

“I DON'T HAVE ANY PROBLEM WITH IT BEING MARKED PUBLIC... :-)” MAKING SENSE OF CHALLENGES TO OPENNESS IN MULTIPARTY IS DESIGN

Research paper

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Abstract

Discourses on openness permeate Information Systems (IS) literature. Open source, innovation, design, and data, among others, have aroused IS scholars interest during recent years. However, in IS research less attention has been paid to practical realities and challenges associated with openness. IS design, furthermore, has become highly distributed and involving multiple participants and perspectives that each may have a different standpoint to openness, the consequences of which so far have not been examined in the literature. This study, by relying on nexus analysis as a sensitizing device, address these limitations and examines multiparty IS design as social action, for the understanding of which nexus analytic concepts of discourses in place, historical body and interaction order are essential. The analysis identifies a variety of views and challenges involved with openness in multiparty IS design. Despite openness being postulated as a driving force of the design process, it was realized in a limited sense. The participants' historical bodies, especially in the sense of their disciplinary background, and the interaction orders they had mutually established delimited openness in this design project. Variety and challenges involved with openness in multiparty design are discussed and implications for IS research and practice are considered.

Keywords: Openness, multiparty, nexus analysis, design, discourse, historical body, interaction order.

1 Introduction

Discourses on openness permeate Information Systems (IS) research. Open source, open innovation, open design, open access, open standards and open data, among others, have aroused IS scholars interest during recent years. Openness has inspired IS research in a multitude of contexts, while particularly relevant for this study is the existing research in the design and development context, addressing open innovation (Chesbrough 2003, West & Gallagher 2006, von Hippel 2001), open design (Avital 2011, Tooze et al. 2014) and open source software development (e.g. Bergquist & Ljungberg 2001, Fitzgerald 2006, Niederman et al 2006, von Hippel & von Krogh 2003). The value and benefits of openness have dominated the IS discourse on the topic, even if the dark side of openness and the challenges associated with it have also deserved some attention (see. e.g. Dahlander & Magnusson 2005, Deng 2016, Iivari 2009, Iivari 2010, Irani & Silberman 2013, Lukyanenko et al. 2016, Rajanen et al. 2011, West & Gallagher 2006, Ågerfalk & Fitzgerald 2008). Along these lines, this study critically scrutinizes openness in IS design context, with a specific focus on how openness is enacted and negotiated in practice in multiparty IS design. Hence, the focus is on how designers interpret, enact and enable openness in IS design – the designers representing multiple disciplines and organizations.

In IS research, increasing interest in such multiparty design process has emerged; multiparty IS design involving stakeholders that represent different organizations, professions, areas of expertise, disciplines, or nationalities. Already for decades in IS research, it has been acknowledged that IS design involves different types expertise: that of designers, who have expertise in how to “put together computer systems” (Greenbaum & Kyng 1991: 20) and that of users, who possess domain knowledge and are experts in their work. Collaboration between and among these experts has been discussed extensively in the IS literature (see e.g. Markus and Mao 2004), while it has particularly been advocated within the participatory design tradition (Greenbaum and Kyng 1991, Kensing and Blomberg 1998). However, during recent years it has also become acknowledged that, in addition to collaboration between users and designers, design involves collaboration among numerous other stakeholders representing e.g. multiple organizations, professions, areas of expertise, disciplines, and nationalities (Boujut and Blanco 2003, Cummings & Kiesler 2003, Hanisch & Corbitt 2007, Newell & Galliers 2000, Kotlarsky & Oshri 2005, Lang 2003, Lawrence 2006, Lee 2007, Levina 2006, Levina & Vaast 2005, Sarker & Sahay 2004, Schutz et al. 2009, Weedman 2008). Research has already revealed that in multiparty design teams, communicating, collaborating, and arriving at shared understandings may be very challenging (Boujut and Blanco 2003, Cummings & Kiesler 2003, Lawrence 2006, Lee 2007, Levina 2006, Newell & Galliers 2000, Weedman 2008). Albeit the extant research provides interesting insights on the tensions and complexities involved in multiparty IS design, it lacks an explicit perspective on openness. The very positive toned IS discourses on openness, then again, lack grounding in the practical realities of IS design, including multiparty IS design. We can hypothesize that within a multiparty design team, the team does not necessarily have a shared understanding on openness, either.

Hence, this study critically scrutinizes openness in multiparty design context: meanings attached to it, factors shaping it, and challenges associated with it. The study reports results from a nexus analytic empirical inquiry on a design project in which openness was argued as being one of the critical principles driving the design process, but where openness was still realized in a limited sense. Nexus analytic concepts of interaction order, historical body and discourses in place (Scollon & Scollon 2004) were utilized to make sense of the case. This analysis revealed many factors shaping and tensions associated with openness in multiparty design. This study explicates a number of issues or forces looming in the background, still reducing or hindering openness. This study wishes to arouse a critical debate on the theme of openness in IS research and to chart new directions for openness inspired IS researchers.

The paper is structured as follows. Next section outlines the theoretical background of this study, including reviews on openness in IS design and nexus analysis as a research framework. The third section presents the research setting and methods used in the empirical inquiry. The fourth section outlines the findings of the empirical study, the fifth section discusses them through nexus analytic lens and the last sections address the implications for IS research and practice.

2 Theoretical background

2.1 Openness in IS design

Open design, development, collaboration and innovation have aroused IS researchers interest, among other scholars. However, the concept of openness is vague with a variety of meanings attached to it. If examined from the viewpoint of design context, some of these views are more important than others. Then again, this paper also attempts to explicate the variety associated with openness in IS design.

Open source software movement has been very influential in arguing for openness in our discipline – open source development model has been studied in open source communities as well as in company context (e.g. Bergquist & Ljungberg 2001, Fitzgerald 2006, Niederman et al 2006). In open source movement, openness relates to the outcome of the work: to the source code that should be open for all. The license adopted needs to comply with certain criteria with the point of trying to allow people to access the source code and through this to join in the development without discriminating against anyone (<https://opensource.org/osd>). Hence, the emphasis is on the design outcome and its openness to anyone interested in making use of it. Even if the development process is also characterized in the literature, it referring to the community development model where individuals develop software due to their personal needs, but also voluntarily reveal it to be used and further developed by others (e.g. Bergquist & Ljungberg 2001, Sack et al. 2006, von Hippel & von Krogh 2003), the development model is not binding but the associated license settles whether one can talk about open source or not.

Open innovation research, then again, is looking at openness from the perspective of a firm and emphasizes the process aspect, not only the outcome. Within this literature base, it is acknowledged that innovations emerge outside the company boundaries - talented people exist also outside the firms and might provide valuable ideas and insights (Chesbrough 2003, von Hippel 2001). Open innovation hence is about “systematically encouraging and exploring a wide range of internal and external sources for innovation opportunities, consciously integrating that exploration with firm capabilities and resources, and broadly exploiting those opportunities through multiple channels” (West & Gallagher 2006: 28). Recent research on crowdsourcing addresses a related theme: taking a challenge faced by a firm and instead of asking internal R&D to solve it, distributing an open call to external individuals with relevant expertise to solve it, relying on an assumption that the crowd has something valuable to contribute and hence mobilizing the competence and expertise of the crowd (Majchrzak & Malhotra 2013, Zhao & Zhu 2014, originally Howe 2006). Overall, in this literature base, process view is emphasized: it is not the openness of the outcome for external parties to access and make use of, but openness of the process for them – mobilizing resources to collaboratively contribute. Open collaboration research, along these lines, broadens the focus from the perspective of the firm to the various constellations of people creating things together (Forte & Lampe 2013). Open design may refer to the same phenomenon, where the process is open for anyone to join in and contribute (Tooze et al. 2014). However, open design may also be interpreted to concern the outcome: creating such design that is open to all to make further use of and to modify (Avital 2011, Tooze et al. 2014). Different types of openness have also been identified in the open innovation literature, characterized by the direction of influence and resources: inbound (outside-in) and outbound (inside-out), the former referring to acquiring or sourcing in resources external to the firm, while the latter referring to selling or licensing out ideas for their further development. Openness can also denote a coupled perspective including co-creation with complementary partners. (Dahlander & Gann 2010, Enkel et al. 2009)

As for the dynamics involved, literature on open government further informs us of the variety that can be associated with openness. It is argued that openness should involve both bottom-up empowerment and top-down transparency (Götz & Marklund 2014). Transparency denotes “openness to public scrutiny”, but also access to information and understanding of the process are seen as important here; hence, transparency is seen to concern both data (what), process (how) and the decision/policy (why) – transparency should allow the citizen to know what is being decided, when, where, why, by whom and how the process goes (Bannister & Connolly 2011). Bottom-up empowerment, then again, argues for more power of decision for citizens (to generate ideas, to make decisions, to provide feedback on

them), while variety can also be identified related to it. Empowerment can denote acquiring or assigning access or control over resources, acquiring or assigning access to the arena of decision-making, or creation of a will to resist (Abu-Shanah 2015, Hardy & Leiba-O'Sullivan 1998). A mainstream management view on empowerment may postulate empowerment as a tool for motivating people to strive for management goals by giving them some power of decision (Hardy & Leiba-O'Sullivan 1998, Howcroft & Wilson 2003, Conger & Kanungo 1988, O'Connor 1995), while critical tradition emphasizes that empowerment can never happen through those having power giving some to others, but on the contrary, empowerment involves the oppressed combating the oppressors and achieving power to affect decision outcomes this way (Hardy & Leiba-O'Sullivan 1998, Howcroft & Wilson 2003, O'Connor 1995). Critical, Foucauldian notion of power, moreover, warns us that "empowerment in the sense of freedom from power effects is not possible, although local struggles may produce more positive experiences" (Hardy & Leiba-O'Sullivan 1998: 462).

Overall, the existing literature directs us to study openness in multiparty IS design as regards both the outcomes and the process. The literature also advises us that the direction of contribution (in-bound, outbound) needs to be acknowledged. Moreover, both bottom up empowerment and top down transparency as characterizing the process and the outcome should be acknowledged.

2.2 Nexus analysis

Nexus analysis has derived inspiration from a variety of fields, such as linguistics, conversation analysis, ethnography of communication, discourse analysis, practice theories, activity theory, social semiotics and new literacy studies (Scollon & de Saint-Georges 2012). Due to the origins, linguistics and discourse analysis play a prominent role in this research strategy, while nexus analysis specifically emphasizes that the interest is both in discursive and non-discursive practices through which our social reality is constituted (Scollon & de Saint-Georges 2012). Nexus analysis wishes to guide attention to social action as the unit of analysis (Scollon & Scollon 2004) that is seen to be constituted by three facets: historical bodies of the participants, interaction order among them and discourses in place circulating around (Scollon & de Saint-Georges 2012).

The concept of historical body was originally introduced by philosopher Nishida and it emphasizes that people behave differently depending on their personal experiences and accumulated life histories, i.e. their historical body (Scollon & Scollon 2004). Bourdieu (1984) is argued to refer to the same phenomenon with his concept of habitus, which, according to Bourdieu, consists of various kinds of capital: economical, cultural, social. Such capital can be acquired and accumulated during the life span, e.g. through education, but some can also be inherited by birth. In nexus analysis the concept of historical body is preferred as it explicitly includes the bodily aspects that the concept of habitus neglects (Scollon & Scollon 2004, Scollon & de Saint-Georges 2012).

The concept of interaction order is derived from Goffman (1983) who was interested in people's face-to-face interactions that were to be viewed as social institutions that need careful analysis. In nexus analysis, interaction order directs our attention to the social arrangements by which we form relationships in social interactions (Scollon & Scollon 2004). The concept acknowledges that we behave differently depending on with whom we are (Scollon & Scollon 2004); hence, the variety of participants and how they shape the interaction needs to be recognised in any social action. The interactional, socially situational aspects, related to which participants engrossment, involvement and attention are critical, are to be acknowledged as well as broader concerns on how social order is maintained, taking into considerations various conventions, norms and rules of the game (Scollon & Scollon 2004).

Finally, the concept of discourses in places emphasizes that all social action takes place in real time and place by human actors in a situation in which always a variety of discourses circulate (Scollon & Scollon 2004). In nexus analysis discourse refers both to face-to-face encounters that are to be examined in detail and to broader sets of concerns that are circulating around in our society. Nexus analysis thus involves discourse analysis both as micro-level analysis of specific moments of interaction in real time and place and as broader socio-political-cultural analysis of issues, concerns and power interests in society (Scollon & Scollon 2004). Overall, nexus analysis sees as one of its central tasks to examine

how “the broad discourses of our social life are engaged (or not) in the moment-by-moment social actions of social actors in real time activity” (Scollon, 2001: 139). Equipped with these conceptual tools, this paper will make sense of openness in multiparty IS design.

3 Research Setting and Approach

Nexus analysis not only provides the theoretical frames to study a topic, but it also offers a research strategy to be utilized by researchers. Nexus analysis involved three cycles: engaging, navigating and changing. Engaging refers to the researcher engaging in the social action in question and getting to know the research participants or communities, and vice versa – positioning the researcher in the social world and figuring out the social issue to be examined within. The navigation cycle entails various kinds of data collection and analysis to find answers to the research questions identified by the researcher. This also involves observing and making sense of the social action in focus through different methods and data. Changing happens almost inevitably when the researcher enters the scene and engages in research in practice, while it can be also more intentionally be aimed at in collaboration with the research participants to address a social issues of concern for them (Scollon & Scollon 2004).

The research reported here stems from the author’s engagement in a multinational and multidisciplinary design project of a learning application. The project partners come several countries and organizations ranging from research institutions to information technology (IT) companies. The research institutions have expertise in IT or educational sciences. Some of the IT researchers have expertise specifically in human–computer interaction (HCI). The author of the paper represents one of the HCI specialists in the project. She was involved already when applying funding for the project, while in the actual execution of the work, she acted as a manager and supervisor of more junior researchers working on the project. In her position, she was heavily engaged in the social action and community being studied (cf. Scollon & Scollon 2004). Due to her position, she was also involved in changing the social action in question in the sense of developing the collaborative work practices of the project (cf. Scollon & Scollon 2004). Overall, she acted as an “involved researcher”, instead of an “outside observer” (Walsham 1995), i.e. she had a direct personal stake in the outcomes and interpretations and was able to get a direct sense of the field from the inside (Walsham 1995). As regards the topic of openness in multiparty IS design, she had a voice in the design discourse, but in her managerial and supervisor positions, she remained relatively silent from the viewpoint of this account.

The navigation cycle in this case entails making sense of the variety associated with openness in this multiparty design process. Interpretive research tradition sees research to consist of “a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings and memos to the self” (Denzin and Lincoln 2000: 3). The representations that “transform the world” in this study consist of all the documents produced in the project during over one and half years’ timeframe. As the project was a distributed, multinational and multi-organization endeavour, this documentation quite comprehensively captures the trajectory of the design process. The documentation was created independently of this research interest for the purposes of the project, but they were collected to form the research material to be examined in this study. Table 1 presents the data collection and analysis steps taken on the data.

Analysis step	Description
Data collection	Collecting together the documentation created in the project (number of files around 2 000), including data from a shared data repository and email correspondence
Data selection	Restricting the data to such that address design (number of files around 500), the data including project plans, project deliverables (on requirements and design), memos and informal documents (e.g. sketches, drawings) and email correspondence among the project partners addressing requirements or design.
Chronological	Creating a chronological account of the happenings of the design process: whose voices were

account	present, what was said and who were heard within the design process.
Actor focused account	Identifying divergent groups of designers, creating an account of the happenings of the design process according to each designer group
Member checking	Delivering a case study write-up for the project participants for comments, correcting based on the feedback, removing a couple of direct citations, as requested.
Openness focused account	Sensitizing the analysis to the variety of views on openness, identifying how the participants interpreted and enacted openness in practice, whether it concerned the design process or the outcome, its direction, and whether empowerment and/or transparency characterized it
Nexus analytic account	Sensitizing the analysis with nexus analytic concepts of historical body, interaction order and discourses in place to what kind of historical body and interaction order related issues and discourses were shaping the social action in question and openness within.

Table 1. Data collection and analysis procedure.

4 Openness in Multiparty Design

4.1 Educational science specialists as authoritative designers

Design was started soon after the project was initiated, and it was carried out during the entire year. The educational science specialists were in a very influential position in the design process: they had ideated the whole project and they authoritatively outlined the (educational) requirements for the application: what users were to be able to do with the application with associated educational goals. They first introduced the educational requirements and designs of an earlier version of the application that they had developed, and then they presented their new educational requirements and ideas, e.g.: *“Attached is a UI design as a PowerPoint show, made by [an educational science specialist]. In addition, a PowerPoint show that was presented in [project] negotiations. There are the things pretty much crystallized. You have already seen the processing chart, but it is here again. Maybe these will help to clarify the picture of the requirements set for the program”* (Educational science specialist emails) In addition to imposing requirements, the educational science specialists invited other experts to comment on them: *“Hi all! We just made some new sketches with [an educational science specialist] for [a part of the application] (...). You can find also all the files from [a data repository]. These files are also attached to this email.”* (Educational science specialist emails)

More formal work with requirements and design ended up with the creation of educational requirements and design documents. In their design document, the educational science specialists described how user is expected to use the application and how it should behave, including a description of the main screens of the application, possible user actions in each screen, and system responses. They also outlined the requirements goals for the application, with associated theoretical backgrounds, e.g.: *“Scaffolding aims to increase the difference between what a learner can do independently and what the same learner can do when tutored (Vygotsky, 1978). (...) Thus, the following characteristics are required from the tutor: ...”* (Educational science specialist documentation).

Intense collaboration among the parties was expected to take place during the production of Software Requirements and subsequent design documents, to which almost all parties were expected to contribute, but related to which a research institution of educational science specialists was the leader. An educational science specialist asked for help from other parties, but did not gain that. They then specified the requirements following some documents produced by some HCI specialists and their own requirements documents. After finalizing the Software Requirements, however, an HCI specialist pointed out that the result was not satisfactory: there was too much design, many unclear issues, and some controversies: *“Although well written and certainly worthwhile, the document that has the title Software Requirements is not entirely what I would envisage a software requirements document to be. (...) As the document progresses, especially as it becomes the tables, the document starts to confuse design solutions with software requirements – many of the requirements are in fact design solutions.*

(...) We seem to have a rather bizarre situation where we are specifying requirements and finalizing design decisions in tandem” (HCI specialists’ emails).

The educational science specialists replied that that this was not their area of expertise; they had to do it, but they would have needed help. They also mentioned that they actually had adopted the format from a requirements document produced by some HCI specialists containing similar kinds of problems. All agreed that the educational science specialists should not have been responsible for producing the software requirements. The HCI specialists promised to go through the document and to improve it, which was appreciated by all project partners: *“The project plan was mostly constructed by non-software focused people, who created the entire research idea. We [the educational science specialists] only had some tiny little background experience on developing the (...) application. We were not familiar enough what a project like this could bring in front of our eyes. (...) [The HCI specialists] are working on [the software requirements document] and trying to find a consensus with [the educational science specialists] in the software requirements” (Educational science specialist emails).*

This phase also initiated discussions on the appropriateness of the division of work, scheduling and the selected development model: *“... the deliverables were originally meant to be written by non-software professionals/researchers. We (SW persons) have participated in many video conferences and physical meetings where the requirements were discussed. However, it was not exactly clear to us what non-software people really wanted software to do, nor did we have enough time to decipher that. We tried to tell them what is possible and feasible, and what is not, but after all it was planned that non-software people are writing down their thoughts finally. (...) The project is following waterfall model where only one cycle from requirements analysis to design, to implementation, and finally to testing and experimenting is done. (...) our process is far from ideal (...) We have tried to overcome this limitation by using different process and schedule internally (...) For example, we have already built prototypes” (IT specialist emails)*

4.2 HCI specialists bringing in users

The HCI specialists started the project work by commenting on the requirements and designs created by the educational science specialists. They entered the scene more visibly when initiating their empirical work with users. The HCI specialists started planning their user studies and asked for needs from other partners. Their empirical work involved user testing of the earlier version of the application, user interviews and observation, paper prototyping with users, and design sessions with users. The educational science specialists asked for user comments on their specific ideas, which were gathered. In addition, feedback related to the earlier version of the application and to early designs were delivered as well as users’ ideas and designs for the forthcoming application. The results of the inquiries were discussed over the analysed time period and also used as arguments for certain design decisions later on.

A usability requirements document was produced among the HCI specialists, and sent to the other partners for comments. It contained the results of the design and evaluation studies carried out. Feedback to the earlier version and to new designs, as well as the users’ ideas, designs, and preferences were reported: *“[Users] found it enjoyable to use the touch-screen” “When prototyping [users] didn’t quite understand the idea of [a function].” “None [of the users] recognized [an icon] that is usually used to indicate a function, and very few associated a picture with (a function). Therefore, if the use of text is to be avoided, the icon used to represent the function needs to be clearly recognizable to the [users], and more work would need to be done to find a suitable symbol.” (HCI specialist documentation)* In addition, the HCI specialists brought up users as a significant and eager participant group in the project: *“Thanks to the team for today’s getting to know each other session. It was a nice session and [users] got excited about this!” “Thanks to the whole group for today’s workshop! We have a well functioning group! The workshop succeeded very well and [users] enjoyed (in addition to us). The [prototypes] were left there, cheering up also others” (HCI specialist emails).* The HCI specialists reminded also other design participants of users as noteworthy “team workers”: *“I just remind you of the [users] we have “as team-workers” in the background. Some questions, we are discussing, sound to be just [not from their] world” (HCI specialist emails).*

As for the collaboration inside the design team, during the requirements specification phase, a HCI specialist already criticized that the educational science specialists were producing too “designy” stuff: “[Requirements work package] produces information on what will be implemented, but you do not need to design the user interface in it. So, there just needs to be the information, in one form or another, on what needs to be available in [the application], we will produce the user interface design” (HCI specialist emails) The same discussion emerged when the parties collaboratively produced the Software Requirements deliverable, of which the educational science specialists produced the major part. The deliverable was criticized by an HCI specialist as containing too much design, instead of plain requirements. The educational science specialists were also later blamed for designing things that were to be or already had been designed by the HCI specialists. The educational science specialists were first expected to produce their requirements and then their design, but it was left unclear how the design responsibility was actually divided between them and the HCI specialists, who were expected to design “usability on top” (HCI specialist emails). The HCI specialists had taken the educational science specialists’ early designs as a basis and evaluated and refined them together with users, based on which they had created their usability design. The educational science specialists, however, had continued their design work; hence, those that the HCI specialists had evaluated were not the most current ones anymore. The educational science specialists had also neglected the results of the HCI specialists’ work. While producing their design documents, neither party examined the other party’s doings to prevent conflicts and overlapping work. Instead, both parties, when delivering their documents, mentioned that there might be some overlap between their and the other party’s documents that they asked others to check. Moreover, the design deliverables were scheduled to be delivered at the same time and the partners started to send them to others for comments too late to prevent overlapping design.

The conflicting designs were extensively discussed, negotiated, and even challenged in the project: “We are wondering here together with [a HCI specialist] why the user interfaces for (...) have been made again, and our findings from the project during last spring have been neglected? The project gathered feedback and generated new ideas based on the scenarios produced [by the educational science specialists]. Now it seems that our feedback has been neglected but the work seems to continue from the own scenarios. (...) I would say (...) that we should prefer designs that already have been evaluated with [users] (I mean to utilize the ideas presented, not necessarily to use the hand drawn graphics)” (HCI specialist emails) The HCI specialists relied on their empirical user data to convince the other project participants, while the educational science specialists relied on the defined project goals and on their authority to set the educational aspects of the application, highlighted as very important in the project to begin with. After intense discussions some changes were made by the educational science specialists to their designs, based on the HCI specialists’ feedback. In the end, however, the project ended up having two conflicting designs for the application after the first year of work.

4.3 IT specialists arguing for openness

The IT specialists started to contribute early by presenting technological possibilities and ideas to other partners. They got acquainted with the features and problems of the earlier version of the application, and identified new technological possibilities that could be utilized as well as restrictions prohibiting certain ideas proposed by the educational science specialists: “Looks very nice. However, as far as I understand, those are technically separate devices of which each is just [doing something]. It is slightly different idea than in [the application] that should [do something]. (Or should it?)”. Moreover, they interpreted and translated the results of the educational science specialists’ and HCI specialists’ work into more technical vocabulary. The HCI specialists’ documents were considered very helpful basis for use cases: “In the meeting the contributions of [Architecture WP] partners was discussed: (...) UI group requirements will be sent later (remark: [a HCI specialist] sent within [Software requirements] writing process), extremely helpful for getting use cases” (IT specialist documentation).

The IT specialists emphasized the importance of open development model from the very beginning of the project. In the project plan, it was stated numerous times that the development will “be organized according to open source software principles” and this included that “the procedures and rights for

further open source software development based on the results are negotiated and set” (Project plan); hence the solution was to be released as open source with a suitable license. Early on, the IT specialists started producing functional prototypes of some parts of the future application, along with associated videos illustrating the implemented functionality or features: “Hi all. I just uploaded three new videos of [the application]. I would like to hear any comments [a link]” (IT specialist emails). The implemented parts quite straightforwardly followed the design documentation produced by the HCI specialists. The IT specialists put all source code and prototypes available to an open source development environment for other partners (and everyone else) to view: “The repository for [the application] can be browsed in [a link].” (IT specialist emails) They also started advertising their work and progress through putting videos available in public for other partners (and everyone else) to view and comment: “Hi all. I just uploaded three new videos of [the application]. I would like to hear any comments. [A link]” (IT specialist emails) IT specialists not only wished to gain feedback but also to adhere to the principles of open source software development. They also wished the design documentation was open to all: “I really encourage all participants to make their results public if there is no specific reason to keep those secret. We ought to be constructing an open source software, but it is really hard to do so if background material is not available for potential developers.” (IT specialist emails) The other participants generally agreed with this “I don't have any problem with it being marked public... :-)” (HCI specialist emails), but they never published their design documentation. Moreover, no external parties contributed to the development during the timespan.

5 Nexus analytic interpretation of openness in multiparty IS design

This section discusses findings on openness in an allegedly open multiparty IS design process that was approached with nexus analysis as social action within which historical bodies of the participants, their interaction orders and a variety of discourses circulating around were all influential. Table 2 summarizes the main findings on how all this shaped openness within multiparty IS design.

	Educational science specialists	HCI specialists	IT specialists
Multiparty IS design as social action	Carry out design; comment on HCI specialists' design; negotiate with HCI specialists	Comment on educational science specialists' design; negotiate with educational science specialists; carry out design; represent users in design	Comment on educational science specialists' and HCI specialists' designs; implement the HCI specialists design
Discourses relied on	Argue for theory based educational design	Argue for user-centered design	Argue for open source development
Historical body	Educational sciences: educational design based on theoretical insights	Human Computer Interaction: user data and user participation essential; Software engineering: methods and models	Open source software development: user and developer participation essential; Software engineering: methods and models
Interaction order	Division of work and schedule problematic; Authority struggle with HCI specialists	Division of work and schedule problematic; Authority struggle with educational science specialists	Division of work, development model and schedule problematic; Prioritize HCI specialists' design
Openness	Limited - open only within the design team: design process open for HCI specialists & IT specialists to comment, for HCI	Partial - open outside-in, focus on empowerment of users: design process open for educational science specialists, IT specialists and users	Maximized - open inside-out and outside-in, emphasis both on empowerment of users and transparency of the process and outcome: design process and outcome open for educational science specialists, HCI specialists and users to contrib-

	specialists to make some design decisions	to contribute	ute
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Table 2. Openness in multiparty IS design

When characterizing this **multiparty design process as social action** (cf. Scollon & Scollon 2004), important is first to acknowledge that three distinct groups of designers emerged: educational science specialists, HCI specialists and IT specialists. Users were not allowed to act as designers in the process; they remained merely represented by the HCI specialists (cf. Cooper & Bowers 1995, Iivari 2006). The educational science specialists were very influential; they initially created the design inspired by educational science theories. They also welcomed the HCI specialists and IT specialists to comment on their design and were willing to refine it based on that. The HCI specialists worked with users and mediated user feedback and ideas to the design process; hence, representing users in the design process. Additionally, based on their understanding of the user, they created their usability design. Eventually, they and the educational science specialists ended up with conflicting designs that they needed to negotiate. The IT specialists implemented their prototypes directly following the HCI specialists design that was thanked as a useful from the perspective of the IT specialists. In addition to implementing the prototypes, the IT specialists actively commented on the educational science and HCI specialists' designs. Some findings on openness can be pinpointed already here: the design process was relatively open within the design team – for the IT specialists, educational science specialists and HCI specialists – even if the HCI specialists and IT specialists were first settled into a commentator role, from which they progressed into more influential decision-maker positions later during the design process. Users, however, were positioned merely into informant and evaluator roles without any power of decision in the design process. Then again, they were allowed to provide feedback and ideas for the design process; hence, the design process was open in the outside-in sense.

The concept of **historical body** (cf. Scollon & Scollon 2004) enables to consider the influence of participants' backgrounds, histories and experiences as shaping the social action in question. In this case it made visible particularly the influence of different disciplinary systems at play. In this multiparty design process, HCI and educational science emerged as highly influential disciplines, while also software engineering had some legitimacy: the IT specialists and the HCI specialists indicated in many ways during the process that they knew how the design process ought to proceed and what should be included in the different documents delivered during the project; i.e., they indicated that they possessed software engineering expertise, which the educationalists were seen as lacking. The disciplinary knowledge and background shared by the HCI and IT specialists seemed to contribute to the IT specialists preferring the HCI specialists' design in their work. Moreover, the HCI specialists brought to the process their HCI expertise in user studies and user participation. Hence, their disciplinary background introduced openness into this design process in quite a significant sense. The educational science specialists, then again, relied in their design work on their educational science theories and ideas. Both the educational science specialists and the HCI specialists positioned themselves as the ones who know what is “good for the user/learner” and claimed authority in the design process to settle this, while the HCI specialists' and IT specialists' shared disciplinary background and knowledge seemed to open the path from design to implementation particularly for the HCI specialists' design.

The concept of **interaction order** (cf. Scollon & Scollon 2004) highlights that participants' interactions and relationships shape the social action in question. Various interaction orders were established as well as emerged in this multiparty IS design process that also shaped openness within. There emerged conflicts between the different designer groups in the project and overlapping design work was done and negotiated. The problems were blamed of being caused by the problematic division of work, development model, and scheduling of different design documents; the participants implying that without them the contribution of each party would have been included even more fully and in a more meaningful way. Some of the decisions made can again be argued of being dictated by the disciplinary systems at play, but most of these decisions were actually made by the participants themselves during the project planning phase. The educational science specialists, lacking knowledge of software engineering, were made responsible for specifying software requirements, divergent design documents were scheduled to be delivered at the same time without a clear plan for their integration and the wa-

terfall type of development model was selected despite other alternatives. The interaction order in question was collaboratively created. Particularly it created struggles for the educational science specialists' meaningful participation in the design process, albeit it caused extra work for all participants.

When looking at the **discourses** circulating around (cf. Scollon & Scollon 2004), a significant concern of the IT specialists to follow the principles of open source software development characterized the entire design process. They argued for openness to the external world: for releasing the source code as open source but also all the design documentation. The project participants did not object this, but they did not release their design documentation to the world either. No external contributions emerged either, even if the source code was publicly available. The HCI specialists argued for openness of another sort, as they strongly advocated user participation in the design process. However, they did not enable users to act as design participants but merely to offer various kinds of input to the design process.

We can conclude that the design project was open in some senses: it was relatively **open within** the design team as well as **open inside-out and outside-in** (cf. Dahlander & Gann 2010, Enkel et al. 2009), to an extent. A multidisciplinary group of designers collaboratively designed the application, relying and building on each other's expertise. This was the only form of openness emphasized by the educational science specialists. Then again, also challenges as regards openness emerged even within the design team. The educational science specialists can be argued of being sidelined due to their divergent historical body compared to that of the IT specialists and HCI specialists. The collaboration between them and the HCI specialists also suffered from lack of transparency as regards the design outcomes that hindered combining their contributions. On the other hand, the design process was **open inside-out and outside-in** (cf. Dahlander & Gann 2010, Enkel et al. 2009), to an extent: the IT specialists released their source code in an open source repository and tried to encourage external people to contribute and the HCI specialists actively gathered user input to inform the internal design process, while did not invite users as decision makers into the design process.

As regards **empowerment** (Götz & Marklund 2014, Hardy & Leiba-O'Sullivan 1998, Conger & Kanungo 1988), one must conclude that users were not empowered much in this design process. They were not given any authority in the design process; they were merely invited to offer input. The concept of empowerment allows also to scrutinize the internal workings of the design team, too, in which case noteworthy is the struggle for design authority among educational science specialists and HCI specialists. The former had authority to begin with while the latter gained such through their user studies and collaboration with IT specialists. Some historical body and interaction order related issues can be connected with these findings. IT specialists' and HCI specialists' historical bodies in the sense of open source software development and HCI expertise contributed to the emphasis on the empowerment of users to freely use and develop the solution as well as to provide feedback on the solution. However, nobody considered user empowerment in the sense of increased power or control in the design process. Educational sciences, furthermore, do not seem to highlight openness the design process at all, albeit they were not hostile towards that either. Inside the design team, all seemed to share a positive attitude towards open collaboration in general – indicated e.g. by all asking for comments from other parties, whereas interaction order related arrangements hindered openness in practice.

Only the IT specialists were advocating **transparency** of the design process and outcome (cf. Bannister & Connolly 2011, Götz & Marklund 2014) in this multiparty IS design case. They strongly argued for releasing the source code as well as the design documentation as “open to public scrutiny” (Bannister & Connolly 2011). However, the IT specialists' calls for more openness were neglected by other design participants and there were problems as regards transparency even inside the design team, as the HCI specialists and educational science specialists realized too late that they had created overlapping designs for the application. Both historical body and interaction order related issues can be connected with these findings. The IT specialists' historical bodies in the sense of strong commitment to open source software development led them to arguing for and realizing transparency as regards the process and the outcome, while the jointly agreed division of work and scheduling of work as well as the disciplinary background guiding the work hindered transparency within the design team.

The challenges to openness identified were as follows: historical body in the sense of disciplinary systems can be hindering openness in multiparty design work. Even if some disciplines may contribute to openness, others may be resistant towards it or interpret it in very limited sense. Moreover, limited background knowledge may lead to some design participants and their contributions to become neglected or at least not prioritized. Furthermore, interaction order in the sense of mutually created division of work and scheduling may hinder openness. The actual design work may be planned and executed in such a way that not all participants have equal opportunities to contribute or the participants may not have an opportunity to combine their contributions, which may lead to the design process including several competing designs and some becoming selected over others.

5 Concluding Discussion

This study critically scrutinized openness in multiparty IS design. Specific interest was on how openness was interpreted, enacted and negotiated in practice by designers representing multiple disciplines and organizations. Nexus analysis was used as a sensitizing device that guided to view multiparty IS design as social action, within which discourses in place, historical body and interaction order play a role. Despite openness being postulated as a driving force of the entire design project, it was realized in a limited sense. This study succeeded in identifying a lot of variety as regards openness in this multiparty IS design case. However, the main contribution lies in the identification and discussion of the challenges associated with openness. Next the implications for IS research are discussed.

IS research has discussed multiparty design as a political process involving rivalry and numerous agendas, within which arriving at a shared understanding may be difficult (Boujut and Blanco 2003, Cummings & Kiesler 2003, Lawrence 2006, Lee 2007, Levina 2006, Newell & Galliers 2000, Weedman 2008). This study reveals similar kinds of findings, but offers novel insights as regards the challenges of openness in multiparty collaboration. Multidisciplinary collaboration has been discussed also earlier (e.g. Cummings & Kiesler 2003, Newell & Galliers 2000, Lang 2003, Levina 2006, Levina and Vaast 2005, Schutz et al. 2009, Weedman 2008), while this study contributes by scrutinizing the workings and influences of different disciplinary systems in micro-level as shaping openness. One can argue that software engineering or educational science disciplines do not seem particularly to advocate openness in design process. HCI as a discipline, then again, specifically caters for users and their needs – the discipline has been established on these grounds (Cooper & Bowers 1995). Hence, HCI discipline can be argued of advocating openness, but only of a kind: outside-in with user empowerment, but in a limited sense still. This kind of openness aligns well with IS research that has centered on user participation for long (cf. e.g. Markus & Mao 2004). Then again, user empowerment in a stronger sense has also been advocated within certain IS traditions: for example the ETHICS and the Scandinavian trade unionist methods to systems design have argued for a more authoritative position for users in the design process if not even for empowering systems to be developed (e.g. Greenbaum & Kyng 1991, Mumford 1983). However, contemporary IS research does not advocate user participation in this stronger sense, but rather settles with user participation representing the one advocated by the HCI specialists in this case. Yet, critical IS literature could make a valuable contribution here by increasing openness of the design process in the outside-in sense combined with stronger user empowerment – advocating the critical view on user empowerment rather than the mainstream management view (see Hardy & Leiba-O’Sullivan 1998, Howcroft & Wilson 2003, O’Connor 1995).

Another interesting finding concerns the open source software development principles strongly embedded in the case that yet did not realize in practice. Although IS literature has celebrated open source software development as enabling everyone to join in and to collaboratively contribute (cf. Bergquist & Ljungberg 2001, von Hippel & von Krogh 2003, von Hippel 2001), this study shows that design projects may involve designers totally ignorant of open source software principles even if actively advocated within. Also literature on open source software development and open innovation has indicated that development may remain hostile or ignorant towards external contributions and that external parties may not be motivated to contribute (e.g. Rajanen et al. 2011, Rajanen et al. 2015, West & Gallagner 2006, Ågerfalk & Fitzgerald 2008). In this case, no hostility was witnessed towards ex-

ternal contributions but a general neglect of acting truly in an open way, external parties seemingly also having a limited interest to contribute. This study wishes to warn IS researchers and practitioners strongly committed to open design and development processes and outcomes that there are cases in which openness needs to be negotiated with other than like-minded designers. It might also be that openness emerges in discourses circulating around but not in practical action of designers. In such cases, the historical bodies of participants and the interaction orders established or emerged among them might be useful to examine. Especially researchers could consider whether the disciplinary systems at play may help explain the challenges encountered.

This study invites openness oriented IS researchers to consider the variety of openness that can characterize a design process – and to do so particularly from the perspective of the masses instead of that of the skilled developer-user, who has already eagerly joined in open source software development and open innovation (e.g. Bergquist & Ljungberg 2001, Chesbrough 2003, Niederman et al. 2006, von Hippel 2001, von Hippel & von Krogh 2003). Openness may be very difficult to achieve for the masses. For the masses to become empowered, i.e. to gain control, authority and power of decision in a design process (cf. Hardy & Leiba-O’Sullivan 1998, Conger & Kanungo 1988), the transparency of the design process and outcome may not suffice. Here, intermediaries “representing the users” (e.g. Cooper & Bowers 1995, Iivari 2006, Iivari et al. 2009) and catering for user participation in the design process (Markus & Mao 2004) may become significant. In this case the HCI specialists adopted such a role. These intermediaries may try to empower the masses in the sense of equipping them with needed resources and access to the decision making arena (Hardy & Leiba-O’Sullivan 1998) – lack of these issues has already been reported as hindering user participation and contribution in open source software development (Iivari 2009, Rajanen et al. 2011). However, this study has also identified numerous limitations as regards openness enabled by the HCI specialists in this case. One can even criticize that in this case the users remained silenced. They were acknowledged by the HCI specialists during the design and evaluation sessions as providers of valuable insight and feedback, but nobody considered them as a group that should have any access or actual voice in the design decision making. Therefore, their participation was realized in a very limited sense that especially participatory design researchers may see insufficient (e.g. Greenbaum & Kyng 1991, Kensing and Blomberg 1998). In this case one can argue that the discipline of HCI played a significant role in shaping the implementation of user participation. Future work is welcomed to consider how to broaden the approach to user participation and how to deal with the various disciplinary systems at play in (participatory) design process.

This study argues that nexus analysis (Scollon & Scollon 2004) provides a useful lens to study IS design, among other topics. It enables to look behind the current action – at factors shaping it and circulating around. The concept of historical body (Scollon & Scollon 2004) sheds light on how participants’ background directs and shapes their current actions. For example, their education and professional background as well as their ideological or value-based priorities and preferences are significant to scrutinize – also when examining how they approach openness in multiparty IS design. Moreover, not only the concept of historical body offers valuable insights, but also the concept of interaction order (Scollon & Scollon 2004) that emphasizes that it is not only the accumulated knowledge and experiences that are driving our actions, but situated interactions shape those, too. Hence, design participants collaboratively negotiate and settle their mutual design process. This many times is not dictated or predefined by forces external to the individuals involved, but it emerges and evolves *in situ* in social interaction. This perspective allows also interesting future studies on how multiparty IS design teams mutually arrange and negotiate their workings and how those evolve in time.

There are several limitations involved in this study that need to be taken into account. The results are based on only one case; hence, more cases and more varied kind of cases should be included to examine the research topic in depth and breadth. There is also a need to find similar kinds of multiparty design cases to achieve comparable results. On the other hand, this particular case could be examined in more detail regarding the mediational means used at micro-level, including discourses and material artefacts, and the ways those shaped the social action in question and openness achieved (cf. Scollon & Scollon 2004). Lastly, other researchers could attempt to determine appropriate methods and tools for alleviating the challenges of openness identified in multiparty IS design.

References

- Abu-Shanab, E. A. (2015). Reengineering the open government concept: An empirical support for a proposed model. *Government Information Quarterly*, 32(4), 453-463.
- Avital, M. (2011). The generative bedrock of open design. In B. van Abel, R. Klaassen, L. Evers, & P. Troxler (Eds.). *Open design now: why design cannot remain exclusive*. Amsterdam: BIS Publishers, pp. 48-58.
- Bannister, F., & Connolly, R. (2011). The Trouble with Transparency: A Critical Review of Openness in e-Government. *Policy & Internet*, 3(1), 1-30.
- Bergquist, M., & Ljungberg, J. (2001). The power of gifts: organizing social relationships in open source communities. *Information Systems Journal*, 11(4), 305-320.
- Boujut, J. and Blanco, E. (2003). Intermediary Objects as a Means to Foster Co-operation in Engineering Design, *Computer Supported Cooperative Work 2*, 205-219.
- Bourdieu, P. (1984). *Distinction: A social critique of the judgement of taste*. Harvard University Press.
- Chesbrough, H. (2003): The Era of Open Innovation. *MIT Sloan Management Review* 44(3): 35-41.
- Conger, J. A., & Kanungo, R. N. (1988). The empowerment process: Integrating theory and practice. *Academy of management review*, 13(3), 471-482.
- Cooper, C. & Bowers, J. (1995). Representing the users: Notes on the disciplinary rhetoric of human-computer interaction. In P. Thomas (Ed.). *The Social and Interactional Dimensions of Human-Computer Interfaces*. Cambridge, Cambridge University Press, pp. 48-66.
- Cummings, J., & Kiesler, S. (2003). Coordination and success in multidisciplinary scientific collaborations. In *ICIS 2003 Proceedings*, 25.
- Dahlander, L., & Gann, D. M. (2010). How open is innovation? *Research policy*, 39(6), 699-709.
- Dahlander, L., & Magnusson, M. G. (2005). Relationships between open source software companies and communities: Observations from Nordic firms. *Research policy*, 34(4), 481-493.
- Deng, X., Joshi, K. D., & Galliers, R. D. (2016). The duality of empowerment and marginalization in microtask crowdsourcing: Giving voice to the less powerful through value sensitive design. *MIS Quarterly*, 40(2), 279-302.
- Denzin, N. & Lincoln, Y. (2000). Introduction: The Discipline and Practice of Qualitative Research. In N. Denzin and Y. Lincoln (Eds.). *Handbook of Qualitative Research*. Thousand Oaks: Sage, pp. 1-29.
- Enkel, E., Gassmann, O., & Chesbrough, H. (2009). Open R&D and open innovation: exploring the phenomenon. *R&D Management*, 39(4), 311-316.
- Fitzgerald, B. (2006). The Transformation of Open Source Software. *MIS Quarterly*, 30(3), 587-598.
- Forte, A., & Lampe, C. (2013). Defining, understanding, and supporting open collaboration lessons from the literature. *American Behavioral Scientist*, 57(5), 535-547.
- Goffman, E. (1983). The interaction order: American Sociological Association, 1982 presidential address. *American sociological review*, 48(1), 1-17.
- Greenbaum, J. & Kyng, M. (Eds.) (1991). *Design at Work. Cooperative Design of Computer Systems*, New Jersey: Lawrence Erlbaum Associates.
- Götz, N., & Marklund, C. (2014). *The Paradox of Openness: Transparency and Participation in Nordic Cultures of Consensus*. Leiden: Brill.
- Hanisch, J. & Corbitt, B. (2007). Impediments to requirements engineering during global software development. *European Journal of Information Systems*, 16(6): 793-805.
- Hardy, C., & Leiba-O'Sullivan, S. (1998). The power behind empowerment: Implications for research and practice. *Human relations*, 51(4), 451-483.
- Howe, J. (2006). The rise of crowdsourcing. *Wired magazine*, 14(6), 1-4.
- Howcroft, D., & Wilson, M. (2003). Paradoxes of participatory practices: the Janus role of the systems developer. *Information and organization*, 13(1), 1-24.
- Iivari, N. (2006). Understanding the work of an HCI practitioner. In *Proceedings of the 4th Nordic conference on Human-computer interaction*. New York: ACM, pp. 185-194.
- Iivari, N. (2009). "Constructing the users" in open source software development: An interpretive case study of user participation. *Information Technology & People*, 22(2), 132-156.

- Iivari, N. (2010). Discursive construction of ‘user innovations’ in the open source software development context. *Information and Organization*, 20(2), 111-132.
- Iivari, N., Karasti, H., Molin-Juustila, T., Salmela, S., Syrjänen, A. & Halkola, E. (2009). Mediation between design and use – revisiting five empirical studies. *Human IT – Journal for Information Technology Studies as a Human Science* 10(2): 81-126.
- Irani, L. C., & Silberman, M. (2013). Turkopticon: Interrupting worker invisibility in amazon mechanical turk. In *Proceedings of the SIGCHI conference on human factors in computing systems*. New York: ACM, pp. 611-620.
- Kensing, F. & Blomberg, J. (1998). Participatory Design: Issues and Concerns. *Computer Supported Cooperative Work*, 7(3-4), 167-185.
- Klein, H. & Myers, M. (1999). A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. *MIS Quarterly*, 23(1), 67-94.
- Kotlarsky, J. & Oshri, I. (2005). Social ties, knowledge sharing and successful collaboration in globally distributed system development projects. *European Journal of Information Systems*, 14(1): 37-48.
- Lang, M. (2003). Hypermedia systems development: a comparative study of software engineers and graphic designers. *Communications of the Associating for Information Systems*, 12, 242-25.
- Lawrence, K. A. (2006). Walking the Tightrope: The Balancing Acts of a Large e-Research Project. *Computer Supported Cooperative Work*, 15(4), 385-411.
- Lee, C. (2007). Boundary Negotiating Artifacts: Unbinding the Routine of Boundary Objects and Embracing Chaos in Collaborative Work. *Computer Supported Cooperative Work*, 16(3), 307-339.
- Levina, N., (2006). Collaborating on Multiparty Information Systems Development Projects: A collective Reflection-in-Action View. *Information Systems Research*, 16(2), 109-130.
- Levina, N. & Vaast, E. (2005). The Emergence of Boundary Spanning Competence in Practice: Implications for Implementation and Use of Information Systems. *MIS Quarterly*, 29(2), 335-363.
- Lukyanenko, R., Parsons, J., Wiersma, Y. F., Sieber, R., & Maddah, M. (2016). Participatory Design for User-generated Content: Understanding the challenges and moving forward. *Scandinavian J. Inf. Systems*, 28(1).
- Majchrzak, A., & Malhotra, A. (2013). Towards an information systems perspective and research agenda on crowdsourcing for innovation. *The Journal of Strategic Information Systems*, 22(4), 257-268.
- Markus, M. and Mao, Y. (2004). User Participation in Development and Implementation: Updating an Old Tired Concept for Today’s IS Contexts. *Journal of the Association for Information Systems*, 5(11-12), 514-544.
- Mumford, E. (1983). *Designing Human Systems for New Technology. The ETHICS Method*. Manchester: Manchester Business School.
- Newell, S., & Galliers, R. D. (2000). More than a footnote: The perils of multidisciplinary research collaboration. *AMCIS 2000 Proceedings*, 304.
- Niederman, F., Davis, A., Greiner, M. E., Wynn, D., & York, P. T. (2006). Research agenda for studying open source II: View through the lens of referent discipline theories. *Communications of the Association for Information Systems*, 18(1), 8.
- O'Connor, E. S. (1995). Paradoxes of participation: Textual analysis and organizational change. *Organization Studies*, 16(5), 769-803.
- Rajanen, M., Iivari, N., & Anttila, K. (2012). Introducing Usability Activities into Open Source Software Development Projects—Searching for a Suitable Approach. *Journal of Information Technology Theory and Application (JITTA)*, 12(4), 2.
- Rajanen, M., Iivari, N., & Lanamäki, A. (2015). Non-response, Social Exclusion, and False Acceptance: Gatekeeping Tactics and Usability Work in Free-Libre Open Source Software Development. In *Proceedings of INTERACT 2015: Human-Computer Interaction*. Cham: Springer International Publishing, pp. 9-26.
- Sack, W., Détienne, F., Ducheneaut, N., Burkhardt, J., Mahendran, D. & Barcellini, F. (2006). A methodological framework for socio-cognitive analyses of collaborative design of open source software. *Computer Supported Cooperative Work*, 15(2), 229–250.

- Sarker, S. & Sahay, S. (2004). Implications of space and time for distributed work: an interpretive study of US-Norwegian systems development teams. *European Journal of Information Systems* 13(1), 3-20.
- Schutz, D. M., Kim, Y. Y., Yoo, Y., & Pavlou, P. A. (2009). An Empirical Investigation on the Role of IT Materiality in Multidisciplinary Innovation. *ICIS 2009 Proceedings*, 73.
- Scollon, R. (2001). Action and text: towards an integrated understanding of the place of text in social (inter) action, mediated discourse analysis and the problem of social action. In R. Wodak & M. Meyer (Eds.). *Methods of critical discourse analysis*. London: Sage, pp. 139-183.
- Scollon, R. & Scollon S. W. (2004). *Nexus analysis: Discourse and the emerging internet*. London: Routledge.
- Scollon, S., & de Saint-Georges, I. (2012). Mediated discourse analysis. In J. Gee & M. Handford (Eds.). *The Routledge Handbook of Discourse Analysis*. London: Routledge, pp. 66-78.
- Tooze, J., Baurley, S., Phillips, R., Smith, P., Foote, E., & Silve, S. (2014). Open design: contributions, solutions, processes and projects. *The Design Journal*, 17(4), 538-559.
- Walsham, G., (1995). Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*, 4, 74-81.
- Weedman, J. (2008). Client as designer in collaborative design science research projects: what does social science design theory tell us? *European Journal of Information Systems*, 17(5), 476-488.
- West, J., & Gallagher, S. (2006). Challenges of open innovation: the paradox of firm investment in open-source software. *R&D Management*, 36(3), 319-331.
- von Hippel, E. (2001): Innovation by User Communities: Learning from Open-Source Software. *MIT Sloan Management Review*, 42(4): 82-86.
- von Hippel, E. & von Krogh, G. (2003). Open Source Software and the "Private-Collective" Innovation Model: Issues for Organization Science. *Organization Science*, 14(2): 209-223.
- Zhao, Y., & Zhu, Q. (2014). Evaluation on crowdsourcing research: Current status and future direction. *Information Systems Frontiers*, 16(3), 417-434.
- Ågerfalk, P. J., & Fitzgerald, B. (2008). Outsourcing to an unknown workforce: Exploring opensourcing as a global sourcing strategy. *MIS quarterly*, 32(2), 385-409.