## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appreciations</td>
<td>3</td>
</tr>
<tr>
<td>Introduction</td>
<td>4</td>
</tr>
<tr>
<td>Design process</td>
<td>5</td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td>6</td>
</tr>
<tr>
<td>Initial research</td>
<td>7</td>
</tr>
<tr>
<td>Market research</td>
<td>8</td>
</tr>
<tr>
<td>Ethnographic research</td>
<td>10</td>
</tr>
<tr>
<td><strong>Synthesis</strong></td>
<td>18</td>
</tr>
<tr>
<td>Grounded theory</td>
<td>18</td>
</tr>
<tr>
<td>Personas</td>
<td>20</td>
</tr>
<tr>
<td>Communication mediums</td>
<td>20</td>
</tr>
<tr>
<td><strong>Creative process</strong></td>
<td>22</td>
</tr>
<tr>
<td>Design principles &amp; goals</td>
<td>23</td>
</tr>
<tr>
<td>Brainstorming &amp; a workshop</td>
<td>25</td>
</tr>
<tr>
<td>Experience test</td>
<td>27</td>
</tr>
<tr>
<td>Prototyping &amp; development</td>
<td>28</td>
</tr>
<tr>
<td><strong>Design proposal</strong></td>
<td>29</td>
</tr>
<tr>
<td>Target user and touchpoints</td>
<td>31</td>
</tr>
<tr>
<td>Reflections</td>
<td>38</td>
</tr>
<tr>
<td>References</td>
<td>39</td>
</tr>
</tbody>
</table>
Appreciations

Collaborators

This project would not be realized without extensive collaboration and support of many people who volunteered their time & effort. I would like to thank all of the amateur food production enthusiasts and experts, who shared their stories and experiences in interviews, online surveys and testing. Their knowledge and experience provided deep understanding of the area during research and helped ground the solutions.

I also want to thank the staff of Umeå University for guidance and financial support invested in realization of this project. Particular appreciation is given to Kent Lindberg, interaction designer at Interactive Institute, for tutoring of this thesis project.

Instructors
Kent Lindberg
Project Tutor

Key industry experts and collaborators
Johanna Paulsson
Studieorganisatör
Sonja Marklund
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Increased fears around food in developed countries has sparked enthusiasm in self-sufficient and sustainable food production practices. Personal inspiration comes from a strong culture of providing for yourself, which has been established over the source of soviet history at my home country, Belarus.

Having lived in the US and Sweden, I felt very helpless at local stores. And I was not alone. Currently, vegetable gardening is the most common way people try to gain full control over the quality of food they consume today. However, despite supporting services, self-sufficient food production is still challenged by many factors. This thesis project is looking to identify those factors and build a design proposal around them.
Design Process

Mastering traditional methods of food production is about learning and gaining experience. Amateurs build their confidence within a long learning timeframe where decisions and judgments are based on use-specific and context-sensitive knowledge. Here making a mistake is too easy.

There are endless examples of products and services that aim to support and motivate vegetable gardening today. Market analysis was used to define possibilities within those mostly personalized tools, which directed the creative process towards a service design proposal. On the other hand, this project aimed to satisfying grower’s needs by focusing on his growing activity. Research questions and synthesis were framed around “the behavior surrounding particular tasks”. This approach is called activity-centered design.

Design ethnography and specifically grower and expert interviews were used during the research. Pared with online surveying it provided deep insight into experiences and learning methods they use today. First-hand experiences were gathered using action research with self-documentation. This method filled in on lack of observation opportunities and provided a more personal insight into the growing activity.

Multifaceted research data was then synthesized using mapping and grounded theory. Data was scaled together to boil down the opportunity areas for the future design. Following series of brainstorming sessions, workshops and testing helped narrow down and shape the final Roots concept that is looking into creation and direction of interest around food production in local communities.

Research overview

The research for this project was approached from three perspectives. On one hand, market analysis was done to ensure a deep understanding of products and services that are available for amateur gardeners today. This was done in parallel with user and expert interviews, user survey and action research. All these steps helped gather diverse findings that defined the future opportunity areas.
Historical overview

Initial research

The first stage of the project was focused on networking with stakeholders. At the same time initial literature research was done on plant-related sciences.

There are three main clusters of plant related knowledge: about plants, their specification and health, about care processes and about their meaning in human’s life.

The most insightful finding of this initial step was that the human-plant relation or ethnobotany being yet not very investigated is what makes growing activity meaningful and fun.

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Grower observation were not possible due to the late growing season in Northern Sweden. As a work around action research and self-documentation were used during growing a small vegetable garden in greenhouse conditions. It was an important step that helped personally associate with the medium and test the initial ideas.

Action research produced a few interesting insights. One of them is that working in the garden is a relaxing activity that is used to get away from technology but not to engage with it again. So having a personalized digital tool would be useful only to plan, track and share the results of an activity and mainly to deal with problems.

The observations and short interviews with visitors and supply store assistants have been done in the gardening supply store. The supply store is a place where amateur grower makes the first choices. They come with a rough idea of what they need. However, all the information about required products, care guidelines as well as suitable growing methods and tools are traditionally provided by the supply store assistants. This is a touch-point where an amateur usually gets overwhelmed by the amount of information.

There is virtually endless amount of products, services and organizations that work hard to support amateur food enthusiasts today. A lists of the most advanced solutions have been clustered into four categories: automated, simulators, expert guidance, and crowd-sourcing. A short introduction of the positive and negative aspects of these product groups follows.1

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1. Please see Appendix 1 for a more detailed description of the mentioned products.
Click&Grow, AeroGarden, Texting leaf sensor, Botanicalls, Koubachi Wifi Plant Sensor, Windowfarm, Tower Garden are all automated products. They track light, temperature and water conditions and notify about the required care. Highly technical, they provide good guidance. However, they are often too limited. First of all, they are too expensive to be used in bigger quantities and in a larger garden. Secondly, these sensors do not measure other information, like soil chemicals for example, that is essential for plant’s health. And lastly these alarm systems always use the same feedback, which does not help in experience enhancement.

FarmCraft, DigitalSeed, Gardenopoly, Root View Farm are gamified solutions that use game dynamics to explain some basic growing scenarios. These can be explored with the whole family, which is important as it develops interest of grower’s network evenly. However, “it’s much more difficult in life” rather than in the game, as most of the simulators do not yet provide the learning that would be applicable to the real world scenario.

MinFarm, Garden Sensor service, Stufa Herb Kit, SproutRobot, Grow the Planet, BBC gardening guide, Farmer’s Almanac are all examples of expert guidance provided to amateurs. There are traditional guidance tools like Farmer’s Almanac, which were successfully translated into the digital medium. Here users can get all the information about the plants they order online from the same digital service. Step by step instructions on how to take care of the plants is also provided. However, these solutions are yet not very sensitive to the specific differences of the local growing context because the information they provide is very plant-specific and is not yet region-specific.

Garden registry, Propaganda or guerrilla gardening, R&DIY, FarmHack, Grow Food not Lawns feeds on Facebook and Pinterest are the community based services that use the online networking powers to find solutions to the growing issues or organize growing activity together. Shared knowledge and inspirations are brilliant and often include open-source technically in-depth material. Active and inspired users of those networks are growing their knowledge by building on top of each other’s experiences. However, these platforms do not yet adjust to the local specific context of use that a more passive grower would be able to benefit from.

2. Please see Appendix 2 to read stakeholder interviews.
Before diving into interviews a short surveying was done to test some of the questions as well as some preconceptions related to the topic. Very open and qualitative ethnographic research methods were applied to user studies. Interviews were carried out with both amateur and expert stakeholders.

Based on interviews project’s focus was slowly narrowed down to the problems associated with the traditional and local knowledge, which is so difficult to collect and even more difficult to frame and present, as the traditional methods and knowledge carriers are being vastly lost.

1. The essential transcribed parts of the following interviews can be examined in Appendix 2.
A short survey was done to test interview questions and to make sure that some of the preconceptions around the topic are not taken for granted by mistake. Most questions were open-ended essay fields rather than options. They invited to share stories and experiences about growing.

Surveying was a good exercise that helped focus further ethnographic research. It was divided into three parts:

1) Starting a garden was the first section aimed to provide an overview on the growing context and the first growing experience. From 10 respondents 5 would be urban gardeners, 3 gardened in the yard or at home and 3 had troubles starting a garden but would dream about having one.

2) The second section addressed the growing problems and the ways to deal with them. 7 out of 10 would come with their problem to an older more experienced family member. The rest would address either the supplier or try to find relevant information online.

3) The last section provided some information on how people plan, track and process their harvest.

“Words of wisdom sometimes help and actually solve the problem with a plant. However, I never feel like I actually understand what is going on with the plant and if I am going to be able to know the answer the next time.”
Eight in-depth interviews were carried out with amateur growers. Following interview insights will sum up the findings.

**Traveler gardeners.** The couple with longer gardening history was interviewed first. Their parents did not grow anything so they talked about their challenges as beginners. Most of the help was provided by their local network: a more experienced neighbor or a local supply assistant. They approached a lot of problems by trial and error and are generally quite relaxed about their gardening and enjoy the process more than the result.

The couple stressed that the growing specifics change from place to place. All the knowledge they got in a new country they moved to was from other enthusiastic people. However, after moving again recently, they found it hard to start gardening again.

They are very enthusiastic about growing and even shared images of best gardening memories. For example, their vineyard tour experience was one of the most important insights of the interview. There they learned about a little companion planting tip that they were able to apply at home. However, this tip was introduced to them casually. So when they ran into problems at home they had to find help elsewhere.

“When you see those things you also learn. Roses and grapes growing together look like decoration. But it is not. When we asked, they explained the purpose of this companion combination. And they do research and investigation and development there to find out solutions like this one.”

This story became one of the inspirations for the final concept.

“*Gardening has taught me patience, and to pay attention!*”

**Casual gardeners.** A few amateur gardeners shared the same casual profile. All of the interviewees pointed out patience, own mistakes and observation as the best teachers they could have. Moreover, they valued the knowledge more if they figured the solution themselves, through observation, trial and error. When the problem would be too complex to solve, they would usually address an experienced elder, friend or expert from their personal network.

Younger amateurs mostly have some sort of online support system that they can come to in case of a problem. However, it did proof to be less helpful then addressing somebody locally.

**Kindergarten teacher.** This amateur grower was learning from a plant specification book that his parents gave him. He was exploring the plants around him with the help of this book and this is how he developed his interest to the plant world around him on the first place. As a kindergarten teacher he could share personal enthusiasm with children at work. They planted a small garden together. In his experience enthusiastic teacher is the main channel for successful learning. He believes that creating interest to nature in general early in life is the most important motivator later on as it sets the right habits.

“You have to be interested in nature as a whole “

**Grandmother and grandson.** I examined a fruitful connection of a grandmother and her grandson to see how the subjective growing knowledge is being
taught traditionally. The biggest issue with learning from elders is that they often do not know how to frame and communicate what they know. They only know how to explain by doing.

Kid: “So I decided to play this farming game. It excited me. I wanted to live through it in reality. But I learned that the game is very much easier. “

The kid on the other hand was sharing his perception of the world of plants what he finds interesting and important. He clearly learned a lot more from practical exercise rather than from his favorite gardening computer game.

“I don’t think that the game could do a better job preparing me for the village because it will always lack something. “

“Anything from this knowledge about nature makes you a better amateur, because you have to know about weather, about plants and weeds to know about the life cycle of plants.”
Minfarm. The first meeting was with the local project MinFarm. It adds a layer of transparency between the local farmer and the consumer by documenting and sharing inside view on farm life. The founder of the project shared his ideas about the traditional knowledge that needs to be collected and framed into something readable for an amateur. He was the first one to mention that the information found online cannot be useful because it lacks local relevancy.

Horticulture teachers from Forslunda Gymnasiet, a local agricultural school. Meeting with a former horticulture professor and a current study manager provided insight on agricultural education structure. Some of the main findings of this meeting where related to the plant physiology. All the knowledge about care comes from understanding the origin of the plant. It also depends on the planting zone and how inland does it grow.

“You have to know where the plant comes from”.

The teachers talked about big problems in educational structure. They indicated that poor presentation of gardening in schools lowers interest in gardening for teenagers. So, they do not choose to study it as a career. On the other hand, people normally start to develop interest for growing after 25 years old. They try to organize classes, but often school cannot afford that for adults.

Coordinator of the regional agricultural program in Vasterbotten from Länsstyrelsen. Meeting with a coordinator who is also a former gardening consultant was an interesting insight on the history of the region’s farming development. Agricultural board consultancy was an organization that existed in Sweden before it joined the EU. This organization used to unite research experts, teachers and consultants in a specific plant or growing technique with professional as well as amateur growers in one place. It sounded like a lot of people from this organization still keep in touch. They do not perform their past duties & tasks.

“Around 10 years ago we had a quite developed counselor service, but that is all gone now, because now we are members of the EU. [...] We had a service for the commercial gardeners, for those who wanted to live on it. Then you had advisers that worked with amateurs.”

Typically the consultant would either help over the phone or would travel on location. Consultants would deal with a variety of questions from the most basic to the most advanced.

“...what kind of insects, the weeds, how should I grow this, what kind of technique would I have to use, how long does it take, what is an ordinary harvest, everything... “

Finally, the most paradoxical comment was when this expert said that they are all amateurs in gardening. This proved again that growing experience is difficult to pass on not only due to its own time and context sensitive nature. But also, because of the attitudes of the people who own it. They simply don’t consider themselves knowledgeable.

“We are all amateurs!”

Coordinator added that any local growing project would be supported as long as they see the interest and a plan for it.
Supply store assistant. This interview provided a lot of insight on the needs and concerns of beginners who come to the store.

“They mostly start with herbs, because it’s the easiest.”

A lot of them are increasingly concerned with the quality of plants. For example, they specifically ask for organic seeds. It becomes especially difficult when parents come to buy plants for their kids, because assistants do not know for sure if the plant was treated with chemicals or not.

Local organic farmer, former SLU researcher, former organic farming consultant and the first organizer of the local Farmer’s Market. The interviewee shared his insights on the agricultural education structure, plant physiology, soil chemistry and the specifics of organic farming. Organic vegetable gardening is quite different from other types of gardening, as it requires a lot of preparation and experience. Farmer pointed out that despite all the education some of his judgments are still guided by experience and a feeling, rather than a calculation. This knowledge in subjective and cannot be documented.

Pedagoge. Interview was conducted to get a better understanding on the nature of learning. Pedagoge viewed every step of the learning process through the lens of interest. Seeding the interest in learning was one of the main takeaways.

Psychologist. Talking to the psychologist gave an insight on habits as well as a basic insight on behavioral psychology. This meeting steered the focus towards creation of awareness and interest.

“People want behavior and attitudes to be in sync, they want balance. And as we change our behavior, rapidly, we tend to look at our attitudes and say “I probably think this, because I act like this, so this is probably what I like”. “

Study group organizer at Studie Främjandet. This interview was conducted later in the process. The study social service aims to organize classes and study groups for adults around their interest. They run gardening courses along with other locally relevant classes.

The social service aims to build stronger local communities around shared interest. Their biggest problem, however is to engage enough people and communicate their services to them.
Synthesis
Grounded theory

All the research findings have been collected together and mapped onto a physical wall: quotes, transcribed interviews, data about stakeholders, their connections and scales.

After the map was complete a grounded theory method was used to prioritize and cluster the findings. Color-coded circular stickers were applied to different quotes indicating a problem, an inspiration or a need. Then those codes have been subdivided by topics into 6 main opportunity areas.

1) User setup
2) User network and guided cooperation
3) Setting expectations
4) Collection, framing and preservation of traditional and subjective knowledge
5) Collection and framing of locally relevant knowledge
6) Gardening education - resource reorganization

This method also helped outline four persona profiles and scale the relevancy of communication mediums.
Three grower types were identified: fighters, casual gardeners, dreamers.

Fighters share the same impatient profile. They want “everything at ones”. Their motivation has different origins. Either it is inspired by food or financial insecurity. Very active they usually find a lot of personalized tools for help.

The casual gardener have a very process oriented outlook, which helps getting over the challenges. They enjoy sharing their process, harvest and experience with the people they know and share interest with.

The last group of dreamers do none or non-confident steps to start gardening. They have no supportive network or method to be successful. The final design proposal was shaped around this profile.

Analyzed services as well as the user studies showed that the most relevant information is local. Personal network, Growing context, Experience, Reasoning and delayed feedback are among other factors that can and should influence the grower’s decisions. This task-oriented analysis helped define and scale existing communication mediums by their qualities.

On the vertical axis information can be directional (answer the questions “what and when”) or qualitative (“how and why”). On the horizontal axis information can also be presented in scientific or exploratory ways.

On the other extreme we have all activities that usually require collaboration and time. However, they also provide better quality knowledge and local connections that help you grow your experience faster.

This scale helped direct the final solution towards the classes, tours and need for observation as the main learning mediums. Focus was put on an exploratory solution and a creation of initial interest rather than on a personalized tool. Market area will better support and motivate amateur grower in the long run.

Generally speaking, all the resources on the right bottom are personal and support individualistic values. Most of the analyzed market solutions are located around this area.

1. Please see Appendix 4 for a detailed description influencing factors.
Quality knowing how and why

Directional feedback knowing what and when

Scientific

Regular Inconsistent

WEB

Exploratory (Interest booster)

Collective values

Individualistic values

Online forums

Experienced Peer

Consultant

Gardening books

Gardening classes

Gardener’s club

Personal Observations

Farm tour

Tracking services

Botanical Garden
A lot of initial ideas were generated during research. The first concepts were based on these initial ideas. They were presented to expert stakeholders as well as the users. The directions were eventually narrowed down to one concept and a service around it.

A workshop with peers and brainstorms were carried out to explore the design components for this idea. A concept developed through a few iterations. A short experience test outside with unprepared public defined the last elements of the final proposal.

After that an actual production process started with prototyping and wire-framing.

1. More detailed description of the initial ideas is in Appendix 3.
Having a place were you can learn more about your interest is important. Right now, there is little or no physical or digital space that would give a cohesive perspective on local nature, tell about it’s past and present usage and give you simple introduction on how to try using it yourself. What if local plants could become the ambassadors of traditional knowledge associated with them? What if they could communicate its values and benefits in a more meaningful and engaging way?

The final proposal aims to generate interest in traditional food production and directs it towards local study communities. The final design should in some degree satisfy the following principles.

- It should be sensitive to the qualities of personal network, context and bioregion.
- It should promote hands on, practical involvement rather than theoretical learning or simulation.
- The solution should explain rather than direct. It should encourage collaborative exchange of experiences.
- The solution should take advantage of the time required for growing. Make it a good thing!
- The solution should encourage exploration and focus on the process rather than on the result.
Brainstorming & a workshop
Creative process

First step was a short brainstorming session. It was held with 2 design peers and was used to prepare questions for the workshop. The workshop was conducted with design students. They all share essential qualities of a target persona. The goal of this sessions was to explore options for interaction with a plant and to sketch down some initial scenarios for the outdoor tour experience.

The first stage of the workshop was devoted to values of a plant. Each participant in the group was given a herb that they could name. Everybody had a plant that they could personally associate with. Then participants were asked to answer the questions on the wall about the values of a plant. After the wall was filled up with values each participant could choose one to build upon. They had to imagine, how their plant could communicate a selected value. In order to simplify the task, “fate cards” with short inspirational poems were distributed among the participants. The cards would describe a specific medium or sense that could be used in interaction.

The second half of the workshop was devoted to the outdoor tour experience. Participants sketched down the places in the city that they associate with nature, plants and growth. Afterwards, they were asked to work in teams in order to create a museum experience for one traditional dish. In the final show and tell session all experiences were placed on a city map.

The first activity helped explore opportunities for the plant-human interaction interface. For example, in one of the concepts plant’s stories could be dragged out of the branches or triggered by touch. This became an inspiration for the future design proposal. The second session also set a few principles for the future outdoor tour experience. Playing with culture, local secret place, change of perspective are some of the inspirational values that were used in the final design.
Emotional journey

Please, evaluate how curious or bored did you feel during different parts of the tour. What was bad about it? What was good?

- Finding the tree
- Scanning the code
- Listening to the stories
- Searching for other stories

Curious

Bored

Please, evaluate your knowledge and curiosity before and after this session.

Max

Before

After

Before

After

Min
Experience test was done to make sure that all the design elements work well together. The tour experience has been quickly tested with 5 unprepared people from the street. Testing station was set next to the currency exchange bureau in the middle of the city. It was the best place to meet a lot of non-locals (target persona) within a short timeframe. A birch tree was picked as a target plant, as it is very common for Umeå, which simplified the search for a test location. On the other hand, this tree already has a lot of local culture associated with it, which simplified the concept introduction.

A set of assets were produced quickly before the test: audio files with actual stories about the tree, a little iPhone interface prototype and a poster for the tour introduction. A phone prototype was bound as a booklet, which worked very well. On one hand, it was rigid enough for testing outside. On the other, it had a familiar structure that users could easily navigate themselves.

The users had to perform a set of tasks both on the tree and on the phone, while the audio files were switched in their headphones by the facilitator.

Last but not the least, a small survey was distributed to the participants. It helped analyze the curiosity level of respondents on different stages of the experience. Participants were also asked to evaluate the level of knowledge and curiosity for local food enthusiasts they had before and after the session.

As a result the first stages of the experience have been rethought. The use context, the audio output and navigational aspects of finding and connecting to the tree were redesigned based on this test. For example, the audio output on the phone was replaced by a speaker on a plant itself. On the good side, the curiosity about the local food culture after the session proved to raise.
Prototyping of digital, physical and service elements of the design was done with wire frames, scenarios and use cases. This methods have been used to narrow down and define all the elements of the final proposal.

The physical prototype was roughly sketched in cardboard and paper and placed in the context for testing.

From the technological perspective it was exciting to try out the interactive plant technology. Currently this technology does not have a functional application. It is used mostly for fun. Being able to sense the touch on a plant is a very appropriate technology for the concept and is used here with a purpose, as it helps differentiate between the stories depending on where you touch.

Prototyping electronics took more time, as very specific rare component had to be ordered for plant sensing. However, with the components on hand it was impossible to prototype the whole plant-touch interface. It is because the frequencies are read only from the little portion of a plant. Instead, other sensors can be used to simulate the ideal experience.
Design proposal

Local Roots is a design of a system where local interest circles and study groups share their knowledge and interest in the context of an outdoor museum. Here, by touching local plants we can listen to the guide and get inspired by a first glimpse into the local culture of traditional food production.

The biggest inspiration for the plant installation concept comes from interviewees. They talked about a farm tour learning experience, where they found out about a growing tip. On the other hand, teachers talked about developing general interest in nature and watchfulness as a key to success in any nature-related task.
The design proposal lives within an existing social service, an expert knowledge provider Studie Främjandet. Their goal is to better expose study events and activities in order to build stronger community and educate adults on their interests. On the other hand the goal of the local museum is to better collect and expose the memories of local community. The service blueprint provides an overview of both existing and edited steps of this service.

This thesis project mainly focuses on the introduction experience to this system, on the outdoor museum plant tour “what’s my flavor”. Following is a step by step description of desired experience.

**Target audience** of the study group is a young person, newcomer to the area. These people do not usually have any local community connections as well as the knowledge of the local nature. They come from different climate conditions and their network at home would not be able to support a dream about a small garden in a new place. The character is based on the third persona profile, the dreamer (p. 20).

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1. Please see Appendix 5.1 for the illustration of the current service.
2. Please see Appendix 5.2 for a service blueprint.
3. Please visit [http://vimeo.com/67209961](http://vimeo.com/67209961) to view the movie of the experience.
Interactive plant audio installations of this tour are placed on or around the local plants, which are growing on the museum’s territory. *What’s my flavor?* Interactive plant tour is introduced by museum staff or by explanatory media materials, posters and brochures available at the reception. They tell about the interactive installations, their location and the things visitor will learn from them. They also illustrate how to interact with a plant installation. The museum map and signs will guide the museum visitor to the talking plants.
The **plant installation** shape was inspired by a birdhouse, as it is familiar and common for the context. It also provides a better sound and light feedback when placed higher up, closer to the visitor’s face.

The behavior of a birdhouse was borrowed from a radio to introduce a fun and a low-tech flavor to the experience of navigating a very plant. It really helps to create an illusion that the plant can actually understand your touch.

The lights on the front of the birdhouse turn on and off in a wave-like manner to fix visitor’s attention on the installation.

Every birdhouse has unfixed amount of **light sectors**. All of them represent both the stories and their relative location on the plant.

By touching the plant visitor starts literally turning into the content hidden inside. The front light sector get brighter as the hand approaches the story on the tree trunk associated with it. The radio turning in sounds accompany the search of the story.
Currently playing story lights up and stays on till the visitor leaves the plant. This way, when all stories are opened, the front of the birdhouse will be all bright.

By touching different parts of plants of the tour, museum visitors trigger information about plant’s nutritional and cultural values. They start to see food opportunities in natural ecosystems, gain experience and train watchfulness the same way they would do it for centuries before, by touching, smelling and reading the signs of nature together with the more experienced peers.

The example story about tapping birch trees from a local wild food interest circle is triggered when a visitor touched the middle of the trunk of a birch tree:

**Tunning in sound**

Background sounds of the forest.

“Sap is an incredibly reach source of vitamins and nutrients, which the tree uses in order to start its new season. So, it starts all the buds and the leaves and that’s the fuel that gets everything going.”

“We are going to make the hole in the tree at a slightly upward angle.”

Drilling sound.

“And before we leave the tree we have got to make sure that we cover the hole, because otherwise the tree will keep loosing sap and eventually will bleed to death.”

Sound of breaking branches.

The content for the plant installations is fed from two constant channels. One is the museum staff & archives. The other comes from the study groups.

The study plan of the study groups was slightly redesigned. Now it proposes that every classes will end with a final wrap up session for feedback or with a final event or activity, where class members would be able to share their interest with the community. That would allow to collect, preserve and expose the most interesting facts, stories and food-related experiences.
MIDSUMMER CELEBRATION
BREWING CLUB

USED FOR FERTILIZING
GARDENING STUDY GROUP

BROWN CAP BOLETUS
MUSHROOM STUDY GROUP

EDIBLE LEAVES
WILDFOOD STUDY GROUP

TAPPING BIRCH TREES
WILDFOOD STUDY GROUP

NITROGEN FIXATION
GARDENING STUDY GROUP
How does it work

Installation details

An outdoor birdhouse radio can sense the touch on a plant by sending and measuring specific ranges of frequencies. This plant sensing technology was originally introduced by Disney Research.¹

The artifact has a solar panel on the top and a battery to store the energy. There is a frequency sensor that measures the signal from the plant and a distance sensor that checks for visitors.

Any input on the plant is processed by a controller, which selects the tracks to play through the internal speaker. It also triggers an associated flexible light sector to light up.

Wireless communication would let the installation owners upload their audio files to the plant without unmounting the birdhouse. This allows high content flexibility.

During the tour museum visitor gets directed towards the Local Roots website. Local Roots is a responsive life-logging and resource platform where all interested community members can share and document their food production process. They like to get updated on the upcoming events, activities, resources of the study groups or catch up with peers after participating in the classes. On the other hand, ability to document and browse tips from local experts helps beginners develop the interests with reliable information before they invest time into a study group.

The platform plays an important role in connecting people based on their food and nature related interest as it helps the study services, local experts and other collaborators adjust to ever-developing trends.¹

¹ Please see Appendix 6 for more screenshots of the interface
The website has **geolocation capability**, which checks if the visitor accesses the website from near the plant installation. If so, it proposes to open the information related to the one placed at the installation nearby.

After joining at least one online community member interacts mainly with the **personalized feed**. He can always add different food production techniques to his feed. The **feed filter** is available on the top of the browser. It is designed to help sort through the available data by expert resources, study events and classes, local community projects, collaborations and volunteering, geotagged data from the museum, inspirations and updates from other online community members.
Reflections

I believe that as a designer you can never have a feeling of fulfillment. In most cases it is true and your work is never done even after its shipped.

Due to this project I found out a lot of things about myself and about the tasks that I should or should not take on in the near future. For example, more insight into the daily tasks of account directors and project managers will help me respect and appreciate their work after school even more. As both a designer and a project/account manager you have to unite the doubt and to have the courage for a strong believe in your idea. However, both attitudes do not coexist well together.

With that said the goals of the project were met as expected. I challenged myself in many ways and was willing to find an alternative solution, something that was not yet done. I also tried to get out of a personal comfort zone by pursuing the activity-centered design approach and prototyping. The process on the other hand was challenged by the subject itself. Growing takes time and happens only at a specific time. This slowed down the work process and decision-making.

I was very ambitious in the beginning of the process with my networking success. But, even though I got a lot of people to share their experiences with me, due to the lack of experience I could not understand how to form even stronger networking connections with them. The disadvantage is that I felt less confident and could not easily test my ideas. The good thing is that I was able to approach the problem from system standpoint and take into account different players and stakeholders without a goal to satisfy one of them specifically. But rather to produce something that would make a point. As a result, the system becomes more cohesive because all of the players are taking part and getting exposure through the designed tools.

In general, I am happy to be done with the long project. I also understand that it is important that I can see my mistakes clearly and learn from my own process. So, hopefully I will be able to account for that in my future work.
References


Csikszentmihalyi, M. (n.d.) Objects and the self. p.27.


Appendix 1
Products overview
<table>
<thead>
<tr>
<th><strong>Click&amp;Grow</strong></th>
<th><strong>AeroGarden</strong></th>
<th><strong>Texting leaf sensor</strong></th>
<th><strong>Botanicalls</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Click&amp;Grow is an easy-to-use electronic smart-pot that grows plants without watering and fertilizing. No knowledge about gardening required. Everything is taken care of by the smart technology.</td>
<td>AeroGarden is a low maintenance system that creates near to perfect conditions for plant growth. A simple set up for a few basil plants can be as expensive as 100$.</td>
<td>This sensor works based on the Smart Dust technology. It is still in development. However, it is designed to collect vast variety of data and can be used for a bigger scale farming.</td>
<td>A cheap assemble-it-yourself equivalent of a plant sensor. In this project plants are given the ability to call and text message people to request assistance. People who are unsure of their ability to effectively care for growing things are given visual and aural clues using common human methods of</td>
</tr>
</tbody>
</table>

**Click&Grow website:**
http://www.clickandgrow.com

**Aerogarden website:**
http://www.aerogarden.com

**Online description:**

**Botanicalls website:**
http://www.botanicalls.com
Koubachi Wi-Fi Plant Sensor

Koubachi Wi-Fi Plant Sensor measures soil moisture, temperature, and light intensity. Information is collected in the cloud and displayed on users’ phones, where he gets care guidance for free. The 150$ sensor can be used for a few plants.

Windowfarm

Windowfarms began as an experiment developing environmental solutions through open source collaboration and has evolved into a social enterprise, a successful business that organically fulfills a mission toward healthier people and a healthier planet.

Tower Garden

Tower Garden is a state-of-the-art vertical aeroponic growing system. It’s perfect for rooftops, patios, balconies, terraces—just about any relatively sunny place outside. For about 500$ this automated system provides an amateur grower with high yields and all the nutrients required for plant growth.

Koubachi website:
http://www.koubachi.com/features/sensor?locale=enm

TED talk by Britta Riley
A garden in my apartment:
http://www.ted.com/talks/britta_riley_a_garden_in_my_apartment.html

Windowfarm store:
http://www.windowfarms.com

Tower Garden website:
https://www.towergarden.com
FarmCraft

FarmCraft is a game for kids, where they learn about agriculture. On different levels of the game they create different gardens for different weather conditions. The basic knowledge of fertilizing the soil, watering, seeding and harvesting is well communicated in the game.

FarmCraft web page:

Digital Seed

The Digital Seed is a microworld for learning about plant growth designed at MIT. The Digital Seed is a virtual alter-ego of a real seed - a cube. The user must take care of the seed: watering the cube, keeping the cube the right temperature, and exposing it to the right amount of light. A perfect learning tool for kids.

Digital Seed web page:
http://www.i-cherubini.it/mauro/projects/digitalseed/

Gardenopoly

A board game were the whole family can develop their interest in growing together. Players buy garden favorites, collect clay pots and trade them in for greenhouses. Going through different game scenarios can evoke interest and will teach the whole family about basic gardening.

Digital Seed web page:
http://www.i-cherubini.it/mauro/projects/digitalseed/

Root View Farm

A science toy for kids to explore the growth of a seed into a sprout and then into a developed plant. The 30$ setup is designed mainly for the classroom usage.

Root View web page:
http://www.insectlore.com/root-vue-farm
<table>
<thead>
<tr>
<th>MinFarm</th>
<th>Garden sensor, service from Japan</th>
<th>Stufa Herb Kit</th>
<th>SproutRobot</th>
</tr>
</thead>
<tbody>
<tr>
<td>MinFarm allows people build a virtual farm online that is grown locally, by farmers. A customer can choose whatever veg, fruit, dairy, herbs and livestock, they like, and watch them grow online.</td>
<td>This sensor measures the temperature, the moisture of the soil and the level of sunlight. For a 30$ a month service a set of scientists will analyze the data from the sensor and supply the user with personalized growth plan via e-mail or text.</td>
<td>A herb gardening kit that provides you with the seeds, pot plates, printed material for care and even recipes! The product is mainly targeted on urban pot gardeners and aims to support their motivation and love for gardening.</td>
<td>SproutRobot is an online service were a user can create a virtual version of the garden, order seeds and other related produce. From tie to time he gets email notifications and updates on the garden’s status.</td>
</tr>
</tbody>
</table>

MinFarm:  
http://www.minfarm.com  

Online description of the product:  

Stufa website:  
http://stufaconcept.com/about/  

SproutRobot website:  
http://sproutrobot.com
Grow the Planet

A gardening community network. This service takes a step forward from SproutRobot and SmartGardener services. It provides guidance. But most importantly it to connect gardening enthusiasts not only by their interest but also by their location. Here, for example, you can search for

Grow the Planet website:

BBC gardening guide

An online resource that provides amateur gardeners with basic tips, brings all the projects and resources together in one space and even gives advices on how to make your family and network more interested in supporting your gardening activity. However, a lot of those tips can be used

Gardening guide website:
http://www.bbc.co.uk/gardening/gardening_guides/

Farmer’s Almanac

This is a traditional moon-based calendar that predicts weather and dates for germinating, seeding, harvesting and other. Traditionally in this sort of books you would find all the details needed for growing.

US Farmer’s Almanac website:
http://www.almanac.com

Garden Registry

An online map and a networking tool created to connect urban gardeners of San Francisco. The website is used to register the existing and potential food production zones within the city limits of San Francisco.

Garden Registry website:
http://gardenregistry.org
Propaganda or guerilla gardening

A group of activists are invading the city space with vegetable gardens in a little British town Todmorden. The movement starts to grow to other cities where more and more people can find the benefits of a city garden.

Ted talk by Pam Warhurst
How we can eat our landscapes:
http://www.ted.com/talks/pam_warhurst_how_we_can_eat_our_landscapes.html

Guerrilla gardening homepage:

R&DIY

Open source collaboration platform where participants from all over the world share their insights on a hydroponic windowfarm. Project illustrates a great way to develop, test and apply complex and very practical ideas.

Research and develop it yourself project's website:
http://www.rndiy.org

FarmHack

Farm Hack is a farmer-driven community to develop, document and build tools for resilient agriculture. The process is accelerated by connecting farmers with other farmers, engineers, designers, architects and other allies through in-person events on farms or at institutions, and through an online forum.

Farm Hack online community website:
http://www.youngfarmers.org/practical/farm-hack/

Grow Food not Lawns, Facebook and Pinterest feeds

There are a lot of very popular online feeds, where enthusiasts from all over the world are posting inspirational projects, mottoes and news about self-sufficient food production. This type of resources shape culture and provide general overview of possibilities.

Online resource:
https://www.facebook.com/GrowFoodNotLawns?fref=ts
Appendix 2
Selected interview quotes
Interview with local organic farmer

“I was studying a tree (algus incarnates), it’s a nitrogen fixing tree and it leaves both clover and alnus they have the bacteria in the roots, they take the nitrogen in the air, transform it to ammonium and give it to the tree and tree gives sugar from the leaves and photosynthesis to the bacteria. So it’s like the symbiosis. And I was studying it for my PHD. And I wanted to study how the ensien that binds nitrogen it needs a lot of energy and oxygen. But, at the same time nitrogen ensien is very sensitive to oxygen. So, how does that function. How do bacteria and the plant both supply the ensine and process the energy and how do they protect it against the damages from oxygen. “

“So, if you do want to know what the plant needs and what the situation is you have to analyze the leaves and you have to analyze the soil also. But this is really expensive, and in an organic farm you cannot fix things like you do when you use chemical fertilizers, because they are not allowed. You cannot use chemical fertilizers to fix the situation. That’s bad for the plant. So, in organic farming you have to be one step ahead. Sometimes we say that in organic farming we don’t fertilize the plant, we fertilize the soil. So, you have to prepare for the good situation in the soil and that’s when crop rotation become very important.”

“I know that the modern, commercial farmers, they have infra-red sensors on the tractor. They can measure by illuminating the pants by infra-red light, get reflection, and the sensor tell you that this plant need more nutrients. And then you have commuter programs that make a quick calculation so the you get information to your machine that spreads the fertilizer. So, you can drive over a field and this sensor measure the situation of the plant, adjusts the amount of nitrogen for the specific part of the field and you can adapt the amount of fertilizer as you drive. I mean in different spots of the field there is different situation. I think, this is the most modern technique. But it is not organic.”

“If you grow cabbage and different kinds of broccoli, they need a lot of Boron. And, Boron deficiency is very common in our soils here. So, I have to add some Boron and I have to know that in advance. So I have to measure the amount of Boron in the soil, so that I know in which field do I have a deficiency and add some.

So, for example, now, when I make my plan for this year, I decide to have cabbage in a certain field and if I have cabbage there, I know that I need much more Boron, then if I have carrots there. So, I need to know of that field contains enough Boron or if I have to add some. “

“If you study agronomy, you can study a lot of different courses, but I was focusing on plant production. So, I studied soil chemistry, soil biology, plant physiology. When you deal with chemistry and physiology, you do a lot of laboratory work and you read a lot also, and it is theoretical work. You are not out working in practice way, you study the plants in laboratory. Sometimes you make field trials, but mostly it’s very theoretical.”

“When we discussed why there
Interview with a psychologist

“We know that some people, without us telling them to, actually do choose to re-frame.

There are many methods. What it is, it to transform the payoff structure of this dilemma, making it a gain, even if I choose to do something for someone else. And the people, who actually make those choices, it’s about their basic values.

We know, that people who have more collective values, for whom guiding principles in their life is solidarity, it’s about taking care of each other, nature, that kind of values the influence their lives. These are important value to hold in order to make the “right” choice. In comparison, or the other side of it, if you have very individualistic values, where it is achievement, power, money and power. Those people, to less degree choose to re-frame from the immediate gain of the easy life. “

“Habits is basically when you have an automatic idea in your head and an immediate response, without thinking, without concerning myself - what are my options. For example of taking the car choice in the morning, your aim is to get to work. If you have just moved to a new city, for example, or you have relocated to a different part of the city, we see that people tend to stop and think “Well, it’s nice weather today and I have my bike and that’s not far, and I have my luggage to carry or I don’t have much time pressure today, so maybe bike is a good choice today”. But, habits develop in a stable context, when we repeat the same behavior over and over again in a stable context, such as going to work every morning, we tend to develop habits. And, if you have started to choose the car and you do it repeatedly, finally you do not think of anything else, you just grab the car keys, when you think of work you grab the car keys. And it’s not a conscious thinking process or choice process, it’s just there..

The same works with any social habits.”

“The thing about habits is that it is extremely difficult to break them when they are set, because you have to go into individual feedback. And that’s very difficult to get into people’s mind. What you can do, is to start forcing them to change behavior. What we do now, when it come to the environmental aspects of life, the society or the community as a whole has so far focused on information campaigns, education - all aiming to change attitudes. The problem is that the affects of this change attitudes don’t reach the behavioral change, because of these habits. So we have to break the habit before we can see any affect of the new, improved attitudes. Then we can actually focus on behavior. “

“People want behavior and attitudes to be in sync, they want balance. And as we change our behavior, rapidly, we tend to look at our attitudes and say “I probably think this, because I act like this, so this is probably what I like”. “

“But you have to get them to find that social dilemma as their personal internal moral dilemma. Because, otherwise it’s quite easy to find excuses and say, well “I have no time, no money, no possibility. But, everybody else should do the right thing, but I cannot.” But if you get people to feel that they have a moral obligation to actually do their part, then you have a better chance of seeing the behavioral change. “

“But the interesting thing about gardening also, you can view it, which makes it a bit more complicated, growing your own vegetables on one side it might be a part of is taking action towards a more pro-environmental society, but it may also be closely related
Interview with a pedagogue

“Many things in education are achieved via game and interest if a child. Even difficult things can be presented in a gamified way and it will be interesting.

“Taking an active part in the learning process and creating something together. And it does not matter if it is difficult then. It’s always interesting when the teacher is taking part in this active process of learning, exploration and creation. I have a student who even forget that I am a teacher and starts addressing me like an equal classmate.

“It’s 100% better to use different senses when learning.

“If from childhood you had a good base in education, it was interesting, you felt like you can or you want to figure out something yourself, then the information has a better chance to stick or it is easier to learn or relearn something in the future.”

“I advise parents to have the shelves with kid’s achievements, so it does not collect dust somewhere but is up on display. It’s important for the kids to see the results of their creativity and it’s value. Or that they can give it for the present for somebody.

“Long ago I realized that your personal experience and even your own mistakes are often the best teacher.

“It’s important to prepare the soil, to craft a question or dilemma that would be interesting or relevant to the students. Sometimes it’s important not only to have an enthusiastic teacher that loves the subject, but also to give a good background to the subject, back it up with a history. Then reenactment is also a good technique because it makes students apply what they learn to themselves, become this other person or thing and helps them understand better. Reenactment will not help them solve a specific problem, but rather would start them thinking about it. “Put this seed into their soil”. Something becomes interesting when it becomes a part of you. It is always possible to develop interest, even for those who do not seem to care at all.

When there is a lively discussion in the class, those who are not ready and not interested are starting to listen and still will understand the subject. Energy and love for the subject is like a chain reaction. The more people a passionate about a question, the more people will pay attention to it.

We can have more or less of some qualities but, no matter if we want it or not our main values are quite similar. For some reason I believe that those values are present for every person.”
Interviews with amateur gardeners

“I would say it is time-consuming but you have fun with it. So, it’s not that stressful.”

“That was the part that we personally did not like because in that case [to cure the rose] we had to use a little chemicals. Maybe at the vineyard they don’t use chemicals but at home for us to do it quick is with chemicals.”

“When you see those things you also learn. Roses and grapes growing together look like decoration. But it is not. When we asked, they explained the purpose of this companion combination. And they do research and investigation and development there to find out solutions like this one.”

“Sometimes it [the plant] has too much sun. Sometimes it needs water, or sometime we need to move the soil, for it to drain better. Or you have to move a positions, because maybe where it is the plant don’t like the specific place.”

“You talk with the plant. All of the plants that we have at home, all of the plants look lovely, all of them are named.”

“My neighbor [to address for help], and if I don’t find my neighbor I will go to the internet. But normally, in the area, where we live, they are normally dedicated to gardening. So, I will go to this specific place to buy small plants of salad, tomatoes, cucumber. And I will go also and I will explain to them the problem, and he will say: “well, try this or the other”. And that is a more direct contact. But, the first thing you have on hand is Internet. So you Google it.”

“Something cultural also I think. Now as we are in [this new country] for example, one thing it is a big city. So when we go place outside the big city, you see the kids of different ages and they are working on the land and soil. I think it is something cultural.”

“Those things we know because we received them from our grand parents in Panama when we were young. Mothers, grandmothers gave us all that knowledge. And now we know and we know the plants also. So, today we can just go and see a plant and know it is good for this or the other.”

“Kids for example, if you teach them from very small and they see it all as a game it will be something more natural for them. And my grandmother, when she reached a certain age is when she decided to go doing gardening.”
Рис. 18. Тысячелистник обыкновенный

Видна ветвь с листьями и цветами. Край листьев узкий, с небольшими зубцами. Цветки собраны в рыхлые метельчатые метки. Растение имеет ветвистые корни, которые могут проникать в глубокие слои почвы.

Вот некоторые приметы, которые помогут отличить тысячелистник от других видов:
- форма листьев: узколинейные, с едва заметными зубцами
- цветы: белые, собраны в метельчатые метки
- корневая система: ветвистая, проникающая в глубокие слои почвы

Наличие тысячелистника в местности может служить индикатором наличия в ней подходящих условий для роста других растений.
Appendix 3

Initial ideas
Outdoor tour

This concept aims to expose and create interest in local food tradition.

Here, a bench in the park would be used to open another perspective on nature around using visual, augmented reality or audio communication.

Plants is a static local medium that can contain stories of local interest groups, their activities, produce and history.

By navigating the plants or walking in this specific park a user would get the first engaging introduction to the local communities interested in food production.

The concept responds to the need of the many stakeholders interviewed during research to expose their activity in a more engaging way.
Summer memories

This concept is looking into encouraging knowledge exchange within the family.

A summer workbook is given to a child at school. During the summer you complete the tasks in the book. By doing that you unlock levels in your virtual farm, where you can compare and trade with your classmates.

The book encourages a kid to pick up recipes and records information about plants from parents or grandparents. This information can be shared with the class after the summer.

In many years you can come back to the book to listen to its recipes and to the voice of your grandmother explaining you the plants.

The concept was highly evaluated by expert stakeholders. However, from the technological perspective today it is nearly impossible to identify the plants correctly, which makes the book less useful.

On the other hand, considering children were not the main focus of the project originally, they did not become a core research focus.
From dream to reality

This concept aims to provide tools for people to organize their activity, goals, aspirations and time in order to create a work/community garden.

This concept would require 2 sided collaboration with the Social service that provides classes in the community and with experts in both traditional and automated gardening set ups, like aquaponics for example.

The idea is to have an online platform where let’s say a work garden could be planned and visualized by an enthusiastic person. Then it could be shared with co-workers and with the building/organization authorities, who would need to sign off on the specifics of the plan.

Having everybody on literally the same web page with the project would make it easier to schedule the time and budget for building works or for additional education.

The plan in this system would also be more visible to the government authorities who are constantly looking to fund green projects like that.
Storyteller plant

This concept aims to distribute learning about a specific plant over time.

As the plant grows it tells the story about the place where it originates from. For an amateur grower it's important to understand the original “perfect” conditions required for a plant. Understanding the origin of the plant would help an amateur take more adequate care of a plant.

The stories are opened on a smart device when it's placed next to the pot. It also takes pictures of a plant that can be rewound to show the growth progress.

On later stages grower unlocks learning functionalities on your phone, like this companion planting widget sketch.
Appendix 4
Qualities of knowledge

User studies showed that the advice that works the best is locally-relevant. Following is a list of factors that influence the grower’s decisions.

1. Local relevancy.

Most of the plants would have different care in different so-called “planting-zones” and even within them. For example, the rivers, elevated and inland areas would have different planting culture even if they are located within the same planting zone.

2. Personal network.

A lot decisions will need to be coordinated around or with the grower’s network, which could be represented by colleges at work or a child at home or even a pet. The network as is, does not relate to gardening at all. However, it will influence the process and has a potential of making it both more or less successful.

BBC resource in appendix 1 is a perfect illustration of this type of resource.


Starting from a simple balcony pot with standard soil and ending with a traditional flat-land farming with uncoordinated soil - growing contexts differs greatly for every person. Most of the tutorials do not consider those differences, which creates more problem for a grower. He then needs to filter through a lot of unnecessary information in order to adjust the answer to his specific context.

4. Experience.

The knowledge of growing processes is very much based on a feeling or experience rather than on a calculation. Even professionals admit that there is a lot of subjective judgment involved in the process.
5. Reasoning.

Plants differ in specifics of care, while the process of taking care of a plant is similar in its essential steps for all the plants. So, getting to understand why do you take specific care of this plant is important, as this knowledge is applicable to the other plants in the future. Provides a sense of security that you will be able to make your own independent decision next time.

6. Delayed feedback.

Time is a big component of both learning and growing. It can be used and viewed as both a positive and a negative thing. For example, as the feedback of your learning decisions gets delayed, your motivation might also start decreasing. On the other hand, using the time as an opportunity to subdivide the information into manageable bite pieces would set a positive outlook and make learning easier.
Appendix 5.1
Service map illustration

Current experience is illustrated on the left while redesigned one is shown on the right.
Appendix 6

Interface screens