Understanding the Impact of *Boundary Conditions* on Participatory Activities.

Lessons from a Large-Scale IT Project in Health Care

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ABSTRACT

This paper addresses how conditions external to participatory activities in large-scale information technology (IT) projects may affect participation and potentially reduce user impact. We propose *boundary conditions* to denote such conditions. We explore this issue through interviews with eight participants in a large ongoing health IT project. The aim of the project is to implement a shared electronic health record system for health care services in a region of Norway. Four phenomena are discussed—*group discontinuity*, *informal follow-up meetings*, *contractual discussions in the participatory activity*, and *the "parking" of design decisions*. For each phenomenon, we reflect on the associated boundary conditions and their effects on participation and user impact. Based on the findings, the following recommendations are made to help participatory design scale with the complexities of large-scale projects: (1) make the boundary conditions explicit; (2) plan for reflections on the process; and (3) plan for peer interaction between users.

CCS CONCEPTS

• **Human-centered computing**; • **Interaction design**; • **Interaction design process and methods**; • **Participatory design**;

KEYWORDS

Boundary conditions, Electronic health record system, Large-scale IT projects, Participatory activities, User impact

ACM Reference Format:
Øivind Klungseth Zahlsen, Dag Svanæs, Arild Faxvaag, and Yngve Dahl. 2020. Understanding the Impact of *Boundary Conditions* on Participatory Activities.: Lessons from a Large-Scale IT Project in Health Care. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society (NordiCHI '20), October 25–29, 2020, Tallinn, Estonia.* ACM, New York, NY, USA, 11 pages. https://doi.org/10.1145/3419249.3420129

1 INTRODUCTION

While it is often challenging to quantify user involvement as a return on investment, there is considerable empirical evidence showing it is a key factor in developing usable information technology (IT) systems [17]. However, user involvement does not guarantee that users *have a say*, that is, that their perspectives are reflected in the end product [15]. In particular, the complexity of large-scale IT projects can raise issues that limit users' impact [7, 13, 16, 20, 28]. This demands empirical research that investigates how participation plays out in such projects.

Shapiro [26] poses the challenge that "*Participatory Design as a community of practitioners should seriously consider claiming an engagement in the development of large-scale systems, and more particularly an engagement with the procurement and development of systems in the public sector.*" The current research should be seen as an attempt to answer that challenge.

Although we know that the design methods that emerged from small-scale participatory design (PD) projects such as *Utopia* [8] do not automatically scale [27], little is known about what aspects of scaling make user participation difficult. Svanæs and Gulliksen [28] used the term *boundary conditions* to describe the collective factors that may prevent or constrain user-centered activities in a design project. Their work was a meta-analysis based on experience from earlier projects rather than a bottom-up analysis of participation as it plays out at the micro-level of participatory activities. This makes the following research question topical: How is participation shaped and user impact constrained by the boundary conditions of participatory activities in large-scale IT projects? We explore

this issue by drawing on participant interviews conducted as part of a case study of an ongoing large-scale health IT project where the respondents reported on their experiences from participatory project activities.

The main contributions of this paper are: (1) a qualitative understanding of how boundary conditions of participatory activities in large-scale IT projects may shape participation and constrain user impact and (2) insights and recommendations derived from the case study as to how user participation can be better accommodated in large-scale IT projects.

The structure of the paper is as follows. We begin by elaborating the concept of *boundary conditions* before reviewing related studies addressing user participation on a large scale. We then describe the IT project that formed the object of our case study and the case-specific boundary conditions we applied as "lenses" in analyzing the collected data. Next, we describe the data collection and analysis methods, present the results, and discuss the aspects pertaining to the focus of the study. Subsequently, we provide some brief methodological considerations and discuss the key lessons learned from our study concerning the adaptation of PD to large-scale IT projects. We end by providing some concluding remarks.

2 BOUNDARY CONDITIONS DEFINED

Boundary conditions as understood in this work refer to factors in the wider context in which user-centered and participatory project activities take place and that still may have a significant effect on the activities and how they unfold. The sum of a project's boundary conditions comprise what Svanæs and Gulliksen [28] referred to as a project's *context of design*. As examples of such contextual boundary conditions they list: The organizations involved, their relations and agendas, internal factors in the developer organizations, software development methodology and tools, internal factors in the client organizations, and customer–developer legal relationships (e.g., contracts and tender).

In many ways, boundary conditions are close to what Bratteteig and Wagner [7] describe as the structural elements that can affect decision-making in a project. We have chosen to use the term *boundary conditions* here to underscore that relevant factors may be conceptually closer or further from the given participatory activity—that is, relate to different boundary spheres—but not directly a part of the activity (Figure 1). For example, while the facilitator of a PD workshop is definitely part of the PD activity (micro-level), the agenda he or she has for the workshop reflects the priorities set by the project the workshop is a part of (meso-level). Again, the project is shaped by societal aspects (macro-level), such as rules and regulations, economic factors, political priorities, etc. As such, the PD activity does not take place in a vacuum but is shaped by conditions in its boundary spheres. Some of these conditions may enable participations, while others can impede participation.

The term *boundary* also suggests that the conditions are not necessarily clearly defined, easily identifiable, or fixed (as a barrier) throughout a project. For example, activities occurring at one point in a project can form boundary conditions that are likely to shape future activities.

While virtually all IT projects—-small and large—have conditions that will shape their participatory activities, the pressure on PD to scale with the complexities of large projects [24] makes the study of such cases particularly relevant from a PD perspective. Some of these complexities are further elaborated in the subsequent section.

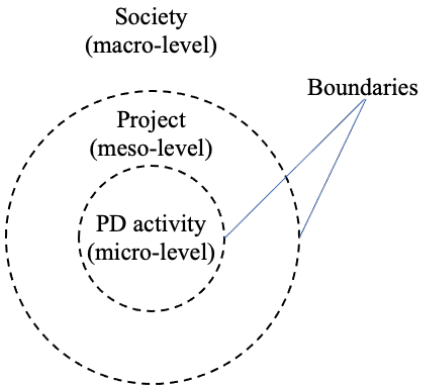

Figure 1: Conceptual model of the boundary spheres of a PD activity.

3 USER PARTICIPATION ON A LARGE SCALE

The aim of the current study is to contribute towards an understanding of user participation in large-scale IT projects. Research on user participation in IT has typically been done under the umbrella of PD. Most early PD projects were small in scale [5, 25], involving few users and stakeholders (e.g., *Utopia* [8, 10] and *Florence* [4]). In 2004, Oostveen and van den Besselaar [22, p. 174] argued that PD researchers should take on the challenge of large-scale PD: *"From participation in the design and development of small scale isolated systems, we now move into the directions of participation in systems innovation in the development of large technical systems"*. Eight years later, Simonsen and Hertzum [27, p. 21] pointed out that PD researchers to a large extent were still reluctant to take on large-scale projects: *"Participatory Design has achieved an international reputation and application. Nevertheless, its proponents still seem reluctant to engage it in the development of large-scale information systems. Participatory Design undoubtedly has a lot to offer; but as an approach, it also faces considerable challenges in claiming a serious influence on the design and implementation of large-scale information systems*".

Currently, PD projects to a large extent are still done on a small scale, as observed by Bødker and Kyng [11]: *"(..) current PD is refining design tools and techniques that support the involvement of users, current and future, in design processes. However, the questions of how design goals are defined, and how decisions are made about what to implement, are outside the realm of this type of PD"*. Simonsen and Hertzum [27, p. 18] identify multiple stakeholders as one of the major challenges in large-scale PD: *"Navigating and managing this complex set of multiple stakeholders in a political environment is a major challenge to Participatory Design approaches"*. Oostveen and van den Besselaar [22, p. 174] list a number of challenges that emerged in a large-scale PD e-government project, including (1) multiple stakeholders *"with different cultural backgrounds, opinions, norms and values, all influencing the requirements, expectations, evaluation and acceptance of the new technology"* and (2) that the

"political and normative dimensions, as well as indirect and long term effects" need to be accounted for.

Dalsgaard and Eriksson [16] described large-scale challenges such as the need to develop the required skills within project organization to conduct participatory activities, issues related to the decision-making structure, and the problem of analyzing the rich data from PD activities.

In an investigation of PD methods in health informatics, Pilemalm and Timpka [23] identified six major issues related to the application of such methods in large-scale system design. Identified issues were related to organizational scale and heterogeneity, problems with stability of design groups, time-consuming procedures, and technology remaining abstract in the design processes.

Bødker et al. [9] point out the need to look beyond the PD activities and examine their context: *"(..) we do see the need to expand the understanding of PD work beyond the micro-dynamics of PD interventions, towards a focus on the sometimes fuzzy and chaotic processes that emerge before, between and after these interventions"*.

Svanæs and Gulliksen [28] consider how various boundary conditions restricted user involvement in design projects. The authors suggest that early identification of boundary conditions that could impede end-product usability should be given priority as part of a tactical user-centered design approach.

It is widely recognized that acquisition-through-tender poses challenges for user involvement [2, 18, 21]. One central reason is that the tender process dictates that important requirements are frozen at an early stage in the contract, often without user involvement.

In investigating the complexities of design decisions in PD, Bratteteig and Wagner [6] highlight the dynamics and multiple parties—internal and external—and how these factors may impact the process. The authors describe how power can be grounded in different sources. Studying the dynamics of decision making in PD, Bratteteig and Wagner [7] highlight how *design moves*—that is, the *creation*, *selection*, *concretization*, and *evaluation* of design choices—prevent some opportunities and facilitate others. In addition, each move typically involves different participatory activities. Therefore, decisions made in preceding moves can be considered to form boundary conditions for future moves.

The current research differs from most PD research in that we investigate how the micro-level of specific PD activities (multi-stakeholder project meetings) is constrained and affected by the properties of the project as a whole (meso-level). This is different from research such as that by Dahl and Svanæs [15] that describes PD facilitation only at the micro-level and research on infrastructuring (e.g., [19]) that studies only the meso-level of projects. By focusing on the boundary conditions of the PD activities, we explore the interplay between the micro-level and the meso-level.

4 THE CASE AND ITS BOUNDARY CONDITIONS

Our investigation of boundary conditions is based on a case study of participatory activities that were part of an ongoing electronic health record (EHR) system implementation project. The aim of the project is to implement a common EHR system for all health care services (primary and secondary care) in Central Norway, a region with a population of 720 000 and with 40 000 healthcare professionals and three hospitals. The estimated cost of the project is EUR 270 million.

The program responsible for the procurement of the EHR system was initiated in 2012. After a tendering process, a US software company was contracted as the EHR system vendor in March 2019. To manage the contract and to help develop the new EHR system solution according to local needs and requirements, the regional health authority and the region's largest municipality (i.e., the *client organizations*) established a joint-stock company (i.e., the *project organization*).

All IT projects are different, all in their own way. It is consequently difficult to agree on a project taxonomy that captures all relevant project dimensions. The focus of the current study is on user participation. We have therefore chosen to focus on aspects of the project that make it different from the small, well-defined projects described in the early PD literature. As an example of early PD projects, *Utopia* [8] was a small research project run by a small homogeneous group of IT researchers in an industrial setting with the support of the workers' union. Compared to *Utopia*, the current project was not initiated by researchers. Nor does it have user empowerment, as understood in the PD tradition (e.g., [11]), as a key objective. As further described below, it is large, complex, and heterogeneous and involves multiple stakeholder organizations.

We used Svanæs and Gulliksen's [28] list of contextual boundary conditions and Bratteteig and Wagner's [7] description of influential structural elements as a basis for identifying boundary conditions relative to the case. The case-specific boundary conditions (BC1–BC4) described in Sect. 4.1–4.4 emerged from our reading of the open call for tender documents and publicly available descriptions of the project with a focus on how it differs from small-scale PD projects. The list of identified boundary conditions is not conclusive.

4.1 BC 1: Multiple Large Stakeholder Organizations

The project currently has five stakeholder organizations:

- Client organization 1: The regional public health authority.
- Client organization 2: The municipality of the region's administrative center.
- Client group: Primary care physician offices (organized as independent business owners).
- Client project organization: A joint-stock company owned by the client organizations.
- Developer organization: The EHR vendor (consisting of multiple divisions, such as sales and development).

These stakeholder organizations all have their own internal organization structure and way of making decisions. In addition to the regional stakeholder organizations in the project, national agencies have a strong impact on strategic decisions related to how the regional EHR system should be integrated with national e-health services. The regional project is designed as the first instantiation of the national strategy *One Citizen – One Health Record* [1].

All five stakeholder organizations have different interests related to the project.

The regional public health authority runs and coordinates the region's state-owned hospitals. The hospitals have significant autonomy but not when it comes to IT infrastructure. The regional public health authority's interest is to manage the transition to an EHR that is used by all clinicians in the region and that enables more standardized and efficient workflows.

The municipality currently has its own EHR system, different from the current system in the hospitals. The municipality's interest is to renew their EHR portfolio and achieve better integration with the hospital and primary care systems.

Primary care physicians currently have EHR systems that work well for primary care practice. Their interest is to get an EHR that is better integrated with the systems at the hospitals and municipalities.

The client project organization is a company that aims to successfully implement the new EHR. In addition to its permanent staff, the company has recruited more than 400 workers from the client organizations as domain experts. Its main interest is to implement an EHR and a patient administrative system for the hospitals and municipalities in the region from the fall of 2021.

The EHR vendor is headquartered in the US and has relocated 30 employees to Norway for the period of the project. The vendor owns a configurable EHR system with tailor-made installations in hospitals in the US and elsewhere. The vendor's main interest is to deliver on the contractual commitments. In addition, it has a strategic interest in securing a regional foothold in the national health care system.

4.2 BC 2: The Project Contract (Procurement through Tender)

As with all procurement-through-tender projects, there is a phase before and a phase after the signing of the contract (signed in early 2019). The signing of the contract is an important milestone because it marks the end of the tendering period. In the current project, the call for tender was developed by a different project organization than the current joint-stock project organization company. This pre-contract organization was also responsible for analyzing the bids, negotiating with the bidders, and detailing the contract with the winning vendor. When the contract was signed, this organization was dissolved. After signing the contract, all stakeholder organizations have to relate to the contract as the overall requirement for the project. The contract also regulates the legal relationships between the stakeholder organizations, the budget, and the overall time constraints.

4.3 BC 3: Project Phases (Temporal Aspects)

The post-contract part of the project (currently) is scheduled to last approximately four years and consists of seven distinct sequential phases. The participatory activities we studied as part of our investigation took place in the *Specification phase* (4 months), which followed the initial *Preparatory phase*. At the core of this phase were *Direction Sessions*, approximately 270 meetings between various project participants (8 meeting days during a period of 3 weeks). The aim of this phase was to develop the details of the requirements for tailoring the system. This phase is followed by the *Development phase* when the requirements are used as the basis for the tailoring.

4.4 BC 4: Structural Aspects of Participation and Decisions

The project follows an implementation approach characterized by scheduled participatory activities (meetings) where invited project participants gather to decide on specific aspects related to the configuration of the EHR system. The activities typically include vendor representatives (e.g., activity facilitators and developers, with the latter only present via a video conference in a different time zone), health care professionals with backgrounds relevant to the topic of the activity (domain experts), and client organization representatives responsible for tailoring the system (application analysts). Most of the application analysts have a clinical background. Most domain experts also confer with their peers in their home organization between the participatory activities.

The meetings are at the first level (Level 1) of a four-level decision structure. If consensus cannot be reached on a topic at Level 1, the design decision is "parked". Parking a decision means either postponing it to another meeting at the same level (with the same or different individuals) or sending it up one level.

Level 2 is the management level of the project with other domain experts. Decisions that cannot be made at this level go one level up. Level 3 meetings include permanent middle management representatives of the two client organizations. Strategic decisions that cannot be made at the first three levels end up at Level 4, which involves top management from the client organizations.

5 DATA COLLECTION AND ANALYSIS METHODS

There are two data sources for the current analysis: (1) project documents and (2) semi-structured interviews with eight participants involved in meetings relative to the Norwegian home care services (as part of the Specification phase). Among the eight participants were four domain experts (health care professionals from the client organizations), three meeting facilitators (two vendor employees and one project organization employee), and one enterprise architect (project organization employee).

All the meetings referred to by the interviewees were held in conference rooms in the client organization's office space, where artefacts like flow-charts, power point slides and documents were discussed. The majority of participants would normally be physically present. Participants from remote areas (e.g., overseas developers) joined via video conferencing tools.

The interview guide for the semi-structured interviews was constructed to help reveal the participants' perception of the meetings and the overall project.

The project documents were used to identify BCs. These characteristics were used as lenses to identify relevant phenomena from the interviews.

Our analysis process had four steps:

- *Document analysis*: The project documents were used to identify a number of BCs using existing frameworks as a theoretical lens [7, 28].
- *Coding and filtering*: The interviews were listened through. The parts of the interviews related to boundary conditions were transcribed and inductively coded. This allowed us to

filter in only those aspects of the interviews that were related to conditions boundary to the meetings.
- *Clustering*: The transcribed material was further coded to identify recurring phenomena.
- *Analysis of phenomena*: Each of the identified phenomena were analyzed in relation to the four BCs:
  - ◯ What the phenomenon is
  - ◯ The interview respondents' reflections on the phenomenon and how it might be explained with reference to the BCs (i.e., the boundary conditions of the project meetings)
  - ◯ Effects on participation and user impact

6 RESULTS AND ANALYSIS

By analyzing the collected data, we identified four recurring phenomena we consider to be the result of a combination of different boundary conditions. The four phenomena are: (1) group discontinuity, (2) informal follow-up meetings, (3) contractual discussions in the participatory activity, and (4) the "parking" of design decisions. Below, we account for each of the phenomena, discuss how they relate to various boundary conditions (i.e., the four BCs), and suggest possible implications for participation and user impact.

6.1 Group Discontinuity

The analysis of the collected data revealed that several participants found the lack of group continuity or stable assemblies of stakeholder representatives to form a key barrier to effective collaboration in the project. As elucidated below, the lack of group continuity was seen as a challenge to both the transition between different project phases and to related meetings within a given phase.

6.1.1 Group Discontinuity across Project Phases. The following statement by one of the client organization's enterprise architects illustrates how he perceived the lack of group continuity across the pre-contact, specification, and development phases to cause more challenges related to communication and understanding:

(Quote 1, Enterprise architect)

[The domain experts] who were invited to these meetings [Direction Sessions] had not been involved in the requirements process, so they didn't know what we [the client organization] requested and how [the vendor] had replied to the requests. They [the domain experts] came into the meetings without [an understanding of] the context, and therefore they had a lot of questions—And they were also somewhat unfamiliar with the solution [the demo version of the EHR system] and how it worked. . . .And the vendor [representatives] asked about many details. I felt that they [the domain experts and the vendor representatives] didn't really understand each other. The ones [the domain experts] supposed to become the future users [of the EHR system] didn't really understand the setting they were in, the questions that were asked, and why the questions were asked.

Elaborating his concern, the enterprise architect considered the lack of continuity not only to apply to domain experts but also to vendor representatives:

(Quote 2, Enterprise architect)

The people from the vendor who were part of the sales team are not that closely involved in the [current] implementation process. After all, they are somewhere else in the world selling solutions. . . . They [the new vendor team replacing the sales team] were not involved in discussions. They may have seen the [project organizations'] requirements and the response [from the vendor's sales team] to our requirements, but they were not part of the discussion that led to the response. . . .We requested that the vendor involved those who were present during the procurement, so that handover of information could improve—because to some extent they [the current vendor representatives] started from bare ground.

As the following quote illustrates, the importance of establishing stable groups of stakeholder representatives across the requirements and development phases was partly related to the "generalness" characterizing the requirements specification:

(Quote 3, Enterprise architect)

The requirements are overarching....The requirements we laid down represent a need, and [the vendor] provide an answer as to how they can solve the need, but not in detail. That is what the implementation process, the process we participate in, is going to solve in detail. That is what we are currently working on.

From the enterprise architect's perspective, continuous participation was central in establishing a common ground for effective collaboration. To a large extent, this common ground encompassed implicit knowledge and understandings that had grown out of previously shared contexts and common experiences in the project and that could not be acquired through project documentation, such as the requirements specification

6.1.2 Group Discontinuity within Project Phases. From conversations with meeting participants, we also learned that group discontinuity not only applied across different phases of the project but also across related activities within the same phase, such as meetings related to the development of specific system modules. Regarding the latter, one domain expert expressed the following concern related to explaining to US vendor representatives how home care services in Norway is structured:

(Quote 4, domain expert #1)

We [the domain experts] have a lot of challenges with respect to this [explaining how the home care services in Norway is structured and how it operates]. . .and then we need to explain it to them [the US vendor representatives] several times before they begin to understand. And, then, people are swapped around [which means that] we need to start [explaining] from scratch again. I understand that they [the vendor] need to swap around people and things like that, but it is really challenging for us having to explain everything from the beginning over and over and over again. . .

Implicit in the concern expressed in the above quote is the perceived negative effect group discontinuity has on the progress of

the work related to the system module in question—continuously having to inform new vendor representatives about the use context of the system module, that is, to achieve common ground for all activity participants takes a considerable amount of the domain experts' time in the project.

When asked to comment on the concerns expressed by the domain expert (Quote 4), the enterprise architect pointed to the logistical challenges of the project:

(Quote 5, Enterprise architect)

After all, we had 270 meetings that were to be held within four weeks, or six weeks. That was quite intense. There were quite a few meetings. There was an incredible amount [of issues] we were supposed to go through...They [the project organizations and the vendor organization] are dealing with a jigsaw puzzle, right? You have so and so many [domain] experts at your disposal and you just have to figure out who to send [to which meeting]. You feel that the home care services need to be represented there, but AI [the artificial intelligence group] already has a conflicting meeting... It was quite a puzzle. They didn't really have a ready agenda [for the meetings related to the home care services].

6.1.3 Boundary Conditions in Play. In what way can group discontinuity be seen as a result of the four BCs? Referring to the handover issues that arose as a result of group discontinuity across different project phases (Quotes #1–2), one plausible explanation lies in the organization structures of the vendor and the project organization (BC 1). None of the domain experts had taken part in the pre-contract phases of the project. On their part, the vendor organization had a clear division between employees dealing with sales and employees dealing with development; they were organized in separate teams and were involved in different phases of the project (Quote 2). From a business perspective, such a clear-cut division can be considered rational, that is, having specialized resources whose primary responsibility is to acquire new projects for the vendor organization.

The group discontinuity in activities can also be seen as a potential consequence of a resource problem resulting from the number of meetings arranged within the timeframe of the Direction Sessions. As described in Quotes 4 and 5, the large amount of participatory activities, the number of participants involved, and the tight time schedule created a situation where both domain experts and vendor representatives had to switch between potentially concurrent meetings. This situation can be seen as a consequence of the temporal aspects of the project, that is, the project phases (BC 3).

6.1.4 Effects on Participation and User Impact. Concerning the effects the group discontinuity phenomenon had on participation and user impact, we see some significant implications. The knowledge and understanding about the (group) discussion that led to the current status of a particular subject and that were "knowledge in the head" for regular participants were not easily transferred to newcomers or substitutes via project documents (Quote 3). When a participant stopped following a series of associated meetings, this form of implicit knowledge disappeared with the person. In terms of contributing to the participatory process, having been part of the previous discussions appears to be central for intersubjective communication and understanding within a group. The construction of *common ground* between individuals is essential for constructive group discussions [12] and having been part of the discussions plays an important role in this. In contrast, when common ground is lacking, the opportunities for constructive dialog, criticism, and reflection—aspects that may help improve the quality of the end result—are significantly reduced. In PD, participation is not only about giving the individual a possibility to *have a say*, but to ensure genuine impact through the collective shaping of design solutions. This collective shaping is at risk when group discontinuity occurs.

6.2 Informal Follow-Up Meetings

Most of the gathered interview data described participants' experiences from formal (scheduled) project meetings, that is, events to which participants were invited by a project organization coordinator. However, the analysis of the transcribed interviews revealed the occurrences of informal, spontaneous meetings initiated by the participants, in which issues from scheduled meetings were further discussed.

One of the domain experts gave the following account of the value she identified in informal "debriefing meetings", which often could take place as an immediate continuation of a scheduled meeting or in places beyond the project organization's workspaces:

(Quote 6, domain expert #2)

Then it [the conversations] goes like "Do you think this [suggested solution] was okay? Did you get that? Or was it a little . . . ?" So, we agree that after all it's a heavy process... It's nice to get confirmation from a colleague that you're not the only one who's not getting everything. "Did you get that?", "No, I think that was a bit strange" and "that we should look a little further into". So, it's a nice thing [the informal follow-up conversation].

Responses from domain experts, such as in the above quote, suggest that ad-hoc follow-up meetings offered a valuable opportunity for participants to continue discussions and align their understandings of topics discussed in the project meetings.

The follow-up meetings were also commented on by one of the US vendor organization's meeting facilitators stationed in Norway:

(Quote 7, Facilitator #1, vendor)

It seems to me that in Norwegian meetings [meetings held in Norway] things go on, and then after the meeting—like when "OK, we are done"—then,. . .everyone talks again (chuckles) and, like, make some decisions or think about things there. And after the meeting time is when some important, like emotions and feelings or understandings, are achieved.

As with the description the domain expert gave of her perceived value of the informal follow-up meetings (Quote 6), the facilitator's statement also hints at the important role these events appeared to play in terms of helping the domain experts create common ground. Elaborating on the follow-up meetings, the facilitator described the value she identified in joining such events:

(Quote 8, Facilitator #1, vendor)

> *And that's the kind of thing that our developers who are only ever on the phone, are never gonna get to be a part of until they come here to visit. So that's the gap I'm trying to bridge to. I am in those little after meetings and I did hear what they [the domain experts] were saying and I saw that look of panic on their faces [with regard to some options that were presented in the formal project meeting]. I can message our developer and be like: "not good (laugh), not good".*

For this facilitator, the follow-up meetings presented an opportunity to better understand the perspectives and concerns of the domain experts. The insights acquired through these events were again perceived as helpful in explaining the issues to remote developers.

Reflecting on aspects of the formal project meetings that could explain the domain experts' need for follow-up meetings, the same facilitator stated:

(Quote 9, Facilitator #1, vendor)

> *I have been trying to think about that, and I think there's some degree of the formality aspect to it. So, like the meetings that we have in the room with Skype and the videos, I think feel very formal to people. And they are not formal at this point. We [the vendor facilitators and developers on Skype] have met with them [the domain experts] for so long time—like everyone know each other, and we have like casual conversations at the beginning, but for some reason. . .(pause). . .I think may be because [the vendor] is there, or because I'm there. I don't know. There is something that makes it different, so that some of the [domain experts] feel like they can't speak up or they don't speak up in those meetings, and then do talk a bit after.*

Judging from the above statement, the form or structure of the project meetings appears to be one possible explanation for the follow-up meetings. Even if the facilitators, developers, and domain experts were well acquainted, the meetings did not appear to provide an arena allowing for sufficient discussion of the topics on the agenda. Further elaborating on how the structure of the project meetings created a possible need for alternative arenas where relevant topics could be discussed in more depth, the facilitator stated:

(Quote 10, Facilitator #1, vendor)

> *Maybe it's a feeling of being polite. Or, or maybe it's just a time to process, because when you are getting a ton of information thrown at you in one of these meetings, you need a few minutes to do: "How do I feel about it?". And you need to say to another person: "How did you feel, how did I feel". That's how we process things. So maybe that's just... (pause). They feel more comfortable doing that in a small setting with just their peers, as opposed to processing their emotions in front of [vendor representatives]. That's reasonable, that's probably what I will do.*

Here, the facilitator identifies both the amount of information the domain experts are presented and the lack of possibilities for interacting with one's peers as potential reasons for the ad-hoc after-meetings.

6.2.1 Boundary Conditions in Play. If we consider the ad-hoc follow-up meetings in light of boundary conditions, one aspect that could explain the phenomenon is the structure of the (formal) project meetings (BC 4), that is, the project's implementation of participatory methods. Statements from interview respondents (e.g., Quotes 6, 7, 9, and 10) could indicate that the structure of the meetings did not allow enough space for necessary reflection, discussion, and alignment of perspectives among meeting participants on relevant subjects. Therefore, the informal follow-up meetings can be seen as a result of a need among the domain experts to create such a space outside the formal project meetings.

6.2.2 Effects on Participation and User Impact. Participation in the scheduled meetings appeared to be significantly colored by the structure of the meetings and the large amount of information presented to the participants. The lack of arenas that allow for in-depth discussions and alignment of understandings between participants can be considered a serious threat to user impact in participatory processes. As described above, the domain experts attempted to compensate for this situation by redesigning the participatory process on their own initiative, that is, creating (informal) arenas where common ground could be established. The extent to which such "repair" initiatives are ideal from a PD perspective depends on aspects such as who participates and the degree to which there are power asymmetries between participants [15].

6.3 Contractual Discussions in the Participatory Activity

Another phenomenon the analysis helped reveal relates to concerns expressed by participants regarding how some meetings turned from focusing on the EHR system and how it could best accommodate the needs of the domain experts to contractual issues, that is, what was to be considered within or beyond the scope of the project as per contract. One of the domain experts gave the following account of such a shift taking place in meetings relative to a specific EHR system module:

(Quote 11, domain expert #3)

> *There were some contract disagreements about what is inside and outside the [scope] and suddenly people dressed in suits, whom we never seen before, came into the meetings. We then understood it was going to be "business" more than "subject matters" (laughing) and after that it [the development] all stopped, when there was no agreement on what was within or beyond scope.*

Two domain experts expressed the following concerns regarding contractual issues becoming the focus of meetings:

(Quote 12, domain expert #3)

> *This kind of discussions . . . I just disconnect—Because, then I start thinking that this has nothing to do with me. This is about money and it's about the frames of [the project].*

(Quote 13, domain expert #1)

> *I was pretty positive when I came to the meeting, thinking that now they will surely develop something for us. And then you come out and just think "Oh! Now it's stopping completely. How is it going to affect us? Will we be able to use the system at all?" Those were my thoughts when I walked out of there... Yeah, it really was [demotivating].*

Both quotes show resistance among the domain experts to being involved in contract-related discussions. Quote 12 illustrates how some of the domain experts felt that contractual issues were not a concern they should be dealing with. Quote 13 shows that the same issues also provoked uncertainty among domain experts about the realization of the end product. One of the project organization facilitators expressed a similar view:

> (Quote 14, facilitator #2, project organization)
>
> *There was [a degree of] insecurity in that meeting. The agenda was not right for that arena. The [domain experts] are there to talk about their needs. If it's about contractual things, then they don't need to be in that discussion. Then it has to be addressed on a higher [decision] level.*

6.3.1 Boundary Conditions in Play. Incidents such as those described in Quotes 11–14 exemplify how factors related to the project contract (BC 2) can affect participatory activities and processes and participants' perception of them. In many ways, the current phenomenon is the one among the four discussed in this paper where boundary conditions appeared to have the most profound effect on the participatory activities. Not only did the project contract influence the activities, but it became the activities' primary focus. The way contractual discussions "hijacked" the meetings (from the domain experts' viewpoint) can also be related to the structure of the meetings (BC 4), as there were no established common "ground rules" preventing this from happening.

6.3.2 Effects on Participation and User Impact. Our findings show how contractual ambiguity risks disrupting ongoing participatory processes. The results indicate that events in which contractual issues became the focus represented a "breakdown", that is, a situation in which their clinical competence became less relevant and where they did not have any real power to influence the outcome.

6.4 "Parking" of Design Decisions

The last phenomenon we address concerns meeting incidents where design decisions pertaining to the EHR system were "parked". As explained earlier (Section 4.4), parking refers to the postponement of decisions regarding matters on the meeting agenda. Describing the rationale for parking decisions and the ways the concept could be employed in meetings, one of the vendor organization's facilitators explained:

> (Quote 15, Facilitator, vendor)
>
> *Often people [the domain experts] will start talking about something. And it is important. But because we [the vendor] have to meet a certain deadline it may not be important for another month. Or maybe another group is discussing it, and then another group has the right experts. So it's not that we don't want to talk about it. We just don't have the time to talk about it right now, because our priority is this discussion. Or that they're not kind of coming to the same conclusion, you can tell some of the conversations after five or ten minutes, people are still not getting each other. You kinda have to just stop and say like "We'll park it. We come back. We will think about how we should talk through it". ... That will do. And then we come back and say "Ok. We thought about it a little bit more, and we think you are saying this. Is it correct?" So it's a combination of making sure people are actually saying the same thing and agreeing and then staying on track.*

Based on the facilitator's statement, the main reasons for parking decisions were (1) the shortage of relevant domain expertise in a given meeting, (2) the down-prioritization of a topic vis-á-vis others on the meeting agenda (considered more urgent by the facilitator given upcoming project deadlines), and (3) the lack of consensus on a given matter among the domain experts present. From the facilitator's account, we also find that parking was used as a mechanism to prevent discussions among participants from taking up too much meeting time, thus reducing the chance of getting through all the items on the meeting agenda. Reflecting on meeting incidents where decisions had been parked, one domain expert stated after a follow-up question:

> (Quote 16, domain expert #2)
>
> *They are parked, yes. But where they end up, I don't know. I've never offered it a thought. It may well be...that it [a parked item] has been discussed later at some meeting. But I can't remember reflecting on whether anything parked has come back [to us]. Perhaps it mainly occurred in the Direction Sessions. There were a lot of things that got parked there, which I guess was followed up later.*

The domain expert admits that she has no particular awareness of how parked items are followed up, including when and by whom.

Concerning follow-ups on parked items, another domain expert stated:

> (Quote 17, domain expert #3)
>
> *I have received feedback [regarding parked items], yes. But not on everything. It's something about it—and it's on me —that there is so much that when I've been in a meeting, I relate only to what's important to me. ... When I leave the meeting and the things that got parked aren't important to me, then, I don't think about them anymore. But of course, if it is important for me and my service, and what I should do in the future, then maybe I will be more aware of whether I receive feedback or not. Or that I'm thinking: Where's it placed? You just have to trust that people know what they are doing in the other groups. After all, it's a really big ordeal because I have ... control. I'm used to being where the decisions in my field are made. And I am not now.*

6.4.1 Boundary Conditions in Play. As a meeting mechanism, parking reflects in many ways the project's decision structure (BC 4)

in the sense that a parked decision can be postponed, forwarded to another group, or moved up to a higher level in the decision hierarchy. At the same time, parking and the way it can be used to prevent longer discussions (Quote 15) also reflects a meeting structure prioritizing efficiency (getting through the items on the meeting agenda) over more in-depth debate on individual items. At a more general level, parking can also be seen to reflect the temporal aspects of the project, that is, a project divided into specific project phases (BC 3), each with concrete deliverables and deadlines.

6.4.2 Effects on Participation and User Impact. The effect parking can have on participation and user impact is somewhat ambiguous. On one hand, parking decisions due to the lack of relevant competence in a meeting can be seen as a way to ensure that relevant competence is present when making decisions. On the other hand, the facilitator being able to park any discussion as he or she sees fit can also be considered a democratic problem, i.e., a problem generic to the parking concept. One possible consequence is that the power to make decisions on real and important matters is moved from the domain experts (i.e., the "user" level) to management levels.

Another concern with parking vis-à-vis empowerment relates to the potential opaqueness of how the parked issues are followed up. As shown in both Quotes 16 and 17, the interviewed domain experts related not knowing the status of parked items, that is, whether or not the parked items have been processed and by whom.

7 LIMITATIONS

Having described the case study results, it is important to examine the findings in the light of the employed methodology. Below, we briefly discuss three central methodological limitations.

First, the phenomena were identified using a inductive approach guided by a set of predefined categories (i.e., BC1–BC4) as lenses. While such an approach is helpful in terms of identifying relevant data in the collected material, it also makes the analyst "blind" to aspects for which no appropriate lens is available. Therefore, there might be phenomena in our data that remain undiscovered as a consequence of the employed approach.

Second, as with all qualitative research methods that focus on the human experiences, the results reflect the perspectives (and the memories) of the study participants. Given the relatively small number of study participants (compared to, for example, the total number of partakers in the project's participatory activities), it is likely that there may be other and potentially conflicting perspectives on the topics discussed as part of the interviews that we have not covered.

Third, while we have investigated various ways by which boundary conditions can pervade participatory activities and compromise user impact, it is not our intention to criticize the project that is the focus of our case study. As opposed to early and strongly politically motivated PD projects such as *Utopia*, user empowerment was not a key objective in the current EHR project. Therefore, one could argue that the occurrence of incidents that may be considered disruptive from a PD perspective should not come as a surprise. Our motivation was to provide an understanding of how boundary conditions can affect PD activities that are part of large-scale IT projects and to identify important PD lessons that can be learned from this.

8 LESSONS LEARNED

The analysis of the case and the eight interviews have given us a better understanding of how boundary conditions relative to participatory activities in large-scale IT projects may affect the activities and the process they are part of and how they may limit user impact. Starting with the four identified phenomena, we reflected on what lessons can be learned about PD on a large scale.

8.1 Lesson 1: Make the Boundary Conditions Explicit

The interviews revealed that many domain experts experienced the meetings as something they were thrown into without having the necessary context and understanding to be able to fully contribute their domain expertise. As the project was a tendered acquisition where the domain experts in this phase had not been involved in creating the call for tender in the previous phase, important aspects of the overall requirements were already given for reasons unclear to the new domain experts.

The contract, including the overall requirements, thus became a boundary condition that stayed hidden in the background and that was only brought to the fore when the discussions in the meetings touched on the scope of the EHR solution, for example, whether resources existed for implementing a new EHR system module. Other boundary conditions that were unclear to the domain experts include the overall temporal and decision-making structure of the project: What happens to their design decisions?

Insight: domain experts with a limited understanding of the boundary conditions given by the project will not be able to optimally contribute their domain expertise.

Recommendation: One suggestion to remedy the lack of contextual understanding is that the facilitators make important boundary conditions more explicit early on in the meetings and ensure the domain experts understand the context.

This is in line with the recommendations of Svanæs and Gulliksen [28]: *"Based on our findings, we recommend that user-centered design projects give priority to an early identification of factors in the context of design that pose risks to end-product usability."* The authors also provide a list of potential contextual boundary conditions that can be helpful in identifying the boundary conditions for a specific project.

8.2 Lesson 2: Plan for Reflections on the Process

Many domain experts experienced the meetings as "formal", and this made them less willing to participate in the discussions than they would have been in a less formal setting. The formal nature of the meetings and the time limits put on each agenda item led to unplanned-for "after-meetings" initiated by the domain experts. We see these after-meetings as a kind of "repair" activity compensating for the rigidity of the meeting structure and meeting plan.

One interesting observation is how the project organization reacted to these after-meetings of domain experts. The project organization let them happen, and on some occasions the facilitator asked to join and became part of the informal discussion. We see this as an example of best practice from the project organization.

Insight: domain experts are resources for the project not only as contributors of domain knowledge but also as co-designers of the design process.

***Recommendation*:** For the domain experts to be able to have an impact on the design process, co-reflection on the process at regular intervals should be an integral part of the design methodology.

This recommendation is in accordance with best practices in agile software development. In 2001, Fowler and Highsmith [3] listed reflection on the process as the 12th agile principle: *"At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly. . . . we all recognize that we can't come up with the right process for every situation. So any agile team must refine and reflect as it goes along, constantly improving its practices in its local circumstances."*

Co-reflection on the design process is useful for PD on a small scale [15] but becomes essential for PD on a large scale where the complexity of the projects are orders of magnitude greater. The co-reflection must be followed by a willingness by management and the facilitators to make appropriate changes to the design process when necessary. One benefit of making such reflection an integral part of the design process, is that corrections to the process can happen without anybody losing face.

The core question to ask in the reflection part of the meetings with the domain experts should be: "To what extent is knowledge transfer between the domain experts and the project actually happening?" This is the raison d'etre for the PD activities and should be their main success criterion.

8.3 Lesson 3: Plan for Peer Interaction between Domain Experts

One of the reasons the domain experts gave for initiating the after-meetings was that they felt the need for more discussion time with their peers. One effect of the observed group discontinuity and the size of the project was that the domain experts did not form stable teams. To a large extent, the domain experts were treated by project management and the facilitators as carriers of knowledge that were allocated to meetings according to the need for domain expertise in each meeting. Current best-practice methods in software development put a strong emphasis on teamwork [31].

Insight: PD on a large scale runs the danger of not being able to harvest the benefits of team interaction among the domain experts.

Recommendation: To remedy this, the design process should be planned with an eye to the value of peer interaction among domain experts in teams. This can be achieved by forming more stable teams.

Treating the domain experts only as individual resources risks creating an experience of alienation and being "a cog in the machinery". The sheer size of the projects in PD on a large scale makes peer interaction between domain experts something that needs to be planned for, different from PD on a small scale where such interaction often happens by itself [14, 29]. The intimacy of small PD projects does not scale by itself. It must be scaled up by design. The effect of scale on social relations has been a topic in sociology since its infancy. Tönnies [30, pp. 27–58] differentiated between small-scale *Gemeinschaft* and large-scale *Gesellschaft* and pointed out how complex societies like large cities lead to social relationships that are more goal-oriented and contractual than what is found in smaller groups of people.

9 CONCLUSION

In this paper, we explored the interplay between PD activities (micro-level) and the large-scale project they are part of (meso-level) to provide a qualitative understanding of how the activities' boundary conditions affect participation and possibilities for user impact. We identified a number of phenomena illustrating how the context for PD on a large scale can be considerably different than that for PD on a small scale. Applying the lessons learned from studying the nature of the domain experts' participation in the current EHR project to user involvement in large-scale projects in general, we recommend the following measures:

- Boundary conditions should be identified and made explicit to users early in the project.
- Regular co-reflection on the participatory process is required to adjust the design methodology accordingly.
- Peer interaction between users should be planned for and realized by forming stable teams.

The practical effects of implementing the above steps need to be further investigated.

ACKNOWLEDGMENTS

This study has been conducted as part of the KonPas and the PlatVel projects. Our special thanks go to the interview respondents for sharing their time, commitment and viewpoints.

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