# Facilitating interaction in web-based communities: the case of a community for innovation in healthcare

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**Abstract:** Integrating users on web-based platforms is achieved in many settings such as communities for innovation as well as in different areas like healthcare. In web-based communities, interaction is the basic mechanism from which users as well as organizers derive benefit and, thus, is very important for indicating whether a community is successful or not. Facilitation of users can help to address challenges in establishing and nurturing interaction in web-based communities. The objective of this paper is to explore interactions on web-based communities for innovation and how they could be supported by means of automated or human facilitation. Following an action research approach, we investigate possibilities for interaction along an exploratory interpretive in-depth single case study of a community for innovation that pursues to help patients suffering from a rare disease. Using investigative analysis, we disclose possibilities of interaction and suggest a framework for interaction-based facilitation.

## 1 Introduction

Web-based communities have become a widely used medium for interaction [BGB10]. To survive and thrive, web-based communities (e.g., communities for innovation) must provide the benefits and experiences that users seek [Bu01, Ki00]. In such communities, interaction is the basic mechanism by which participants derive benefit. People come to web-based communities seeking solutions to their problems, encouragement, and conversation. When interaction takes place, participants benefit and become more committed. Thus, people especially profit from the presence and activity of others in web-based communities, from the information and support they provide and the conversations they participate in [BLW04]. Web-based communities are utilized in many different areas such as in healthcare, where patients use communities to seek information in order to help them make sense of a given diagnosis or to assist each other by exchanging recommendations with regards to treatments [SLK06]. In patient communities the need for information and, especially, interaction plays a very important role in dealing emotionally with a disease. Since recently, such web-based communities are more and more enlarged with opportunities for solving fuzzy problems in order to generate innovation, thereby building on the sticky information of many participating users [Hi94] independent of their technical expertise.

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Nevertheless, web-based communities are not only defined by the group of people seeking interactions, but also by the technical basis allowing for these interactions. Thus, a web-based community can be described as a socio-technical system incorporating both technical as well as social aspects [NBK09]. Interestingly, this distinction is also in line with research investigating the concept of interaction, which either focuses on functions of features or on the user [RA07]. The technical basis for interaction in web-based communities has its roots in classical hypertext-systems, which consist of documents and, thus, are text-based environments [Be89]. While these text oriented environments formerly required knowing particular markup languages and technical skills in order to be able to interact with other users, the advent of Web 2.0 made interacting in web-based communities a lot easier and more accepted in the general public. Therefore nowadays one major key to the success of people interacting in a socio-technical system is facilitation [GFN98]. Facilitation helps participants exploit the capabilities of the platform's underlying technology as well as the group in order to complete the task [ABW95]. System designers of web-based communities allow users to perform several actions on the platform in order to interact with each other by implementing human-computer interaction interfaces such as text boxes, evaluation schemes or file uploads in advance. In addition, they support users by means of human or automated facilitation incorporating tasks such as process, content or technical facilitation [CBA93, DPR93, GFN98]. Thus, by means of various interaction interfaces incorporated on the platform as well as diverse facilitation tasks, participants on web-based platforms as well as their relationships are supported in order to let interaction happen.

Web-based communities for innovation, thus, provide an appropriate case to study interaction that is relevant on many other web-based platforms such as forums or question answering sites. As interaction is becoming a success factor of many web-based platforms [Co99], its understanding and facilitation may lead to widely applicable insights. In our contribution, we will especially focus on how interactions can be enabled through interaction interfaces ex-ante and possibilities for facilitation ex-post. Surprisingly, various categories of interaction interfaces as well as facilitation have not been researched within one single study. The purpose of this work is to, *first*, investigate categories of interaction interfaces in a community for innovation with respect to the actions they allow and, *second*, to recommend how interactions could be supported by means of facilitation. The remainder of the paper is structured as follows. Section 2 provides theoretical background information on interaction and facilitation in web-based communities. Section 3 presents the in-depth single case study used to explore the research object as well as data collection and analysis. Section 4 continues with the results and section 5 concludes the paper with a discussion of implications and an outlook.


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# 2 Foundations

## 2.1 Interaction in communities for innovation

It is through interpersonal interactions that many individuals experience a web-based community[Pr00]. Moreover, interaction is positively and directly related to the innovativeness of web-based communities [Bl11,FL11]. Thus, to increase the benefit that users receive from interacting in a web-based community and organizers receive from increased innovative output, it is important to understand the possibilities for interaction through which people experience the community [Pr00]. Unlike human-human interactions on a web-based platform, which do normally not follow a designed formula, interactions across the human-computer interface are to structure more easily [Pr01]. We would like to classify the possible human-computer interaction interfaces actors in distributed communities have for e.g. uttering statements and, hence, interacting with each other. In web-based communities we can distinguish between visiting, voting, writing and visualizing as means to interact in online media. These categories were derived from the basic idea that hypertext allows navigating through linked sets of documents and are in line with research of Rafaeli and Ariel [RA07], who extensively reviewed literature on interactivity in computer-mediated environments. Hypertext documents feature form controls (as e.g. conceptualized in HTML specification), which allow submitting single and multiline text fields, single and multiple scales as well as uploading files to a server. From these basic elements a set of different human-computer interfaces for interaction can be created, which in turn limit the possibilities for interaction in communities to the ideas of the system designer. The *visiting* category encompasses all actions a user can make while browsing through hypertext. The user can click on links and remain on a site for a certain span of time. The *voting* category uses form controls to create absolute or relative scales for rating importance or quality of hypertext documents or specific parts of these. Allowing users of a community to freely judge the contributions in question has also become known as open evaluation (e.g. [Ha11, MHB10]). The *writing* category consists of all written text in single or multiline text boxes. Taxonomies allow filling in single line fields based on a pre-defined item list, whereas tagging offers user to freely categorize items in multiple categories without restriction. Finally, *visualizing* allows users to enrich their contributions, with graphics, audio or video files. Though, however limited the possibilities through human-computer interaction interfaces are, a system may still suffer from too much information and, thus, cause ambiguity for its users. Ambiguity is created when relations between entities are not present (uncertainty) or not clearly mapped (equivocality) [DLT87]. This is the case for platforms extensively using contributions in natural language such as web-based communities. In such cases automated recommender systems or human facilitators can reduce ambiguity by resolving unmatched or equivocally matched entities.


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### 2.2 Facilitation in communities for innovation

Facilitation can help to address challenges in establishing and nurturing a community [Fo01, KL04] and, hence, can support communities to thrive. Inspired by facilitation in the context of Group Support Systems (GSS), facilitation in the context of communities can be defined as a set of functions or activities carried out before, during, and after the formation of the community to help it achieve their own outcomes. Thereby, the essential characteristic of facilitation is to help make an outcome easier to achieve (adapted from [BAC93]). In the original context, facilitation is supposed to enhance processes in the group (i.e. efficiency, effectiveness, and commitment) without affecting the content of the decision [ABW95, Ro93, Sc69]. Literature distinguishes between various types of facilitation such as technical and group process facilitation [CBA93], whereupon process facilitation is focused on enhancing users' interactions with each other [GFN98] and the focus of our paper. Anson et al. [ABW95] even point out that process facilitation is a key component of facilitation in general, thereby enhancing communication and interaction of group members in order to help the group achieve outcomes that make better use of the resources available within the group. Process facilitation can further be distinguished in automated or human facilitation. Human facilitation is arranged by a human actor taking over the role of a facilitator (e.g. [DG87, DPR93]). As web-based communities consist of people and the content they exchange, a human being can facilitate the community either in a more emotional (affective) manner by motivating people to participate [De93, KB97] or in a more task-related (cognitive) manner by furthering the content they contribute (e.g. [BAC93, CB96]). Facilitation conducted by a designated human facilitator could be divided into several facilitation tasks either directed toward the internal functioning of the community or to the functioning of a community as a whole [TD05]. In addition, facilitation tasks could be arranged around the stages of development that a community may go [TD05]. In the original context of GSS, automated facilitation is the enrichment of a system with decisional guidance cues that guide decision makers towards successful structuring and execution of the decision making process. Like human facilitation, automated facilitation involves providing the group with decisional guidance in order to help them achieve their own outcomes. In the context of web-based communities, automated facilitation can be distinguished into approaches based on content or relying on collaborative filtering. While content based approaches solely rely on comparing a user model with a model retrieved from analyzing contributions to the community [CJF09], collaborative filtering recommends contributions to the community by users' shared appreciation of these [CJF09]. Content-based approaches, therefore, need contributions, which offer semantic data for analysis such as text descriptions or user profiles. Collaborative filtering relies on the activity of users on the platform, who rate items by creating page impressions or explicit votes. As automation may involve some risks, for example, the loss of the "human touch" could result in a decrease of satisfaction among members [Wo03], a combination of both, automated and human facilitation, seems to be most suitable for the support of a community. Based on the existent literature on human and automated facilitation as well as interaction, we suggest a new orientation of facilitation. With respect to the various types of interaction interfaces allowing participants on web-based community platforms to interact with each other, we suggest an interaction-based approach of facilitation in communities.


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# 3 The case of "Gemeinsam für die Seltenen"

## 3.1 Research method

To gain a deeper understanding of possibilities for interactions and to give a more detailed picture of how interaction-based facilitation in real world communities can look like, various interaction interfaces are illustrated along an exploratory in-depth single case study [Yi03]. According to Ulrich [Ul81], explorative research starts in practice, is focused on analysing the context of use and ends in practice. As we conducted the research with the aim to create value for those acting in the context of communities as well as for the academic community, the tradition of the action research method seemed to be especially suited [Ba99, BM04, La97] and fits well with the exploratory case study approach. Action research is a method developed in the late 1940s in the field of social sciences and defined by research being conducted simultaneously with action in practice [DMK04]. This kind of research expects to produce useable knowledge for academics as well as practitioners, which can be applied and validated in action [Ba99, Ko99]. The case to study is a community for innovation in the healthcare sector with the focus on rare diseases called "Gemeinsam für die Seltenen". The need for facilitation in this web-based community is beyond all question, since the context of rare diseases raise special challenges such as the wide variability of patients' medical expertise, the severity of problems due to misinformation and the need for emotional support. The requirements of the action research approach were fulfilled as three of the authors were part of the organizing team of "Gemeinsam für die Seltenen" having access to all relevant project information and decision processes [Gu00].

## 3.2 Case description

On the web-based community for innovation "Gemeinsam für die Seltenen"[1], users can contribute problems or find solutions that people suffering from a rare disease face or are in need of respectively. Further, patients get the possibility to exchange their past medical histories. The site has been launched in March 2011 and addresses German-speaking people from diverse backgrounds. Not only patients are welcome, but also caregivers, health workers, physicians, nurses; family members, friends, fellow patients; or researchers, engineers, product managers and civil servants. The aim of the platform is to help people suffering from a rare disease by finding innovative solutions for improving their quality of life. Therefore, the organizers asked participants on the one hand for problems that these patients suffer and on the other hand for product and service innovations that can help these patients in their daily lives.

By means of various interaction interfaces for visiting, voting, writing and visualizing implemented on the web-based platform, participants get the possibility to interact with each other in many different modes. For instance, participants can submit solutions and problems on the platform using a pre-defined form for textual description. Participants

[1] www.gemeinsamselten.de


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are also encouraged to visualize their submissions, e.g. in form of photo stories or videos. Further, participants get the possibility to create personal profiles, to give comments on problems and solutions submitted by others, to evaluate submissions of their peers or to send each other personal messages. This is just a compendium of possibilities how participants could interact with the rest of the community on the platform of "Gemeinsam für die Seltenen". The completed list of interaction interfaces implemented on the platform is given in the findings part. To get a better picture of "Gemeinsam für die Seltenen", figure 1 shows a screenshot of the home page of the web-based community for innovation.


Figure 1: Screenshot of the homepage of „Gemeinsam für die Seltenen"

### 3.3 Data collection and analysis

We use the web-based community of "Gemeinsam für die Seltenen" to explore interaction by systematically collecting interaction interfaces implemented on the platform. Interaction between participants in the community for innovation is based on either closed elements (i.e. based on check boxes, drop down menus or scales) or open ended elements (i.e. based on text, tags or files). In order to uncover all possibilities for interaction between participants on the platform, two people of the research team (whereby one was not part of the organizing team) individually collected all possible interaction interfaces and assigned each to one of the four types of interaction interfaces (visiting, voting, writing and visualizing). We describe how the use of the identified interaction interfaces is supported by means of human facilitation and recommend automated facilitation as it is not implemented until now.


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## 4 Findings

On the basis of an in-depth single-case study of "Gemeinsam für die Seltenen", we systematically collected possible interaction types, which we use as starting points for our interaction-based facilitation approach. All in all, we discovered a multiplicity of 19 different types of interactions participants can perform on the platform. Table 1 describes the possibilities for interaction identified on the platform and categorizes them according to one of the four categories for interaction as well as to the input needed from the participant. In addition, we describe how these various possibilities for interaction on the platform of "Gemeinsam für die Seltenen" are supported by means of human facilitation and recommend possibilities for automated facilitation, which might add on the human activities.

For the category of *'visiting'* we identified one type of interaction. As visiting submitted solutions and problems is the start point of interaction between participants in communities for innovations, users have always to be triggered viewing contributions of others. Hence, taking our interaction-based facilitation into practice, the four human facilitators of "Gemeinsam für die Seltenen" are continuously motivating participants to view solutions and problems submitted by their peers (1)[2]. Based on the experiences or needs a participant lists on his or her profile, the human facilitators are giving recommendations for solutions and problems worth viewing. In addition, we recommend integrating automated facilitation using data from page visits to enhance data for collaborative filters; thereby – privacy issues aside – recommending potentially suitable contributions to visit or participants with similar browsing behaviors for interactions.

For the category of *'voting'* we identified four types of interactions. Voting actions is sustained by the human facilitators activating people to spontaneously evaluate solutions or problems by means of 'thumps up' or 'thumps down' (2) or to evaluate solutions by means of pre-defined criteria (3). As the evaluation of problems and solutions by peers could be a very important source of feedback for their owners, the human facilitators on the platform are controlling whether users are participating in valuation or not. In addition to these more common evaluation actions participants are motivated to indicate whether they are in a good, fair or bad mood (4) or to evaluate their health insurance (5). The human facilitators are not only controlling the quantity of delivered evaluations, but also the quality to ensure that participants vote fairly and do not systematically evaluate solutions or problems either good or bad. Additionally, we suggest for future that automated facilitation can assist participants on "Gemeinsam für die Seltenen" (freely translated to "the many help the few") with concrete suggestions for voting solutions or problems using computations of network or semantic closeness. For the category of *'writing'* we identified 13 types of actions, which could be separated into eight actions allowing for text as input and five actions allowing for tags or a taxonomy as input. The human facilitators on the platform are supporting the community by encouraging participants to present themselves by contributing personal information (6) and choosing a role they want to occupy (17) or by communicating their daily conditions (7). Further, human facilitators are motivating patients or their family members to specify information concerning diagnoses, symptoms or therapy of their rare disease (8, 14),

[2] The numbers in brackets used in the following part apply to one of the 19 interactions described in table 1.


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| Category | Input | Interaction | Description of interaction |
|---|---|---|---|
| **VISITING** | Click | (1) Viewing solution / problem | *Participants can click on a solution or a problem they are interested in to view the detailed descriptions.* |
| **VOTING** | Ordinary Binary Multiple | (2) Liking solution / problem | *Participants can use a 'thumbs-up'/'thumbs-down'-button to demonstrate their gusto for a solution or a problem.* |
| | | (3) Evaluating solution | *Participants can evaluate submitted solutions according to various criteria using a pre-defined Likert-scale.* |
| | | (4) Status evaluation | *Participants can opt for their daily conditions by using a drop down menu.* |
| | | (5) Health insurance evaluation | *Participants can evaluate their personal health insurance by indicating their satisfaction on a Likert-scale.* |
| **WRITING** | Text | (6) Personal information | *Participants can introduce themselves to other members by writing about their person or motivation to participate.* |
| | | (7) Status messages | *Participants can communicate their daily conditions by writing about their state of health.* |
| | | (8) Patient information | *Participants can give information about false diagnoses, their symptoms, medication, therapy or medical history.* |
| | | (9) Medication description | *Participants can give additional information on their medication.* |
| | | (10) Physician description | *Participants can give additional information on their physician.* |
| | | (11) Personal messages | *Participants can write a personal message to another participant by leaving a post on his or her pin board.* |
| | | (12) Submitting solution / problem | *Participants can submit a problem or a solution by filling in pre-defined text boxes.* |
| | | (13) Commenting on solution / problem | *Participants can comment on a solution or problem by leaving a note on the solution's or problem's board.* |
| | Tag Taxonomy | (14) Disease | *Participants can indicate their disease by using auto-complete tags.* |
| | | (15) Medication information | *Participants can indicate their medication by using tags.* |
| | | (16) Physician information | *Participants can indicate their physician by using tags.* |
| | | (17) Role | *Participants can choose a pre-defined role they want to occupy on the platform (e.g. patient, caregivers, etc.).* |
| | | (18) Classifying solution / problem | *Participants can choose pre-defined categories by using check boxes.* |
| **VISUAL-IZING** | File | (19) Video / Audio / Photo | *Participants can upload a video, audio or photo file to visualize their solutions or problems.* |

Table 1: Overview of interaction possibilities on „Gemeinsam für die Seltenen"

medication (9, 15) or physician (10, 16). Further, the four human facilitators are encouraging participants to communicate with other users by adding personal messages (11). The most important facilitation task on the platform of "Gemeinsam für die Seltenen" is motivating participants to submit problems patients with a rare disease suffer as well as solutions for these problems (12) and to classify these problems and solutions to one or more of the seven different categories: housing, eating & drinking, mobility & travel, education, career, leisure & sport or other (18).Though, the human facilitators are not only motivating participants to hand in problems and solutions, but especially to discuss these various problems and solutions with each other by means of comments (13). In addition, automated facilitation is using personal and patient data and creates semantic user profiles to suggest participants fitting solutions or problems, that they should visit or even link with other contributions. As interactions in the category of *'writing'* create content from which participants benefit most, these interactions are also the ones, which are facilitated most on the platform.

For the category of *'visualizing'* we identified one type of interaction, which needs to be supported. The four designated human facilitators on the platform are continuously activating participants to hand in visualizations; therefore striving to increase the quantity of submitted photos as well as video and audio files (19). Moreover, the human facilitators are pursuing to ensure or even enhance the quality of uploaded graphical material by pointing submitters towards weaknesses. As automated facilitation on the base of file data is still in its infancy, since the collection of meaningful meta-information from graphics or video files still needs manual involvement by e.g. tagging of users or objects in pictures, it is not yet implemented on the platform. However this tagging can again enhance recommendations given on the platform, but would essentially fall into the text-based category of *'writing'*.

## 5 Discussion & Outlook

This work intended, *first*, to investigate interactions between participants in a web-based community and, *second*, to find a new approach for facilitating such a community. By reviewing existent literature on interaction [RA07] and facilitation in communities [TD05, Wo03], we deduced a new approach for the facilitation of a community. The action research method, further, was suitable to gain a deeper understanding of possible types of interactions in a community for innovation and to demonstrate how interaction-based facilitation in a socio-technical system can look like. Hence, our research on facilitation in web-based communities differs from previous research that e.g. suggests to arrange facilitation around the stages of the development of a community [TD05], as it provides a new orientation for facilitation focusing on interactions. Based on our theoretical pre-understanding of interaction and facilitation as well as on the insights from our action research approach, we subsume our findings by proposing a tentative framework for interaction-based facilitation (table 2). It shows how automated and human facilitation can be arranged around the four interaction interfaces for visiting, voting, writing and visualizing as integral parts of every web-based community. From our findings, we see a set of managerial implications, which especially require attention of community managers. We recommend making use of our systematization of possible


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interactions (cf. table 1) and taking it as example for thoroughly arranging interactions on web-based platforms.

| Category | Automated facilitation | Human facilitation |
|---|---|---|
| ***Visiting*** | ▪ Suggest interesting contributions to visit.<br>▪ Suggest people to interact with based on their browsing behavior. | ▪ Motivate users to browse the platform and to view and to link contributions based on their interests. |
| ***Voting*** | ▪ Suggest contributions and people to interact with based on users' explicitly stated votes and preferences.<br>▪ Advise users of equivocal evaluations based on their voting behavior. | ▪ Motivate users to evaluate contributions.<br>▪ Suggest contributions to evaluate based on their knowledge and experiences. |
| ***Writing*** | ▪ Create semantic profiles from user input and make recommendations about similar user or matching contributions.<br>▪ Classify contributions or files to make them filterable according to a free tagging scheme or a pre-defined taxonomy. | ▪ Motivate users to submit contributions.<br>▪ Motivate users to give feedback to other users and suggest contributions to review based on their knowledge and experiences.<br>▪ Motivate users to use feedback of other users to revise contributions.<br>▪ Advise users of their strengths and weaknesses. |
| ***Visualizing*** | --- | ▪ Encourage users to visualize their submitted contributions.<br>▪ Advise users of their strengths and weaknesses. |

Table 2: Framework for interaction-based automated and human facilitation

Such an overview of interactions might also allow for verifying data that should be tracked on the platform to be used as key facilitation indicators. Further, to ensure sustainable success of a web-based community, we suggest to continuously adapting human-computer interaction interfaces as well as automated and human facilitation tasks according to the needs of the community. As our proposed framework clearly separates interactions, it presents an ideal basis to share facilitation tasks among multiple human facilitators. Concerning future research, the next step should be to generalize our proposed interaction-based facilitation approach by transferring it into other communities. Additionally we shall extend the framework to also incorporate elements of attraction next to interaction-based facilitation. These go beyond the socio-technical system design, but are nonetheless vital to generating a critical mass of interacting participants. Further, we would like to evaluate the framework by analyzing the impact of facilitation on interaction as well as by measuring participants' satisfaction with this interaction-based form of facilitation.

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