Analyzing the Requirements for Knowledge Management using Intentional Analysis

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Abstract

Novel approaches to knowledge management aim at exploiting knowledge properties such as its distributed and local nature, and to consider organizations as set of actors cooperating and competing to pursue private as well as common goals. Therefore, designing knowledge management solutions requires a deep analysis of the interests and intents of strategic organizational actors, and of the dependency relationships among them. This paper describes an approach based on intentional modelling techniques. Two examples from a hospital case study are used to illustrate.

Introduction

Novel approaches to Knowledge Management (KM) pose challenging issues for the research in distributed systems technology and for the research in system analysis and design methodologies. While on the technology side Multi-Agent Systems (MAS) (Dignum 2002) and peer-to-peer technology (Oram 2001) are being proposed, on the methodology side a clear need of new approaches to requirements elicitation and analysis which support explicit modelling of the organizational dimension is emerging. This need has been pointed out in the EDAMOK project (EDAMOK means Enabling Distributed and Autonomous Management of Knowledge), a joint effort of the Institute of Technological and Scientific Research (IRST) and of the University of Trento, in which a peer-to-peer platform for distributed KM is under development (Bonifacio *et al.* 2003). But how do we analyze the application environment to make the technology achieve organizational goals?

For traditional information systems there are well-established techniques and methods for system development and management. Of particular interest are methods for requirements elicitation and analysis, aimed at matching organizational needs with technical capabilities and system qualities. Modelling techniques such as ER diagrams, SADT, and more recently UML are widely used. However, these are geared primarily towards systems for routinized work, with highly structured data, or reactive systems with well-specified behavior.

KM focuses on the effective use of human intellectual capital. Much of human knowledge is tacit and intangible. KM therefore calls for a much deeper understanding of the environmental context. Issues such as sharing, cooperation, and community go much beyond those typically considered in the traditional automation of explicit work processes.

A crucial issue pointed out by organizational and cognitive studies is the distributed nature of knowledge. According to this idea, knowledge is contextual, that is, it is created from some perspectives, and interpreted according to them. Perspectives arise from local needs and differ because locally autonomous units have different capabilities and responsibilities, interests and aspirations, backgrounds and resources.

Traditional systems analysis techniques are ill-equipped to deal with such complex human and organizational issues engaged by KM. Similarly, it may be argued that traditional software engineering and implementation techniques are not well suited to deal with the kind of complexity and heterogeneity implied within KM applications. This motivated the proposals of novel methodologies for requirements analysis, based on an organizational perspective, (Dignum, Weigand, & Xu 2001; Molani *et al.* 2002) extending approaches that were originally proposed in Agent-Oriented Software Engineering (Ciancarini & Wooldridge 2001; Wooldridge, Ciancarini, & Weiss 2001; Giunchiglia, Weiss, & Odell 2002).

In (Dignum 2002) the suitability of the Agent paradigm for KM is discussed, both at the technological and at the methodological level. In our opinion, there are at least other two important reasons that motivate the adoption of agent oriented approach to KM. First, the agent mindset fit well with concepts that are suitable for modeling the needs of the so called "knowledge workers", i.e. individuals who need several kind of knowledge in order to execute their tasks. Adopting such a common set of concepts is crucial to allow the understanding of the influence that the social organization model has (or has to have) on the functionality and objectives of the eventual agent-based application.

Moreover, adopting an agent-oriented approach to requirement engineering results in a more uniform and coherent software development process, which can eventually lead to the implementation of an agent-based system.

In this paper, we argue that we need to analyze the intentional dimension of the organizational setting —the interests, intents, and strategic relationships among actors— in order to delivery effective KM solutions. Local perspectives result from differences in goals, know-how, and resources. Attempts to manage knowledge and intellectual capital need to take into account the competing as well as complementary interests of social actors. We use two examples from a hospital setting to illustrate. The intentional analysis is aided by a graphical modelling approach based on the ***i**** modelling framework (Yu 1997). This work complements recent work to develop technologies to support distributed knowledge management (Bonifacio *et al.* 2003).

Section *Background* elaborates on the theoretical background on distributed knowledge management. Section *A Case Study* describes two examples from a hospital case study, with discussions from knowledge management perspectives. Section *Intentional Analysis* outlines the use of intentional analysis as applied to the examples. Section *Related Work* presents a brief overview of related work. Conclusions are given in the last section.

Background

Traditional KM approaches, resting on a centralized view of knowledge, lead to the realization of KM applications based on one or a few repositories of documents, organized around a single ontology or other meta-structures. While these approaches may appeal to managerial control and appear to render intellectual capital more tangible and manageable, they often flounder in practice as users return to their normal, disparate ways of working once they fail to receive the expected benefits for their investments (Bonifacio, Bouquet, & Traverso 2002; Davenport, DeLong, & Beers 1998; Grudin 1994).

Explanations for this failure can come from organizational and cognitive sciences studies that characterize KM respect to its social, distributed, subjective and intersubjective nature. According to this literature, concepts like identity, knowledge, meanings are strictly connected to the idea of Community as a typical social setting (Wenger 1998). The idea is that complex organizations are made up of several sub-units called *communities*. A community is a group of people who share a set of elements, such as spaces, practices, artifacts or jargons, in order to reach some common goals. As an example, we can think to a company, which is made up of people belonging to different departments, each of them characterized by a physical location, meeting schedules, routines, a specific language, etc. This set of shared elements contribute to shape the community's identity, since it allows the members of the community to recognize each other. In the meantime, they contribute also to shape the community's boundaries since they allow its members to distinguish respect to people belonging to some other communities. Within its boundaries, a community develops its own internal knowledge schema (also known as mental model (Johnson-Laird 1992), mental space (Fauconnier 1985), or context (Ghidini & Giunchiglia 2001)), with which its members can interpret what is internal to the community itself. Moreover they can also develop ideas about what is external to it, such as the other organization's communities (which are the other departments or offices in the case of a company). The possibility of developing an idea about *who is outside* is at the root of any collaboration and cooperation dynamics within organizations: interaction among communities is based on different levels of context sharing. Wenger (Wenger 1998) discusses a set of elements which support these interactions, such as:

- *Mediators*: people who work between communities playing the role of broker between groups (for example a project manager who has to coordinate people with different competencies);
- *Boundary Objects*: objects that are used by more than one communities, even if for different goals, (for example a job contract with administrative details, content details, legal details, etc.);
- *Boundary Encounters*: events that gather together communities (for example a convention, or a conference).

Thanks to this kind of elements, a community can get in touch with other communities, and try to understand the other's world —the other's perspective— but always resting on its own specific knowledge schema. In this sense, knowledge is always local, since each piece of knowledge is intrinsically linked to the specific context where it has been developed. Moreover, even if in order to open the collaboration a community has to make explicit a part of its own perspective, much of knowledge is implicit or tacit (Polanyi 1966), since it is embedded in the community's everyday life, within processes, structures, roles, spaces, tools.

According to this conceptual framework, a basic logical architecture for KM solutions must include both means to support each community to autonomously manage its own local knowledge —that is, supporting the *perspective making* process (Boland & Tenkasi 1995)— and means to support the collaboration among communities —that is, the *perspective taking* process (Bonifacio, Bouquet, & Traverso 2002). The latter includes:

1. *context*, that is an explicit representation of at least part of the communities knowledge system;
2. *mapping*, that are relations between a community's context and the others';
3. protocols for *meaning negotiation*, to allow individuals to interoperate by exchanging knowledge on the basis of the identified mappings.

There are several possible technological realizations of these components. For example, within EDAMOK, the development of the discussed architecture is made by a P2P communication infrastructure and agents communication protocols (Bonifacio *et al.* 2003), by XML-based representation language (Bouquet *et al.* 2002) and by meaning negotiation algorithms (Magnini, Serafini, & Speranza 2002).

To complement the theoretical framework and its embodiment in technology, we are investigating on the development of a requirement analysis methodology, based on the *Tropos* methodology (Bresciani *et al.* 2003). The methodology being developed is based on agent abstractions. That is to say, to complement the use of agent technologies as a software paradigm, we use agent concepts to characterize and analyze the world in which the software agents will function (Yu 2001).

A case study

The Health Care domain offers rich and interesting KM scenarios and several works report interesting analysis, see for instance the MENELAS project[1] and the Guardian Angel project (P. Szolovits & Long 1994).

In the following, we present two examples derived from an analysis conducted at the Hospital Santa Maria della Misericordia in Udine (Italy)[2], with the aim of investigating the knowledge management needs of the organization, and of analyzing requirements for possible KM solutions.

1 example: the "Cartella Integrata"

In order to have all the information about a patient accessible by the different wards involved in the care-flow, as well as to fulfill legal requirements, the hospital maintains a paper folder which contains all the documents, data and information on the patient, collected during her stay in the hospital. This folder is called the *Cartella Clinica*. In the case of a patient who has been transferred in more than one ward (for example in the case of a patient first accepted in Emergency, then transferred in Acute Care, then in General and Internal Medicine and finally in Surgery) the Cartella Clinica could be quite a thick volume, where information, which are stored simply in a chronological order, are very difficult to be quickly accessed. The physicians and nurses of a ward, who have to get all the information about a new incoming patient, spend a lot of time reading all the data in order to find out only those that are relevant to their work.

This process is perceived as quite problematic by these actors, who complain about the large amount of time and efforts they need in order to manage the Cartella Clinica.

The Surgery Ward is currently experimenting with the so called *Cartella Integrata* solution, which consists in delegating the task of filtering information collected within the Cartella Clinica to an expert nurse of the ward. The nurse extracts only the information and data that are relevant for the surgical operation, and organizes them into another clinical report, called the *Cartella Integrata*, that will be read by the surgeon before the operation.

2 example: the Emergency Ward nurse teams

The Emergency Ward is made up of several units: Emergency Room, 118[3] Operative Center, Temporary Observation Unit[4] and Neonatal Pathology.

The Emergency Room and the Temporary Observation Units are directed by a chief physician and a chief nurse and are provided with two nurse teams. The chief nurse complained about the lack of collaboration that sometimes emerges among nurses of the two teams, each of them thinking she works harder than the others. She says that, in spite of the fact that she told them that: "everyone does the same work, which differs only for the different unit's needs", they keep on thinking to be the *hardest workers* and the consequence is that they do not feel as part of the same team.

In order to resolve this situation, the chief nurse is introducing the use of the work rotation: nurses are required to take teams to work in each unit so that they can become aware of their respective situations.

Intuitive Analysis

In the two examples, one can envisage some of the problems that can arise if technology is applied without careful consideration of organizational issues such as the autonomy of organizational units and actors, and the locality and distributedness of knowledge. Considering the example of the *Cartella Integrata* from a KM perspective, we can identify different individuals (the hospital and the wards involved in the patients therapy) which produce knowledge about the patient according to their own objectives (i.e., their own perspective on how to cure patients). This knowledge is immediately captured, while it is generated in the ongoing work, via the business process related to the maintenance of the Cartella Clinica. That is, each ward adds its new sheets to the centralized archive. The only *shareable* schema for the Cartella Clinica is based on the simple collection, in chronological order, of the various records (each of which with its own structure, that is on the paper). Obviously this type of report becomes quite soon an inaccessible and unviable resource. So, the Cartella Clinica is an unsatisfactory solution to the problem of making workers of the different wards able to easily access to existing knowledge on an incoming patient. According to organizational sciences, wards can, indeed, be seen as different communities —with their own resources, knowledge and practices— and the Cartella Clinica can be seen as a *boundary object* for these communities. In fact, it is used by all of them even if from different perspectives and it can works as a bridge across them. Nevertheless, it seems a too weak solution. Rather, it poses a new problem, i.e., how to make the Cartella Clinica really exploitable by a specific ward. The solution to this new problem proposed by the Surgery Ward is that of asking an expert nurse of the surgeon ward, who also has experience on how the other different wards work, to extract the needed data from the Cartella Clinica and to insert them in a new structure (the Cartella Integrata).

In a sense, the solution proposed by the Surgery Ward adopts some of the Distributed Knowledge Management assumptions: the nurse performs a real *mapping* (done by hand) between two *contexts*: the first is represented by the individual ward that has produced knowledge on a specific patient and then recorded it within the Cartella Clinica, and the second is the Surgery Ward context (her own context), that needs relevant knowledge on the patient in order to properly plan the operation.

In the second example, the organizational solution to the problem of making the Emergency Ward subunits to better cooperate consists in having the same chief nurse for dif-

[1] http://www.biomath.jussieu.fr/~pz/Publications/Zweigenbaum:IOS95/edited-report.html

[2] This hospital represents a modern health-care organization

[3] The telephone number 118 is the Italian correspondent of 911, but limited to medical emergencies.

[4] The Temporary Observation Unit is the area where patients are temporary kept in order to better understand the gravity of their conditions and in which specialized ward they might be eventually transferred.

ferent units who has a sort of inventory of all the tasks and duties of the nurses.

The matter is that the conviction of being a hard worker that each nurse has within a specific unit contrasts with what the chief nurse points out, that is that the tasks and responsibilities across units are comparable. The chief nurse, is simply not trusted. With work rotation, the nurse can perceive that the chief nurse is right, directly.

Referring to the elements supporting interaction dynamics that we present in the section *Background*, the chief nurse is supposed to play as *mediator*, since she works in both communities, but the resulting conflict demonstrates that, in this specific situation, this element is not enough to promote the perspective making mechanism. The solution is being experimented is rather a case of *Boundary Encounter*, in particular it is the case called *Immersion* in (Wenger 1998), that consists in "visiting a practice" of another community, in order to better understand its internal configuration and its relations with the rest of the world. The key of the solution is then in proposing a sort of perspective taking through practice. In a sense, this can be considered a demonstration that the tacit knowledge about the demands and challenges of the tasks/roles need to be experienced directly.

Intentional organizational modelling and analysis

The examples illustrated the need to include the analysis of organizational issues in a systematic methodology for developing KM systems. Conventional techniques for requirements analysis (such as ER modelling and Object Oriented methods) are inadequate for modelling and reasoning about organizational issues (Yu 2001).

In this section, we illustrate how the organizational issues from the two examples can be brought out more clearly and systematically using an intentional modelling approach.

Intentional analysis allows to model complex relationships among social actors in terms of their interests and intents and of the strategic relationships among them. Unlike behavior models, intentional models allow us to focus on *why* questions: What are the goals of the actors? Who share these goals? What are the divergent goals that lead to different perspectives? Why are particular behavioral or informational structures chosen? What alternatives are considered? What are the reasons for choosing one alternative over the others?

The ***i**** framework (Yu 1997) supports intentional analysis through actor and goal modelling and provides an intuitive diagrammatic representation of these models. Here the concept of actor represents an abstraction of the concept of agent used in software paradigms. The intentional elements in ***i**** are goal, softgoal, task, and resource:

- a goal is a condition or state of affairs in the world that the actors would like to achieve;
- a task specifies a particular way of doing something, a particular course of action;
- a softgoal represents a state of affair that should be reached but only at a qualitative level, that is, differently from goals (see above), no clear-cut criteria can be given to decide whether a softgoal is satisfied or not, but only an approximate notion of *satisfaction* can be given.
- a resource is an (physical or informational) entity, about which the main concern is whether it is available.

Intentional links between the above entities, in ***i****, include dependency links between pairs of actors which allow to model the fact that one actor depends on another in order to attain some goal, execute some plan, or deliver a resource. The former actor is called the *depender*, while the latter is called the *dependee*. The object (goal, plan resource) around which the dependency centers is called *dependum*. By depending on other actors, an actor is able to achieve goals that it would otherwise be unable to achieve on its own, or not as easily, or not as well. At the same time, the depender becomes vulnerable. If the dependee fails to deliver the dependum the depender would be adversely affected in its ability to achieve its goals. These type of information can be graphically depicted trough *Strategic Dependency diagram*, a graph whose nodes represent actors (circles) and whose arcs represent dependencies (a couple of arrows linked by its dependum). In ***i**** actor's goals (or tasks) can be analyzed from the actor point of view, and depicted in a sort of balloon, called *Strategic Rational diagram*. For instance, for goals, means-end analysis proceeds by refining a goal into subgoals in order to identify tasks, resources and softgoals that provide means for achieving the goal (the end). Contribution analysis allows the designer to point out goals that can contribute positively or negatively in reaching the goal being analyzed. Decomposition allows for a combination of AND and OR decompositions of a root goal into sub-goals, thereby refining a goal structure. In the reminder of this section we sketch an intentional analysis of the two examples presented above.

1 example: the Cartella Integrata

In the Cartella Clinica Integrata example we have seen that different actors (the hospital, the wards, the surgeon and the nurse) deal (directly or indirectly) with some representation of clinical data (the Cartella Clinica and the Cartella Clinica Integrata) for different purposes. Here we propose to extend our analysis by explicitly introducing some intentional elements (the goals of the various actors) and the related intentional dependencies among the actors. The intuition is that, by doing so, we will be able to recognize possible ways to change the current setting and, eventually, propose also some kind of technological solution that can better fit the needs.

The intentional analysis starts considering two of the main actors and their expectations: the hospital (as an administrative organization) that has to fulfill several legal requirements, and the wards. In Figure 1, they are depicted by two thick-line circles, corresponding to the special kind of actor that is a community. On the right of Figure 1 the Surgery Ward model has been expanded showing details of two of its relevant actors: the Surgeon, who has the task operate on patient, and the surgery Nurse.

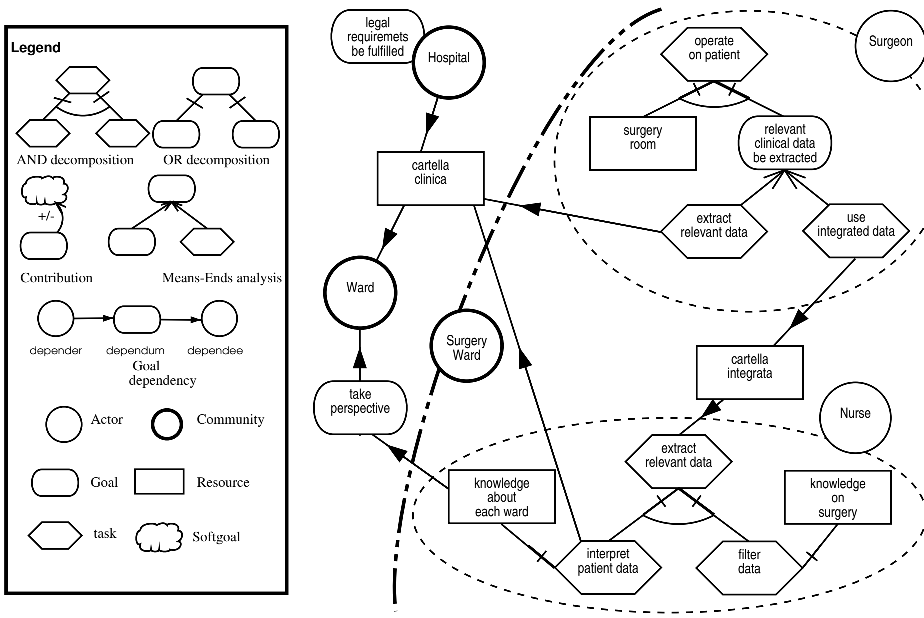

Figure 1: Intentional model in ***i****notation for the *Cartella Integrata* example.

The actor-community Hospital has the goal legal requirements be fulfilled which means being able to provide any patient data on request. The question is: how can the hospital fulfill this goal? The hospital cannot maintain patients' data by itself, but it depends on the wards for having them available by means of the Cartella Clinica (see resource dependency cartella clinica). So, having each ward recording the patient info in the cartella clinica results in a way to satisfy the hospital goal of legal requirements be fulfilled. On the other side, in order to operate on a patient, the surgeon needs relevant clinical data that may have been produced by the wards the patient was cured by. This comes out from the analysis of the task, conducted from the point of view of the actor Surgeon, as depicted inside the upper-right dashed circle in Figure 1 (see the goal relevant data be extracted. Two possible means to fulfill this goal are evidenced. Either, the surgeon can extract the relevant data by herself and, in order to accomplish this task she depends on the other wards to have the cartella clinica available (this is depicted in Figure 1 by the resource dependency linking the surgeon's task extract relevant data to the actor-community ward, through the resource cartella clinica. Or, she can save time and delegate the task extract relevant data to an expert nurse who then collects them in a specific report, that is the Cartella Integrata (see the resource dependency cartella integrata, in Figure 1). The actor Nurse will satisfy the cartella integrata dependency by performing the task extract relevant data, that, upon a further analysis, can be decomposed in the two sub-tasks: interpret patient data (from the original Cartella Clinica) and filter data (to be put into the Cartella Clinica Integrata). In order to exploit the Cartella Clinica, the nurse needs two kinds of knowledge: the knowledge on surgery and the knowledge about each ward. Notice that the first kind of knowledge pertains to the nurse's original *perspective* (she is a nurse of the surgery ward). As well, she needs to *take the perspective* relative to the other wards that recorded patient info in the Cartella Clinica (see the take perspective goal and its resource dependency).

The analysis could be pursued considering possible technological supports, that we will not analyze deeper here[5]. The nurse performs a very critical task that requires specific skills and expertise (the surgery specific perspective). Here the *technological* issue is if any sufficiently sophisticated software system (e.g., an expert system) may support a generic nurse, or even the surgeon herself, in performing the task. Alternatively, we can consider the fact that the task to be finally performed (from the surgeon's point of view) is an appropriate data-access and filtering. Thus, if coding the relevant knowledge inside an expert system may seems too complicated and risky, why not providing the surgeon herself with an appropriate and easy to use data access system that allows himself to filter out the set of information she needs from the Cartella Clinica? Of course she has all (and more) the technical/scientific knowledge of the nurse. Possibly she may lack some *practice* in understanding and interpreting other wards documents. A KM tool, including context mapping algorithms, may be provided to support him in this task, and to overcome any schema heterogeneity problem. Further steps in this direction may finally lead to adopt a distributed KM solution, for which, instead of a single centralized Cartella Clinica, a "virtual" Cartella Clinica, based on the distributed availability of the data from the different wards is provided (Bertolini *et al.* 2002).

[5]The analysis could be shown in a diagram analogous to that of Figure 1, pointing out how dependencies among social actors change upon the introduction of new software-system actors.

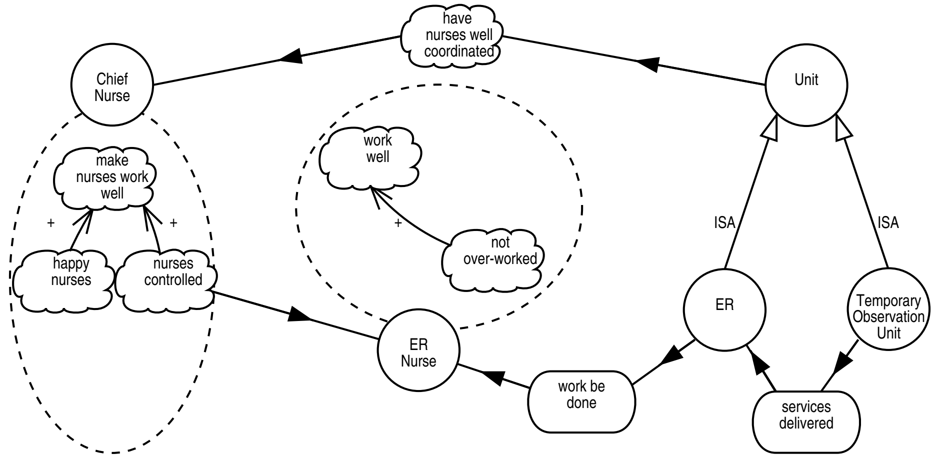

Figure 2: ***i**** model for the Emergency Ward Nurse Teams Example.

2 example: The Emergency Ward Nurse Teams

In this second example the key of the solution consisted in proposing a *perspective taking* by practice. It will be here interesting to see how a simple analysis of the topological properties of the ***i**** diagrams describing the two different perspectives puts into evidence the quality of the proposed solution.

As mentioned, this example requires to compare two different settings: first, we need to analyze the state of affairs that generates the nurse's conviction to be the hardest worker. Then we can analyze if this state of affairs changes after the work rotation experiment.

In other terms, we must describe the different perspectives of the nurse before and after the work rotation experiment. The ***i**** model depicted in Figure 2 includes the actors Chief Nurse, ER Nurse, Unit, ER, and Temporary Observation Unit. Here, the point of view of the *unhappy* ER nurse is considered: she is willing to work well (softgoal work well) but at the same time she believes that she is probably working too much (and thus not well) because of the requests of work coming from her own unit (goal work be done) that also include requests originally coming from the Temporary Observation Unit (see the goal dependency services delivered between Temporary Observation Unit and ER, which eventually has to be delegated to the nurse). This makes her reluctant to be cooperative. In order to take into account the softgoal have nurses well coordinated, the chief nurse wants nurses controlled. This may also contribute positively to the chief nurse's own softgoal make nurses work well. The diagram puts in evidence the fact that the unit nurse is the target of different dependencies (here only work be done and nurses controlled are depicted, but other could be added), while she has no control or dependency on other actors. This configuration corresponds to an unbalanced situation with the clear identification of a weak element in the dependency chain: the nurse. Of course this is a particular *perspective* the nurse has on the real scenario. Figure 3 depicts the new nurse's perspective, that derives from the application of work rotation. Notice that now the two actors ER Nurse and Temporary Observation Nurse represent the two roles that the same nurse plays according to the work shift. In this way we modelled the *Immersion* Boundary Encounter (introduced in section *Background*) of the nurse and the new points of view developed by her as a consequence of this. In the new perspective, be well coordinated is a nurse's softgoal that is not in conflict with the chief nurse's softgoal nurses controlled (we can even think it is reinforced by it), thus leading to a synergy and positive contribution to the softgoal not over-worked. The latter is no longer hurt, now, by work be done and services delivered, they being now equally distributed among the units. As a result, not over-worked is enabled and, thus, it may positively contribute to work well. Note that the solution here has been obtained not by means of a major business redesign, but simply by introducing a simple change (the work rotation) that the analysis reveals to be a sort of perspective taking mechanism, through practice. The intentional analysis together with the ***i**** representation allows to make this observation evident also in terms of diagram topology. The first diagram places the nurse at the center of the picture, as a target of several intentional dependencies, while the second diagram is much more symmetric, introducing also dependencies the nurse may have on other actors.

Related work

Different lines of research are relevant to the work presented here. We already mentioned in the *Background* section research from organizational and cognitive sciences that provide us with distributed KM theoretical concepts. Work on technological solutions for KM, such as P2P (Oram 2001; Tsui), MAS, see for instance the FRODO project [6] and (Dignum 2002), and mixed approaches (Bertolini *et al.* 2002) provides a technological counterpart to some of these theoretical concepts, for instance, peer group can be used to implement virtual communities.

[6] http://www.dfki.uni-kl.de/frodo/

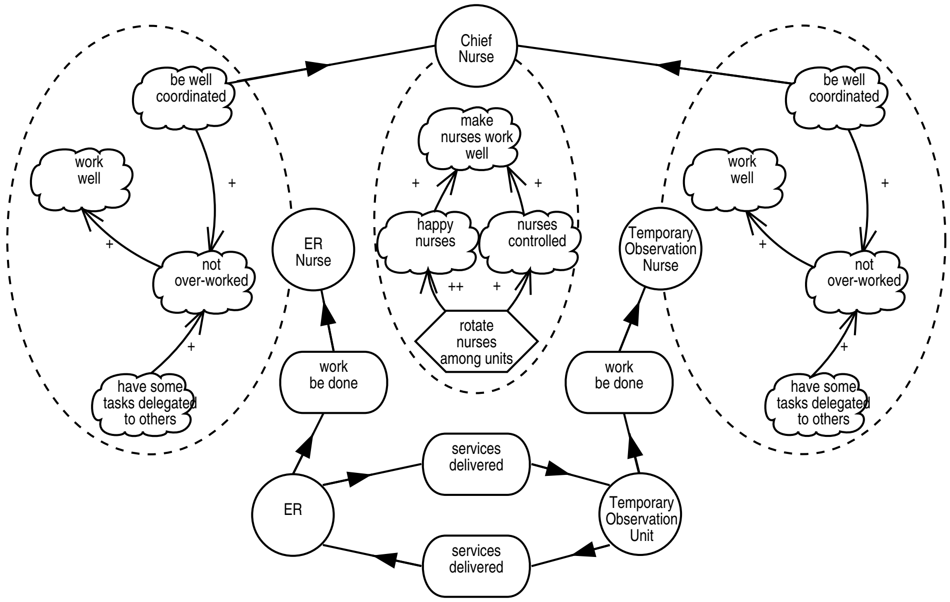

Figure 3: ***i****model of the nurse's perspective taking in the Emergency Ward Nurse example.

Focusing on methodologies, the following agent-oriented software engineering approaches are worth to be mentioned:

- the methodology proposed by Dignum (Dignum, Weigand, & Xu 2001) that adopts an organizational perspective to domain analysis, analogous to that proposed in ***i****;
- the *Agent-Object-Relationship (AOR)* methodology (Wagner 2002) which proposes a set of concepts and relationships for modelling organizational information systems extending UML notation (via UML stereotypes). The methodology provides also a set of diagrams and guidelines to go from analysis to detailed design;
- the *Tropos* methodology (Bresciani *et al.* 2003) which proposes a requirement driven approach to software development adopting intentional modelling methods and techniques which are rooted in organizational studies.

We share a basic objective with other methodologies, such as scenarios-based analysis (Carroll 1995), DECOR (Rupprecht *et al.* 2000) or CommonKADS (Iglesias *et al.* 1996), that is we consider all the stakeholders, and in particular the users, as central actors in the analysis of the organization where the system-to-be (either a new process or a new software system) will be deployed. A few differences are worth to be mentioned. Scenario-based design consists, basically, in analyzing a particular situation where a user exploits a specific set of facilities in order to achieve a specific outcome, under specified circumstances or time intervals. In our approach (i* dependency diagram), we do, in a sense, scenario-based analysis for eliciting the intentional model, focusing on "why" questions (i.e. why using a facility instead of another one, why giving priority to the achievement of a specific outcome, etc.). CommonKADS proposes a methodology based on six phases, each one supported by a tool, a specific model and a template, which has to be filled. Resting on the *Tropos* methodology, our approach gives a relevant role to requirement elicitation and specification, (two phases which precedes architectural design and detailed design in *Tropos*), using the same conceptual modelling language and the same analysis techniques. Methods proposed in DECOR system are rather interesting in KM context and can be usefully applied in analyzing a generic KM scenario. As pointed out in Section *Background*, we adopt a KM paradigm that exploits autonomy and distributedness of knowledge, so a methodology based on intentional analysis seems to be more appropriate.

Work in requirement engineering is also relevant. In particular, we refer to approaches that propose goal analysis techniques to get a deep understanding of an application domain and of system requirements (Dardenne, van Lamsweerde, & Fickas 1993).

Conclusion

In this paper, we pointed out the theoretical background we are referring to in the context of our research on a methodological framework for KM. Basically, we can summarize it in terms of concepts such as community, mediators, boundary objects, and in terms of coordination mechanisms such as perspective making and perspective taking. We showed that intentional analysis allows to identify and model these elements in an organizational setting in which a KM solution will be delivered. In fact, it offers a methodology to model the intentional dimension of an organization, as well as to perform elicitation and analysis of the solution requirements. In the paper we motivated the use of intentional analysis to complement the distributed KM theoretical framework adopted in the EDAMOK project and its embodiment in technology. Two examples from a hospital case study have been used to illustrate it. In all the examples, aspects such as local vs. distributed knowledge and needs for actors cooperation are relevant. From the analysis, the actors' local perspectives resulted, basically, from differences in their goals, know-how, and resources. The effects of KM solutions —at the organizational level or at the technological level— have also been shown into the models.

Future work will be aimed at integrating intentional analysis for KM into an agent oriented software engineering framework (Perini *et al.* 2001), in order to offer both a methodology and a technology support to the analysis, design and development of distributed KM applications.

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