Sustained Participatory Design: Extending the Iterative Approach

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Introduction

In 2005, Shapiro described how many large-scale systems development projects are highly troubled.[1] Attempts to introduce ambitious information systems in the public sector have been especially notorious for being late, over budget, or functionally inadequate; in addition, "the situation in the private industry may be no better, but commercial confidentiality and the lack of public accountability may make it less visible."[2] For Participatory Design approaches to lead to the best and most effective systems that support the work they are used for, "Participatory Design as a community of practitioners should seriously consider claiming an engagement in the development of large-scale systems."[3]

Participatory Design undoubtedly has a lot to offer. Benefits can accrue in terms of clarifying goals and needs, designing coherent visions for change, combining business-oriented and socially sensitive perspectives, initiating participation and partnerships with different stakeholders, using ethnographic analyses in the design process, establishing mutual learning processes with users from the work domains in question, conducting iterative experiments aimed at organizational change, managing stepwise implementation based on comprehensive evaluations, and providing a large toolbox of different practical techniques.

Participatory Design is characterized by the intention of establishing mutual learning situations between users and designers.[4] A sustained Participatory Design approach allows an organization to experiment and learn—not only as part of the initial design, but also as part of the organizational implementation and use of a technology. The overall design process that includes, and transcends, the technical development of a technology has been identified by Markus as "technochange" management and, in particular, as a technochange prototyping approach.[5] Technochange combines large information technology (IT) projects with organizational change programs to produce technology-driven organizational change: "Here, what is to be prototyped is not just a technical solution or just an organizational change, but both together."[6] The technochange prototyping approach uses the traditional iterative prototyping approach as an overall model for organizational change.

1 Dan Shapiro, "Participatory Design: The Will to Succeed," in *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility* (New York: ACM Press, 2005), 29-38.

2 Ibid., 30.

3 Ibid., 32.

4 Keld Bødker et al., *Participatory IT Design. Designing for Business and Workplace Realities* (Cambridge, MA: MIT Press, 2004).

5 Lynne Markus, "Technochange Management: Using IT to Drive Organizational Change," *Journal of Information Technology* 19, no. 1 (2004): 4-20.

6 Ibid., 17.

Iterative Participatory Design experiments using various sorts of mock-ups and prototypes have been conducted for decades.[7] However, most experiments have been restricted either to small-scale systems (often driven by researchers), or to the initial stages of larger scale information systems development, followed by a conventional contractual bid.[8] Recently, however, a growing number of Participatory Design experiments includes both initial design and real-use evaluation.[9]

Active engagement in—and documentation of results with—large-scale information systems represents a major goal for Participatory Design. In this article, we pursue Shapiro's call for a collective approach by extending the iterative prototyping approach into a sustained Participatory Design approach, including large-scale Participatory Design experiments. We do this by means of an exemplary reflection: *What are the challenges that Participatory Design must face when engaging in design and implementation of large-scale information systems?* We describe and reflect on a Danish Participatory Design initiative in the healthcare sector involving a Participatory Design experiment with an Electronic Patient Record (EPR) system. The experiment was conducted by the authors in close collaboration with the vendor, CSC Scandihealth (CSC), and the customer, the region of Zealand, one of Denmark's five healthcare regions—and in particular, the region's EPR unit and the neurological stroke unit at Roskilde Hospital. We describe the experiment and our experiences and present the challenges that the Participatory Design paradigm must address to succeed in filling a greater role in large-scale information-systems projects.

A Sustained Participatory Design Approach

Our sustained Participatory Design approach introduces iterations of design and implementation and emphasizes improvisation, experimentation, and learning. This approach challenges conventional plan-driven approaches that maintain a clear distinction between design and organizational implementation.[10] Orlikowski and Hofman suggest that, as an alternative model for managing technological change, improvisational change management be defined as "a way of thinking about change that reflects the unprecedented, uncertain, open-ended, complex, and flexible nature of the technologies and organizational initiatives… [where] managing change would accommodate—indeed, encourage—ongoing and iterative experimentation, use, and learning."[11]

Orlikowski and Hofman characterize improvisational change management by distinguishing between three kinds of organizational change: anticipated, emergent, and opportunity-based.[12] *Anticipated change* is planned ahead and occurs as intended by the originators of the change. *Emergent change* is defined as local and spontaneous changes, neither originally anticipated nor intended. Such change does not involve deliberate actions but

7 For a more elaborated review of related literature, see Jesper Simonsen and Morten Hertzum, "Participatory Design and the Challenges of Large-Scale Systems: Extending the Iterative PD Approach," in *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008* (New York: ACM Press, 2008), 1-10.

8 For the former, see Andrew Clement and Peter van den Besselaar, "A Retrospective Look at PD Projects," *Communications of the ACM* 36, no. 6 (1993): 29-37; Anne-Marie Oostveen and Peter van den Besselaar, "From Small Scale to Large Scale User Participation: A Case Study of Participatory Design in E-Government Systems," in *PDC 04: Proceedings of the Eighth Conference on Participatory Design: Artful Integration: Interweaving Media, Materials, and Practices* 1 (New York: ACM Press, 2004), 173-82. For the latter, see Keld Bødker et al., *Participatory IT Design.*

9 See, e.g., Monika Büscher et al., "Ways of Grounding Imagination" in *PDC 04: Proceedings of the Eighth Conference on Participatory Design*, 193-203; Thomas Riisgaard Hansen et al., "Moving Out of the Laboratory: Deploying Pervasive Technologies in a Hospital," *IEEE Pervasive Computing* 5, no. 3 (2006): 24-31.

10 Barry Boehm and Richard Turner, *Balancing Agility and Discipline: A Guide for the Perplexed* (Boston: Addison-Wesley, 2004).

11 Wanda Orlikowski and Debra Hofman, "An Improvisational Model for Change Management: The Case of Groupware Technologies," *Sloan Management Review* 38, no. 2 (1997): 12.

12 Ibid.

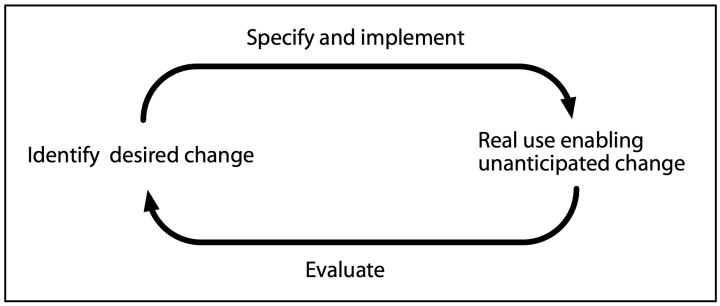


Figure 1
Outline of our sustained Participatory Design approach.

grows out of practice. *Opportunity-based changes* are purposefully introduced changes resulting from unexpected opportunities, events, or breakdowns that have occurred after the introduction of a new information system.

Emergent and opportunity-based changes are widely noted in Participatory Design projects,[13] but there has been surprisingly little focus on managing and learning from such changes over longer periods of time. A sustained Participatory Design approach in large-scale information-systems projects entails the integration of design and development with organizational implementation. This integration is necessary to obtain data and experiences from real use during design and development and thereby to move iteratively through the three change perspectives: (1) evaluate progress on planned changes, (2) become aware of emergent changes, and (3) turn selected emergent changes into opportunity-based changes. Charting progress on planned changes is a means to ensure that system possibilities get integrated into actual work practices, while turning emergent changes into opportunity-based changes is a means to ensure that work practices are changed in relevant ways.

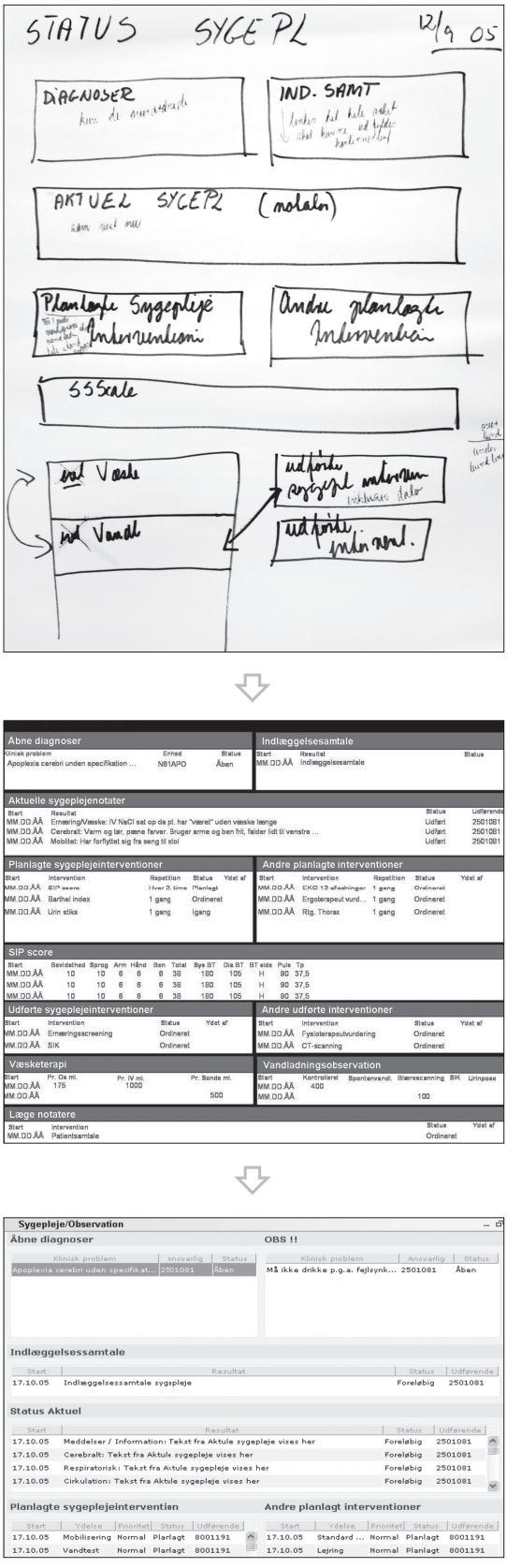
Our sustained Participatory Design approach—outlined in Figure 1—is an extension of the traditional iterative approach. It emphasizes the evaluation of systems by exposing them to real—situated[14]—work practices. The anticipated and intended changes are the starting point of an iteration. These desired changes are further specified, for example, in terms of the effects of using the system. The system (or a part/prototype of it) is then implemented and tried out under conditions as close as possible to real use. Actual use of the system allows for unanticipated changes (both emergent and opportunity-based) to occur. Finally, evaluation of using the system informs subsequent iterations. Thus, selected emergent changes are turned into opportunity-based and new desired changes, thereby forming the starting point for the next iteration.

In the following sections, we describe the sustained Participatory Design approach we propose by presenting an experiment that exemplifies the four elements depicted in Figure 1. The experiment involved the clinical-process module of an EPR system. This EPR module supports clinical documentation and decision-making

13 See, e.g., Gro Bjerknes and Tone Bratteteig, "The Memoirs of Two Survivors: Or Evaluation of a Computer System for Cooperative Work" in *Proceedings of the 1988 ACM Conference on Computer-Supported Cooperative Work*, Irene Grief, ed., (New York: ACM Press, 1988): 167-77; Susanne Bødker, and Jacob Buur, "The Design Collaboratorium—A Place for Usability Design," *ACM Transactions on Computer-Human Interaction* 9, no. 2 (2002): 152-69; Pelle Ehn, *Work-Oriented Design of Computer Artifacts* (Stockholm, Sweden: Arbetslivcentrum, 1988).

14 Lucy A. Suchman, *Human-Machine Reconfigurations: Plans and Situated Action, 2nd Edition* (New York: Cambridge University Press, 2007).

Figure 2
Results from three iterative Participatory Design workshops: mock-up, non-interactive PowerPoint prototype, and running prototype of screen to be used during nursing handover.



and comprises the ongoing documentation of medical patient information made by the clinical staff. Today, the majority of clinical documentation is still paper-based. To initiate the development of this EPR module, a large-scale Participatory Design experiment was conducted during the fall of 2005, involving a close collaboration between CSC, the region of Zealand, the stroke unit at Roskilde Hospital, and the authors. The stroke unit is an acute inpatient clinic with nine beds, and it treats approximately 850 patients a year. The experiment involved one iteration of the sustained Participatory Design approach.

Step 1: Identify the Desired Change

The overall desired change that the experiment aimed for was to implement a fully IT-integrated EPR system that included support for the clinical process and replaced all paper-based patient records. The clinicians at the stroke unit specifically requested improvements in obtaining a patient overview and support of their mutual coordination. On a national level, another long-term aim was to increase the structuring and standardization of the content of patient records as part of the development of the EPR system.[15] In response to this overall political objective, the EPR unit wanted to introduce and evaluate a new structure of the nurses' narrative recordings by dividing it into 14 categories of basic nursing care.[16]

Step 2: Specify and Implement

The desired changes were specified in the first part of the experiment (August to October) through five full-day Participatory Design workshops where clinical staff, in cooperation with designers from CSC and project managers from the EPR unit, designed and configured the EPR system. The main parts of the system were designed and configured in three steps, as depicted in Figure 2: At one workshop, mock-ups were drawn on flip-over charts. At the following workshop, a preliminary, non-interactive PowerPoint prototype was discussed. At a third workshop, a running prototype was demonstrated and discussed. In articulating their requirements, the physicians and nurses focused on two aspects central to their work: their continual creation and re-creation of an overview of the status of the patients and the coordination among the clinicians. The overview and coordination are particularly prominent in relation to three clinical activities:

- *Team conferences.* Every morning on weekdays, the physicians, nurses, and therapists meet for about 15 minutes to go through the admitted patients.
- *Ward rounds.* After the team conference, the chief physician starts the ward round, which consists of medically assessing each patient and adjusting the treatment and care accordingly.

15 Claus Bossen, "Participation, Power, Critique: Constructing a Standard for Electronic Patient Records" in *Proceedings of the Ninth Conference on Participatory Design: Expanding Boundaries in Design* 1 (New York: ACM Press, 2006), 95-104.

16 Virginian Henderson, "Virginia Henderson International Nursing Library," www.nursinglibrary.org (accessed January 22, 2012).

- *Nursing handovers.* At the start of every nursing shift, the nurses meet for about 45 minutes to go through the admitted patients and coordinate activities.

Through the Participatory Design workshops, the clinicians specified a number of desired effects. For example, they requested coordination support during the three activities described. The chief physician wanted to be able to complete the daily ward rounds as a "one-man show" (i.e., without an escorting nurse), where all sharing of information and coordination with other clinical staff were done through the EPR system. This effect was given high priority because the nurses are busy, and time taken to escort the chief physician during the lengthy ward round takes away from patient care. Improved patient overviews were also identified as a desired effect, especially in relation to the team conferences and nursing handovers. In addition, the EPR unit needed the nurses' recordings to follow a more consistent structure and needed prompt system response times to evaluate the performance capabilities from CSC's new configurable development platform.

CSC undertook the technical development of the EPR system in November and December, which included ensuring appropriate interfaces to various systems currently used at the hospital. Five years of patient data were migrated to the EPR system to enable access to previous patient records, as well as to records of patients that would be hospitalized during the experiment. The amount of data also provided a data load that enabled a realistic evaluation of system performance.

Step 3: Real Use Enabling Unanticipated Change

The trial period, where the EPR system was in real use, took place in December and lasted five days. During this trial period, all clinicians at the stroke unit used the EPR system 24 hours a day, and the system replaced all paper records for all patients. The system involved stationary and portable computers, PDAs for bedside measurement of patient parameters, and a large shared display projected on the wall during team conferences and nursing handovers (see Figure 3). Transactions involving other wards not involved in the experiment were simulated by a back office staffed

Figure 3
Photos from the five-day period of real use.

24 hours a day. Patient-record entries that involved paper transactions with other wards were initiated in the EPR system by the clinicians. The back office continuously monitored the system, identified such entries, mailed them in the conventional fashion, waited for the results to arrive, and immediately typed them into the EPR system. Thus, the clinicians at the stroke unit experienced the EPR system as if all transactions were fully IT supported. To safeguard against troubles and misunderstandings, which might have entailed risk to patient health, the clinicians were supported by "shadows" who had detailed knowledge of the EPR system and were present 24 hours a day.

The five-day trial period made it possible to test the EPR system in real use and to identify unanticipated changes. Although the trial period was short, we observed both emergent and opportunity-based changes. Emergent changes included that the traditional oral way of communicating about patient status changed to collectively reading the information on the large shared display used for team conferences and nursing handovers. As a result of the clinicians' ability to read the patient record on the shared display, we further observed that the clinicians initiated collective investigations of the patient record during these activities.[17] We observed that at the nursing handovers before the trial period, the patient record was seen only by the nurse team leader, who held the patient record in her or his hand and conveyed the status of the patient by reading key information out loud. During the trial period, the patient record was projected on the wall and repeatedly inspected by all nurses present at the handovers, and they collectively participated in interpreting the status of the patient.

As an example of an opportunity-based change, the nurses were able to make their observations more visible at the team conferences: Halfway through the trial period, they initiated a change in the team conference screen by having CSC add a panel with nursing observations relevant for the team conference. In this way, the nurses' observations became more salient to the clinicians as they were forming their overview of the patients' status.

Step 4: Evaluate

The evaluation of the desired changes included a quantitative analysis that verified a number of positive effects.[18] For example, the chief physician was able to complete his daily ward rounds without a nurse escort. This result was important to the clinicians. To CSC, the major result of the experiment was the implementation of a fully integrated EPR module that performed well throughout the trial period. Thus, CSC received a valuable reference in proving that it has a highly configurable EPR platform that can deliver satisfying response times. However, the experiment also fostered several new desired changes that were unanticipated and significant.

17 For a detailed ethnographic study of this behavior, see Jesper Simonsen, and Morten Hertzum, "Iterative Participatory Design," in *Design Research: Synergies from Interdisciplinary Perspectives*, ed. Jesper Simonsen et al. (Boston: Routledge, 2010): 16-32.

18 Morten Hertzum, and Jesper Simonsen, "Positive Effects of Electronic Patient Records on Three Clinical Activities," *International Journal of Medical Informatics* 77, no. 12 (2008): 809-17.

To summarize, using the large shared display during the team conferences and nursing handovers resulted in various unanticipated changes: the change from oral presentation to collective reading of patient records, initiation of collective investigations of patient records, and inclusion of nurses' observations as a prominent part of the shared agenda during team conferences. As a direct consequence of the clinicians' requests for coordination support, CSC initiated the design of a completely new EPR module supporting task allocation and management. After the experiment, the nurses requested the addition of more structure to the nursing record. This request resulted from their experiences of how structured nursing observations became part of the agenda during team conferences. This request came as a surprise to the members of the EPR unit, who expected that the nurses would resist rather than request increased structure in their documentation.

Challenges for Participatory Design

We argue that the Participatory Design community should think big by applying a sustained Participatory Design approach to large information systems. Extending the iterative Participatory Design approach beyond initial design (as outlined in Figure 1) raises the overall challenge of how to manage this improvisational and relatively open-ended process. We identify in the following sections four major challenges in managing such a sustained, iterative process.

Creating Appropriate Conditions for Participatory Design

Both customer and vendor need to be motivated and interested in committing to a Participatory Design approach. An *initial challenge, thus, is to obtain the appropriate conditions for Participatory Design*. This necessity might presuppose, for example, earlier experiences and previous collaborations motivating Participatory Design; access to mature, configurable development platforms; and knowledge of other successful Participatory Design projects. In our experiment the customer (the EPR unit) had become ready for a Participatory Design approach through earlier experiences with a drug administration module. The manager of the EPR unit (who had a background as a physician) was further aware that the EPR system supporting the clinical process could not be designed as a one-size-fits-all standard system. The vendor (CSC), on the other hand, had a new and highly configurable EPR platform and an urgent need to prove its ability and to obtain a valuable reference. Finally, the customer and the vendor knew each other from the development and deployment of the drug administration module. This mutual knowledge laid the foundation for the close partnership and collaboration required by the experiment.

Managing a Multitude of Stakeholders

Large-scale information-systems projects are characterized by the involvement of a number of different actors spanning different organizations and different organizational levels. Thus, a second major challenge is to *manage and align the motivations and interests of this multitude of stakeholders*. Traditionally, the focus of Participatory Design projects has been restricted to the relationship between designer and end-users.[19] As a result of our experiment, we can identify the following, broader range of stakeholders:

- Politicians and strategists engaged in health care at a national level (requesting increased structuring and standardization of the EPR content).
- The vendor (needing a reference for another contractual bid).
- The EPR unit (requesting an initial structuring of the nursing record and proof of system performance).
- The management of the stroke unit (requesting improved quality of the reporting to a national clinical research database).
- The physicians (striving to obtain a more autonomous and efficient ward round).
- The nurses (wanting improved overview and coordination during nursing handovers).

The challenge is to comply with the premises and goals set at the national and political levels and by high-level organizational strategists; to align these premises and goals at the different levels represented by the stakeholders; and to argue how Participatory Design, with its direct involvement of end-users, is an effective means to manage, mesh, and meet the needs of these different interests.

Navigating and managing this complex set of multiple stakeholders in a political environment is a major challenge to Participatory Design approaches, as noted in other large-scale projects.[20] In our research, we experiment with using means-end hierarchies, known from cognitive systems engineering as part of a strategic analysis to identify and relate different stakeholders' interests.[21] Using such means-end hierarchies, we might, for example, make the following argument: (1) A national and political demand for increased structure in the EPR system (2) can be met by a stepwise change and incremental increase of the EPR structure, which again (3) can be initiated by introducing structure to the narrative part of nursing records, which (4) can only succeed if the categories fit the nurses' documentation practice, (5) all of which ultimately calls for a Participatory Design approach focusing on the nurses' work practices.

19 Clement and van den Besselaar, "A Retrospective Look At PD Projects;" Oostveen, and van den Besselaar, "From Small Scale to Large Scale User Participation."

20 Bødker et al., *Participatory IT Design*; Oostveen, and van den Besselaar, "From Small Scale to Large Scale User Participation."

21 Jens Rasmussen et al., *Cognitive Systems Engineering* (New York: John Wiley and Sons, Inc., 1994); K. J. Vicente, *Cognitive Work Analysis: Towards Safe, Productive, and Healthy Computer-Based Work* (London: Lawrence Erlbaum Associates, 1999); Bødker et al., *Participatory IT Design*, (especially chapter 5: In-Line Analysis Phase: Strategic Alignment Analysis).

Managing a Stepwise Implementation Process

A third major challenge is to effectively *manage sustained, large-scale, iterative Participatory Design experiments that form an overall stepwise implementation process.* This process includes managing individual Participatory Design experiments, as well as an overall stepwise implementation process that involves a series of such experiments. The latter introduces an important problem of representation: Our experiment was carried out in close collaboration with one clinical specialty. How well the results are transferable to similar specialties at other hospitals remains an open question.

Our Participatory Design approach entails conducting a series of experiments where functional prototypes are evaluated during real use, resulting in a stepwise implementation process similar to the technochange prototyping suggested by Markus.[22] A stepwise implementation process stands in contrast to the traditional way of managing large IT projects as a "design first then implement" process;[23] no iterations or improvisations are incorporated into the prevailing way of conducting competitive bids and formulating IT contracts. The argument for a stepwise process includes emphasizing the problems in the traditional process while pointing to the less risky aspects in a phased implementation process. However, phased implementation also introduces the challenge of managing an implementation process that acknowledges the need for improvisation.[24]

Participatory Design needs a strategy for managing this challenge. In our research, we investigate how to manage a stepwise design and implementation process on the basis of identifying and measuring the effects of using a system.[25] The sustained Participatory Design approach facilitates an iterative process managed on the basis of the effects of using a system: The desired changes can be specified in terms of the effects of the system's use, focusing on the work domain in question (e.g., to be able to complete the ward round alone). We have been successful in convincing managers in both the customer and vendor environment that such a sustained focus on effects is a promising idea and that it potentially leads to an effects-based commercial contract model, where the customer's payments depend on the effects that come from using the vendor's system.[26] This research, however, is a work in progress, and many questions are still unresolved.

Conducting Realistic, Large-Scale Participatory Design Experiments

A fourth major challenge concerns the *methodological question of how to conduct realistic, large-scale Participatory Design experiments* to evaluate prototype systems during real work. Our experiment raises two issues in respect to this challenge: the restricted timeframe for evaluations and the need to safeguard against errors.

22 Markus, "Technochange Management: Using IT to Drive Organizational Change."

23 Ibid., 17.

24 Ibid., 18.

25 Morten Hertzum, and Jesper Simonsen, "Effects-Driven IT Development: Specifying, Realizing, and Assessing Usage Effects," *Scandinavian Journal of Information Systems* 23, no. 1 (2011): 3-28. Hertzum and Simonsen, "Effects-Driven IT Development: A Strategy for Sustained Participatory Design and Implementation," in eds. K. Bødker et al., *Proceedings of the 11th Biennial Conference on Participatory Design: Participation – the Challenge* (New York: ACM Press, 2010): 61-70.

26 Morten Hertzum and Jesper Simonsen, "Effects-Driven IT Development: Status 2004-2011" in *Balancing Sourcing and Innovation in Information Systems Development,* ed. Morten Hertzum and Carsten Jørgensen (Trondheim, NO: Tapir Academic Publishers, 2011): 165-92.

The timing of real-life experiments is a trade-off between two perspectives:

- Evaluating early and quickly to acknowledge project deadlines, save resources, and curtail the diffusion of ineffective systems.
- Evaluating after a longer period of time to allow system errors to be corrected, users to gain proficiency, work practices to stabilize, use situations to reach their true level of heterogeneity, emergent and opportunity-based changes to develop, and long-term outcomes to emerge.

If a Participatory Design experiment is biased toward early and brief evaluation to honor the realities of IT projects, the consequences of various learning effects become critical to the interpretation of the experiment.

In our experiment, the trial period was five days. In this short period of time, none of the clinicians gained proficiency in using the EPR system, and their ways of working were thus in flux; meanwhile, their prior effective use of paper records was facilitated by long-standing work practices. The encouraging element is that some improvements could be identified after using the EPR system for only five days. However, longer trial periods are highly desirable because they, among other things, provide a means of getting beyond the goodwill that can be a factor in trying something new for a restricted period of time.

Special precautions against errors may be necessary to evaluate systems during real use. Participatory Design experiments involve a balancing of the benefits of evaluating prototype systems during real use against the confounding elements introduced because of the necessity of taking special precautions to safeguard against unacceptable errors. While experiments with real use increases validity and the possibility of unanticipated discoveries, special precautions may reduce validity. For safety- or security-critical systems, leaving users to a process of trial and error when they encounter situations not covered by training might not be acceptable. Thus, users must have immediate access to appropriate support during the entire real-use experiment.

In our experiment, the clinicians were supported by shadows, and certain parts of the EPR system were simulated by the back office using Wizard of Oz techniques,[27] where designers from the vendor played the "wizard" by simulating the system's transactions with other wards. These precautions were necessary because troubles and misunderstandings in using the system could have entailed risk to patient health. However, with these precautions in place, the EPR system could replace paper records for the duration of the trial period.

27 David Maulsby et al., "Prototyping an Intelligent Agent Through Wizard of Oz," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM Press, 1993), 277-84.

Conclusion

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.

We have suggested an ambitious and sustained Participatory Design approach, emphasizing that mutual learning situations should be provided during the organizational implementation of large-scale systems. This approach acknowledges the uncertainties of technology-driven organizational change and at the same time poses the challenge of treating the entire design and implementation process as a process of genuine development. Our sustained Participatory Design approach incorporates anticipated changes, as well as emergent and opportunity-based changes, as identified by Orlikowski and Hofman.[28] We argue for large-scale Participatory Design experiments that transcend traditional prototyping tests to evaluate systems as they are exposed to real work situations.

We have reflected on our experiences leveraging Participated Design in the Danish healthcare sector and have reviewed the important lessons learned. Four major challenges have been discussed: the establishment of appropriate conditions for Participatory Design; the handling of the different interests of a multitude of stakeholders; the management of an ongoing and stepwise implementation process, guided by a series of large-scale Participatory Design experiments; and the conduct of experiments during which the system is in real use, although it is still being designed as opposed to deployed.

So far, this approach has yielded promising results in the Danish healthcare sector. However, applying it also forces us to face the challenges described. It thereby raises a number of how-to questions that cannot be satisfactorily answered with general methodological guidelines. What we need is research—preferably action research—that refines this Participatory Design approach by applying it in a number of cases and thus stimulating the mutual creation and sharing of knowledge and experiences.

28 Orlikowski and Hofman, "An Improvisational Model for Change Management."