

The App Is Not Where the Action Is

Discussing Features of an Internal Communication System for a Permaculture Village

Anne-Marie S. Hansen

School of Arts and
Communication
K3 / Malmö University
Malmö Sweden
anne-marie.hansen@mau.se

ABSTRACT

This paper presents an initial study on how members of a 90-household large Danish permaculture community, Permatopia, would like an internal communication system to work regarding organization of work, distribution of natural and human resources, documentation of learning, and support for social sustainability. The study is informed by theory of permaculture: mainly the principle *care for people* and of theory from computer supported cooperative work (CSCW), in particular the phenomenon *we-awareness*. A combination of contextual inquiry and co-design methods were used to uncover community members' needs, desires and concerns. Results show that a traditional app and profile-based communication system might not be beneficial to the social sustainability of the community. Instead, technologies and data should be handled with care: the benefits of structure and data visualization should be balanced with the need for privacy and respect for individual lifestyles, face-to-face communication and shared goals.

CCS CONCEPTS

- Interaction design • Collaborative and social computing • Ubiquitous and mobile computing • Visualization

KEYWORDS

Permaculture, Shared living, Social sustainability, Social learning, Assets-based approach, Computer supported cooperative work.

ACM Reference Format:

Anne-Marie S. Hansen. 2020. The app is not where the action is: Discussing features of an internal communication system for a permaculture village. In *7th International Conference on ICT for Sustainability (ICT4S2020) June 21-26, 2020, Bristol, United Kingdom*. ACM, New York, NY, USA, 10 pages. <https://doi.org/10.1145/3401335.3401824>

1 INTRODUCTION

This paper presents an initial investigation of how an internal communication system might support members of the Permatopia permaculture community [23] in organizing their community in

terms of work and social well-being. The Permatopia village is an ambitious permaculture project that, at the time of the study, was at the beginning of its realization. Supported by a bank and a public housing agency, the village contains 90 households where 1/3rd of the houses are privately owned, 1/3rd are owned by a housing coop, and 1/3rd are public housing. A separate coop manages all shared facilities and resources. The idea is that all members of the community above the age of 15 should work two hours per week to grow their own food and thus contribute to making the community as resilient as possible. Community members were organized in more than 30 different work groups according to sociocracy principles [3] to avoid an overwhelming meeting culture. The sociocracy principles distribute trust amongst members of different theme-based work groups and ensure a sufficient level of communication between groups. The organizers and facilitators of the community rely on the latest knowledge in permaculture and agroecology [12]. They are open to employ high-tech solutions when viable, and the community consists of a distributed group of members who already have experiences with management, farming and crafts. In general, the community relies on an assets-based approach [18] where the professional and personal capabilities and interests of each community member are taken into account.

At the time of the study, the community used a combination of paper-based hand written notes, Facebook and Podio [24] as tools for communicating and organizing practical and social activities. Some of the members who were situated in the local area were able to participate in regular face-to-face meetings and work weekends, while other members were situated in other parts of Denmark and in other countries. Before moving into the village, local members started to transform an old farm into a permaculture village. At the time of the study, Permatopia members grew their first vegetables and planted willow trees in their willow treatment plant. This study engaged co-present members in design activities that took place at work weekends in the community facilities: the old farm house and surrounding fields. The design activities had the aim to gather insights regarding the following three research questions:

- 1) How might a communication system facilitate organization of work and creation of social well-being?
- 2) When and how should members encounter such a communication system, and how should they use it and contribute to it?
- 3) What are the benefits and draw-backs of a digital communication system? When should online communication end and face-to-face communication begin?

Through a scenario-based mock up, contextual inquiries and prompt cards, this study investigated the hypothesis that an app-based communication system with individual membership access through individual profiles would be a suitable solution. However, this hypothesis turned out to be wrong. Instead, members proposed and preferred partly anonymous and embodied approaches to data gathering and information sharing. The main principles can be summed up as follows: 1) *data follows action* where data will be generated automatically through interaction with physical materials, tools and facilities, and 2) *information follows the community*, where the sense-making of data generated by members of the community is not tied to individuals, but tied to shared action, conditions, resources and facilities. When designing a shared communication system according to these principles, it might be possible to create a we-awareness that protects individual privacy and favors collaboration over competition. Thus, Dourish's focus on embodied interaction (tangible computing and social computing) [7] is important to keep in mind, when designing for a communication system that relies on data generation that is integrated into the physical surroundings. Results from this study indicate that the app as a profile-based individual tool for registration and sharing of data and learning is not a viable tool, given the strong need to build and increase social capital [27] in the community. This paper proposes alternative solutions.

2 THEORETICAL BACKGROUND

This section briefly presents the elements of social capital that serve as a basis for the creation of a well-functioning community. The social capital elements are then related to the permaculture principles and previous experiences from organization of permaculture communities. Then follows a discussion about how experiences from studies in computer-supported cooperative work and learning (CSCW/L) can inform the organization of a permaculture community.

2.1 Building Social Capital

Social capital is a term that covers non-material life-quality issues such as well-being, shared learning through experience, social organization of a community, shared norms and trust amongst community members, and different kinds of commitments and accountability [27]. To facilitate the process of building social capital, different kinds of member characteristics are valued, such as "catalytic personalities", "community champions", and "super networkers" [p.86, 27]. However, can a digital communication

system contain some of these "personality traits" and thus support the creation and maintenance of social capital? A digital system might support social capital in ways where the history of shared learning is documented and where the visibility of shared accomplishments creates a sense of well-being. Furthermore, it can create an overview of human resources and assets [18] and facilitate organization in ways that make decision making visible and clear to everyone. Finally, a digital system can be used to collect various forms of data that can contribute to a continuous and holistic assessment of the community well-being – for example, using the sustainable neighborhood for happiness tool (SNfH) [5], and the policy matrix for permaculture tool (PMPC) [1] for monitoring progress and planning.

2.2 The Permaculture Principles

The global permaculture movement embodies a series of experiments that explore how to transition into agroecological ways of growing food without depleting the limited natural resources. To achieve this transition, it requires more localized and laborious work as well as changes of diet [12]. The common-sense and holistic permaculture movement that mainly exist outside academia and that is not supported by governments or businesses, is influenced by indigenous knowledge systems and principles of self-regulation and feedback [32]. The lack of standardization makes it challenging to come up with general ways of working together. Furthermore, standardization might stifle the process of self-regulation and feedback: each member of a permaculture community is on a continuous journey of learning while building specialized knowledge, and there is "no such thing as wrong as long as you learn" [p.10, 20]. The ethical framework that guides the permaculture spirit and the twelve permaculture principles [12] require a flexible and practice-based manner in which community members create and coordinate mutual responses to continuous change.

2.3 Experiences from Eco-communities

Mannen et al. [19] highlight that mutual learning can depend on inspirational stories with personal notes, short videos and image materials that can serve as practical guidelines in (digital) teacher-apprentice relationships. They present a useful diagram of how the permaculture principles apply to human systems [p.361, 19]. Their study of how members of a permaculture gardening project organized themselves lead to key insights into which components are necessary to accomplish commitment: organization needs to be aligned with a core mission, members should be able to draw upon stored resources like knowledge banks at all times, results and achievements should be visible to everyone to encourage formulation of shared goals, there should be feedback mechanisms that support learning that enables comparison of new ways to previous ways, and there should be a mapping and integration of human resources. The significance of actions, different kinds of involvements and social connections should be highlighted. In line with the assets-based approach [18], social identity can be related to which kinds of learning that different members create and thus establish a who-to-go-to culture. Maye

[20] adds to this picture by suggesting that documentation of learning needs to be formalized and validated through social networks and events so that the permaculture community can develop into a community of practice (CoP). Through formalized documentation of practices, methods of growing food, for example, can be replicated, scaled up and transitioned from niche to mainstream practice. Norton et al. [21] demonstrate through their prototype how a digital database system with libraries of information might guide choices and planning. Such systems could even contain elements of machine learning.

While Ingram et al. [16] emphasize the importance of joint enterprise and shared repertoire, they also encourage respect of a diversity of knowledge and motivational factors. Their experiences from a permaculture community show that members share information freely with the absence of hierarchy. A digital system that formalizes knowledge sharing might create an unintended hierarchy of knowledge. The high level of reciprocity in the communication amongst members that Ingram et al. found was transformative, might indicate that face-to-face communication in some cases should be favored over digital communication. This is also the case from the insights gathered in [22]. Ingram et al. [16] also found that the experimental actions associated with permaculture practice contained a great level of performance and tacit knowledge. These actions were internalized in shared understandings amongst members of the community, but in order to include new members of the community (or specialized work groups) documentation of such knowledge is crucial. In Ergas' [8] interviews with eco-villagers stated that they tried to achieve a broad set of skills through mutual learning where they attended each other's workshops. Furthermore, they made it clear that documentation of their practices and life-styles also had an educational aim to the surrounding mainstream culture where they demonstrated that *they* were being the change themselves. However, being the change comes with some costs: for example, insecure financial situations, part time jobs because of the laborious lifestyle, challenges living up to an ideological mindset, where not all parts of eco-villagers' lives should be exhibited. This raises the question if and how a digital communication system should encourage members in life-style dilemmas to make personal choices, or exhibit the challenges of the community in ways where things are brought up for debate, while still protecting individual privacy.

2.4 Creating We-awareness

The experiences from existing eco-communities point towards a communication system that a) documents learning and history of learning, b) creates an overview of skills, (human) resources and interests, c) distributes tasks and duties according to b, d) displays data that inform decision making processes, e) share information about decision making and progress. In addition to this, a communication system should also help build CoP, by facilitating the "softer" aspects of well-being in the community, such as: planning of social events, encouragements to engage in different activities, ways of strengthening the sense of social identity and

mutual trust. The below sub-sections discuss how a shared communication system might create mutual awareness towards shared goals in the community.

2.4.1 The Philosophy of We-awareness. By referring to phenomenology, Stahl argues that there has been a shift of attention away from individual minds to communities where people together make sense of their surroundings [29]: people accomplish shared understandings through continuous reciprocal relationships where members of a conversation repair misunderstandings in order to reach shared meaning-making. The question is, if a digital communication system might slow down the process of shared meaning-making. Especially when considering that our physical actions carry meaning with them in a common world. In order to achieve joint intentionality and accountability, members of a community need to know that other members know what they know [17]. Thus, a digital interface needs to display the intentionality of others, and a digital platform should support ongoing negotiation-process of sense-making and facilitate the steps of this process. Physically situated action is performative, and always visible to others. The culture that people develop over time to understand ongoing action makes their interpretation of other's actions possible [11]. How can this culture be reflected in a digital system? Schmidt shows an example that the tacit knowledge inherent in physical actions can be documented as they unfold. In order to design a communication system that shares learning, designers should understand the didactic practices that people develop when sharing their learning with others. Being in the situation and dealing with the circumstances of the situation, makes people know how to act, sometimes even without being able to explain how they do things (tacit knowledge). And this means that in some cases, learners need to be physically co-present to learn appropriately [28]. Physical co-presence allows for the possibility of mutual monitoring of ongoing action that creates a shared consciousness about the aim of each action. If some of the shared action happens through profile-based digital interfaces, the screen might break up the mutual orientation towards the same material and thus black-box the intention of others. Furthermore, people who act together orient themselves towards the situation from different perspectives, and these perspectives might get lost, if people 'hide' behind individual profiles [31].

2.4.2 Digital Versus Face-to-face Communication. Greenberg and Gutwin argue that digital interfaces should support the creation of interpersonal spaces where smaller groups of people can review and discuss the data that is made available to them. This requires a bigger display to allow for enough space to show how other people view and interpret data. Digital devices like mobile phones with small screens might limit what different members of a community see and create disjoint workspaces [9]. Thus, when reviewing data on a screen, members of a community need to find ways of sharing their interpretations of digitally displayed data with others. Either through digital comments or face-to-face meetings. The efficiency of shared interpretation and understanding needs to be constantly evaluated according to how it works through digital or face-to-face encounters.

2.4.3 Privacy. Current mobile technologies allow people to work together from different indoor and outdoor locations and become aware of the whereabouts of other people. However, always being connected to a shared communication system might create a feeling of constantly being obligated to respond to messages and updates. Ciolfi and Carvalho suggest that collaborators develop a nomadic strategy for interconnectivity, availability and accountability [4]. When it is possible to monitor the digital status of mobile devices and personal profiles, members of a communication system might feel the need to protect their personal boundaries in relation to others. Crabtree, Tolmie and Knight [6] show that people to a very high degree worry about managing their personal data in relation to the intimate relationships in their lives, such as family, friends and acquaintances. They develop everyday life strategies for how to cope with potential intrusions of personal borders and where it is appropriate to disclose which kinds of information: the flow of personal information matches personal relations. Interacting partners need to cooperatively agree on privacy borders. Romero, Markopoulos and Greenberg present the Privacy Grounding Model (PGM) that might serve as a tool for considerations on how people manage private data in a shared communication system [26]. For example, different interaction situations might require different privacy settings. However, it would be a tedious process for each member of the community, if they had to reset their personal privacy settings when interacting with a new community member through a shared communication system. Thus, designers should consider to design for *situation-based privacy settings* rather than *profile-based privacy settings*.

2.4.4 Potential Benefits and Limits of a Communication System. While Stephanidis et al. present benefits of new technologies, they raise some general concerns regarding the use of specific features of new technologies [30]. The use of AI might benefit the analysis and interpretation of data about resources in the community through quick statistical overviews and their related visualizations. The possibility for human environment interaction (HEI) where a system takes environmental factors into account might strengthen mutual awareness of a situation. On the other hand, human-technology symbiosis might in some cases diminish human awareness and abilities, if members of a community blindly rely on AI. Regarding privacy issues, the community needs to have a discussion about if/how personal data should be anonymized and thrown into a shared data pool in order to monitor community production and consumption patterns. Furthermore, the question is if it is wise to add intelligent features to the communication system that apply persuasion techniques to nudge members of the community to change behaviors. In summary, the following questions could be addressed: if learning is mediated through a digital system, will members apply a copy-paste attitude to the information, instead of adapting knowledge to a concrete situation? To what degree is a communication system with intelligent features able to identify problems, support the problem-solving process and support collaboration? In a long-term study of two sustainability communities that engage with permaculture, it was clear that the majority of their values and

principles clashed with the typical workings of digital systems [22]: the communities perceived messaging to be a burden, and there were indications that the trend in current software systems to focus on individual contributions rather than collective contributions was against their spirit. However, the study also showed that community members did use a wide collection of software tools to support their practice. But they also realized that these same tools took them away from the physical environment. They highlighted the permaculture principle “culture of place” and argued that too much focus on IT might isolate people from developing engagements in physical environments. Furthermore, they emphasized how fragile technology devices might be in different weather conditions with manual labor. Raghaven et al. [25] argue that digital systems can aid permaculture practitioners’ need to have information and knowledge at their fingertips. They highlight that it might be unsustainable, if knowledge is kept within individuals because it thus will be scattered, inconsistent and not widely accessible. They suggest crowd-sourcing as a method to share information and learning, and data visualization that can support ways of extracting knowledge in systematic ways.

3 EXPERIMENT: UNCOVERING WHERE THE ACTION IS

To get a better understanding of the issues raised in section 2.1–2.4, I engaged community members in three different activities that were tailored the regular “work-day” activities happening over a summer: a scenario-based dialogue for a community meeting, prompt cards for coffee breaks, and contextual inquiries. Sections 3.1–3.3 describe these methods and sections 3.4–3.7 present the findings from an integrative analysis of the results that the three methods generated.

3.1 Scenario-based Dialogue

In a community meeting, I presented a “provotype” [2] of a communication system scenario. After the short presentation, we discussed the scenario in plenum. The scenario represented the assumption that an app with profile-based access to different parts of a digital communication system would offer data visualization and the possibility for communication between work groups. The scenario demonstrated how a member from the field group could register harvest of carrots, and how a member from the kitchen group could review food storage, make a plan for the weekly menu, and communicate with the farm shop group. Figure 1 shows the second half of the carrot harvest scenario.

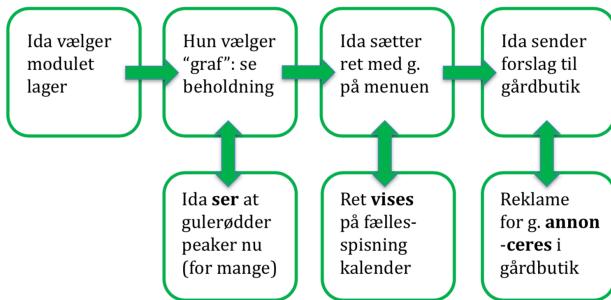


Figure 1: Fictive scenario carrot harvest. Row 1, col. 1: *Ida chooses the module storage.* Row 1, col. 2: *She chooses “graph”: see content.* Row 2, col 2: *Ida notices that carrots peak at the moment (too many).* Row 1, col. 3: *Ida puts a dish with carrots on the menu.* Row 2, col. 3: *The dish is displayed on the shared dining calendar.* Row 1, col. 4: *Ida sends a suggestion to the farm shop.* Row 2, col. 4: *A commercial for a special offer on carrots is announced in the farm shop.*

3.2 Prompt Cards

A drop-in workshop designed for coffee breaks on two work days contained theme-based prompt cards inspired from the post cards in [p.66–67, 10]. The prompt cards asked members to imagine an every-day life situation in Permatopia and imagine which functions a communication system in the shape of an app could contain. Other cards prompted members to reflect on who they were, their life situation and dreams about living in Permatopia. Based on what members wrote on the cards throughout the work days, I engaged in spontaneous informal conversations between members who sat in groups and filled in the cards.

3.3 Contextual Inquiry Journeys

I walked along with different members in the indoor and outdoor spaces to make sense of ongoing activities, facilities and materials that they shared to perform and coordinate work. Through contextual inquiries [14] we inspected concrete work situations, and it was possible to shed light on if and how potential features of a communication system should be implemented.

The scenario-based dialogue and the prompt cards stimulated vivid conversations between members about issues and concerns regarding features and dynamics of a communication system. Members engaged in conversations about their own made up what-if scenarios [15] where they considered desired and undesired situations that a communication system could create. They based their discussions on their experiences with the existing communication system – Podio [24] – that they found useful, but also confusing, messy and time consuming. For example, several members stated that some of the perceived messiness was due to lack of prioritization of “must-have” and “nice-to-have” information, as well as lack of shared agreement on how and where to post information. The contextual inquiries provided insights into desires for concrete solutions that pointed

towards the principles *data follows action* and *information follows the community*. Section 3.4 gives an impression of the kinds of life styles that the communication system should support. Section 3.5 discusses the potentials of a digital communication system, followed by concerns about specific features and communication dynamics of such a system (3.6). Section 3.7 discusses how a system might support and strengthen community engagements.

3.4 Life Styles – Impressions from the Cards

Members who responded to the prompt cards indicated that they were at a point in life where it was time to start a new life phase and change their lifestyles dramatically: practice life in harmony with nature and become part of a strong community. A new couple wanted their children to grow up in a village. A single parent no longer wanted to be a city dweller. There were couples whose adult children moved away from home, and some people who just retired. They described themselves as active and ready to work, highly educated, creative, nerds, activists, visionaries, altruists, nature persons, responsible world citizens, practically minded, and as someone who wanted to engage in and learn community practice. In addition to this, some were interested in spirituality, holistic thinking, and having a peaceful life outside the city – away from a stressful world with a lot of media and new technology. A few even desired technology-free lifestyles.

3.5 Potentials

From the prompt cards it was obvious that members embraced features of an app that could help them with practical issues such as planning and managing shared dining, facilities, resources and shopping locally produced food. Coordination of work inside and between work groups was also high priority. One person stated that a digital system might enable everyone to contribute with data and thus lighten the documentation burden of management and accounting work groups. Another important feature that some were interested in was the ability to review data related to storage, harvest and the general condition of the community in terms of the farm, finances and consumption of resources. This with the aim to learn and adapt. Many talked about how an app could support social aspects: for example, a bulletin board that could inform about shared social, cultural, (re-)creative and physical activities that could bring community members closer together.

Through informal conversations in the shared space, members made it clear that in the existing digital tool, Podio, communication was time consuming, sometimes confusing, and it lacked a formal way of presenting data, information and tasks. Furthermore, there was no distinction between high priority and nice-to-have information as well as no distinction between work related and socially related posts. Members expressed the need for a shared communication system that would be associated with the payment system for their shared dining facility. They asked for a system that had a curated and organized way of sharing information that could be distributed in a manner that each receiver would perceive as “relevant”. The below figures

document how members experimented with paper-based methods in their shared space at the farm to organize and document work.

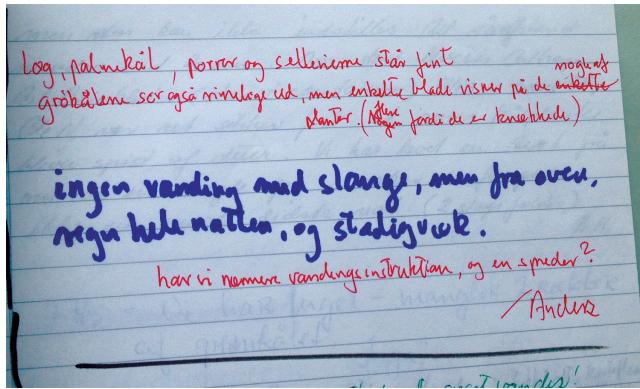


Figure 2: Diary in the shared space. Members wrote messages to each other about status and learning. They asked questions related to the daily work. Before they took over from others, they reviewed the notes related to their work. Red text at the top: *plant palm cabbage, leek and celery stand great. The green cabbage also looks ok, but some leaves wither on some of the plants because they are broken. Blue text in the middle: no watering with hose, but from above. Rain from the entire night, and still. Red text at the bottom: can we have an easier irrigation instruction and a sprayer?*

Aarbødsopgaver	Beskrivelse af arbejdet	Kompetencer
Vægbeklædning på LOEN	Vandrette bætter m. fer og not skydes på med smpistol.	A + B
Nedrivning af SØLO	Beklædnings-bætter skærtes på længde på elektrisk kap-/geringsssav	C
	Silokonstruktionen skærtes i mindre dele med elektrisk stikssav eller rundsav	C
	Kraftigt tømmer skærtes med håndtømmer eller elektrisk kædesav.	C + D
	Bolte læsnes med skruemønster / Armeringsjern skærtes med vinkelsliber	D / C
Rense genbrugs-ejet træ for sam og andet		Lidt D
Hugge gamle betongtømmer op	I det fremtidige storlækkken, grønkakken, kolerum, æg-pakkeri samt i toilet- og gangområdet til Loen hugges det eksisterende betongtømmer op med en STOR el-hammer maskine.	A1 + D
Ny hældning udvendig på LOEN	Skylpe bætter/beklædning på 1-4 et. vindspærre) udvendig på den isoleringsveg, som entreprenøren har opført på yderstenen af Loens vægge.	A + B + F + D
Stue nye betongtømme	Bætterne males før efter opsætning.	E
Nyt guld i LOEN	I det fremtidige storlækkken, grønkakken, kolerum, æg-pakkeri samt i toilet- og gangområdet til Loen skal vi stave nye betongtømme med fald til gulvfladt. (Entreprenøren lægger klinker på gulvrene)	F + C
Vindtøm ved indgang til LOEN	Isolere oven på 'sandpuðe' med 2 lag 150 mm flamingo-plader + lægge varmebefordelingsplader til VVS erenes varmesænger + legge nyt 25 mm svømmende massivt trægavl (elektrisk kap-/geringsssav)	F + D + B
Orangeri	Hele vindtøm = (punkt)fundament skal vi selv lave. Præcis design er ikke lavet; men der kan være terrasse ovenpå, hvis Vestlingens tagplader forlænges ud over vindtøm	
Prikle-drivhus	Præcis design(?) af stuehuset skal så- og prikle-drivhuset opføres med de STORE genbrugsvinduer	F + D + B
<i>ge halvtungt værktøj uge tungt værktøj ejde på rullestofslids uge for elektrisk skærrende værktøj</i>		
Kompetencer: <i>D: Kræver en del kraft E: Kræver erfaring med at rette beton af F: Kræver flair for håndværksmæssigt G: Ingen krav – alle kan 'gå til hånden' på alle opgaver</i>		

Figure 3: List of upcoming work. Overview of tasks (left column), description of each task (middle column), description of competences needed to do the task (right column). Competences listed below in red. Note: the description of tasks are sometimes very competence-specific. A reader who has not been part of the manual work would need photos of the different items described in order to understand what they are. Alternatively, an indication of who to ask questions.

Dag	tilstand	handling
Tirsdag 16/5	→ <i>genvestre side</i>	
Torsdag 18/5	<i>planter i Græmtsgården øst hørskov</i>	
Weekend 20-21/5	<i>Mægt Tøjord, Slanger (3x20m) indkøbt</i>	
Tirsdag 23/5		
Torsdag 25/5	<i>Først lidt jord om planter. Fjern fiberdej - alle planter</i>	
Weekend 27-28/5	<i>Ole har fået alle ordnet og undtagen</i>	
Tirsdag 30/5		
Torsdag 1/6		

Figure 4: Another way to structure work related to growing food: date, condition and action. On the illustration it is clear that the description of conditions and actions go beyond the size of the table. Example translation of row 4: weekend 2–21/5, *Very dry soil, hoses (3 x 20) bought* (and then an arrow to more text outside the table). Example translation of row 6: *Too little soil around plants. Remove fiber coverage* (from then on it is difficult to read the hand writing).

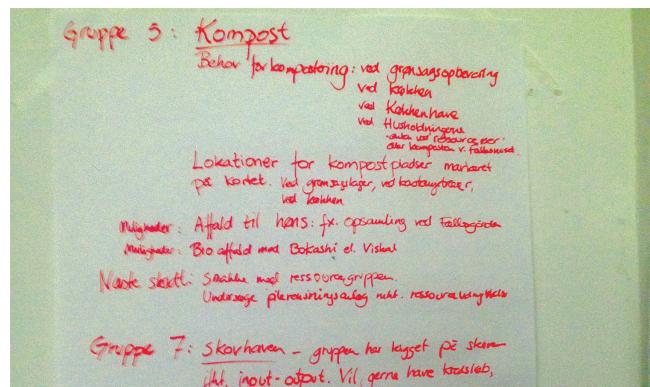


Figure 5: A less structured example of documentation of work. In the work plan for group 5 that deals with composting, needs are stated, followed by concrete suggestions for how needs might be addressed (some possible solutions), and finally, the next immediate step to accomplish the task. **Group 5: Compost.** Need for composting: at the vegetable storage, the kitchen, the kitchen garden, at the households and at the shared farm house. Locations for compost spots are marked on the map. At the vegetables, the ... trees, at kitchen. Possibilities: trash for chickens, e.g. collect at the shared farm house. Possibilities: bio trash with ... Next step: talk to the resource group. Investigate willow treatment plant regarding resource ...

Figure 2–5 show that members experiment with different ways of documenting work and progress. While a digital system might add clarity and structure, there is also a risk that a digital system might formalize and freeze this experimentation process. Through informal conversations about the hand written notes, some members stated that they did not know “the right way” of doing things, and asked for the possibility to constantly be able to adapt

functionalities in a digital communication system to match their learning. This made me consider a modular system, where the functionalities in each module could be replaced by another module with adapted functionalities. Another question that surfaced our conversations was how individual members access and receive information, and how this information ties in with their everyday lives. This is discussed in the below section.

3.6 Concerns

In the community meeting after the presentation of the app-based carrot picking scenario, one of the first questions was: “do you really think that we should log onto an app with our muddy hands and register every carrot that we pick?” Another member was concerned that wearing and using mobile phones in the field would be a distraction from engaging in the shared meditative condition of carrot picking. Other members expressed a similar kind of mindset: that the kind of repetitive physical work would make them engage in some sort of spiritual connection with the ground and each other – what Hobson et al. describe in [13]. Parents wanted to bring their children with them into the field and regarded mobile phones to be a distraction from their connection with their children and co-workers. Also, regarding the topic of distraction, there was a member who thought that it would be stressful to always get messages and status updates on the phone: “I don’t want my mobile phone to bing at me all the time.” In other words, members regarded the always-connected, always-available features of the mobile phone to be a distraction from their connection with nature and other members of the community. In the meeting, members also addressed privacy issues such as the profile-based approach to registration of carrots – that this would create competition, instead of focusing on shared contributions towards a shared goal. In a coffee-break conversation one of the members of the management group suggested to have bundling materials with bar codes that would be registered at “collection points”. On a contextual inquiry journey, a member from the communication group supported this solution by suggesting an infrastructure, where *data follows action*, not people. In this way, the system could create a kind of we-awareness through an indication of need and action. She demonstrated that the communication system data registration process could happen through a series of strategically distributed touch points incorporated in physical materials at physical locations where for example tools are stored.

During the coffee break conversations, another concern that members aired regarded the possibility of data visualization of each household’s consumption patterns. This concern is in line with what Crabtree discovered in [6]. Should members be able to review each other’s water and electricity consumption? The answer was no, because members had different life styles and life conditions. Instead, some members were interested in inspecting community related data in order to re-consider personal life style and learn from the history of data. One member wanted to get the opportunity to review and reflect on data visualizations of different aspects of the community production and consumption,

while other members did not want to bother with this information at all. None of the members who participated in this discussion wanted a mobile phone screen to display simplified versions of the complex picture. Either it became information overload, or the screen was too little to inspect details and get a picture of the complexity of the situation. Thus, the idea that *information follows the community*, rather than individuals came about. Although this information could be made available to everyone, only the ones with particular responsibilities should be held accountable to inspect and understand this information. The members who expressed interest in inspecting the data had a desire to do so at home in the evenings when they were in a contemplative mode to allow for deep reflection.

Another aspect that members addressed was the balance between face-to-face communication and communication through a digital communication system: “It’s easier to walk over and knock on each other’s doors.” While face-to-face communication was valued over communication through digital means, there were some concerns regarding meeting culture and if everyone should be involved in everything. Some indicated that the community should trust the decision-making processes in different work and management groups and rely on carefully selected information to be shared through a digital system. One member argued that face-to-face communication would hold people more accountable to each other. For example, if it was possible to digitally sign on and off from duties, then it would be easier to change plans. The next section will discuss how a digital communication system might encourage different engagements in the community, without overloading members with information. Furthermore, the discussion will keep in mind the balance between digital and face-to-face communication.

3.7 Community Engagements

Different work groups and members of the community would like to enter the shared communication system from different perspectives and with different purposes. Their entry points might match their skills and level of understanding of the data presented. Primarily, community members wanted a digital communication system to support practicalities, but they also wanted to access information related to work and different “mind spaces” in the community. In the practicalities category they listed the food ordering system, shopping in the local farm shop, a calendar with announcements, and a room-, car- and laundry booking system. Furthermore, to enable members to find a good position in the community, an online communication system could display an overview of different work groups with a summary of their current, future and past activities. There was a discussion if all group meeting decisions should be made visible, and if that would open up to other members interfering with decision making processes through endless series of comments. However, some agreed that information related to decision making that had an influence on everyone should be announced publicly. There was general agreement that data about shared production and consumption should be made available, because such data might

encourage members to engage more and form an opinion about the status of things.

Community members were interested in different “mind spaces”, such as learning, socializing and well-being. In terms of learning, and in line with [19], members suggested that work groups video and photo document learning in their daily work and share with others who might consider entering new work groups (each community member should be part of two work groups). Part of the learning mind space could be to create a platform for communication with the outside world: people who might be curious about life in Permatopia, public and private institutions and decision makers who might be interested in transferring Permatopia experiences to other communities. For internal learning, some members mentioned the importance of reviewing the history of experiences made throughout the seasons and the years. This could be information about ways of growing food, soil quality, weather conditions, ways of organizing work etc.

The socializing and well-being mind spaces could both consist of activities that create a sense of well-being and perhaps even build a shared sense of identity and belonging. Some suggestions for activities were singing in a choir, meditation, beer-brewing, nature walks, different kinds of arts and crafts and cultural activities. Some of these activities could be open to the local area: to integrate well and share resources with the local community. There was a certain kind of awareness of the human resources in the community and the personal skills and qualities that each member could contribute with.

4 DISCUSSION

In this discussion I highlight what a shared communication system should achieve and favor in a community like Permatopia. These are: shared forms of embodiment (4.1), documentation not surveillance (4.2) and the sense of joint intentionality (4.3). Then I propose how a system development process might progress (4.4), and conclude with explaining the most important system features that might strengthen social capital (4.5).

4.1 Shared Forms of Embodiment

The two principles *data follows action* and *information follows the community* illustrate that members of Permatopia have a strong need for embodied presence when transitioning into lifeforms that are in balance with nature. Furthermore, they desire a non-individualized contribution to a shared data pool that give the impression that “we are in this together” – that action is interdependent and shared. The shared data thus motivate the kind of we-awareness that will nudge members to act according to shared conditions [30]. The *data follows action* principle is in line with Dourish’s idea about socially and culturally learned embodied interaction [7] and ties in with the HEI approach suggested in [30].

4.2 Documentation not Surveillance

With respect to personal boundaries in a community where people share large aspects of their everyday lives, data should not be produced through personal profiles because it might create aspects of surveillance that intrude on personal boundaries, and thus work against we-awareness *and* the sense of personal freedom [6]. Instead, a shared data pool visualized according to achievements related to the permaculture principles [12] might create a general sense of well-being, when community members realize that they are on the way to achieving shared goals. Documentation of the overall production, consumption and learning – the possibility for members to constantly do a “reality check” – might bring attention to practice [12] and stimulate the ability to self-regulate and adjust [32]. Thus, the overall social capital can be built with small bricks of documented action and come together into a bigger picture.

4.3 The Sense of Joint Intentionality

All activities seem to be encounter-based: people face the situation through face-to-face encounters and make sense of things on-the-fly and on-the-spot. A digital communication system should not get in the way of this, but instead collect insights generated in those daily moments. Still with the respect for privacy, the second principle – *information follows the community* – supports the willingness to develop a strong community practice and spirit. There were indications that aspects of surveillance would counter-act this. The aim of following the second principle would be to develop joint intentionality [17] that attunes people to each other and toward shared goals. Thus, a shared communication system should be implemented wisely: not because something is technically possible (for example through nomadic computing [4] in the shape of individual mobile devices capturing profile-based actions at all times), but because a community of practice developed a way to produce and share information that is stored digitally. The communication system should be developed according to the permaculture principle “care for people” [12] and pay careful attention to how different forms of social capital evolves.

4.4 Proposal for Development Process

I suggest a development process with focus on the design of a few modules at a time. Modules can be designed like “puzzle bricks” with basic functions that can replace each other. Each puzzle brick should contain the possibility to make adaptations so that they can play together with other modules. Encounters with the system should always be balanced with face-to-face encounters in a way where results of real-life experiences are documented, stored and made available to everyone. In turn, the way that shared documentation is available should again support face-to-face encounters. Thus, complex information arrived at from data analysis should give community members the possibility to inspect, talk about and reflect upon data presented on big screens [9]. This kind of shared meaning-making [29] enables participants to discuss and repair each other’s understandings through a dynamic reciprocal relationship [16].

4.5 Features that Strengthen Social Capital

In line with Mannen [19], community members thought that learning depends on personal documentation of work stored in a kind of DIY knowledge bank that everyone can contribute to. The DIY style allows for documentation of knowledge inherent in physical actions as they unfold [28]. This might allow everyone to achieve a broader set of knowledge and skills [8] that in turn support the kind of face-to-face apprentice learning style needed. In addition to the desired democratic forms of learning, it seems like there was an awareness that social events allow for appreciation of different personal assets and capabilities. Social events could indeed be a way of establishing a community of practice [20]. A digital communication system that favors a community bulletin board, that encourages people to participate in lively social life over static individual profiles, might be a way to experience personal assets and capabilities instead of just seeing them on display.

5 CONCLUSION

In this initial study of how an internal communication system might support a permaculture community, it was clear that technology should be used to stimulate documentation of learning, while respecting the face-to-face embodied (inter-)actions necessary to make the transition into more sustainable life forms. The use of the technology itself must be socially sustainable and not occlude and complexify the kinds of encounters that foster and shape a community of practice. The scenario-based dialogue, the prompt cards and contextual inquiry journeys generated data that showed that status quo technology manifested through an app that is managed through individual profiles was an insufficient way for community members to engage with the community. It might even threaten the social sustainability of the community. Instead of documenting individual actions, traces of collective actions and consumption should be documented for the purpose of learning and adjusting to changing conditions. In this way, an internal system might create a sense that members “are in this together” and direct attention towards joint intentionality without compromising individual life styles and life conditions. In the below sections, I will list some concrete proposals for which elements that an internal communication system could consist of in response to the research questions presented in the introduction.

5.1 Organization and Well-being

According to research question one, organization of work could be done through *maps* of:

- a) Physical resources such as facilities, machines, tools and touch points for documentation of work and yield that goes into digital databases.
- b) An overview of the different work groups and how they relate to each other: members, tasks and responsibilities, meeting minutes, decisions, expertise needed to be a member of a work group, and history of work that the group has been involved in.

And *graphs* of:

- c) Weather patterns, soil quality, the condition of plants and any other factors that affect yield.
- d) Yield and the quality of it.
- e) The condition of physical resources and consumption.
- f) Work group efforts: hours used to work on different tasks.

Community members should be able to inspect several graphs in a flexible manner in order to compare and understand how groups of data are related.

Social well-being might be obtained through the following system components:

- a) easy-to-use *management* components regarding planning, booking, payment, shared dining and farm shop.
- b) Curated sharing of information with the community as a whole, and within and between work groups.
- c) A *visual bank* of documented work, so that members can learn from each other. This could for example be DIY videos and printable pdf files with written and visual instructions that can be brought into the field.
- d) An *activity bulletin board* that acknowledges initiatives from the community members who have special capabilities and interests. This could be social and cultural events, workshops and services.

5.2 When Members Encounter the System

Through this study I learned that community members are not interested in encountering the communication system while doing manual work. Thus, I suggest that analogue elements integrated in the physical environment could be used to collect data. Such elements could deliver data at touch points distributed on physical locations that are designed as “pick up” stations that register physical activities and materials, rather than asking for finger navigation on touch screens. Community members who are interested in sharing their accomplished practices and learning can use their mobile phones to create DIY videos etc. that they might submit to *visual bank* that the communication group members curate and administrate. Community members should not be required to engage with an internal communication system, unless they have special tasks and roles in a work group where they collect and analyze data. The only time a profile-based app might be useful is for payment, planning and booking, or for interpersonal engagements through the activity bulletin board.

5.3 Digital and Face-to-face Engagements

At this point, it is difficult to predict how to best balance the digital with the face-to-face engagements. Only when community members have developed a specific practice within and between work groups or through the activity bulletin board, it might become clear what can be solved through face-to-face encounters and what kinds of communication might happen more efficiently if it is facilitated through digital means. Further analysis of handwritten documentation of work as well as how community

members use digital tools and services to structure and accomplish their activities is needed.

5.4 Future Work

I suggest that the Permatopia community engages in a modular development process of an internal communication system where each element is appropriated to the other elements, before new elements are added. Parts of this appropriation should concern practical experiences that inform decisions about how the element should interrelate with others. The development process could be structured according to the following priority list: a) *management* and *map* functions, b) data visualization components: c) a *visual bank* of documentation of work, d) an *activity bulletin board* through which community members can engage with each other in inclusive ways, e) *communication* with the outside world. Finally, the community could consider whether some of the data related functions could benefit from elements of machine learning to inform decisions and planning – similar to [21].

ACKNOWLEDGMENTS

The author would like to thank Permatopia members' participation in workshops. Special thanks to the communication group for their willingness to include communication system workshop activities within the framework of community meetings and work days. Thanks to members of the administration and management group for sharing their perspectives on the potentials of an internal communication system.

REFERENCES

- [1] Faiza Akhtar, Suleman A. Lodhi, Safdar Shah Khan and Farhana Sarwar. 2016. Incorporating permaculture and strategic management for sustainable ecological resource management. *Journal of Environmental Management*, vol. 179, 31-37. DOI: 10.1016/j.jenvman.2016.04.051
- [2] Laurens Boer and Jared Donovan. 2012. Prototypes for participatory innovation. *Proceedings of the Designing Interactive Systems conference (DIS)*, Newcastle Upon Tyne, United Kingdom, 388-397. DOI: 10.1145/2317956.2318014
- [3] John A. Buck and Gerard Endenburg. 2004. *Sociocracy: the creative forces of self-organization*. The Sociocracy Group, 1-23.
- [4] Luigina Ciolfi and Aparecido Fabiano Pinatti de Carvalho. 2014. Work practices, nomadicity and the mediational role of technology. *Computer Supported Cooperative Work*, vol. 23, 119-136. DOI: 10.1007/s10606-014-9201-6
- [5] Scott Cloutier, Erica Berejnoi, Steven Russel, Beth Ann Morrison and Allison Ross. 2018. Toward a holistic sustainable and happy neighborhood development assessment tool: a critical review of relevant literature. *Ecological Indicators*, vol. 89, 139-149. DOI: 10.1016/j.ecolind.2018.01.055
- [6] Andy Crabtree, Peter Tolmie and Will Knight. 2017. Repacking 'privacy' for a networked world. *Computer Supported Cooperative Work*, vol. 26, 453-488. DOI: 10.1007/s10606-01709276-y
- [7] Paul Dourish. 2004. *Where the action is - the foundations of embodied interaction* (paperback edition). MIT Press, Boston.
- [8] Christina Ergas. 2010. A model of sustainable living: collective identity in an urban ecovillage. *Organization & Environment*, vol. 23, No. 1, 32-54. DOI: 10.1177/1086026609360324
- [9] Saul Greenberg and Carl Gutwin. 2016. Implications of we-awareness to the design of distributed groupware tools. *Computer Supported Cooperative Work*, vol. 25, 279-293. DOI: 10.1016/j.jenvman.2016.04.051
- [10] Joachim Halse, Eva Brandt, Brendon Clark and Thomas Binder. 2010. *Rehearsing the future*. Danish Design School Press, Copenhagen.
- [11] Richard Harper. 2016. From I-awareness to we-awareness in CSCW: a review essay. *Computer Supported Cooperative Work*, vol. 25, 295-301. DOI: 10.1007/s10606-016-9247-8
- [12] Mark D. Hathaway. 2016. Agroecology and permaculture: addressing key ecological problems by rethinking and redesigning agricultural systems. *Journal of Environmental Studies*, vol. 6, 239-250. DOI: 10.1007/s13412-015-0254-8
- [13] Nicholas M. Hobson, Juliana Schroeder, Jane L. Risen, Dimitris Xygalatas and Michael Inzlicht. 2018. The psychology of rituals: an integrative review and process-based framework. *Personality and Social Psychology Review*, vol. 22, No. 3, 260-284. DOI: 10.1177/108868317734944
- [14] Karen Holtzblatt, Jessamyn Wendell, and Shelley Wood. 2005. *Rapid contextual design: a how-to guide to key techniques for user-centered design*. Morgan Kaufmann, San Francisco.
- [15] Rob Hopkins. 2019. *From what is to what if – unleashing the power of imagination to create the future we want*. Chelsea Green Publishing, United Kingdom.
- [16] Julie Ingram, Damian Maye, James Kirwan, Nigel Curry and Katarina Kubinakova. 2014. Learning in the permaculture community of practice in England: an analysis of the relationship between core practices and boundary processes. *Journal of Agricultural Education & Extension*, vol. 20, No. 3, 275-290. DOI: 10.1080/1389224X.2014.887756
- [17] Timothy Koschmann. 2016. The trouble with common ground. *Computer Supported Cooperative Work*, vol. 25, 303-311. DOI: 10.1007/s10606-016-9245-x
- [18] Kretzmann and McKnight. 1996. Assets-based community development. *National Civic Review*, vol. 85, No. 4, 23-29. DOI: 10.1002/ncre.4100850405
- [19] Delia Mannen, Scott Hinton, Tineke Kuijper and Todd Poerter. 2012. Sustainable Organizing: a multiparadigm perspective of organizational development and permaculture gardening. *Journal of Leadership and Organizational Studies*, vol. 19, No. 3, 355-368. DOI: 10.1177/1548051812442967
- [20] Damian Maye. 2016. Examining innovation for sustainability from the bottom up: an analysis of the permaculture community in England. *European Society for Rural Sociology. Sociologica Ruralis*, vol. 100, No. 00, 1-19. DOI: 10.1111/sorus.12141
- [21] Juliet Norton, Emily Kang, Gabriela Pena Carmona, Birgit Penzenstadler, Nora Koirala, Jaineet Shah, Bill Tomlinson, Samantha McDonald, Rieko Konishi, Sebastian Troncoso. 2019. The SAGE community coordinator – a demonstration. In *proceedings of LIMITS'19 June 10-11, Lappeenranta, Finland*, 1-10. DOI: 10.1145/3338103.3338108
- [22] Juliet Norton, Birgit Penzenstadler, Bill Tomlinson. 2019. Implications of grassroots sustainable agriculture community values on the design of information systems. In *Proceedings of the ACM Human Computer Interaction*, vol. 3, No. CSCW, Article 34, 1-22. DOI: 10.1145/3359136
- [23] Permatopia. 2020. Online: <https://www.permatopia.dk/> [accessed March 11 2020]
- [24] Podio project management and collaboration software. 2020. [online]. Available at: <https://podio.com/> [Accessed May 15 2020].
- [25] Barath Raghavan, Bonnie Nardi, Sara T. Lovell, Juliet Norton, Bill Tomlinson, Donald J. Patterson. 2016. Computational agroecology: sustainable food ecosystem design. In *Proceedings of CHI'16 Extended Abstracts* May 7-12 2016, San Jose, USA, 243-435. DOI: 10.1145/2851581.2892577
- [26] Natalia A. Romero, Panos Markopoulos and Saul Greenberg. 2013. Grounding privacy in mediated communication. *Computer Supported Cooperative Work*, vol. 22, 1-32. DOI: 10.1007/s10606-012-9177-z
- [27] Mark Roseland. 2000. Sustainable community development: integrating environmental, economic, and social objectives. *Progress in Planning*, vol. 54, 73-132. DOI: 10.1016/S0305-9006(00)00003-9
- [28] Kjeld Schmidt. 2012. The trouble with 'tacit knowledge'. *Computer Supported Cooperative Work*, vol. 21, 163-225. DOI: 10.1007/s10606-012-9160-8
- [29] Gerry Stahl. 2016. From Intersubjectivity to group cognition. *Computer Supported Cooperative Work*, vol. 25, 355-384. DOI: 10.1007/s10606-016-9243-z
- [30] Chairs Constantine Stephanidis and Gavriel Salvendy, Members of the group, Margarita Antonia, Jessie Y. C. Chen, Jianming Dong, Vincent G. Duffy, Xiaowen Fang, Cali Fidopiastis, Gino Fragomeni, Limin Paul Fu, Yinni Guo, Don Harris, Andri Ioannou, Kyeong-ah (Kate) Jeong, Shin'ichi Konomi, Heidi Krömker, Masaaki Kurosu, James R. Lewis, Aaron Marcus, Gabriele Meisselwitz, Abbas Moallem, Hirohiko Mori, Fiona Fui-Hoon Nah, Stavroula Ntoa, Pei-Luen Patrick Rau, Dylan Schmorow, Keng Siau, Nobert Streit, Wento Wang, Sakae Yamamoto, Panayiotis Zaphiris and Jia Zhou. 2019. Seven HCI grand challenges. *International Journal of Human-Computer Interaction*, vol. 35, no. 14, 1229-1269. DOI: 10.1080/10447318-2019.1619259
- [31] Josh Tenenberg, Wolff-Michael Roth and David Socha. 2016. From I-awareness to we-awareness in CSCW. *Computer Supported Cooperative Work*, vol. 25, 235-278. DOI: 10.1007/s10606-014-9215-0
- [32] James R. Veteto and Joshua Lockyer 2008. Environmental anthropology engaging permaculture: moving theory and practice toward sustainability. *Culture and Agriculture*, vol. 30, No. 1-2, 47-58. DOI: 10.1111/j.1556-486X.2008.00007.x