Community Design – Growing One's Own Information Infrastructure

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ABSTRACT
This paper examines the phenomenon of Community Design. It is a radical phenomenon in that community members collectively grow their own community information infrastructures without the intervention of professionals typically associated with such endeavors. A recently initiated comparative study draws on ongoing, longitudinal research engagements with a small number of communities and has identified a set of characteristics that apply across these communities that undertake Community Design. We present the characteristics grouped into three dimensions of community: organizational, social and technical. Finally, we draw attention to future research topics that we see as relevant to the expanding scopes of Participatory Design.

Keywords
Community Design, information infrastructure, long-term, continuity, in situ, local, community membership, Community of Practice

INTRODUCTION
Community Design (CD) as a phenomenon relates to a traditional topic in Participatory Design (PD): users continuing the design of information systems (IS) to make them fit their use contexts [2, 4]. CD takes a step beyond 'design-driven by users' by having design carried out and 'owned' by community members without the direct intervention of non-member IS professionals or PD researchers. CD can be seen as one example of recent design trends in which groups of people create and organize new ways of carrying out joint design, such as with free/libre open source software and a wide range of virtual community network arrangements. There has been less interest to date within PD in the heterogeneous practices of community-driven design than with undertakings configured as 'design partnerships'.

CD is about community members growing their own information infrastructure for community purposes. It is PD in the sense that community members are involved both as 'users' and 'designers' – to use the familiar terminology – to ensure that the outcomes meet their needs and are usable by them. Furthermore, CD is a radical form of design because 'empowered' community members have taken design and decision making into their own hands. It can be seen as shifting the (non-member) professional IS designers' taken-for-granted responsibility for design decisions and innovation to community members.

CD relates to the notion of Communities of Practice [7]. In contrast to Community Informatics that refers to the use of information and communication technology for the process of collective human development within communities, CD refers to the phenomenon of community members advancing their shared interest and in support of this they engage collectively in growing their community information infrastructures as well as creating their own ways of doing infrastructure work. Information infrastructure is a multifaceted concept referring to and relating technical, social and organizational arrangements involving hardware and software technologies, standards, procedures, practices and policies together with digital configurations in support of human communication and capabilities [8].

In comparison to virtual communities that build on the possibilities inherent to digital mediation, our study communities interweave existence in physical and virtual environments. Characteristically members may be distributed geographically yet firmly situated in their local environments and circumstances. Community membership affords them the opportunity to come together both physically and electronically in pursuit of common interests, aims, and shared practices. Members of each community work collectively with locally collected data, as the data are a valued contributor to the advancement of the community's overarching interest and long-term mission. In order to cope with these data, community members have started to grow their own information infrastructures [1, 5, 6], though they typically have no (formal) education in systems design.

Though our study communities are vastly different in some ways – for instance, some function in professional contexts whereas others could be characterized as way of life communities – they bear similarities in terms of the conditions they provide for members to collaborate in growing their own information infrastructures. In this paper we identify these conditions through a comparative analysis across the CD communities with which we have ongoing, longitudinal research engagements. The conditions are described in the following sections as a set of characteristics in relation to

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three dimensions of community: organizational, social and technological. CD challenges some of the current wisdom and common assumptions of PD, thereby offering new possibilities for learning about these topics through differently positioned perspectives and associated questions.

STUDIES AND METHODOLOGICAL APPROACH

Our recently initiated comparative study draws on ongoing research engagements with communities whose members grow their own information infrastructures. Three of the communities have continued for a number of years and one began a year ago. In each community we have used an ethnographic approach and gathered data via observation, participation and interviews as well as document and e-mail collection. Furthermore, we have also been participants in the communities, ranging from full members to participant observers. We have previously conducted data-driven analyses on each and reported on them individually and/or analyzed their activities in terms of infrastructure work [1, 5, 6]. This paper particularly draws on analyses across the communities: juxtaposing data, linking and contrasting findings, and discussing interpretations. Through these iterative processes as well as comparisons with PD and infrastructure literature, we have identified a set of characteristics intrinsic to all four communities and their ways of carrying out design. These characteristics are presented in the following sections grouped under the categories of community relations, knowledge practices and technological practices (Table 1).

Organizational: Community relations	-Overarching community interest drives judicious approach to technology design -Membership in Community of Practice -Continuity of community efforts
Social: Knowledge practices	-'In situ' holistic knowledge of local setting -Long-term experience-based learning environment
Technical: Technological practices	-Collaborative approach to local heterogeneities -Blurring boundaries between use, design and maintenance -Continuous process of intertwined design and articulation work -Continuing implementation to local enactment

Table 1. Characteristics of Community Design

ORGANISATION: COMMUNITY RELATIONS

There are distinct characteristics of the communities studied that contribute to a particular kind of environment conducive to community-design relationships.

Overarching community interest drives judicious approach to technology design

The study communities have clearly stated missions and core activities; they are about advancing a shared interest with a long-term orientation. Their main activities are not necessarily about technology development, but since they rely on local data collection and collaborative data tasks, information infrastructure has become thoroughly and complexly embedded in and interwoven together with each community's core activities. Technology design is driven by the overarching activity of the community; information infrastructure is grown in alignment with the core activities. As technology is ultimately evaluated against its value to the core activity, member designers are accustomed to thinking about and designing technologies embedded within their cultural, social and organizational contexts. This results in a judicious approach to information infrastructure. In a long-term community, design is seen not as taking on an isolated task but rather undertaking an ongoing series of solutions that reckon with past choices and future plans where the issue of maintenance is central. Having community members involved in the design and aware that they will be directly involved also with maintenance, has a pronounced effect on the design approach.

Membership in Community of Practice

Community members' 'in situ' location within the communities helps to guarantee that they intimately know and appreciate practices associated with core activities. Being locally situated creates an engagement with the activities of the community that contributes to understanding and patience that in turn leads to renewed commitment. The strength of community membership identity comes from a sense of responsiveness and dependability within the local setting and community.

Community designers' embeddedness in various ensembles and activities gives them dual membership as a community participant and community designer. Knowing their communities and 'systems' from inside out, these designers know where problems and critical issues, values and benefits of design decisions reside. Design issues take on an 'insider' significance when viewed as infrastructure features to support explicit needs from a 'members' point of view rather than simply general problems to resolve for 'users'. Furthermore, as a community member, there is an immediacy of responsibility with respect to one's own design actions as integral to future community efforts.

Continuity of community efforts

The long-term orientation of the communities provides an opportunity to develop a sense of experience of ongoingness with core activities that links the past to the present and the present to the future. This connectedness over time evolves into an awareness of community's temporal continuity. Continuity creates the trust needed to interact regularly, maintain reciprocity and collaborate in various kinds of developmental undertakings. Thus, community continuity is based on communally knowing about the past, today's lived experience, and caring about the community's future.

The processes relating to growing an information infrastructure are profoundly influenced by confidence in community continuity which sets up conditions that facilitate collaborative methods of design that are tentative, flexible and open. The growing of information infrastructure is intricately related to building on the installed base [8], and the ongoing efforts also have a prospective element of anticipating and planning for the future. Particular care is directed to managing the longevity of data by consciously

nurturing the elements of stability and permanence within a changing environment, and to providing ongoing access and availability to ensure value for the communities' core activity in a continuous manner. In fact, growing an information infrastructure can be seen as managing the continuity of data and its sociotechnical environment.

SOCIAL: KNOWLEDGE PRACTICES

Community knowledge practices involve both the local setting with its everyday activities and a long-term learning environment as a meta-level activity.

'In situ' holistic knowledge of local setting

Local settings form the day-to-day environment for community members who attend to their everyday duties and gain 'in situ' knowledge about the local settings in detail and at large. For instance, community members learn to know intimately the data collected in their situated circumstances, and they learn to understand how it relates to the local phenomenon that is part of the larger-scale phenomenon of community interest. Being 'tied to the site' means seeing 'both the trees and the forest' and understanding how the parts are related and interlinked, how changes affect other parts and the infrastructure as a whole. Purely technological knowledge is less important than understanding holistically the local setting and being able to relate technical options and opportunities to existing community arrangements, that is, being able to account for the 'tacitly known' in making comparisons and evaluations. Thus, community members are well positioned to assess what kinds of technology solutions and timeframes work and do not work for their community.

Long-term experience-based learning environment

Within a long-term community, community designers view each new (re)design effort as a three-fold opportunity, first to meet an immediate community need, second to articulate and share design constraints, choices, and use among community members, and third to analyze previous design experiences and proposed tasks, thereby gaining insight into present and future design undertakings. The last two opportunities, importantly, relate to the notions of lifelong and active learning. In the second case, a reciprocal learning occurs, and in the third, the comparison over time is a meta-level learning activity that layers into the development trajectory of a long-term community. The shared activities between member co-designers creates a stream of experience-based activities over time from which a joint understanding emerges [cf. 3]. Together these suggest a notion of long-term experience-based learning environment in which meta-level design, learning and development activities are a continuous part of everyday working practice.

TECHNICAL: TECHNOLOGICAL PRACTICES

In CD the endogenous characteristics of community relations and knowledge practices are inherited into a number of technological practices and methods.

Collaborative approach to local heterogeneities

Our study communities, as mentioned previously, consist of members who are widely geographically dispersed and firmly situated in their local circumstances. Community designers have created technological practices and approaches that rely upon characteristics inherent to their community organization, collaborative dynamics, and situated knowledge practices. The communities have given rise to a number of 'home-grown' collaborative methods for jointly designing shared infrastructures that appreciate local knowledge by nourishing bottom-up approaches, regard local heterogeneities as strength, and utilize the distributed local structures to the communities' advantage [5]. There is a common struggle to grow information infrastructure that takes into consideration both the legitimate diversity at the local level and consensus among community members.

Blurring boundaries between use, design and maintenance

The blurring of boundaries between use and design characterizes the work of community designers because their dual membership provides them the lived experience of a community participant and a community designer. The blurring intensifies over time as maintenance and redesign issues start to conflate due to changes in the information infrastructure itself and in community needs. Though maintenance from a developer perspective involves keeping elements aligned and functional, from a design perspective, the concept of maintenance may be broadened to represent the opportunity to redesign existing applications to meet both existing needs as well as new needs. Furthermore, embeddedness in various community activities provides an extended range of perspectives, for instance, in terms of tailoring, appropriation, training, modification, and evaluation. In Suchman's words: "Integration, local configuration, customization, maintenance and redesign on this view represent not discrete phases in some 'system life cycle', but complex, densely structured courses of articulation work without clearly distinguishable boundaries between" [9].

Continuous process of intertwined design and articulation work

System updates and technological change are intimately intertwined with both system technical performance and community usefulness. Though technological modifications are ongoing, they are not necessarily a simple incremental process, nor a wholesale displacement and transformation [3]. Change is rather informed by enduring, tentative and open interaction between understandings based on the knowledge in the long-term domain of community practice, in the experience of using and having developed existing tools, methods and technologies, and in the "leaps of faith inspired by imagination" [9] in envisioning updates and incorporating new technologies. All of these are brought together in focused attempts to take advantage of major advances in technological innovations and local understandings interposed by interludes of relative stability. Similarly, in relation to large evolving systems and information repositories, Fischer et al. proposed "systems that

evolve over a sustained time span must continually alternate between periods of activity, unplanned evolution, and periods of deliberate (re)structuring and enhancement" [3].

In longitudinal, ongoing communities, the infrastructure, in terms of systems and applications, is made up of many parts that become outdated or updated at different times. Any one part may undergo redevelopment independently resulting in an information system component that itself changes incrementally until larger-scale design decisions are made that have ramifications for groups of system elements. A deliberate aspect of CD is its emphasis on documentation as articulation work. This is important for self-reflection as well as for contributing to ongoing dialogue on topics pertinent to design. Time is periodically dedicated to articulation efforts with an understanding that this is part of a longer-term strategy that creates integrative interludes where assessment leads to shifts with ramifications in some or all parts of the system.

Continuing implementation to local enactment

The processes of incremental design extend to the implementation of new technologies. These processes of 'implementation from within' may be described as community members taking responsibility for incorporating a new piece of technology into use and developing a set of arrangements for it in relation to existing technologies within a community. The process unfolds incrementally; while community members cannot anticipate all details, they have awareness that technological change is an integral part of their environment and towards this they are prepared.

In a CD setting, the issue of implementation is a complex one. Information infrastructure is intended to serve the community, to be available inclusively in such a way that the majority of local members find it both useful and useable. However, in reality, local community members are differently positioned in their capabilities and readiness with regard to information literacy and new technology use. Therefore, periods of enactment are a necessity, expected and planned for, where enactment refers to the additional work after adoption and deployment of techniques required to bring about deeper understanding and adoption of new digital practices. A long-term community orientation fosters, on one hand, respect for existing practices, and on the other hand, a trust to consider new practices.

DISCUSSION

In this paper we present CD as an approach being used to grow information infrastructures in communities concerned with providing both ongoing use and continuity for local data in support of overarching community interests. Initial findings are summarized in Table 1. CD suggests topics that call for further research. Embeddedness and dual membership in community bring about considerations for participation that are different from the typical ones in PD, such as regulated user participation together with taken-for-granted designer participation and the differentiated user-designer roles and activities. Traditional perspectives on use, design, and participation make it difficult to capture, value and potentially support activities that community co-designers perform in order to make use of information systems including experience-based meta-level learning about design, managing the continuity of data and information infrastructure, and developing 'home-grown' methods that account for and appreciate communities for what they are – heterogeneous yet sustainable environments where members engage with common interests and learning.

CD, as described here, emerges as members undertake information infrastructure building in conjunction with digital record keeping in a continuous manner. We relate these efforts to community member awareness and trust in a shared long-term orientation and perennial nature of community interests. Design is thoroughly entwined with other community activities, not an insignificant part of which can be characterized as collaborative care. 'In situ' community designers take personal responsibility for their own actions in a larger context, in a broader, communal sense (cf. located accountability [9]), and thus can be seen to conduct 'responsible design'.

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