

# Third-Wave HCI, 10 Years Later— Participation and Sharing



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Almost 10 years ago I gave a keynote at NordiCHI in which I discussed the second and third waves of HCI [1]. I chose the topic due to a general frustration over whether the third wave was about to throw out the baby with the bath water, discarding what was useful in the second wave. Here is my interpretation of the three waves: The first wave was cognitive science and human factors. It was model-driven and focused on the human being as a subject to be studied through rigid guidelines, formal methods, and systematic testing, as discussed by Liam Bannon [2]. He talked about the move to the second wave as that

“from human factors to human actors.” In the second wave, the focus was on groups working with a collection of applications. Theory focused on work settings and interaction within well-established communities of practice. Situated action, distributed cognition, and activity theory were important sources of theoretical reflection, and concepts like context came into focus in the analysis and design of human-computer interaction. Proactive methods, such as a variety of participatory design workshops, prototyping, and contextual inquiries, were added to the toolbox. In the third wave, the use contexts and application

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## Insights

- In revisiting considerations of second- and third-wave HCI, participation and shared interaction emerge as new, important themes.
- The research center PIT has been focusing on shared interaction around “common artifacts,” involving the participation of several users rather than individuals disappearing into small devices.



Ekkomaten is an interactive installation that served as an interface with 18th century Aarhus, Denmark. The machine provides a soundscape where visitors can listen to different "echoes" from the past that have been "intercepted" by the machine.

types broadened, and intermixed, relative to the second wave's focus on work. Technology spread from the workplace to our homes and everyday lives and culture. Research in the third wave challenged the values related to technology in the second wave (e.g., efficiency) and embraced experience and meaning-making (e.g., [3]). Early on in the third wave, second-wave methods such as participatory design were questioned, due to the perception that they were dealing only with existing (work) practices and not with emergent use.

I was not alone in my thinking. It turned out that Harrison, Tatar, and Sengers did an almost parallel analysis [4] to my NordiCHI keynote. Finalizing the analysis 10 years ago, I raised a number of challenges to HCI in the years that were to come. In the following discussion, I'll take stock of the developments of the past 10 years and use the challenges to talk about our current research at the Center for Participatory IT (PIT; see sidebar on page 28), seeking lessons learned and further challenges ahead.

## TEN YEARS LATER

Here are a few thoughts about what has happened with technologies and our understanding of them over the past decade: The iPod Nano recently had its 10-year anniversary, which illustrates that we have come a long way in terms of mobile devices, particularly smartphones, which integrate phones with music and video streaming, Internet, and more. Facebook and other social media add to this picture of technologies that reach into all corners of life. These developments also touch upon one of the concerns of 10 years ago, namely that much of the development has focused on consumer technology—for “the rest of life,” as I called it—whereas the development of innovative technology for work has been much less of a focus than it was in



The Ekkomaten machine in the city square, Aarhus, Denmark.

the second wave. This is not to say that work technology has not developed in this period; rather, it seems to have done so mostly as a continuation of things like Web technology and by integrating smartphones and other mobile devices.

In the keynote I argued that we were facing new, multiple, experience-oriented technologies across life and work. These were seen as so open that we needed to do technological experiments to understand which questions to ask. At the same time, I pointed out that it is important to not just “dump” technology on people—which, unfortunately, is what has happened in this period. Subsequently, one of the questions that remains is *whether we have become better at studying these multiple, experience-based use situations, methodically, empirically, or conceptually*. A number of authors, especially in the ubicomp field, have argued for the need for “in-the-wild” studies (e.g., [5]). Yet in my work with Matthias Korn we discuss how in the wild alone does not solve these methodological challenges, and how we often need to work more directly with technical experiments and participatory prototyping, for simple reasons of time,

complexity, and the fundamental open-endedness of the design space [6].

In the second wave, and regarding work technologies, research paid a lot of attention to *cooperation, learning, and participation*, which I predicted would be lost in the third wave with the increase in “rest-of-life technologies.” As a matter of fact, the whole fields of computer-supported cooperative work (CSCW) and participatory design (PD) developed largely as second-wave responses to these challenges. In my keynote I suggested that in bridging between the second and third waves, there was a need to strike the balance differently between individual experience (third wave), on the one hand, and sharing, learning from each other within communities of practice, and participation in shared development and appropriation of technology (second wave), on the other. In my work with Ellen Christiansen and Clemens Nylandsted Klokmose, we have studied appropriation and longer-term development of use among people using iPhones [7,8]. We point out both the shared and explorative phases that are part of this development, and how the iPhone moved from a fancy telephone to, for example, a highly individual “poetry machine,” in the hands of one of the interviewees [7].

In my keynote I discussed how we could understand components that come from outside the context of the immediate configuration of technological artifacts. I proposed that we needed to understand and combine different levels of tailoring and integrating to develop such

**What does it mean to bring the common artifact out of the purpose of physical, practical coordination and into the work of computer-mediated activities and artifacts in civic and artistic communities?**

configurations, and suggested participation of, and cooperation between, different users in this reconfiguration process. I concluded that end-user programming by individuals needed to be replaced by a wider look at the configuration of multitudes of artifacts. This issue has been picked up in the meantime by several authors who use Karen Ruhleder and Susan Leigh Star's idea of infrastructure and infrastructuring [9] to embrace the notion that technologies are appropriated and reappropriated into networks of technological infrastructures and use situations [10,11], or use participatory methods to rethink design in these cases [12].

In the conclusion of my keynote, I pointed out that "the second and the third wave seem to be stuck on either side of the divide between work on the one hand and leisure, arts, and home on the other; between rationality on the one hand and emotion on the other. While development on either side may lead toward a true third wave, I don't believe that we will get there until we embrace people's whole lives and transcend the dichotomies between work, rationality, etc. and their negations." I picked up this idea with Erik Grönvall in a discussion of calendars as a vehicle for planning and coordination between families and professionals such as caregivers [13]. This work points toward new connections between rationality and emotion, between work and leisure. The paper also addresses how it is necessary to better understand the technologies that mediate relationships between people in and across such situations. We also discuss the difficulties of designing in this space through the participation of users with such a multitude of backgrounds [14,15].

In summary, the challenges of third wave meets second wave, 10 years later, pivot around how design may utilize the bringing together of technologies, experiences, and users across domains, some of which are work, others not, as well as how we may conceptualize and study these open-ended relationships. I have sketched how some elements of this discussion have developed over the years. Yet more questions have been raised, really, than have been answered. Since the technological possibilities as such are among the biggest changes, in the following discussion I will use

examples from our current research to discuss what we mean when we ask for open technological designs that invite participation, and conceptual thinking that helps us embrace people's whole lives and transcend the dichotomies between work, rationality, and their negations.

## INTERACTION AS COMMON—INTERACTION IN COMMON

In much of my recent work, I have been interested in understanding and conceptualizing multitudes of artifacts and the ways in which they mix in activities that people do together. Colleagues and I have talked about artifact ecologies and looked at how technological artifacts are brought together in configurations that change over time, due to people's changing needs and to things such as new technological solutions becoming available. In the 2012 paper with Klokmose, we noted that "[i]f we think of the artifact ecologies we surround ourselves with, they most often consist of multiple artifacts built for similar purposes but with slight variations and no clear delineation of when to use which artifact ... Artifacts come and go; they can break and be replaced, or their function becomes obsolete due to changing circumstances, activities or because of newly acquired skills" [8]. In this work we propose that users' shared capacities and experiences are not just based on individual acting and learning in the world; rather, they are bound to shared practices, joint activities, and so on, in artifact ecologies. It is against this background that the relationship between the user and the artifact exists.

Thus, artifact ecologies, more than actual sharing of artifacts, help us focus on multitudes of artifacts that users bring together when carrying out particular activities. Differences and similarities between sharing and holding in common were discussed extensively in CSCW in the 1980s and 1990s, when Mike Robinson pointed out that having and holding in common means to have access to and to use, without specifically using together all the time and for the same purpose [16]. In this debate, he introduced the idea of *the common artifact* to help us understand what it means to share artifacts. Robinson presents a classical hotel keyrack as a prototypical example of a common artifact:

*Guests can leave and collect their keys: can see which other guests are in or out, and leave messages in the pigeonholes. Hotel staff uses it to communicate with their colleagues, and place bills, faxes, etc. to be given out to guests. The presence of keys, or contents of pigeonholes, conveys information, and may be the subject of questions or discussion. Some operations are considered legitimate, while others are not: Usually only the receptionist can place keys or messages; keys have to be hung over appropriate numbers; etc. The keyrack is a model of the hotel, mapping the rooms. A glance at the keyrack in the late evening gives an overview of the hotel occupancy. Yet this keyrack is not foolproof, nor is it 'active'. There is nothing to prevent keys being hung in the wrong places, or lost. It can be used in many idiosyncratic ways—probably violating the recognized procedures. Conversely, there are certain things about a keyrack that are fixed,*



When pointed at a specific location, say a church or city building, "echoes" emerge.

*like the positions of the hooks. It is simply not possible to hang a key between two hooks, as there is nothing to hang it on. So potential uses are a result of physical properties, local conventions and rules, and situated activities [16].*

In this description, Robinson pays little attention to other artifacts in the ecology surrounding the hotel keyrack. The notion of artifact ecology adds to the common artifact a focus on multiplicity, and on learning as happening together. The hotel keyrack needs to be understood in relation with other artifacts used by people in activities relating to the keyrack (cleaning, leaving messages, etc.). And the learning to use the keyrack in whatever form happens together with other users who already use the keyrack. The hotel keyrack places itself on the boundary of work and non-work. Accordingly, the ideal of the hotel keyrack as common artifact is still interesting when we want to better understand the participation of many people/users, who do not necessarily share purposes, around a central artifact that they use and maintain.

What does it mean to bring the notion of the common artifact out of the purpose of physical, practical coordination in a hotel and into the work of computer-mediated activities and artifacts in civic and artistic communities? Would the idea be useful in understanding what it means when people engage together, through technological artifacts, in creating something that they have in common, such as a political debate, a local neighborhood story, an art curation, or an art piece itself—all examples from what we have worked with in PIT?

## CURATING ART IN COMMON

To further explore how to support collaborative or participatory art curation, we built Local Area Artwork (LAA), a ubicomp system to explore location-specific collaborative text production in a local space [17,18]. We worked with a contemporary art venue, specifically with one exhibition by a local art collective. In this work, and in collaboration with artists and curator, conventional curatorial descriptions were replaced by collaboratively written texts on digital panels. The conventional curatorial descriptions of artworks placed in the art gallery were replaced by texts on digital panels,

## PIT PRIORITIES

The Center for Participatory IT (PIT; pit.au.dk) has strong roots in the Scandinavian participatory design (PD) tradition, which combines the areas of technology development and use with a broader interest in participative practices in the workplace. With IT in recent decades diffusing from the workplace to people's everyday lives, PD practice and research face new challenges that reflect new communities of IT use, as well as technological developments. For our research, we seek those primarily in artistic and civic communities who are almost by nature blurring the boundaries between work and non-work. In PIT, the belief is that interaction needs to be understood and addressed in the context of people being together and sharing. This continues the long tradition of HCI research in Aarhus, where we have focused on the theoretical and empirical challenges involved in people doing things together. Pragmatism, semiotics, and activity theory have all helped draw attention to this work. In order to develop the foundation for understanding alternative forms of thinking and for supporting participation through IT, we propose a shift from participation in design (PD) to IT support for participation in all aspects of life. PIT brings together research in a unique combination of arts/humanities/aesthetics and computer science to tackle the challenges identified, with the goal of moving beyond classical interdisciplinarity as it is commonly understood in HCI.

collaboratively written and rewritten by visitors during the exhibition using their personal mobile devices as mediators. The system detected when visitors were in close proximity to an artwork and redirected their browsers to the respective editable text. With LAA, a part of the usual curatorial activity of authoring interpretive descriptions for artworks was opened up for participation by anyone in the space—visitors, artists, curators, and staff. They participated through their collaborative interpretation of artworks—or whatever they chose to add—and the format was basically that of a one-page co-produced text to be edited and re-edited.

Hence, LAA was making the existing interpretive role of the audience explicit and visible by enabling co-interpretation among audience members in the physical space. The use

of phones had familiar yet surprising features that challenged the here-and-now togetherness of people in the exhibition space. People felt that instead of discussing art with those that they were with, they were focusing on their cellphone and a discussion with people who were not present, and whom they did not know. At the same time, the phones were familiar yet used in a new situation, interacting with something (the text, the art piece, or the artist, perhaps, as discussed in [17]) that was not clear to users. While the panels shifted the relationship between the art pieces, the curation, and the discussions of the audience, they were not perceived or appropriated in the gallery in the way it had been imagined. In my paper with Anna Marie Polli we introduced the Facebook wall as a metaphor to illustrate how users perceived the text—as a flow of comments rather than as an open, yet coherent, piece of curational text [17]. And even though the timeframe was short, it seemed that the panels were appropriated by the audience as a discussion flow more than as a piece of text. This was at the same time problematic because the panels forced users to delete text once the size of the text exceeded the one “screenful” on an iPad.

In terms of participation, the panels seemed to shift involvement, engagement, commitment, and group action from happening among a group of visitors toward an engagement that was, on the one hand, for people individually (drawing attention away from the group), and, on the other hand, for involvement with and commitment to other groups—either other visitors over time or groups of artists, curators, and staff.

Accordingly, if we look at the LAA as a common artifact, it supports multiple actions and activities/purposes; in particular, text can be produced (locally) and read (locally or on the website). The curatorial text could be handled by more users, mainly over time, through their own individual telephones. This means that users found it slightly confusing *whom* they were interacting with and about what. This shifted the focus from people who were together to people who came after, or were absent, and people were confused about whether they were communicating with other spectators or with, for example, the artist. The role

of the artist, the curator, and others was unclear and invisible. In that manner, the orientation around the common artifact was for only those co-present in the location, whereas other users were left more obscure.

How might we find ways of making it clearer what people hold in common, in particular the shared meaning in such use, where people come and go, where both professionals and non-professionals play a role, and where it is desirable for users to interact through well-known artifacts?

## CREATING COMMON MEANING

To further this discussion, I'll look at an additional example from PIT. Ink is an interactive literary installation (Ink – “Accidentally, the Screen Turns to Ink”) designed to encourage the public to engage with digital literature [19]. Through their engagement with Ink, people could individually or collaboratively produce poems by manipulating three physical books embedded with sensors. The books enabled users to select floating sentences and move them toward a digital “sheet of paper” to produce a poem, visualized on a large display. When the poem reached 350 characters, Ink finished the last sentence chosen and printed the poem for people to take home. The poems also appeared on a blog where people, in real time, could read their own and others’ poems and comment on them. Ink has been exhibited at several libraries, conferences, events, and festivals, and a collection of poems from Ink has been published. Currently, a new version of Ink is being developed for nationwide exhibition at libraries and as a platform for literary interaction in urban spaces, institutions, and organizations.

Ink shares with LAA that there are, underlying the immediate activity of the users, professional users, who in this case produced the sentences that can be chosen. In comparison with LAA, Ink provides a clear, shared object upon which one or more users can act simultaneously through the handling of the books. People are invited to participate by being able to watch others and by the books themselves, which are easily picked up. While books are well known to people, the way they are handled here is different, and they provide a different kind of access to texts than



books normally offer. This contrasts with how LAA depended on users’ familiarity with their own devices, the smartphones. The idea of the common artifact—and not least its prototype, the hotel keyrack—offers visibility and sharability qua size, whereas familiarity, as in bringing experiences from other domains and settings, is not discussed. I'll return to this issue after further exploring the challenges of big, visible shared artifacts.

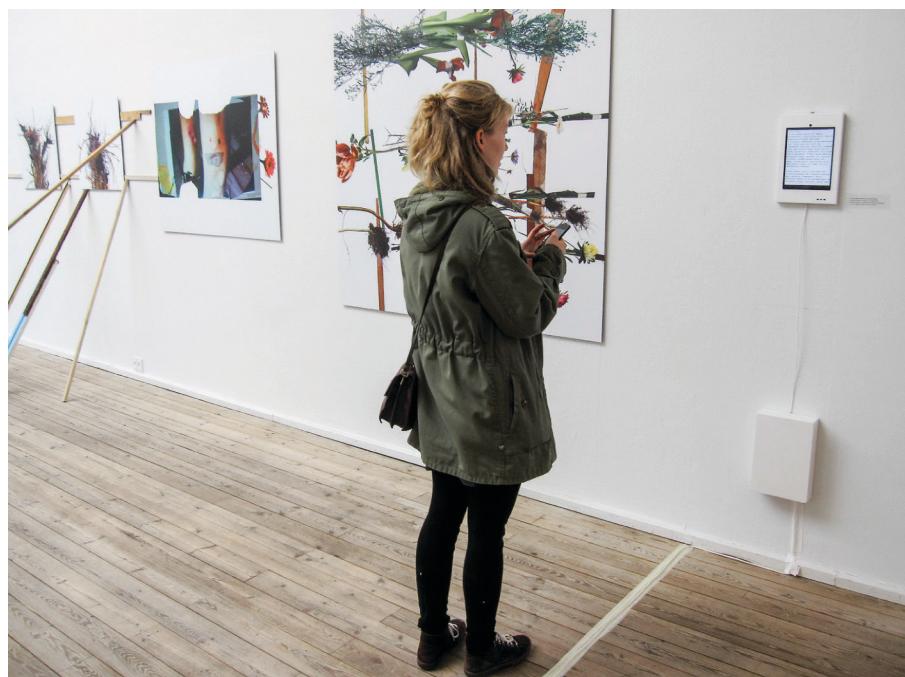
## INTERACTING THROUGH A BIG ARTIFACT

In PIT we have explored a couple of alternatives that offer big, visible sharing and orientation around an artifact, the first being the coMotion bench, a shape-changing bench designed as a probe to understand how people experience shape-changing

interfaces, as well as meetings between strangers, in their daily life [20]. The coMotion bench was modeled on a bench, where strangers hang out for periods of time. With its focus on strangers and loitering, the coMotion bench was in a sense without a specific purpose, in that the action it supported was mainly sitting.

Ekkomaten originally let people explore an 18th-century soundscape and six site-specific echoes tied to a physical location in a city [21]. The echoes were recordings of fictional stories inspired by historical events and dramatized as radio plays. In a later version, the Ekkomaten was also used to gather local histories in a nearby neighborhood. The Ekkomaten machine is a large turnable device with three wooden horns interconnected by rubber and metal tubes, supporting users in jointly orienting in the soundscape. Rotating the machine made it possible for up to four people to orient the soundscape and listen to the echoes at the same time through the headphones provided.

Neither the coMotion bench nor the Ekkomaten leave any doubt as to how users are to orient themselves around the device, since this is explicit and visible even to people watching the activity. Both devices invite new people in and offer some sort of immediate recognizability or affordance in terms of basic handling: One can be sat on, the other turned.



The Local Area Artwork (LAA) introduced art gallery visitors to a new technological artifact.



**Ink** is an interactive installation designed to encourage the public to engage with digital literature.

In both instances, however, it was less obvious what the shared meaning was, or what, underneath this navigation, people were sharing. Looked at as a common artifact, it seems that, like the hotel keyrack, it is the recognizability and shared orientation toward a “big thing” that puts this in common among users, more than it is a familiarity pertaining to past experiences and familiar routines.

### THE ROAD AHEAD

There is a strong tension running through the examples here: On the one hand, visibility; big, visible artifacts seem to invite people in and let them rather easily orient toward others, participate, and hence collaborate. On the other hand, the pervasiveness of everyday, mundane small devices such as the smartphone; people are familiar with these, yet their use, such as in the

gallery setting, creates distance to other people rather than co-participation, cooperation, and sharing. At the same time, big devices are not practical and do not seem to lend themselves to many uses. This makes it difficult to see how people should learn from them in a manner they can bring to other activities, in contrast to the location-based smartphone use of LAA.

The physical plays a major role in these examples as well as in the hotel keyrack; however, there are other important elements of the common artifact that are not primarily physical. Robinson talks about overlapping purposes and the sharing of meaning as essential, and these elements seem to pose major challenges in the current situation: Most of the examples do not clearly convey an intended purpose, meaning, or outcome to the users, and perhaps they are not able to. Ink

is different, yet even there it is not obvious that the users immediately understand where the sentences come from and how and why the artist brought them in. In LAA the roles of the professionals were even more pervasive, yet there were serious doubts among the gallery visitors as to whether they were participating in the action, mediated through the panels, or not. It seems interesting to explore such ambiguity further, and also if and how the roles of artists and curators could become clearer, without this being too explicit.

While these cases offer openness in terms of different forms of rationality, there is a challenge that none of them fully addresses: the shared and equal participation of professionals and “rest of life” users that the third wave paper wishes for and the common artifact notion deals with, though perhaps somewhat implicitly. In all these example the contribution of professionals, if any, is left opaque and in the background. This has consequences for when appropriation goes astray, as with LAA, when the attempt at participatory curation got reappropriated as an almost guest-book-like Facebook wall, most likely less valuable to the professional curators.

In the meeting of the second and

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**When sharing becomes a matter of engaging with other users through multiple common artifacts, it is also in and through this multiplicity that people participate.**

third waves, 10 years later, a challenge is to go beyond embracing individual experience as it develops over time when people carry out activities and use artifacts. The multiplicity of meetings of these experiences of professional and non-professional users, and the appropriation that happens during shared activities with common artifacts, needs to be added. From the analysis here, it seems that visibility is important for this. Visible handling of the many emergent forms of devices is one element of this that needs more exploration, and the visibility of meaning and meaning-making an equally important one. Orientation toward other people around the common artifact is not so much a matter of recognizing and reflecting on the here-and-now coming together of a group of users as it is a matter of how this unfolds over time, in changing and only partly visible configurations. This would seem to add new layers to both how we may understand appropriation and how we design and engage users in such design.

From this perspective, participation and sharing go hand in hand: When sharing becomes a matter of engaging with other users through multiple common artifacts, it is also in and through this multiplicity that people participate. They make meaning, they create outcome, and together they appropriate the artifacts and develop use. This view on participation has strong links to the view of Björgvinsson et al. [12] and other recent developments in participatory design. In PIT we are quite concerned with how participatory methods may be developed to capture the time dimensions mentioned above.

In preparing for a CHI 2015 panel on transdisciplinary design [22], I was asked if a fourth wave is coming. My best answer is that HCI is in the middle of a chaos of multiplicity in terms of technologies, use situations, methods, and concepts. Hopefully something lies beyond that horizon, but for now, I'll leave it to others to identify it.

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