Activating Online Collaborative Communities[1]

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Abstract
Collaborative communities often make use of complex tool systems. In these systems, work gets fragmented over many tools, often halting communication. We discuss online community activation in terms of the Language/Action Perspective, and its more recent offshoot, the Pragmatic Web. We propose collaboration patterns for defining high-level socio-technical design solutions for activation problems. We illustrate the approach using examples from a digital tutorial case.

Keywords: online communities, tool systems, communication, collaboration patterns, activation

1 Introduction

Collaborative communities increasingly make use of the Internet to carry out and coordinate their activities. One problem in such online communities concerns how to activate their members. Such activation is already difficult in communities in which the communication is mediated by a single tool, such as a mailing list or a groupware system. Collaborative communities often make use of complex tool systems, however, in which work easily gets too fragmented, causing communication to come to a standstill.

Communities have been defined as groups of people sharing social interactions, social ties, and a common 'space' (Kozinets 1999) and as a set of relationships that provide sociability support, information, and a sense of belonging (Wellman 2001). The key seems to be strong and lasting interactions that bind community members and that take place in a common space. In online communities, the common space is provided by a suite of collaborative and communicative functionalities (Preece 2000; Wershler-Henry & Surman 2001).

In communities of practice there is often a common disciplinary background and shared set of work activities, tools, stories, contexts and values (Millen et al 2002; Carotenuto et al. 1999). Collaborative communities are communities of practice in which they are not only shared practices, but also common goals, such as the joint production of a good or service. Effective and efficient communication is essential in collaborative communities, not only to perform and coordinate work, but also to define, calibrate, and evolve community governance structures and processes, as communities cannot be declared, but need to grow over time (De Moor & Weigand 2006). Such communication also helps to create a sense of community, in which community members feel they belong, are able to influence other members, and experience a state of flow (Koh & Kim 2004, Jones 1997, Blanchard 2004). For collaborative communities to become successful and productive, focused, sustained, and evolving communication processes are thus all-important.

For communication to serve all these purposes, they require a rich diversity of communication forms, from informal chatting, discussing, debating, asking and answering questions, to consoling, advising, and empathizing (Preece 2000). To support these rich communication forms, a multitude of tools is used by collaborative communities, often put to very different

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uses than originally intended by their designers (De Moor & Aakhus 2006). In addition, many of these tools are built on top of an emerging cyberinfrastructure of organizational practices, technical infrastructure, and social norms (Edwards et al 2007), only adding to the complexity of analysis. Instead of the static, customized monolithic information systems of before, we thus have to study distributed, evolving tool systems in their context of use in the collaborative community (De Moor 2007). However, the problem with such distributed systems is that building enough sense of community for a critical mass of users to start and keep communicating, is even more difficult than with traditional information systems. Still, in other online communities with minimal social context cues, including public document repositories such as Wikipedia, many self-oriented and other-oriented motives have been shown to contribute to creating such a critical mass. These include self-oriented motives like self-expression, developing writing skills, enhanced understanding of the topic, utilitarian motives, and enjoyment and other-oriented motives like social affiliation, altruism, and reciprocity (Peddibhotla & Subramani 2007). Our proposition is therefore that the problem is not the lack of motivation, but the lack of activation caused by the fragmentation of communicative acts across tool system functionalities. In this paper, we aim to explore (1) how to frame these activation problems and (2) how to model socio-technical design solutions to remedy these problems.

We define online collaborative community activation as supporting the initiation, execution, and evaluation of goal-oriented computer-mediated communication processes in collaborative communities in order to increase the effectiveness and efficiency of their collaboration. In Sect. 2 we present the case of a digital tutorial community to illustrate typical activation problems. In Sect. 3 we use ideas from the Language/Action Perspective and the Pragmatic Web to frame community activation in terms of pragmatic communication processes and present a rudimentary conceptual model of online collaborative communities. Sect. 4 uses these insights to introduce collaboration patterns representing socio-technical design solutions for activation problems. We end the paper with a discussion and conclusions.

2 Case: A Digital Tutorial Community

In the fall of 2004, the author taught a course on the Quality of Information Systems to a group of 19 second-year Information Management students. The course consisted of a face-to-face series of lectures, as well as a parallel digital tutorial. For their tutorial assignment, the students had to create a group report in which they were to outline the design of a hypothetical information system (called PRISMA) for supporting Dutch parliament in its monitoring of large national infrastructure projects. The assignment lasted eight weeks, with an evaluation survey and face-to-face discussion to discuss the findings in the ninth week[2].

To produce the report, the students initially used this tool system:

- *Blackboard*: a generic courseware system which contained the course information and assignments.
- A set of *blogs*: one for each week, on which students were to post items and comments with questions and materials related to the lecture of that week, plus one central blog for posting materials related to the design of the PRISMA system.
- A customized *group report authoring support system* (GRASS)[3], which allowed students to jointly write a structured report about a specific research problem. The

[2] The author wishes to thank Jaap Wagenvoort and Jurrit de Vries for their help with the experiment.

[3] http://www.grass-arena.net

tool allows authors to define a set of key questions, define and take positions on each question, and add argumentation pro and con positions and arguments (Heng & De Moor 2003).

The students had to start from the materials on Blackboard, use the week and PRISMA blogs to collect and discuss relevant information items from the Web, and use GRASS to write the report. Report items were to link to items on the blogs to substantiate the claims made in the report. The students had to score the quality of each other's contributions, playing different authoring and review roles. Students had to get a minimum number of points to successfully finish the tutorial. The three highest scoring students were awarded with a book voucher.
Overall, the experiment was a success. Despite the considerable cognitive complexity of defining questions, gathering and discussing materials, and the joint authoring, a 63 page report[4] was created in the space of only 8 weeks. Also, most students scored much higher than the required minimum number of points. In the evaluation afterwards, the majority of students indicated that they thought the digital tutorial worked better than a face-to-face tutorial, and that the overall way it was set up was adequate. Furthermore, they stated that both the blog posting and commenting functionalities and the GRASS position definition/taking and argument creation functionalities were important and easy to learn.
However, problems were also reported, especially concerning the use of the blog. Even though creating posts and comments was considered easy, *following* what was happening was considered very difficult. Part of this was caused by the individual blog tool functionalities themselves: initially, a sequential comment thread was used. This made it difficult to see whether a specific comment replied to its immediate predecessor or a much earlier comment. This problem was resolved by installing a module that supported indented replies, so that it was visually immediately clear to which previous comment a comment replied.
A more profound problem was the reported sense of fragmentation in discussion. Students got lost in the various tools. Especially the blog posts and comments being distributed over several blogs and not being immediately visible when working in GRASS or Blackboard made their participation come to a standstill. This problem was solved by creating a "blog monitor" web page with a clickable overview of new blog posts. Immediately after its introduction, participation rates increased significantly and in the evaluation, students also indicated that they considered this tool a very useful functionality.
Summarizing, the following activation strategies were used:

- Creating *incentives* for individual students to participate (minimum score required, overview of current scores per student, vouchers)
- Improving the *overview of activities within individual tools* (e.g. indented instead of linear comments in blog)
- Creating "meta-tools" to keep *overview of activities across tools* ("blog monitor")

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3 Modelling Pragmatic Communication Processes

To support collaborative communities in their rich communication requirements, well designed and customized tool systems are necessary. The old term "information systems" is a misnomer in this respect. Communication is the primary focus of analysis, the information needed for or produced by communication processes should only come second (as is already shown by the simple linguistic fact that one can "support communication", but to "support

[4] http://grass-arena.net/report-overview.php?reportid=7

information" does not make any sense). The Language/Action Perspective (LAP) has provided a useful lens for shifting the analysis from systems for data storage and retrieval to systems for supporting communicative inter-actions. Already from the very beginning, the LAP community has stressed the importance of communication as an analytical starting point, seeing information systems as "social systems only technically implemented", and information system science as "a discipline for studying conditions and rules for achieving intersubjectivity in understanding and effective communication" (Goldkuhl & Lyytinen 1982). In the past decades, LAP has produced a very rich literature, much of it building on conversation modelling and systems design ideas such as the "conversation for action" (Winograd & Flores 1986).

Almost three decades later, LAP has inspired the Pragmatic Web vision. This research stream is building up a body of work on augmenting human collaboration effectively by applying appropriate Web technologies to help improve the quality and legitimacy of collaborative, goal-oriented discourses in communities (Schoop et al 2006). The Pragmatic Web is distinct from the Semantic Web in its orientation toward process and context over data; services as agents in a rich system of interaction; grass roots meaning negotiation among community members; and the negotiation of commitments. The practical Pragmatic Web challenge is therefore to build a socio-technical infrastructure that supports the negotiation of meaning and the coordination of action (Aakhus 2007). In this paper, we explore one particular aspect of this challenge: how do we go about modelling activation in collaborative communities using distributed tool systems? Two concepts that are cornerstones of a theoretical foundation are *actability* and *interactivity*.

Information systems within a work context should have actability: the ability to act and to support human action. Actability goes beyond usability, as it is about promoting appropriate social behaviour, mediated by rules and norms. Actability has many dimensions, one of them being the "action potentiality" of the information system, which focuses on the set of communicative actions the system affords and supports (Agerfalk 2004).

Whereas actability focuses on the communicative action potential of the system, interactivity concerns more the dynamic relations between those communicative actions. Liu and Shrum (2002) define interactivity as the degree to which two or more communicating parties can act on each other, on the communication medium, and on the measures and the degree to which such influences are synchronized. Three important dimensions of interactivity are active control, two-way communication, and synchronicity. To analyze these dimensions, both structural (designed) and experienced (as perceived by the users) aspects need to be taken into account. Especially with respect to the issue of active control, the gap between structural and experienced aspects becomes problematic, however. Through their functionalities, web sites give many structural *opportunities* for active control. However, users may not always be capable or motivated to exert control, and thus do not experience active control.

There are many possible reasons for this lack of taking control, and the ensuing paralysis in online collaborative communities, such as lack of leadership, off-line activities or enjoyability (Koh 2004). However, we focus on another issue: the complex communicative and collaborative dependencies caused by the distributed nature of tool systems. This is known to be an important breakdown in communications in distributed blog tool systems (Blanchard 2004; Efimova & De Moor 2005). From there, we postulate that this is even more so the case for tool systems using a mixes of different classes of tools. However, very little is known about such "functionally diverse" systems.

Before showing how collaboration patterns can help to frame this complexity and to design solutions, we first outline a simple conceptual model of online collaborative communities in which these patterns are grounded.

3.1 A Conceptual Model of Online Collaborative Communities

We define a tool system as the system of integrated and customized tools tailored to the specific information, communication, and coordination requirements of a collaborative community. Such a tool system does not operate in a vacuum, but co-evolves with its usage context, different for each community. Contrary to Goldkuhl and Röstlinger (2006), we analytically separate the usage context from the (technological) information system itself, in order to group and make precise mappings between requirements for functionality and the functionalities supporting those requirements. We do share their view that this context should capture a whole range of workpractice transaction and infrastructural conditions, which are often not heeded sufficiently in mainstream IS development methods.
Earlier, we presented a conceptualization for such a socio-technical system for collaborative communities, a full description of which can be found in (De Moor 2007). We need such a model as the basis for our collaboration patterns. We summarize the main elements of this model here:

Tool System

A tool system consists of components of different levels of granularity. At the lowest level, we distinguish *systems* of tools or services. The next level consists of the *tools* or services themselves. Then come the *modules* comprising the tools or services. Finally, we distinguish the particular *functions* grouped in a module.
An example in an e-learning context is that there is a group report writing system, consisting of several blogs, a courseware tool, and a customized authoring support tool. The authoring support tool offers such modules as defining and taking positions, creating arguments, and writing conclusions. To create an argument, there are several functions, such as selecting a node (to be commented), adding an argument pro, or adding an argument con.

Usage Context

Three core elements of any usage context are goals, actors and domains.

- **Goals**

In collaborative communities, *goals* are all-important. They give a sense of purpose, drive people and processes, and can be used as evaluation criteria. We distinguish two types of goals. *Activities*, such as ”writing a group report” are operationalized goals, in that they are processes with a concrete deliverable as an outcome, often in the form of an information object such as a group report. *Aspects*, on the other hand, are abstract goals, cutting across processes and structures. Examples would be non-functional requirements and quality criteria like “legitimacy”, “efficiency”, and so on.

- **Actors**

In collaborative communities, it is not sufficient to talk about “The User”. Instead, a careful inventory needs to be made of the many actor roles that the various stakeholders can play. Such roles, in turn, are the basis for defining norms and rules, and can be translated in

concrete system design specifications like Role Based Access Control mechanisms[5]. Mainstream role classifications are still often abstract and technology-driven (Administrator, Facilitator, Member, etc.). However, much more customized and domain-specific role ontologies (e.g. including roles like Position Defender, Argument Summarizer, and Report Conclusion Editor), would be an essential step on the way to better community activation, as they are at the heart of more precise definitions of the responsibilities, permissions, and prohibitions involved in the use and (evolutionary) design of collaborative community support systems.

- **Domains**

The very different domains communities originate from have a great impact on the usage context of their tool systems. Numerous domain characteristics can and should be taken into account when analyzing the context: the professional culture (is there an attitude of sharing, informality and cooperation, or is it a very formal community, with heavy focus on procedure and shielding knowledge?), external pressures (are there deadlines forcing the community members to be very efficient in their discussions?), and so on. Ontologies, as specifications of conceptualizations, can help capture and reason about the manifold concepts and their relations in such a domain. Such specifications should not just be regarded as formal representations of a domain, but as *community contracts* about these representations (Hepp 2008). Essential is that these formalizations can evolve and that the members of the community themselves define them in a legitimate process. Such (community-sanctioned) formalized domain knowledge can then be used in defining the collaboration patterns that are essential for the selection, linking, and configuration of functionality components of the tool system. This, in turn, is necessary condition for increased activation.

4 Collaboration Patterns

Patterns and pattern languages are on the rise in community informatics (Schuler 2002; Chai & Khine 2006). Patterns define relatively stable solutions to recurring problems at the right level of abstraction. This means that they should be concrete enough to be useful, while also sufficiently abstract to be reusable. Collaboration patterns are a particular class of patterns that capture socio-technical lessons learnt in optimizing the effectiveness and efficiency of collaboration processes. In (De Moor 2006), we presented a typology and approach to represent and use collaboration patterns for the purpose of community memory activation. In the current paper, we generalize this approach to one that can be used for online collaborative community activation.

We distinguish five types of collaboration patterns (De Moor 2006):

- **Goal patterns** are conceptual representations of community and individual objectives. *Example:* a community objective could be a finished group report, an individual objective could be to produce 3 arguments contra a particular position.
- **Communication patterns** are sets of communicative workflow and norm definitions describing acceptable and desired communicative interactions within a community. In language/action terms, communication patterns detail the structure of the initiation and evaluation stages of workflows, in other words the commitment dependencies between the actor roles.

[5] http://csrc.nist.gov/rbac/

Example: each student must define positions and pro-arguments for an assigned section of the report. All students may comment on these positions, but assigned students must define arguments pro or con these positions. At the end of this position defining and argumentation stage, all students must take positions and specific students must write section conclusions for the sections assigned to them.

- **Information patterns** are conceptualizations of content knowledge obtained from knowledge production activities. They define the knowledge elements essential for the collaborative process.
  Example: each blog post and comment is marked up with a category from a predefined list of categories describing the topics of the discussion.
- **Task patterns** define which information patterns are to be created in particular steps in the communicative process, thus describing the role content can play in collaborative communication. In language/action terms, task patterns detail the structure of the execution stage of workflows, which is the focus of mainstream workflow modelling methods like Petri-net approaches.
  Example: at the end of each day, each of the new posts and comments displayed in the Blog Changes Overview-web page are categorized by students playing the Discussion Summarizer role by selecting the most appropriate categories from the type hierarchy. If a required category does not yet exist, it is added to the type hierarchy.
- **Meta-patterns** are conceptual patterns necessary to interpret, validate, link, and assess the quality of other collaboration patterns.
  Example: one legitimacy-pattern could say that any goal-pattern representing the topic of the report must have been discussed in a consensus-building communication pattern applying to all members of the digital tutorial community.

These collaboration patterns provide a way to efficiently model the usage context, starting from an expansion of the goal and actor concepts of the conceptual model of Sect. 3.1.

4.1 Using Collaboration Patterns to Capture Design Solutions

In this section, we will illustrate the use of the collaboration patterns by giving examples of the use of goal, information, and communication patterns in the digital tutorial case. The usage context could be further detailed by adding task and meta-patterns, but these will not be introduced here for lack of space.
The example patterns below are in conceptual graph notation. With their direct mapping to language, conceptual graphs serve as an intermediate language for translating computer-oriented formalisms to and from natural languages. With their graphic representation, they serve as a readable, but formal design and specification language. Their notation and properties are not further explained here, but the reader is referred to (Sowa 1984) for a good introduction.

The *goal pattern* of Fig. 1 expresses that all students together have to write a group report within a period of 8 weeks.

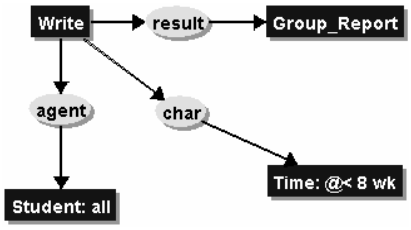

Figure 1 A goal pattern

The *information pattern* of Fig. 2 indicates that a group report has three main parts: a report introduction, one or more sections, and a report conclusion. Each section, in turn, has a section introduction and conclusion, a set of positions, and one or more arguments for or against each position (we do not model the complex structure of the argument tree here).
The owner of the report introduction and conclusion is the report editor, which means that s/he is responsible for any workflow acting on it. The two report editor-concepts are connected by a so-called line of identity, indicating that the role is played by the same individual. Similarly, the same section editor is the owner of the section introduction and conclusion for which s/he is responsible. Authors are the owners of the positions and arguments they create.

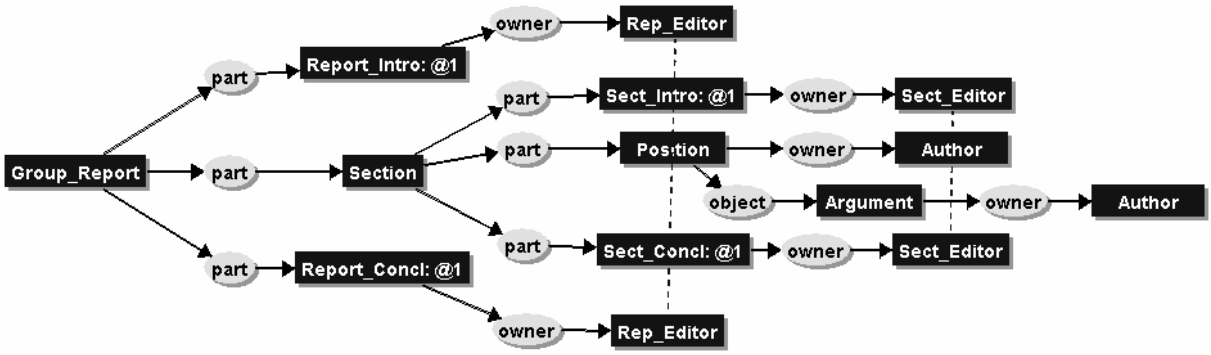

Figure 2 An information pattern

The *enabled* communication pattern (Fig. 3) captures the socio-technical solution to the digital tutorial activation problem discussed in Sect. 2.2. The graph shows the activation solution (marked in colour) which was developed after the students reported a strong sense of being lost due to the blog posts being distributed over so many blogs.
In a week schedule included in the Course Documents on Blackboard, students were assigned the roles of Information Collector, which entailed creating blog posts and comments on web pages potentially relevant for the group report, and Argument Creator, who had to process the blog materials into coherent arguments pro or con positions or other arguments in the GRASS report. However, initially, argument creation did not sufficiently make use of the generated blog materials, as students creating the arguments were not aware when and where potentially relevant blog materials had been created. Only after the Blog Monitor-web page was made available, accessible to all students, including the Argument Creators, did the quality and quantity of the argument creation process improve drastically.
The syntax of our approach is an adaptation of the one used in the activation graphs introduced in (De Moor 2006), as the functionality components (e.g. tool, module) are now coupled to the control roles rather than to the transaction/workflow process directly. Our approach adopts a LAP coordination and interaction perspective in that, for each transaction

(i.e. information collection, argument creation) it distinguishes three control roles: the initiator, executor, and evaluator of the transaction. Many LAP-grounded communicative workflow modelling approaches distinguish only two such roles (e.g. customer/performer in Action Workflow and the initiator/executor in DEMO). However, in our work on virtual communities we have introduced a separate evaluator role, as especially in communities and networks the evaluators are not necessarily the initiators of the transaction (cf. De Moor & Weigand 2007). In the digital tutorial case, this is shown by the Blog Monitor-tool supporting the crucial evaluation process of the Information Collection-stage.

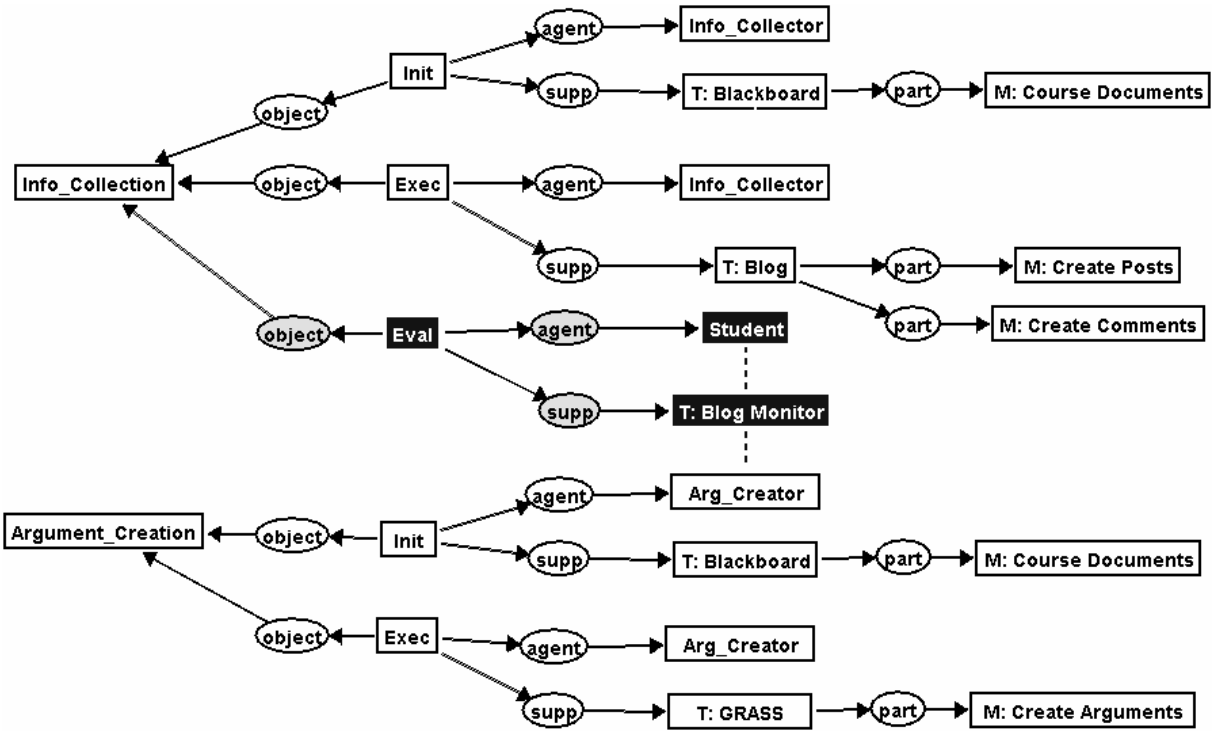

Figure 3 An enabled communication pattern

5 Discussion and Conclusions

Activation of online collaborative communities is a multi-faceted, very complex phenomenon. What exactly it is, how it should be employed, and what are the best ways of doing so are still ill-understood. Fostering activation requires more than just a technical trick, leading to, for instance, a barrage of e-mail notifications. The community is not done a service by robotic spamming facilities not sufficiently taking into account usage context aspects like many subtle transaction and infrastructure conditions, such as listed in (Goldkuhl & Röstlinger 2006). To build more useful forms of activation, first the concept of what activation is needs to be explored. We mentioned two important theoretical concepts, actability and interactivity, and two related areas of research, the Language/Action Perspective and the Pragmatic Web, as fruitful starting points for investigating the activation questions just posed and building activation typologies. This paper only sketched some very broad directions in which this kind of research could be pursued, and needs to be worked out in much more detail. Goal-oriented communication being such a staple of collaborative communities, much more attention needs to be paid to developing detailed socio-technical designs of pragmatic argumentation structures and the supporting tool functionalities, for example along the lines of (Aakhus &

Jackson 2005; de Moor and Aakhus 2006; Buckingham Shum 2006). Another relevant topic is norms, as these regulate acceptable and desired behaviour and should thus play a key role in activation. De Moor and Weigand (2007), for instance, present a norm conflict resolution mechanism and conversation model that allow for the exact calculation of which particular individuals must, may or may not be involved in particular control processes of communicative workflows. Such formal mechanisms could be operationalized into actual activation mechanisms such as intelligent notification by e-mail, tag clouds for visualizing workflow task priorities, and so on.

Whereas LAP and the Pragmatic Web provide the theoretical foundation for understanding ICT-mediated communicative interactions from a transaction and coordination point of view, many other disciplines should get involved for a fuller understanding and operationalization of community activation. Community informatics is a budding field[6], which studies the interplay between community cultures, drivers, norms, and constraints and ICTs. Other areas that should make a contribution include coordination theory, CSCW and social psychology with respect to studying incentive and motivation patterns in collaboration, and interoperability research for dealing with web services across distributed technological infrastructures. Interesting work is done in the development of empirically grounded pattern languages, such as in the "Pattern Language for Living Communication Project"[7]. To capture and reason about these complex socio-technical patterns, conceptual graph theory, with its solid body of work in conceptual knowledge representation and reasoning comes to the fore. Work very relevant to the topic of this paper is being done on using conceptual graphs to build "active knowledge systems", which aim to make knowledge systems more useful for solving real-world problems (Delugach 2006).

Figure 4 Communicating across virtual worlds

In this paper, we have tried to make the case that the activation of online collaborative communities across tools is difficult and requires well thought through socio-technical design solutions. This is even more the case with a whole new class of cyberspace applications quickly gaining prominence, namely virtual worlds, of which Second Life is a well-known example (Twining 2007). Whereas "normal" tools require a bridge between the physical world and cyberspace, with virtual worlds a double bridge is needed. A person can have a username in, say, a discussion list, but also have an avatar in a virtual world. Collaboration may take place in face-to-face meetings in the "real world", of which results are mailed through mailing lists and put on a wiki in "first-order cyberspace". However, those same collaborators may also hold a virtual meeting in Second Life, where, for example, Powerpoint

[6] http://www.ciresearch.net/

[7] http://www.publicsphereproject.org/patterns/

slides from "first-order" cyberspace may be displayed on the walls of a virtual conference room. Those workflows there need to be matched with the workflows in ordinary cyberspace, which in turn need to be matched with the workflows in real life. It is not hard to imagine the sense of fragmentation exponentially growing without proper activation in such meta-distributed work environments. To begin tackling these issues, one could focus on gateway technologies that form bridges between worlds. For example, Fig. 4 shows (the Second Life avatar of) the author wearing a so-called Second Talk[8]-earpiece. It allows the user to use Skype when another avatar also wearing such an earpiece comes "within hearing range". This connects first- and second-order cyberspace, considerably reducing the barriers, and thus increasing the activation potential of collaborative communities.

In our ICT and network-saturated world, the main bottleneck in online collaborative communities is no longer information or communication, but activation. This paper has touched upon some of the myriad issues surrounding this fascinating concept so crucial for making collaborative communities work better.

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