Information sharing in an online community of urban gardeners

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Abstract

This research investigates how a communication system could support urban gardeners in their activities. By looking at agriculture not as a mere activity for food production but as a rich social practice, this research addresses gardeners dual need of acquiring knowledge and develop social relationship.

Findings from an ethnographic research of two local agriculture communities are described. Participatory design has been used to identify design opportunities and co-create concept ideas. Prototypes have been used to evaluate key aspects and refine the final concept. By inviting intended users to take an active role during the entire design process, the result of this research is grounded not only in the theory but also on people's aspirations and real experience.
1. Introduction

This research aims to contribute to the field of Interaction design by investigating how information technology can support local urban gardeners in their activities. With the term urban gardeners, I refer to individuals engaged in the practice of growing and cultivating plants within the city boundary, in a non-professional way. In particular, my research focuses on the practice of olericulture, namely the branch of agriculture that deals with production of vegetable crops.

In recent years, research on food and food practices has emerged as a central subject of investigation within the HCI community. “In these few years, ‘food’ and what is loosely referred to as ‘food practices’ – for example, shopping, eating, cooking, growing, and disposal – have grown out of the periphery of HCI research to become a central topic of interest in and of themselves.”(Comber, Choi, Hoonhout & O’hara, 2014).

The growing body of work has expanded to cover the whole food chain, from food production and agriculture, to distribution and consumption. At the same time, research about food has evolved to include the socio-cultural and environmental aspects of food practices. For instance, food plays a central role in people's health and wellbeing, but at the same time its production and distributions represent key factors in sustainability (Comber, Choi, Hoonhout & O’hara, 2014).

This research aims to contribute to the current body of work by looking at agriculture and food production from an interaction design perspective. In particular, it investigates how a digital communication system can support local urban gardeners in their activities.

Recent technological developments are opening up new possibilities for agriculture, announcing a deep transformation that will affect this sector. Already in the 20th century, research and technological development have been the cause of a revolution in the agricultural sector: the so called Green Revolution was made possible by the development of new high-yielding varieties of cereals, by the introduction of synthetic fertilizers and pesticides and by the use of new mechanised method of cultivation (Green revolution, 2016). In the 21st century, the new revolution that will affect agriculture will be driven by the new possibilities offered by the Information and communication technology.

Projects such as the Open Agriculture research project (see figure 1), for instance, make use of ICT to create controlled environment agriculture systems. Plants grow in closed environments where the optimal climate conditions are reproduced by controlling climate variables such as carbon dioxide, air temperature, humidity and root-zone temperature. Growing isn’t influenced any more by geographical location. A specific growing environment
can be crafted for each stage of the plant development.

In the Farmbot project (see figure 1), ICT is being used to create a CNC farming machine: by the use of a simple interface, users can plan their vegetable garden and set specific regimens for each plant. Interchangeable tooling such as seed injection, watering and soil moisture sensors enables the machine to accomplish different tasks.

![Figure 1. From the left, Open Agriculture's controlled environment, Farmbot machine and close up of soil sensor tooling](image)

Other research, points to a different role for ICT in the field of agriculture. In his ethnographic research of urban agriculture communities, Odom (2010) discloses how members of the community heavily resist technological augmentation of their agricultural practices. The use of sensors, for instance, is seen as a practice that would subvert members’ development of knowledge and intuition, skills that are acquired by a continuous direct interaction and observation of the site. Furthermore, relying on a computer would undermine the learning and sharing knowledge between members, a fundamental activity for the creation of the community. Finally, the research proposes different ways in which ICT could help the community in their agricultural practices. For instance, an interactive system could connect the community with restaurants in the area in order to acquire their food waste to produce fertiliser.

These examples, far from being an exhaustive account, show two different approaches for HCI research in the intersection of agriculture practices. While the first two examples pursue efficiency and automation of agricultural practices, the later one takes into account the
social aspect implied in those practices. In this research, agriculture is not seen as a mere activity for food production but as a rich social practice.

Therefore, ethnographic research has been used in order to understand communities and individuals engaged in urban gardening. Participatory design has been chosen as the design method: by inviting the target group to take part in a co-creation process, the research aims to unveil the real needs and keep the users in focus during the whole process.

### 1.2. Research question

Growing food can be seen as the result of different activities. It usually starts with a planning phase where the gardener sets her/his goals and the steps needed to achieve them. Typical activities of this phase are for instance, the search for information, the evaluation of previous experience, the creation of shopping lists and a rough calendar of activities. Once the first seeds have been planted, the main activities are connected with plant care and acquisition of knowledge.

In urban communities devoted to agriculture, like the one studied by Odom (Odom, 2010), knowledge is mainly created and spread among its members through engagement in shared activities. For the individual gardener, contrariwise, information technology plays a central role in the acquisition of information and knowledge, it enables people to connect to each other and create shared virtual spaces, where virtual communities can take shape. Those spaces, not only cater for people’s need of knowledge, but also for people’s need of social interaction. Distances have faded and people connect with peers across countries and cultures.

This research aims to explore the opportunities that can be raised by connecting urban gardeners living in the same city, but also how a digital communication system could address their needs. A first research question, therefore, can be formulated as following:

- **How can a digital communication system support local urban gardeners in their activities?**

Through a co-design process with a group of urban gardeners, the research question has been narrowed to address the specific need of acquiring and sharing knowledge. The sub-research questions can therefore be formulated as following:
How can a digital communication system cater for the informal learning needs of urban gardeners? How can this system address people’s dual need of acquiring information and develop social relationships?

2. Theoretical framework

This section describes the theoretical frameworks that underlie the design process. The concept of Community of practice (Wenger, 2012) informed the study of local urban agriculture communities and their practices of knowledge creation. Theories in computer-mediated communication provided an understanding of media choice in relation to people's goal and personal preference.

2.1. Community of practice

The concept of Community of practice (CoP) was initially proposed by cognitive anthropologists Jean Lave and Etienne Wenger in 1991, and further expanded by Wenger in 1998. A community of practice can be defined as a group of people who share a concern or a passion for something they do and engage in a process of collective learning. Community of practice can be found everywhere; it is part of people's everyday life. Members of a community of practice share a common domain of interest and in pursuing their interest, they engage in joined activities, they share information, they help each other and learn from each other. All of the above results in the development of a shared repertoire of practices (Wenger, 2015).

The concept understands learning as social participation, “a perspective that locates learning, not in the head or outside of it, but in the relationship between the person and the world, which for human beings is a social person in a social world. In this relation of participation, the social and the individual constitute each other.” (Wenger, 2009). Learning is not seen therefore as an individual process, neither as separate from other activities people engage with in their life. Learning is not only about acquiring skills and information, but also a process that produce a social structure. When people become part of a social context, they participate to social life by engaging in activities, in conversations etc. and at the same time, they produce artefacts, physical or conceptual, that reflect their shared experience. Wenger uses the terms participation and reification to describe these processes. “Meaningful learning in social contexts requires both participation and reification to be in interplay. […]"
Participation and reification represent two intertwined but distinct lines of memory. Over time, their interplay creates a social history of learning, which combines individuals and collective aspects. [...] a history of learning becomes an informal and dynamic social structure among the participants and this is what a community or practice is.” (Wenger, 2009).

Communities of practice usually reckon on different levels of participation: a core group, active participants, occasional participants, peripheral participants, and transactional participants. Each group is defined depending on people’s active participation, engagement, interest on the domain, and identification with the community goal (Wenger, 2011).

Since the initial formulation, the concept of CoP has been used in several fields and expanded to include virtual community of practice (VCoP). Members are no longer co-located, but make use of ITC to connect to each other. Virtual collaborative spaces are established by the use of a wide range of media and member interaction is mediated by technology (Dube, Bourhis & Jacob, 2006).

The concept of Community of practice has been used in this research to provide an understanding of the social aspect of learning. In particular it has been used as theoretical framework for the study of two associations of urban gardeners in Malmö, Sweden.

2.2. Virtual communities

“Virtual communities are online networks in which people with common interests, goals, or practices interact to share information and knowledge, and engage in social interactions. It is the nature of social interactions and the set of resources embedded within the network that sustains virtual communities.” (Chiu, Hsu & Wang, 2006).

People join virtual communities to seek for information and knowledge, but also to develop social relationships, meet other people, seek for support and of a sense of belongingness. In virtual communities knowledge and information become a valuable currency and a social resource, while members develop relationships and a sense of being part of a larger social group (Ridings, Gefen, 2004).

This research, by exploring the possibilities for a communication system connecting local gardeners, makes use of the concept of virtual community, but it does not foreclose the possibility of an offline interaction.
2.3. Media choice in computer-mediated communication

Computer-mediated communication is an interdisciplinary branch of study that deals with the investigation of the impact of different computer-supported communication technologies.

In particular, the study of the relation between communication effectiveness and media choice has been a central topic of investigation. One fundamental theory in this field is the Media richness theory (MRT) proposed in 1986 by Richard L. Daft and Robert H. Lengel. The theory argues that each medium has a different ability to enable people's communication, depending if the media is used in a context of equivocality or uncertainty (Daft, Lengel, 1986).

Media are classified in relation to their richness, defined as the "the ability of information to change understanding within a time interval." (Daft, Lengel, 1986). Factors that influence richness are the medium ability to transmit cues, such as tone of voice or body language, the presence of immediate feedback, the degree of personalisation and the ability to convey natural language. For instance, face-to-face communication represents a richer medium than e-mail or instant messaging because it conveys a higher number of cues, it enables immediate feedback and is based on natural language (Daft, Lengel, 1986).

Daft and Lengel (1986) argue that rich media are best suitable in equivocal situations, where the meaning of a message is unclear and needs to be interpreted, while lean media are a preferable choice for an uncertain situation, where a framework for interpretation do exist but there is a lack of information.

Several empirical studies that evaluate the MRT, though, have shown contradictory results, especially when it comes to the “new media”, based on computer-mediated communication. These studies informed the Media synchronicity theory (MST) by Alan R. Dennis and Joseph S. Valacich (1999). MST focus on the ability of the media to support synchronicity, defined as the extent of which people work together, at the same activity and at the same time. The theory argues that a medium can be described by five characteristics, called media capabilities, that may influence media synchronicity: immediacy of feedback (the ability to support rapid bidirectional communication), symbol variety (the number of ways in which information can be communicated), parallelism (the number of simultaneous conversations that can be supported), rehearsability (the extent to which the media enables to elaborate the message before being sent) and reprocessability (the extent to which a message can be processed again within the communication event) (Dennis, Valacich 1999). Contrariwise the concept of equivocality or uncertainty of MRT, Dennis and Valacich argue
that all tasks are the results of two processes: conveyance and convergence. “Conveyance is the exchange of information, followed by deliberation on its meaning. It can be divergent, in the sense that not all participants need to focus on the same information at the same time, nor must they agree on its meaning. In general, low media synchronicity is preferred for conveyance. Convergence is the development of shared meaning for information. By definition it is convergent, in that participants strive to agree on the meaning of information and agree that they have agreed. This means that participants must understand each other's views. In general, high synchronicity is preferred for convergence.” (Dennis, Valacich 1999).

In Dennis and Valacich's view (1999) the effective use of a medium required a matching between the medium capabilities and the communication process that needs to be supported. “Because most tasks require individuals to both convey information and converge on shared meanings [...] Media switching may be most appropriate.” (Dennis, Valacich 1999).

Nowadays media often provide multiple capabilities that users can choose from depending on their preference and context of use. For instance, Skype offer the same capabilities than media such as telephone, video conferencing and instant message chats; it is up to the users to choose how they want to use the service to accomplish their goal. The creation of the right mix of media capability, therefore, need to take into account both the user goal and personal preferences. In the context of this research, media capabilities have been used to create and evaluate different media mix, in relation to users task and personal preferences.

3. Related examples

In this chapter I will describe few examples of digital artifacts, designed to support urban gardeners. Different qualities of those artifacts will be highlighted in relation with this research project. Furthermore, an example of urban installation that makes use of audio as communication medium will be presented.

3.1. Koubachi

Koubachi is an app designed to help inexperienced gardeners in the care of plants. The app contains a library with information about most popular plants. Users can create a virtual garden by selecting plants from the library. The app contemplates the use of a moisture, temperature and light sensor that, by pairing the real plant with the virtual one, support the
user in the caring activities, by sending notification with instructions. Overall the app provides information suitable for beginners, who face the challenge of basic care. The plant library though is limited and does not comprehend the richness of plant varieties.

This is only one example of several similar apps available on the market, designed to help people gardening. They conceive gardening as an individual activity in which the system's role is to provide generic plants information and care instructions. These apps do not contemplate interaction between users, furthermore, the information provided is rather generic and it does not take into account the specific growing conditions determined by user's geographical location and chosen growing method. Enabling users to interact and share knowledge based on their geographical location, is therefore a quality that could support urban gardeners to access relevant information and gain insight from other people’s experience.

Figure 3. Screen shots of Koubachi app
3.2. GrowIt!

GrowIt! is a mobile app launched in 2014, which aims to connect gardeners living in Chicago, USA. The app allows users to share pictures of their plants, rate them, ask for help in identifying plants, browse what other people are growing, get information about plant care, create a list with projects and automatically create a shopping list with plants for them.

Users can rate each other’s pictures by choosing one of these options:

- Leave it: the plant does not look good and perhaps needs help or it is not adapted to grow in that area;
- Like it: the plant is something the user grows or would like to grow;
- Grow it: this is a must-have plant.

As one of the founders explain in an interview: “We wanted to give gardeners and growers a chance to finally rate plants in their local area. Someone, maybe an experienced gardener or a beginning gardener, takes a picture of a plant. If they know what it is they tag it, if they don’t, they can select ‘Help me identify’. They also give it a “leave it”, “like it” or “grow it” rating, and then anyone within 75 miles is shown that photo and they get a chance to rate it.” (Gardencentermag, 2014).

The app was developed with the intention to close the gap between the consumer and the industry in this sector, by providing the later one with useful information about people’s preferences and needs. As mentioned later in the interview (Gardencentermag, 2014), the app was initially available only for garden retailers, garden writers and others involved in the industry. This allowed the creation of an initial database of information about plant care curated by professional and, at the same time, allowed the industry to test and refine the app. Under this perspective, the rating system seems to serve primarily the industry's interests, by providing information about buying intention of plants and product for specific care.

Unfortunately the app is not available for download outside USA, therefore it was not possible to experience it at first-hand.

GrowIt! shares with this research the idea of connecting urban gardeners living in the same city. Users create and share information about their plants. They interact with each other by rating pictures, posting messages or following other users. This app is therefore a starting point for the design of a system that aims to create value for its users by connecting them through digital means.
3.3. Urban Garden Share

Urban Garden Share is an online platform that aims to pair together gardeners with gardens. Garden owners can seek for co-operation and offer to share their land with other users. The user interaction is mediated by a message service. This is one of the several examples where digital communication provides services by connecting people.

Figure 4. Screen shots of GrowIt! app

Figure 5. Screen shots of urbangardenshare.org
3.4. Nørrebrodagbog

Nørrebrodagbog is a project by collective "Hurraaa" (2009) designed as part of the exhibition 'En Historiefabrik', a contemporary historical exhibition about life in Nørrebro, Denmark. The installation featured 6 wooden stations, placed around Nørrebro neighbourhood, where people were invited to share their thoughts and experience. Passers-by could write or record audio clips to create a common diary.

The call to leave personal thoughts and stories has been nicely addressed by choosing hand-writing and voice recording as a mean of self-expression. Those media, besides removing any technological barrier, conveys the message together with more personal qualities. When comparing people's contributions using both media, it is also possible to notice how longer messages are often conveyed by using audio recording.

The project relates to the research in the way that it creates a communication channel between people living in the same neighbourhood and in the use of audio recording as a channel for self-expression.

Figure 6. Wooden station and close up of a diary page.
4. Method

In this section I will describe the methodological approach used in this research. Participatory design, interviewing and prototype will be briefly introduced, accompanied by a description of their use in the design process.

4.1. Participatory design

Participatory design, within the field of Interaction Design, is an approach to design in which people destined to use a particular system, are called to play a critical role in the design of it. This approach is based on the assumption that the people that will be served by the design are in fact the most knowledgeable of their own experience, and therefore the one in the best position to determine how to improve their life. The user is seen therefore as an expert and is empowered, subverting the traditional designer-user relationship (Hillsdale, 1993).

In this perspective, the role of the researcher is shifted. Rather than acting as a translator between the user and the designer, the researcher becomes a facilitator which provides users with tools and process to express themselves, to surface their needs and aspirations. The designer, in the same way, crafts and guides users through a collaborative creative process, providing tools for ideation and expression. This shifted role is reflected in the focus of a wide range of practitioners from the design research field that, over the past decade, have explored and developed co-design tools and technique (Sanders, 2012).

By involving the user in a co-creation process, this research aims to unveil the real needs and keep the user always in focus. During the design process a group of urban gardeners have been invited to take part of different activities during a workshop session. The goal of the workshop was to surface people's needs and co-create concept ideas together with future possible users. The workshop will be described in detail in chapter 5.4.

One of the activities was inspired by a co-design method called Storytelling Group. (Kankainen, Vaajakallio, Kantola & Mattelmäki, 2012). In this method, developed for service design, participants are guided in the creation of scenario for new service ideas: during a group session, participants create fictive stories of customer journeys; at the same time they are encouraged to tell real-life stories related to the scenario, in order to reveal their motivations and attitude toward the service being designed. This method has been used as inspiration for the plan of a co-design activity where three urban gardeners have been invited to imagine different scenarios, using real life stories to support their ideas.
4.2. Interview

Interviews are a fundamental tool of ethnographic research. They provide to the research valuable information about people’s perspective. Depending on how structured the questions are, interviews can be described as unstructured, semi-structured or structured interviews (Blomberg, Burrell & Guest, 2003).

Unstructured interviews allow the researcher to modify the questions as the interview unfolds, giving the freedom to explore different topics and discover novel insights. Open ended questions allow participant to express their experience in their way, using their own words. Unstructured interviews are often used in the initial phase of the research, to get a sense of the activities and of people studied. On the other end, in structured interviews the questions are more specific and become more focused (Blomberg, Burrell & Guest, 2003).

In this research, semi-structured interviews have been used in the initial research phase, where the aim was to get a sense of people’s situation and explore opportunities for design. Structured interviews have been used to evaluate a prototype, by asking user specific questions about their experience.

4.3. Prototype

Prototypes are important means in the design of interactive systems. They allow the design team to explore and evaluate different aspects of the design, in different stages of the design process. As Houde and Hill describe “Prototypes provide the means for examining design problems and evaluating solutions. Selecting the focus of a prototype is the art of identifying the most important open design questions.” (Houde, Hill, 1997).

Interactive systems, furthermore, are often complex and impossible to craft into a single prototype in the early stage of the design process; therefore choosing what to prototype is a critical choice that the design team needs to make. Houde and Hill (1997) provide a model which can help the design team to separate the design questions in three different categories, each of one can be addressed by a different prototype (see figure 7). “Role” prototypes are built to investigate the function of a certain artifact, “Look and feel” prototypes aim to explore the sensory experience of the artifact, while “Implementation” prototype address questions connected with the artifact specifications and components.

During the design process a prototype of a voice message service have been crafted to explore users attitude toward the voice modality and the role that such artifact could play in people's life. The prototype can be therefore situated in between “Role” and “Look and feel”.
5. Design process

The design process, illustrated in figure 8, started with a fuzzy front end, also called 'pre-design', characterized by the exploration of the broad topic of urban growing. As the adjective “fuzzy” suggests, this phase of the process is blurred, chaotic and the research question is not defined yet. “Considerations of many natures come together in this increasingly critical phase, e.g. understanding of users and contexts of use, exploration and selection of technological opportunities such as new materials and information technologies, etc.” (Sanders & Stappers, 2008).

This phase results in the formulation of an initial research question, followed by generation of ideas, exploration of concepts, and an iteration of prototypes and tests. During the fuzzy front end, fieldwork research has been done about two local associations working with urban gardening: Hemmaodlat and Folkets odling. Semi-structured interviews of members were conducted, exploring different topics such as people experience and
motivations. Being carried out in the initial phase of the design process, the questions were open-ended. The purpose was to get an initial understanding of different local communities of practice in the field of urban gardening.

After this initial exploration, a research question was formulated and more focussed activities were planned. A group of urban gardeners were invited to participate in a co-design workshop, which resulted in the definition of three different design spaces. One concept was explored and developed further through a prototype. Evaluation of the prototype informed a final design proposal.

5.1. Hemmaodlat

Figure 9. Hemmaodlat initiatives.

Hemmaodlat is a non-profit organisation, based in Malmö, which mission is to promote home growing in an urban setting. Founded two years ago, it focuses on hydroponic cultivation and it is today a referent point in this field. The organisation offers courses on hydroponics, has a shop based on Community Supported Agriculture (CSA) and it is involved in several projects as consultant.

The goal of the educational initiatives is spreading knowledge about hydroponic. The organisation offers different courses and lectures that members can attend, besides organising workshops for schools. The main educational offer is comprised by 8 lectures during which
people learn about the different types of hydroponic cultivation and build their own hydroponic system to grow vegetables at home. The lectures are supported by video material and shared on the Hemmaodlat channel on youtube. Furthermore, members have also access to a small library for a more focused and deep study of the topic. The main challenge they are facing at the moment is to keep people engaged during the whole course and prevent participants from dropping out.

Adding to the more structure educational offer, the members meet once a week to carry out maintenance activities and plant caring. This is an important moment of sharing knowledge, where members with different levels of expertise team up and work together. In those sessions they engage in shared activities, socialise with each other and create a shared repertoire of experience; factors that stimulates a sense of community.

Hemmaodlat runs also a shop based on CSA, an alternative economic model of agriculture and food distribution in which individuals support local growers by sharing the risk and benefit of food production. CSA members pay at the onset of the growing season for a share of the harvest. At Hemmaodlat, CSA members pick, once a week, a bag of fresh herbs and vegetables. Having grown indoors, in a controlled environment where nutrition and light are provided artificially, the service works all year around, contrarily to the traditional agriculture that is subject of season and weather condition. Besides producing locally organic products, another important value is the attention posed to the variety of the offer, which reveals a commitment for the safeguard of biodiversity, contrary to the monoculture of large scale intensive cultivation. Through surveys, customers are invited to give feedback and make suggestions about the selection of vegetable that they receive.

Hemmaodlat works also with companies and organisations as consultant. For instance, recently it has collaborated with MKB, a property company, and Vilanova, the state innovation agency, in the construction of a common window farm for a new residential building in Holma, Malmö. It is also involved in research projects, such as the collaboration with the Swedish Standard Institute, towards the definition of standard for indoor food production in urban environments.

Because of the growing method used at Hemmaodlat, hydroponic, technology is necessary to monitor different variables of the system, such as level of nitrogen and water circulation. Besides that, the association use e-mail as the main communication channel between its members has a youtube channel where it uploads the lectures and makes use of whiteboards for internal organisation, such as shift and activities.
5.1.1. Interview with Niklas, founder of Hemmaodlat

The conversation with Niklas helped me to understand the different initiatives of Hemmaodlat and his personal motivation for running this project. “The overall topic is important for me. I believe we need more farmers, more people that understands the value of growing food, even if it is in a small scale at home. Because if you can get thousands of people to do that, all of the sudden you have something going on. […] When you start to grow, you get an understanding of what it takes for something to turn from a seed to a plant, the amount of energy it takes, the amount of care it takes. I think we take food for granted”. These words reveal his strong commitment to the environmental cause pursued by Hemmaodlat.

5.1.2. Interview with members

During my visit to Hemmaodlat I had the chance to interview three members: Julia, Carolina and Jonas. Julia and Jonas became members when they joined the association for the 8 lecture course that Hemmaodlat provides and they are quite experienced members, while Carolina is a new member and joins only the Wednesday meetings.

Overall members share a personal interest in organic food and that represents one of the motivating reasons for them to join the association, together with the will to learn something new in a social context. Learning by doing, engaging in activities with other people and sharing knowledge with other members, were mentioned as positive facets. In her interview, Carolina mentioned: “One of the nicer aspects of Hemmaodlat is the knowledgeable people that you find here. The atmosphere is relaxing and welcoming. You can always ask questions to people and learn from them”.

Beside those shared motivations, members mentioned the therapeutic aspect of growing plants to reach well-being, or their satisfaction in growing their own food at home. Jonas felt so engaged with the association that he would use the pronoun “we” to refer to Hemmaodlat.

5.2. Folkets Odling

Folkets odling is a recently started project of a shared urban garden in Malmö, Sweden. The members, all living in the same neighbourhood, share a small lot where they grow different crops. They are organised in shifts, so each of them takes care of the plants over a one week time period. Once every other week, they organise learning activities and meet
The communication between members is carried out by using Slack, a messaging app designed for teams (see figure 10). The app enables teams to organise conversations in different channels, to share pictures, text messages and documents.

Below an account of the interview with Bodil, the organiser of the group, and Kristina, one of its member.

![Figure 10. Screen shots of the Folkets Odling page in Slack.](image)

### 5.2.1. Interview with Bodil

Bodil is the person who started the Folkets Odling project. In the past, she has been part of similar initiatives in Västerås, Sweden. During the interview we spoke about both her experience in Västerås and the new project in Malmö.

Her initial motivation to join an urban gardening group was a personal interest in sustainability, preceded from her studies in Environmental science. Many, as a matter of fact, are the environmental benefits of growing food within the city boundaries. For instance, the reduction of carbon footprint. Furthermore, the social aspect of joining a group activity was mentioned as another important motivation.

The group welcomed anyone interested in gardening, independently of the level of expertise. People learn by sharing experience and knowledge with each other, and by trying new things. As Bodil mentioned in the interview: “The good thing of being in a group is that there is always someone who has the answer, you just need to ask”. Decisions are made with
the consensus of all the members and there is no hierarchy. From time to time, more structured learning activities were organised, such as watching documentaries or informal lessons about specific topic prepared by the more experienced members.

5.2.2. Interview with Kristina

Kristina joined the Folkets Odling association to learn more about olericulture and, at the same time, to expand her social circle. Beside the group she also grows food at home and shares a vegetable garden with her partner. She developed an interest in gardening thanks to her partner who supported her in the beginning. She recalls how, before, growing plants was a frustrating activity, but with some help she gained confidence again. Her source of information are people of the Folkets Odling group, her partner and online webpages.

Figure 11 shows a collection of articles she saves and a notebook where she keeps track of plants growth and writes useful information to be used as base for the next year planning.

![Figure 11. Example of how interviewed people collect and annotated useful information.](image)

5.3. Reflection

The interviews revealed the complexity and multiplicity of people's motivation to join and engage actively to local communities. Social ties, self development, considerations of reciprocity, altruism, identification with the community, building a reputation, are some of the values that underlie people's motivation. In both initiatives, membership takes different forms, from active to peripheral form of participation. Active members are key to create a vibrant community, and with the time, members take on different roles. Learning, sharing experience
and knowledge are a central activities that take different forms, from structured lessons to informal conversations.

5.4. Workshop

In order to include the end user in the design process, a workshop was organised. The goals were to get an insight about people's experience, surface their needs, and together explore possible interactions and services that a digital communication system could enable. Three people participated, each of them with a different level of expertise and interest in gardening and olericulture: Hanni, Kristina, and Rebecca.

In the first part participants were asked to pick a card from a deck, which contained different questions, and in turn, all participants were invited to answer (see Appendix A). The exercise, in addition to work as ice breaker for the group, aimed to get insights about people experience, memories, knowledge, motivations and stories in connection with gardening. Some highlights from this initial conversation:

- Information about gardening is often sought either by asking friends and family members or by searching in google;
- Learning is often based on trials, and it can extend over years. Previous year experience informs the next year's planning;
- People can be really passionate about gardening and spontaneously, during the workshop, participants engaged in conversations where they shared tips and experience;
- Often participants refer to plants with words such as “my tomato plant”, or even give names to their plants;
- Participants mentioned how the experience of growing food made them more aware of sustainability issues such as food waste and the use of toxic products;
- The more experienced participants usually engage in gardening activities on a daily basis: a quick check on plants status in the morning and the rest of activities are usually done in the afternoon.
Figure 12. Different moments of the workshop.

The second part of the workshop aimed to explore the needs of the participants in terms of information and knowledge. Participants were asked to reflect upon the different activities connected with gardening and write on post-it notes questions and topics of interest. After that, participants shared their contribution with the rest of the group.

The results showed topics connected with the different gardening activities: from planning the garden to plant care, from harvesting to preservation of crops, plus topics of general interest such as medical and culinary properties of plants (see Appendix B). This activity aimed to get a sense of the type of information people seek and the time perspective: most of the topics did not require an immediate answer.

The third activities of the workshop, inspired by the Storytelling Group method (Kankainen, Vaajakallio, Kantola & Mattelmäki, 2012), aimed to surface people’s aspirations and co-create concept ideas. The general premise was to imagine being able to connect with other urban gardeners living in Malmö through a digital service. The task was to explore a hypothetical scenario of what such a system could be used for and which interactions it should enable.

A map of Malmö and paper figures representing different users of a hypothetical on-line
gardening community was presented to the participants. Each of them was asked to choose a figure and place it on the map. The ideation phase was carried out by asking the participants to elaborate around “what if” questions, such as “what if you could connect to people in your city”, or “what if you could narrow down your communication within your neighbourhood”.

During the process it became obvious that people's imagination was triggered by other people's ideas. By asking them to refer to personal experience, people were invited to reflect about their attitude towards the idea being explored. The results of this co-design session identified three design spaces: service design, urban interventions and sharing experience and knowledge (see Appendix C).

Services such as seedling and plant swaps, a plant hotel or a service for people to book/offer one hour of their time to help other members were imagined. A temporary garden created by people's potted plants or a system to co-ordinate guerrilla gardening activities were some of the concepts of urban interventions.

Finally few ideas explored a platform for sharing knowledge and experience. As one of the participants highlights “connecting with people around you seems better than, for instance, looking in internet. They live in the same climate conditions, they go to the same gardening stores,..for sure from their experience I can get relevant information”.

In the last activity of the workshop, participants were invited to imagine an app for urban gardeners. This exercise, by giving participants the freedom to explore and materialise their idea, aimed to understand which of the concepts emerged previously, were more important. Material such paper phones, icons and markers were provided and people engaged with the materials. Finally, each participant shared her idea with the rest of the group. Figure 13 shows the results of this activity. Because of the restriction of having a single phone to work with, participants condensed all the desired functionalities in it. While sharing their design, they explained their choice and how they imagined the different parts could work. Here follows a short account of the three ideas:

- Phone one: people would create user profiles and use the app to save information about their plants. The app should provide a search function to explore other user profiles and access to their plants information. For instance you could search for people who started growing tomatoes the same week as you, so you could compare the growing status of your tomatoes plants. Another feature could be a chat message function to speak with another user, in a one-to-one type of communication;
Phone two: people would create user profiles and use the app to save information such as plant care, pictures, useful links, and favourite shops. The app would also show a time-line for each plant. The user could explore other people profiles, by navigating an interactive map that shows users location. Finally some kind of chat/forum function would allow communication between gardeners;

Phone three: people would create a user profiles, indicating their interests and level of expertise. The app would allow users to create their own “how to” tutorials and share links to useful source of information. A section would be dedicated to services such as give-away/selling plants, and sharing tools. Finally a chat/phone service would allow members to communicate with each other, with the possibility to set different status such available/not available.

Figure 13. The gardening apps designed by participants.

The results showed similarities with existing gardening apps in the market. Therefore, while participants shared their design, I invited them to elaborate about topics I considered promising: how users could share and compare the growth of their plants, and how people could use the app to ask questions to other members.

An idea for a plant time-line was explored: users could add activities to a calendar, such
as seedling or pruning, add pictures and write notes to create a diary for each plant. The system would allow users to compare their plants time-line, having the option to filter users by type of plant, date, number of weeks from sowing, or the chosen growing method. Furthermore, over the years, the diary would become a useful tool to keep track and learn from previous experiences.

When it comes to how people could interact with each other, the conversation open up to an evaluation of existing channels, such as chat and forum, and resulted in a definition of some of the qualities the system should have. The need expressed was to be able to ask a question to the community and receive back relevant answers. Contrariwise forums, the system should allow a limited number of replies: neither too many nor too few. Receiving multiple answers was mentioned as a key factor, since often there is not a single solution to their problems. Too many answers though, were perceived as overwhelming and time consuming.

Finally, another important quality highlighted was that the system should cater for a fun and pleasant experience. As one of the participant said: “Being able to ask an expert could be nice, but it must be fun also. Sometime experts makes things boring and take away the fun of basic things! I am not planning to win a gold medal for my tomatoes, I am here to enjoy!”.

5.5. The “Chain of voice messages” concept

From the workshop three design spaces emerged, (service design, urban interventions and a system for sharing experience and information). Design ideas for an app of urban gardeners have been explored, with a focus on two functionalities (plant diary and communication between members). Due to the limited scope of this thesis project, a decision was made to focus on the latter topic. Through a brainstorming session the “Chain of voice messages” idea was developed. Below a description of the concept.

Through a hypothetical app, users could share information, experience and stories by sending audio messages to each other. For instance, one person records a message with a question and automatically, the system sends it to few random users. The users who receive the audio message can decide to decline or answer the question. When someone declines, the system, automatically, re-send the message to another user. When someone answers, the message is saved in a playlist, together with other people answers. People’s contributions remain anonymous; the playlist does not show the user name. When a certain amount of answers has been reached, the chain closes and the playlist is shared between all the users.
who contributed to it.

5.5.1. Prototyping

In order to evaluate the idea, a prototype has been created. The main goals of the prototype were to investigate the role that this communication system could play for the user and get feedback about the experience of using voice messages. In particular, the aim was:

- to get people's feedback about their experience with the voice modality;
- to get people's feedback about their experience in interacting with strangers;
- to test the system with different type of questions;
- to use the prototype as a boundary object for a further ideation session with the users.

In order to simulate the experience, six people were recruited and WhatsApp was used to exchange audio messages. A first question was sent to each participant who would send their answers back to me. All the answers were later merged in a single file and shared among the participants. This process took place four times, with four different questions. At the end, a

![Figure 14. Screen shots of the prototype created using WhatsApp.](image)

In order to simulate the experience, six people were recruited and WhatsApp was used to exchange audio messages. A first question was sent to each participant who would send their answers back to me. All the answers were later merged in a single file and shared among the participants. This process took place four times, with four different questions. At the end, a
A survey was sent to the participants to get their feedback. For more details, see figure 14, appendix D and E.

The survey posed open questions, formulated to allow people to express with their own words their opinion about specific topics. Below some highlights:

- expressing themselves through voice messages has been initially perceived as “awkward” and “uncomfortable”, while toward the end people felt more comfortable and at ease with it;
- to hear other people’s voices has been perceived as “nice”, “personal”, “authentic” and “friendly”;
- people enjoyed to be connected with strangers, they felt curiosity to discover more about the people in the group, especially when the question allowed for a more personal story: “You get to know them little by little. You know nothing about them except the small pieces you collect from their stories. No preconceptions.”
- when it comes to specific questions about gardening, both positive and negative aspects were highlighted: “It feels like these are more real experiences and knowledge, they come from real people and real life situations.”, “This is something else than retrieving pure facts. You get advice/facts/input in an old fashioned way. Facts can't give you everything. Good advice or an interesting story can help you along in a greater extent. Depending on the topic or answer you are looking for, of course. You feel safe and taken care of, someone cares and will help you!”, “You won't know if they actually know what they are talking about. No guarantees for truth.”, “I think I still would prefer Google because it seems more accurate than the opinions of friends who maybe aren't experts.”
- “curiosity” and “surprise” were two qualities people enjoyed.

5.5.2. Iteration of concept

In a second iteration, the concept has been refined further. Unfortunately only one participant from the prototype session could attend the meeting. A storyboard with a user journey was used to stimulate a discussion with the participant, who also refers to her direct experience from the prototyping session.

In order to improve the credibility of the information, the playlist should include a
greater number of people. Receiving similar answers, for instance, could be a sign of accuracy. Because people do not know who else will receive the playlist, a key factor is anonymity. For instance, the playlist should not show any user name. At the same time, participants highlight how this is an interesting way to meet other gardeners, therefore the system should allow contacting “favourite” people. For this purpose, an idea to tag favourite messages was developed: when two people have marked each other as favourite, their user name becomes visible and therefore they can get in contact through the app. To better convey certain type of information, the possibility to attach a picture to the voice message was also expressed. Finally, the possibility to delete and make a new record before sending the message was added.

Two scenarios illustrate the user journey of four urban gardeners, using the “Chain of voice messages”.

Scenario 1
Kristina is a member of a new online community of urban gardeners living in Malmö.

Using the community app Kristina creates a diary of her plants: she takes pictures and writes short notes with useful information.

Hej there, this is Kristina!! I am looking for advice for gardening outdoors... I have a small balcony and I would like to try to grow some vegetables there. Do you have any suggestions for me? Which plants could I try? I am not really experienced so I would rather start with something easy....

When she has a question or needs advice, she uses the app function called “Chain of voice messages”: she records her question on an audio message....
„that is randomly sent to 10 users of the gardening community.

Erica’s phone

You have a new message

She answers to Kristina by recording another audio message.

—if you are not satisfied with the first recording, don’t worry, you can make a new one!

Erica feels surprised and curious to hear the message. She doesn’t know who is sending it, neither who else in the community will receive it.

Hej Kristina… I also have a balcony and I can give you some tips! If you want something easy I suggest that you start with some lettuce and potatoes. I usually buy seeds at the …
Kristina’s message flows across the community. Everytime someone declines it, the system re-sends it to a different user. When 10 people have answered, the system collects their messages in a playlist, ”

”and shares it between the contributors.
Kristina feels excited and can't wait to hear people's answers.

She got so many good advices and interesting stories!

At the same time, few blocks away, Erica is also listening to the playlist. When she hears her voice it feels a bit awkward, but the feeling lasts only for a second.

Oh... this is a nice idea... I want to try it!!

Other people's experience gave her some nice new ideas for her balcony.

end
Scenario 2
Francesca is member of a new online community of urban gardeners living in Malmö.

She feels surprised to recognize the voice ... she heard it few weeks ago in a playlist about toxic plants. She remember it because the guy told such an incredible story!

While driving home, she receives a message, sent by a community member (Lorenzo) using the "Chain of voice messages" function.

"Hej there! I think I can help you! I also had the same problem few weeks ago... from one day to the other all my hole were covered by little yellow eggs! The best thing to do is to check each single plant and remove the eggs. It takes ages but it is the easier and most ..."

Once at home, she reply by recording an audio file.
Her message is saved in a playlist, together with other people answers.

When 10 answers have been collected, the system sends the playlist back to all contributors.
Francesca and Lorenzo listen to the playlist. Many people mentioned that ladybirds are really good in protecting kale from aphids and scale insects.

Lorenzo really liked two of the answers. He can tell that they came from people with similar experience as him, he likes that. Sometime experts make things boring and take away the fun of basic things.

As soon as he swipe the message2, Lorenzo receive a notification: Francesca, the voice behind the message, has also swiped him. Their user names, now, are visible to each other.
Lorenzo can go now online, and look for Francesca profile in the community. He discovers that she is also stubborn like him and keep trying to grow tomatoes in the cold swedish summer.

He starts to follow her. On a shared timeline he can compare their plants, leave comments and send messages in a chat.

Few weeks later... 

"Francesca and Lorenzo meet in person. They are going to a gardening fair together."
6. Discussion

From the initial ethnographic research, to the last concept iteration, the people I am designing for played a central role. The whole design process was an attempt to involve future users to co-design a communication system that would cater for their needs and aspirations.

The study of two associations of urban gardeners provided an understanding of the dynamics of two different communities. Being done during the fuzzy front-end of the design process, when the research question was not defined yet, they informed this work by providing insights about urban gardeners. The concept of Community of practice by Lave and Wenger (Wenger, 2012) served as theoretical framework in the study of such communities.

Once the research scope was defined, co-design activities were designed to surface people needs and create concept ideas. The use of different material, such as post-it notes, cards, paper illustrations and markers made the activities fun and engaging, although it has been challenging to keep the energy level high during the whole workshop. A solution could have been to split the workshop in two different sessions. Being my first experience with participatory design, it has been hard to recruit people, in particular find people that could represent the intended user group and that were eager to participate to the whole process. Keeping people engage was also a challenge, especially in more demanding activities such the online survey. A solution could have been, for instance, to combine a shorter survey with a face-to-face interview.

Another challenging aspect has been to keep a balance between participants individual aspirations and a more holistic view, who could cater for a larger group of users. Designing for a community of people means taking into account different perspectives. When this is done together with a small group of people, it is difficult to mediate their aspirations and personal opinions with insights I have gained from the previous research and theories. Working with a smaller group of people, however, was the right choice in relation to the limited scope of this 8 weeks project. In order to get a sense of the heterogeneity of the intended user group, cultural probes (Gaver, Dunne & Pacenti, 1999) could also have been used during the initial phase of the design process.

The co-design method Storytelling Group (Kankainen, Vaajakallio, Kantola & Mattelmäki, 2012) has been an inspiring recipe for the design of the workshop activities. Furthermore it informed the creation of illustrated user journey to evaluate and refine the concept together with the users.

Theories on media choice, such the Media richness theory by Daft and Lengel (1986) provided a theoretical framework for understanding the interrelation between media choice,
task to be accomplished and user personal preferences. Further studies about the voice as medium of expression, although, could have provided a deeper understanding of the psychological and cognitive aspects connected with oral communication.

The prototype resulted a key tool to enable people to have a first-hand experience of what the “Chain of Voice-messages” could be and to iterate on the concept later on. Inviting people to answer four different questions resulted also into a key factor because it allowed participants to experience a change in their ease in using the voice modality, overcoming an initial reticence.

Far from being a final product, the design proposal should be further developed. Remaining key questions could be addressed by making a working prototype, used by a greater group of participants over a longer period of time. Such prototype, for instance, could provide a greater understanding about the concept's potential to foster social interaction between members, both online and offline.

6. Conclusion

This research explored new opportunities for designing interactive system that support urban gardeners in their activities. For the individual gardener, information technology plays a central role in the access of information and knowledge. Furthermore, by connecting people, it fosters the creation of shared virtual spaces, where virtual communities can take shape. This research looked at agriculture not as a mere activity for food production but as a rich social practice, where individuals interact with each other and pursue their personal growth by participating in a social context. Therefore an interactive system need to cater for people's dual need of acquiring information and develop social relationship.

Three research questions guided the design process: how can a digital communication system support local urban gardeners in their activities?, how can a digital communication system cater for the informal learning needs of urban gardeners?, how can this system address people’s dual need of acquiring information and develop social relationships?

Based on the assumption that “the people that will be served by the design are in fact the most knowledgeable of their own experience, and therefore the one in the best position to determine how to improve their life.” (Hillsdale, 1993), Participatory design has been chosen as design method. A group of urban gardeners have been invited to take an active role and
participate in co-design activities. Through a workshop, design opportunities have been identified and an initial concept have been developed. A prototype enabled the evaluation of key aspects and informed a second iteration. Based on insights from users experience and on the evaluation of the prototype, the “Chain of voice messages” concept has been refined further.

This project, by focusing on urban gardening, aims to highlight the social aspect of agriculture practices. In the light of recent technological development in the field of food production, this research aims to foster a use of technology to empower people and foster their personal growth.
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Appendix A. Deck of cards used for the workshop, activity 1.
Appendix B. Topics emerged during the workshop, exercise 2.
Appendix C. Ideas from the co-design activity.
Appendix D. Recordings from the audio message prototype.

Question 1: my favourite vegetable. Answer available at:
https://drive.google.com/open?id=0B5kMC0k_T5Q3NjFZY0IyZUFBOEk

Question 2: toxic plants for animals. Answer available at:
https://drive.google.com/open?id=0B5kMC0k_T5Q3UGQzQWsyT1ZSalE

Question 3: what I like about gardening. Answer available at:
https://drive.google.com/open?id=0B5kMC0k_T5Q3ZUdHQmdFUmlIDODA

Question 4: my favourite place in Malmö. Answer available at:
https://drive.google.com/open?id=0B5kMC0k_T5Q3NFdmU01UODhheXc
Appendix E. Survey results.

How did it feel to do this experiment? Can you describe your experience?

(3 responses)

It was something different, novel so in that sense it was really interesting.

I really enjoyed it. I was looking forward to hearing other people's answers. It was also really nice to know that there is a question waiting for me and I have no idea what it is. The curiosity and whether it is nice. Listening to other people's voices was nice. Especially the ones you didn't know from before.

It was a pleasant experience, interesting and exciting.

How did it feel to receive the questions? From the first one to the last one, did the experience change?

(3 responses)

Exciting. Like an interview. Its fun to think about yourself and your opinions/thoughts.

I felt like the answers became more thought through as the experiment progressed. The questions became a little more demanding which opened up for a deeper engagement. I was happy to review the questions and I waited to listen to them until I was at home by myself. I was always very curious, it would be fun if they continued to come!

The first question came a little bit like a surprise because of its topic. Then I was simply very curious and anxious about the next ones. Every question was engaging and therefore I was looking forward to the next.

How did it feel to record the audio messages? From the first one to the last message, did the experience change?

(3 responses)

I became more comfortable with the voice recording format towards the end. I was anxious about that after receiving the first message.

Well, it is horrible to hear your own voice. But hearing other voices is wonderful! So, that is just how it is. The first recording felt really awkward, but it did get better. Or I stopped thinking about it that much. I felt I just had to do it and then let it go.

It's much easier to talk then write on the phone's keyboard so it was a great way to collect the responses. Hearing other people's voices made it more exciting and it gave it an extra 'human' touch.
How did it feel to receive and listen to the playlists? From the first one to the last playlist, did the experience change?
(3 risposte)

Really interesting to hear different responses to the same question. Created a little anxiety waiting to hear my voice and trying to remember my response. I didn't notice a big difference from the first to last.

It was a pleasure to listen to them. From the first to the last.

My curiosity grew as I was listening to everyone. I wanted to know more about these people and their planting habits.

Which playlist you liked most? Why? (3 risposte)

The philosophical question created the most interesting responses. It was inspiring to hear them. There was more variation in the answers.

Dog/vegetable! I had never heard of this being a problem so I learned something! Personal stories from the recorders which was nice to listen to.

Probably the first one and the last.

Which playlist was your less favorite? Why? (2 risposte)

The favorite places in Malmö. The answers were a little superficial. It wasn't clear why those were the favorite places.

First and last. Did not enjoy the favorite vegetable or favorite Malmö spot. It felt soulless and uninteresting to me. And it was hard to answer. It annoyed me.

Not sure, I didn't really have such.

How was the experience to hear other people's voice? (3 risposte)

It felt personal. Like listening to the radio but more authentic.

SO NICE :) 

It gave a friendly touch to the whole thing.
The questions you have been invited to answer were ranging from practical information to more personal stories. Think about the practical information ones, such as toxic plants for dogs. What is, in your opinion, a nice/interesting thing about receiving the answer in this format (=the playlist) instead than asking Google?

I didn't get that one because I answered too late.

Ooh goodness, so much. This is something else than retrieving pure facts. You get advice/facts/input in an old fashioned way. Facts cant give you everything. Good advice or an interesting story can help you along in a greater extent. Depending on the topic or answer you are looking for of course. You feel safe and taken care of, someone cares and will help you! And most of them you will most likely never have met. Human connection. Creating community and sharing.

It feels like these are more real experiences an knowledge that is coming from real people and real life situations.

„and a negative thing? (3 risposte)

I think I still would prefer Google because it seems more accurate than the opinions of friends who maybe aren't experts.

You won't know if they actually know what they are talking about. No guarantees for truth.

The findings can be less credible.

Now think about the personal stories, such as what you like about gardening. What is, in your opinion, a nice/interesting thing about collecting and sharing these experience with audio?

Everyone answers so differently. It almost says more about the different personalities of the respondents than it says about the question itself.

You create a bond to the other participants. You get to know them little by little. You know nothing about them except the small pieces you collect from their stories. No preconceptions. Waiting for the stories we like waiting for the next episode of an engaging tv-show.

Personal stories told by people via voice recording is a great combination. The way of recording fits the purpose well.
Imagine that the voice message is a feature of a future app that connects you with other gardeners living in Malmö. What would you like to use this function for? (can be something different from the way we use it in the experiment,

I think it could be useful for advice and information about local conditions ex: is it too late to plant xxx seeds.

I really enjoyed it as it is. Maybe a function could be a “walkie talkie” for instant answers from fellow gardeners. You through a question out to everyone and hopefully get many answers back a few sec/minutes later. I must say though that I like that it is slow! You record and wait and then you receive this gift of people’s voices/stories.

Similarly to these questions.

Now it is your turn to send out a question, what would that be? (3 risposte)

Why are my tomato plants so tall and skinny?? I would attach a picture.

What plants would be good for me to start with?

Tips on how to grow spicery successfully in a kitchen window where there’s lack of light.

Any other reflection/ideas/feedback?????? (2 risposte)

It was best when you answered the question yourself as an example. It set a standard for how specific the answer should be. You could collect more philosophical answers and put them together into a podcast. With some editing it could be really interesting.

Sorry, boring with only positive feedback but that’s the only thing I can think of!!! I really like it!!! Let me think some more and I’ll send you comments if I think of something!! Enjoy Greece!!