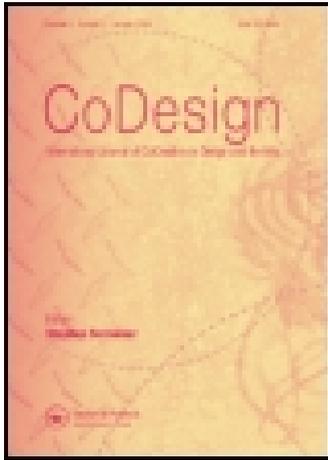


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Ole Sejer Iversen^a & Christian Dindler^a

^a Department of Aesthetics and Communication, Center for Participatory IT, Aarhus University, Helsingforsgade 14, Aarhus 8200, Denmark

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Sustaining participatory design initiatives

Ole Sejer Iversen¹ and Christian Dindler*

*Department of Aesthetics and Communication, Center for Participatory IT, Aarhus University,
Helsingforsgade 14, Aarhus 8200, Denmark*

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While many participatory design (PD) projects succeed in establishing new organisational initiatives or creating technology that is attuned to the people affected, the issue of how such results are sustained after the project ends remains an important challenge. We explore the challenge of sustaining PD initiatives beyond the individual project and discuss implications for PD practice. First, based on current PD literature, we distinguish between four ideal typical forms of sustainability: maintaining, scaling, replicating and evolving. Second, we demonstrate from a case study how these various forms of sustainability may be pursued in PD practice and how they can become a resource in reflecting on PD activities. Finally, we discuss implications for PD practice, suggesting that a nuanced conception of sustainability and how it may relate to PD practice are useful resources for designers and researchers before, during and after design processes.

Keywords: participatory design; sustainability; maintaining; scaling; replicating; evolving

1. Introduction

Participatory design (PD) has been hailed as not only a way of creating technologies that are attuned to people's needs but also as a way of changing practices and giving people a voice in technological development. Whether or not PD in general has been successful with these ambitious goals is difficult to answer. It is evident that the more or less direct involvement of people, in a variety of guises, has become common practice in many public and private institutions. However, it is also the case that although the PD literature has demonstrated some success in designing technologies and promoting democratic ideals, there are only a few studies that assess the sustainability of these results. Given that PD researchers and practitioners entertain ambitious goals that stretch beyond the immediate product, the issue of sustainability is a central, albeit underdeveloped, aspect of PD.

In this paper, we address the issue of sustainability within PD by proposing a more nuanced conception of what we mean by *sustainability*, and by discussing how various forms of sustainability may be pursued in PD practice. Although the issue of sustainability has been addressed within the PD literature to some extent, we suggest that a deeper understanding of how results from PD are sustained beyond the individual process is needed. In order to develop a more nuanced understanding of sustainability, we propose four ideal typical (Weber [1904] 1949) forms of sustainability: *maintaining*, *scaling*,

*Corresponding author. Email: dindler@cavi.au.dk

replicating and *evolving*. Each of these describes ideal typical ways in which the ideas, technologies or practices developed during a PD project may be sustained beyond the project. Based on our outline of various conceptions of sustainability, we turn to PD practice and explore how certain PD activities may promote different kinds of sustainability. To illustrate our points, we provide an analysis of a PD project dealing with the design of educational technology for the Country primary school. We focus on the coupling of the forms of sustainability pursued in the project and the PD activities undertaken. We conclude the paper by discussing how a more nuanced conception of sustainability may support designers and researchers in their practice before, during and after design projects.

2. Sustainability in PD

PD comes in many flavours, and although a modest common denominator may be a concern for how the people who will be using the designed technology come to play a critical role in its design (Schuler and Namioka 1993, xi), more ambitious aims are also pursued. These include improving quality of life and products, and promoting workplace democracy. The pragmatic argument for engaging in PD is that direct involvement of the people who are to become users leads to better products (Kensing and Blomberg 1998). The more political agenda has its roots in the Scandinavian Cooperative design tradition, where researchers engaged with workers and unions to explore alternatives to how technology might be designed for skilled workers. What was evident from many of these early Scandinavian projects was a focus on how technological development went hand in hand with organisational development (see Bjercknes, Ehn, and Kyng 1987 for further discussion). Although the societal and political landscapes may have changed significantly, parts of PD research still retain a commitment to exploring organisational development as an integral part of design.

As researchers or designers engage with more ambitious goals, such as ensuring that participants and organisations enjoy lasting gains from their participation, it becomes important to consider not only what happens during the project, but also what happens after the project has ended. In the PD literature, the issue of sustainability is, in a way, embodied in the fundamental understanding of the collaborative design processes as one of mutual learning. Robertson and Simonsen (2013) identify mutual learning as the central component in their understanding of PD as investigating, understanding, reflecting upon, establishing, developing and supporting mutual learning among multiple participants, in a collective 'reflection-in-action'. The process is according to Robertson and Wagner (2013) resulting in a well-functioning system or application, amenable to users' reconfiguration and redesign, to fit evolving use. Mutual learning is framed as a way of finding common ground, and ways of working in the PD process (Kensing and Greenbaum 2013), to build trust among participants (Bratteteig et al. 2013) and to share power within the project (Bratteteig and Wagner 2012). From a sustainability perspective, mutual learning provides designers with an opportunity to acquire knowledge of use practice, in order to determine which traditions are fundamental and sustainable, and which are outdated (Bødker, Kensing, and Simonsen 2004). As stressed by Bødker, Kensing, and Simonsen (2004), only when a design team has fundamental knowledge of existing practices will it be possible to arrive at what they call a 'sustained design'. In this respect, the objective of a sustainable design artefact (in a process of mutual learning) is already present in PD. However, as noted by Blomberg and Karasti (2013), it is still questionable whether and in what way the goals of mutual learning (knowing enough about each other's worlds to

enable the collaborative and cooperative design of workplace change) are achieved in PD projects at all.

Although PD may strive for processes in which participants become the driving force in the mutual learning process, researchers often (willingly or not) take on a central position where initiatives are bound to their presence in the project. When researchers leave at the project's end, there is a risk that momentum will decline and initiative will fade. The issue of sustaining PD has been addressed to some extent in the literature. Bødker (1996) argues that PD work is not only about project achievements, but also about putting the organisation in a position where experiences may be used beyond the project's end. This is echoed in the MUST method (Kensing, Simonsen, and Bødker 1998), where sustainability is one of the grounding principles in ensuring that new IT systems fit preferred work practices. Simonsen and Hertzum (2012) further this line of inquiry, arguing for a sustained PD practice in which IT systems are evaluated by exposing them to real practice. In order for the achievements of PD projects to be sustained over a longer period of time, Clement and Van den Besselaar (1993) note the importance of participants becoming 'animators', and that actors outside the individual project must learn and care about the project. A similar point is made by Carroll et al. (2000), noting how, in their long-term project, teachers changed their role from practitioner-informant to analyst, designer and coach for their colleagues in the organisation. Given that PD initiatives live on after the project's completion, the issue of where and how these have their impact is raised. Gärtner and Wagner (1996) discuss the challenges of bringing insights from individual projects to other arenas, such as the organisation and beyond. Complementing this work, Bossen, Dindler, and Iversen's (2010, 2012) studies suggest how PD initiatives may be sustained by more indirect channels, through the establishment of personal and professional networks that stretch across formal organisational boundaries. Perhaps most comprehensively, work in the Civic Nexus project has raised issues such as the importance of organisations developing self-sustaining learning processes, and the critical roles establishing and reinforcing social networks within communities (Carroll and Rosson 2007; Merkel et al. 2005). The idea of 'infrastructuring' has been used as a way of discussing the significance of these networks and social relationships in terms of sustainability (Pipek and Wulf 2009). Björgvinsson, Ehn, and Hillgren (2012) work on 'design things' continues the discourse of infrastructuring and demonstrates the importance of these socio-material assemblies in terms of creating enduring, self-sustaining collaborations.

An obvious challenge emerging from this line of research relates to what can be done during a PD project to ensure that initiatives are sustained, and perhaps even keep on evolving, after the project ends.

3. PD initiatives

PD projects form an inhomogeneous group to address and study, as they vary significantly on many parameters. Some PD projects seem to work from a pragmatic approach, whereas others lean towards political agendas. Although these are not mutually exclusive, they may fundamentally shape the form and ambitions of a given project. Furthermore, parameters such as the duration and nature of participation are by no means given. Projects also vary significantly in terms of scope and aims; in some cases, projects are conducted with a small group of people, allowing everyone affected to participate directly in the process, whereas in other cases, they are large-scale projects (e.g. Dalsgaard 2010), where direct involvement of all the people affected becomes challenging. In terms of the aims of a

particular PD project, there is also significant variation; some projects have as their aim that changes or technology developed during a project is maintained after the project ends. In other cases, the ambition may be that insights from a small project are brought to bear on a larger group of people, or that the project is merely the beginning of a longer process of organisational transformation.

Although there is significant variation in PD practices, approaches and aims, a hallmark of many PD projects remains that of addressing technology design and organisational change as fundamentally interrelated processes and results (Bødker 2003). This prompts us to consider more precisely what it is that we might want to sustain after a project ends. Initially, we may distinguish between sustaining the technology that is designed in terms of technical systems or design objects, on the one hand, and sustaining the organisational changes and ideas that have been developed during the process, on the other hand. These two aspects are, however, intertwined in more than one sense. First, they are typically co-developed, as new technology shapes the way people work or socialise, and vice versa; envisioning new organisational structures poses demands for new technology. Second, new design objects may come to function as representations of new practices. Not only do new design objects have use-qualities that shape our everyday practices, they also serve to remind us of the changes and ideas that brought them about. Although it is sometimes simply the case that a particular technical system, a practice or an idea is sustained from a project, things may be more complicated. It may be the case that complex constructs comprising physical artefacts, practices, and ideas are sustained after a PD project. In this paper, we use the term *PD initiative* broadly, to include physical objects, systems, ideas, practices and various combinations that can be sustained after a project. Initiatives may be both material and immaterial, and be more or less articulated and shared within an organisation or community. As we discuss later, initiatives may also evolve over time, and be transformed as they are brought into new situations.

4. Forms of sustainability

Based on our reading of the literature on sustainability within PD and related disciplines, we suggest distinguishing between at least four ideal typical forms in which PD initiatives are sustained: maintaining, scaling, replicating and evolving. We suggest that these forms are to be thought of as ideal types that do not exist in their pure forms, but may serve as lenses through which we can inspect PD projects, and begin to understand how sustainability is pursued and achieved. Moreover, they are not mutually exclusive – often, they are accumulative, in the sense that any form presupposes the prior one. These four forms of sustainability may be distinguished by looking at two parameters: the context in which the initiative is sustained, and the extent to which the initiative remains stable or is further developed once the project ends.

4.1. *Maintaining*

A first form of sustaining PD initiatives is that of *maintaining*. Maintaining relates to how the initiatives developed during a PD process are integrated into an existing practice after the project has ended. In the literature, Bødker (1996) frames this as the challenge of placing the organisation in a position where experiences from PD may be used beyond the project. Moreover, the importance of stakeholder engagement and ownership has been identified as important factors that support maintenance (e.g. Clement and Van den Besselaar 1993). Maintenance is arguably a baseline ambition for many PD projects; that

at least some of the initiatives developed during the process continue to exist after the project ends. This said, there are obviously varying degrees of maintaining initiatives. Often, during the process, it is the case that PD projects are successful in developing a wide range of ideas that are considered fruitful, some of which are pursued and some of which are more or less consciously abandoned owing to limited time, resources or commitment. Although maintaining initiatives might be a common goal of many PD projects, it is often less clear from PD studies how participants, researchers and designers work to achieve this, and not least, which initiatives are particularly important to maintain. While a PD project might be concluded by the construction of an interactive system that supports a community, it may be that the really important insight from the project was a newfound sense of coherence within the community, or a new way of thinking about their shared resources. As stated above, these may be closely connected, but in terms of maintaining initiatives it is interesting to see which of these aspects participants work to sustain, and how this is done.

As an ideal type, maintaining may be characterised as a form of sustainability where the initiative and the context of the initiative remain stable. The aim of maintaining is for initiatives to exist in the same way, and within the same context, after the project is completed.

4.2. *Scaling*

In many cases, PD projects have ambitions of bringing insights from the project to bear on a wider group of people. This ambition may also take on several forms. If it is hoped that insights from a small part of an organisation will impact the entire organisation, sustaining the initiatives may imply the challenge of scaling initiatives. Scaling up information systems or organisational insights from a potentially small group of participants to a wider organisation may not be a trivial task. Often, this process requires the involvement of management and other parts of an organisation or community. Gärtner and Wagner (1996) have discussed this challenge in terms of the various arenas of participation. Clement and Besselaar (1993) note that embedding PD initiatives within an organisation requires a broad political engagement with several managerial levels. As noted in the introduction, designers or researchers most often take on a central position in the project, and initiatives are bound to their presence. If the ambition is to scale up PD initiatives, it requires other people to have the necessary time and resources, and for them to take on the initiative.

As an ideal-type, scaling may be characterised as a form of sustainability where the initiative, in the form of an idea system, or way of working, remains relatively stable, but the context of this initiative changes, typically from a small group to a larger group or organisation.

4.3. *Replicating*

Looking beyond the individual group or organisation, lessons learned within a particular project may be useful to other groups or organisations. In this case, it may be useful to consider the extent to which PD initiatives are replicable in other settings. Although most PD projects value the particular over the general, the lessons learned and solutions developed may be valuable beyond the particular situation. Replicating PD initiatives shares several traits with that of scaling, in the sense that the challenge is one of bringing insights from one group of people to another. In contrast to the challenge of scaling, replicating does not necessarily imply that the insights are brought to a larger group of

people. It may be the case that results achieved among teachers and pupils at one elementary school may be achievable and desirable for a similar group at another school. Of course, there are often significant differences among schools, in terms of working practices, cultures and resources, meaning that replicating achievements from one context to another is not necessarily trivial. First, it is usually necessary to involve several layers of the organisation; management may need to approve the decision, and the engagement of teachers and pupils needs to be ensured. Second, it is vital that people be able to appropriate PD initiatives into their own practices.

As an ideal-type, replicating may be characterised as a form of sustainability where the initiative, in the form of an idea, system, or way of working, remains relatively stable, but the context of this initiative is changed from one context to another.

4.4. *Evolving*

Looking at a PD project as part of an organisation's ongoing development, the ambition may be that PD initiatives keep on evolving after the project ends. The PD project, then, may be seen as a catalyst for more continuous development. Based on experiences from the Civic Nexus project, Merkel et al. (2005) stress the importance of establishing and reinforcing social networks, and the idea of establishing self-sustained learning processes. Similarly, Björgvinsson, Ehn, and Hillgren (2012) stress the importance of socio-material assemblies to support enduring collaborations and Bossen, Dindler, and Iversen (2010) show how PD initiatives may evolve through indirect channels, creating networks across formal organisational boundaries. Moreover, Bossen, Dindler, and Iversen's (2010) studies illustrate that in the process of evolving, design initiatives are subject to change. What may have started as a material object is used by people as a springboard for developing more general ideas, and vice versa; abstract ideas developed during a PD project may be turned into tangible products later on. In the case of understanding sustainability as evolving, there is arguably an even greater need for mobilising resources within and outside the organisation, to ensure that initiatives keep on evolving. Practitioners and stakeholders need to support the initiative, and most often political support is needed.

As an ideal type, evolving may be characterised as a form of sustainability where the initiative, in the form of an idea, system, or way of working, is subject to change, or acts as a catalyst for new processes. The context of the initiative may also be subject to change, as ideas develop beyond organisational boundaries.

In sum, any given project may be driven by different ambitions concerning how PD initiatives should be sustained after the project ends. Maintaining, scaling, evolving and replicating, as discussed above, may be some of the ideal typical goals, and may also serve as lenses through which to appreciate the achievements of individual projects. In practice, these are obviously not neatly separated, but coexist and blend. For PD practitioners, one of the crucial questions is, what can be done during the project to ensure that PD initiatives are sustained in a desirable manner? In the remainder of this paper, we turn our attention to how PD practices may be seen as promoting various forms of sustainability.

5. Sustainability and PD practices

As we address the connections between PD practices and the various forms of sustainability pursued in a given project, it is important to clarify how we view this relationship between forms of sustainability and PD practices. One approach for

understanding this relationship is to map particular PD techniques and tools to discrete forms of sustainability. However, we argue that this would present an overly simplified picture of how sustainability is related to PD practices. By acknowledging that PD is an emerging and sometimes even unpredictable process, we suggest that a more nuanced conception of how PD practices are related to sustainability is needed. We propose to view the various categories of sustainability that we have presented as lenses through which we are able to appreciate how particular design events support sustainability. In practice, this means that a workshop where teachers and pupils develop future scenarios may include qualities that serve maintenance, but might also support scaling, replicating or evolving. Looking back on PD projects, this approach allows us to identify and appreciate activities according to their influence on the sustainability of the design initiative. Moreover, as PD projects often develop in unpredictable ways, it is necessary to acknowledge that while some PD practices may have been undertaken to maintain design initiatives, they may eventually turn out to play key roles in replicating or scaling PD initiatives. Designers or researchers may undertake a project with the intent of ‘merely’ designing artefacts and practices that can be maintained within the organisation, but as the project progresses, it becomes evident that the insights and ideas developed may indeed be applicable to other organisations, or may scale to a wider context. The point to be made is that, whereas a PD project may have an initial, strategic idea of the extent to which design initiatives should be sustained, this strategy may change as the project progresses. We use the ideal type categories of maintaining, scaling, replicating and evolving as lenses through which we can appreciate how particular PD events support various forms of sustainability, and not as discrete categories or fixed strategies.

6. CASE: the Litirum project

To exemplify how PD activities resonate with the suggested forms of sustainability, we present a case study from our own PD portfolio. We point out how well-known PD activities, such as participant observation, workshops, collaborative prototyping and storyboarding, can support sustainability. Moreover, we will include activities often considered outside the core PD repertoire, such as dissemination of results and political engagement, as important for the sustainability of PD initiatives. Some of these activities cannot be planned, or reduced to a formula. Nonetheless, we stress that these activities are important to the sustainability of PD initiatives.

In August 2012, the Participatory IT Centre at Aarhus University initiated the Litirum project, a 10-month PD project. The aim of the project was to investigate how social media could support the exchange of formal and informal learning among teenagers at primary schools. Our work extended the idea of learning environments that combine subject matter teaching with everyday experience (Hedegaard, Edwards, and Flear 2012), and we envisioned social media as a bridge between these two forms of knowledge acquisition.

The Litirum was funded by the European Union through the European Regional Development Fund. The project was highly interdisciplinary, involving researchers from computer science, anthropology, architecture and pedagogy. Moreover, two commercial partners were invited to join the project: a company specialised in augmented and physical learning environments, and a software company with experience in online learning environments participated in the entire design process. The commercial partners were invited to the project to ensure that the prototypes developed could later be matured for commercialisation.

The reason for choosing a participatory approach to the design task was threefold. First, we wanted to engage children, teachers and school management in the design process, to integrate existing knowledge of augmented learning environments into the design project. From this perspective, our design partners acted as informants, to ensure that the design outcome would eventually fit into existing teaching practice, and into the lives of the teenagers. Second, a PD approach was chosen to initiate a mutual learning process among our commercial partners, and the teachers and students. We wanted the commercial partners to learn about existing learning practice from the teachers and students, to make them reflect on how the technology could potentially support and develop existing learning practices. This also offered teachers and students the opportunity to learn about future technology. Finally, we chose a participatory approach to investigate whether novel technology could be sustained within existing school practice, by engaging a corps of teachers, students and school management as our design partners. Strong claims have been made for the potential of new technology to transform teaching and learning in schools (e.g. Lowe and Schnotz 2006; Mayer 2009; Spector et al. 2008), but only a few of them have been supported by research documentation (Mayer 2010). By applying a PD approach, we wanted to study how technology is introduced, developed and sustained in a school context, through active participation in the design process.

The backbone of the Litirum project was composed of seven collaborative workshop activities, held in parallel strands, at two elementary schools. Between these events, internal research and design workshops took place among members of the research team, our commercial partners and school management. Each school workshop engaged 16–80 pupils, and 5–10 teachers and school administrators. In all, about 120 pupils and 25 teachers and administrators took part in the Litirum project for a longer or shorter period of time. The Litirum project developed a social media application called ‘Narrify’, to support pupils in sharing knowledge with peers in and outside of school. A more thorough account of the Litirum project design process is provided in Smith et al. (2013).

In the following sections, we present examples of PD activities from the Litirum project that were envisioned as supporting the various forms of sustainability presented earlier. The Litirum project was chosen, as it incorporated elements of all four forms of sustainability. As the project is recent, our aim is not to retrospectively draw conclusions regarding the extent to which the activities undertaken in the Litirum project did, in fact, end up supporting sustainability. Our aim is suggestive and illustrative; to suggest that concerns for sustainability may be transformed into concrete PD activities, and to illustrate how a nuanced conception of sustainability may be a resource for discussing the means and ends of PD activities.

6.1. *Maintaining*

As presented earlier, ‘maintaining’ covers the ambition of integrating initiatives developed during a PD process into existing practice, once the project is concluded. In the Litirum project, successful maintenance of the PD initiatives would mean that the application developed during the Litirum project would eventually become a part of the digital learning resources used in the two school environments. To support this ambition, we identified three key challenges to address during the process:

- (1) the PD initiative should be anchored in participants’ existing practice, in order to be considered meaningful;
- (2) the participants should be able to identify their own interest in the project, to take ownership of the outcome and

- (3) a new technology should be introduced as a way to realise new opportunities within the existing environment.

Reflecting on the Litirum project, several workshops, design meetings and meetings between school management and researchers addressed these three challenges. However, one intervention in particular exemplifies the efforts made to share ownership and support anchoring in the existing practice.

One month into the Litirum project, a workshop was held to explore motivational aspects for integrating informal learning practices into the formal school system. Apart from the research team, 16 sixth graders, 6 teachers and 5 members of the school management participated in the ‘Garden of Motivation’ workshop held in the central indoor square at a local school.

The Garden of Motivation workshop was initiated to motivate reflection on existing school practices among our participants. We asked the participants (teachers, school management and pupils) to bring an indicative scenario (Carroll et al. 1998) detailing a good personal experience, or learning experience, that connected their private lives and the school. Based on the storyboards, we facilitated discussions in groups of four pupils, about the values and meanings underlying their experiences, their motivation for choosing particular events and the relation between their everyday lives and the school. Through the discussions, we helped the pupils make individual or collective motivational statements. The statements were written on motivation cards, and planted in a potted plant containing QR codes linked to a Facebook site established for the project.

Eventually, a garden of participants’ motivation cards emerged, as (see [Figure 1](#)) each participant placed a plant and presented their motivation card to the whole group, who were instructed to acknowledge the statements they liked. Having established the garden, all participants wrote their names on the motivation cards they supported. The process of planting and liking motivational statements was intended to establish shared ownership



Figure 1. Participants planting a statement in the shared garden of motivation.

and commitment among the pupils, teachers and designers, and to anchor the PD initiative in their existing practice.

After the workshop, the participants were asked to scan the QR codes, join the Facebook group, and upload a picture of their plant from their homes or classrooms. This was a way of maintaining their motivation, and integrating their contributions into a shared space for collaboration.

As the motivation cards supported ownership and anchored the Litirum project in existing teaching practice, we used them as basis for all Litirum-project-related activities. During the next workshops, they were used as a starting point for exploring how current school activities (and physical spaces) could be developed to create new motivating learning environments by use of technology. The children envisioned new learning activities in optative scenarios (Carroll et al. 1998), and furthered their understanding of current and future learning environments in dialogues with teachers and designers. In this way, new technology was introduced as a way to realise new opportunities within existing practice, and directly linked to their motivation for learning (as formulated in the motivation cards).

The garden of motivation is an illustrative example of a PD activity aimed at establishing ownership among participants, and anchoring new technology in existing practices. Supporting ownership and commitment throughout the entire process is important for maintaining the PD initiative after the PD project ends.

6.2. *Scaling*

Scaling up information systems or organisational insights from a small group of participants to a wider organisation demands attention throughout the entire PD process. In the Litirum project, the idea of scaling the Narrify application from sixth graders to the entire school was on the agenda from the beginning. In retrospect, this focus on scalability brought about a concern for:

- (1) identification and engagement of the key stakeholders;
- (2) creating visibility, accessibility and interactivity of PD activities in the organisation;
- (3) supporting the fertilisation of PD outcomes in the organisation and
- (4) opening the PD process and outcomes to a general critique.

In the initial stage of the Litirum project, we conducted several visits to the two schools involved, to match expectations with the principal, the teachers and the pupils. As we progressed through the planning process, the school principal extended the circle of staff members who would be directly involved in the design process. As the project was highly dependent on the school's existing hardware platforms and WiFi resources, an IT manager was recruited for the project. School management also handpicked a group of teachers to participate in the project. According to the principal, the selected group of teachers possessed the ability to not only reflect on their own teaching practice but also to move the entire teaching staff in the direction of a shared goal and changed practice. Recruitment through dialogue with the school staff was an important means of establishing a core group of stakeholders that could eventually communicate, and perhaps even pioneer, the PD initiatives to colleagues and pupils.

All design process activities in the Litirum project were conducted at the school's square (see Figure 2). During the workshops, staff members and pupils could approach the people involved, and ask questions about the development of new learning activities and



Figure 2. Dissemination to 100 pupils and teachers at the school's square.

new prototypes. Not only did this open-access design process affect the dissemination of the design findings during the workshop, it also trained the design participants to claim ownership, by communicating project findings to other pupils, teachers and parents passing by the workshop activities. During one of the workshops at the square, teachers, researchers, programmers and pupils developed 10 cardboard and paper mock-ups of a new, hybrid learning environment. To communicate how technology might effect the physical school environment, we invited 100 pupils and 8 teachers to critique the design proposals. This was done not only to enrich the early mock-ups with additional input, but also to communicate knowledge gained in the project to a larger audience.

The final evaluation of the Narrify prototype was conducted among 78 sixth graders. During the entire evaluation phase, a 60" screen with Narrify highlights was mounted on the wall in the school lobby, to communicate how the prototype progressed, and how the application was slowly appropriated as a tool for learning among sixth graders and their teachers. The Narrify application was evaluated at a very early stage. Thus, technical, conceptual and content-related challenges emerged during the evaluation sessions. These challenges were reported by pupils, teachers and school management, and eventually used as a basis for the development of a new version of the Narrify application. The openness and early evaluation of the Narrify application was a way to open the PD project to the entire school, and thereby slowly encourage teachers and pupils not directly engaged in the Litirum project to participate in the development of Narrify.

By carefully recruiting project stakeholders in a dialogue with the school, and by providing an open, accessible and interactive prototype for the entire school to critique and interact with, we aimed to support the eventual scaling of the Litirum project.

6.3. *Replicating*

Earlier, we introduced the idea of replicating PD initiatives to focus on how a result from a particular PD project may be useful to other groups or organisations. PD projects typically

value the particular over the general; however, the lessons learned and solutions developed may be valuable beyond the particular situation. In the Litirum project, two schools were selected as our design partners. However, we recruited a third school, from which school management, a teacher and four students were invited to the project, to participate in the workshop activities. The third school was enrolled to explore how the findings of the Litirum project would replicate in other school settings.

To support replication, we identified three challenges in the Litirum project:

- (1) Provide accessibility and transparency in the ongoing design activities.
- (2) Legitimise participation of ‘outsiders’ in the design activities.
- (3) Scaffold knowledge exchange and collaborative reflection among participants.

During the design process, we introduced a shared Facebook group, to keep participants and stakeholders up to date on our activities, and to discuss emerging themes as they unfolded during the process. Our primary concern was to establish a shared meeting place for participants and designers, where they could discuss design-related issues between the design interventions. Here, participants could browse and comment on workshop findings that were uploaded to the Facebook site during each workshop session (see Figure 3). The Facebook group was also a place for Q&A sessions, where researchers could gain more knowledge of specific topics that had emerged during a design workshop, or participants could ask questions regarding the progression of the design process. More interestingly, Facebook also supported external communication, providing outsiders with legitimate access to exploring findings and design decisions that eventually lead to design choices. Thirty-seven followers used the opportunity to ‘peep through the keyhole’ of the Facebook site, and thereby gain a glimpse of how the Narrify application progressed. It was our belief that access to the design decisions as they were made would be a valuable asset when replicating PD findings in another setting.

Another and very literal way of pursuing replicability in the Litirum project was the enrolment of the four pupils and a teacher from a neighbouring school to participate in the

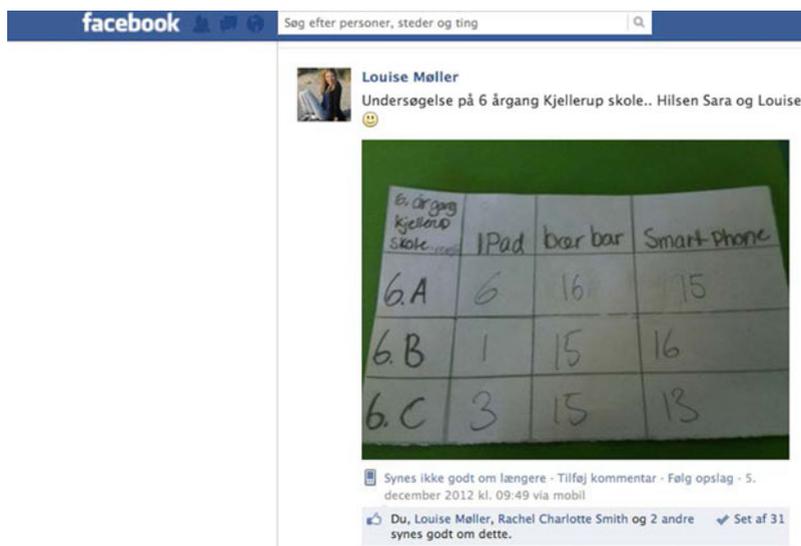


Figure 3. Sara and Louise (13 years of age) made a survey of technology used in the sixth grade, and posted it on Facebook.

design process. By being legitimate participants in the design process, the teachers and pupils could bring back knowledge gained in the design process and eventually use this knowledge in their own school. During the process, school management facilitated Skype meetings between teachers and pupils representing two very different school environments. During these Skype meetings, the teachers and pupils exchanged concerns and experiences related to social media, knowledge creation and production, and on formal and informal learning environments.

6.4. *Evolving*

The final form of sustainability that we address is that of evolving, where initiatives from a project become a catalyst for ongoing development. The ‘snowball effect’ of PD projects has already been discussed, and is valued within existing PD research as one of the important outcomes of a PD process (e.g. Bødker 2003). In the Litirum project, evolving was primarily supported by efforts to:

- (1) provide visible and accessible outcomes for others to pick up and use;
- (2) support network activities among project partners and
- (3) include dissemination activities as a core PD activity.

As the Litirum project slowly matured from sketchy design ideas to interactive prototypes, we gradually communicated project findings to a larger audience of politicians, decision-makers and domain experts, through various media. We explicitly addressed the way in which project findings, such as the use of social media to connect formal and informal learning spaces, might affect future educational settings, and encouraged a larger audience to consider the effects of augmented learning environments. As a supplement to research papers, we wrote articles for publication in journals for educators, to initiate public debates. By integrating these activities into the PD process, we provided visibility and accessibility to our project outcomes for others to discuss, challenge and follow.

As a part of our PD approach, pupils, school management and technology experts worked together to formulate visions of technology-enhanced teaching and learning. However, every now and then, we deliberately separated our project participants into subgroups, to encourage discussion among peers. Here, school management could have in-depth discussion about challenges related to budgets and spending, hardware purchases and new ways of organising the school day according to project findings. The pupils would discuss how this ‘schoolification’ of their spare time would affect their life more generally. The reflection among peers was a valuable part of the evolving initiatives within the Litirum project. Here, new initiatives could be discussed and reflected on, according to current challenges and state-of-the-art knowledge. The establishment of new networks among project partners provided each member of the project team with support for communicating project findings to other networks and forums.

The open communication strategy led to interesting invitations to lecture in different decision-making forums. We specifically accepted invitations from think tanks, teacher training courses and lectures for networks of educational consultancies, to disseminate findings from the Litirum project. In one public hearing, 600 participants, including teachers, parents, pupils, politicians and technology developers, worked with the outcomes of the Litirum project by relating project findings to their own understanding of educational environments. The entire event, with 600 participants, was recorded and made available on YouTube as an example for other municipalities to follow. By including

outreach programmes as a core PD activity, the Litirum project findings were shared and discussed to a degree that perhaps surpassed the true extent of the technological outcome of the project.

As stated in the introduction, the aim of our case study has not been to retrospectively evaluate the extent to which the activities undertaken in the Litirum project eventually supported the sustainability of the project initiatives. Neither do we claim that the activities discussed here are by any means the only ones that could support maintaining, scaling, replicating and evolving. Our aim is to suggest and illustrate that concerns for sustainability may be reflected in PD activities.

7. Discussion

As stated in the introduction, the aim of our case study is not to provide an evaluation of the Litirum project, to determine whether, or to what extent the project initiatives were sustained. Instead, the case study illustrates how concerns for sustainability were consciously pursued in a PD process. More specifically, we pinpoint the fact that actually, sustainability is not an inbuilt intent in PD methods, or something inherently covered in the mutual learning process. We perceive sustainability as a perspective of its own, cultivated by researchers throughout the entire PD process. The four ideal types of sustainability presented above (maintaining, scaling, replicating and evolving) offer a vocabulary for articulating the effort in which PD researchers engage when pursuing a sustainable design. The vocabulary does not imply any specific method or technique related to what Bannon and Ehn (2013) identify as the guiding principles of PD. Instead, the vocabulary guides the PD researcher when navigating and choosing among the values, virtues and principles of PD. As in our case, this was manifested in the choice of methods and techniques, where, for example, public dissemination and knowledge exchange were foregrounded. In general, the sustainability perspective does not fundamentally change the PD toolbox, but may influence the choice of method, how they are modified and when they are used.

By introducing a vocabulary for sustaining PD initiatives, we aim to provide a resource for PD practitioners to use before, during and after a project. Before a project, the ideal typical forms of sustainability may be used to articulate ambitions and strategies, and as a point of reference, when designing the design process. During the PD project, our vocabulary can provide a means of reflecting on the process according to the initial ambitions, and to evaluate the opportunities and obstacles that participants encounter. Comparing expectations with actual achievements may shed light on alignment, and eventually initiate new PD activities. Finally, we suggest that the conceptualisations may be used as a resource when evaluating PD with respect to how and to what extent they achieve sustainable outcomes.

In current PD literature, the role of the designer as a central actor and facilitator of mutual learning is well recognised. However, we believe that PD researchers and practitioners should also be committed to ensuring that people enjoy lasting results from PD projects. This entails a responsibility for making sure that PD initiatives can live on when the designers leave. Designers must be aware of how they enter a project, how they act in a project, but not least they should be aware of how they leave a project. In our case, efforts were made to anchor the initiatives in the existing organisation and to ensure that important actors inside and outside the project picked up the initiatives.

The Litirum project case study presented in the previous sections exemplifies the relation between concerns for sustainability and PD practice. It is notable that the four forms of sustaining are not mutually exclusive. In the Litirum project, numerous design

activities, such as storyboarding and prototyping workshops, served several purposes related to the sustainability agenda. We suggest that maintaining, scaling, replicating and evolving are ideal typical forms of sustainability that are highly interrelated, and even highly interdependent. PD activities that support the maintaining of a PD initiative may also be prerequisites for scaling, replicating and evolving. If the teachers and pupils in the Litirum project failed, we would not be able to inform the think tank of project findings that led directly to the dissemination of the Litirum project to a broader audience through the public hearings. Being mutually interdependent, the four forms of sustainability provide PD practitioners with a language for articulating different aspects of sustainability that emerge during a PD project.

As illustrated by the Litirum project, pursuing various forms of sustainability in PD does not necessarily correlate with the use of particular PD tools or techniques. Rather, the existing repertoire of PD tools and techniques may be applied in pursuit of all the mentioned forms of sustainability. In the Litirum project, scenarios and storyboarding techniques were used to establish a shared understanding and commitment to the project (maintain), to strengthen the communication with peers inside the school (scale) and to disseminate project findings to other schools, decision-makers and other external stakeholders (replicate, evolve). Although we do not see a direct correlation between specific PD techniques and ambitions of sustainability, our categorisation of sustainability does entail viewing political work and dissemination activities as integral parts of PD. If the aim of a PD project is for initiatives to scale or evolve, then politics and dissemination should be considered core PD activities. During the Litirum project, we did not differentiate between core design activities (such as prototyping workshops, co-design events and internal design meetings), political work (think tank talks) or dissemination activities (local hearings, presentations in mass media). Rather, we envisioned PD activities as a unified political, communicative and designerly endeavour in which all components are important.

Although we have used the Litirum project to exemplify all four aspects of sustainability, it is obvious that not all projects need address this span. It should not be regarded as a scale where the aim is to necessarily cover everything. In some cases, it may be preferable to focus on maintenance, and not be concerned with scaling or replicating. Moreover, as PD projects may develop in unpredictable ways, there may be a significant drift in the ambitions. What may have started as a modest project with the aim of maintaining a new system or practice may be picked up and replicated by others, and evolve. The point is that the four categories are not fixed – although it is probably useful to initially discuss the ambitions of a project among stakeholders, these ambitions tend to change as the project progresses, and new opportunities and obstacles emerge.

The conceptualisation of sustainability that we have presented in this paper is drawn primarily from our reading of existing PD literature. We extend the insights reported, such as the importance of stakeholder engagement, and the construction and reinforcement of social networks. What we offer in this paper is a more nuanced conception of what sustainability could mean in a PD project. Moreover, we have illustrated how various concerns for sustainability may be pursued in PD practice – not in the use of particular techniques or tools but as a way of appreciating the potential of the existing PD repertoire.

8. Conclusion

Sustaining PD initiatives beyond the individual project is an important challenge for PD researchers and practitioners that wish to engage with ambitious goals of ensuring that

organisations and participants enjoy lasting gains from their participation. In this paper, we have suggested a more nuanced conception of sustainability in PD, by presenting maintaining, scaling, replicating and evolving. These are the four ideal-typical forms of sustainability that resonate with central insight from the PD literature. Through our case, we illustrated how these various forms of sustainability may be pursued in PD practice and may be supported by the existing PD repertoire of techniques and tools. We are not suggesting new tools as such, but a way of appreciating, appropriating and adjusting existing ones. Moreover, the case illustrates how this conception of sustainability may be a resource for reflecting on PD activities. This applies before, during and after a PD project, where the conceptualisation of sustainability offered here provides a resource in terms of reflecting on project ambitions, progress and the results that are eventually achieved.

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Note

1. Email: oiversen@cavi.au.dk

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