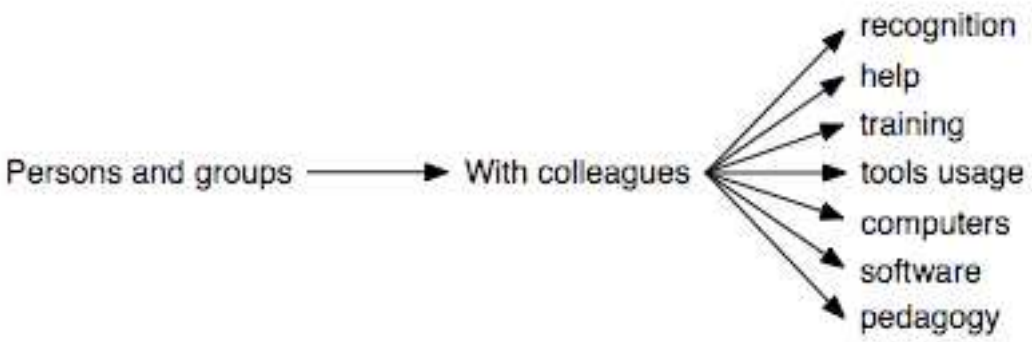

Table 3.2 shows the final result we obtained for 'human problems'. That's not an ontology per se, just a list of organized in a draft hierarchy keywords.

Second level	Third level
Avec les professeurs et élèves	respect travail, consignes, matériel, portabilité, compatibilité, déontologie, filtre
Avec les collègues	reconnaissance, assistance, formation, utilisation des outils, machine, logiciels, pédagogie
Avec moi	compétences, formation, rôles, missions
Avec les élèves	assistance, aide ponctuelle, occupations des ordinateurs hors cours
Avec les CGC (centres de gestion centralisés)	manque de moyens, pas de réponse
Avec les fournisseurs d'accès à Internet	
Avec les extérieurs	
Avec la direction	Reconnaissance, attributions, budget
Avec la Communauté Française	Reconnaissance, organisation de formations
Avec tous	Gestion, organisation, horaires des locaux, réservation hors cours, installation de logiciels
Avec l'autorité	qui fournit la Région Wallonne, qui fournit la Région Bruxelles-Capitale, qui organise, qui subside, qui est responsable, Communauté Française, public, libre

Table 3.2: 'Human Problems'

3.5.2 @pretic 'Learning and Teaching' Ontology

This second ontology was tougher to write, because it encompassed a larger reality: were it complete (but then, it would probably be far too complete), it would be a complete lexicon of all things pedagogical. So, we proceeded in two steps.

The first step was basically the same as the brainstorming for the 'human problems' ontology: we said 'Now, let us talk about training and learning.' and wrote every keyword that was pronounced on the whiteboard, while trying to keep related words in the same zones. For the first step, we chose to let only the CoP members speak.

After a while, the brainstorming was over and a finite number of keywords was written on the whiteboard shown in the appendix 4, Fig A4.1.

The second step was to let the researchers in pedagogy talk, fix, reorganize and enrich the pre-ontology with the help of both their own brainstorming and they theoretical knowledge of pedagogical vernacular.

This dual approach allowed us to collect a good number of relevant words. We let CoP members add their final output to the whiteboard, which allowed a very fast validation. After this final validation, we can see in the appendix 4 that Fig. A4.2 and Fig. A4.3 are not very different, just a bit more complete.

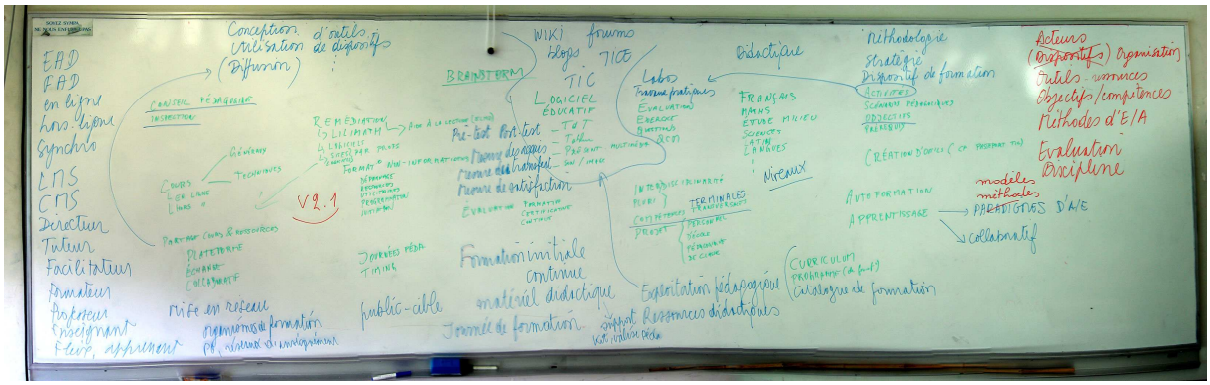

Fig. 3.9: Whiteboard 'Learning and Teaching', final version

Here is the final result we obtained for 'Learning and Teaching', after a bit of post-session cleaning and a short surrounding discourse.

3.5.3 Post-processed ‘Learning and Teaching’ ontology

Please note that, as it stands here, this work has to be improved. Nevertheless, a first draft of the results is presented hereafter. It will be used to annotate some messages and to retrieve them.

The current structure is as follows:

- Actors
- Educational strategy
- Goals/competences
- Discipline
- Teaching and learning methods
- Resources
- Organization
- Evaluation

For each concept, we shall present hereafter a table with some sub-concepts and their correspondence in English and in French.

3.5.3.1 Actors

As defined by the CoP's members, this concept is related to the categories of people that can intervene or be concerned by training and learning questions and who are not computer scientists. Those people are interacting or can interact with the @pretic resource persons.

Teacher, professor, trainer, tutor, facilitator, moderator	Enseignant, professeur, formateur, tuteur, facilitateur, modérateur
Pupil, learner	Élève, apprenant
Pedagogic adviser, inspector	Conseiller pédagogique, inspecteur
Director, organizational "power", teaching network	Directeur, pouvoir organisateur, réseau d'enseignement
Training organization	Organisme de formation
Software designer, Website designer	Concepteur de logiciel, concepteur de site

3.5.3.2 Educational strategy

This concerns some general facets of the design of the educational environment and of the educational strategy.

Strategy, training environment, learning environment, pedagogical activity, pedagogical scenario	Stratégie, dispositif de formation, dispositif d'apprentissage, activité pédagogique, scénario pédagogique
Curriculum, training program	Curriculum, programme de formation
Tools design, training environment design	Conception d'outils, conception de dispositif de formation
Use of training environment, use of learning environment	Utilisation de dispositifs de formation et d'apprentissage
Diffusion, training catalog	Diffusion, catalogue de formation

3.5.3.3 Objectives

This section deals with concepts linked to the concept of educational objectives.

Objective, prerequisite	Objectif, prérequis
Knowledge, skill	Savoir, savoir-faire, savoir-être

Taxomony of objectives	Taxonomies d'objectifs
Transversal competencies, last year competencies	Compétences transversales, compétences terminales

3.5.3.4 Discipline/content

It includes considerations about some disciplines. Notice that an ontology of the domain has been developed concerning computer components and problems linked to their use.

Interdisciplinary, multidisciplinary, didactics	Interdisciplinarité, pluridisciplinarité,didactique
French, mathematics, environment study, sciences, latin, foreign languages	Français, mathématiques, étude du milieu, sciences, latin, langues
ICT, ICT passport, computer programming	TIC, passeport TIC, programmation
School level	Niveau scolaire

3.5.3.5 Teaching and learning methods

Some concepts about the way to teach or to learn are explained.

Methodology, self-training,learning, learning model, teaching model, learning method, teaching method, learning paradigm, teaching paradigm	Méthodologie, auto-formation, apprentissage, modèle d'apprentissage, modèle d'enseignement, méthode d'apprentissage, méthode d'enseignement, paradigme d'apprentissage, paradigme d'enseignement
Network, exchanges, collaborative work, collaborative learning, group work	Mise en réseau, échange, travail collaboratif, apprentissage collaboratif, travaux de groupe
Personal project, school project, pedagogical project, classroom project	Projet personnel, projet d'école, projet pédagogique, projet de classe
Remediation	Remédiation
Laboratory, practical work	Laboratoires, travaux pratiques
Evaluation	Évaluation
Exercise	Exercice
Questionning	Initiation, question, questionnement

3.5.3.6 Tools/resources

A part of the kinds of resources used by teachers and the @pretic members are listed hereafter.

Didactic material, didactic resource, pedagogical support, pedagogical kit, pedagogical suitcase, website produced by teachers, software produced by teachers, book, paper, computer, software, educational software, audiovisual, multimedia	**Nature des ressources** : matériel didactique, ressources didactiques, support pédagogique, kit pédagogique, valise pédagogique, sites réalisés par des enseignants, logiciels réalisés par des enseignants, livre, article, ordinateur, logiciel, logiciel éducatif, audio-visuel, multimédia
Lilimath, ELMO, word processor, spreadsheet, multimedia presentation, sound, image, wiki, forum, blog, ICT, ICTE	**Ressources didactiques** : Lilimath, aide à la lecture, ELMO, traitement de texte, tableur, présentation, présentation multimédia, son, image, wiki, forum, blog, TICE, TIC
e-learning platform, integrated e-learning platform	Plate-forme de formation à distance, plate-forme intégrée de formation à distance
LMS, CMS	LMS, CMS

3.5.3.7 Organization

This concerns the way to organize the training.

Initial training, in service training	Formation initiale, formation continue,
Face-to-face, at a distance, hybrid, blended, distance education, e-learning, distance training, online course, offline course, synchronous, asynchronous	Présentiel, à distance, hybride, EAD, enseignement à distance, FAD, formation à distance, cours en ligne, cours hors ligne, synchrone, asynchrone
Duration, timing, schedule	Durée, timing, horaire
Pedagogical day, training session, seminar	Journée pédagogique, journée de formation, séminaire

3.5.3.8 Evaluation

Several types of evaluation and some tools are considered.

Functions: formative evaluation, continuous evaluation, certification, summative evaluation, normative evaluation, criteria	**Fonctions** : évaluation formative, continue, certificative, sommative, normative
Test, pretest, posttest	Test, pré-test, post-test
Tools: Multiple Choice Question, MCQ, portfolio	**Outils** : Questions à choix multiple, QCM, portefolio
Levels: skill measure, transfer measure, satisfaction measure	**Niveaux** : mesure des acquis, mesure du transfert, mesure de satisfaction

3.6 Comparison of the ease of organizing the three hierarchies

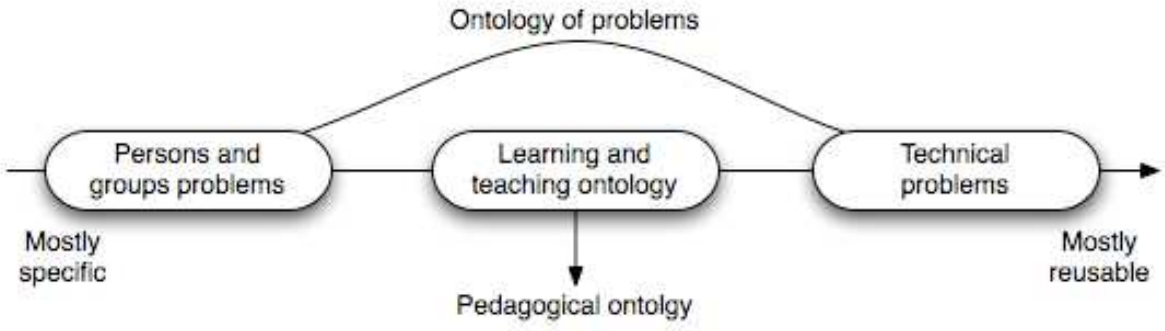

Fig. 3.10: Reusability line

We noticed that, even if we did not get very far in the process of organizing the keywords in ontologies, some of them are easier to manage. A more concise ontology, as the *'Persons and groups problems'* one, is relatively easy to classify and manage.

At the other end of the spectrum, the other ontologies, that cover each one a complete field for science (pedagogy and computer science), are hard to manage. We tried a simple exercise involving a few CRIFA members and the way they thought they would manage these ontologies varies greatly. Moreover, it is hard, if not impossible, to say what is the most pertinent: everybody chooses entry points based of his/her own experience, and create a 'knowledge tree' that is as good as the one of anybody else.

3.7 Prospects

What ULg lacked at this stage and before going further, was an ontology manager: SweetWiki's own was too buggy, ULg was not able to use ECCO at the time. Ideally, a simple interface, allowing almost nothing but simple drag and drop would help ULg greatly to finish this ontology.
As soon as we have a good ontology manager, we will be able to complete the organization into an hierarchy of the three ontologies, and then to merge them.

At this stage, we will have a fairly usable ontology, which we will import in both SweetWiki (for organizing the still-to-be-written articles) and the new Hypergraph-based portal developed by INRIA and that will be discussed in D.KNO.06.

3.8 Lessons-learnt on building the @pretic ontology

3.8.1 Lessons-learnt on building the 'Technical Problem' ontology

On cleaning

Noises of mails are both in the structure and content, the cleaning phase of an e-mail corpus requires the establishment of a mail specific cleaning chain to retrieve the e-mail bodies. Since the natural

language processing tools require orthographically and grammatically correct texts, which is not the case of e-mails, the content of e-mails requires a preliminary processing phase to correct non accentuation, not punctuation and other problems such as the grammatical errors. The cleaning chain that we developed solves most of these problems and is reusable for other mailing lists since it is field independent. More generally, the approach of repetitive cleaning can be reused to accelerate the cleanup of any low quality corpus.

On effective building

Building ontologies from very low quality texts such as e-mails requires to distinguish generic and specific knowledge. In @PRETIC ontology experience, the analysis of emails permits the segregation between computer components hierarchy and computer problems. While the first is generic and reusable, the second is CoP-dependent.
This separation allows the use of external and formal resources to model generic knowledge as WeboPedia was used to model OntoPedia.
However to model CoP dependent knowledge, we must exploit the CoP knowledge sources (i.e. e-mails). For thus we use NLP tools to extract candidate terms from e-mails. Due to low quality of e-mails, the extracted terms are very noisy; so we seek heuristic rules to maintain only meaningful and useful ones.

The method adopted for building *Technical Problem* ontology is reusable for other corpus of e-mails (or other kinds of texts) discussing about problems in a given area. Indeed:

- The first phase of messages cleaning is domain-independent.
- We assume that the terms used to evoke a problem do not vary with the domain, which makes the bootstrap stage reusable.
- The structural patterns in terms exist or appear within a given community (i.e. such regularities were found in our corpus, as in the corpus described in [Golebiowska et al., 2002]), which eases the ontology enrichment process.

3.8.2 Lessons-learnt on building ‘Human Problems’ and ‘Learning and Teaching’ ontologies

Iterative process

Participatory design being the chosen method for PALETTE, the @pretic ontology creation was an iterative process. Many ideas of how to produce the ontology were devised, some achieved success, some were failures – not because the ideas were bad, but because of the lack of enthusiasm in the CoP to work in order to obtain an ontology. Some tools were not finished or polished enough, too.

The social-tagging approach

In this first scenario, it was hoped that @pretic was still strong enough for some motivated members to quickly write SweetWiki articles, both newly written and recycled from interesting topics in the mailing-list archive.

The results were far from what was expected: most of the CoP members only registered in SweetWiki. The most motivated of them created their 'User page', but very few, if any, articles were written.
Since the ontology would have been collected from the 'tags' users would have chosen to mark their pages, this experiment did not give any result.

We continue to believe that the method has its merits, since ULg used SweetWiki and its ontology system in two other projects: our internal documents were produced through SweetWiki – what we called our 'dogfooding method' – and another CoP we work with – TFT – successfully collected tags thanks to this method. Chapter 6 will detail this experiment with TFT CoP.

What we learned was that the social-tagging method worked well in an academic environment: ULg's usage was academic by definition and TFT's ontology was mostly (if not entirely) created by the CoP's moderator, i.e. another academic person.

If @pretic members had written and tagged a lot of pages, we believe they could have produced a lot of 'tags' or 'keywords', but not an ontology per se.

At this stage of the process, it became evident that we would not obtain results by following that way. The experiment was not a failure, but it did not work either, for a lot of internal and external reasons. A more proactive way was needed.

Semi-automatic ontology creation

The @pretic e-mail archive is made of complaints about people and organizations, pedagogical and technical advise, but it only appeared after a manual exploration of the messages archive and interviews of @pretic members by the CRIFA–ULg team.
Moreover, the original messages lacked a structure. They were short, quickly-written questions and answers: contrast that with, say, a scientific article: no semantic structure (in many cases, no structure at all), lexical poverty, casual writing. Therefore, due to the low linguistic quality of the e-mails and their lack of structure, only technical problems – that are generally expressed with linguistic regularities as often in technical domains [Golebiowska et al, 2002] - could be extracted automatically by NLP tools. But the aspects more linked to human interaction or human cognition are expressed in far more complex way and therefore cannot be automatically identified by NLP tools in the texts.

Despite its shortcomings, we believe that the mailing-list archive is still an invaluable source of information, but it needs a fine-tuned ontology that probably cannot just be extracted automatically from the archive itself.

4 – Chapter 4: Form@Hetice Ontology

4.1 Introduction

Form@HETICE is a network of teachers of High Schools of the French Community of Belgium addressing the integration of ICT in their educational practices.
The main objective of this community is to develop a network among "resource persons in ICTE" and their colleagues inside the High Schools (HS) to help introducing ICTE in their educational practices, and share their projects and practices.
The members exchange personal experiences and help each other through a website and meetings.
In this CoP, BayFac is used in order to classify, and consequently, search more efficiently documents shared by the members.

The ontology we have proposed to Form@Hetice has been designed with the main purpose of being used by the classifier tool that they are interested in using: the Bayesian Faceted classification service, namely BayFac. There are thus two important things that need to be retained about this ontology: firstly it has been designed to be used in document classification and thus concepts that can be found in it are related to documents shared by the CoP; secondly it contains the definition (instantiation) of facets that are used by BayFac.

4.2 Method for building the ontology

BayFac has been presented in Liege in June 2007 to the Form@Hetice CoP. The aim was to receive feedbacks on the tool (concerning functionalities) and validation of the ontology it exploits. In order to collaborate on its improvement, the ontology diagram was also sent to the Form@Hetice CoP.

Collaborative works and comments did not concern directly the ontology but BayFac itself. More precisely, comments were related to functionalities to add or modify. However, in order to take into account these remarks, the Form@Hetice ontology has also been sometimes adapted.

The approach used to build this ontology was bottom-up. It started from a real need to define relevant facets. Then it was bound to the O'CoP ontology (by aligning the vocabulary) to ensure the interoperability with other services using the O'CoP ontology.

We have realized the preliminary version of the Form@Hetice ontology based on the analysis of a document corpus shared by the CoP on its Web site[3]. In order not to reinvent the wheel, it has also been decided to try as much as possible to relate to concepts from existing ontologies such as Dublin Core[4], Foaf[5], or SIOC[6]. We proposed the facets based on a first set provided by the CoP mediator. Globally, the methodology we have followed consists of six points:

- Analysis of the CoP's Web site and extracting terms used for naming, summarizing, describing their documents
- Organization of the concepts by making hierarchies and finding relations between concepts
- Reorganization slightly according to existing ontologies and try to position their concepts in the Form@Hetice ontology
- Formalization of the ontology
- Definition of facets according to the ontology and the CoP's contact proposal
- Refinement of the ontology according to the CoP's feedbacks.

[3] http://www.stecrifa.ulg.ac.be/formahetice/
[4] http://dublincore.org/documents/dc-rdf/, http://purl.org/dc/elements/1.1/
[5] http://xmlns.com/foaf/spec/, http://xmlns.com/foaf/spec/index.rdf
[6] http://rdfs.org/sioc/spec/, http://rdfs.org/sioc/ns#

Each document stored on Form@Hetice's Web site is characterized by a title, the date at which it has been posted on the site, and a small summary of what it is. The main formats used are: MS Word or PowerPoint, Adobe PDF, HTML documents. The documents are stored according to some categories organized into folders like in common exploitation systems. This first overview allows us to define the core part of the ontology:

A Document, characterized by a Title (name), a posting Date, a Summary, and a Format.

The analysis continues by gathering information from different sources. First, we exploit the existing classification by extracting information from the folders' names and hierarchy. Then we use the documents themselves by extracting information from their title, their summary, and finally their content. By analyzing the sentences and words, we define a set of concepts that are commonly used to characterize the documents. Then, we create the links between these concepts and in particular the link they have with the main class Document. This is done either by looking at the structure of the sentences containing the words that correspond to these concepts, or in an ad-hoc manner, trying to find the more logical link.

The previous step performed, we have looked into existing known ontologies and tried to reuse some parts of them when possible. This step has however not been pushed very far as the goal was firstly to provide a preliminary ontology so that the CoP can use the BayFac service, and then to refine it according to their feedbacks.

4.3 Description of the ontology

4.3.1 First version of the Form@Hetice ontology

The preliminary ontology is represented in Fig. 4.1, in the form of a simple semantic graph constituted of nodes and relationships between them. This representation has been transmitted to the CoP and does not strictly correspond to what has been actually encoded. A short version containing only the main classes and relations has been first encoded to simplify the use of BayFac by the CoP, and facilitate feedback.

The core of the ontology is the Document class. Then, in addition to information provided by the analysis of the CoP document corpus, the properties we have considered are greatly influenced by the initial facets proposed by the CoP's mediator. In his proposition, documents are characterized by the following facets: the document date, its author(s), the event it is related to, support of the document, kind of document, subject matter.

The following list explains the different concepts used in the preliminary ontology. Classes' names begin with an uppercase letter, and often the couple property - class is considered at the same time. We first start by the properties of the Document class.

- *Document:* The abstract notion of a document; not to be mistaken with its electronic form (e.g. file, email, etc.), which is represented by the DataSource class.
- *hasCreator* - Creator: The main creator of a document, which is a subclass of Person. See Dublin-Core (dc) dc:creator comment (http://purl.org/dc/elements/1.1/creator). Here, contrary to Dublin-Core in which creator, contributor and publisher are properties, we have made the choice of using property - classes couples, so that they can be defined as special kinds of Persons, and also to facilitate the use of them as facets.
- *hasContributor* - Contributor: A contributor to the document, also subclass of Person. See dc:contributor comment (http://purl.org/dc/elements/1.1/contributor).
- *hasPublisher* - Publisher: The publisher of the document. In our context, this corresponds to the person who has published the document on the Web site, making it available for the CoP. See dc:publisher comment (http://purl.org/dc/elements/1.1/publisher).

- *hasTitle* - Title: The title of a document. It corresponds to dc:title concept; the matching has been done later. See dc:title comment (http://purl.org/dc/elements/1.1/title).

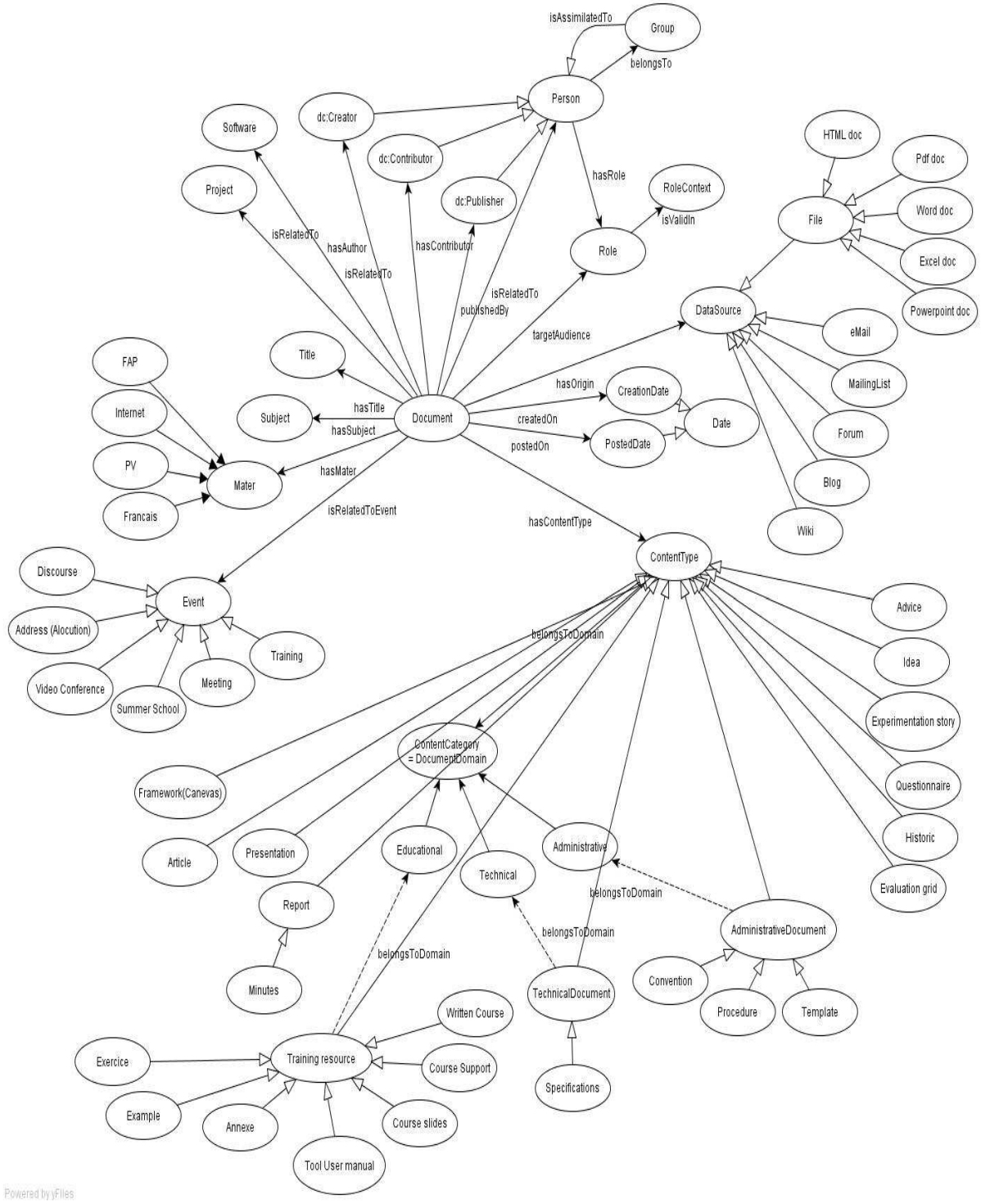

Fig. 4.1: Semantic graph of the first ontology for Form@Hetice.

- *hasSubject* - Subject: The subject of a document reflects what the document is about; its topic. This can be a list of key words, predefined or not. At this level, we did not detail the typical subjects that could be used by the CoP. It corresponds to the dc:subject concept; the

matching has been done later. See dc:Creator comment (http://purl.org/dc/elements/1.1/subject).

- *hasMatter* - Matter: A Document property allowing to precise the specific matter addressed by the document. In the CoP, four different matters are commonly used, which are modeled as Matter instances: FAP (Formation d'accès en Permanence), Internet, PV (Procès verbal), Français. These matters were provided by the CoP representative.
- *isRelatedToEvent*: A Document can be linked to an Event instance with which it has some relation. The class Event is then derived into different subclasses according to the common event types that have been found from the CoP's Web site.
- *targetAudience* - Role: Denotes the targeted audience of the document (who will use it). It is linked to a Role of a Person.
- *createdOn* - CreationDate: The dates at which the document has been created.
- *hasOrigin* - DataSource: The hasOrigin property allows linking a document to its "physical" representation or datasource on an IT system.
- *hasContentType* - ContentType: The content type refers actually to the kind of content of the document. For example, it is an article, a presentation, a report, etc... Many different kinds have been reported from the CoP's Web site analysis. We have attempted to make a hierarchy and in particular classifying content kinds according specific domains. The task is not totally finished as many links can exist between kinds; moreover the goal at this step was to make a first proposal, avoiding as much as possible too much complexity so that feedback can be gathered.
- *isRelatedTo* - Project, Software, Person: These links have been added to allow specifying CoP resources that the document may be about. Project, Software, Person are only examples of which specific resources it can be worth to relate. This is a first step towards the linking of this ontology with the O'CoP, which will facilitate retrieval or statistical tasks (ex: retrieve all the documents related to the software x that is used by CoP members).
- *Person*: This represents human-beings as well as moral persons.
- *Group*: A person can belong to one or more groups. A group is assimilated to a person (by the isAssimilatedTo property), so as to allow group of persons to be considered as one, when they are declared as an author, contributor or publisher.
- *DataSource*: The hierarchy of datasources, represented as levels of subclasses, allows specifying the electronic form ("physical" representation) of the document or its source. This is a rough classification that needs to be extended and can benefit to related work performed in D.KNO.02.

4.3.2 Implemented version of the Form@Hetice ontology

The version of the Form@Hetice ontology that has been implemented is lighter than the first one as can be seen in Fig. 4.2. This simplification has arisen from two facts: first the implementation provided to Form@Hetice with BayFac has been limited to classes and relations that were really necessary for a first test by the CoP, secondly the CoP has provided some feedbacks and requirements for new simplifications. At this stage, the ontology used by the CoP is still in this simplified form, and we have not yet added the classes and properties removed from the initial proposal as there was no specific request for that.

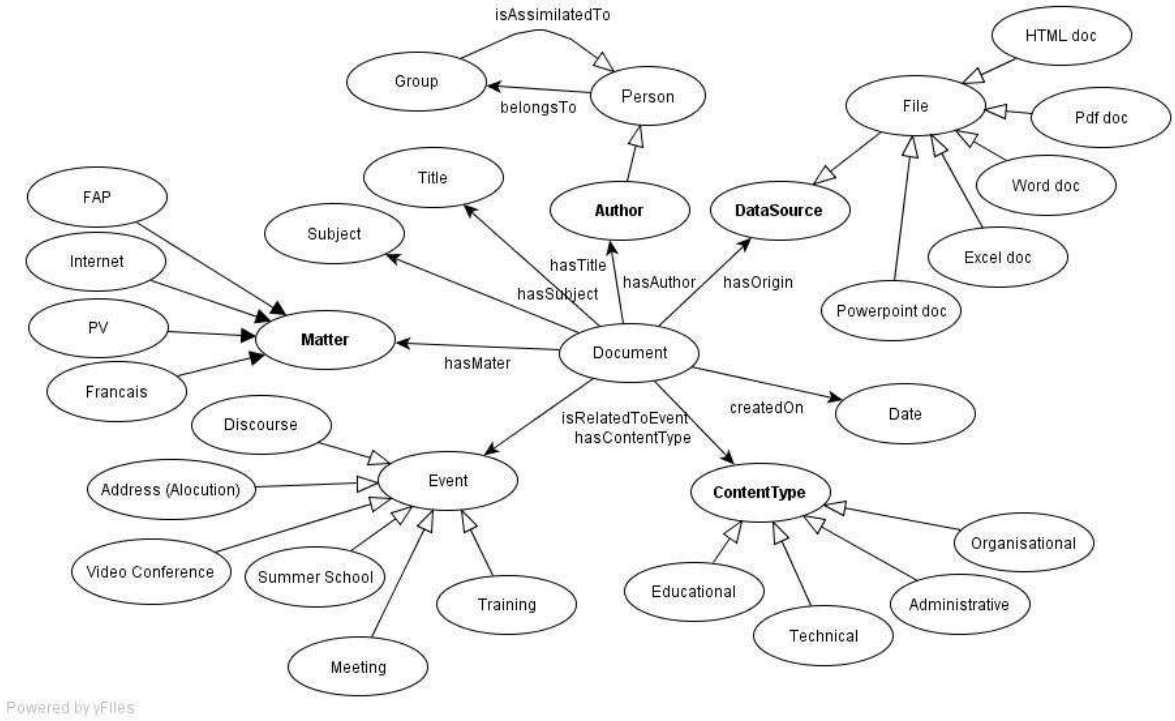

Fig. 4.2: Second version of the Form@Hetice ontology

Some implementation simplification choices are the following:

- The *'Creator'*, *'Contributor'* and *'Publisher'* classes coming from Dublin Core, were simplified into a single class *'Author'*, as this was apparently the only one used by the CoP. The old classes have not yet been proposed to the CoP.
- The subconcepts *'CreationDate'* and *'PostedDate'* have been removed, and the relation *createdOn - Date* was kept.
- At last, the class named '*Event'* was not used in the BayFac tool. It was kept for future use but is not proposed in BayFac.

Then, the first point on which the Form@Hetice CoP wanted modifications was on the classification of their document with the BayFac tool. The first version permitted to choose the content type of the document among a dozen of propositions. Their will was to only have to choose among four categories: 'Pédagogique', 'Organisationnel', 'Technique' and 'Administratif'. For that, the subclasses of the *'ContentType'* class have been reduced to the four corresponding to the CoP's request.

The second request of the CoP was to have the possibility to create themselves instances of the 'Mater' class. As for the 'Person' class, the BayFac tool allows users to dynamically add new author by creating new instance in the ontology. It is now the same for the *'Matter'* class. This did not impact the ontology since it occurs at runtime.

4.3.3 O'CoP version of the Form@Hetice ontology

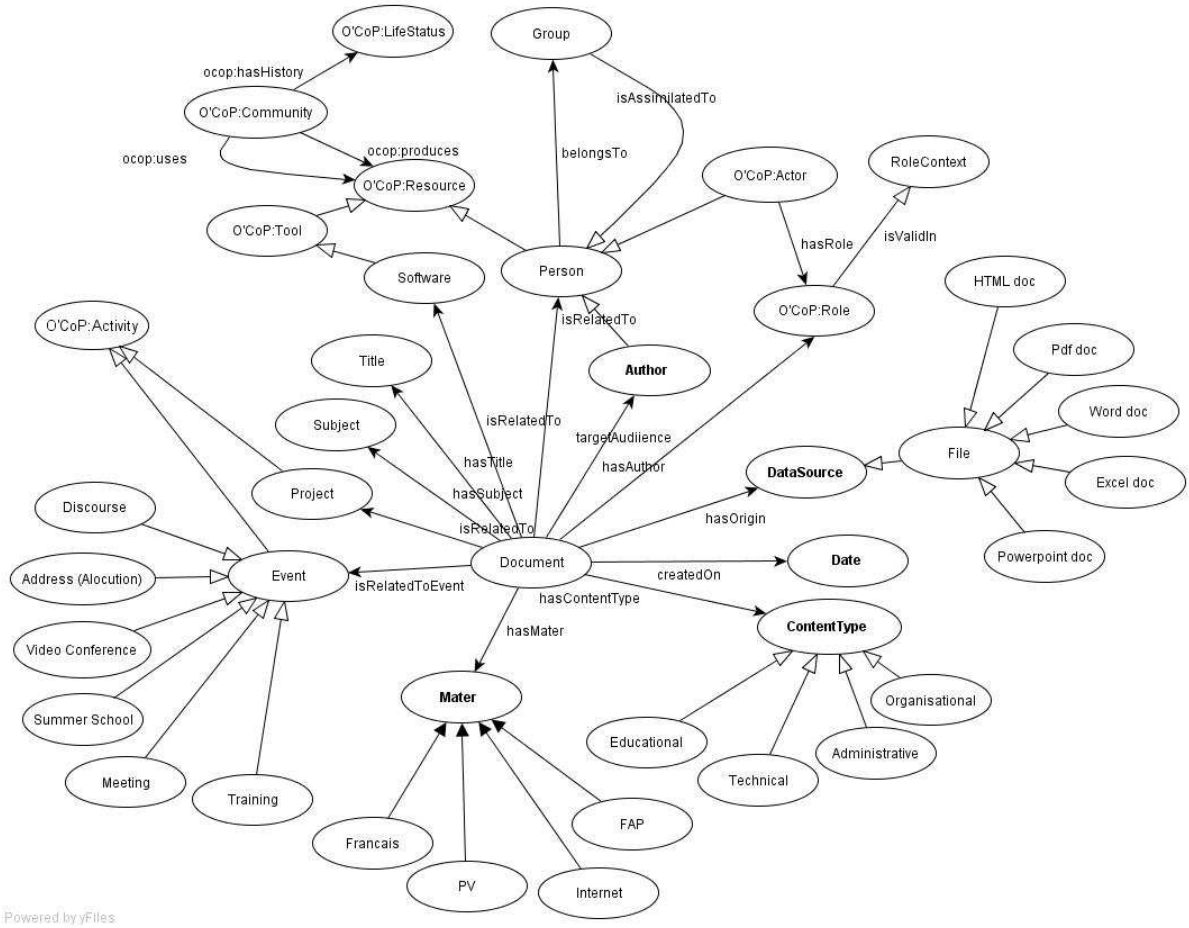

Fig. 4.3: O'CoP version of the Form@Hetice ontology

The last version of the ontology is based on the previous one, but linked to the O'CoPs developed in the D.KNO.02.

In the schema of Fig. 4.3, the O'CoP concepts are highlighted by the prefix O'CoP. Here after we present the justification of the mapping done between them and the Form@Hetice ontology.

- *O'CoP:Actor* : this concept is a specification of the *"Person"* concept, because an author or a contributor is not necessarily a CoP member.

It is not sure that *O'CoP:Individual* can be assimilated to *Person*. The D.KNO.02 is not clear on the relationships between *Individual* and *Member*: in O'CoP, *Member* is not a subclass of *Individual*, since for some CoPs such as Adira, the *Members* consist of *Organizations* and not of *Individuals*. If we keep the *Actor* hierarchy as it is, the single link we have is that *O'CoP: Actor* is a subclass of *Person.*

- *O'CoP: Role* : an actor has a role or maybe several, and these roles are valid in a context.

- *O'CoP: Document* : Logically, the Document class should be replaced by *O'CoP:Document*. However, there are some modeling differences between the initial Form@Hetice ontology and the O'CoP one that needs to be processed. While O'CoP provides a hierarchy of documents of different kinds, we have made a distinction between the document itself and its support, or dataSource in the ontology. Hence, we have tried to separate what the document is, from the form in which it is provided. To illustrate this, let's take the example of a report. A report as such, can be formalized or represented in the form of a book, a piece of paper, a file, an email,

etc. If we follow this reasoning, then the *O'CoP:Mail* and *O'CoP:OnlineDocument* branches should not be part of the document hierarchy but be instead part of a document support, or data source hierarchy. In this ontology, this concept is overloaded according to the CoP needs.

- *O'CoP: Resource* : this concept is the generalization of the resource used and produced by a CoP.

- *O'CoP: Tool* : As this concept represents the tools used by the CoP, the *Software* class of our initial ontology can be linked to it by a subclass relation.

- *O'CoP: Activity*: this concept represents the different kinds of activities that can be performed in the CoP. That's why the *"Event"* and *"Project"* concepts are considered as sub-concepts of *O'CoP:Activity*.

4.4 Lessons-learnt on building and on use

The ontology we have proposed to Form@Hetice has arisen from the initial will of this CoP to use the BayFac service for classifying and managing its documents. The intent was thus not to construct a full ontology of the CoP, but one that can be used in BayFac to fulfil their classification needs. Hence the method we used to build this ontology, based on the analysis of already existing documents classifications and annotations and of the set of facets initially proposed by the CoP mediator. As the goal of BayFac is precisely to benefit from an ontology, but hiding it from the end-user, the main validation that the CoP has provided concerns BayFac rather than the ontology itself. The alignment with the O'CoP ontology has been realized after the CoP had accepted the BayFac instance using the initial ontology. It is important to notice that even if the CoP did not need this alignment in the context of the use of BayFac, it is an important step to ensure interoperability between other services. In particular, annotations using the O'CoP ontology made by other PALETTE Services will be exploitable by BayFac to generate a first classification, based on them.

Moreover, the restricted use of BayFac by Form@Hetice implies few feedbacks on the CoP's ontology. This can partly explain the simplicity of the ontology. A close collaboration between the ontologists and the CoP's members could lead to a better exploitation of the tool and consequently a more complex ontology.

Let us summarize the characteristics of the Form@Hetice ontology: it comprises 29 concepts, 7 concepts from the O'CoP ontology, 14 properties, 4 properties from O'CoP. Its maximal depth is 2.

5 – Chapter 5: Learn-Nett Ontology

5.1 Method for building the ontology

The methodology used to build the ontology is based on a proposition-evaluation-evolution workflow. After the identification of the needs, a proposition is made. From it, the decision-maker evaluates (by use or by consultation) the capabilities of the proposition to respond to the needs. Usually, some corrections have to be done and the cycle begins again.

5.1.1 Identification of the CoP's needs

Learn-Nett is a Learning Network for Teachers and Trainers. At the beginning, Learn-Nett gathered teachers and researchers in the field of educational technology from five Belgian universities. Their goals were to build and share collective practice. Since 1997 other universities joined the network that now covers Belgium, France and Switzerland. This CoP only works at distance, with videoconference meetings and discussions in forums.
Since 10 years, Learn-Nett has accumulated a lot of documents, for instance students' reports, research article, conference presentations, available on multiple platforms. So this CoP expresses the need to have a unique platform where most of its documents are stored. The objective of using BayFac in this CoP is also linked to the need of tracing its memory. Here BayFac is used as a platform of depositing files, in order to search and classify them according to specific concepts.
In order to use BayFac, an ontology had to be defined. So the first step was to know what the CoP wants to search with this tool. To respond to this, the tool BayFac was presented to the CoP mediator, and some exchanges on the different functionalities and the CoP's needs occurred. Then the service mediator explained what BayFac could do, i.e. what it is possible to search and classify, in which way and according to what. Knowing that, some tracks to the use of BayFac by Learn-Nett were found. From that, the CoP mediator has worked on the CoP's needs and has provided the characteristics of the person and document concepts as the CoP wants to search and classify them.

5.1.2 Design of a first draft of the ontology

As said previously, the CoP mediator has proposed a listing of the interesting concepts (document and person) and their characteristics, in the context of Learn-Nett using BayFac. Learn-Nett wanted to search and classify persons and documents. From it, an ontology was built with some propositions of the service mediator. The characteristics proposed were formalized as properties and the more complex of them were conceptualized as classes. These propositions, from both mediators, constitute the first draft of the Learn-Nett ontology as illustrated below.

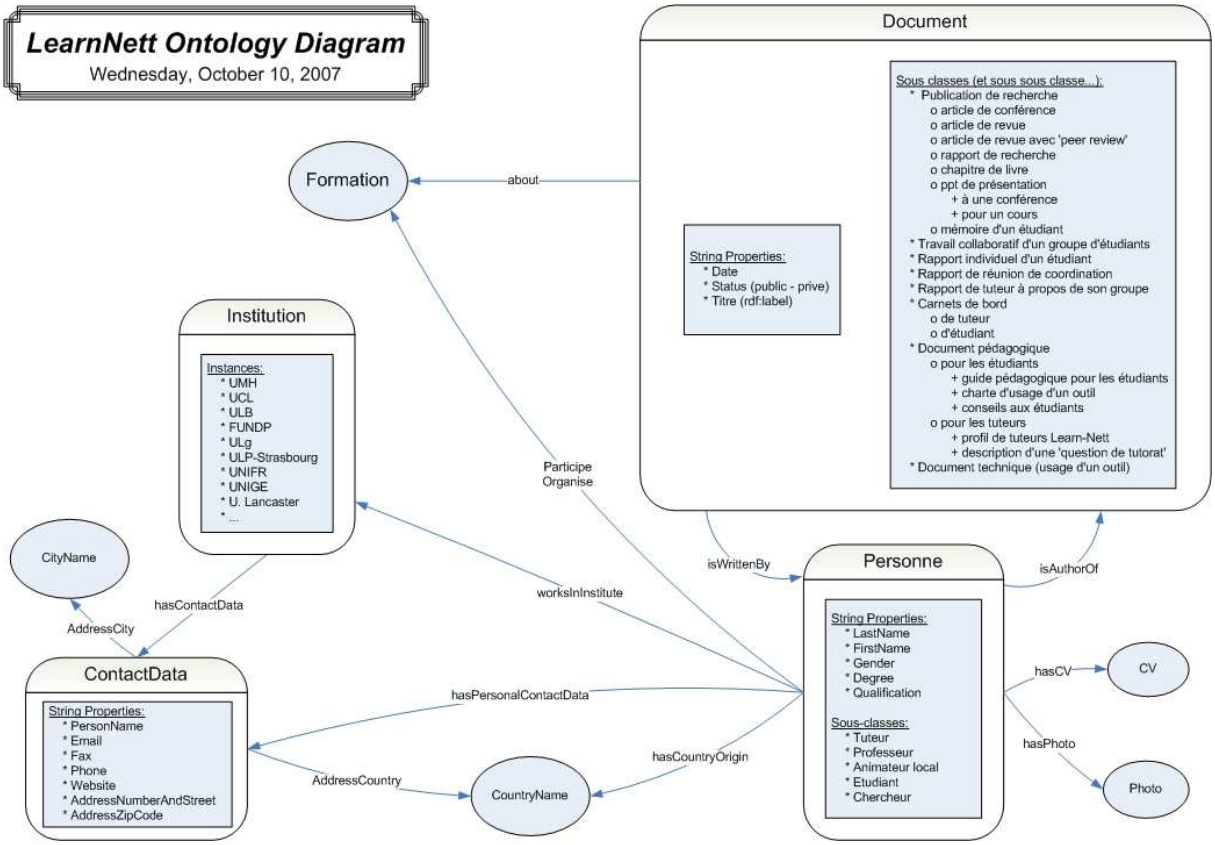

Fig. 5.1: Semantic graph of the first ontology of Learn-Nett

5.1.3 Evaluation according to needs

After the proposition of the first version ontology, an evaluation was made. The ontology proposed was discussed and explained with a focus group composed of several CoP members in a videoconference meeting. A better understanding from both mediators about the work of the other has allowed to add some concepts and to delete others.
For example, the *"Formation"* concept was discarded because only one training is given during a year. Instead, the CoP talks about sessions. There is one session per year, it is during a period of the year so the concept built is kinds of period with start and end dates.
The *"Role"* concept appears also very important and was inserted. Each member has one or several roles in Learn-Nett. These roles can change from a year to another.
Finally, we understand that a temporal composition was needed, so we build the *"Situation"* concept to describe the situation of a member (role(s), institution…) during a session or during a part of a session.

From these propositions, a new ontology was designed taking the concepts *"Situation"*, *"Role"* and *"Session"* into account. The need of links to the O'CoP ontology has been identified too. So, some of its concepts were selected and linked to the Learn-Nett ontology. For a better interoperability, some concepts and relations were taken from the Dublin Core ontology.
The result is illustrated above by the ontology scheme. The description of its main concepts takes place above, in the next section and the O'CoP mapping description is in the part "Description - Abstract O'CoP concepts".

From this latest draft, the CoP's members felt the need to well define, according to their needs, the properties of a document and more particularly about the document hierarchy. So, they discuss of the documents they want to insert and use into BayFac and the purpose of this use. From this really interesting virtual conversation, they provide a new hierarchy of document and a complete list of interesting thematic to be link to documents.
In parallel, they make too some remarks on the relevant properties of a member. It means what would be interesting to know about a member of LearnNett through the years.

From this latest discussion, the final ontology was built, and will be described in the next paragraph.

5.2 Description of the ontology

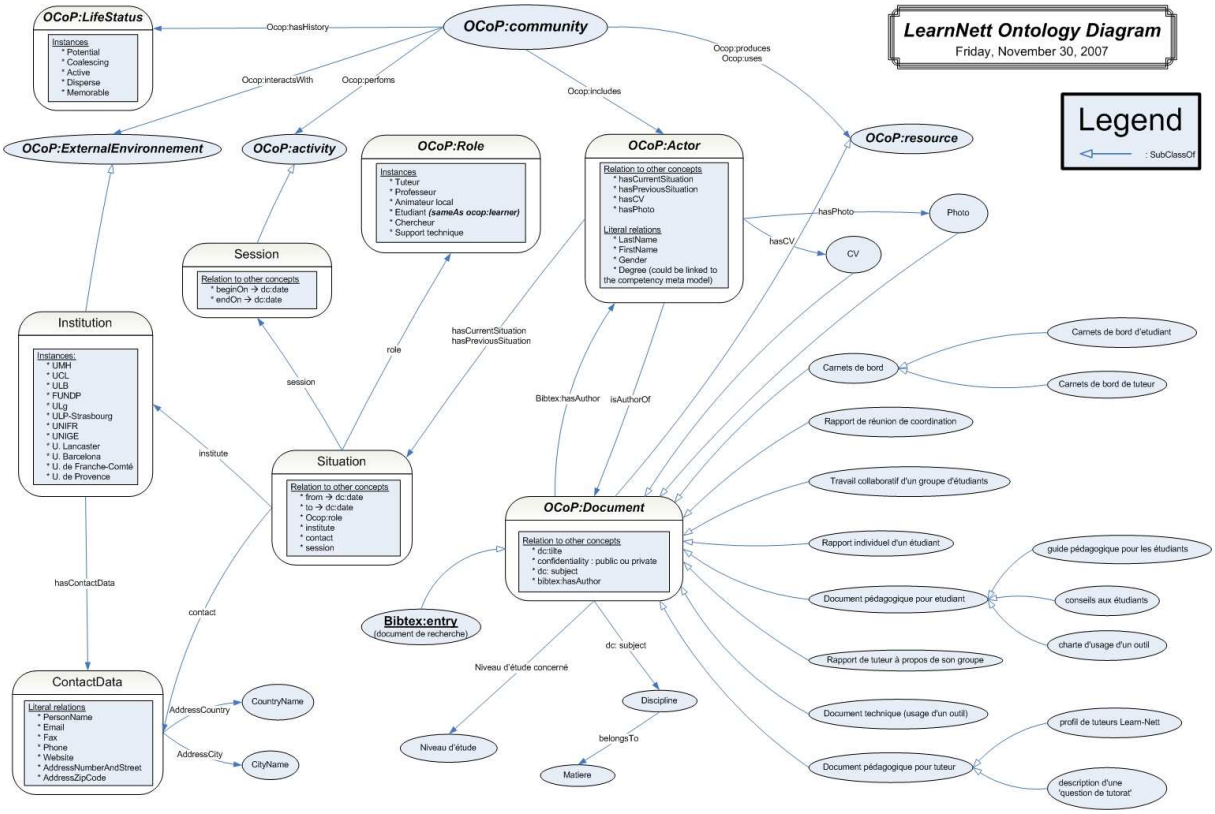

Fig. 5.2: Semantic graph of the second ontology of Learn-Nett

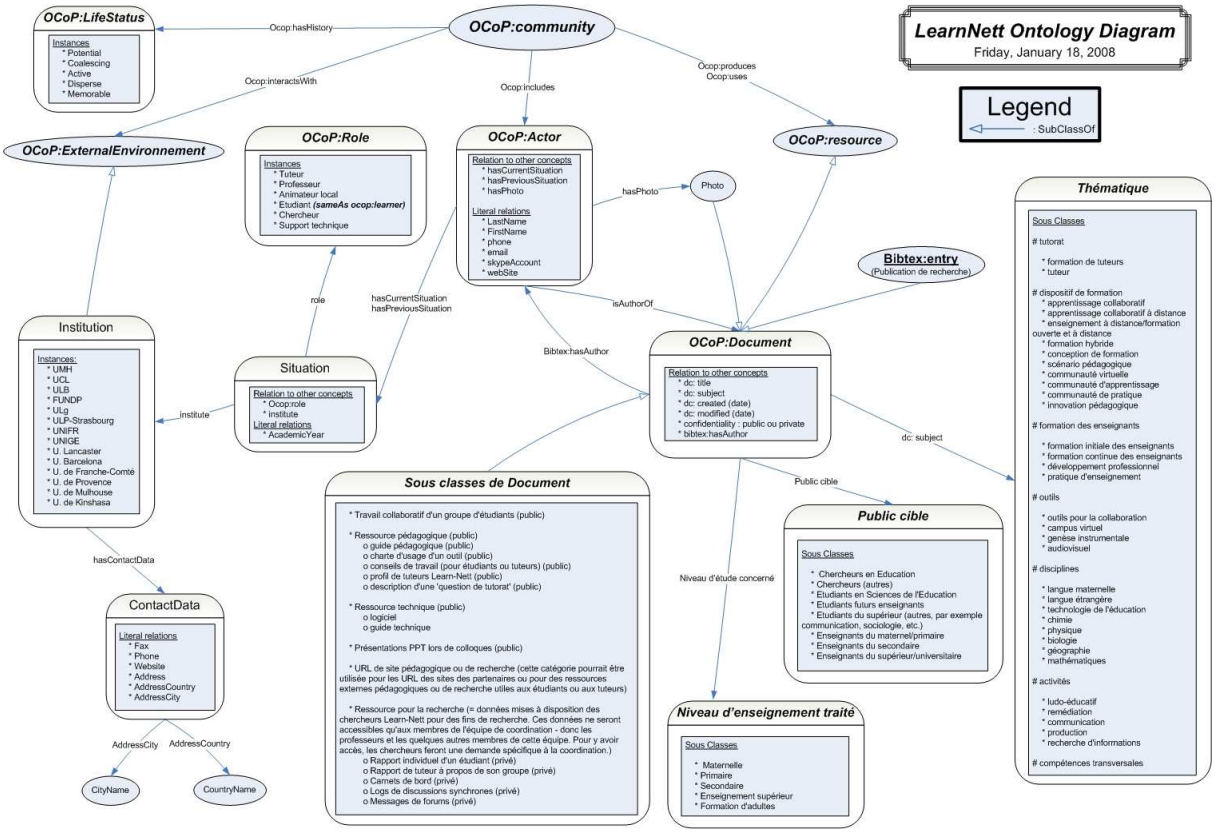

Fig. 5.3: Semantic graph of the final ontology of Learn-Nett

This final version of the ontology (see Fig. 5.2 or, for a more visible picture, the following link http://www.palette.tudor.lu/wiki/doku.php/learnnett_bf) will be deployed on the BayFac of the CoP but can still be modified if needed, thanks to Generis. We are going to describe it in this section.

The bubbles represent the concepts and the arrows, the relations between them. Inside the bubbles, the relations are listed and sometimes the instances are listed too if they are identified. The "literal relations" are relations represented by a literal (just words for human reading) and not by a concept, identified by an URI and having some characteristics.

Notice that, because the LearnNett CoP is French-speaking, some concepts, needing a perfect comprehension from the members, appear in French.

Now let's see the description of the main concepts, composing the ontology.

Document concept

The *"OCoP:Document"* concept is considered as a subconcept of the *"Resource"* O'CoP concept;

- *dc:title :* this property of Dublin Core specifies the title of the document.
- *dc:subject :* this property of Dublin Core specifies the subject, i.e. the thematic of a document. These thematics are listed in the picture above.
- *dc:created :* this property of Dublin Core (refinement) specifies the creation date of a document.
- *dc:modified :* this property of Dublin Core (refinement) specifies the latest modification date of a document.

- *Confidentiality:* a document could be public or private. When a document is private, only the CoP's members can access it. Thus, the two instances of the *"Confidentiality"* concept are *"Public"* and *"Private"*.
- *bibtex:hasAuthor* : this Bibtex ontology property specifies the author of the document.
- *Public cible*: this property links the document to its targeted public.
- *Niveau d'étude concerné*: this property links the document to its teaching level.

The *"Document"* concept has a lot of subconcepts.
For scientific documents, the Bibtex ontology will be used because it is a reference in scientific bibliography.
For other types of documents, the CoP has specified its needs in the form of a hierarchy as it appears in the scheme (*"Sous classes de Document"*).

Person concept

This concept is the *"O'CoP:Actor"* concept. It is detailed here by some literals to specify the name, the phone, the email, the skype account and the website of the person.
The role of the person, represented by the *"O'CoP:Role"* concept, and the attached institutes are not directly linked to the "Person" concept because they can change from a year to another.
To represent this temporal aspect of the *"Person"* concept, we chose to build a *"Situation"* concept in which we describe some person's characteristics that may evolve. Thus, a person has a "current situation" and can have "previous situations". This latest relation can be useful to represent the CoP's history.

Situation concept

A situation represents a period of time in which some person's characteristics are true. This period of time is here only represented by an academic year (former "session" concept) because most of time a member keeps its role and institute during a year. The person's temporal characteristics are:

- the role(s), defined by the O'CoP *"Role"* concept;
- the institution, in which the person works. The "Institution" concept is considered as a subconcept of the *"External Environment"* O'CoP concept.

Abstract O'CoP concepts

To take the common backbone of the O'CoP ontology, the *"Community"* concept has been inserted to link the different O'CoP concepts. Thus, in this ontology we can find that the Learn-Nett Community:

- *has an history* where we can find its life status (O'CoP: LifeStatus concept);
- *interacts with* external environment (O'CoP:ExternalEnvironment concept), mainly the institution of its members;
- *includes* some actors (O'CoP:Actor concept) which have some roles (O'CoP:Role concept) according to the situation in which they are.
- and *produces and uses* some resources (O'CoP:Resource concept), mainly documents (O'CoP:Document concept).

5.3 Lessons-learnt on building and on use

Like the ontology of Form@Hetice, this one is done for BayFac. Its aims are not to model the CoP's domain exhaustively. This ontology is done as a beginning of the modeling because we can use it with BayFac.

The lessons learnt mainly concern the methodology to build the ontology and the discussion to do it.

- Discussion about terms or relation can be very difficult because of the interpretation of each member on each concept. When the needs and the exploitation are not concretely expressed, the debate is endless… That is why we only take time to conceptualize concepts that are directly used by BayFac. For this reason, some concepts of the O'CoP ontology have not been inserted.

- To understand why building ontologies is interesting but also quite difficult, trainings are necessary.

5.4 Conclusions

Building the ontology is interesting. To really go forwards in its building we need to discuss with CoP members. The challenge is to be able to have a communication between all the concerned CoP members, which lead to a consensus about the ontology.
Let us summarize the characteristics of the Learn-Nett ontology: it comprises 25 concepts, 8 concepts from the O'CoP ontology, 15 concepts from Bibtex, 15 properties, 5 properties from O'CoP, 40 properties from Bibtex. Its maximal depth is 3.

6 – Chapter 6: TFT Ontology

In this chapter, we describe the method used to build the ontology of the TFT community of practice, (TFT CoP) : it us closely bound to the setting-up of this new CoP. Later we will show how the progressive structuring of this ontology was carried out and finally, in the last part, we will draw some lessons from the work achieved.

6.1 Context: the TFT CoP

6.1.1 A new CoP

The TFT community of practice (TFT CoP) is a new community of practice related to the hospital circle and which was created on a member of the PALETTE project's initiative early in 2007.

Several tasks were carried through simultaneously in order to set up this CoP:

- locating potential members
- listing resourceful persons / key informants
- sending e-mails in order to arouse the creation of this CoP
- meeting volunteers in their institutions, phone calls, and so on…
- writing a presentation of the project,
- first gathering of the participants' preoccupations…

Further to these first investigations, we offered to make up a group of persons interested in the accompaniment (supervision) of the trainees (students in schools educating nurses) on the premises of the training so as to cope with the problems bound to the transition between school instruction and concrete professional work. The « TFT » acronym means Transition Formation Travail, in the sense « links between training moments (on the place of work) and education moments ».

In fact, each institution confronts similar problems and copes with them according to their specific environment. Formal and informal networks exist where these questions are sometimes dealt with, but these networks are made up with members from the same institution. Moreover, there are meetings of people sharing the same responsibility as to welcoming trainees in several departments and/or hospitals. Several persons we met told us about the difficulty in organizing such meetings (being present) because of the load of work and the little time available.

Consequently, after locating the key persons (teachers, nurses in charge of welcoming trainees in hospitals…) we offered them the use of a PALETTE service to exchange practical experiences, tricks and ways, possible solutions…

6.1.2 Features/characteristics of this CoP

This nascent CoP which started during the second term of this year 2007, brings together professionals in educating future nurses and professionals in nursing. It is based on the needs uttered for meeting between the nursing personnel and the teaching personnel. Several members of it have already taken part in exchange networks (some stopped, others are still working). Seeing that the history of this CoP is very short, there are neither own archives nor own documents available. Several members of this CoP have some resources that have not been put at the disposal of the entire CoP yet, apart from a few texts, and this with the intention of testing the use of SweetWiki in terms of sharing documents and the collaboration on writing.

6.2 Methods and steps for building the ontology of the TFT CoP

The methodology followed is a participative building of the ontology. It is based on the coming and going between the mediator's proposals and the participants' reactions. It namely uses the SweetWiki service. The mediator of the TFT CoP is the person who decided to use SweetWiki as a support for the collaboration work within this new CoP. This mediator is also the person who incited the creation of the ontology of the CoP, namely starting from semantic annotations on pages edited by SweetWiki, first by himself, but later also by members of the CoP. He also plays the part of administrator of ontologies.

Here are the steps we followed in our work:

1. Building of a starting ontology
2. Use of SweetWiki to create a folksonomy of the CoP
3. Structuring of the tags in ontology
4. Organization of the validation and adjustment of the ontology

6.2.1 Building a starting ontology

When we achieved previous projects, we noticed that the problematic of the place of the trainees (male nurses and nurses) in the different departments of hospitals was an important topic among the different actors, as much for the personnel in the hospitals, as for the trainers in the different schools.

On the basis of the experience acquired in some of other projects (Flexifor[7], tutoring in hospitals[8], …), the mediator of the CoP offered a first sketch of an ontology bound to the problematic of the welcoming of trainees that helped to structure contents brought in SweetWiki.

Here follows the first structure that was used as a basis for the creation in SweetWiki of an ontology focused on supervision during trainings.

Supervision of training:

- definitions
- history: evolution,…
- feelings of the supervisors and the supervised persons
- problems and solutions
- clarification of the parts of the intervening persons /participants
- description of a few « cases » in training: how it happens in concrete terms
- legal frame:
  - civil liability of nurses in charge of the supervision of trainees inside the hospital
  - liability of the trainers
  - « as official » declared aims, reference documents?

[7] go to http:www.stecrifa.ulg.ac.be/flexifor/ the project was financed by the European Social Funds, ADAPT AD53 program and the following partners: the CEGI, a team specialized in evaluation and introduction of change in organizations; the « Région Wallonne », direction of training and careers; IFAC, Intercommunale Famenne, Ardennes, Condroz; IPAL, Intercommunale des personnes âgées (elderly people) de Liège et environs (surroundings) and the CPAS of Liège (public center for social help) , welcome service for people seeking refuge…

[8] tutoring as a method of transferring abilities in initial training and further training in the field: « accompagnement » (accompaniment) is a research project aiming the improvement and valorization of tutor functions within the firm in order to optimize the methods for transferring abilities in initial training and further training in the practise.

- evaluation
    - of whom? of what ?
        - trainees
        - supervisors
        - training systems
        - places of work
    - types of evaluation
        - formative
        - summative
        - certificative
    - evaluation tools for
        - the trainee
        - the worker
        - the matron/chief nurse
        - the trainer
        - …
- involvement of the learner, the departments receiving the trainees…
- tools for the supervision that might be useful to
    - the supervisor
    - the person supervised
    - the personnel in the departments
    - the managers (?)
- attitudes
    - of the trainees
    - of the personnel
    - of the supervisors
- the matter of the relationships between generations

6.2.2 The use of SweetWiki to create a folksonomy of the CoP

Parallel to this a priori-work, the mediator opened a private SweetWiki for the TFT CoP in April 2007. The participants of the TFT CoP were trained to use SweetWiki during a small initiation time when the project was presented. Several members then took part in a training given by the University of Liège at the beginning of October 2007. Besides two members of the CRIFA are continuously at the participants' disposal for a more personalized help, by mail or phone.

In November 2007, 26 persons were registered in the TFT SweetWiki[9]

- 8 members of the Palette project
- 8 teaching nurses
- 5 nurses in charge of welcoming new ones and students
- 2 nurses in charge of continuing education
- 2 other members of the TFT CoP

At the beginning, the TFT SweetWiki was supplied (in contents and tags) by the mediator, then progressively by the participants (social tagging). The SweetWiki pages contents are mainly references dealing with the theme of the supervision of trainees (e.g. webography, papers, etc.) that are commented by the mediator or a CoP member. There are also documents written by a CoP member (e.g. about the problem based approach developed in a paramedical High School). Nevertheless, at this stage, there is no real collaborative edition of documents. The SweetWiki service is used to use the first draft of the ontology to tag documents and to collect new tags to enhance the ontology. In this way, a series of keywords were used or collected (191 tags), composing the folksonomy of the CoP.

[9] for further details, go and consult annex 1

Here follows an extract of the folksonomy as it was available in TFT SweetWiki after 3 months of use. As Fig. 6.1 lets us see, a part of the concepts stated has been structured (here by the mediator), others are 'root', in other words not linked to others. You'll find the whole folksonomy in appendix 1a.

Fig. 6.1: Folksonomy of the TFT CoP

6.2.3 Structuring the Tags in ontology

In the developing process of the CoP and the involvement of its members, this work of structuring tags is an important step which has to be achieved with members of the CoP. Indeed, as Viau described in his book « la motivation en contexte scolaire » (motivation in school context) (1994), the determiners of motivation (and thus of the participants' involvement in the CoP) are, among other things, the control of his actions (does my doing influence the result of the group's work)

Another element next to the possibility to decide about the contents the participants are going to work on) is the perception of the value of the activity (here use SweetWiki and the semantic Web). This value is influenced by the meaning the actors will give to what they are doing and by the perception of the ability they have for achieving this activity. From there the importance of direct help and training in the use of Palette tools and services, otherwise we expose ourselves, if not to a pure and simple rejection, to a non-use and progressive closing down.

So that the participants should make out the usefulness of the tags and their structuring, the mediator plays the part of administrator of the ontology.

Because of the important number of tags and as the SweetWiki ontology manager is not usable enough, (namely impossibility to achieve in a simple way a hierarchical organization with the help of a drag and drop, or absence of a graphic representation of the concepts), we recovered them in an EXCEL file (see appendix 1b) and pre-processed in a word-processing program allowing a sorting out

on columns. In this way we can identify the already existing structure (subclass of). The totality of concepts collected in this version of the ontology under construction is available in appendix 1c.

Before coming back to the SweetWiki ontology manager, the mediator also structured these tags or keywords as concept maps. He used the CmapTools software to produce graphical representations.

You will find in appendix 2a series of concept maps from the following central concepts: actors, training system, structure, pedagogy (educational methods), hospitals and awareness.

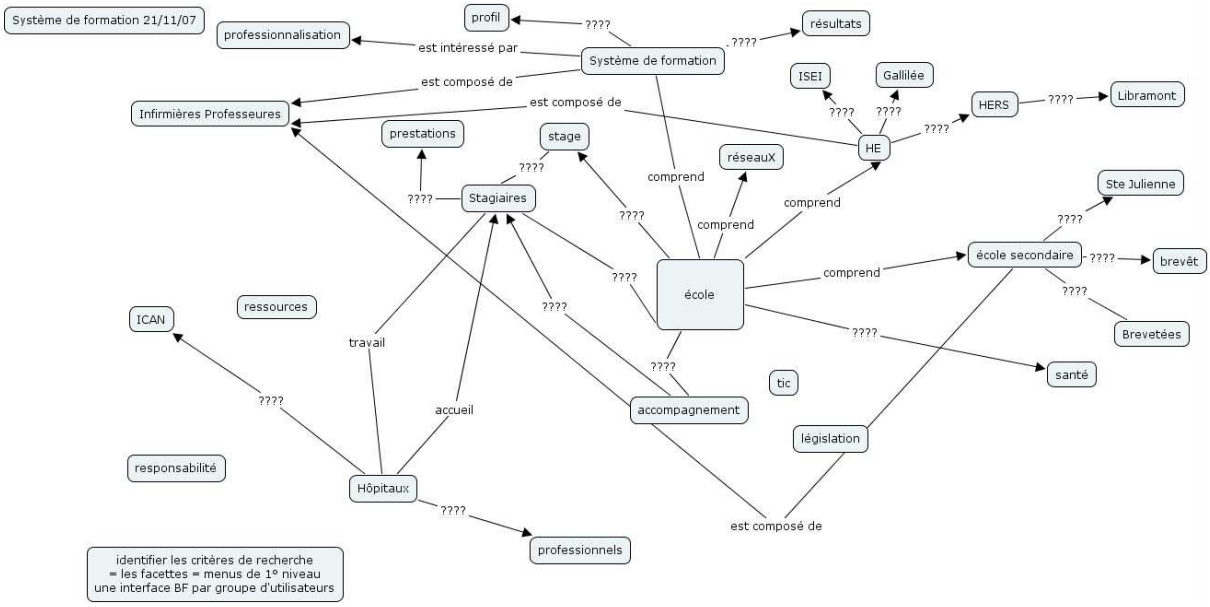

Fig. 6.2: concept map starting from the concept « training system »

The maps « training system » and « pedagogy », which are the most elaborate concept maps, are those proposed to the members of the CoP and the persons wishing to modify them.

So far in the structuring, the mediator, helped by the ontology manager tool, has linked tags that were only related to « new concept », to one or several other concepts (see the structured list of tags in appendix 1c). For a better interpretation of the meaning of the keyword used, it has been necessary to see the context in which the tag was produced, the tagged page as well as the other tags associated to the same page. According to this information, the tags have been linked to other concepts. This structuring operation achieved by the mediator has given rise to several technical problems, among which the creation of loops, which made part of the ontology invisible, leading (because of the lack of indications about this occultation of the data) to a new coding of part of these.

6.2.4 Organization of the authentication/validation and adjustment of the ontology

Before suggesting that the participants go on supplying the SweetWiki with the documents they wished to share with the whole CoP, we wanted to show the work achieved and to ask the members of the CoP their opinion about the work in progress.

A meeting for the validation and adjustment of the TFT ontology took place on December 6th 2007. It also enabled us to sum up the development of the PALETTE project and its current orientation, and to

gather questions or preoccupations from the ICAN[10], teaching nurses, nurses in charge of continuing education.

a) Participants

Besides the mediator and the validator of the TFT CoP, eight members of the TFT CoP took part in the validation meeting:
- A female teacher who has worked half-time since 1974 in a school of « infirmières brevetées » or « A2 nurses »l (=licensed practical nurses) and half-time in another school (1st and 3rd year). She does not go and see students during the training but used to work a lot with trainees. She is interested a lot in computer applications/tools and uses the ACOLAD platform.
- A person in charge of e-learning at the HEMES (higher education school in Liège)
- A teacher from the « École de la province de Liège », who coordinates training periods in different Departments
- the ICAN of the IPAL (elderly people in Liège)
- A nurse from the « Bois de l'abbaye » hospital in Seraing since 87 and ICANE since 2003
- A teaching nurse in the « Ecole de la province » who just discovered the project and finds it very interesting.
- An « ICAN » nurse from the CHR (regional hospital center) in Huy for 2 years who used to be a teacher in the « Province de Liège » and showed herself interested as well in education as in welcoming new nurses.

b) Development of the validation session

- Reminding of the working context
Starting with this small group of persons interested in and taking part in the validation session, we offer to start the exchange of views, the reflection on the theme of training in hospitals. We remind participants of the fact that the CoP is a living organism, unclosed, that other colleagues can join us any time in our works, our meetings, according to their wishes, their interests. The CoP is characterized by a voluntary involvement of a series of persons and by communication about themes considered as important. As far as this CoP is concerned, communication happens through meetings being present, through a common use of SweetWiki and through a forum.

The level of suitability of Palette tools and services varies from the one member of the CoP to the other, which is rather normal, as the CoP is in its early stages. The mediator and the validator (supervisor of the work achieved inside the TFT CoP) are at anyone's disposal to help in case of technical difficulties to log in. It is only through use that each member will perceive the advantage of the new tools put at he CoP members' disposal.

How far have we got in developing the pattern of this TFT CoP?
About thirty institutions were contacted and a fair number of them showed some interest in the problematic. A private SweetWiki was opened and supplied by a few members, to « prime the pump » and to train themselves to use this new type of Wiki.

- Reminding of the work achieved about ontologies
A first starting ontology was achieved by the mediator. Next, a series of tags were associated to the CoP's Wiki pages. A third step was the structuring of the tags by the mediator, which showed the improvements to be carried out to the system within the management of ontologies. Indeed, it is only by handling this software for a concrete use , on data that are meaningful in the context of a work in

[10] ICAN means « nurse in charge of welcoming new nurses ». You can also find ICANE « nurse in charge of welcoming new nurses and students » (« Infirmière Chargée de l'Accueil des Nouveaux Entrants »).

progress, that the user can, from his/her own point of view, see the limits of the system and make proposals for improvements. We'll talk about this again later in the chapter « lessons learnt ».

c) Members' opinions and adjustments

The CoP members found the structure offered by the mediator strongly theoretical and that the tags were structured, but in a too complicated way. Therefore, it was decided to leave this work aside for a short while and to gather the elements of the ontology of the problems among the participants starting from a brain storming. This activity was achieved the members being present, following a creating method of concept map from a « metaplan » describing the field to be dealt with by the CoP.

The orders were formulated as follows:
« If we focus on the welcoming of trainees or new nurses in the department, which words help to describe the situation in question? What are the difficulties, the problems and the solutions? In other words: when I think of welcoming a trainee, which images, words, concepts cross my mind? What you have to do is write a word or a short phrase/idiom on small maps at your disposal. We'll write on a few maps then we'll place them on the blackboard and we'll organize them. The teaching nurses have to use yellow maps, the ICAN white maps. »

The gathering of concepts led up to an ontology of practical problems bound to welcoming trainees or new nurses in institutions.

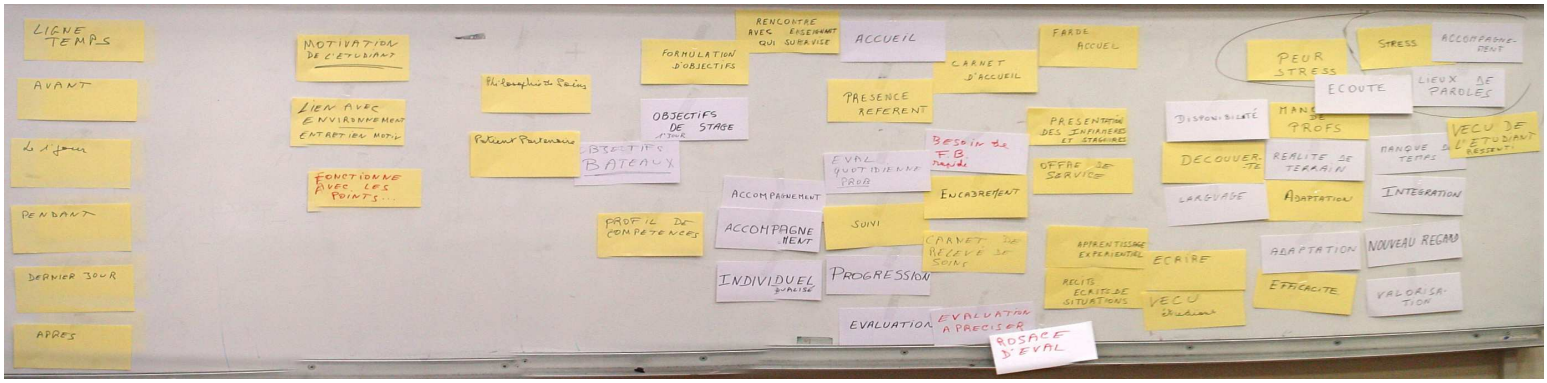

Fig. 6.3: Piece of the panoramic table of concepts

This table shows some large categories of concepts bound to practical problems met on welcoming trainees or new nurses in institutions. These concepts are presented as concept maps and commented in annex 3. We can quote, for instance, the notion of accompaniment (appendix 3, Fig. A3.1), the concept of welcoming (appendix 3, Fig.A3.2), the notion of chronology which is transversal, which can be applied for the most part to the other notions and give them a temporal structure (appendix 3, Fig. A3.3), the concept of objectives and the very close notion of abilities (appendix 3, Fig. A3.4).

d) Decisions of the group as to following up his/her works

To help the CoP members in their choice of the subjects to be dealt with as a priority among the themes tackled, it will be necessary to determine what is important and frequent. The choice will be made according to the meeting of both criteria and also considering the common ground as far as the problems of the teachers and of the « ICAN » are concerned.

At the end of the meeting, the first proposals as to following up the work in the TFT CoP (adaptation of the development to the requests made by the CoP members), seemed to turn towards:

- the reflection on the « objectives » (which objectives, defined by whom, how to be used, when, with which links with the evaluation) in the context of training periods in hospitals could be dealt with in a forum and on the SweetWiki of the CoP.

- The practice of « word places / places for speaking » (Lieux de paroles). The latter is not kown by all, and within the context of the TFT CoP, this topic could be tackled. The TFT SweetWiki could be supplied with information on this theme. Some volunteers will be called in to supply the SweetWiki on this theme of the implementation of the « places for speaking » in the context of training periods in nursing circles. What they will have to do is to provide a description of the plan of action, of the abilities necessary for the animation of the places in question, of the links with the general policy of the hospital, its philosophy. Moreover, one special day with the members being present could be organized on this theme and ensue from a reflection beforehand on the forum.

6.3 Lessons learnt on building TFT ontology

6.3.1 The starting ontology

The starting ontology defined by the mediator according to his knowledge of the field proved to be very theoretical, scholastic, formal. However it only claimed to be able to start a defining and structuring work. It has been only very little used so far. It will be a possible resource for future work, if the CoP members wish to refer to it.

6.3.2 The tagging stage

The tagging stage of the pages by the mediator, and, to a minor extent by a few members of the CoP, has made it possible to add a large amount of concepts to the first list. The structuring of these concepts has provided an ontology that turned out to be unnecessarily complicated when it was used: the number of connections/ links between concepts as well as the number of crossed connections, results in the reference of one page to a great number of other concepts and to other pages. This results in a multiplication of possible links and so, to such interference that the relevant piece of information is lost.

6.3.3 The validation, a new focus on the heart of the matter

The validation session with the work group made up of teachers and ICAN members representative of most CoP members' worries, has permitted a focus on real practice and on the interests of the CoP members.

6.3.4 The way towards a new ontology

The next step will be the diffusion/spreading of the new ontology stemming from the group work, to have it authenticated by the other CoP members who could not be present.

The current ontology we can find in SweetWiki will also have to be cleaned and centered again on the concepts (and their links) used by the CoP members during the validation session held in December.

Then we will offer the use of the TFT SweetWiki using the purified and updated ontology, and we'll enrich it with tags linked to the new pages.

6.3.5 Conclusions and prospects

If an ontology is too complex, it becomes unusable. Would the creation of specific ontologies be the solution? For instance, an ontology that would be suitable for teaching nurses, an ontology that would be suitable for nurses in hospitals, an ontology that would be suitable for nurses in charge of the setting up of actions for continuing education… We don't think so, at least in the current case and for the problem tackled. Indeed, the objective aimed with the making up of the TFT CoP is the creation of a network grouping people with different status and preoccupations for a better comprehension of each other's point of view in a particular field. From there is the advantage of only one common ontology.
The matter of the size and of the specificity of ontologies will possibly form subject for further reflection.

7 – Chapter 7: Conclusions

7.1 Lessons-learnt

The development of the different ontologies was varied, according to:

- *The information sources:*
  - Semi-automatic analysis of a corpus of e-mails for the *"Technical Problem"* ontology for @pretic CoP,
  - Brainstorming between CoP mediator and CoP members for several ontologies *('Human Problems", 'Learning and Teaching'* for the @pretic CoP) ,
  - Reuse of existing ontology for Ontopedia, the *Component* ontology for @pretic CoP,
  - Manual analysis of a document corpus shared by Form@Hetice on its Web site and reuse of Dublin Core,
  - Discussions with CoP service developer, CoP mediator and CoP members for Learn-Nett CoP.

- *The developers of the ontology:*
  - The CoP mediator for TFT
  - The KM service developers (e.g. INRIA for @pretic, CRP-HT for Form@Hetice)
  - Both the KM service developers and the CoP mediator for Learn-Nett.

- *The methodological approaches used:*
  - Semi-automatic approach based on NLP techniques for 'Technical Problem' ontology for @pretic,
  - Automatic transformation of an existing hierarchy Ontopedia for the "Component' ontology of @pretic,
  - Folksonomy-based approach for TFT,
  - Manual creation guided by the applicative objectives for 'Human Problems', 'Learning and teaching" ontologies dedicated to @pretic and for the Form@Hetice and Learn-Nett ontologies.

In all cases, the validation of the ontology terms or the ontology structure was performed by the CoP mediators, and with some CoP members.

The ontologies related to "*Human Problems"*, *"Learning and Training"* and *"TFT-Transition Formation-Travail"* were manually built, starting from problems mentioned by CoPs members through discussions, either in mails (@pretic lists) or in face-to-face discussions during previous projects and when the CoP emerged (TFT). Finally, the different corpus have been mainly developed and validated through brainstormings with CoPs members animated by their mediator. This method offers the opportunity to catch concepts at several levels (cognitive and socio-affective).They organized the collected information as conceptual maps. Afterwards, the hierarchy of concepts was introduced by the mediator in ontology manager tools as ECCO or SweetWiki.

In the TFT CoP, the proposed scenario was to provide and annotate in SweetWiki resources dealing with the specific domain of the management of the work nurses students and their supervision by professional ones in the hospitals. The evolution of the TFT ontology showed that starting from the work of an expert of the domain who proposed a list of concepts (first draft of the ontology) and using them to annotate SweetWiki pages can produce a folksonomy. Nevertheless, the version of the TFT ontology developed using social tagging was estimated too complex by the CoP's members. In fact, the hierarchy was difficult to establish and the consistency of some concepts has to be improved. Therefore the CoP and its mediator revisited the priority concepts to deal with in the ontology during the validation session.

These stages are part of the methodological approach presented by [Dieng, 2007]. We have defined needs and proposed a scenario, built and validated the first drafts of the ontologies, built and validated some annotations. The use and evaluation of the system showed that we would need a more useful ontology manager tool to formalize and manage them. The cycle is not finished: the ontology will be maintained and evolve. This work is an illustration of the participative design process, not only in terms of ontology building but also concerning the tool and service evolution and the process of ontology building itself.

When developing manually an ontology, a phase of brainstorming with the concerned actors and a first structuring of the concepts with the help of a metaplan or/and a graphical representation (conceptual map) is recommended. This guarantees that the context, sometimes very particular is taken into account. Matching these results with experts knowledge of the domain and existing ontologies and taking into account should produce relevant and consistent ontologies.

7.2 Comparison with related work

We can compare our work on the O'CoP ontology with recent work linking CoPs and ontologies. In [O'Hara et al, 2002], the authors present a method based on analysis of the relationships between instances of a given ontology in order to identify potential CoPs in an organization. In [Bettahar et al, 2006], the authors develop an ontology aimed at enabling services among a civil servant CoP; in [Floyd et al, 2005], design of situated ontologies for knowledge sharing in a CoP is studied; in [Ankolekar et al, 2006], a semantic web system for open source software communities relies on specific ontologies (*Code, Bugs, Interactions, Community*). In comparison to this related work, the O'CoP ontology is original through: (a) the method used to build it cooperatively from analysis of several real CoPs, b) its objective of enabling to annotate CoP's resources in addition to modeling of the notion of CoP, and (c) its three-layered structure, with a generic layer, a middle layer gathering concepts common to all CoPs and a low layer specific to a given CoP. Our work can also be partially compared to the typology of virtual CoPs (i.e. CoPs interacting through ICT) proposed by [Dubé et al, 2006] or to the typology of CoPs based on their knowledge characteristics [Klein et al, 2005] but these typologies are not materialized through ontologies.

In this deliverable, we presented an experience for building semi-automatically an ontology from the mails exchanged through a mailing list of the @PRETIC CoP. This experience raised two issues: building ontologies from low quality texts and using mails as knowledge source. The first issue was tackled by [Even and Enguehard, 2002] who present an approach based on building semi-formal ontology that model corpus information and relationships. However the authors apply this approach on a low quality but formal corpus. Extracting information from mails was also offered by [Zhong et al., 2002] and [Sakurai and Suyama, 2005] but their main objective is e-mail classification in order to spam filtering for example as [Jongwan et al., 2007]. The originality of our work is the combination of the two noted issues: building semi-automatically an ontology from e-mails. A Problem ontology was developed in the framework of Samovar project [Golebiowska et al, 2002] but it was dedicated to problems encountered in vehicle design projects. Our method for semi-automatic building of the Problem ontology was inspired of the method used in Samovar project relying on NLP tools for semi-automatic construction of the ontology from textual comments of databases – that were also poor-quality texts.

In the context of the both CoP Form@Hetice and Learn-Nett, BayFac is used to search and classify documents. Because of this use, in the ontologies built to use BayFac, the central concept is *"Document"*. Numerous ontologies describe the domain of document, but only few are considered as standard. The first used ontology is the well known Dublin core ontology which describes in a very general way documents and their annotations. This ontology is used in both Learn-Nett and Form@Hetice ontologies.
In the case of Learn-Nett ontology, the need to describe scientific document appeared. We choose to use an ontology of the BibTex entries (http://zeitkunst.org/bibtex/0.1/bibtex.owl), well known by

anybody writing a paper with LaTex. This ontology, very exhaustive, allows annotating a document with every known relations of BibTex and provides all concepts of scientific document, they are the different entries of this ontology.
The use of known ontologies can be very useful for the interoperability of several information system or knowledge base; it allows an easier matching between the concepts of each system. For the moment, the case has not yet occurred in Palette CoP, but these CoP will use several services on the web therefore the need of interoperability between these different information systems will become undeniable.

The *"Human problems"* ontology that is particularly linked to the @pretic CoP's context was only built from concepts identified in mails and debated with CoP's members. The structure and the proposition of additional concepts for the @pretic *"Learning and Training"* ontology mainly rely on the expertise of the mediator who referred to models of learning systems [i.e. Leclercq et al. 2000; Denis, 2006]. As in the part of the TFT ontology dealing more directly to training and learning problems, existing ontologies [Mizoguchi et al., 1996 ; Amorim et al., 2003] can be useful to enhance the CoP's ontology definition and hierarchization since they deal with generic educational and training problems. Nevertheless, adopting an ontology developed by others is not so evident, the concepts have generally to be "redefined" in the CoP's context in order to get an consensus about it and its further use.

7.3 Reusability issues

Now that we have gone deep into the analysis of these CoP-specific ontologies, we must wonder what is the level of reusability of these ontologies. A study of these reusability issues was performed for the @pretic sub-ontologies. Such a study has not yet been carried out for the other CoP-specific ontologies described in this deliverable.

7.3.1 Reusability of the 'Persons and groups problems' ontology

It appears clearly that the *'Persons and groups problems'* ontology is mostly specific to the @pretic CoP: it is very dependent on things like regional specificities. Interlocutors are very specific, too. Organizations and governmental organizations names cannot be reused elsewhere. The kind of problems that occurs often is very specific, too: budgetary problems and recognition problems are hardly present in all CoPs.

In the case of this ontology, its only value when it comes to reusability is that is can be used to conduct a brainstorming in order to write other CoPs specific *'Persons and groups problems'*.

7.3.2 Reusability of the 'Learning and teaching' ontology

The *'Learning and teaching'* ontology is less tainted with @pretic-CoP-specific terms, as it tends to be an ontology of pedagogical matters. It would need an extra cleaning if we wanted to transpose it to another CoP dealing with pedagogical matters, and we sure would not want this extra cleaning for @pretic, since it deals with both general pedagogical matters and @pretic specific pedagogical matters.

Its reusability is thus far better than the *'Persons and groups problems'* ontology. Turning it into a CoP-agnostic ontology would be easily done without conducting another brainstorming: the intervention of a pedagogical expert should be enough in order to make it general and thus reusable.

7.3.3 Reusability of the 'Technical problem' ontology

By essence, the *'Technical problem'* ontology is the most reusable. Since the *Ontopedia* ontology was extracted from web directories, it is of course independent of @pretic and completely reusable by any CoP focusing on computer components. The *'Technical Problem'* ontology was semi-automatically extracted from the mailing-list archive; it is a bit more specific, but marginally: ISP names, for instance, are specific to Belgium. But it is an example, taken from a restrictive list. This *'Technical Problem'* ontology seems to be reusable for any CoP exchanging on computer problems.
Notice that the approach of use of NLP tools for analysis of a corpus can be reused for any corpus of documents, e-mails, forum discussions, etc. and this method seems to be completely reusable for other CoPs having already a huge volume of textual data that cannot be processed manually for building the CoP-specific ontology.

7.4 Further work

As a further work, we will achieve the development of the different CoP-specific ontologies presented in this deliverable and exploit them in the relevant KM services. Moreover, from the lessons learnt from these experiments, we will abstract a methodology for guiding any new CoP for the development of its CoP-specific ontology, according to the available information sources and the chosen approach. If some concepts developed for a specific CoP ontology are considered as useful for several CoPs having similar objectives, or similar domains and fields, these concepts may be added to the O'CoP ontology.

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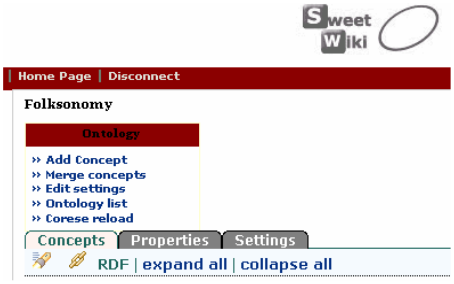
[Zhong et al. 2002] Zhong, N., Matsunaga, T., and Liu, C. 2002. A Text Mining Agents Based Architecture for Personal E-mail Filtering and Management. In /Proceedings of the Third international Conference on intelligent Data Engineering and Automated Learning/ (August 12 - 14, 2002). H. Yin, N. M. Allinson, R. Freeman, J. A. Keane, and S. J. Hubbard, Eds. Lecture Notes In Computer Science, vol. 2412. Springer-Verlag, London, 329-336.

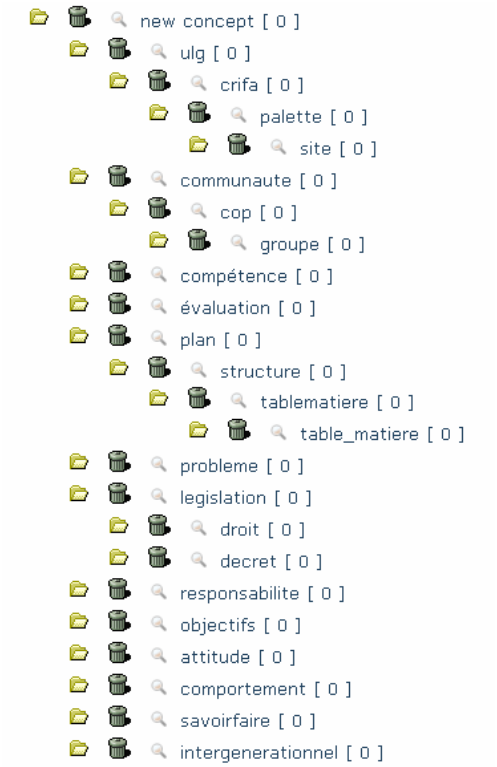
9 Appendix 1: State of the folksonomy after 3 months of use of SweetWiki

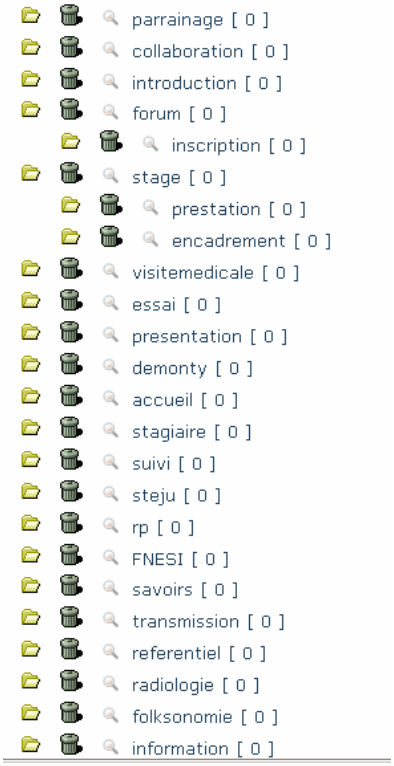
a) List of the tags in Sweetwiki

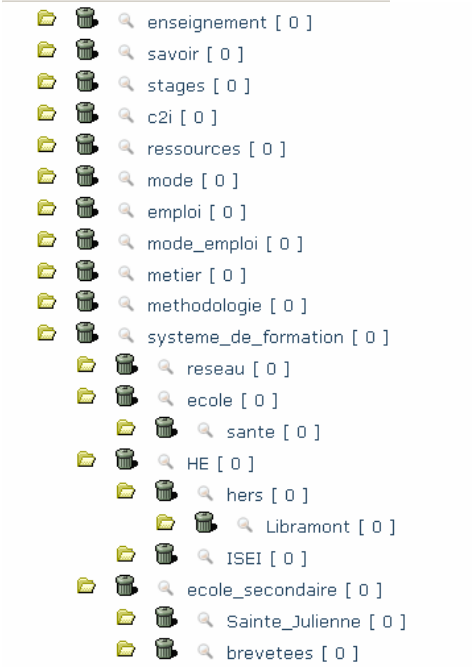
Having used SweetWiki during three months, we tried to structure tags, to organize these concepts in networks and to produce concept maps. Here is the presentation given by SweetWiki.

NB: the tags are not translated.



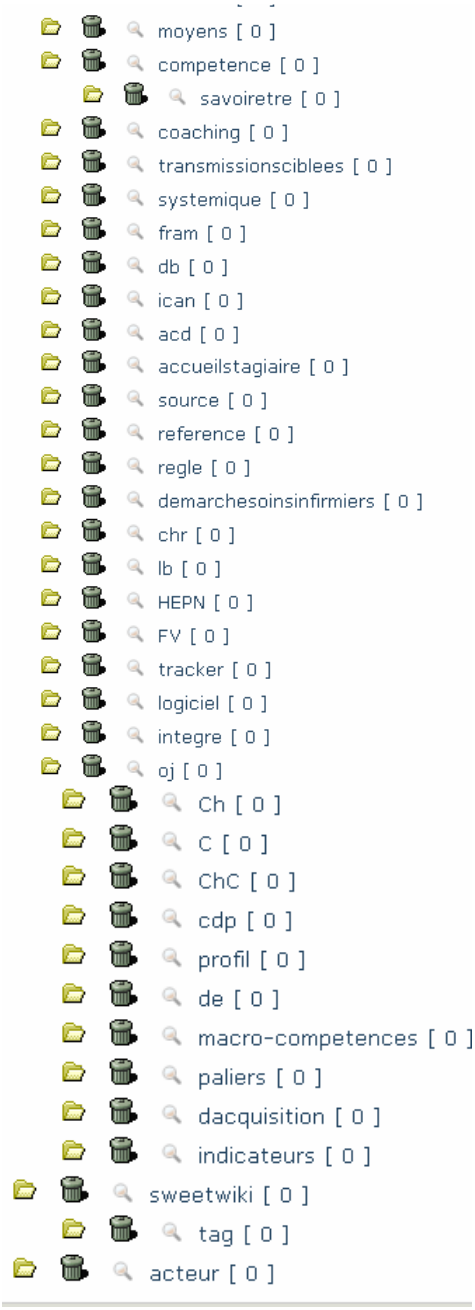







pedagogie [0]
apprentissage [0]
Pedagogie [0]
outil [0]
scenario [0]
histoire [0]
rechercher [0]
cas [0]
evaluation [0]
qualite [0]
controle [0]
sommative [0]
tutorat [0]
formation [0]
roles [0]
exemple [0]
cooperation [0]
autoconstruction [0]
competence [0]
savoiretre [0]
theorie [0]
definition [0]
actes [0]
recherche [0]
constructivisme [0]
epistemologie [0]
autoconstruction [0]
Piaget [0]
metacognition [0]
soutien [0]
APP [0]
etude_cas [0]
role [0]
bibliographie [0]
administration [0]

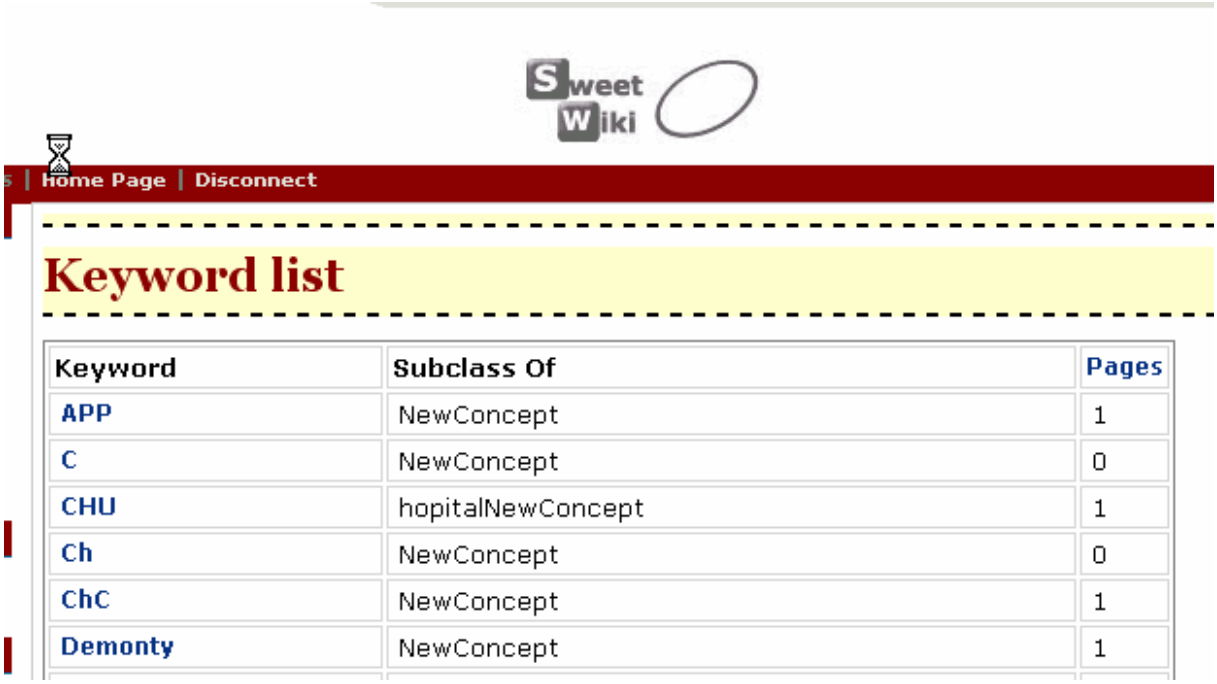

acteurs [0]
stephane [0]
rieppi [0]
venezia [0]
validateur [0]
chercheur [0]
robert [0]
peeters [0]
mediateur [0]
RP [0]
noben [0]
professionnels [0]
modelisation [0]
resultats [0]
Demonty [0]
hopital [0]
CHU [0]
IPAL [0]
HBA [0]
Liege [0]
brevet [0]
brevetees [0]
intercommunale [0]
personnes_agees [0]
enseignante [0]
transfert [0]
performance [0]
environnement [0]
diplome [0]
action [0]
combiner [0]
professionnalisation [0]
informatique [0]
infirmiere [0]
art [0]
enquete [0]
tic [0]
lemenu [0]
dispositif [0]
activites [0]
accompagnement [0]
ip [0]
carnet [0]
consignes [0]
projet [0]
reflexions [0]
autoevaluation [0]
criteres [0]



This presentation does not allow a direct and easy reorganization of the terms, for example by "drag and drop" of the concepts.

b) Recovery of the data of the folksonomy

We then recovered the terms that were going to be organised thanks to another feature of the software.



Keyword	Subclass Of	Pages
APP	NewConcept	1
C	NewConcept	0
CHU	hopitalNewConcept	1
Ch	NewConcept	0
ChC	NewConcept	1
Demonty	NewConcept	1

In this zone of SweetWiki, we selected all the contents of the table then we paste it in an EXCEL file.

APP	NewConcept
C	NewConcept
CHU	hopital NewConcept
Ch	NewConcept
ChC	NewConcept
Demonty	NewConcept
FNESI	NewConcept
FV	NewConcept
HBA	hopitalNewConcept
HE	systeme_de_formationNewConcept
HEPN	NewConcept
Help	navigationawarenessaide

IPAL	hopitalNewConcept
ISEI	HEsysteme_de_formationNewConcept
Libramont	hersHEsysteme_de_formationNewConcept
Liege	NewConcept
NewConcept	.
Piaget	theorieNewConcept
RP	acteursNewConcept
Sainte_Julienne	ecole_secondairesysteme_de_formationNewConcept
accompagnement	NewConcept
accueil	NewConcept
accueilstagiaire	NewConcept
acd	NewConcept
actes	theorieNewConcept
acteur	.
acteurs	NewConcept
action	NewConcept
activites	NewConcept
administration	NewConcept
aide	navigationawareness
apprentissage	pedagogie1NewConcept
art	infirmiereNewConcept
attitude	NewConcept
autoconstruction	theoriepedagogie1NewConcept
autoevaluation	NewConcept
awareness	aidenavigation
bibliographie	NewConcept
brevet	NewConcept
brevetees	NewConceptecole_secondairesysteme_de_formation
c2i	NewConcept
carnet	NewConcept
cas	pedagogie1NewConcept
cdp	NewConcept
chercheur	acteursNewConcept
chr	NewConcept
cle	motnavigationawarenessaide
coaching	NewConcept
collaboration	NewConcept
combiner	NewConcept
communaute	NewConcept
comp	pedagogie1NewConcept
comportement	NewConcept
compétence	NewConcept
consignes	NewConcept
constructivisme	theorieNewConcept
controle	evaluationpedagogie1NewConcept
cooperation	pedagogie1NewConcept
cop	communauteNewConcept
crifa	ulgNewConcept
criteres	NewConcept
dacquisition	NewConcept
db	NewConcept
de	NewConcept
decret	legislationNewConcept
definition	theorieNewConcept

demarchesoinsinfirmiers	NewConcept
demarrage	aidenavigationawareness
demonty	NewConcept
diplome	NewConcept
dispositif	NewConcept
droit	legislationNewConcept
ecole	systeme_de_formationNewConcept
ecole_secondaire	systeme_de_formationNewConcept
emploi	NewConcept
encadrement	stageNewConcept
enquete	NewConcept
enseignante	NewConcept
enseignement	NewConcept
environnement	NewConcept
epistemologie	theorieNewConcept
essai	NewConcept
etude_cas	NewConcept
evaluation	pedagogie1NewConcept
exemple	pedagogie1NewConcept
folksonomie	NewConcept
formation	pedagogie1NewConcept
forum	NewConcept
fram	NewConcept
groupe	copcommunauteNewConcept
hers	HEsysteme_de_formationNewConcept
histoire	scenariopedagogie1NewConcept
hopital	NewConcept
ican	NewConcept
indicateurs	NewConcept
infirmiere	NewConcept
information	NewConcept
informatique	NewConcept
inscription	forumNewConcept
integre	NewConcept
intercommunale	NewConcept
intergenerationnel	NewConcept
introduction	NewConcept
ip	NewConcept
lb	NewConcept
legislation	NewConcept
lemenu	NewConcept
logiciel	NewConcept
macro-competences	NewConcept
mediateur	acteursNewConcept
metacognition	theorieNewConcept
methodologie	NewConcept
metier	NewConcept
mode	NewConcept
mode_emploi	NewConcept
modelisation	NewConcept
mot	navigationawarenessaide
moyens	NewConcept
navigation	awarenessaide
noben	acteursNewConcept

objectifs	NewConcept
oj	NewConcept
outil	pedagogie1NewConcept
palette	crifaulgNewConcept
paliers	NewConcept
parrainage	NewConcept
pedagogie	apprentissagepedagogie1NewConcept
pedagogie1	NewConcept
peeters	acteursNewConcept
performance	NewConcept
personnes_agees	NewConcept
plan	NewConcept
presentation	NewConcept
prestation	stageNewConcept
probleme	NewConcept
professionnalisation	NewConcept
professionnels	NewConcept
profil	NewConcept
projet	NewConcept
qualite	evaluationpedagogie1NewConcept
radiologie	NewConcept
recherche	theorieNewConcept
rechercher	pedagogie1NewConcept
reference	NewConcept
referentiel	NewConcept
reflexions	NewConcept
regle	NewConcept
reseau	systeme_de_formationNewConcept
responsabilite	NewConcept
ressources	NewConcept
resultats	NewConcept
rieppi	acteursNewConcept
robert	acteursNewConcept
role	NewConcept
roles	pedagogie1NewConcept
rp	NewConcept
sante	ecolesysteme_de_formationNewConcept
savoir	NewConcept
savoiretre	comppedagogie1NewConcept
savoirfaire	NewConcept
savoirs	NewConcept
scenario	pedagogie1NewConcept
site	palettecrifaulgNewConcept
sommative	evaluationpedagogie1NewConcept
source	NewConcept
soutien	NewConcept
stage	NewConcept
stages	NewConcept
stagiaire	NewConcept
steju	NewConcept
stephane	acteursNewConcept
structure	planNewConcept
suivi	NewConcept
sweetwiki	.

systeme_de_formation	NewConcept
systemique	NewConcept
table_matiere	NewConcept
tablematiere	structureplanNewConcept
tag	navigationsweetwikiawarenessaide
theorie	NewConcept
tic	NewConcept
tracker	NewConcept
transfert	NewConcept
transmission	NewConcept
transmissionsciblees	NewConcept
tutorat	pedagogie1NewConcept
ulg	NewConcept
validateur	acteursNewConcept
venezia	rieppiacteursNewConcept
visitemedicale	NewConcept
évaluation	NewConcept

c) Data processing of the folksonomy

This list was transferred in a word file (see below). For a better readability, we separated manually the groups of terms proposed in a block by SweetWiki. These terms were then transcribed in a table to show their links, starting from the most general (by default = NewConcept) in the right column then, towards the most specific (left columns).

1 is part of 2	2 is part of 3	3 is part of 4	4 is part of 5	5 is part of 6	6 most general concept	
				accompagnement	NewConcept	2
				Accueil	NewConcept	2
				accueilstagiaire	NewConcept	1
				Acd	NewConcept	2
			theorie	Actes	NewConcept	1
				Acteur	.	0
				Acteurs	NewConcept	1
				Action	NewConcept	2
				Activites	NewConcept	1
				administration	NewConcept	1
		awareness	navigation	Aide		1
				APP	NewConcept	1
			pedagogie1	apprentissage	NewConcept	2
			infirmiere	Art	NewConcept	1
				Attitude	NewConcept	1
		pedagogie1	theori	autoconstruction	NewConcept	1
				autoevaluation	NewConcept	1
		navigation	aide	awareness		1
				bibliographie	NewConcept	1
				brevet	NewConcept	1
	systeme_de_formation	systeme_de_formation	ecole_secondaire	brevetees	NewConcept	1
				C	NewConcept	0
				c2i	NewConcept	1
				carnet	NewConcept	2
			pedagogie1	cas	NewConcept	1

				cdp	NewConcept	0
				Ch	NewConcept	0
				ChC	NewConcept	1
			acteurs	chercheur	NewConcept	1
				chr	NewConcept	3
			hopital	CHU	NewConcept	1
aide	awareness	navigation	Mot	cle		1
				coaching	NewConcept	1
				collaboration	NewConcept	2
				combiner	NewConcept	1
				communaute	NewConcept	1
			pedagogie1	comp	NewConcept	0
				compétence	NewConcept	0
				comportement	NewConcept	1
				consignes	NewConcept	2
			theorie	constructivisme	NewConcept	2
		pedagogie1	Evaluation	controle	NewConcept	2
			pedagogie1	cooperation	NewConcept	1
			communaute	CoP	NewConcept	2
			ulg	CRIFA	NewConcept	2
				criteres	NewConcept	2
				dacquisition	NewConcept	1
				db	NewConcept	1
				de	NewConcept	1
			legislation	decret	NewConcept	2
			theorie	definition	NewConcept	2
				demarchesoinsinfirmiers	NewConcept	1
	awareness	navigation	Aide	demarrage		1
				Demonty	NewConcept	1
				demonty	NewConcept	0
				diplome	NewConcept	1
				dispositif	NewConcept	2
			legislation	droit	NewConcept	1
			systeme_de_formation	ecole	NewConcept	1

			systeme_de_formation	ecole_secondaire	NewConcept	1
				emploi	NewConcept	0
			stage	encadrement	NewConcept	6
				enquete	NewConcept	1
				enseignante	NewConcept	1
				enseignement	NewConcept	1
				environnement	NewConcept	1
			theorie	epistemologie	NewConcept	1
				essai	NewConcept	1
				etude_cas	NewConcept	1
			pedagogie1	evaluation	NewConcept	7
				évaluation	NewConcept	0
			pedagogie1	exemple	NewConcept	1
				FNESI	NewConcept	1
				folksonomie	NewConcept	1
			pedagogie1	formation	NewConcept	2
				forum	NewConcept	1
				fram	NewConcept	2
				FV	NewConcept	1
		communaute	CoP	groupe	NewConcept	1
			hopital	HBA	NewConcept	1
			systeme_de_formation	HE	NewConcept	2
	aide	awareness	Navigation	Help		1
				HEPN	NewConcept	1
	systeme_de_formation	systeme_de_formation	HE	hers	NewConcept	2
		pedagogie1	Scenario	histoire	NewConcept	1
				hopital	NewConcept	1
				ICAN	NewConcept	2
				indicateurs	NewConcept	1
				infirmiere	NewConcept	1
				information	NewConcept	1
				informatique	NewConcept	1
			forum	inscription	NewConcept	0
				integre	NewConcept	1

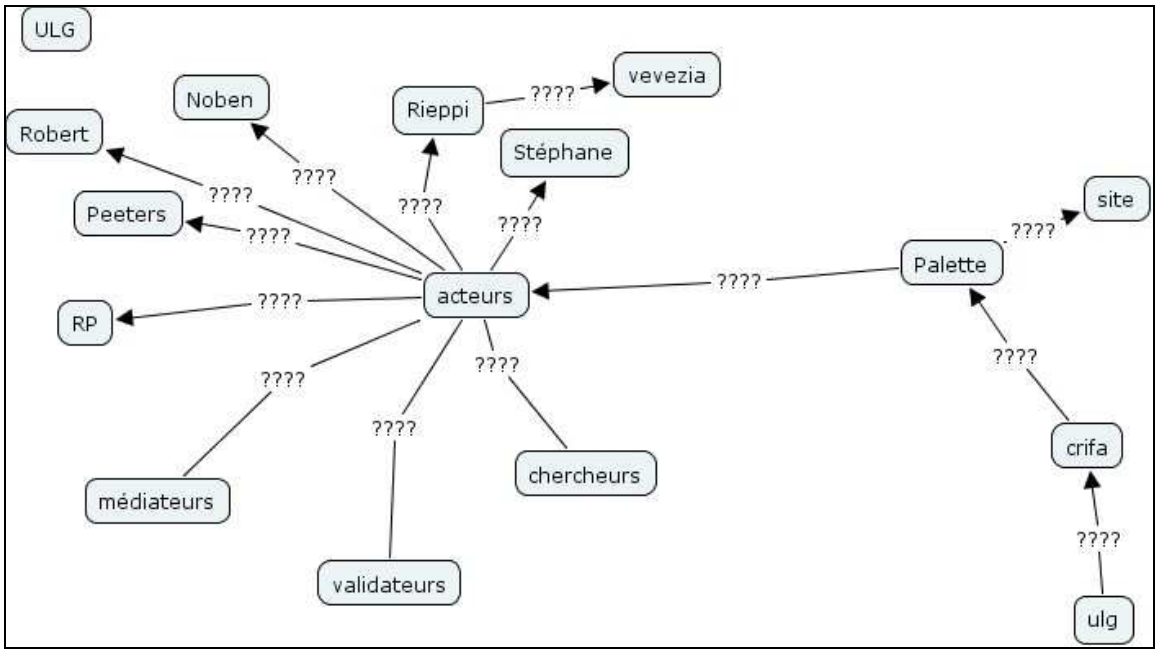
				intercommunale	NewConcept	1
				intergenerationnel	NewConcept	1
				introduction	NewConcept	1
				ip	NewConcept	3
			hopital	IPAL	NewConcept	1
	systeme_de_formation	systeme_de_formation	HE	ISEI	NewConcept	9
				lb	NewConcept	1
				legislation	NewConcept	1
				lemenu	NewConcept	5
	systeme_de_formation	HE	Hers	Libramont	NewConcept	1
				Liege	NewConcept	4
				logiciel	NewConcept	1
				macro-competences	NewConcept	1
			acteurs	mediateur	NewConcept	1
			theorie	metacognition	NewConcept	1
				methodologie	NewConcept	2
				metier	NewConcept	1
				mode	NewConcept	0
				mode_emploi	NewConcept	3
				modelisation	NewConcept	1
	aide	awareness	Navigation	mot		1
				moyens	NewConcept	1
		aide	Awareness	navigation		4
				NewConcept	.	0
			acteurs	noben	NewConcept	1
				objectifs	NewConcept	5
				oj	NewConcept	2
			pedagogie1	outil	NewConcept	4
		ulg	CRIFA	palette	NewConcept	2
				paliers	NewConcept	1
				parrainage	NewConcept	1
		pedagogie1	Apprentissage	pedagogie	NewConcept	2
				pedagogie1	NewConcept	0
			acteurs	peeters	NewConcept	1

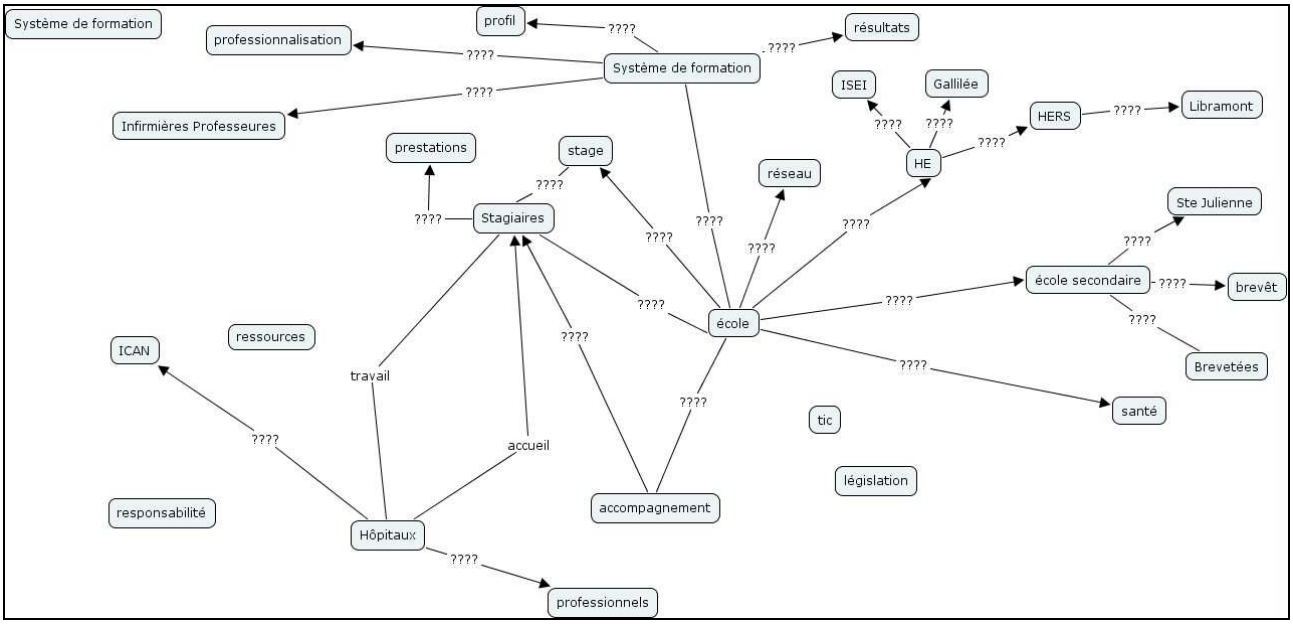
				performance	NewConcept	2
				personnes_agees	NewConcept	1
			theorie	Piaget	NewConcept	1
				plan	NewConcept	1
				presentation	NewConcept	2
			stage	prestation	NewConcept	1
				probleme	NewConcept	1
				professionnalisation	NewConcept	2
				professionnels	NewConcept	1
				profil	NewConcept	1
				projet	NewConcept	1
		pedagogie1	Evaluation	qualite	NewConcept	1
				radiologie	NewConcept	1
			theorie	recherche	NewConcept	1
			pedagogie1	rechercher	NewConcept	0
				reference	NewConcept	1
				referentiel	NewConcept	4
				reflexions	NewConcept	2
				regle	NewConcept	1
			systeme_de_formation	reseau	NewConcept	2
				responsabilite	NewConcept	1
				ressources	NewConcept	5
				resultats	NewConcept	1
			acteurs	rieppi	NewConcept	2
			acteurs	robert	NewConcept	1
				role	NewConcept	1
			pedagogie1	roles	NewConcept	1
				rp	NewConcept	8
			acteurs	RP	NewConcept	3
	systeme_de_formation	systeme_de_formation	ecole_secondaire	Sainte_Julienne	NewConcept	1
	systeme_de_formation	systeme_de_formation	Ecole	sante	NewConcept	1
				savoir	NewConcept	2
		pedagogie1	Comp	savoiretre	NewConcept	1
				savoirfaire	NewConcept	2

				savoirs	NewConcept	1
			pedagogie1	scenario	NewConcept	2
	ulg	CRIFA	Palette	site	NewConcept	1
		pedagogie1	Evaluation	sommative	NewConcept	1
				source	NewConcept	1
				soutien	NewConcept	1
				stage	NewConcept	4
				stages	NewConcept	4
				stagiaire	NewConcept	3
				steju	NewConcept	3
			acteurs	stephane	NewConcept	2
			plan	structure	NewConcept	2
				suivi	NewConcept	1
				SweetWiki	.	2
				systeme_de_formation	NewConcept	1
				systemique	NewConcept	1
	plan	structure	Tablematiere	table_matiere	NewConcept	1
		plan	Structure	tablematiere	NewConcept	0
aide	awareness	SweetWiki	Navigation	tag		2
				theorie	NewConcept	1
				tic	NewConcept	1
				tracker	NewConcept	1
				transfert	NewConcept	1
				transmission	NewConcept	1
				Transmissions_ciblees	NewConcept	1
			pedagogie1	tutorat	NewConcept	1
				ulg	NewConcept	2
			acteurs	validateur	NewConcept	1
		acteurs	Rieppi	venezia	NewConcept	1
				visitemedicale	NewConcept	1

10 Appendix 2: graphic representation of the data

We represented the data of the appendix 1 in the form of conceptual maps. We structured (by linking them) the level concepts 0 "NewConcept". These conceptual maps produced by the mediator would afterward be submitted to members of the CoP representing professionals' various types (Nurses, Teachers, ICAN, Nurses in charge of the Continuing Education, Directions, etc. (See conceptual maps below).





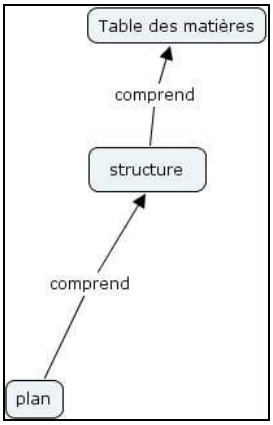
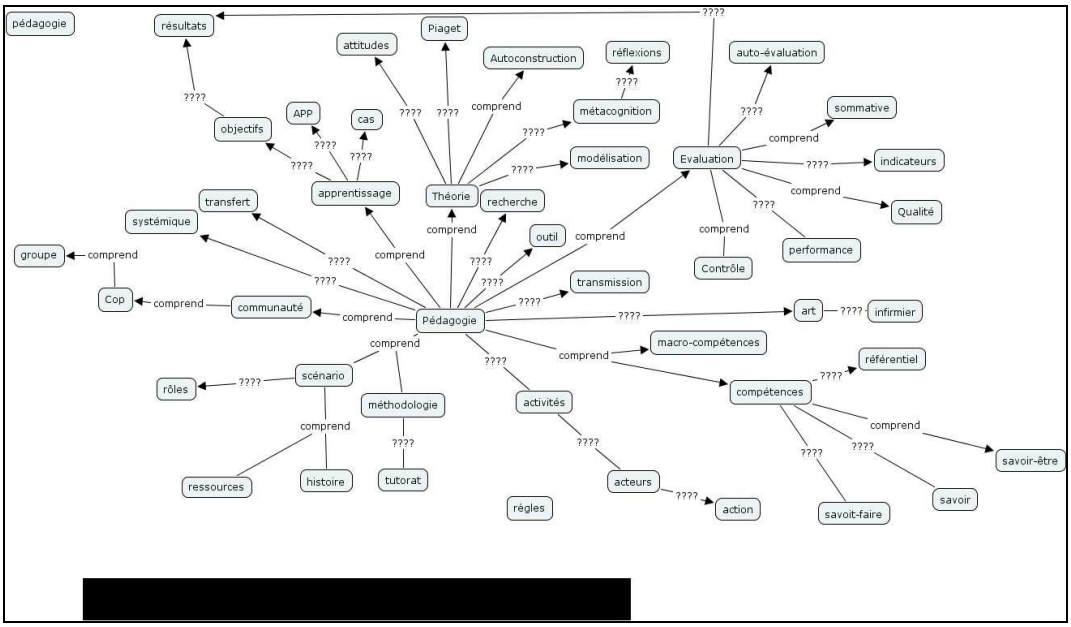
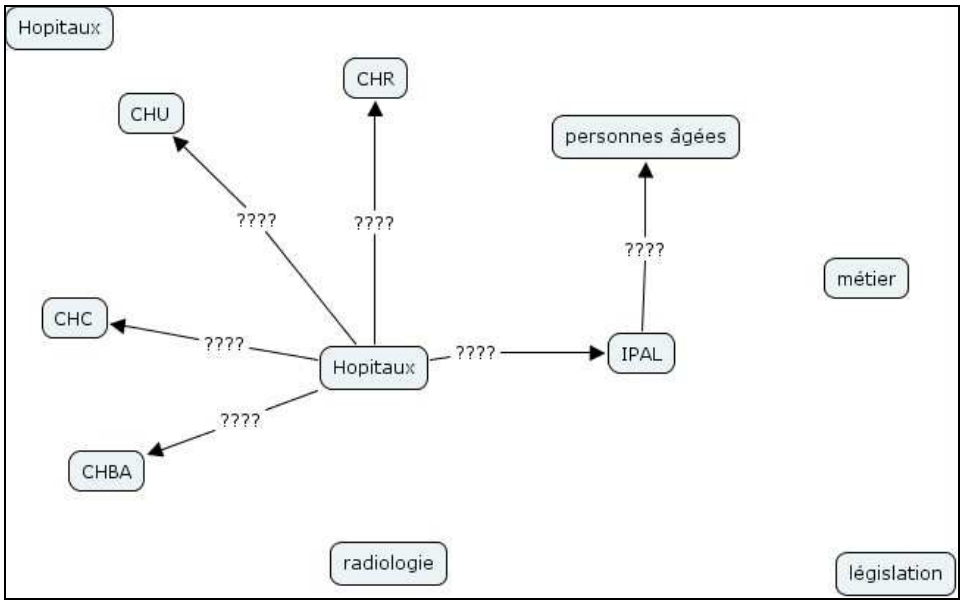
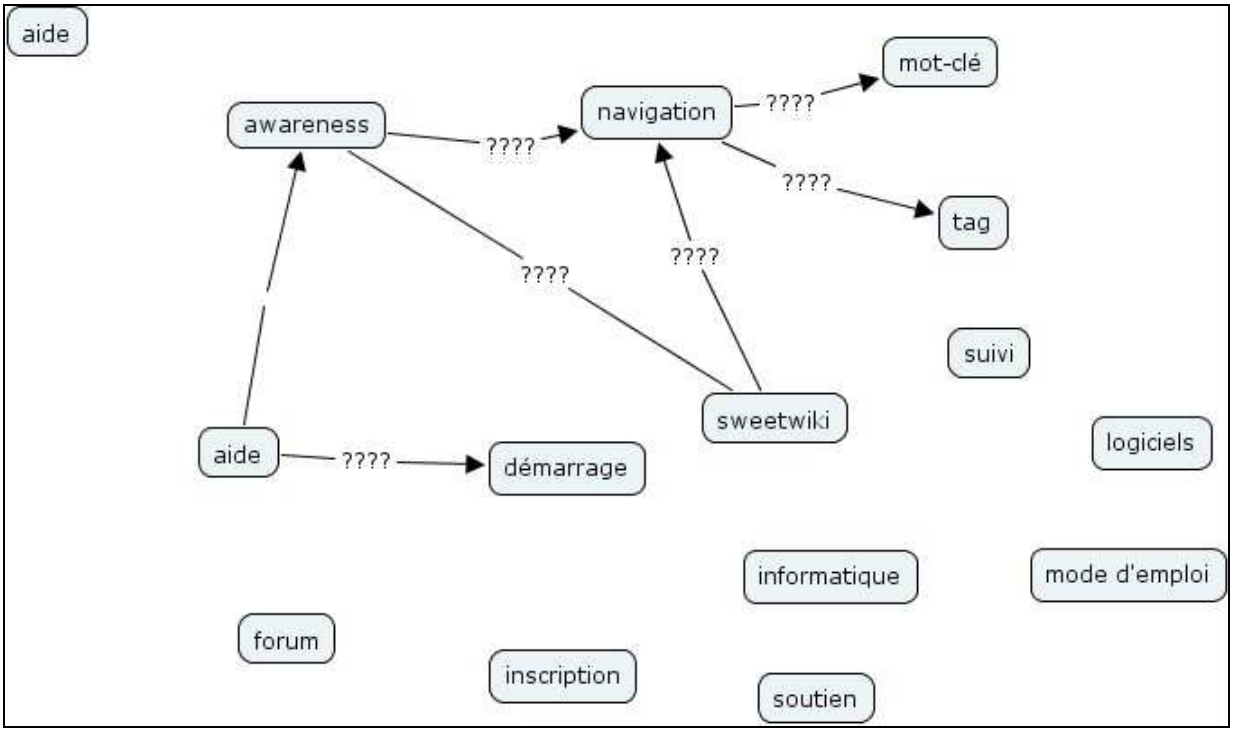


Table des matières
comprend
structure
comprend
plan


pédagogie
résultats
Piaget
attitudes
Autoconstruction
réflexions
auto-évaluation
objectifs
APP
cas
métacognition
sommative
modélisation
Evaluation
indicateurs
apprentissage
Théorie
recherche
Qualité
transfert
systémique
outil
performance
groupe
Contrôle
transmission
Cop
communauté
Pédagogie
art
infirmier
macro-compétences
scénario
référentiel
rôles
méthodologie
activités
compétences
savoir-être
ressources
histoire
tutorat
acteurs
savoir
règles
action
savoit-faire
comprend
????


Hopitaux
CHR
CHU
personnes âgées
????
métier
CHC
Hopitaux
IPAL
CHBA
radiologie
législation


aide
mot-clé
navigation
????
awareness
????
????
tag
????
????
suivi
sweetwiki
aide
????
démarrage
logiciels
informatique
mode d'emploi
forum
inscription
soutien

11 Appendix 3: Ontology from the work of the group of validation

a) List of terms

The TFT CoP's members enumerated and organised together a list of concepts (terms) during the ontology validation meeting the mediator organised.

accompagnement		
accueil		
Adaptation		
Apprentissage	expérientiel	
Besoin	De FB	
Carnet	accueil	
Carnet	De relevé de soins	
découverte		
disponibilité		
Écoute		
écrire		
Écrits	De situation	
Efficacité		
encadrement		
entretien	Motivation	
Environnement		
Évaluation	quotidienne	
évaluation		
Farde	accueil	
individualisation		
Intégration		
largage		
Lieux de parole		
Ligne du temps	avant	
Ligne du temps	Le 1° jour	
Ligne du temps	Pendant	
Ligne du temps	Le dernier jour	
Ligne du temps	après	
Manque	De professeurs	
Manque	De temps	
Motivation	De l'étudiant	
objectifs	Bateaux	
objectifs	Formulation d'	
Objectifs	De stage	
Offre	Du service	
patient	partenaire	
peur		
philosophie	De soins	
points	Fonctionne avec les	
Présentation	Des acteurs	
profil	De compétence	
progression		
Réalité	De terrain	
Récits		

référent		
regard	Nouveau	
rencontrer	enseignant	
Ressenti	De l'étudiant	
Rosace	D'évaluation	
Stress		
suivi		
superviseur		
Valorisation		
Vécu	De l'étudiant	

b) Organization as conceptual maps

On basis of the brainstorming, here is a first reorganization, as an example of some stated concepts.

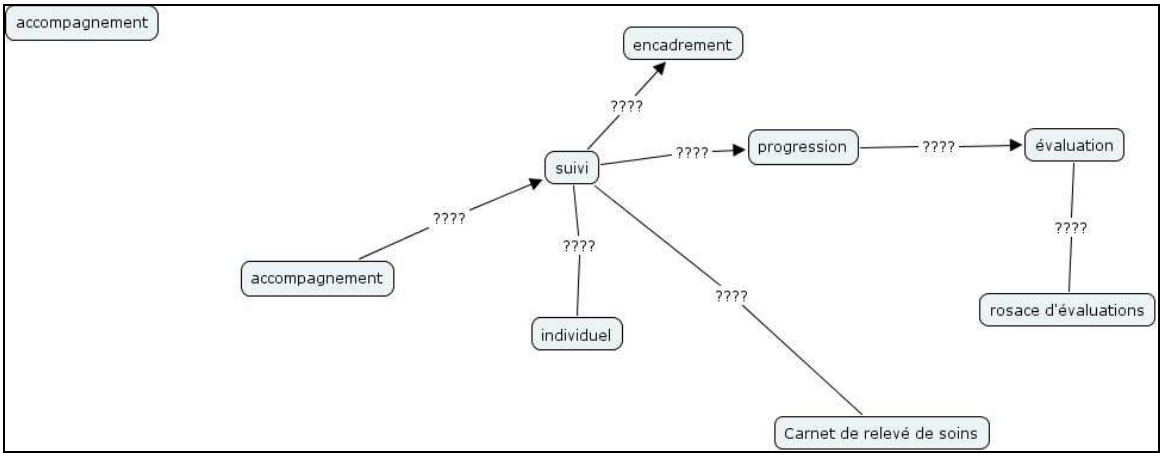


Fig.A3.1: The « follow up » concept

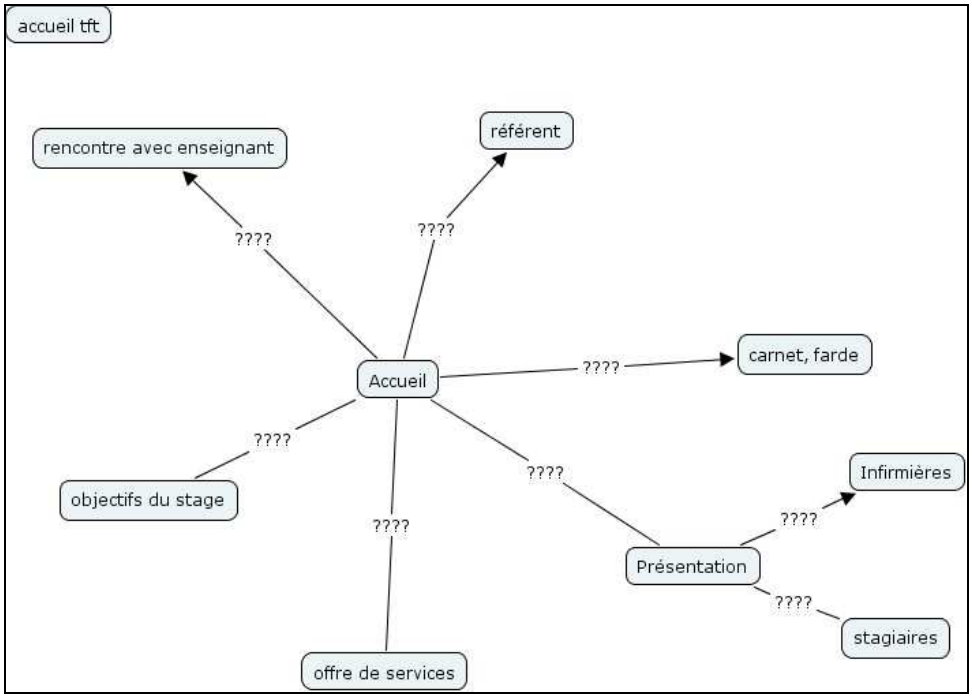


Fig.A3.2: The welcome (reception) concept

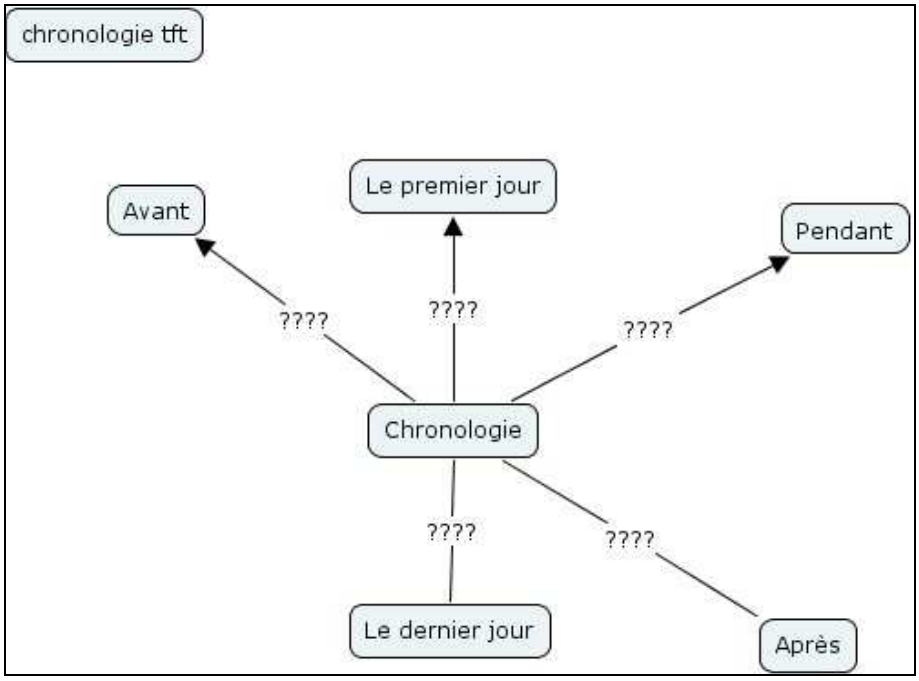


Fig. A3.3: The chronology concept

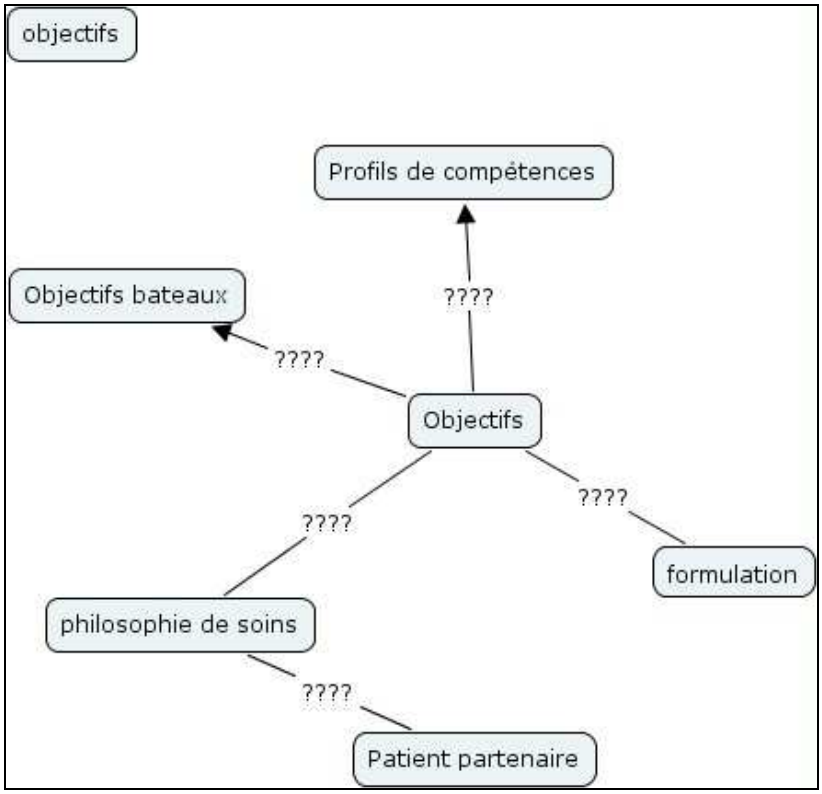


Fig. A3.4:The objectives concept

c) General comments about some important concepts mentioned during the groupwork.

Notion of "New glance". The group expresses its interest of the "outside" sight of the work place and the importance to take it into account to improve the functioning of hospital departments.

In this context, the trainees must be valued, encouraged to express their points of views, what surprises and what calls out, etc.

The group asks the question of how to **encourage the trainees** to express a new glance, which will not be disrupted by the fear of an evaluation and which would be profitable as much to the student who would be valued by his/her contribution as to the hospital department which would have an original idea about its functioning.

Moreover, this valorisation of the outside glance of the student on the reality of the work is taken into account by the teachers within the **experiential learning** where the teacher works on the real experience of the student after his/her work experience in comparison with what he wrote before, so that the student can see his/her evolution. The teachers are estimating here the distance between what the student thought before and after his/her work experience.

A work experience is not the other one

It is necessary to clarify what work experience is about. If it is the first work experience, it is often not much precise but if it is the 2nd or the 3rd work experience, the student can have much more precise objectives, based on his/her observations from the previous work experiences.

Another important point is the **evaluation matter**. Who is realizing the evaluation and which evaluation?

We will clarify this evaluation concept: distinguish the formative level, the control level (points). These precisions are necessary because we do not speak about the same reality (cf. the different concepts, methods and instruments developed by Leclercq in his "**Evaluation wind rose")**. The evaluation deals with different contents, different moments, … It is suggested to create a discussion in a forum on this topic.

The question of the evaluation scales is raised: the comparison of different tools could help as much the teachers as the ICAN.

The evaluation at the end of the work experience is important, but there also is the daily evaluation which is asked to the nurse and which is posing problems.

As a rule, the nurse has to return every day feedbacks to the student. The daily evaluation should help in the final evaluation but considering the difficulty to make a daily evaluation, how to do it, what are tools, evaluation scales which are used, and what do the users think about that?

The student needs a direct **feedback** during their work experience. However, students are focused on scores. A "simple" feedback sometimes does not make effect while to say "it is a failure situation" leads to the student to be aware of this situation. We notice a difficulty when the students have to estimate the gravity of some elements of the feedback given by the nurse. For example, if the student has an inappropriate behaviour towards the staff or the patients, he needs a feedback clear and immediate and to take it into account immediately.

The notion of welcome of the trainee

This aspect is raised by an ICAN. Linked to this concept, there are the notions of "presence of a reference person", note book about the reception, folder of reception, meeting with the teacher who supervises the work. This meeting between the supervisor and the student has to come before the work experience; it is a kind of pre-reception.

In the welcome phase, it is necessary to distinguish the roles, the persons and the tools.

The welcome is linked to the reality of the field. How to help the student to confront his/her experience with the reality of the field? We notice that there is a gap between what the student believes, imagines before the work experience and the reality of the field. It is necessary to take into account the real life of the student, his/her perceptions, his/her feeling.

The creation of places, of moments of "listening" is a solution to the problems of fear and stress.

The terms of "stress", "fear" are brought by the teaching nurses and these of "listening", "places of words ", "accompaniment" are proposed by the ICAN.

Chronology. There are different moments mentioned: "before", the "1st day ", while "last days" (for the ICAN), " after" (for the teachers), … We can analyze the various subjects according to various moments: ex: welcome, follow-up, how do the tools take into account the line of time ...

The term "**Objectives**" is central because (it) makes the link between the teachers and the various professionals who (supervise) the students. The notion of "Objectives" must be also seen according to the chronological aspect. It is mainly the first day of the work experience, when we present the work experience that the objectives must be clarified. The Objectives must be also specified before the work experience. Nurses notice that the students sometimes formulate objectives very "ordinary" and so vague that they are not understandable.

Besides, it is difficult for the students to consider objectives while they do not know where the work experience will take place. However, it is possible to have very practical, technical objectives (for example, learn to manipulate such tool). For the technical objectives, the formulation is often clear but for the objectives of the other levels, it is often vague. An exchange between professionals who supervise the students could take place about the use of the objectives within the practical work in a hospital.

12 Appendix 4: Whiteboards illustrating participative approach for building @pretic ontology

This appendix shows the successive whiteboards elaborated during the brainstorming-based, participative and interactive approach for building the *"Learning and Teaching"* ontology.

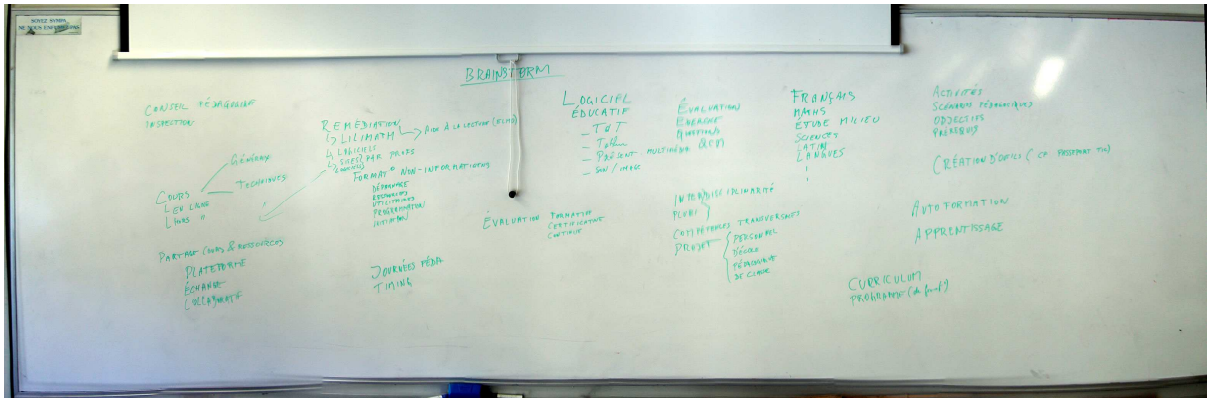


Fig. A4.1: Whiteboard 'Learning and Teaching', initial brainstorming

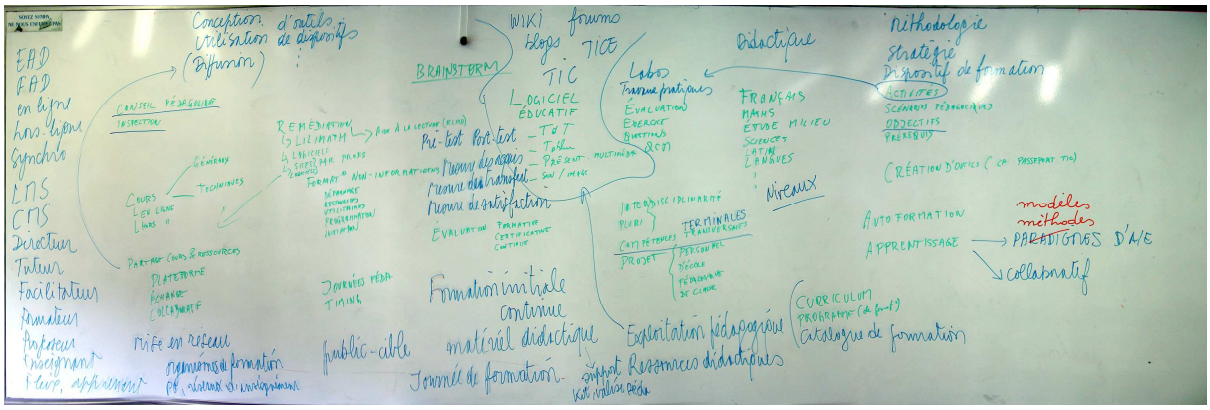


Fig. A4.2: Whiteboard 'Learning and Teaching', enriched

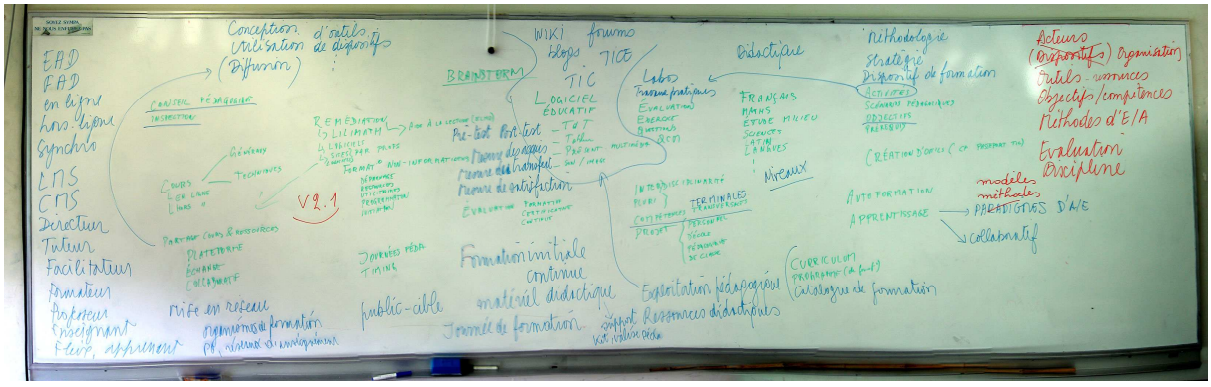


Fig. A4.3: Whiteboard 'Learning and Teaching', final version