

# Exploring ICT supported usage of public spaces to empower communities

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# Exploring ICT supported usage of public spaces to empower communities

MASTER'S THESIS

submitted in partial fulfillment of the requirements for the degree of

**Diplom-Ingenieur**

in

**Media Informatics**

by

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# ABSTRACT

This work takes developments and fields of tension in the area of urban live as a starting point for an explorative design process. Urbanization, the emergence of the sharing economy and the commercialization of public space present new challenges for society and makes new methods for public participation necessary. The goal of this work was to conceptualize an information and communication system that aims to create stronger interaction between people in urban areas, encourage usage of public spaces and strengthen local communities. It was very important that the question ahead did not imply the answer in some way. After an initial literature research, the design process consisted of multiple iterations of creating design prototypes and reviewing them by experts. New prototypes where created, based on the insights from the expert reviews. The first prototype was the concept for a crowdfunding platform for civic projects. This idea turned into a collaborative platform for people, which aims to help them initiate and realize green and sustainable projects in urban areas. The final design prototype was then implemented as a web-based, functional prototype and was evaluated by a series of expert reviews.

This work focuses primarily on the design process and the development of the project, based on the insights from the expert reviews.

# KURZFASSUNG

Diese Arbeit nimmt die Entwicklungen und Spannungsfelder im Bereich des urbanen Lebens als Ausgangspunkt für einen explorativen Designprozess. Die verstärkte Urbanisierung, die Privatisierung und Kommerzialisierung von öffentlichen Räumen und das Aufkommen der sogenannten Sharing Economy stellen gesellschaftliches Zusammenleben vor neue Aufgaben und machen neue Methoden der öffentlichen Partizipation notwendig. Ziel dieser Arbeit war es ein System zu konzipieren, dass stärkere Interaktion zwischen Menschen in Ballungsräumen fördert, den öffentlichen Raum wiederbelegt und somit, als übergeordnetes Ziel, lokale Gemeinschaften stärkt. Das Ziel dieser Arbeit wurde bewusst so formuliert, dass die Aufgabenstellung keine potentielle Lösung impliziert. Die Methodologie dieser Arbeit besteht, neben einer anfänglichen Literaturrecherche, darin iterativ Prototypen zu entwickeln und diese mittels Begutachtungen von Experten zu evaluieren. Basierend auf den Erkenntnissen der Gutachten wurden iterativ neue Prototypen entwickelt. Der erste Prototyp war eine Crowdfunding Plattform für zivilgesellschaftliche Projekte. Im Zuge des Designprozesses wurde daraus eine kollaborative Plattform die es Menschen ermöglichen soll grüne und nachhaltige Projekte zu initiieren und umzusetzen. Dieses Konzept wurde anschließend in einem funktionellen, web-basierten Prototypen umgesetzt und mit Hilfe von Expertengesprächen evaluiert.

Diese Arbeit betrachtet dabei sehr stark den Designprozess und die Entwicklung des Projektes, basierend auf den Erkenntnissen der Expertengespräche.

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# 1. INTRODUCTION

In February 2015, the website [gigaom.com](http://gigaom.com) has released an article called *Disrupting reality: Silicon Valley is busy ignoring the real world* (Roettgers, 2015). The article criticizes how many startups in Silicon Valley base their products and services around taking out the friction in human interaction. In order to find a profitable business model, technology and services are used to propose a potential solution to a problem that might not need a service or technology in the first place. The author of the article even goes further and says:

„It's not about meeting your neighbors anymore, it's about putting them to work.“

(Roettgers, 2015)

This cynically formulated statement bares a truth that is inherent to computer science and engineering in general. The question on whether the things designers and engineers create benefit society.

The Viennese designer Victor Papanek was a strong advocate of the socially and ecologically responsible design of products and services. In his influential book *Design for the Real World: Human Ecology and Social Change* he argues that we live in a society and economy of abundance that produces too many products which lack usefulness. (Papanek, 1971)

Although there is a 44-year timespan between Papanek's book and the article of [gigaom.com](http://gigaom.com) the problem of designers and engineers ignoring what they call "the real world" is probably more present than ever before. This observation was the initial motivation for this work.

## 1.1. STRUCTURE OF THIS WORK

Chapter 2 will explain the initial motivation behind this work. In particular it explains the developments in urbanization, the emergence of the sharing economy and the commercialization and privatization of public space. These 3 topics serve as starting point for an explorative design process.

The motivation sets the frame for the aim of this work, described in chapter 3. After describing the motivation and the aim, Chapter 4 will explain the approach behind this work. In order to get a better understanding of the approach behind this work, Chapter 4 will also give a brief history over design methodology and explain why this work's approach has been chosen.

Chapter 5 documents the design process in detail including every design decision and every expert review. The aim of this chapter is to show the impact that the iterations of prototypes and expert reviews have on the project. The implementation and the scope of the resulting functional prototype, which is based on the design process described in chapter 5, will be explained in chapter 6.

Chapter 7 covers how the prototype was evaluated and documents the process. Furthermore the findings of the evaluation will be presented.

The discussion in chapter 8 reflects upon this work's aim and result followed by a summary in chapter 9 which summarizes this work.

## 2. MOTIVATION

The motivation for this work can not be boiled down to a particular motivation but is more defined by a complex set of observations and developments in society and technology.

Live in urban areas is currently undergoing dramatic changes. With the advances in technology and the massive growth of population in cities, society is faced with new challenges. I want to highlight three trends that are currently impacting live in urban areas.

### 2.1. URBANIZATION

Urbanization describes the population shift from rural areas to urban cities and the resulting ways of live. Today, 54% of the worlds population lives in urban areas and 40 urban regions generate two thirds of the worldwide economic performance (United Nations, Department of Economic and Social Affairs, Population Division, 2014). This development challenges city planners but also computer scientists and designers. Urbanization has a strong impact on the requirements of Information and Communication Technologies (ICTs). Designer of such systems are therefore confronted with new constraints and have to develop an understanding of the implications on society of their systems to a new degree.

What is also becoming more evident that new forms of participation need to be established so that citizens have an active role in shaping their environment.

### 2.2. COMMERCIALIZATION AND PRIVATIZATION OF PUBLIC SPACE

Open public spaces are an essential part of democratic live in urban cities and help creating equality in society while giving its citizens a platform for culture, sport, political discourse and individual wellbeing (Beck, 2009). Currently we are witnessing a development of large urban areas being reconstructed to serve financial investors purposes. The problem of commercialization of public spaces often refers to the stronger usage of advertisement and billboards in these spaces (Baker, 2007). Privatization on the other side even goes further and describes the transfer of ownership of property to privately owned organization or company from the state. (Starr, 1988)

This work will focus on the shift in usage of these places. The English art critic and poet John Peter Berger claimed that publicity turns consumption into a substitute for democracy (Berger, 1972). Recreational areas and market places are turned into cafes, bars and shopping malls. While urban areas are populated more densely, it becomes harder for its citizens to spend their recreational time in consumption-free areas (Wahyuni & Nasution, 2012).

### 2.3. THE SHARING ECONOMY

The term *sharing economy* and *collaborative consumption* is used to describe a socio-economic system built around the sharing of human and physical resources (Rogers & Botsman, 2010). Botsman & Rogers describe the shift in the way people consume and share their goods and services. This has an increasing impact on the way how companies work and a lasting impact on society. Companies like *Airbnb* already have a strong economic (Airbnb, 2014) and environmental impact (Airbnb, 2014). Although some services in the sharing economy have strongly impacted how individuals can interact with each other, reality shows that the idea behind the sharing economy doesn't seem to apply this easy in everyday live. Companies in this field have been accused of driving very aggressively into the markets while ignoring regulatory mechanisms.

### 3. AIM

The goal of this work is to develop a concept of an information and communication system that aims to create **stronger interaction between people in urban areas, encourage usage of public spaces and therefore strengthen local communities.**

The aim is defined very loose on purpose. The potential outcome of this work should not be implied by the aim but rather be completely open. This openness gives more freedom in the design process. The concrete manifestation should use information and communications systems in some form but does not have to subordinate itself.

The focus of this work shall not be on the technical solution or implementation but **rather on the design process and the reasoning behind decisions that have been made in order to reach a successful concept.**

Successful in this context means that the concept that shall be created has the potential to be adopted by potential users.

In case a technical implementation of an ICT will be necessary as a result of the designed concept, it will be implemented as a functional prototype to evaluate it.

The overarching goal of this work is that the result should benefit society. The goal is not to create a viable business model or develop a technology with no clear benefit for society.

## 4. APPROACH

A brief elaboration of the development of design processes will help to explain this works approach.

### 4.1. A BRIEF HISTORY OF DESIGN THEORY

Since the early 1960, academic research has tried to understand how design processes work and what distinguishes them from classic academic problem solving approaches. The first design conference, *The Conference on Design Methods*, was held in London in 1962 which led to the formation of the Design Research society in 1966. (Buchanan, 1992) This group of researchers set its goal to promote the study and examination of design and the design process. Christopher Alexander was one of the first researchers to heavily contribute to the discourse on design methods. His publication *Notes on the Synthesis of Form* is one of the most important publications of that time. In his work, Alexander criticizes the strong individual impact a designer has on the form-making process. He questions the idea of the genius designer and instead proposes a more methodological approach to design. This approach reflected the belief in academia that design processes can be defined scientifically. Alexander proposes a systematic model by dividing the design process in analysis and synthesis.

*„I shall really be trying to show that for every problem there is one decomposition which is especially proper to it, and that this is usually different from the one in the designer’s head.“*

(Alexander, 1964, p. 83)

Another very important influential researcher around that time was Herbert Simon. He looked for an answer on how research of the artificial can work in comparison to research of nature. In 1969 he published *The Science of the Artificial*. The design process was strongly associated with visual design and product design in the early era of design research. Simon helped to generalize design by viewing it as a more abstract problem solving approach.

*„Everyone designs who devises courses of action aimed at changing existing situations into preferred ones“.*

(Simon, 1969, p. 130)

A very interesting aspect of Simon’s approach was that he proposed the idea of simulation to verify a solution. Therefore, he was one of the first design researchers that coined the idea of prototyping.



„To understand them, the systems had to be constructed, and their behavior observed“

(Simon, 1969, p. 20)

A strong impact on the design community had Victor Papanek's book *Design for the Real World: Human Ecology and Social Change* which was released in 1971. Papanek emphasized the importance of sustainability and moral in design and therefore questions the unconscious approach many designers had at that time and still have (Papanek, 1971). He argues that design at that time has only satisfied wants and desires but neglected genuine needs of mankind. One could argue that Papanek argued for what is today known as Human-Centered Design.

Horst Rittel & Melvin Webber published *Dilemmas in a general theory of planning* in 1973. This paper had a disrupted the discourse of design methods by presenting the concept of Wicked Problems (Rittel & Webber, 1973). They focus on policy planning in that publication but clearly state that new ways of tackling such complex problems need to be found. Their work was the starting point for many proposed design methodologies.

Nigel Cross published the article *Designerly Ways of Knowing* in 1982. Cross recognizes design as its own intellectual and practical culture as a way of finding knowledge by proposing designerly ways of gathering knowledge in contrast to classical research in science (Cross, 1982). Nigel Cross was a proponent of the position that the designer as an individual is the core of the design process and that this process relied heavily on his or her intellect.

The academic discourse about design theory of that time tried to create step-by-step processes to reproduce a design process. Buchanan summarizes this desire as follows,

„In the abstract, such a model may appear attractive because it suggests a methodological precision that is, in its key features, independent from the perspective of the individual designer.“

(Buchanan, 1992, p. 15)

In practical application, this didn't work very well. Lawson reported that there was only one approach to implement the methods described in Alexander's *Notes on the Synthesis of Form* (Lawson, 1980).

## 4.2. CRITIQUE ON DESIGN METHODOLOGIES

While Buchanan understood the desire to create such formulation of a methodology, he was a strong opponent of the understanding of design as a science. He didn't believe that effective methodologies can be formulated. While Alexander was a proponent of structural approach in his notes, he revised his opinion on design methods in 1971 and harshly questioned his own prior work. He even goes so far saying that methodological approaches to design are useless.

*„I've disassociated myself from the field. There is so little in what is called 'design methods' that has anything useful to say about how to design buildings that I never even read the literature anymore. I would say forget it, forget the whole thing.“*

(Alexander, The State of the Art in Design Methods, 1971)

Another relevant designer from that era, John Chris Jones, shares that opinion and states that:

*„In the 1970s I reacted against design methods. I dislike the machine language, the behaviorism, the continual attempt to fix the whole of life into a logical framework.“*

(Jones, 1977, p. 50)

Donald Schön empowered this view in his article *The Reflective Practitioner* in 1983. Schön also strictly refused the concept of design grounding itself in science. He focused more on the problem setting, rather than the actually problem solving. He put his emphasis on framing and contextualizing design problems. This practice of reframing the problem and reflecting upon action was central to the design process in his opinion. The strong emphasis on framing is often recurring concept in design theory. (Schön, 1983)

## 4.3. THIS WORK'S APPROACH

The nature of this problem is *wicked*. Rittel and Webber define one of the characteristics of wicked problem as that such a problem has no definitive formulation. They are too ambiguous and associated with moral and societal issues. Wicked problems are also strongly dependent on stakeholder, therefore there is often little census about what the problem is. Finding the problem would be the same thing as solving it. Therefore the problem can't be clearly defined until a solution has been found. Rittel and Webber explained it like this:

*„Part of the art of dealing with wicked problems is the art of not knowing too early which type of solution to apply“*

(Rittel & Webber, 1973, p. 164)

Schön goes even further and argues that with a confusing and conflicting situation the actual problem has yet to be found.

*„... when the ends are confused and conflicting, there is as yet no “problem” to solve. A conflict of ends cannot be resolved by the use of techniques derived from applied research. It is rather through the non-technical process of framing a problematic situation that we may organize and clarify both the ends to be achieved and the possible means of achieving them.“*

(Schön, 1983, p. 41)

An **explorative design approach** is necessary to tackle this problem.

Ron Wakkery proposes a design method which is appropriate for this approach (Wakkery, 2003). Wakkery's work is based heavily on Donald Schön's concept of "reflective practice" where Schön emphasizes the importance of framing the problem and the need to constantly reflect upon practical prototypes throughout the design process. (Schön, 1983)

**Iteration** plays a crucial part in Wakkery's design method. In his method, the designer has the freedom to reiterate every step in the design process or go back at any point in time. The ability to return to a previous phase or start over from the beginning when a new insight or mistake has been found during the process gives the designer the ultimate flexibility to evolve a suited solution to a given problem.

Following steps will be used in this work. They have **no fixed sequence** and **no specific number of iterations** that is necessary. They will derive from the findings during the process.

#### **4.3.1. State-of-the-Art research**

The designer has the ability to research at any given point about a certain field of interests that is relevant for the design process. State-of-the-Art research gives the designer the opportunity to see how other designers have solved similar problems. It also bears the risk of getting stuck on a certain solution. Therefore State-of-the-Art research should not be the predominant way of finding solutions but rather user testing and academic research.

#### **4.3.2. Design Prototypes**

Design Prototypes will be constantly used throughout the process. The form and shape of the prototype can vary. The prototypes fidelity or interactive depends on the review and evaluation it will be put through. In the early stages of the design process prototypes will be held as time efficient as possible to create since the designer should be aware of the fact that it can be thrown away at any given point in time.

#### **4.3.3. Expert Reviews**

In order to get feedback and validation on the prototypes, expert reviews will be constantly used throughout the design process. Expert reviews should not be a substitution to user testing but rather help the designer to seek experience from people of a certain area of expertise. The goal is to find people that have dealt with similar problems and have experience the field. Expert's don't necessary have to be people that have dealt with similar problems but also can be people that could have been potential users but solved their need for a solution in a different manner. During the design process expert reviews will be used at any given time when questions or ambiguities arise. It is the designers challenge to find adequate people that are able to give insights in the design process.

# 5. DESIGN PROCESS

## 5.1. INITIAL RESEARCH

### 5.1.1. Developments in the usage of public spaces

The design process started with an internet and on-site research on the usage of public spaces and innovation in public spaces. The main goal was to find developments that represent ongoing trends in the field of urban life.

The internet research showed interesting developments in various cities around the world which confirmed that the privatization and the occupation of public places by companies created a counter reaction by activists, primarily artists and architects. (Bela, 2015)

A major problem with public spaces is the often very complicated and strict bureaucracy involved in creating public spaces. As a reaction to this situation, a group of San Francisco based architects called Rebar Group tried to establish recreational parks in public spaces in 2005. This, so called *PARK(ing)*, made it possible to find loopholes in legislation in order to establish temporary public installations. This trend is also often referred to as *hacking of public spaces*. (Rebar Group, 2005)



Figure 1 A parklet in Vancouver, Canada in 2012 (Paul Kruger, 2012, retrieved from <https://www.flickr.com/photos/pwkrueger/7563944478>)

The idea behind so called *parklets* is to occupy metered parking space and to transform them into small, temporary recreational areas that can be used as a public park, outdoor café, bike rack or library just to mention a few usages.

The concept of hacking public spaces became popular and soon many citizens around the world started installing similar projects in various cities around the world. (Occupy Parking Spots: 15 Projects Reclaiming the Streets, 2014)

State legislators within San Francisco's planning department recognized the benefits and of this approach and started adopting the philosophy of temporal and quick installations.

The Mayor's Office of Civic Innovation, the San Francisco Arts Commission and the San Francisco Planning Department created the *Living Innovation Zones* (LIZ) program with the goal to help people and organizations create venues for innovation, connection and in play in public spaces (Living Innovation Zones, 2015). A more open initiative was the *Market Street Prototyping Festival* (Market Street Prototyping Festival, 2015). The idea was to give citizens the opportunity to present their ideas for improving one of San Francisco's largest and liveliest streets and to demonstrate them in public with prototypes for three days. The installations ranged from recreational zones, art pieces, performances spaces to name a few.

### **Insights**

The research on public spaces showed some interesting aspects that influence the decision making in the design process.

The research has shown that **innovation in cities is pushed by civic society**. Citizen's know very well what their neighborhood needs and are a lot **faster in implementing solutions** for their needs. Unfortunately the research also showed that the **legal situation is often very confusing** for citizens and that they often act in a legal gray zone.

#### **5.1.2. Emergence of civic crowdfunding**

The power of individuals to actively contribute to urban live in the sharing economy also created new forms of financing and mobilization. Since the launch of Indiegogo (Indiegogo, 2015) (launched in 2008) and Kickstarter (Kickstarter, 2015) (launched in 2009), Crowdfunding grew to a \$10bn Industry (Sun, Schwartz, & Terry, 2015) .

Belleflamme, Lambert & Schwienbacher define crowdfunding as:

*„Crowdfunding involves an open call, mostly through the Internet, for the provision of financial resources either in form of donation or in exchange for the future product or some form of reward to support initiatives for specific purposes.“*

(Belleflamme, Lambert, & Schwienbacher, 2014, p. 8)

This empowered companies, organizations and individuals to realize ideas without the help of large corporate financial investors. This way of financing gives local organizations more power when it comes to financing projects in their neighborhood. They are not necessarily bound to federal and state money to realize projects. People started applying the concept of donation based crowdfunding platforms like Kickstarter for civic projects such as parks, swimming pools and concerts. (Brady, 2014)

#### **5.1.2.1. Crowdfunding models**

This section should give a overview about the concept of crowdfunding and the existing models before going further into the emerging field of civic crowdfunding

Crowdfunding is fragmented around 4 different business models, depending on how strict they are defined (Giudici, 2012).

- **Donation Based Crowdfunding**  
Platform's like GoFundMe (Gofundme.com, 2015) are based around the idea of personal fundraising for the sake of charity. People or organizations need money in order to achieve a certain goal but have no physical or monetary reward for the donation.
- **Reward Based Crowdfunding**  
Backers of projects receive some sort of physical gift or reward for the money they invest in a project. This model is currently the most popular model. Kickstarter and Indiegogo are among the most successful reward based crowdfunding websites. WeMakelt.com is the most successful platform in German speaking countries.
- **Lending Based Crowdfunding**  
Lending Based Models enable people to lend money to other people or organization with a return in interest rates without going through traditional financial institutions such as a bank. LendingClub (Lendingclub.com, 2015) and Zopa (Zopa.com, 2015) are currently the leading providers of such services.

- **Equity Based Crowdfunding**

This model enables people to fund a startup or small business in return for equity. The investor receive ownership of a small piece of the business Investors have the right to receive their share if the business is successful. Angellist (Angellist, 2015), Crowdfunder (Crowdfunder, 2015) and Fundable (Fundable, 2015) are currently the leading platforms in this sector.

### **5.1.2.2. Current state of crowdfunding**

Goldman Sachs released a research report in 2015, covering the current state of crowdfunding and gives detailed information on the size of the market and the development.

The report states the crowdfunding has **aggregated \$10bn in 2014**. In 2011 the aggregated value was just \$1.5bn According to estimates of the World Bank **60% of all projects were funded in North America and 34% in Europe** during 2012. (Sun, Schwartz, & Terry, 2015)

The study also strongly investigates the demographics of potential funders. It shows that so called Millennials, people born between 1980 and 2000, show strong interest in crowdfunding as a form of finance. In contrast to that, Millennials are less interested in stocks. The transparency and the potential positive social or environment impact plays a crucial role in decision making for this generation.

Crowdfunding is typically done trough the Internet. The strong social component of crowdfunding platforms enable campaigns to reach a large audience and potential viral growth as seen with many successful crowdfunding projects like the Cooler Cooler (Kickstarter, 2015) or the Pebble Smartwatch (Kickstarter, 2014).

### **5.1.2.3. Research on civic crowdfunding**

Rodrigo Davis, a PHD Candidate from Stanford, released a 2 year study about the emerging development in crowdfunding, he calls *civic crowdfunding*.

He defines civic crowdfunding as an:

„Open processes to raise funding for public or shared goods.“

(Davies, 2015)

During his research he has collected data from **1224 projects** between the **beginning of 2010 and Match 2014**. These projects raised **10.74 millions US Dollars**.



The research was focused on seven platforms:

- **Catarse.me** (Brazil)
- **Citizeninvestor.com** (USA)
- **Goteo.org** (Spain)
- **IOBY.org** (USA)
- **Kickstarter.com**, only projects that have been tagged with Civic (US)
- **Neighbor.ly** (US)
- **Spacehive.com** (UK)

I will point out some of the highlights from his work that have been important for the decisions in the design process.

- **Small scale projects**

The vast majority of civic crowdfunding projects have a pledge goal under \$20,000. The average of the successfully funded projects was \$6,357. The pledged average was \$62.

- **Civic crowdfunding projects are more successful than not civic projects**

His work showed that projects that were labeled as “civic” on Kickstarter were funded 81% of the time which is above the average success rate on Kickstarter.

- **Most successful projects are parks or gardens**

His studies also showed that the majority of success projects were parks or gardens. Davies argues that the reason for this is that green projects are usually uncontroversial and are easy to execute.

- **Most projects happen in dense urban areas**

The vast majority of civic crowdfunding projects took place in dense urban areas.

#### **5.1.2.4. Role of government in civic crowdfunding**

Government and law makers play a crucial role in the success of civic crowdfunding. The research shows that civic crowdfunding is often used because there is a lack in governmental funding. Initiators use it because the state by itself is not capable of solving a undesirable situation. This also means that cities with very good infrastructure and funding for the public space often show less need for civic crowdfunding. The problems in these cities are more often the laws that prohibit to realize certain projects. Many cities are very strongly regulated in the field of urban planning. Getting permissions to initiate project turns out to be the bigger obstacle than receiving financial investment.

This explains why civic crowdfunding is predominantly successful in North and South America which have a lot more liberal laws in terms of building laws than European countries for example.

Civic Crowdfunding is often used as a tool if government or state legislators fail to sustain a high level participation and quality public spaces.

## 5.2. INITIAL CONCEPT

The goal of the first concept was to create a collaborative civic innovation platform that helps people to initiate civic projects for urban areas and that follows them through the full process of realizing the project. Citizens should have a tool that helps them to actively shape their environment.

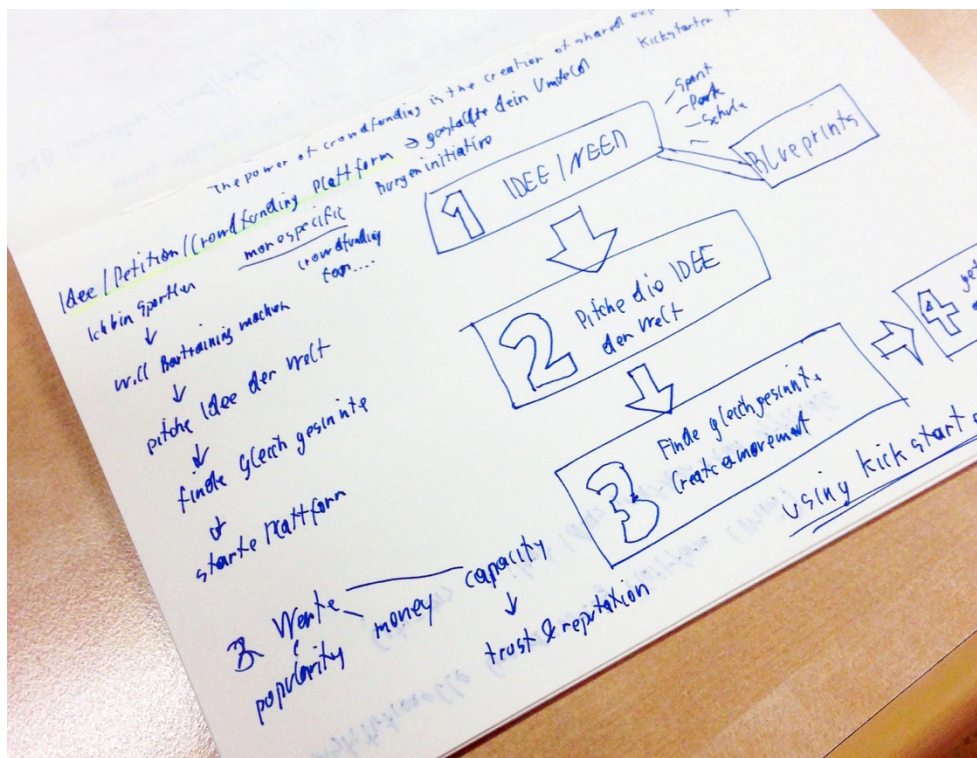


Figure 2 A basic sketch that captured the initial process

### 5.2.1. Process

The process of that the platform should accompany the people which was designed to be in 4 steps:

#### 1. Setting up your Idea

The platform should offer a simple setup process to make their idea public. A idea in this context is **not yet bound to any funding process and has no deadlines**. It should give people a place to express their desires and needs for their neighborhood. In order to make this process simple and effective, the platform would offer **blueprints** for

various categories of projects like Sport, Parks or Events. The main purpose behind the concept of blueprints is to establish a minimum quality in presentation of the ideas. The presentation should appeal to users.

## 2. **Presenting it on the platform**

The idea can be published when the setup process is done and is available on the platform. Users that visit the website will be presented with projects that gather a lot of interest and are close to the users location.

## 3. **Finding likeminded people / Creating a movement**

The platform wants to enable people to use human resources in an effective way. Often people want to engage in civic activities in their neighborhoods but just don't know how to get in touch or to find activities. Initiators of ideas can actively invite people to get in touch with them and to help realize their project. The search for people that want to engage and participate in helping the project is major aspect of platform.

## 4. **Starting the project phase to get funding**

When the initiators feel ready to start the project they can set a funding goal and time plan. After this point it resembles a normal crowdfunding process. Visitors can fund projects.

### 5.2.2. **Ideas and Projects**

The motivation behind the concept of ideas was to lower the barrier of initiating a project. Crowdfunding campaigning shows that projects on crowdfunding platforms have to be very well formulated and have a very sharp focus and goal. The potential funder should have no doubt in the project initiators commitment. The ability to give people the freedom to express their desires for civic projects in their neighborhood gives them the ability to get feedback on the necessity of their idea.

### 5.2.3. **Multiple metrics to measure progress**

One major aspect of the initial concept is that **money** should not be the only metric used for success and progress. **Popularity** also plays a huge role. Visitors will be able to express their sympathy for an idea. This has the potential to create viral effects. The potential benefit from high popularity could be that state regulators see a need for popular projects or that private investors help these ideas financially. **Human capacity** is also an important metric for civic projects. If an idea sets out to find people to support the

projects then this should be communicated through the platform. Visitors should get a sense that more and more people are helping an idea to be realized.

#### 5.2.4. Potential problems

A major field of uncertainty is dealing with law makers and state approval to realize the projects. The question is **how to deal with this uncertainty throughout the project**. A potential solution is to only allow project to start the project phase when all the necessary permits have been gathered. This could lead to other problem that under which the platforms efficiency could suffer. This problem will be further explored in future design iterations in this work.

### 5.3. STORYBOARDS

The next step was to create storyboards in order to understand the process better that should be reproduced and assisted in the platform.

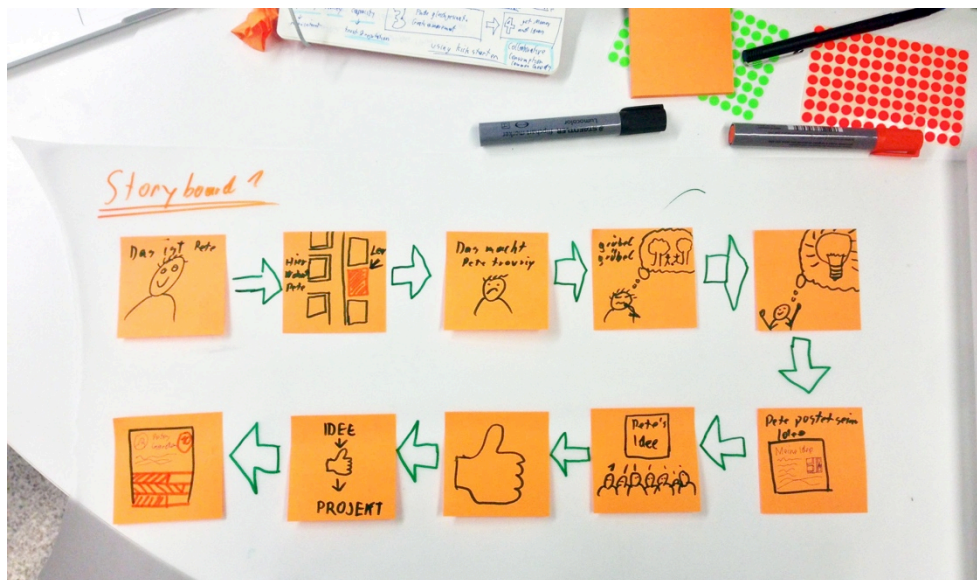


Figure 3 The first storyboard

The storyboards should illustrate the process of a person that has a need or idea and wants to realize it through a crowdfunding platform.

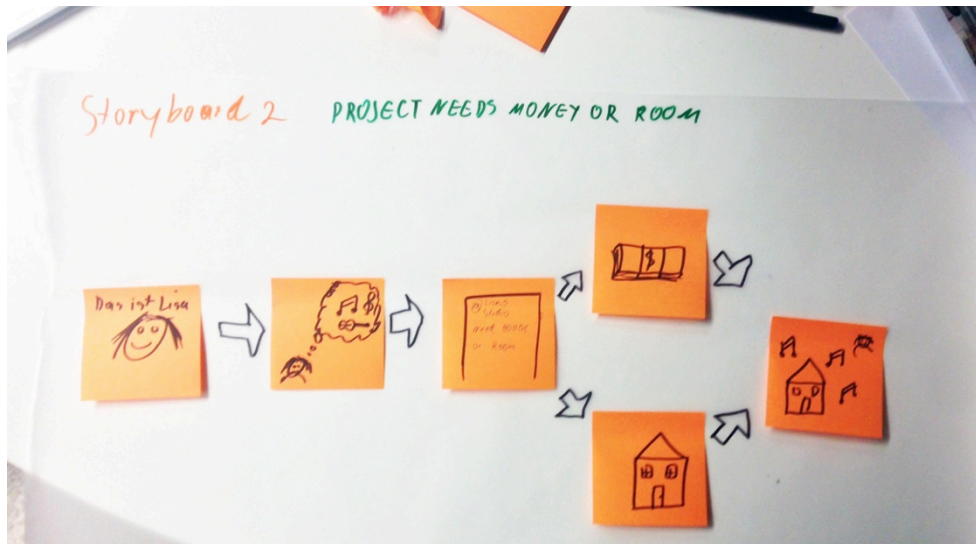


Figure 4 The second storyboard "Project needs money or room"

Visualizing this process helps the get a better understanding on how to cluster the process and at which stage people could encounter problems.

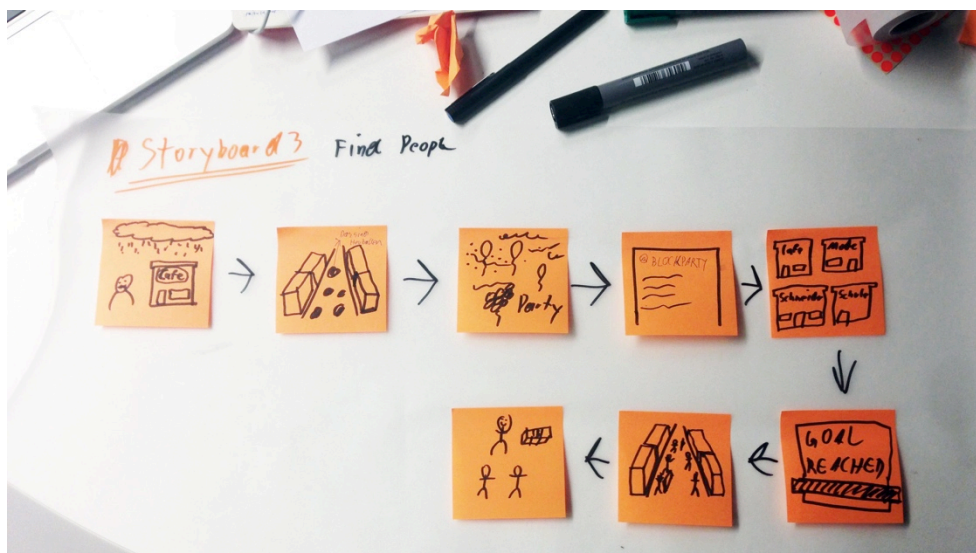


Figure 5 The thirds storyboard "Finding people"

An other benefit of the storyboards is that they tell story. It is a lot easier to explain a problem and potential solution to a person through a story. The process of creating the storyboards also helps to see where people might have problems with understanding what it is about and how it works.

#### 5.4. USER STORIES & PERSONAS

The storyboards gave a good feeling for the process but the insights were not to big. In order to understand the potential needs the next step was to create more detailed user stories and personas that are based on actually civic projects. This enables a scenario-based design process (Carroll, 1995) The personas are on purpose formulated as texts and not just bullet points of

facts. The personas should tell a story about the peoples desires, needs and wishes. Additionally the should give insight on the social and financial background of people as well as their education and professional life.

9 personas and user stories have been created. The people in the user stories are divers in age, gender and origin.

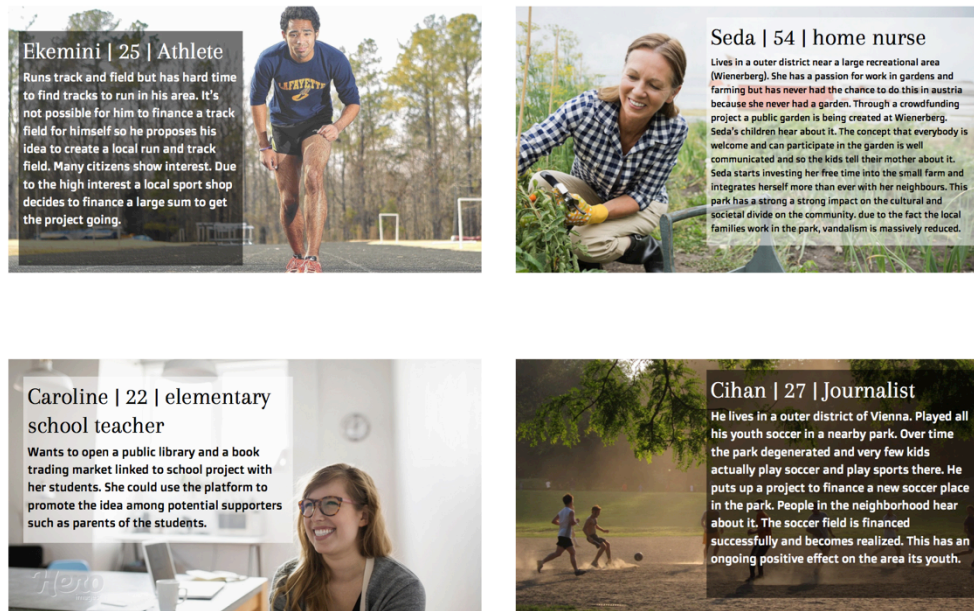


Figure 6 The first four illustrated personas

The user stories also gave a first impression on how such a platform could look and feel although they were just simple slides with text and images. When the slides were presented to people it clearly showed that they triggered emotional response and that people automatically relate and try to identify themselves with the presented personas and their stories.

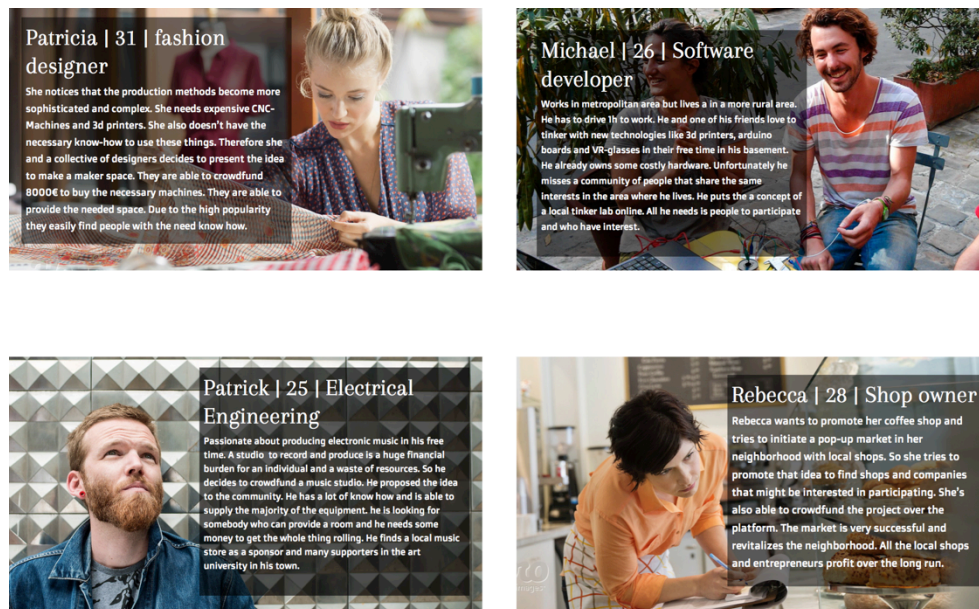


Figure 7 The second four illustrated personas

## 5.5. WIREFRAMING & SKETCHING

Sketching in early phases of the design process is very important in order to explore possible solution (Buxton, 2007). The act of sketching interfaces and workflows was used constantly throughout the design process at any given time when the need was felt to express a thought. Sketches are a great tool to document and test ideas very fast.

Sketches of the basic workflows for the platforms were created after the initial concept and the workflow of the users was defined. The sketches had various goals. One aim was to envision how a user could get a **overview of project's and navigate through the overview and detail views**. The transitions should be fluent in order to give the user a understanding of navigation and spatial reference. The illustration of the **creation process of a project** was also an important aspect of the his process.

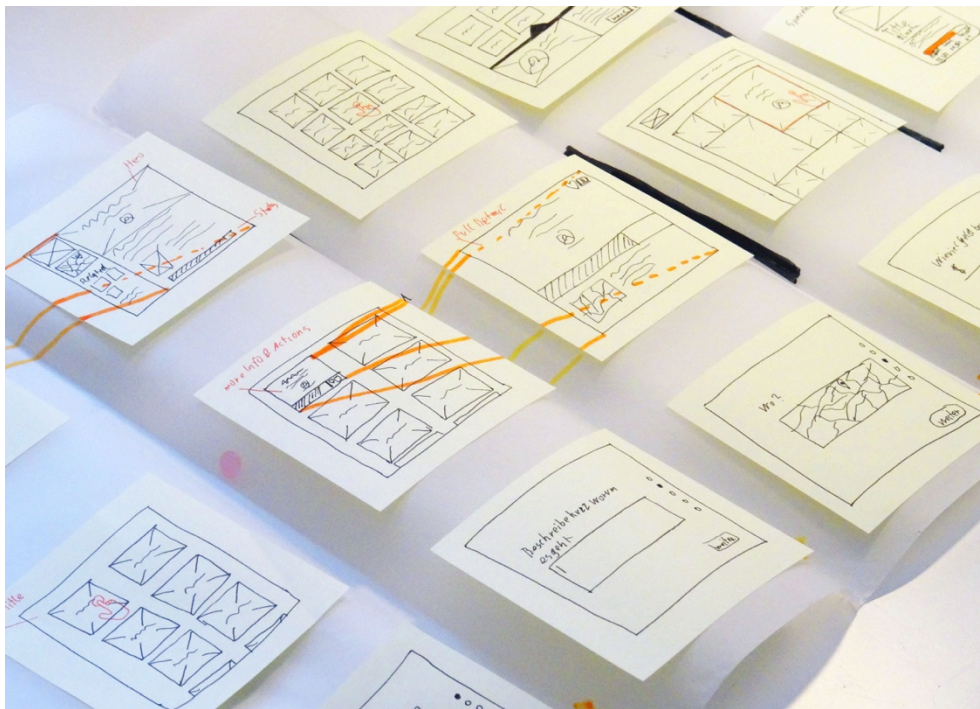


Figure 8 Sketches showing possible navigational concepts in detail

The power of this approach was that it was easy to experiment with many different user interface approaches without having to worry about the technical implementation.

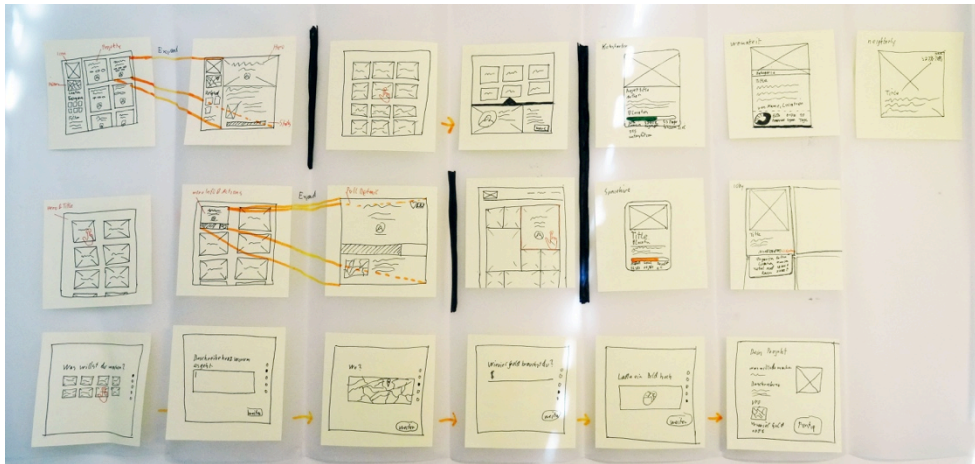


Figure 9 Overview of navigational concepts

A goal of the user interface was that the platform should be reduced to very few screens. Processes should be reduced to as little steps as possible.

### 5.5.1. General approaches in crowdfunding platform user interfaces

Crowdfunding platforms, especially donation based crowdfunding platforms, have produced design patterns that have become popular and accepted by users. Crowdfunding platforms obey certain design rules and are recognizable due to their special needs. I will highlight some of these design patterns by analyzing [kickstarter.com](http://kickstarter.com), [indiegogo.com](http://indiegogo.com) and [wemakeit.com](http://wemakeit.com). These platforms belong to the most successful crowdfunding sites and have proven that their designs work well in practice.



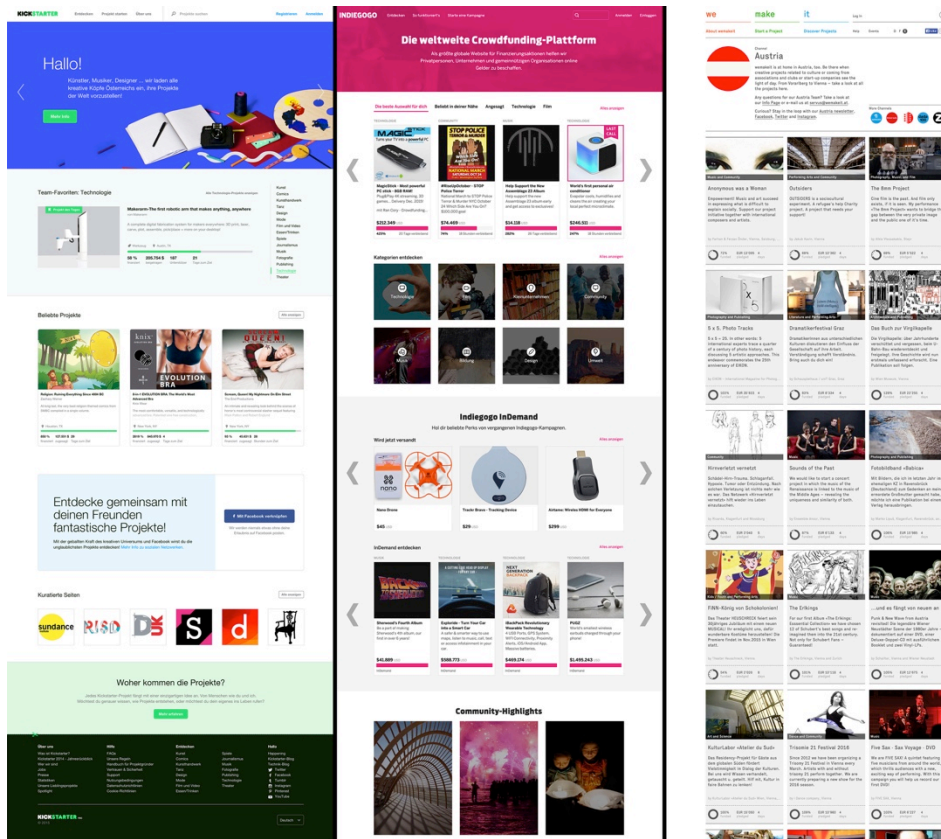


Figure 10 Startpages of crowdfunding platforms, Kickstarter (left), Indiegogo (middle), wemakeit (right)

Following design rules apply to all the platforms start pages.

- All of the platform use a **basic top navigation** with the options to learn more about the platform, start a project or discover more project. Next to these task there are logins and registrations links.
- They also use so called **Hero Headers**. These headers are very large and explain what the platform does and what its aim is. The goal is clearly to catch the viewers attention and make the goals of the site understandable. In the case of Kickstarter it also functions as a carousel that changes content over time. This way current content will be display prominently.
- Most recognizable for crowdfunding is that projects are displayed in so called **card elements**. Cards element usually consist of a image on the top third, the project title, it's category, a short description text and progress indicators.
- All of the platforms above use the start page to indicate currently popular projects.

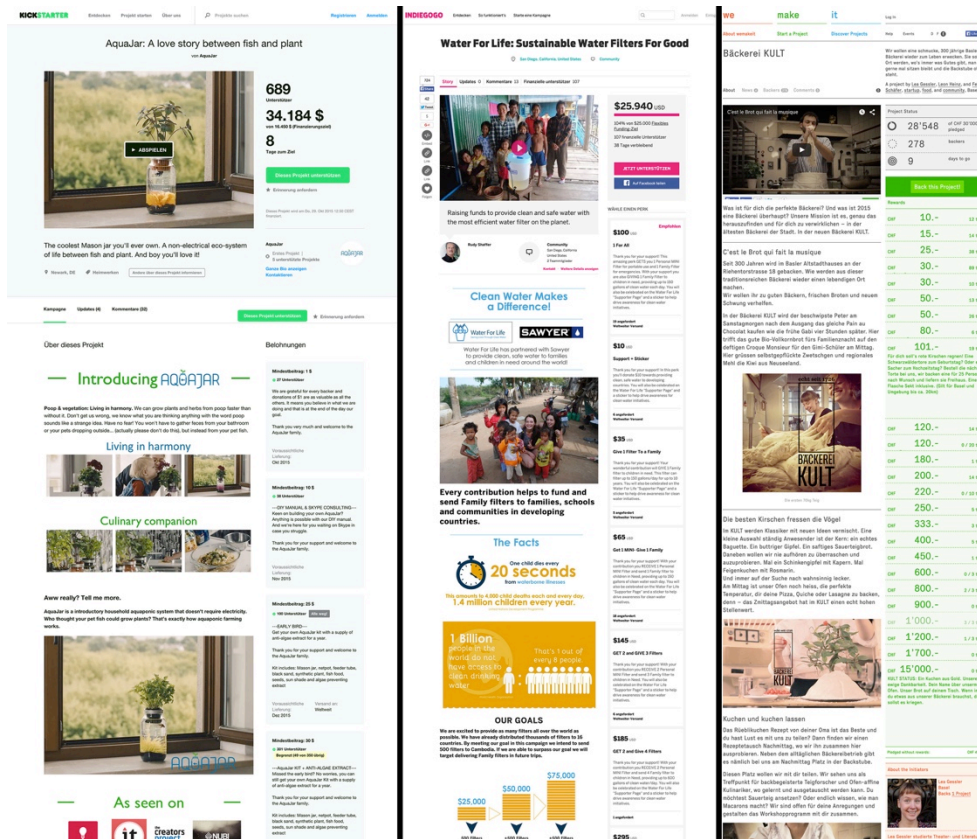


Figure 11 Project detail sites, Kickstarter (left), Indiegogo (middle), Wemakeit (right)

The detail pages of all three websites also clearly resemble each other.

- The most prominent part of the website is the **project video and the title**. Although videos are not mandatory, the website strongly recommend the project initiators to make a video for their projects. Projects without videos barely get any attention and usually unsuccessful. Project videos are an integral part of crowdfunding nowadays.
- The current amount of funded money, the **funding goal and additional information** such as the deadline are directly next to the video. Underneath the information is a very prominent button with a call to action to pledge for the project.
- Underneath the video is a **content area with a tabbed navigation**. The main are is used for project description that can be edited by the authors. These descriptions tend to get very excessive and long on most crowdfunding projects. Also available is an area that is used to display updates and news in the campaign. These updates consist of news written by the authors or are auto-generated news by the platform when certain deadlines or goals have been reached.

- Next to the content area is listing of all **rewards**. Users usually pledge by choosing a reward. This only applies for rewards based crowdfunding platforms

### 5.5.2. Low fidelity mockups

After the general navigation was roughly conceptualized with mockups and a good understanding has been built up on how crowdfunding websites use design patterns to engage and educate their users it was time to design the project pages. The goal was to create many low fidelity mockups that could represent the functionality that the initial process of the platform would offer. These mockups aim to experiment with ideas and find new ways of interacting with the users.



Figure 12 Rough mockups to explore various layouts

The prototypes clearly resembled typical crowdfunding websites but had a stronger focus on the community and participation aspect. The initiators and the people participating in the project should be clearly highlighted in the mockups. An other aspect that was important is that civic project have a geographical reference. The display of maps was therefore important. Visitors should immediately get understanding that the project is about a place and people and not a technical gadget or movie.

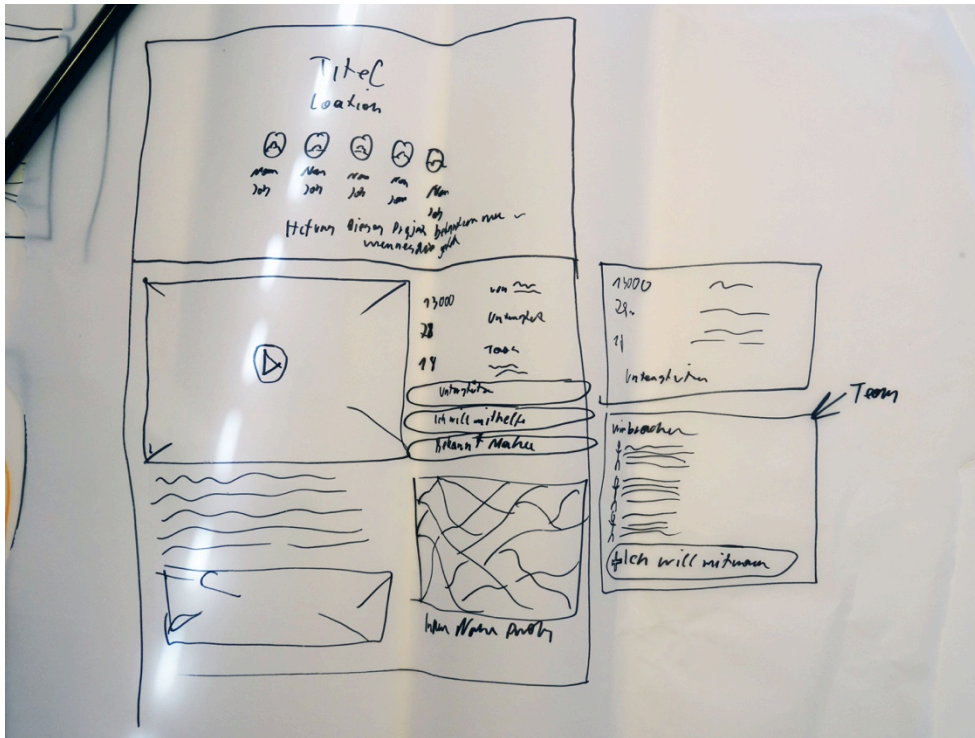


Figure 13 Rough sketch of the initial design

## 5.6. FIRST DESIGN PROTOTYPE

Already very early in the design process it was important to focus on the overall feeling of the platform. The typography, images and color schemes should connect emotionally to visitors and give them an understanding of the platforms values and goals. Since most of the content of the website would be user generated it is important to make a solid foundation for the design. Projects should look pleasing by itself without the having the initiator worry about style and layout.

The first prototypes used **dramatic typography** and **large imagery**. The typography and imagery should give the projects a **playful and inviting appearance**. This is empowered by placing the initiators and participants avatars very present.



Figure 14 First design iteration of a project card, Basic (left), Hover-State (right)

In this iteration the card component was design to achieve legibility by heavily blurring the background image. After hovering the project, details would emerge and the image would be displayed sharp.

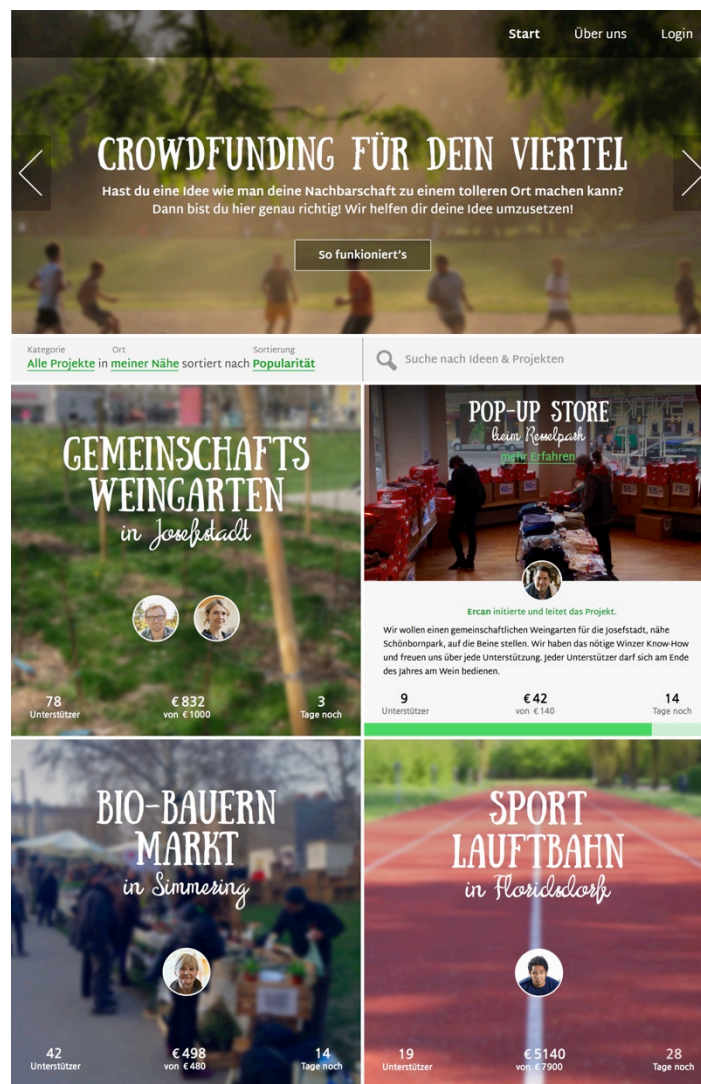


Figure 15 The first design prototype of the start page, hero image on top, filter & search underneath, project cards at the bottom

The layout is intended to be very responsive and adaptive to available screen size. The start page should highlight popular projects. The users should also search directly from the start page. The hero would serve as a carousel that can display important information.

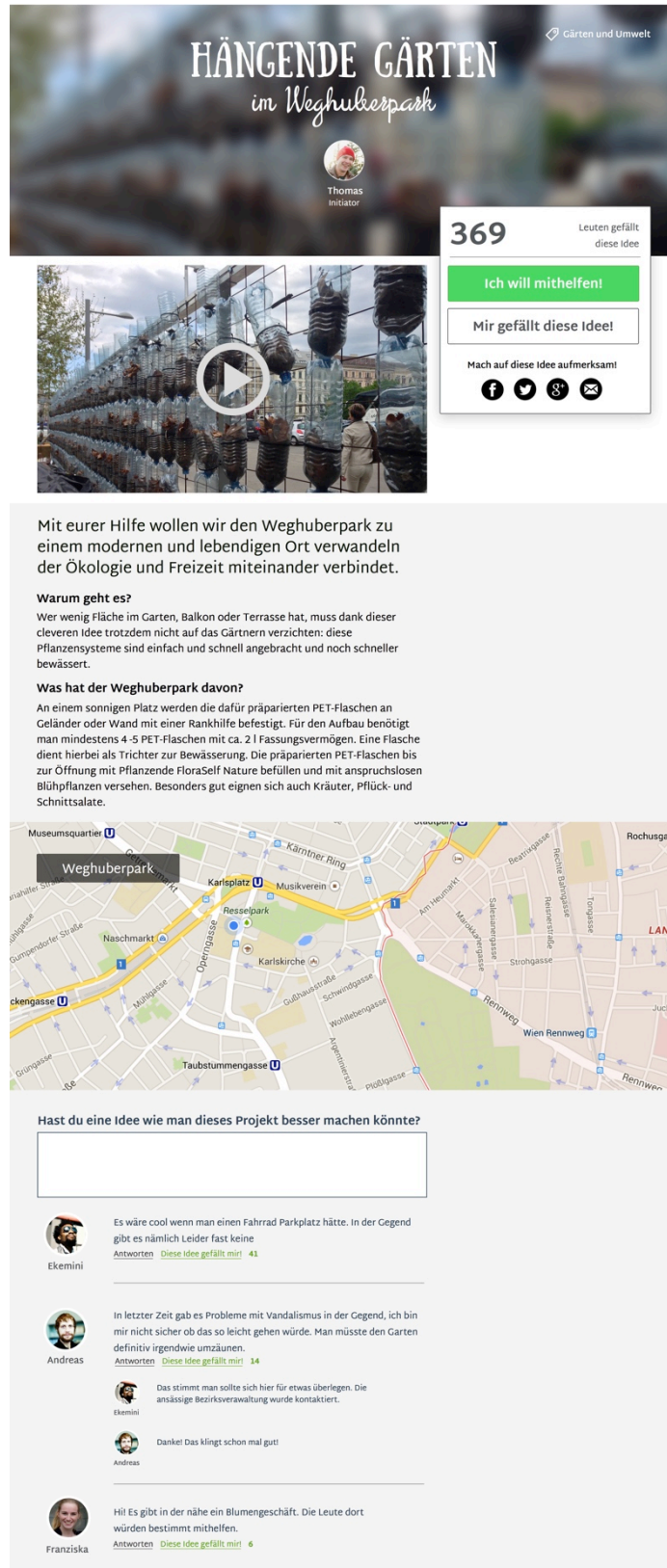


Figure 16 First design prototype for the idea detail page

The **idea detail page** resembles typical crowdfunding project pages but has some unique attributes to it. Since the concept of an idea on the platform is that it serves a playground to express ideas people have the opportunity to participate in the project but also to just express their appreciation for it. Next to the description there would be a map displaying the location of the project and a discussion section where people can interact with each other and express opinions.

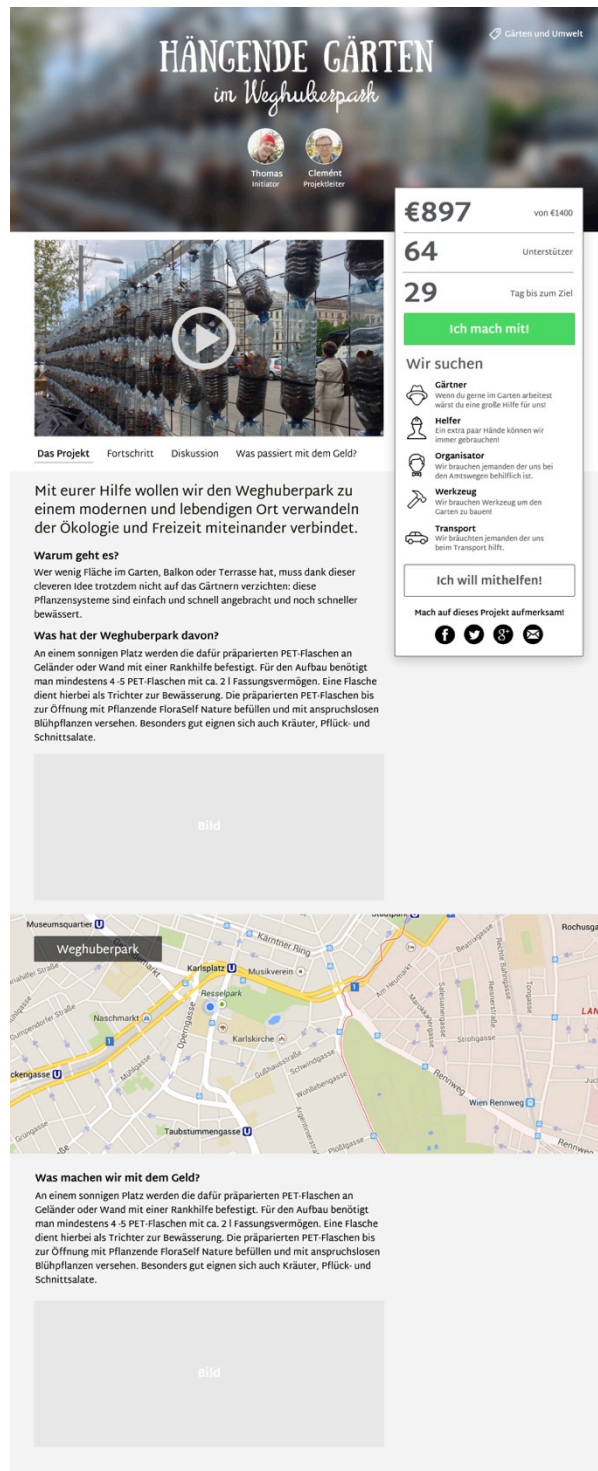


Figure 17 First design prototype for the project detail page

The project detail page shows the funding status next to the video.

Underneath the funding status there is an area where the project initiator can express on whether he needs people that could participate in the project.

After finishing the first prototype a expert review was scheduled.

### 5.6.1. Expert review with Mag. Christoph Chorherr on June 9, 2015

Christoph Chorherr is the speaker of innovation for the green party in Austria. He has decades of experience in the field of civic projects and city government. We contacted him to get his insights on the platform goals and whether he believes that a platform like the currently designed has the potential to be accepted by a broader mass. We presented him the screen designs in large printed format and explained what decisions have lead us to the current design.



Figure 18 The first design prototype has been printed in large A3 format to get feedback in the expert reviews

The following is a summary of the conversation held with Christoph Chorherr.

- Christoph expressed his sympathy for the project. With his experience in the field of civic projects he believes that there is definitely a need for a platform that gives people an opportunity to initiate projects, find supporters and finance it.
- One of our main concerns was whether a project should be able to be funded before it has all the legal permit to actually be allowed. Christoph's view on this question was that it's very hard for a project with no human and no financial support to be fully permitted. Therefore he argued that it might actually be a **good thing to give projects the possibility to fund money before acquiring all the necessary permits.**



- Christoph expressed that a platform that focuses on mobilizing people and financing projects **should not try to solve the legal situation for project's** when it comes to permits of the local governments. This aspect is simply too complicated and differs strongly from city to city. This aspect should be left to the project initiators.
- He further gave some expertise on his experience with civic initiatives in Austria. He explained that civic initiative's in Austria have a tendency to be **used as a tool to stop specific plans**. He argues that a platform trying to motivate people to be constructive in their initiative's has to highly emotionalize its users.
- He believes that a platform like this has to be **highly transparent and should not be associated with an political party or corporation**. This is an important aspect because it strongly influences possible business models.

The conversation with Christoph Chorgherr gave interesting insights into the dynamic of civic projects and the legal situation. He confirmed our assumption that there is need for a platform in the public civic sector. He gave us the advice to contact Helge Fahrnberger for further insights and feedback due to his experience in the field of digital web products.

## 5.7. SECOND DESIGN PROTOTYPE

The goal of the next iteration was to make the start page resemble typical crowdfunding pages. This was desired in order to make people faster understand how projects and ideas are structured. Funded projects should be identified as such and ideas should not be confused with them. The presence of more white space was also necessary to add more visual structure and make the overall appearance more calm and not as visually cluttered as before.

The cards are not relying on a hover state anymore. This was necessary because the design should also work effectively on touch devices.

The filters have been removed from the start page. The navigation now contained a text search for project and ideas.



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### Erfolgsgeschichten

Figure 19 The start page of the second design prototype resembled typical crowdfunding sites stronger than the first prototype

The header of the idea sites is more responsible for participatory component of the site. The call to action to participate should be clearly associated with the people that are working on the project. It should give the feeling of a

community that is trying to achieve a goal. It also adds more visual structure to the layout of the site and makes it easier to differentiate between ideas and projects.



Figure 20 The call to action for participation has been moved to the participants in order to create a association with them

In order to make the process more understandable a illustration was created that should explain how the process of the platform works.



Figure 21 The aim of this illustration was to explain the process and aim of the platform to visitors

After finishing this iteration the next expert review was scheduled with Helge Fahrnberger as suggested by Christoph Chorherr.

### 5.7.1. Expert Review with Helge Fahrnberger on June 26, 2015

Helge Fahrnberger is the co-found of Toursprung GmbH (Toursprung, 2015), a company that provides digital map products. He also teaches Online

Journalism at the University of Vienna and founded Kobukt.at (Kobuk, 2015). This website is one of the most relevant watch-blogs in Austria. He worked as a consultant for digital product strategies.

His strong background in digital product design gives him a wide set of experience in order to evaluate the current status of the platform. He also has a lot of experience in mobilizing people with digital media. This expertise was especially important for the design process.



Figure 22 The second design prototype has been printed in A3 format as well to get feedback in the expert review

Helge was interviewed while examining the current screen designs in large printed form. Helge gave some very impactful insights.

- After reviewing the platform he mentioned that it is absolute crucial to give the platform a lot **stronger profile**. He further elaborated that users need to be able to **immediately grasp what the site's purpose and function** is. If a user is confronted with intangible concepts there is very little chance that they will visit the site another time.
- A possibility to sharpen the profile could be to **choose a specific category** and focus the platform around a specific topic. The concept of civic project seemed to be clearly too abstract for a wide audience.
- He noticed that there might even be a bigger danger. Users might have **different understandings of the platform's goal**. This bears the risk that conflicts arise. This makes it even more important to have a sharp profile.
- Helge mentioned that **mobilization of people in order to get projects started is the hardest part**. The platform should focus on providing easy ways to get in contact with project organizers.
- He also questioned **if crowdfunding is necessary at all for what the platform is trying to achieve**. He believed that crowdfunding ads a lot

overhead and complexity to the platform that might discourage people to engage themselves in civic projects.

Helge made it very clear that a sharper and tighter profile is absolute crucial in order to appeal to a broader audience.

## 5.8. THIRD DESIGN PROTOTYPE

The third prototype was an enhancement of the second prototype. A timeline was added to the project detail page that could be reached through a tabbed navigation. Keeping funders and participants constantly updated in crowdfunding campaigns is an integral part for the success of such projects. It creates engagement, gives the initiators credibility and makes them seem more trustworthy. The timeline consists of custom and also auto-generated messages. Auto-generated messages would appear whenever a certain level of funding is reached or somebody joins the project. The intention behind this is that a project should seem alive event if the initiators don't create a lot of content.



Figure 23 The third design prototype was extended with a timeline that displays progress and a section for rewards

In addition to the timeline a reward-section was added. The reward section serves the same purpose as on the presented crowdfunding pages. Project initiators can create rewards that can be given out to funders. In a civic context it might seem a lot harder to come up with meaningful rewards in comparison to funding campaigns that create physical goods. Nevertheless, rewards often work very well as an effective tool to drive campaigns.

After receiving the insights from Helge Fahrnberger it was evident that the next logical step in the explorative design process would be to meet with people and organizations that could potentially benefit from such platform.

### 5.8.1. Expert Review with Dipl.-Ing. Simone Rongitsch on July 7, 2015

After researching about Urban Gardening Project an interview with Simone Rongitsch was arranged. Simone Rongitsch is the project leader of *Verein Karlsruhgarten* (Karlsruhgarten, 2015). *Verein Karlsruhgarten's* main goal is to empower urban agriculture and to raise awareness for food production in urban areas. This is why they participate in many research projects that deal with these issues. They seemed appealing, especially due to their practical experience in realizing civic urban gardening projects in rural areas. The project was presented through large prints of the current screen designs.

The following points are some of the most important insights.

- In the early stages of their urban gardening ambitions, it was intended to use crowdfunding for financing the project. They have soon withdrawn from the idea. **Setting up a crowdfunding project in order to be appealing to potential customers seemed to be too much work for them.** The effort and the financial investment in order to produce a qualitative video that describes the project was not in relation to the money they actually needed to fund.
- She noted that **ecological project have additional benefits to society** in relation to non-ecological projects.
- The benefits can give all projects a common goal that **gives the platform higher goals** than just a high conversion rate of successful projects.
- Measurements that ecological projects have in common are for instance the size of created green space, the amount of CO<sub>2</sub> or the amount of trash that has been saved just to mention a few. The interesting aspect about these metrics is that they **can be measured efficiently.**
- The idea of giving people the possibility to look for supporters that actually work with them appealed to her. She mentioned that they often encountered the problem that it was hard for them to arrange physical meetings. A platform that would have supported solving these types of problem would have helped them.
- She explained that the vast majority of urban gardening projects like *Karlsruhgarten* is **financed through private corporations.** Many companies have a strong interest in supporting project that try to improve society and ecology.

Simon Rongitsch was able to provide very impactful insights. Her feedback was able to solve the questions the interview with Helge Fahrnberger raised earlier. She further confirmed our ambition the focus stronger in ecologic and green projects than civic projects in a broader sense. The idea of having higher goals in which all projects contribute to also made the concept of the platform a lot more tangible and distinguishable from existing crowdfunding platforms.

## 5.9. FOURTH DESIGN PROTOTYPE

The feedback from Helge Fahrnberger and Simone Rongitsch lead to major changes in the general concept. The platform went from focusing on civic projects in general to ecological, environmentally sustainable, nature-related projects. The following 3 reasons lead to the change:

1. Helge Fahrnberger mentioned in his expert review that a sharper profile is necessary for the understandability of the platform. He further explained that concept such as *public space* and *civic goods* **might not be very tangible concepts for many people**. Visitors should be able to immediately grasp what the platform is about.
2. The research work of Rodrigo Davis shows that the **vast majority of civic crowdfunding projects are gardens and parks**. Therefore it would make sense to specialize on this field more if the general category of civic urban projects tends to be very specific.
3. Simone Rongitsch elaborated what kind of positive impacts green projects have in general on the environment. These impacts give all projects a common goal on a higher level. **The platform serves not as gathering of independent projects but rather tries to reach a higher goal by giving people a tool to realize individual projects.**

This change in focus had strong implications on the general design und orientation.

By giving the project common goals **it was important to embed them visually in the design**. Visitors should immediate understand that the platform impacts the environment in a comprehensible way. Giving projects a common goals makes it reasonable to **group projects by location and city**. Local communities should be able be accountable for their positive impact on the environment. By grouping project in cities also gives a stronger feeling for community.



Now that the platform focuses on green projects it was possible to **rethink the categorization**. It was not necessary anymore to think in very broad categories. Categories could serve as frame to present projects and to give very specific information.

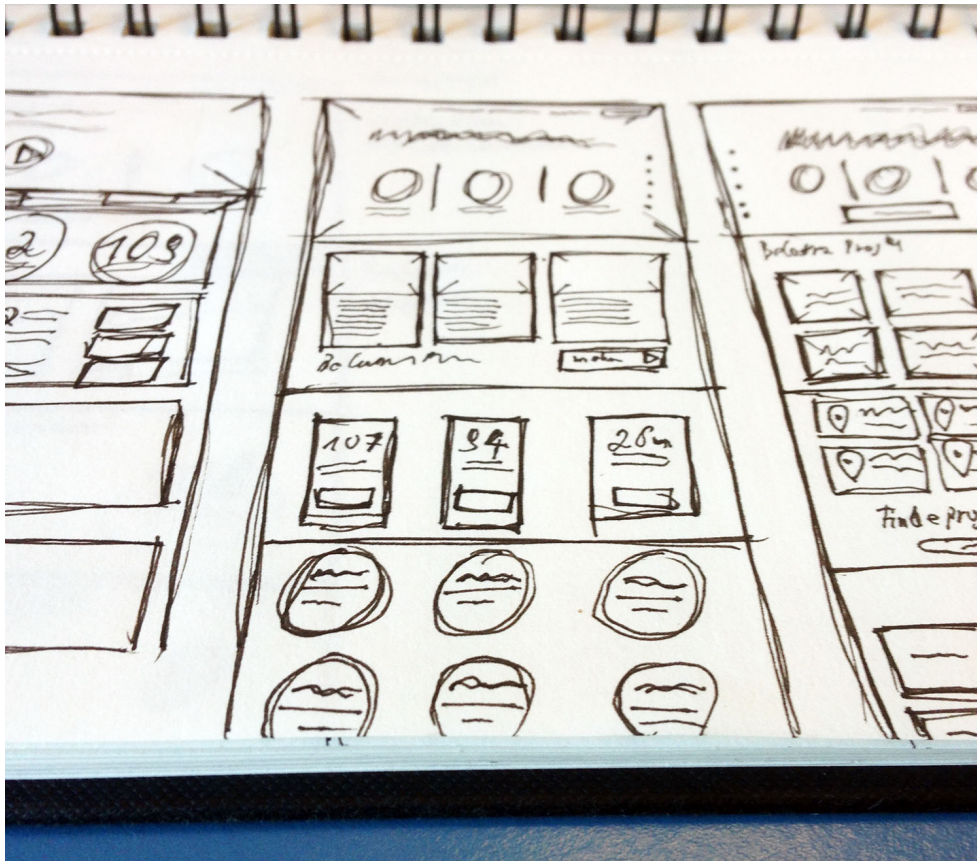


Figure 24 Basic sketches have been created in order to integrate the new concepts in the older prototypes

The designs for this iteration based on new completely new sketches. The general look and feel from the earlier iterations remained.

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**Teile deine Idee**  
Teile deine Idee und mach sie bekannt

**Hol dir Unterstützung**  
Hol dir Unterstützer und finde Leute die dir Helfen möchten

**Setze es um**  
Finanziere dein Projekt mittels Crowdfunding

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**GEMEINSCHAFTS WEINGARTEN**  
in Josefstadt

Projekt in Gärten

Wolfgang leitet mit 3 Helfern.  
Wir wollen einen gemeinschaftlichen Weingarten für die Josefstadt, nahe Schönbornpark, auf die Beine stellen. Wir haben das nötige Wissen know-how und freuen uns über jede Unterstützung. Jeder Unterstützer darf sich am Ende des Jahres...

78 Unterstützer von € 1.000 3 Tage noch

**FAVORITNER PARKLET**  
bei Quellendstraße

Projekt in Parks

Ercan initiierte und leitet das Projekt. Jeder der im Zehnten wohnt kennt die schreckliche Parksituation. Deshalb wollen wir ein anderes Bewusstsein fürs Parken und die Umwelt schaffen. Wir möchten das erste Parklet Wien mitten auf der Quellendstraße...

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**BIO-BAUERN MARKT**  
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Projekt in Veran...

Gudrun initiierte und leitet das Projekt. Der Bauernverein Simmering möchte im Juli für ein Wochenende den Bio Bauern Markt am Simmeringer Hauptplatz veranstalten. Hierfür müssen wir einige Gebühren und Unkosten tragen. Wir bitten Sie um Unterstützung und bitten im...

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391

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9

Tonnen CO<sub>2</sub> gespart

460

Tonnen Müll recycled

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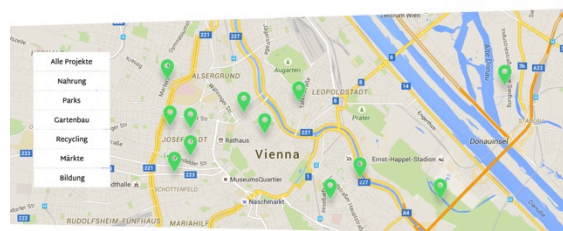
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**BILDUNG**

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Figure 25 The fourth design prototype aims to stronger show the positive impact on environment and focuses stronger on location and categories

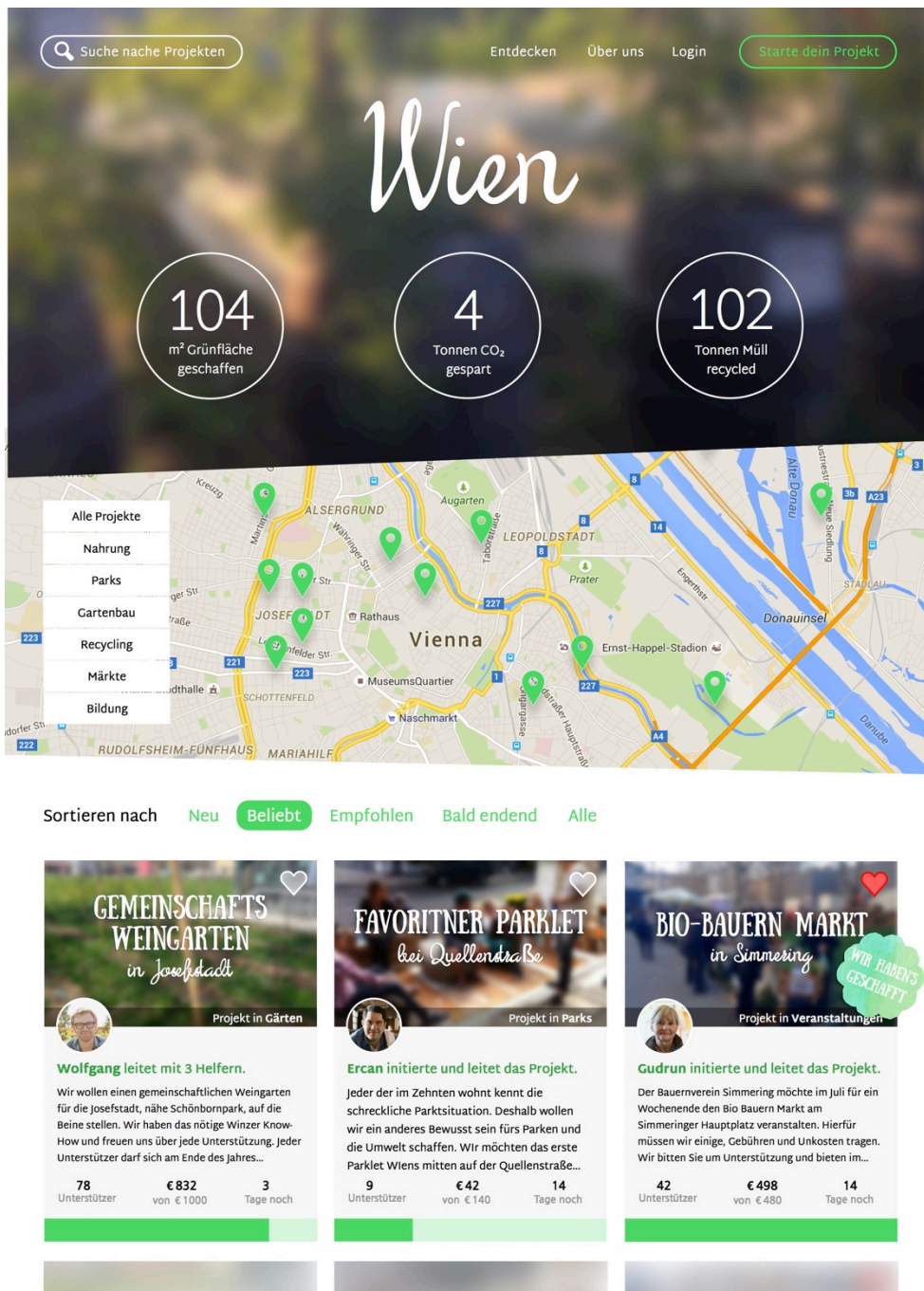


Figure 26 Cities now have their own detail pages. This aims to create a better connection to local communities.

New expert reviews were scheduled after redesigning the platform and changing the focus dramatically in order to determine where new fields of tension could emerge.

### 5.9.1. Expert Review with Mag. (FH) Markus Ogris on July 21, 2015

Markus Ogris works as a project manager for organizational development for BAWAG PSK and is one of the initiators of Crowdfunding.at. Crowdfunding.at is part of the initiative *Es geht!* which tries to support social projects that

focus on having a positive impact on society. The reward based crowdfunding platform is part of this initiative.

Through his strong involvement in crowdfunding.at, it was intended to receive feedback on the platforms potential for successful crowdfunding campaigns and where he sees possible potential and possible problems.

This were the most significant insights from the conversation.

- He confirmed that **regionalism is absolutely crucial for the success of crowdfunding** campaigns that try to impact a specific location.
- The **setup process for projects has to be extremely simple and understandable**. He explained that many projects often get stuck in the draft phase and never actually make it on their website as live projects.
- The **commitment of a projects initiator is very important** for the success of the project.
- He also confirmed like other interview partners before that **constant communication of a projects development** has as strong impact on its success.
- Platforms that are not reward based have an **emotional appeal to the visitors**.
- His experience showed that potential backers show **distrust in payment processes on mobile**. The majority of all payment processes is done on a desktop computer.
- Corporations should be able to support projects not just through money but **actually through active engagement**.
- He sees potential in the concept of finding people to participate in developing an idea to a project although he believes that this might remove the focus from the projects that necessarily need funding.

Markus Ogris feedback gave valuable insights in the long term process of supervising a crowdfunding platform that aims to have a positive impact on society. His expertise made it clear that the platform needs to have a very easy onboarding process and effective mechanisms to engage people over a long period of time.

## 5.10. FITH DESIGN PROTOTYPE

One of the main goals of the platform is that people should be able to participate in projects and help them. In order to do this some mechanism had to be developed that give organizers the ability to express the need for

help but also for visitors to provide this help. In earlier prototypes this was solved by adding an area to the project page where initiators could express what kind of manpower they are looking for. The expert reviews showed that this concept doesn't really meet the needs for such projects. In stead of describing what kind of people a initiator is looking for he should express what has to be done in order to realize the project.

The initiator should express the tasks as some form of To-Do's or Challenges that visitors can choose to deal with. These challenges describe tasks that are necessary for the project but haven't been dealt with so far. Therefore they can change during the lifespan of a project. The participatory aspect of the platform will be based around these challenges.

The screenshot shows a project detail page with a central section titled "Pack selber mit an" (Pack it yourself). Below this title, there is a paragraph: "Es gibt noch einiges zu tun. Du kannst uns dabei helfen unser Projekt zu realisieren. Folgende Aufgaben müssen noch erledigt werden." (There is still some to do. You can help us realize our project. The following tasks still need to be completed.)

There are six challenge boxes arranged in two columns:

- Flaschen besorgen** (Get bottles): Wir benötigen ca. 2000 Flaschen für den Garten. Wenn du uns dabei helfen kannst Sie zu besorgen wäre das Spitze! (We need approx. 2000 bottles for the garden. If you can help us get them, that would be great!)
- Baugenehmigung** (Building permit): Die Genehmigung zu bekommen ist ein aufwändiges Unterfangen. Wenn du know how hast auf Amtswegen hilf uns dabei. Die meisten Dokumente haben wird schon. (Getting the permit is a cumbersome task. If you know how to get it through official channels, help us. Most documents are already there.)
- Bei der Ernte helfen** (Help with harvest): Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit.
- Blumen gießen** (Water flowers): Die Genehmigung zu bekommen ist ein aufwändiges Unterfangen. Wenn du know how hast auf Amtswegen hilf uns dabei. Die meisten Dokumente haben wird schon. (Getting the permit is a cumbersome task. If you know how to get it through official channels, help us. Most documents are already there.)
- Gerüst aufbauen** (Build scaffolding): Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna .

On the right side, there are three funding options:

- 50€**: 9 Unterstützer. Du darfst dich auf von 3-4 kg Bio-Gemüse freuen! Du erhältst eine Gemüsetasche vom Birchhof. Dieses Dankeschön kannst du direkt ab Hof oder in Zürich-Altstetten abholen.
- 100€**: Begrenzt 10/10 Unterstützer. Du darfst dich auf von ... freuen! Du erhältst eine ... vom Birchhof. Dieses Dankeschön ... kannst du direkt ab Hof oder in Zürich-Altstetten abholen. A diagonal banner over this option says "Alle leider schon weg!" (All unfortunately gone!).
- 200€**: 5 Unterstützer. Du lernst auf einer eintägigen botanisch-kulinarischen Wanderung die Bergwelt neu kennen. Zudem zeige ich dir Permakultur-Elemente und natürliche Zusammenhänge in und aus der Natur, und lade dich auf eine Wildpflanzen-Verkostung ein. Wir erkunden, was wir von der Natur für ein nachhaltiges Leben und Wirtschaften lernen können. Die Wanderung ist in der ganzen Schweiz möglich, insofern die Wanderung mit Hin- und Rückfahrt an einem Tag möglich ist. Ich biete dir verschiedene Wanderrouten in verschiedenen Gebieten an, gehe aber auch auf deine Wünsche ein.

**Was machen wir mit dem Geld?**

An einem sonnigen Platz werden die dafür präparierten PET-Flaschen an Geländer oder Wand mit einer Rankhilfe befestigt. Für den Aufbau benötigt

Figure 27 The project detail page has an own designated area for challenges

**5.10.1. Expert Review with Ing. Dr. Karin Büchl-Krammerstätter on September 2, 2015**

Karin Büchl-Krammerstätter is the leader of the **municipal department for environmental protection**. This department is responsible for areas such as

waste management, preservation of nature, air quality, sustainability and environmental protection in general for the city of Vienna.

The goal of the feedback was to get insights on the field of green and sustainable projects and the measurability of positive impact on the environment. The department for environmental protection has a lot of experience in realizing projects that could be interesting for the platform. Therefore one of the main targets was to learn from their experience.

In order to discuss the platform, 2 large posters of the current design have been printed and brought to the meeting.



Figure 28 The fourth design prototype has been printed as well in A3 format for the expert reviews

Here are some of the main insights of the meeting.

- On being asked what the biggest areas for environmental protection in the city are she replied that **urban heat-islands, façade greenery, modern rainwater management, roof greening** and **waste reduction** are among the most important areas.
- After presenting the platform the first question was asked about the legal situation. She mentioned that most projects have to be rejected due to ownership problems or environmental protection laws.
- On being asked how people get in contact with them or how project are initiated they explained that the vast majority of projects is **initiated by them directly contacting people**.

- Projects are most of the time financed by companies. On thing she pointed out was that it was crucial to explain to corporations that **ecological actions also have strong impact on economics**. Saving energy through sustainability can decrease costs significantly.

Insights of the Feedback:

- The feedback showed that civic projects in well regulated urban areas are faced with many obstacles. **The regulations and the law makes it hard to get a project started.**
- Civic crowdfunding projects are often initiated because the initiators see no other way in realizing a planed project. In well regulated cities like Vienna the need for this is smaller. People have official contact points to go to when they want to create a green project.
- The feedback made clear that a platform for ecological projects also has to educate people about the sustainable cities.
- The platform should explain what certain types of project can do for the environment.
- The feedback also clearly showed that a platform that anticipates to create civic projects needs to give people clearly structured information on how to get permission to initiate a project.
- Categories should be clearly more focused. The platform should be less about broad categories of projects but **rather very specific forms of actions that can be taken.**

## 5.11. FIELDS OF TENSION & CONTRADICTIONS IN DESIGN DECISIONS

At the current stage 3 concrete contradictions in the goals of the platform have emerged. In order to solve the problems this platform aims to deal with, these fields of tension have to be resolved.

### 5.11.1. Dealing with laws and regulations

At this point of the design process it was evident that this platform has to deal with the problematic situation of law and local regulations. The strong regulatory mechanisms in the city of Vienna showed that a platform needs to be tightly coupled to local regulators in order to make projects succeed.

This has a strong implications on the platform. The platform can't guarantee that projects will be allowed by the state even if they are successfully funded. In order to make funding possible it would be necessary to check the legal

status of a project before it starts funding money. This can be a too big hurdle for many projects.

### 5.11.2. Funding in green projects

The expert reviews showed that money is not necessarily the main issue when working on civic projects. In these cases crowdfunding would be an obstacle for realizing a project. This is not desirable. The main goal is to make a platform that helps people realize projects and not to put an unnecessary burden on their shoulders.

Another aspect that could harm the credibility of the platform as a crowdfunding-site is that projects that don't meet their funding goals are not necessarily stopped. The project organizers usually would keep working towards their goals whether funding has been achieved or not.

### 5.11.3. Expert Review with DI Roman Mesicek on September 15, 2015

Roman Mesicek is the Program Director for Environment- and Sustainability Management at FH Krems. His core competences surround Sustainability Management, Corporate Social Responsibility, Stakeholder Engagement, Management Sustainable & Social Entrepreneurship. The interview with Roman Mesicek was the last Expert Review conducted before the implementation of the prototype. Therefore it was aimed to present him the goal of the project and the design decisions that have been made throughout the process. It was especially important to confront him with the contradictions that have emerged during the design process. In order to do that, several printed Designs have been presented to him. These designs show the project at different stages during the design process. The goal of the feedback was to gather general insights on whether the focus of the platform is aimed at the right projects. His opinion from a perspective of Sustainability Management and Social Entrepreneurship were also important.

- He agreed that the crowdfunding aspect should **not play a huge role in participatory green projects**. Financing is an aspect that should be investigated at a later step.
- He mentioned to be very cautious when it comes to enabling companies to co-operate with projects on the platform. Primarily because he is witnessing the trend that many businesses have decreased budgets in the area of financing projects and also because the integrity and the aim of many projects can be changed and harmed by cooperating in such manner.



- He mentioned the importance of trust of the platform. He finds it as crucial for the platform to start with a few known projects that can be presented to people.
- Further he suggested that cooperating with platforms that do similar thing in the area of collaborative urban live would be a very effective tool in order to get people to participate.
- He also said that in general he is very pleased by the visual design and believes that a real world approach that acknowledges that people interact and approach each other in real life is very important.

## 5.12. FINAL DESIGN DECISIONS

The expert reviews gave enough valuable feedback to be able to make qualified design decisions. Here are the two most important

### 5.12.1. Removing Crowdfunding

During the process of designing and doing reviews it was continuously more evident that **the concept of crowdfunding simple doesn't meet the needs of a platform that aims to help people start and realize civic, urban and green projects.** Therefore crowdfunding should not be a part of the platform. This would solve many problems at once.

Projects that don't need funding can be represented on the platform. There is no commitment that project initiators enter when creating a project on the platform. This makes the barrier to start a project very small. This can affect the amount of project being represented on the platform very strongly. The removal of the process that comes with crowdfunding also makes it possible for project that already have been realized to be represented on the platform. **The platform can serve as a long term contact point for projects.** This means that the boundaries of beginning and end of an project blur. Projects can be initiated, grow and be looked after on the platform. This can increase the amount of active projects dramatically.

### 5.12.2. Acknowledging real world problems

What was constantly more evident during the design process was that the workflows and goals of the platform simply didn't meet the real world problems that emerge in initiating civil projects. **The platform tried to take out the friction in human interaction by solving them through technological tools but these tools were more hindering than actually beneficial.** A platform that deals with civic projects has to acknowledge that a lot of the work is done by face-to-face communication. **The platform therefore should**

**encourage such behavior not try to reduce them by introducing technological tools.**

Mobilization for small local projects simply works a lot more effective approaching people in the neighborhood directly than by promoting it on social media. Especially because the target group of people is very specific. **This is way the platform enables project initiators to get printable leaflets that can be posted in the neighborhood next to promoting it on social media.**

## 6. FUNCTIONAL PROTOTYPE

The goal of the implementation was not to implement the full platform that was conceptualized during the design process but rather to create a functional prototype that covers some of the most important user stories. Many features are only being hinted at in the prototype in order to ask tester what they would expect from such feature.

### 6.1. IMPLEMENTATION & DEVELOPMENT

#### ENVIRONMENT

The platform was developed using web technology. The majority of the backend development was done using the PHP Framework Yii 2.0 (Yii Framework, 2015). The front-end was implemented with HTML, CSS and JavaScript (using the jQuery Library (jQuery, 2015)) MySQL was used for the database. The data is persisted in a database on a server. Therefore live testing with real data can be done. The prototype had no requirements in backward compatibility to outdated browsers. This ensured that modern visual effects using CSS could have been used for the design.

The prototype has been developed in NetBeans 8.0.2 and Adobe Brackets 1.5.

### 6.2. ROLES

The prototype has 3 types of users.

#### **6.2.1. Visitor**

A visitor is able to browse all sites and view all projects but is not able to participate in a project or start a project. In order to do these actions he will have to register.

#### **6.2.2. Registered User**

A registered user is able to start a project and to participate in other projects. He is not able to modify existing projects except his own ones.

#### **6.2.3. Initiator**

A initiator is a registered user but is offered more functionality due to his ownership of a project. He can modify his projects and will receive notifications whenever somebody wants to join his project.

### 6.3. USER-STORIES

Following user-stories were aimed to be implemented.

- A **visitor** should **login** to be a **user**.
- A **visitor** should **register** to be a **user**.
- A **user** should **create a new project** to be an **initiator**.
- A **initiator** should **add/modify/delete challenges** in a project.
- A **initiator** should **add/delete updates** in a project.
- A **initiator** should **add/modify/delete** a projects **description**.
- A **visitor/user/initiator** should **browse projects by category**.
- A **visitor/user/initiator** should **find information and help** about the platform.
- A **user** should **ask for permission to join a project**.
- A **initiator** should **promote his project** through social media and prints.

### 6.4. IMPLEMENTED PAGES & LOOK AND FEEL

A main goal of the prototype was to capture the look and feel from the design prototypes. Therefore more emphasize was put on the design that usual on a functional prototype. To ensure the look and feel that was designed in earlier prototypes **CSS Filters** and **Web fonts** have been used.

Following pages have been implemented in the functional prototype

#### **Start Page**

The Start Page consists of a short introduction and a call to action to start a project. The three most popular projects and all the categories are displayed as well. The popular projects are followed by the categories section where a user can choose categories. The page ends with a footer from where the visitor can reach the most important sites.

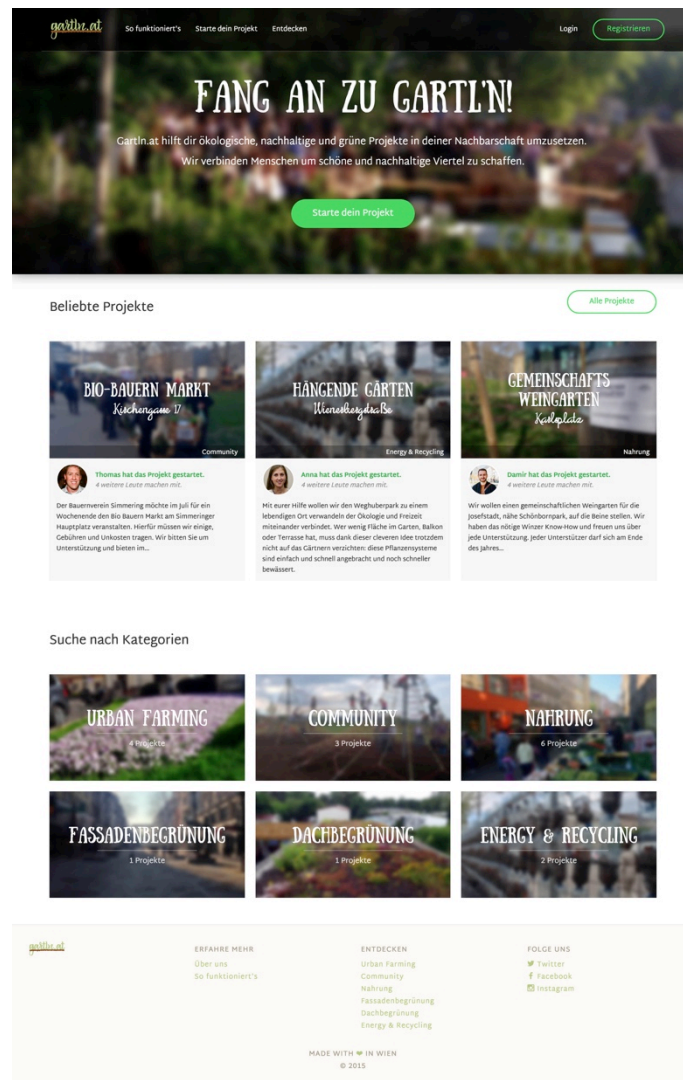


Figure 29 The functional prototypes start page

## How it Works

A page that illustrates the process of realizing a project on the platform.

## Discover Projects

Projects can be discovered by various settings. Inside the prototype users will be able to browse all projects or search them by category.

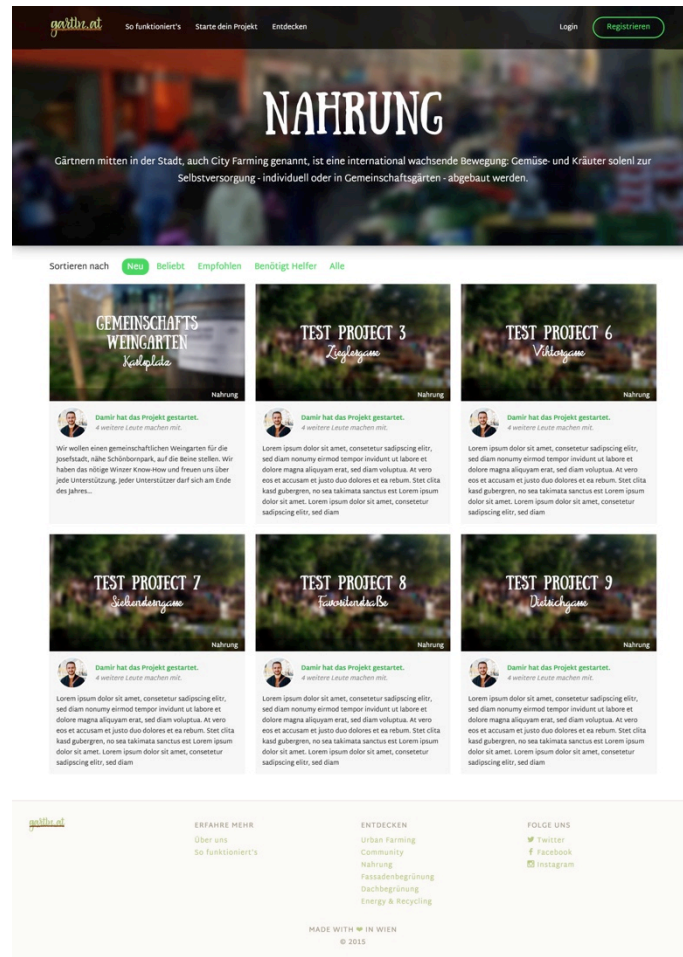


Figure 30 The discover page for a specific category

## Project Detail Page

The Project Detail Page consist of various elements. The header element gives basic information about the project and the participants. It also contains a large call to action to participate. Underneath this area is a map which indicates the location of the project. The body consist of a tabbed navigation with 3 elements. The first element is the project description that can be edited by the initiator. A button to add text block and an image is visible for the initiator. The second element is a overview of the updates that happened during the lifespan of the project. The initiator is able to add updates in this tab. The third tab gives a overview of all tasks associated to this project. A button which is only visible to the initiator leads to a site where he can edit them.

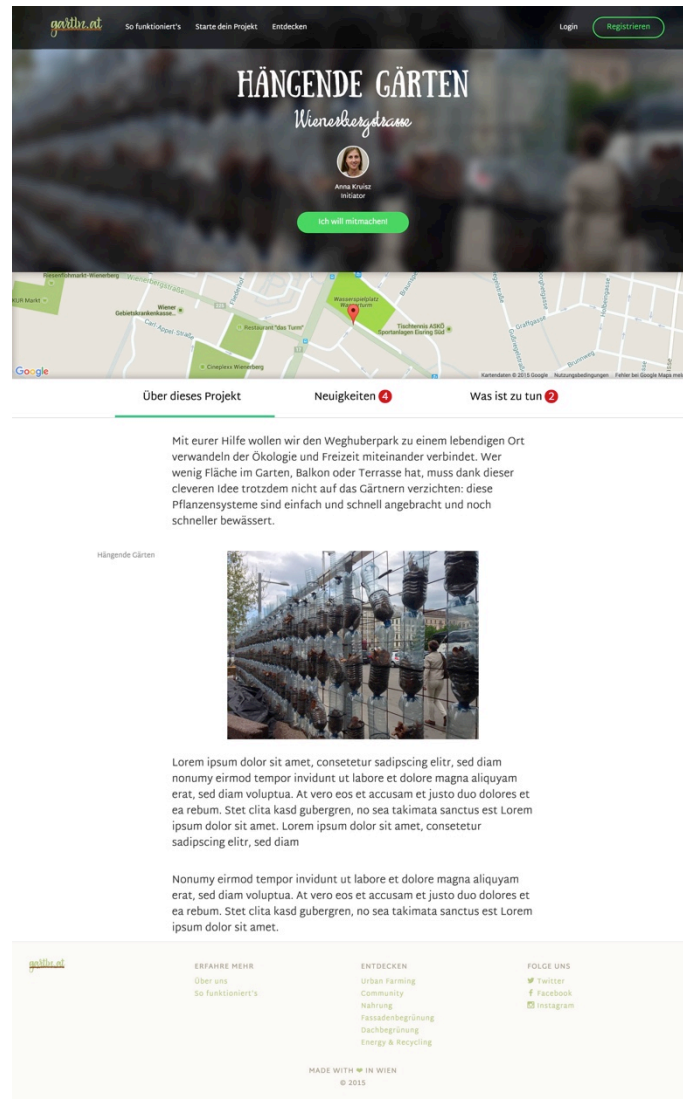


Figure 31 The project detail page's body consists of the tabs that describe the project, show news and display tasks

### Login

A basic login screen for visitors to login.

### Registration

A registration site which enables visitors to create a profile for themselves or an organization.

### Start you project

This page consist of a form that enables user to set up a project.

**Starte dein Projekt!**  
Erzähle uns ein bisschen über deine Idee.

Gib deinem Projekt einen Namen

Der Name sollte am besten kurz und prägnant sein.

Worum geht's?

Beschreibe in 3-4 Sätzen worum es bei deiner Idee geht und was deine Nachbarschaft davon hat.

Wo?

Geben Sie einen Standort ein.

Lade ein Bild hoch

Datei auswählen  Keine ausgewählt

Ein Bild sagt mehr als tausend Worte. Zeig uns den Ort den du verändern möchtest.

In welche Kategorie passt dein Projekt?

Urban Farming	Community	Nahrung
Fassadenbegrünung	Dachbegrünung	Energy & Recycling

**Leg los**

**gaolite.at**

ERFAHRE MEHR  
Über uns  
So funktioniert's

ENTDECKEN  
Urban Farming  
Community  
Nahrung  
Fassadenbegrünung  
Dachbegrünung  
Energy & Recycling

FOLGE UNS  
Twitter  
Facebook  
Instagram

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Figure 32 The user has to fill out a form with basic information when creating a project

## Edit Tasks

Initiators need to be able to add and edit tasks during the setup process and after the project has been set up. This page enables initiators to interactively add, modify and delete tasks for projects.

**Was ist zu tun?**  
Beschreibe kurz ein paar Aufgaben die zu erledigen sind bei denen du Hilfe benötigen könntest.

Wir suchen noch Leute die uns beim Ernten  
ende September helfen.

Falls jemand Erfahrung beim pflanzen von  
Weinreben hat bitte melde!

**Aufgabe hinzufügen**

**Fertig**

**gaolite.at**

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Über uns  
So funktioniert's

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Figure 33 Initiators are able to interactively edit the projects tasks



# 7. EVALUATION

## 7.1. PROCEDURE

The functional prototype was presented to the tester without further explanation. The testers were asked to think aloud and to express their first impressions on whether they understand what the site is about.

After giving the testers some time to navigate through the site, the reviewer took over and gave them a short explanation on what they are seeing. Next the reviewer explained the purpose of the main page. The testers were asked for their opinion and what they think about the presented site.

Next the project detail page was presented to the testers. They were asked to navigate through it and again to express their thoughts aloud.

The reviewer then showed the testers how to set up a project and add tasks.

After showing them the platform the reviewer engaged the testers in a conversation about the platform. They were asked to express their first impression and their thoughts on design and the aim of the platform.

Lastly the testers were asked express their overall opinion.

## 7.2. EXPERT REVIEWS

### 7.2.1. Expert Review with Sebastian Jakl, M.A. on November 3, 2015

Sebastian Jack, M.A. is a freelance communication designer and also works for a Viennese agency for digital products (Jackl, 2015). His work is focused on art direction and design. The main point of the review with him was to get his insights from a design and usability perspective.

#### Observations

- The tester explained that he felt the “Start your Project” button on the main page was too aggressive for him. **He felt that a visitor should first be presented with an explanation before he is asked to participate.**
- After viewing the Todo-Section in a project, the test said that each To-Do should have some direct call to action. This should be in contrast to the participation button the header of the project detail page.

- He expressed that the header of the project detail should have short description text about the project. He again felt that the call to participation in the header was too direct for first time visitors who don't know the project.
- He expressed that the font used for the location information was not legible for him.
- He expressed that he really liked the focus on green projects.
- The tester liked the idea of the printable pdf a lot.
- He further expressed that the platform should guide the project initiators stronger by providing information on how to get permits etc.
- The concept of measurable metrics was considered to be very good and interesting.
- He further expressed that he as an user would have privacy concerns when not knowing what happens by clicking on the participate-button.
- The tester asked himself the question on how a project progress should be determined. **He explained that some sort of milestones would be necessary to see how the project develops.**

### 7.2.2. Expert Review with Mag. Manfred Forster on November 5, 2015

Mag. Manfred Forster is a holder from a Viennese Design Agency and primarily works on the conception and design of digital products (Getdesigned, 2015). He worked in the field of creating websites and web-based platforms for more than 10 years. Therefore it was aimed to get his critical opinion on potential weak points of the presented platform.

#### Observations

- After viewing the main page, the tests said that he understands the basic concept. He got a rough understanding about what the platform is about although he noted that he feels that the actual aim of the platform to help people organize themselves in their neighborhood was not clear to him.
- After presenting him a detail site he noted that he would like to know what happens when clicks on the call to action to participate. He was not sure what kind of commitment that would mean.
- He noted that he likes the structure of the navigation inside a project. The further explained that the focus should be stronger on the news-section.

- The tester created a project and went through the process of setting up a project. He noted that it was too fast for him. Before he is asked to explain what has to be done he would like to get basic information. He further expressed that he would like to get a guide on how to realize project. The focus of such guide should be clearly on how to get people to participate on the project. The focus should be stronger on the participation.
- He expressed that he likes the overall appeal and design of the site.
- He further noted that he found the wording of the site to be confusing. He said that the main catchphrases were misleading in what the platform actually does.
- The most important issue that tester had with the site was that he did not see a clear focus. He found 2-3 different ways to interpret the focus of the site. This was very critical for him.

### **7.2.3. Expert Review with Mag. Matthias Redl on November 10, 2015**

Mag. Matthias Redl is the Chief technology officer at a Viennese Agency for digital products (Getdesigned, 2015). The aim of the review with him was to get his thoughts on the actual functionality of the website and whether he believes that the platform is using the right mechanisms to solve the problems it attends to do.

#### **Observations**

- The tester navigated through the main page, the category page and a detail page by himself. After navigating through the sites he noted that he didn't understand what the website actually does for him. He was not sure what it was that the website was supposed to do.
- When setting up a project he noted that the tasks are even more important than the project set up itself. It should be the first step to him because.
- Further he explained that the website doesn't explain to him what functionality it actually offers. The tester was generally very focused on concrete features. They were more important to him than the actual collaborative aspect.
- He further noted that the News-Tab had the least relevance in his opinion.

- His main wish was that a platform like the presented one would help him strongly in the bureaucratic process of establishing a green project.
- The main argument he made was that the website simple didn't offer him too much unique functionality that it would distinguish itself from other online platforms.
- He noted that instead of using a button to initiate participation in a project, the initiator should be able to empty avatars to the website header.
- The platform seemed to be trustworthy and credible to him due to the design.

#### **7.2.4. Expert Review with Dipl.-Ing. Simone Rongitsch on November 13, 2015**

Simone Rongitsch was part of the expert review described in chapter 5.8.1. The design decisions that have been made since the expert review with her suit the projects that she is involved with a lot better than the prototype that was presented to her in the expert reviews. This is why she was invited again to participate in the evaluation of the functional prototype.

- She navigated very quickly through the site and understood the functionality very well. Especially the concept of tasks was very obvious and powerful to her.
- When she created a project she noted that project doesn't necessarily need a location. She explained that projects such as food trucks are not bound to a position and that some initiators might have an idea but don't know where it could be located yet.
- She liked that fact that the platform could host finished projects and unfinished projects. She noted that it was not obvious whether a project is finished or not.
- **Simone elaborated that many projects in the field of urban farming are nested in large-scale building complexes.** These large projects have very specific needs for urban farming. Such projects can have hundreds of surfaces for gardening and need to be organized and distributed. She felt that the platform was good for small independent projects but might not suit the demands for large gardening projects in modern residential areas.
- After viewing the projects, she noted that the platform only offers people to express if they need something. She explained that very

often people or especially organizations want to share something such as a piece of land for urban farming. This aspect was very important to her.

- From Simone's experience many projects are very similar in the field of urban farming. **That's why she noted that the platform should enable projects to connect with each other to share knowledge.**
- She felt that texts on the platform wear a bit misleading. She was not sure whether visitors would immediately grasp the purpose of the site.

### 7.3. FINDINGS

In general, the reviews underlined a previously made insight that the platform **has to sharpen its profile even further**. The platform needs to articulate very explicitly what it aims to do. It should clearly communicate that it aims to **present green projects, serve as an collaborative tool to find people to realize projects and educate initiators and visitors on how to realize a these projects**.

The review showed that initiators of projects **should be guided stronger through the process of initiating a project**. They should get constant support and be able to find information that is necessary to realize a project. This issue has two aspects. One aspect is that **the initiator should be informed about the bureaucratic steps he has to take**. The other aspect should focus on providing **the initiator with help on how to engage people to participate**.

The review also showed that users might potentially be concerned with privacy issues and what kind of commitment they undertake when initiating or joining a project. The platform has to be **highly transparent and always explain what consequences an action might take**.

One tester said during the interviews that platform feels like a *Content-management-tool with a Todo-Plugin* to him. The platform did not have enough unique functionality that would separate it from similar websites.

Giving the platform **the ability to propose, organize or offer physical meet-ups** could make it more transparent for people that are interested in participating in a project but might be worried about what kind of obligations they have to fulfill.

The platform has to be able to make **distinctions between finished and unfinished projects**. Unfinished projects and their tasks need be emphasized in order to get attention.

During the reviews it became more evident that the platform focuses too strongly on initiators that are looking for people and resources. It should also be possible for **people and organizations to serve as providers for land that can be used for urban farming** for example.

One of the biggest insights of the reviews was that **the platform did not take the requirements of large-scale farming projects into account**. The platform focuses too strongly on independent small-scale projects but did not consider that **urban farming initiatives are often organized in large building complexes**. These projects need to be able to organize many small projects and give them the ability to connect with each other and communicate on a higher level. This has large potential because urban planners are often faced with the problem that it is very hard to engage residents to participate in community projects and initiatives.

## 8. SUMMARY & DISCUSSION

This work started with an examination of developments and fields of tension in the area of urban live. Urbanization, the emergence of the sharing economy and the commercialization and privatization of public space served as the main motivation. The goal was to conceptualize an information and communication system that aims to create stronger interaction between people in urban areas, encourage usage of public spaces and therefore strengthen local communities.

This goal was defined very broad on purpose. It was very important that the question did not imply the answer in some way. This enabled the design process to be as open as possible. This work's focus was not on the technical solution but rather on the design process and the continuous development of the concept.

The process started with an intensive literature research. Approaches to solving the problem in question were investigated with a special focus on public spaces and civic projects. The research showed clear developments.

Forms of civic activism such as urban gardening and other initiatives to encourage innovative usage of public space became more popular while at the same time, crowdfunding-platforms enabled individuals and small organizations to finance civic projects without the support of government or corporate investors.

These two factors were the main impulses for the first design prototype. The concept was to create a platform that in the first step enables people to initiate and present ideas for civic projects. In the second step, these ideas could be financed through crowdfunding. After this concept was explored, an initial design prototype was created.

Expert reviews were used to evaluate these prototypes. The goal behind using expert reviews was to present a prototype to a person that is capable of answering questions that have emerged during the design process. A new prototype was then created, based on the insights from the expert review. The design process therefore was an alternating interplay between designing prototypes and reviewing them with experts.

Many conceptual issues emerged during the design process. The insights from the expert reviews made those problems visible and tangible and have led to drastic changes in the design and concept.

It became evident that the platform needed a sharper profile. The concept of civic projects was too intangible and broad for many experts during the reviews. This ambiguity could have led to potential misunderstandings. This is why the platform started focusing on green projects. This category was chosen because they make up the largest group in civic crowdfunding.

The concept was faced with new challenges after this reorientation. This required changes in the functionality and aim which have led to the removal of the crowdfunding component. Crowdfunding simply implied too many problems for the overall process in relation to its benefits. During the expert reviews it became more evident that funding is not the main problem when initiating and realizing green projects. Further it introduced new problems. Only because a project was funded, it was not guaranteed that it could have been realized. Lawmakers and regulators still had the power to shipwreck a project. This problem could have influenced the possible funding performance dramatically.

The platform then focused to help people initiate, present and realize green projects. It tried to do that by giving their ideas a platform for presentation and by giving them tools to find people to collaborate with on their projects.

This concept was implemented as a web-based functional prototype. This prototype served as the basis for the evaluation which consisted of four expert reviews. The goal of the evaluation was to see how the new orientation was perceived and what new insights could have been gathered.

The reviews showed that the final concept was considered to be a lot more understandable and useful than the initial concept. The reviews also gave very valuable insights. It became clear that the platform needed to sharpen its profile even further. The reviewers understood what the site is about but were not able to precisely articulate what its goal was. The platform needs to be very clear about what it aims to do. The reviews further showed that the project initiators need stronger guidance through the bureaucratic processes and also on how to engage people to participate in their projects.

An other important insight was that the platform focused very heavily on small independent projects. This is not necessarily a problem itself. What the review did show was that green projects often are organized in larger structures such as huge housing complexes. A platform that aims to support these type of projects needs to take them stronger into account.



The biggest insights from the project came from the explorative design process. The goal was defined very broad and the result was left open. The impact of this design process became very clear throughout this work. The concept that started out as a crowdfunding platform for civic projects turned into a collaborative platform for initiating and realizing collaborative green projects.

Throughout the project, problems emerged that were not clearly identifiable. The interplay between iterative prototypes and expert reviews helped to identify those problems and make them tangible. The process also showed how important it was to frame the problem correctly and to find the right questions. Very often during the design process, feedback didn't make immediately sense. The reviewers were not able to properly articulate or identify an underlying problem. The risk was that this feedback would have been ignored and deemed to be wrong. The constant iteration helped to reflect upon feedback at different stages of the design process where the problem was framed again. Viewing feedback under a new problem statement helped to make it comprehensible.

In retrospect, this process was very powerful. It helped to support large changes in the design and the concept and enabled a constant reorientation of the approach to solve the problem in question without losing focus.

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