# CREATIVITY MEETS RATIONALE: COLLABORATION PATTERNS FOR SOCIAL INNOVATION[1]

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Abstract*: Collaborative communities require a wide range of face-to-face and online communication tools. Their socio-technical systems continuously grow, driven by evolving stakeholder requirements and newly available technologies. Designing tool systems that (continue to) match authentic community needs is not trivial. Collaboration patterns can help community members specify customized systems that capture their unique requirements, while reusing lessons learnt by other communnities. Such patterns are an excellent example of combining the strengths of creativity and rationale. In this chapter, we explore the role that collaboration patterns can play in designing the socio-technical infrastructure for collaborative communities. We do so via a cross-case analysis of three Dutch social innovation communities simultaneously being set-up. Our goal with this case study is two-fold: (1) understanding what social innovation is from a socio-technical lens and (2) exploring how the rationale of collaboration patterns can be used to develop creative socio-technical solutions for working communities.*

Keywords: *collaborative communities, socio-technical systems, design patterns, social innovation.*

## INTRODUCTION

Collaborative communities are communities in which there are not only shared practices, but also common goals, such as the joint production of goods or services. Collaboration means much more than mere cooperation. Cooperation means playing together in the same game according to agreed rules of interaction. Collaboration, however, also implies creating solutions or strategies, often for very complex, "messy" problems, through the synergistic interactions of a group of people (Denning and Yaholkovsky 2008). In collaborative communities, communication is key, for purposes of information exchange, coordination of (inter)actions, relationship building and collaborative sensemaking (De Moor 2010b). Collaborative communities often require, besides many forms of face-to-face communication, a rich ecosystem of online tools. These include generic communication tools such as e-mail and social media like Facebook and Twitter. However, they also comprise technologies specific to particular types of collaborative communities, such as publication citation and annotation management tools for scholarly communities (Zaugg et al., 2011). Together, these

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face-to-face and online tools form complex systems, embedded in a rich, situated social context, unique to each community. These socio-technical systems of interlinked social requirements and tools continuously evolve, driven by stakeholders experiencing new requirements and new technologies becoming accessible to and appropriated by the community.

A common misunderstanding about social media and communities is that they automatically trigger a process of self-organization, so that very complex problem solving behaviors will emerge spontaneously. Such emergent behaviours are often limited to much less far-reaching forms of information exchange or coordination on relatively simple issues, however. The often touted "wisdom of the crowds" works best for simple tasks divided up into their smallest possible components, due to a lack of time and attention and diversity of the crowd (Howe 2009). Deeper forms of collaboration needed to address more messy or "wicked" problems do not emerge spontaneously, however (Denning and Yaholkovsky 2008). Furthermore, processes of "social creativity" suffer from spatial, temporal, and conceptual distances between collaborators (Fischer and Shipman 2011). Therefore, concerted efforts are needed to make online creativity work. Such efforts are made by many companies which specialize in providing the technological infrastructure, organization, facilitation, and administrative support of creative communities specifically facilitated for market research, co-created innovation, and corporate idea management[2]. However, such approaches only support highly specialized, constrained forms of creative processes. For more general collaborative communities, with much more widely varying needs, goals, technologies, and cultures, carefully crafted, evolvable socio-technical systems are needed.

For communities to be successfully supported by online technologies, systems designers must translate complex social requirements like freedom, legitimacy, and privacy into technical specifications, thus closing the socio-technical gap (Whitworth 2006). Designing such socio-technical systems, consisting of tool systems that (continue to) match authentic community needs, is not trivial. Like in any requirements engineering process, it is crucial to have key stakeholders identify issues and reach agreement on substantive issues before moving the project forward (Ocker 2010). Socio-technical design patterns describe in a broad way such agreements on the issues of the interactions between the social and technical systems that need to be built (Dixon 2009). They can be of great value in aiding community members to define customized systems that satisfy their unique requirements, while reusing lessons learnt as much as possible. In this way, they are an excellent example of where creativity meets rationale. A few examples of socio-technical pattern languages exist, for example in the domains of software development (Dixon 2009) and societal change (Schuler 2008). Another example are collaboration patterns (De Moor 2009). These capture socio-technical lessons learnt in optimizing the effectiveness and efficiency of collaboration processes. Collaboration patterns make communication tools actionable by describing how individual community members playing particular collaborative roles could best use particular tool functionalities in a specific work and social context. Of course, what best is depends very much on the purpose of the community, its norms and practices, and its

[2] E.g. Redesignme (http://redesignme.com) and InSites Consulting (e.g. http://www.insites.eu)

available tools. There is no mathematically derivable prescription for such patterns. Instead, they need to be created from the careful analysis and comparison of cases within and across domains. One domain in which collaborative communities are paramount is social innovation.

Social innovation is a process in which new ideas are generated that not only meet social or economic needs, but also create new social relationships and collaborations (Murray et al., 2010). Balancing creativity with rationale is essential in order to ensure that those new ideas get generated and processed by the right combinations of stakeholders as effectively and efficiently as possible. Rationale as in some form of structure here should be taken not as a straightjacket, but as a "language to improvise", like used by a jazz ensemble (Kane 2005). Some form of rationale is all the more necessary in the design of social innovation as it is not confined to the boundaries of single organizations. Instead, social innovation takes place in webs of collaborative communities permeating and connecting many different individuals, organizations, and networks. Both its potential impact and governance is at least an order of magnitude more complex than the atomic corporate creative communities mentioned above[3]. Social innovation is therefore a very interesting domain for exploring the role that collaboration patterns can play in amplifying creativity by embedding it in relevant networks of stakeholder relations and processes.

In this chapter, we explore the role that collaboration patterns could play in designing the socio-technical infrastructure for collaborative communities. We do so by analyzing the results from a cross-case analysis of three Dutch social innovation communities simultaneously being set up. Our goal with this case study is two-fold: (1) understanding what social innovation is from a socio-technical lens and (2) exploring how the rationale of collaboration patterns can be used to develop creative socio-technical solutions for working communities.

The chapter is organized as follows. Sect. 2 introduces the concept of social innovation and introduces a real-world social innovation case from a socio-technical point of view. In Sect. 3, we explore collaboration patterns as a way to model the socio-technical systems of collaborative communities and distill lessons learnt from the social innovation cases. Sect. 4 discusses the results. We end the chapter with conclusions in Sect. 5.

## SOCIAL INNOVATION – CO-CREATING NEW BUSINESS

In this section we explore our domain of inquiry - social innovation – by examining a real-world Dutch social innovation case.

### What is social innovation

[3] For example, the Dutch government has started major research programmes to explore the impact of social innovation on health, learning, and safety (http://www.nwo.nl/nwohome.nsf/pages/NWOP_7ZNHTC_Eng)

Social innovation is essentially about the relationship networks and collaboration processes around new ideas that meet unmet needs (Murray 2010). Mulgan gives a comprehensive overview of what social innovation entails: according to Connected Difference Theory, social innovation concerns (1) new combinations or hybrids of existing elements; (2) cutting across organizational, sectoral or disciplinary boundaries, (3) creating compelling new relationships. To realize such innovations, they go through different stages: from the generation of ideas through prototyping and piloting, to scaling up and learning. To be successful, social innovation requires effective alliances between small organisations and entrepreneurs ('bees' who are mobile, fast, and cross-pollinate) and big organisations (the 'trees' with roots, resilience and size) which can grow ideas to scale (Mulgan 2007).

The above bird's eye view shows the ambitious scope of social innovation, but also demonstrates the complexity of putting this complex notion into practice. Interpretations abound, but are still vague and contradictory, although satisfactory and comprehensive definitions of the term are of fundamental importance to both guide research and accommodate a significant number of relevant empirical cases (Pol and Ville 2009). In our view, many of the existing definitions are still of too abstract a level to inform more focused theory construction, let alone provide guidance for practice. What seems to be lacking are "meso-level" conceptual models which on the one hand draw from the high-level social innovation theory frameworks and on the other hand are firmly grounded in concepts recognized by practitioners. In this study, we aim to provide such intermediate level theory-meets-practice constructs by distilling some reusable collaboration patterns from a concrete case: the Social Innovation Award Midden-Brabant.

## Case: Social Innovation Award Midden-Brabant

Midden-Brabant is the central region in the Dutch southern province of Noord-Brabant. The region does not have many large, heavy industries. Key economic activities include leisure, logistics, care, and industrial maintenance. Midden-Brabant has a strong collaborative and innovative ethos, leading to many tight networks of small-and medium enterprises, woven together into a pluriform service economy. Social innovation, defined as "the creation of new business models and market mechanisms in a community of diverse stakeholders" is therefore high on the regional agenda. Midden-Brabant is the first Dutch region that has declared social innovation as being at the core of it socio-economic development, stimulating collaborative projects between business, education, and government at the regional level. Midpoint Brabant[4] is an organization dedicated to promoting the development of these social innovation projects and the collaborative networks in which they take place.

Awarding prizes can be an important incentive for stimulating social innovation (Pol and Ville 2009). The Social Innovation Award 2010 was given by Midpoint Brabant to three social innovation cases that had demonstrated potential for both a strong business case and thriving social network around the development, promotion, and use of the innovation. The winning innovations were:

[4] http://www.midpointbrabant.nl

- *Genicap:* developing a growing set of practical applications of a mathematical superformula (Gielis 2003) that can be used to very efficiently compress spatial information. These applications range from very efficient antennas for ultrawideband wireless communication to intelligent vision systems for robotics.
- *SafeCity*: developing a mobile app that can be used by both professionals and citizens to report unsafe situations in neighbourhoods and homes, both emergency and non-emergency ones, plus the complex workflow backend of all the organisations that have to act upon the problems reported.
- *Dementia Experience*: developing a simulator for professionals, family and volunteers that need to be trained into what it means to be a gradually worsening patient with Alzheimer's Disease and how to effectively help them.

Together, these cases comprise a wide variation of social innovation needs and approaches. The winners had proven themselves to be innovation leaders and shown a keen interest in expanding their communities and social networks. Facilitated by the author of this chapter, they committed themselves to jointly reflect upon developing a common practical social innovation approach. This exercise thus seemed very promising in eliciting grounded and relevant collaboration patterns related to social innovation. The elicited patterns, in turn, should prove useful in terms of furthering socio-technical theory development and testing in the domain of social innovation. Guiding these analytical effort was an emerging Social Innovation Collaboration model.

## Social Innovation Collaboration (SIC) Model

The Social Innovation Collaboration (SIC) model aims to capture and link the various spheres of conversations in which social innovation takes place (Fig.1). It was iteratively developed and applied over a period of half a year from January - June 2011. New versions of the model were discussed during monthly plenary meetings with the Social Innovation Award winners and then applied in the analysis of the various cases in subsequent interviews with the case leaders. Iteratively, this conceptual model was calibrated, until it covered all three cases and was deemed sufficiently stable and relevant by all award winners.

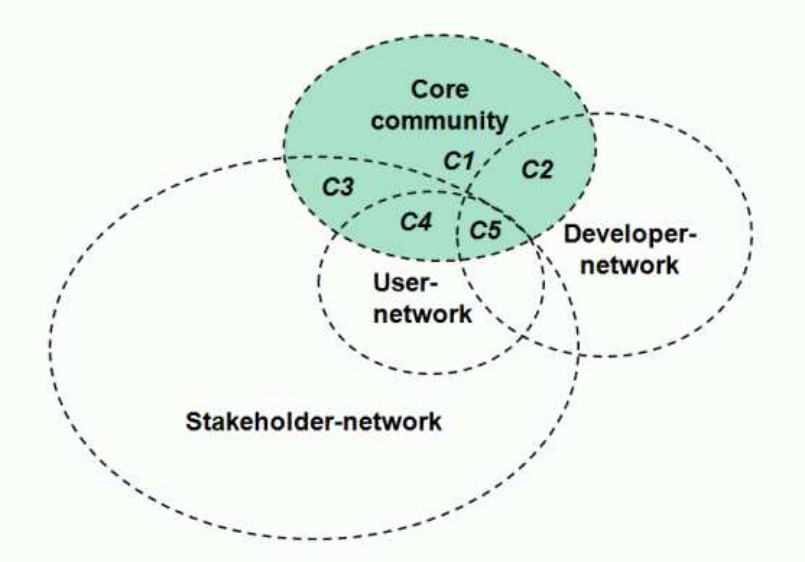


**Figure 1 The Social Innovation Collaboration (SIC) Model**

The SIC model is based on the premise that social innovations develop around a core idea, and take place in *communicative workflows* within and across several interrelated *conversation spheres*. These communicative workflows range from private conversations in the core and development teams, to very public ones with the stakeholder network, supported by often quite a complex tool system of face-to-face and online tools (sometimes supplemented by interactions with the mass media). The workflows can be further analyzed using the Socio-Technical Conversation Context Framework (Fig.2, see De Moor 2010b). In these workflows, community members play many different roles to accomplish community and individual goals, producing a set of concrete results. Each workflow consists of a "loop" in which one role ("customer") (1) requests another one ("performer") to do something, who (2) after promising (3) produces the result, (4) reports back upon completion, after which the performer (5) evaluates the result. Any of these stages can spawn new workflow loops, leading to a complex web of conversations and commitments. This analytical framework is grounded in Language/Action Theory, which is a natural theoretical approach to modeling emergent collaboration (Denning and Medina Mora 1995).

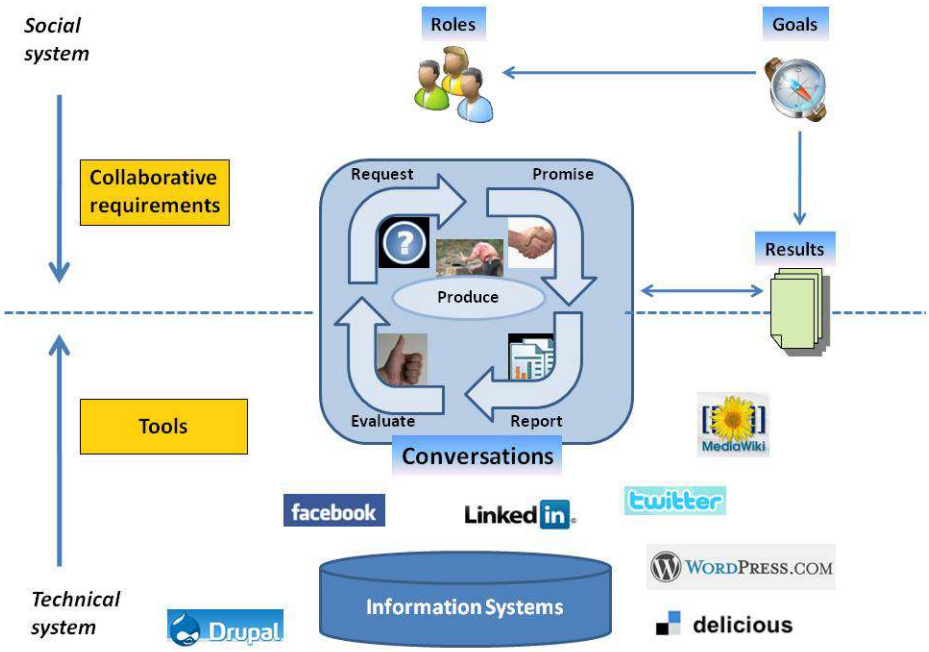


**Figure 2 The Socio-Technical Conversation Context Framework**

The SIC model consists of 4 main connected conversation spheres:

- The *core community*: the initiators of the innovation, often the co-owners of the intellectual property rights, plus the main investors. In the core community, the course for the innovation process is set.
- The *developer network*: the organizations and individuals doing the R&D necessary to go from initial idea to fully implemented product or service.
- The *user network*: the stakeholders using the product or service. In the early stages of the innovation process, often a small group of (future) users is involved as test users.
- The *stakeholder network*: a wide range of stakeholders who directly or indirectly do or could benefit from the innovation. The user network consists of a subset of these stakeholders.

Some conversation spheres, such as that of the core community, are less permeable than others, like that of the amorphous stakeholder-network. Especially the intersections between the spheres require careful attention. From a point of view of design interventions, the core community can affect its own sphere (C1) and the intersections with the other networks (C2-C5). For example, it can decide to have regular face-to-face meetings with its core community members, plus use a private wiki for content management (C1), while it uses regular face-to-face workshops and a closed LinkedIn group as the tool system for communication with the developer network (C2). Still, to communicate with its larger user/stakeholder network, the core community could use a combination of a website, an open Facebook group, and Twitter (C3-4).

## Bootstrapping the SIC-Model

The SIC-Model was bootstrapped together with the case representatives in a grounded theory approach. The conceptual model was then used to make a number of observations on roles, tools, and workflows (a subsequent, more detailed analysis would also explicitly include the goals and results of the socio-technical conversation context). These observations in turn form the basis for the collaboration patterns that capture and make available for reuse the lessons learnt.

### Method

Using the Social Innovation Collaboration (SIC) model as a conceptual framework, a quickscan was made of the socio-technical system of each case, using a growing - partially cross-case - taxonomy of roles and tools. To this purpose, a basic version of the grounded theory methodology was used. In this practice-oriented theory, concepts and relationships describing and "owned by" a community are extracted by a process of constant comparison of emerging codes. In this way, theories of human behavior can be systematically derived from empirical data (Urquhart, 2001; Fernández and Lehmann, 2005). In grounded theory formation, data collected is marked with a series of codes, extracted from the text. These codes are grouped into similar concepts, which then are the basis for categories, which in turn are used for deriving hypotheses and theory. In our approach, we started from a set of initial, high-level concepts, drawn from the Socio-Technical Conversation Context Framework: in particular on the *roles* community members play, the *tools* they use and the *workflows* in which they do so. The validation took place by constantly generating with and re-presenting to the case participants the emerging specializations of these concepts, their relations, and derived working hypotheses. As the case participants are leaders in social inovation processes in their respective domains, the emerging patterns should have sufficient validity for the purpose of initial theory formation.

At each monthly iteration, the findings for the various cases were analyzed and where relevant added to the common core. Driving this process was a set of social innovation goals focusing on business case and social network development. Although the goals were partially different in each case, a common goal was how to create relevant conversational "buzz" around each case. Relevant buzz means that the right stakeholders are involved at the right time with the right degree of participation, while simultaneously ensuring that confidential conversations do not "spill over" into spheres were they do not belong. Furthermore, conversations in different spheres need to be connected by social (people) or technical (tool) "linking pins". This means developing a tool system that is sufficiently tailored to the specific conversation norms and practices of the case at hand. In the cross-case analysis, we discovered that there were differences, but also commonalities in how the cases defined and designed their conversation spheres and supporting tool systems. The lessons learnt can form the basis for theory formation as well as guidance in practice.

### Lessons Learnt

A number of lessons were learnt with respect to designing the conversation infrastructure for the various cases. Key focus of the analysis were the roles (App.1) and tools (App. 2), and how they interact in collaborative workflows. A possible taxonomy of these concept types is presented in App. 3.

***Roles***

- The cases vary widely in level of detail of role specification (Genicap: 14 types of roles, SafeCity 32, Dementia Experience 24).
- We distinguish between innovation process roles (based on the SIC model) and stakeholder roles (depending on the domain).
- Core innovation process roles (dark grey) are similar for all cases and derived from the Social Innovation Collaboration model: Core Community Members, Developers, Stakeholders, and Users. From the individual case analyses, additional innovation process roles were elicited, which can help to refine the SIC-model, e.g. Business Developers, Think Tanks, and Consuls.
- Stakeholder roles are candidates for playing the innovation process roles. They can be generic (e.g. Government, Business, Education, Citizens) and more (case)-specific (e.g. Mayors, Housing Associations, Caregivers, Dementia Consultants).
- Some roles act as containers for more specific roles. For example, Municipality in the case of SafeCity can mean Mayor, Security Coordinator, Security Policy Officer or Security House, depending on the context in which it is used. Another example is the role Professional in the Dementia Experience case, which comprises a wide variety of sub-roles, from Nurses to Neurologists (not further specified in the initial analysis).
- Common stakeholder roles (light/dark grey) across different cases (e.g. Researchers, Citizens, Volunteers) could be very interesting linking pins for social innovation, creating new, unexpected connections between innovations in totally different domains, as, for example, suggested by the earlier mentioned Connected Differences Theory of social innovation (Mulgan 2007).
- Organizations are often used in two different role-playing ways. Sometimes, they are considered a stakeholder role (Ministry of Justice), sometimes they are used as containers for the individuals that need to play a particular innovation process or stakeholder role (e.g. a particular organization as a Core Community Member). In general, roles can best be expressed in generic stakeholder role terms instead of specific organizations, to promote the reuse of the patterns in which they are used.

***Tools***

- The cases are quite similiar in number of tools used (Genicap: 18 types of tools, SafeCity 22, Dementia Experience 21).
- The average number of tools used is much higher than the amount normally examined in Computer-Supported Collaborative Work and Computer-Mediated Communications studies, which is typically 1-3. This suggest that real-world cases may generate much more complex computer-mediated interaction behaviors than typically studied in lab situations.

- We distinguish between face-to-face (e.g. Consortium Meetings), online tools (e.g. RSS Feeds, Facebook), and mass media (e.g. Newspapers, Magazines). Remarkably, the variation in types of face-to-face tools is very high. This suggests that the usual "face-to-face" category used in many CSCW and CMC studies is underspecified.
- Many of the online tools are the same across cases (e.g. Web Site, LinkedIn, YouTube). Given that the roles of the cases differ widely (as indicated by the few greyed roles in App.1), this suggests that the variability in socio-technical systems of online collaborative communities is caused by the mappings of the roles to the tools, not the tools themselves.

#### *Workflows*

Roles and tools are combined in very different ways across the cases, leading to a palette of typical interactions which might inspire the construction of explicit, reusable collaboration patterns. The case study did not model those workflows in full detail, but some intriguing examples were collected in this pilot study (numbered here for reference in the next sections):

1. For intellectual property rights reasons, the core community should have a way to privately work together online for internal planning and coordination (C1), e.g. via a closed wiki or LinkedIn group that is not accessible to developers, users, and other stakeholders.
2. A regular series of face-to-face events, should be organized for the core community and developer network to meet (C2). This conversation sphere should have its own, private workspace.
3. Public content about prototypes (C3) should be advertised by the core community as much as possible on the key social media sites where the content of that particular type belongs (e.g. YouTube for videos, SlideShare for presentations) instead of being hosted on company servers. Apart from increasing outreach efficiency, this generates additional conversations on the social media sites, thus attracting new stakeholders. These stakeholders in turn could be recruited as new members of the user and developer networks (C4 and C5). These spheres could have their own private sections on the community portal.
4. The developer network may include many people representing key stakeholders (e.g. physicians in the Dementia Experience case). These stakeholders interact on their own in their own physical and online fora, such as physical meetings, mailing lists and Facebook or LinkedIn groups. One way to involve them is by creating separate social media channels for the project, and then trying to attract overloaded stakeholders to those new channels (core community members then acting as "ambassadors"). However, it is often more effective and efficient to have stakeholder representatives in the developer network keep their peers informed on their own, existing channels, such as professional society websites and mailing lists (developers then effectively being "consuls") (C5).
5. Typically, a social innovation process takes a long time, often years, from initial idea, via prototype to full product. As an increasing number of developers and stakeholders gets involved, using a growing set of communication tools, collaborative

fragmentation can easily occur. The open, fleeting nature of tools like Facebook and Twitter only exacerbates this situation. Rather than trying to control these conversations, they should only be facilitated (trying to create “buzz”). To keep some focus, the core community should ensure that regular updates about project progress are made on a community portal (e.g. a website) they control. These updates should have deep links (their own unique url), so that they can act as "anchors" in the unruly conversation spheres, being referenced wherever possible. Note that the links can be public and shared with all stakeholders (C3), but content referred to may only be accessible to developers behind a login (C2), in case the innovation is protected by intellectual property rights or privacy concerns, for instance.

6. Much content needs both open stakeholder (C3) and closed developer conversations (C2). For instance, a screenshot of a demonstrator could be put on a public Facebook page, where every visitor can leave comments. However, once sufficient feedback has been collected, a selected set of test-users/developers could be led through an "action funnel" in order to accomplish a result (C2, C5). A (Genicap-case) example would be to foster social media conversations around a web server that allows users to experiment with different types of graphical "supershapes", rendered real-time using software based on the superformula. Once a user sees a potential application, she can be funneled through a series of (private) forms to prepare the "create a business application" process.
7. Use a relevant selection of the total tool system to promote desired user and stakeholder interactions (C3-4). For example (in case of Genicap), at a scientific symposium, actionable deep links to specific research publication sections of the community portal could be presented. Afterwards, conference attendees could continue the conversation on the discussion pages of the papers presented at the conference. These scientists would not easily do this on Facebook. In contrast, Facebook would be a natural habitat for the creatives developing graphical applications of the superformula.

## COLLABORATION PATTERNS: SHARING LESSONS LEARNT

Next, we first explore the nature of patterns in general, and of collaboration patterns in particular. We then examine how collaboration patterns can be represented as conceptual graphs and show some examples from the Social Innovation Award-case. We then explore various possible uses of the patterns.

### Exploring Patterns

In design, creativity and rationale are co-dependent. Design is a broad, often collaborative human activity about "how things ought to be" (Fischer and Shipman 2011). Design seen as a collaborative activity requires common ground to be built over and over again. Rationale can aid creativity in design through helping designers see their world in alternative ways (Carroll 2010). Design rationale represents and articulates the reasoning underlying the design process explaining, deriving, and justifying design decisions. It provides a forum for airing

issues crucial for coordinating group activities (Fischer and Shipman, 2011). Patterns, both individually, and by the network of relations they form in pattern languages, can be an important instrument for providing such design rationale.

Patterns are a way of recognizing and describing approaches and structures that are encountered repeatedly in a discipline. They were first popularized by Christopher Alexander in an architectural context. His intuitive definition is worth quoting here: "Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice (Alexander et al 1977, x)". In other words, patterns define relatively stable solutions to recurring problems at the right level of abstraction, making them concrete enough to be useful in a particular case, while also sufficiently abstract to be reusable across cases (de Moor 2006).

With their template structure, patterns provide enough degrees of freedom for situated, contextualized knowledge to be represented, while providing enough structure to help trigger stakeholders in generating such ideas in the first place. Patterns, do not exist in isolation, however, but are organized in pattern languages. These are networks of patterns that call upon one another, patterns being embedded in larger patterns, related to similar patterns and in turn embedding smaller patterns (Alexander et al 1977, xiii). A pattern language is a living knowledge base that promotes, rather than restrains creativity, collaborative, and critical thinking, integrates theory and action and bridges traditional boundaries (Schuler 2008, 55, 543). Patterns are natural bridges between the unruly world of creativity and the systematic world of rationale. The relationships between patterns in pattern languages furthermore help their users find meaningfully related ideas, which they can then zoom in on to explore the details.

## Collaboration Patterns Introduced

Socio-technical design patterns go beyond the more technical-oriented design patterns that focus on interface, interaction, and implementation, which are at the core of human-computer interaction and software engineering pattern languages (Borchers 2000). Instead, socio-technical patterns play an important role at the beginning of social software projects, where they can be used to help scope in application domain terms the overall interactions between the social and technical systems that need to be built (Dixon 2009).

Collaboration patterns as a category of socio-technical design patterns are especially important for helping to create effective collaboration spaces, as they combine the social structures and processes of the communities in which human beings work together with the effective use of the technologies that enable this collaboration (De Moor 2009). Thus, they capture lessons learnt about how to make available functionalities "actionable" by describing how community members playing particular domain roles best use specific functionalities for particular collaborative purposes.

We distinguish five types of collaboration patterns that together can be used to represent and analyze collaborative lessons learnt: goal patterns, information patterns, communication patterns, task patterns and meta-patterns (De Moor 2009). In this chapter, we will not delve into the details of these different types of collaboration patterns and how they are related. Our purpose here is only to illustrate how collaboration patterns could form a language for the formalization of social innovation lessons learnt. Therefore, we only use combinations of two types of collaboration patterns: communication and information patterns. Communication patterns describe acceptable and desirable communicative interactions within communities. Information patterns are conceptualizations of content knowledge essential for the collaboration plus the roles responsible for its creation and maintenance.

As mentioned previously, the conceptual basis for communication patterns is the *communicative workflow loop*, which is the basic unit of coordinating actions in collaborative communities. This loop is grounded in Language/Action Theory, which emphasizes what people do by communicating, how language is used to create a common basis for communication partners, and how their activities are coordinated through language (Winograd and Flores 1986). Each communicative workflow loop consists of three subsequent stages: the initiation, execution, and evaluation of the result. Each stage can be supported by one or more tools. Communicative workflow loops are controlled by three types of roles: domain roles, conversation roles, and functionality roles (De Moor 2010a). Domain roles are the roles somebody plays in the capacity of being a stakeholder member of a collaborative community. Such roles could be played by be the innovation process roles and stakeholder roles we distinguished in the domain of social innovation. Conversation roles are the initiating, executing, and evaluating roles that community members play in controlling the workflow. Functionality roles are the roles that people need to play in effectively using tool functionalities. An example of a functionality role would be the List Administrator of a Mailing List tool. Conversation and functionality roles in turn can be played by domain roles, so role nesting is common.

## Representing Collaboration Patterns

Patterns can be represented in different notations. Such a notation can be an informal one, such as the patterns in the Liberating Voices Pattern Language[5], which are described in English. Here, the only structure is provided by the headings within each pattern: Problem, Context, Discussion, Solution, Related Patterns. However, for the purpose of collaboration design, this lack of structure does not suffice. Socio-technical systems in the case of social innovation require many detailed design decisions to be made, such as with respect to links between and constraints on workflows, role authorizations, and tool configurations. To be able to represent and (semi-)automatically reason about patterns, ontologies are needed. An ontology is am explicit specification of a conceptualization (Gruber 1994). At the very least an ontology contains the (systematically defined) main concepts and relations agreed upon by the key stakeholders in a particular domain, usually organized in a type hierarchy. App. 3 shows a possible type hierarchy for the roles, tools, and workflows distinguished in this

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

chapter. Often, the ontology also includes the rules needed to reason about these representations.

Our ontological formalism of choice are conceptual graphs. Conceptual graph theory is a powerful formalism for knowledge representation and reasoning that is grounded in linguistic principles on the one hand, and formal semantic network representations on the other hand (Sowa 1984). A key feature is that conceptual graph theory allows for generalization hierarchies of graphs, so that more generic (reusable) patterns can be specialized into/derived from more specific (case)-based patterns. Thus, conceptual graphs are very well suited for representing and reasoning about collaboration patterns.

Communicative requirements and enabling tools meet in so-called *enabled communication patterns*. A template of such a pattern is shown in Fig. 3. This template says that a workflow is controlled by an initiation, execution, and evaluation process. The agent of each of these control processes is some domain role. Each control process is supported ("enabled") by some tool, owned/controlled by some functionality role. The output of each workflow is some result, owned by some domain role. To prevent confusion: the patterns presented in the following figures are not to be directly used (or even seen) by stakeholders. However, they have been included here to stress that *precise semantics of collaboration patterns are of the essence*, as the devil is very much in the detail. Too much of the collaboration support literature is of the "vigorous handwaving" kind: the broad conceptual models all look very agreeable, until one tries to implement the abstract models, when confusion frequently abounds, and collaboration comes to a halt, if it gets started in the first place. These models need to be translated in different languages for different target groups of users. Technical users like collaboration researchers and systems admins can use them almost directly, to construct hypotheses or configure socio-technical collaboration systems. Domain stakeholders, however, could only see part of these models, presented in natural language or a drop-down box in a web form. For instance, the top-left part of Figure 3 says that some tool is used to support the initiation of a workflow. Translated into a "layman's situation" this could mean that a user being consulted on the design of their community system, could be asked "Which tool would you use to start your [name of the workflow]?", then be presented with a list of all the tools accessible to this community. At the end of this section, we further expand on how to use these patterns.

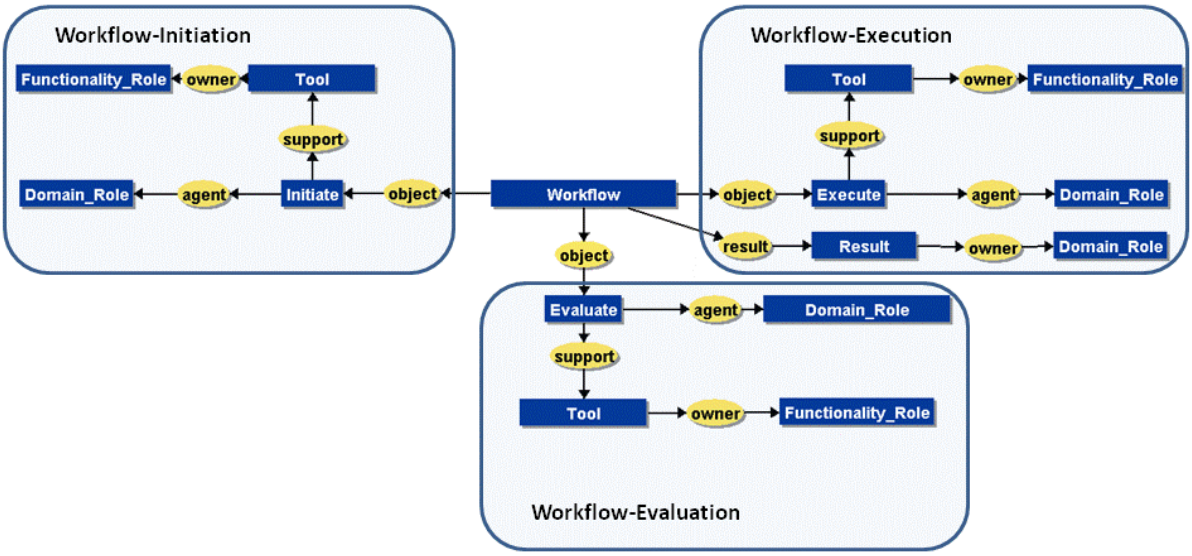


**Figure 3 An (enabled) communication pattern template**

Note that this template is the most generic form of communication patterns. In realistic settings, enabled communication patterns are contextualized by complex amalgams of other collaboration patterns, such as information patterns to describe the key characteristics of the content produced in the workflow. We will give some examples of such realistic patterns in next[6].

## Social Innovation Award: Distilling the Lessons Learnt with Collaboration Patterns

We are now ready to show how collaboration patterns can be used to distill lessons learnt in our social innovation case. The basis for our analysis are the Social Innovation Collaboration model and the Enabled Communication Pattern template. Domain roles in the latter are played by social innovation process roles, which themselves can be played by stakeholder roles, as we have seen. To illustrate, we show patterns capturing some of the lessons learnt in the list of workflow examples in the previous section.

### Recruiting test users

In workflow example 3, we saw that new test users can be recruited by sharing prototype visualizations on social network sites, then inviting the most active users to become test users on the community portal. For example, the Initiator of the C3: Advertise Prototype-workflow could be the (innovation process role) Core Community Member, by virtue of

[6] In this paper, we will refrain from further using functionality roles. These roles especially come into play when optimizing usage of tools across many cases. For example, the book "Wikipatterns" (Mader 2007) gives many examples of functionality roles needed to make effective use of wikis, independent of the particular communities of use. Examples are Champion, WikiZenMaster and WikiGardener.

placing prototype visualizations on relevant social network sites, thus starting the advertising process. Next, this or another core community member could select active participants to test prototypes with developers (C5) on the community portal. Fig. 4 shows the collaboration pattern capturing this lesson learnt.

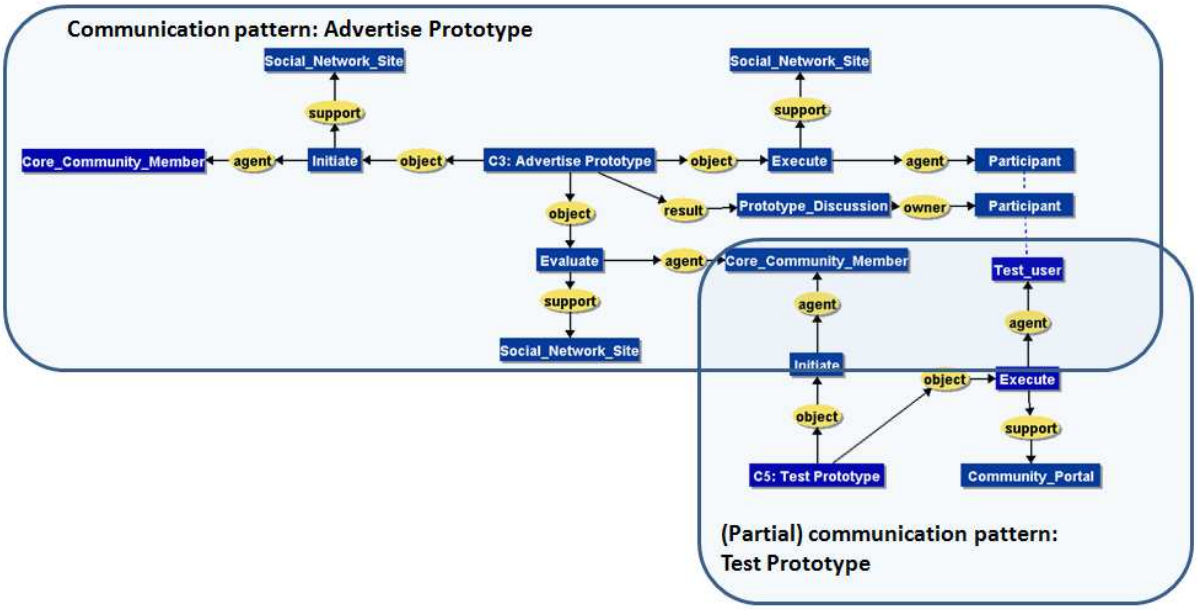


**Figure 4 Composite collaboration pattern: Recruiting Test Users**

Note that this is a composite collaboration pattern, consisting of two interrelated (enabled) communication patterns. Active participants are those who are involved in ("execute") the prototype discussion in the Advertise Prototype workflow. In evaluating this discussion, a core community member selects the most promising participants as test users. This selection process is (part of the) initiation of the Test Prototype-workflow that takes place on the (private) community portal. Note that there are dotted lines between the Participant and the Test User concepts. These are "lines of identity" which indicate that these roles are played by the same individuals. Also note that, for instance, the evaluation of "C5: Test Prototype" is not modeled. This is irrelevant from the point of view of recruiting test users, and can be captured by other collaboration patterns, which can then be connected to the current pattern if and when needed.

#### Reducing collaborative fragmentation

Workflow example 5 discussed a strategy using deep links to (public or private) content in order to create "conversational buzz" while reducing the risk for collaborative fragmentation. Figure 5 shows a collaboration pattern that captures this strategy:

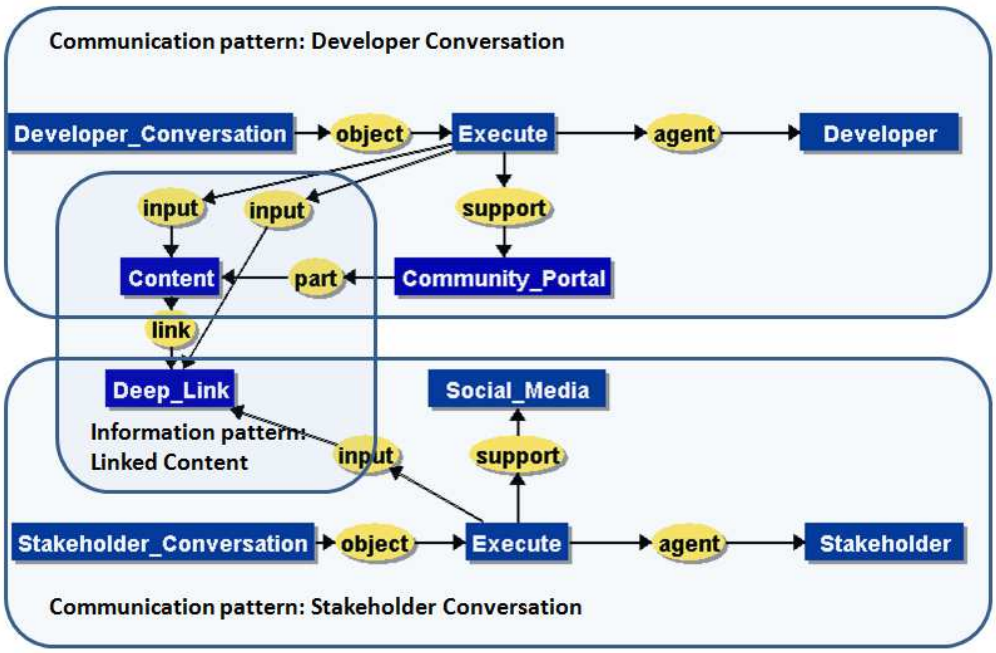


**Figure 5 Composite collaboration pattern: Reducing collaborative fragmentation**

It is a composite pattern consisting of (partial) communication patterns around two workflows (Developer Conversation and Stakeholder Conversation) and an information patterns stating that content can have deep links. Key to this pattern is the distinction between stakeholder conversations taking place on one or more types of social media (Facebook, LinkedIn etc.) and developer conversations taking place on a (public or private) dedicated community portal. How these conversations are started or evaluated is not relevant here. What both types of conversations have in common are deep links to some form of content. However, and this is crucial, in this case the content itself is private and only accessible to developers in their conversation (as an input in the execution of the Developer Conversation).

## Using Collaboration Patterns

Collaboration patterns are conceptual representations of collaboration lessons learnt, in this case with respect to social innovation. We have seen how to distill and formulate them. However, the patterns must be put into practice in order to prove their value. Many applications of these patterns are conceivable:

- Collaboration patterns can be used as best-practice discussion starters for *collaborative sensemaking* by communities. Since the ontology underlying the patterns is expressed in (role, tool, workflow etc.) terms carefully elicited from stakeholders representatives, they provide realistic scenarios related to socio-technical problems and design directions experienced in real world-situations. With a little training, the visual format of conceptual graphs can be understood. Moreover, since

conceptual graphs have a well-established linguistic foundation, they can be automatically translated into controlled natural language sentences, creating mini-stories that community members can validate without having to interpret graphical formalisms.

- Current or desired socio-technical designs of particular collaborative communities can be modeled as collaboration patterns, by either community members or external analysts. *Differences* between requirements and enabling functionalities – socio-technical gaps (Whitworth 2006) – and between existing and desired/best-practice patterns could be precisely calculated with conceptual graph theory (Delugach and De Moor 2005), then interpreted by stakeholders in terms of required socio-technical design interventions. Since collaboration processes and infrastructures can be very easily disrupted, the attention to unambiguous detail made possible by the collaboration patterns is essential for enabling and innovating advanced collaboration endeavors.
- There is a chasm between the subtle social world of communities and the harsh technical world that, for example, system administrators have to operate in. This is a natural consequence of the fact that the functionalities of information technologies afford and constrain social behaviors, often resulting in violations of the social norms of a community (Stamper 1996). Collaboration patterns can help system administrators reduce such violations, for instance by giving clear specifications of role-based access rights to files, folders, and functionalities when configuring the tools used by a specific community.
- Successful collaboration designs, especially in large networks and online communities, cannot be pre-scribed. Instead, they require lots of tinkering and trial-and-error. Typically, fragments of collaboration emerge first and slowly coalesce, often only after many iterations. Collaboration patterns match this *natural evolutionary process*. Initially, only a few, generic collaboration patterns can be selected to kickstart the formation of a collaborative community. Over time, more complex, contextualized collaboration patterns can be added to refine the emerging collaborative infrastructure with increasingly advanced lessons learnt in similar endeavors. The patterns, by using a joint ontology, can be used to circumscribe the boundaries of collaborative workflows at just the right level of detail, and allow for these "collaborative islands" to be linked into a a full-fledged "collaborative landscape".
- A major issue for (especially online) collaborative communities is that they often die down after an initial burst of excitement and activity. Furthermore, many social media applications limit themselves to supporting playful social networking, not addressing the larger, more serious applications that could bring larger benefits to society (Preece and Shneiderman 2009). Collaboration patterns, capturing effective collaboration designs, can be used to model necessary conditions for *activating and scaling* collaborative participation that go beyond toy applications. One benefit, for example, is that they provide a language to precisely define the collaborative roles that community members need to play and the tools that they could use in doing so.
- Collaboration patterns also form a bridge between theory and practice. Emerging fields like social innovation have still only rough, high-level (fragments of) theory at

their disposal to guide research, development, and implementation efforts. Collaboration patterns like the ones distilled in the case described in this chapter, can be considered "proto-theories". They can be used to formulate socio-technical design hypotheses, to be used in further case studies and empirical testing.

## DISCUSSION

Collaboration patterns are bridges: they span general lessons learnt and situations of specific communities; requirements and functionalities; theory and practice. As we have seen in the previous section, they are multi-faceted constructs, with many potential applications. One main reason for their conceptual power is that they zoom in on the essence of socio-technical systems: systems of tools used in complex, real-world domains like social innovation. In contrast, much related work focuses on single tools (e.g. Twitter, wikis) in more limited contexts of use, such as e-learning by students or knowledge management in professional work situations (e.g. Zhao and Rosson 2009; Witney and Smallbone 2011). Although the results of these studies gives a reasonably good idea about the collaboration (inter)action potentials afforded and constrained by such tools, these insights are not specific enough for the effective design and use of combinations of such tools in realistic usage contexts, such as social innovation cases. Collaboration patterns, built on solid ontological foundations derived from both theory and empirics (e.g. Appendix 1-3), can help distill reusable lessons learnt, while diversifying the designs of actual tool systems used in particular communities.

Social innovation theory is still in its infancy. Collaboration patterns are at the "meso-level" between formal theory and unruly practice. They provide practical guidance for social innovation (e.g. tool/role selection, systems configuration), but also help in theory formation (e.g. socio-technical design hypotheses). Yet, the patterns can also further social computing theory: designing social innovations contextualizes and conceptually wraps the design of social computing software and methodologies. In the Social Innovation Award case, we adopted a form of grounded theory methodology to try and elicit collaboration patterns of sufficient quality to serve both purposes. Ours is an inductive way of theory construction and testing. Of course, the patterns may not be universally valid, since we have not done controlled, statistical experiments. But then again, a fundamental question is if such statistical generalization is ever possible in the complex, situated reality of the online collaborative workplace. We do not claim to have a fully developed, let alone tested theory. However, the emerging ontology and patterns can serve as an emerging rich language in which to design further hypotheses and experiments. As such, this approach links the design theory paradigm to the "classical" behavior science paradigm. A design theory is prescriptive theory based on theoretical underpinnings which say how a design process can be carried out in a way which is both effective and feasible (Walls 1992). The design theory paradigm is a natural paradigm for information systems research as it seeks to create innovations that define the ideas, practices, technical capabilities, and products through which the study and development of information systems can be accomplished effectively and efficiently (Hevner et al 2004). Analytical, rather than statistical generalization (Yin 1994) seems to be the appropriate

way for such socio-technical pattern theory generation. This does not mean that behavioral experiments are not important. However, the "rich context modeling" taking place in exercises like presented in this chapter can help to provide the meaningful conceptual scaffolding on which more rigorous statistically-based behavioral experiments can subsequently be built. The Social Innovation Award 2011 has just been given to two new innovation cases, in very different domains (construction industry and restaurant/retail business). The monthly plenary meetings will be continued, together with the previous winners, in a Social Innovation Award Academy[7]. This creates a significant opportunity for evaluating, refinining, and extending the social innovation ontology and patterns developed so far.

The rise in social computing has led to a shift from passive media consumption to cultures of participation. Coordinating and integrating collective design rationale and social creativity provides new synergies and opportunities in sophisticated socio-technically mediated collaborative communities (Fisher and Shipman 2011). Collaboration patterns unite collaboration rationale and community creativity by acting as "boundary definitions", allowing generic lessons learnt to be uniquely modified, extended, and appropriated by individual communities to match the peculiarities of their own, situated reality. As boundary definitions, collaboration patterns complement process rationale recommendations in upstream requirements engineering and critical conversations by stakeholders and software designers (Ocker 2010; McCall 2010). By "setting the discussion agenda", the patterns can inspire a form of "process composition" (taking into account such process rationale recommendations), through which community members circumscribe rather than exhaustively describe their socio-technical system (Fitzpatrick and Welsh 1995). Advantages of such an approach are that, over time, requirements can be gradually refined and that much flexibility remains in the way collaborative work is done, as only the boundaries of the socio-technical system are delineated, at the necessary - and sufficient - level of detail.

One particular focus of socio-technical interest is "the role of roles" (De Moor 2010a). Roles are important constructs in communities, in which they have structuring, coordinating and supporting functions. The development of roles and their functions takes place by perceiving the repetition of social interaction patterns based on patterns of expectations (Herrmann et al 2004). Both explicit and informal roles are very important in community governance, as typically organizational hierarchies are lacking, and interorganizational confusion abounds in collaborative communities. Despite their stated importance, role typologies, let alone fully developed ontologies describing how these roles are to be situated in collaborative workflow patterns, are still relatively ill-developed in the literature. With our work, we have started exploring this relatively uncharted territory, by distinguishing between such concepts as domain, conversation and functionality roles; and our initial attempts at empirically grounded domain-specific roles like the social innovation process and stakeholder roles elicited in the Social Innovation Award case, as well as the collaboration patterns in which they "play their natural roles". Even so, there are many other possible role classifications which we have not even touched upon, but might further enrich the mix, such as the facilitation roles needed in

[7] http://de-brink.wikispaces.com/Social+Innovation+Award+Winnaars

virtual teams (Thomas et al. 2007). As more cases get analyzed, and social innovation collaboration theory solidifies, initially case-specific roles might become generic stakeholder or innovation process roles, then possibly even become part of more generic collaborative community role ontologies. One caveat is that nestings of roles can become very complex: for instance, conversation roles can be played by social innovation process roles, which in turn can be played by stakeholder roles, which might be played by an organizational role, which then again might be played by a particular person. Such role nesting is unavoidable in real world collaborative situations. Conceptual graph theory might be of great help here, as nested contexts and pattern/graph hierarchies are among its key research foci.

Finally, to what extent could the results obtained in the domain of social innovation be generalized to other domains? One very related domain that immediately comes to mind is that of open innovation. Open innovation concerns complex, interconnected webs of interacting individuals and organizations focused on producing knowledge-intensive innovative outputs (West and Lakhani 2008). Popular examples include “Wikinomics” and “We-Think” (Tapscott & Williams, 2008; Leadbeater, 2009), which propose smart combinations of Web-mediated content, social media, context, and conversations to drive and scale mass collaboration forms of open innovation communities. Our approach provides a language and lens for viewing such collaborative problems and socio-technical design solutions with more precision and clarity. It should therefore be applicable to open innovation and other forms of (inter)organizational collaboration networks and communities as well, both in terms of methodology and at least part of the contents of role, tool, and workflow typologies and collaboration patterns.

## CONCLUSION

Real-world collaborative communities make use of complex systems of face-to-face and online communications tools, tinkering them together into intricate fabrics of tools, roles, and workflows. Collaboration patterns help in the process of weaving these evolving socio-technical systems, by inspiring their design and making it possible to re-use lessons learnt across cases. We studied the use of collaboration patterns in one particular domain, social innovation, by analyzing the results from a cross-case analysis of three Dutch social innovation communities simultaneously being developed. One main result is that we have obtained a better understanding of the nature of socio-technical systems specifically for social innovation. Possibly even more important is that we are pioneering an approach and methodology for using collaboration patterns to develop tailorable socio-technical systems for creative, working communities. We are still at the beginning of a long journey of learning about how to do so, and understanding what are the manifold implications. However, as the Chinese saying goes: “every journey starts with a single step.” We are definitely on our way.

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# APPENDIX 1: SOCIAL INNOVATION AWARD – ROLE ANALYSIS

| *Roles / Cases* | Genicap | SafeCity | Dementia Experience |
|---|---|---|---|
| | | | |
| **Innovation process roles** | Core Community Members | Core Community Members | Core Community Members |
| | Developers | Developers | Developers |
| | Stakeholders | Stakeholders | Stakeholders |
| | Users | Users | Users |
| | Business Developers | | |
| | | | Consuls |
| | Front-Desk | | |
| | Investors | | |
| | | | (Other) Innovation Projects |
| | | Think Tanks | |
| | | | |
| **Stakeholder roles** | | Association of Municipalities (VNG) | |
| | Business | | Business |
| | | | Caregivers (amateurs) |
| | | | Care institutions |
| | Citizens | Citizens | |
| | | Common Control Room | |
| | | | Communications Officers |
| | | | Community Representatives |
| | Creatives | | |
| | | | Decision makers |
| | | | Dementia consultants |
| | | Domestic care organisations | |
| | Education | | Education |
| | Government | | |
| | | Housing associations | |
| | | Insurance companies | |
| | | Lone workers | |
| | | | Managers |
| | | | Mass Media |
| | | Mayors | |
| | | Ministry of Justice | |
| | | Municipalities | |
| | | Municipal control room | |
| | | Municipality departments | |
| | | Notifiers | |
| | | PACs | |
| | | Police | |
| | | Politics | |
| | | | Product developers |
| | | Product owners | |
| | | | Professionals (caregivers) |
| | | | Professionals (non-caregivers) |
| | | Public task employees | |
| | | Public task organizations | |
| | Researchers/Scientists | Researchers | Researchers |
| | | Security companies | |
| | | Security policy officers | |
| | | Security coordinators | |
| | | Security demanders | |
| | | Security suppliers | |
| | | | Society |
| | | Street coaches | |
| | | | Students |
| | Technologists | | |
| | | | Visitors |
| | | Volunteers | Volunteers |
| | | | |
| *# of roles* | 14 | 32 | 24 |

Roles that occur in only 1 case are in white; in 2 cases are in light-grey, in all 3 cases in dark-grey. NB Roles not mentioned in a particular case may still be present, but have not been the focus of the initial analysis.

## APPENDIX 2: SOCIAL INNOVATION AWARD – TOOL ANALYSIS

| *Tools / Cases* | Genicap | SafeCity | Dementia Experience |
|---|---|---|---|
| | | | |
| **Face-to-Face tools** | | | Alzheimer Cafes |
| | Consortium Meetings | | |
| | | | Dementia Consultations |
| | | | Developer Meetings |
| | | External Events | |
| | | Network Meetings | |
| | One-on-One Talks | | |
| | | "Pasta Talks" | |
| | | | Professional Information Points |
| | Symposia | | |
| | | | Training Sessions |
| **Online tools** | Blog | Blog | Blog |
| | Delicious (social bookmarking) | Delicious (social bookmarking) | Delicious (social bookmarking) |
| | | Dropbox (filesharing) | Dropbox (filesharing) |
| | Facebook (social networks) | Facebook (social networks) | |
| | Flickr (photo sharing) | Flickr (photos) | Flickr (photos) |
| | | Google Docs (co-authoring) | |
| | Google Forms (forms) | Google Forms (forms) | Google Forms (forms) |
| | | Google Maps (maps) | |
| | | Hyves (social networks) | Hyves (social networks) |
| | LinkedIn (social networks) | LinkedIn (social networks) | LinkedIn (social networks) |
| | Mailing Lists | Mailing Lists | Mailing Lists |
| | | Newspapers/Magazines (mass media) | Newspapers/Magazines (mass media) |
| | RSS Feeds | RSS Feeds | RSS Feeds |
| | | | Simulator |
| | Slideshare | Slideshare | |
| | Tagging Policies | Tagging Policies | Tagging Policies |
| | Twitter | Twitter | Twitter |
| | Websites (Business Portal/Community Portal) | Website | Websites (Own vs. Target Group Sites) |
| | Wikispaces | Wikispaces | Wikispaces |
| | YouTube | YouTube | YouTube |
| | Zotero | | |
| | | | |
| *# of tools* | 18 | 22 | 21 |

Tools that occur in only 1 case are in white; 2 cases are in light-grey, in all 3 cases in dark-grey. NB Tools not mentioned in a particular case may still be present, but have not been the focus of the initial analysis. Also, mass media in the case analysis were grouped under online tools. Strictly speaking, they are a class of their own, which is reflected in the social innovation concept type hierarchy outlined in App. 3.

## APPENDIX 3: SOCIAL INNOVATION CONCEPT TYPE HIERARCHY

An important part of the social innovation ontology-under-construction is the concept type hierarchy. This hierarchy is necessary to interpret, generalize and specialize the growing set of collaboration patterns and helps in theory and hypothesis formation. Inputs are the Social Innovation Collaboration Model, the role and tool types listed in the previous appendices , and the collaboration patterns examples presented in the previous sections.

Concept types from the existing theory (e.g. Conversation Roles) are underlined. The number behind each (newly elicited) concept type indicates how often it was mentioned in the cross-case analysis. The higher the number, the more likely the concept type could become part of the grounded social innovation collaboration theory-under construction.

The concept type hierarchy is far from complete, is merely indicative of the field of social innovation and some of its sub-domains, and is only one out of many possible orderings. The taxonomy presented is only preliminary: for example, is a Public Task Organization part of Government, or its own independent category? The same concept types can be re-organized into very different taxonomies, depending on the (proto)theory being developed. At any rate, the proposed ordering(s) will get more refined and stable over time, in further iterations of the grounded methodology methodology.

Social innovation concept type hierarchy

- Roles
  - Conversation Roles
    - Initiators
    - Executors
    - Evaluators
  - Domain Roles
    - Innovation Process Roles
      - Core Innovation Process Roles
        - Core Community Members
        - Developers
        - Stakeholders
        - Users
      - Candidate Innovation Process Roles
        - Business Developers (1)
        - Consuls (1)
        - Front-Desk (1)
        - (Other) Innovation Projects (1)
        - Investors (1)
        - Think Tanks (1)
    - Stakeholder Roles
      - Business (2)
      - Care Institutions (1)
        - Domestic Care Organisations (1)
      - Citizens (2)
        - Caregivers (1)
      - Community Representatives (1)
      - Control Room

        - Common Control Room (1)
        - Municipal Control Room (1)
    - Creatives (1)
    - Decision Makers (1)
    - Education (2)
    - Government (1)
      - Mayors (1)
      - Ministry of Justice (1)
      - Municipalities (1)
        - Association of Municipalities (1)
        - Municipality Departments (1
      - Politics (1)
    - Housing Associations (1)
    - Insurance Companies (1)
    - Lone Workers (1)
    - Managers (1)
    - Mass Media (1)
    - Notifiers (1)
    - PACs (1)
    - Police (1)
    - Product Developers (1)
    - Product Owners (1)
    - Professionals
      - Professionals (caregivers) (1)
      - Professionals (non-caregivers)(1)
        - Dementia Consultants (1)
    - Public Task Employees (1)
    - Public Task Organizations (1)
    - Researchers (3)
    - Security Companies (1)
    - Security Policy Officers (1)
    - Security Coordinators (1)
    - Security Demanders (1)
    - Security Suppliers (1)
    - Society (1)
    - Street Coaches (1)
    - Students (1)
    - Technologist (1)
    - Visitors (1)
    - Volunteers (2)
  - Functionality Roles
- Tools
  - Face-to-Face Tools
    - Cafe Meetings
      - Alzheimer Cafes (1)
    - Consultations
      - Dementia Consultations (1)
    - Consortium Meetings (1)
    - Developer Meetings (1)
    - External Events (1)
    - Network Meetings (1)
    - One-On-One Talks (1)
    - "Pasta Talks" (1)
    - Professional Information Points (1)
    - Symposia (1)

- Online Tools
  - Blogs (3)
  - Co-Authoring Tools
    - Google Docs (1)
  - Filesharing Tools
    - Dropbox (2)
  - Forms Tools
    - Google Forms (3)
  - Mailing Lists (3)
  - Maps Tools
    - Google Maps (1)
  - Microblogs
    - Twitter (3)
  - Photosharing Tools
    - Flickr (3)
  - Presentation Sharing Tools
    - Slideshare (2)
  - Research Annotation Tools
    - Zotero (1)
  - RSS Feeds (3)
  - Simulator (1)
  - Social Bookmarking Tools
    - Delicious (3)
  - Social Network Sites
    - Facebook (2)
    - Hyves (2)
    - LinkedIn (3)
  - Tagging Policies (3)
  - Video Tools
    - YouTube (3)
  - Websites (3)
    - Business Portals (1)
    - Community Portals (1)
  - Wikis
    - Wikispaces (3)
  - Mass Media
    - Magazines/Newspapers (2)
- Workflows
  - Innovation Process Workflows
    - C1 Workflows (core community)
      - Internal Planning & Coordination (3)
    - C2 Workflows (core community – developers)
      - Involve Consuls (1)
      - Organize Developer Meetings (3)
    - C3 Workflows (core community – stakeholders)
      - Advertise Prototype (3)
      - Create Buzz (3)
      - Inform Stakeholders (3)
    - C4 Workflows (core community – users)
      - Facilitate Research Conversations (1)
      - Gather User Feedback (3)
    - C5 Workflows (core community – test users – developers)
      - Recruit Developers/Test Users (3)
  - Domain Workflows

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