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D1.1 Scenarios and Requirements

Definition Report

Project no. 732546

DECODE

DEcentralised Citizens Owned Data Ecosystem

D1.1 Scenarios and Requirements Definition Report

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This report is currently awaiting approval from the EC and cannot be not considered to be a final version.

Contents

Abbreviations

ABC - Attribute Based Cryptography

IMI - Institut Municipal d'Informatica de l'Ajuntament de Barcelona

GO – Gebiedonline (Neighbourhood Online)

IoT - Internet of Things

MSP – Minimum Successful Product

MVP - Minimum Viable Product

NGO - Non-governmental organization

PCO – Project Coordinator Office

PO - Product Owner

P2P – Peer-to-peer

SME – Small and Medium Enterprise

TO – Technical Office

TW – ThoughtWorks

WP – Work Package

1) Executive Summary

This document summarises the process that was used to compile the user requirements for the DECODE platform. The social requirements were gathered following a lean methodology, including user research with user stories from the identified lead users' communities, the formulation of a main hypothesis and active experiments. The aim is to ensure that the DECODE architecture, requirements, and designs emerge from grounded bottom-up community requirements.

DECODE considers three different use cases: collaborative economy/hospitality, participatory citizen sensing, and open democracy, with a specific focus on how this relates to user communities in two European cities - Amsterdam and Barcelona.

Based on the use cases and through a series of agile inception workshops, the DECODE project has selected four pilots—two in each city—that showcase how DECODE achieves its overarching, ambitious goals, which are empowering the European citizens towards owning their online identity and data sharing in an independent, secure and trusted way. The document also details the process by which the pilots have been selected or accelerated as well as the roles and the involvements of the pilot partners.

Which platform components are necessary to deliver the project and the underlying technical architecture will be determined through understanding the user requirements that emerge from the use cases. This document also explains the evolutionary phases of the technical platform at a high level. Additionally, it describes three prototypes that have been developed to ensure that the DECODE platform is evolving to support the user requirements.

The use cases have been carefully selected to demonstrate the challenges about two different types of data: those belonging to the individual citizens (private) and those that belong to the public, such as that available through sensors (open). Each type of data poses different technical and user-facing challenges, for example the data federation and privacy management that DECODE strives to solve.

The requirements proposed here satisfy the needs of the consortium partners to develop the DECODE platform based on a distributed and privacy-aware architecture, for the decentralised governance of these different types of data and the federated identities.

This document contains data gathered from the initial three agile inception workshops in Barcelona and Amsterdam which took place during May and June 2017. This deliverable will inform the technical WPs (WP3; WP4) and the pilots implementation in T5.1; T5.2.

The DECODE project follows a lean methodology and therefore this document does not contain final specifications but rather a set of blueprints that will feed into the pilot's implementation and the initial round of testing and experiments. Alterations to the requirements will take place following the first round of testing during an ongoing iterative and lean process which will not be complete until the final deployment of the DECODE platform and pilots.

2) Introduction

The DECODE project aims to empower citizens to own and manage their digital data and identity, without needing a central authority. It will achieve this by developing a technology platform based on distributed and privacy-aware architecture for decentralised data governance and federated identities.

The specific objectives of DECODE are:

1. Preventing the concentration of power in the hands of a few platform operators
2. Effectively using an extended range of data coming from people, sensors, devices and the city to enable collective, bottom up decision-making
3. Ensuring that people are in full control of their data and identity, while maintaining privacy and trust in the systems they use
4. Creating space for third parties to implement relevant innovative approaches and applications
5. Preserving the digital sovereignty of citizens and preventing unauthorised use of their personal data on clouds, social networks and the Internet of Things.

In line with these objectives, DECODE has identified three use cases that will guide the development of the DECODE platform. These use cases are collaborative economy/hospitality, participatory citizen sensing and open democracy and they cover the two European cities Amsterdam and Barcelona. Four pilots will be developed that will demonstrate the outcomes and the impact of the DECODE platform.

The following section first describes the lean and agile methodology that the DECODE project team uses to understand the user requirements; this informs how we approach the pilots and develop the platform.

Then the five technical phases are explained that show the evolution of the DECODE platform and the architecture, based on the gathered requirements. Three prototypes were developed to ensure that the DECODE platform is evolving in direction that user requirements indicate. In other words, the prototypes provide a working Minimum Viable Product (MVP) software against which the DECODE platform can be tested.

It is important to note that the prototypes are different from the pilots. The only purpose of the prototypes is to verify the technical approach for the platform and the architecture.

The prototypes are:

1. Air Quality App
2. Marketplace App
3. Petitions App

Section four details the processes that have been used to gather the user requirements which informed the pilots. For this purpose ThoughtWorks (TW) as technical lead for the project, applied a specific process called 'agile inception', which is a key component of the agile methodology.

In the case of Barcelona, the use cases were clear, the pilots were identified, the community was well informed a priori and well coordinated. So the agile inception process could be applied in its full version and resulted in clear outcomes in terms of user experience specifications and technical specifications for both pilots. In other words the agile inception process helped accelerate the pilots in Barcelona. These outcomes, as well as the pilot candidates that were subject to the pilot selection process are explained.

In the case of Amsterdam, the defined use cases did not align with the need to carry out agile inceptions before the summer of 2017. The alternative methodology chosen to identify the use cases (an open challenge with the local communities) required more time than initially planned. Given the different dynamic chosen by the pilot coordinators, ThoughtWorks initially applied a lighter version of the agile inception process in the form of a "discovery session" in Amsterdam, which was tailored towards supporting the local coordination to select the final candidates through the open challenge process. The more mature pilots in Barcelona, the selected pilots in Amsterdam as well as the lightweight discovery session applied in the latter are described in section four.

This document elaborates on each of the pilots, as these are of critical importance to showcase DECODE's capabilities. The four pilots are:

1. iDigital / BCNow Platform
2. IoT Pilot involving #CitizenSense
3. Holiday Rental Register / FairBnB
4. Gebiedonline (Neighbourhood Online)

The document concludes with a discussion of the insights gained and the effectiveness of the user research approach in terms of self assessment.
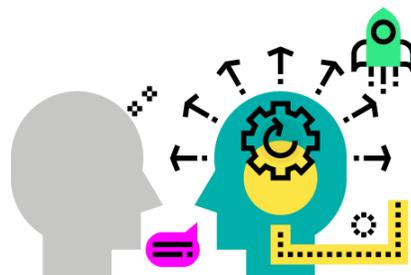
3) The DECODE Pilot Projects

We live in a world where personal data is an increasingly valuable commodity. But many of us worry over our ability to control what personal information is available online. DECODE was conceived in response to those concerns.

The DECODE project explores how we can build a user-centric and privacy aware digital economy; where data is generated and gathered by citizens, Internet of Things technologies and sensor networks. It aims to uncover how that data can be made available—with the necessary privacy protections in place—for the benefit of local communities.

The DECODE pilots provide real world examples that demonstrate how technological architecture, legal framework and smart sharing rules can be used to solve existing problems, while raising awareness of data exploitation, privacy, ownership.

The pilots are intended to show how local residents can be encouraged to participate in these community schemes and to ensure the barriers to entry are sufficiently low to encourage participation. Additionally, they will demonstrate how private data will be shared safely and securely, while the citizens remain in full control. These four pilots were selected in two cities, Barcelona and Amsterdam, which demonstrate DECODE's practical applications and potential benefits.

iDigital / BCNow (Barcelona)

This pilot aims to foster participatory democracy, utilizing an existing digital platform. This platform lets citizens share information about new policy proposals, combining public, open and citizen-generated data. The pilot will augment the resources and tools citizens can use to participate, share, engage and promote initiatives—in a secure, anonymous, reliable and auditable manner.

This project supports the creation of an open, transparent and collaborative city.

The pilot demonstrates DECODE's ability to increase data sharing transparency. It also gives citizens the opportunity to get actively involved in local issues, while remaining in control of how their responses are shared. It engages them through combining data donation, data commons and public data.

Iot Pilot Involving #CitizenSense (Barcelona)

The pilot enables local residents to share data in an effort to combat noise pollution. Typically, local authorities use a mix of compliance officers and field sensors to track noise pollution—but that's not always effective when problems occur outside office hours or away from the sensors. By taking a citizen-led approach, residents are able to collect accurate data on any noise

problems in any location. It helps the council identify problem areas and identify suitable resolutions.

The pilot tackles the technical challenges of collating and storing a stream of citizen-sensed data, while enabling those citizens to control what information is shared.

The pilot builds on a local project, Making Sense, which was established in 2016.

Holiday Rental Register / FairBnB (Amsterdam)

An influx of tourists can put a strain on any local authority—and the emergence of accommodation-sharing platforms, such as Airbnb and Wimdu has exacerbated the problem. This pilot aims to make it easier for local authorities to monitor informal, short-term leases, while enabling accommodation providers to control how their occupancy data is shared.

The pilot involves collaboration with the Amsterdam Municipality and the FairBnB platform, that enables visitors to find accommodation while investing profits in local schemes.

Gebiedonline (Neighbourhood Online) (Amsterdam)

Gebiedonline is a pre-existing digital platform that enables local people, groups and organizations to view events taking place in their neighbourhood, share news, exchange and borrow products and services, and to meet people. This platform has demonstrated its capabilities and been a success with residents in a number of cities and neighbourhoods. Now Amsterdam City Council is keen to spread this to other locations across the city and leverage the platform to increase involvement with policy and decision making.
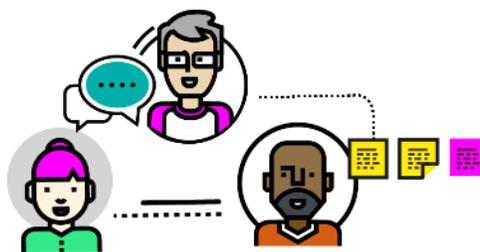
3.1) Pilot Goals & Objectives

The project goals are ambitious in terms of adoption of the four pilot use cases by large numbers of people. Objective 4 of the project is defined as follows: "Validate the platform with use cases providing public value"; and also states "DECODE is testing and evaluating four pilots in Amsterdam and Barcelona following a lean and agile methodology. All use cases will have significant social economic and technological impacts."

The KPIs for user numbers which will deliver those significant results are defined in the proposal section 2.1.1 "Measurable impact of DECODE pilots", table 4 and 5, as follows:

Barcelona:

- Barcelona Now!: 20,000 users
- Organisations using Barcelona Now!: 100+
- Number of citizen proposals: 100
- Number of citizen interactions: 1000+

Amsterdam:

- People reached: 25,000
- Number of participants: 500
- Number of events/lectures/workshops: 15

DECODE scenarios and requirements explained in this document are carefully planned to be able to satisfy these KPIs.

3.2) Pilot Selection Process (Both Cities)

Criteria for selection can be divided into three groups of priorities as follows:

1) Need for the functionality which DECODE provides is the key criterion, and specifically covers the following aspects
   - Giving people ownership of their personal data
   - Decentralised IoT data access
   - Data shared for the public good
   - Appropriate privacy protections

Many potential options were eliminated from the selections because, while they could certainly use DECODE, it would not be central and necessary to them proceeding.

2) Higher level areas are common to the pilots in both cities
   - Highly engaged community groups
   - Potential for long-term impact
   - Innovative idea
   - Ability to achieve the KPIs; at least one pilot in each city to have a wide enough target audience order to reach greater than approximately 20,000 people.

3) Functionality which is specific to an individual city
   - Political issues e.g. housing
   - Geographical issues e.g. noise, air pollution
   - Existing city infrastructure

While the pilot selection process shared some top-level requirements, a very different approach has been taken in each city to match the local communities with appropriate use cases. An

interesting situation has emerged in which, although the three broad use-cases of open democracy, participatory citizen sensing, collaborative economy/hospitality are all covered by the selected pilots, the locations for them have changed. Hence, open democracy and participatory citizen sensing are being realized in Barcelona, while collaborative economy/hospitality is the subject of Amsterdam. This is to ensure the best fit with the location that will give them the opportunity for biggest impact. This is detailed in the section explaining the final pilot selection.

A number of promising use cases could not be taken to the next stage with agile inceptions because of the restriction of having two official pilots in each city. It is envisaged that there will be future opportunities to enable these projects to use the DECODE platform at some later point. For example, projects that have less technical resources available to them would benefit from being involved with DECODE at a later stage, when the DECODE platform and architecture has reached a greater state of maturity.

There will be a programme of co-creation, challenges, hackathons and training which makes up WP5 starting in autumn 2017 and running until the end of the project. This will provide additional support for groups such as these to use DECODE.

3.2.1) Pilot Delivery Schedule and Governance

For the pilots, the consortium is following a structured, iterative approach based on the principles outlined in section 6.1) Lean and Agile Methodology. This approach is taken as it allows multiple opportunities to adapt to changing context in a transparent and timely manner. The schedule is consistent across the pilots, but allows for different specific approaches to be taken at the detailed level. For example, as explained earlier, due to the delays in the Amsterdam pilot, the agile inception process was initially executed in a lightweight version, while in Barcelona it was conducted in its full form. Results of the Amsterdam inception in July will be taken forward in the same way as those from the inception in Barcelona. Findings from both cities will inform the technical architectural decisions, and also the engagement of the user communities in collaborative user-centric design processes. Both pilot locations are subject to the same methodology ensuring consistent and comparable outcomes.

The stages are:

|	
Discovery	A collaborative working group comes together to survey a wide range of options. Output from discovery provides enough information for the partners responsible to make a selection of pilots to go through to delivery
Pilot Selection	Based on a candidate short list and set of criteria, two pilots are selected to proceed to a more detailed 'Inception'
Inception Pilot 1 + 2	Highly collaborative series of workshops exploring user requirements, personas and journeys, alongside technical constraints (Cross Functional Requirements - CFRs) and AS-IS architecture where available. Some exploration of how the DECODE platform will integrate with the AS-IS will be covered, if appropriate although this is not essential at this stage.
Development	The development stage is itself also iterative and will follow a similar process to that described for the platform. There will be three phases, 'Alpha', 'Beta', 'Live'. The goal of 'Alpha' is to develop an MVP product that can be tested with real users but still remains flexible in terms of implementation decisions. 'Beta' sees a maturing of this product and development of supporting features and maturity of operational characteristics to meet the CFRs. 'Beta' will involve live transactions but may be at a reduced scale (for example by invitation only). 'Live' sees the system fully operational with no restrictions in terms of user numbers

and is considered to be an established product where future changes are driven by ongoing user needs.

Table 1: Pilot Delivery Schedule

During the execution of this process, the consortium partners collaborate to provide overall governance, through regular meetings and formally through the meetings of the Project Coordinator Office (PCO) and the Technical Office (TO). IMI as Project Coordinator and ThoughtWorks as Technical Lead, together lead the governance of the process between partners, and are assisted closely by Dyne.org in their role as leaders of Task "T6.2 - Stakeholder engagement and co-creation methodologies"

This governance structure allows the partners to have visibility and respond to changing circumstances. For instance, initial research by Waag Society led to three clear potential options for pilots. The collaborative economy use-case appeared particularly promising, with strong candidates from a commercial peer-to-peer organisation, and community-based FairBnB. The proposal from Amsterdam Municipality was for "Stadspas", a discount card for certain groups of citizens to access leisure and cultural activities.

Discussions proceeded with Waag Society and each of these organisations up to April 2017. A discovery day was carried out on 20th April 2017 to discuss progress. The objective was to firm up selection of 2 candidate pilots and plan dates for their inceptions. In attendance were representatives from TW and Dyne. Outcomes were reported back to the consortium partners at the next project co-ordination meeting.
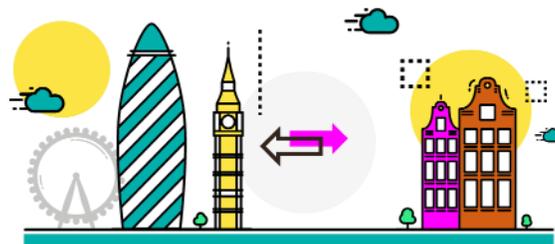
During the discovery day, it emerged that discussions with the commercial organisation had not progressed as hoped, and there might be impediments to its choice as a pilot. In particular, timescales did not align with the need to carry out an agile inception before summer 2017. Moreover, concerns were expressed over the ability of a commercial organisation to commit to a project which had a defined timescale, but no clear plan after the end of the pilot trials in month 36. Research into the FairBnB community had proved its appeal to a wide user audience but raised questions over whether it had enough resources at that time, particularly technical development resource, to support a pilot over the length of the duration of the DECODE project.

This specific concern was also raised during previous interviews, between IMI and the FairBnB team, at the Discovery stage in Barcelona. Discussions with Amsterdam Municipality had progressed more slowly than originally anticipated, and it was understood that the timescales for this may not be a good fit with that timescales for DECODE.

A proposal was put forward by Waag Society to increase community engagement, which involved running a challenge competition to invite other community groups to propose pilot projects. It was understood that this could potentially compromise the timescales for choosing pilots and defining their shape with agile inceptions. However, all the partners involved agreed that a focus from all parties was needed to ensure that this happened before the end of June 2017.

The status as of the production of this report (June 2017) for each pilot city is as follows:

Amsterdam Timeline

Barcelona Timeline

The inceptions for Amsterdam are currently scheduled immediately after the publication of this deliverable (10-15th July), which will put both pilot cities in a position to move to the development phase. As noted, the development phase itself is iterative, leading towards timeframe in the proposal of pilot launch in spring 2018.

3.3) Pilot Selection Outcomes

At the end of the selection process, the following were identified as pilots:

- BCNow / iDigital
- Making Sense / Citizen Sensing
- Holiday Rental Register
- GebiedOnline (Neighbourhood Online)

4) Barcelona Pilots

The process of selecting two pilot projects for Barcelona took place in April and May 2017.

IMI compiled an initial shortlist based on a number of suggestions put forward by the consortium partners, and an additional one from Decidim, which is an organisation that is promoted by Barcelona City Council. It is a platform which aims to promote citizen participation and direct, deliberative and participatory democracy in the city through the different processes, spaces and participation bodies, generating forms of direct and open interaction between the City Council, citizens and different Social agents of the city. Decidim.barcelona is aimed at promoting citizen deliberation and debate, transparency and traceability of participation (in no case to trace the users), and the generation of space for face-to-face and digital participation."

It is managed by the Directorate of Research, Development and Innovation of Rights of Citizenship, Participation and Transparency under the direction of the Commissioner of Citizen Participation and the Department of Participation and Districts of Barcelona City Council, with the collaboration of the Municipal Institute of Information Technology and of the Direction of Communication of the same City council.

The suggested community organisations were asked to complete a submission document, or 'Internal Discovery Document', with key information which would determine their suitability as pilots for DECODE. This was then used as the basis for the next stage of discussions, and also for finalising the criteria by which the pilot proposals would be rated.

IMI drew up a comprehensive list of selection criteria. Each pilot option was carefully weighed against those criteria, balancing the need to ensure large number of users to ensure impact in line with KPIs, with the innovation potential and community maturity. A number of really interesting ideas were presented that could take shape over the course of the project. The chief consideration was how the communities might support the substantial numbers of users needed to achieve the KPIs described above.

A series of meetings were held in early April 2017 in Barcelona between IMI, TW and the other partners involved—UOC (Dimmons Research Group), Eurecat and also Decidim. These enabled in-depth discussions to take place about the benefits and potential pitfalls of the pilot ideas.

Final decision was made by IMI in their role as leaders for T5.2, in late May 2017 and in consensus with all consortium partners after bilateral meetings.

4.1) Pilot Selection Process

Below is the set of questions put together by IMI to assess the suitability of proposed pilot options. Each group completed this assessment, and a comparison between projects was made to facilitate the decisions. These were submitted to IMI by the end of March 2017.

- **Context**: Recent developments and public awareness. Related recent developments.
- **Overall description and problem to be solved**. What are we trying to solve?
- **Aim**: Specific overall objective of pilot. Why should we do it?
- **General proposal**: High level proposal on what the pilot should do. How will we do it?
- **Technical description**: Detailed description of pilot
  - Technical specifications & requirements: Will it need hardware? Only an app?
  - Calendar
  - Identification of tasks for an MVP (and a MSP: minimal successful project)
- **Community**: List of interesting possible users for the pilot and list of opposing parties also considering incentives.
  - **Personas**: Who do we imagine using the platform?
    - Persona 1: End-user
    - Persona 2: Developer keen to work on top of DECODE
    - Persona 3: Potential stakeholder interested in leveraging DECODE architecture
    - Additional related personas
  - **Optional - User journeys**: Which critical steps to UX (user experience)?
  - **Scalability**: How to get more people/communities involved once the pilot is going on?
  - Level of technical knowledge/resources of targeted groups
- **Challenges + SWOT analysis**
  - **Incentives**: Economical and societal incentives for different actors
    - Public administrations
    - Companies / businesses
    - Commons economy (third sector)
    - Citizen organized groups, NGO's, activists
    - Citizens

4.2) Candidate Pilots

Pilots were proposed by consortium partners IMI, Eurecat and UOC (Dimmons Research Group) as follows:

Proposals from IMI

There were options under all three of the broad use cases: collaborative economy, citizen sensing and open democracy participation.

The Collaborative Economy

Barcelona has traditionally been a hotspot for third sector economic alternatives. Calls for pilot submissions in the collaborative economy covered four different areas. This category includes all cooperative initiatives aiming to place people in the centre of business/consumption activity, rather than capital.

Hence, the expectation from the candidates in this category was to achieve impact. It had to solve an existing problem/need detected by an organized group of users, which is related to data of consumption yet that is not restricted to a very specific set of needs (it should target around 20k potential users).

Candidates would be considered as high potentials if they built a common infrastructure for federated data handling of consumption related data, which would allow to: a) monitor consumption patterns of users, b) access on demand (with agreement of users) the data for better planning, studies of social/economical impact, c) generate an ecosystem where initiatives for better "consumption" habits could be developed. The use of this infrastructure would require the development of ad-hoc final, end-user APPS for each service. In the following some examples are provided.

Energy: In Spain, there is a structural problem hindering the adoption of self-generation solutions (that could cost around 4k euros per house and assume around 80% of the energy consumption) and a legal one.

The structural problem is related to the owner of the distribution channels of the "last mile", which are an oligopoly of companies that own both the structure and the energy meters. From a data point of view, this means that they are the only ones with centralized knowledge of consumption/generation patterns for each housing units, and bill accordingly in a highly non-transparent process.

DECODE's vision is to solve this problem by provide a simple, decentralized structure to monitor real energy consumption of citizens (discounting loss generated in distribution), that could be matched against company billing to detect fraud and also to provide datasets and metric control of citizens with regards to energy consumption.

.At the same time, it is worth noting that the Barcelona City Council wants to launch its own energy generation service, and it could run on a DECODE decentralized structure in the future for billing and information acquisition.

Technically, the task expected from the selected pilot would be to develop a version of the DECODE NODE + App running on DECODE OS for mobile phone/webapp that would monitor energy consumption and provide real time analytics to users. Also, it would provide them the option to share the data.

Telecommunications: The key infrastructures of the Spanish state were privatized in a monopolistic regime throughout the 90's. Similar to the energy problem, this means that the infrastructure of telecommunications was split in groups and sold to major companies, which formed a kind of oligopoly, that bases its power on the control of the infrastructure.

Since then, the market has been "liberalized", but very few big players have entered it. This results in a variety of problems for citizens, the most obvious of which is that Internet services in Spain are among the most expensive in Europe. The control exerted by big companies is extremely important. The fact that companies own the infrastructure, puts them also in a privileged position with regards to business related with Data. Each time a call is made/data transaction, these companies have access to sensitive locations of the users, that can be sold later for geomarketing or other usages to third parties.

The task for the selected pilot would be to monitor real user consumption on the one hand for the general user, as well as exactly determine the share of usage by communities of users, to ensure a fair distribution of costs. This could foster local connection points of internet in common houses, that could later be developed into fully functional nodes of a confederated structure.

Technically, two realizations were equally considerable:.

a) phone/mobile focused, such that an app running on DECODE OS that tracks DATA and calls of user as well as internal phone metrics. It stores the metrics in an internal database and uploads them to a DECODE NODE (virtual or physical at home) that encrypts them and uploads them to the DATA COMMUNICATION COMMONS when Wi-Fi connection is available.

b) similar to the energy pilot: The idea is to develop a version of the DECODE NODE + App running on DECODE OS for mobile phone/webapp that would monitor home telco consumption and provide real time analytics to users.

Consumption: There is more and more interest among citizens to pool together to enhance green alternatives to traditional consumption of goods. Concerning the food industry, and specifically the sector of "ecological" and proximity food, there are multiple informal initiatives organized around Barcelona in the form of cooperatives of consumption, as per 2014, in Barcelona there were more than 150 such cooperatives.

These groups however, for a variety of reasons (technological, resources and even philosophical), lack a common centralized technology pool. Each one is self-organized and uses their own

protocols to organize each of the members (from fixed products per week to online forms that allow to chose weekly the contents of each order).

The aim of the pilot here was to provide these groups with a common, distributed register and ontology where the provenance of each good is certified along the supply chain. This use case of blockchain technology could be extended to other types of fair products such as fashion and electronics.

On a second stage, the project could be used as platform for the circulation of "fair coins" via cryptocurrencies (see CIC ECO coin and most specially the FairCoin which is based on blockchain, see white paper).

Technically, the task was to create a centralized, public register with a defined ontology that records producers, consumers, transactions and all the steps along the supply chain that a product travels from producer to consumer. Hence, each time a good is produced and shipped to consumers (e.g. basket of potatoes) a "virtual hash" of the object would be created. Then, any subsequent transaction involving the object would be recorded in the chain. Finally, when the consumer receives the good, the smart contract is executed and a transaction of cryptocurrency (that might be a social coin, which is in use by many of these groups) would be performed among peers. So, the objective was threefold: ensure "fair" provenance of goods, quantify the extent of consumption of these goods and simplify the supply chain to avoid as many intermediates as possible (via smart contracts), thus enabling large scale adoption of these consumption patterns.

Housing: Currently many European cities are suffering an extreme shortage of affordable housing. This is due to many aspects, but in touristic poles of attraction such as Barcelona or Amsterdam, the rise of platforms that scale short time house-renting are draining the offer of long-term rents in the city and driving the prices up. Facing this threat, local authorities have few instruments to use due to several factors: a) lack of information on the extent of the problem (majority of these rentals are non-registered and thus illegal, yet finding them becomes a daunting task by city council without access to data pools of the big players), b) asymmetry of power and information. Proprietary platforms such as AirBnb are transnational companies and harness a lot of political influence and economical power. Without their cooperation, and only via coercion/regulation, few steps can be taken to address the problem.

The solution for the problem to affordable housing and to the influence of short rental is a complex mix of regulatory practice, market actions and information retrieval. Hence, the vision of DECODE is to help in lower the entry costs of other actors in the business of scalable renting, with more "people centred" views rather than "business centred", then incentives would be laid for all the parts to negotiate and find common solutions to the problem.

The City Council of Barcelona has seen the City Council Habitage as the main entity who could benefit from a pilot in this areas, therefore has left it open to discussion with the partners whether to consider a pilot in this category.

Open Democracy

The objective of the iDigital / BCNow "Data Triumvirate" as candidate pilot was to encourage participatory democracy by leveraging on an existing digital platform offered by the Barcelona City Council, and is named Decidim. This platform lets citizens share information about new policy proposals, combining public, open and citizen-generated data. The iDigital / BCNow pilot envisioned to join forces with DECODE to increase data sharing transparency, thereby giving citizens the opportunity to get actively involved in local issues, while remaining in control of how their responses are shared.

The technical objective defined for the pilot was to build a framework that combines existing Barcelona City Council infrastructure with the DECODE platform to generate an environment that allows citizen to participate in a data-informed decision process on city issues via the Decidim platform. DECODE pilot was to provide the following capabilities: a) safe and secure access to the DECIDIM platform, b) rules for data sharing / data "donation" by citizens, c) public registry of projects involving private data, d) public registry of products/research and results that make use of citizens' data at any stage

Participatory Citizen Sensing / IoT

Making Sense, was the candidate pilot in this category with an objective to enable local residents to share data in an effort to combat noise pollution. It is a local project that was established in 2016, which has been co-funded by the European Commission within the Call H2020 ICT2015 Research and Innovation Action under the grant agreement number 688620.

To track noise pollution, typically, local authorities use a mix of compliance officers and field sensors—but that's not always effective when problems occur outside office hours or away from the sensors. By taking a citizen-led approach, resident are able to collect accurate data any noise problems in any location. It helps the Barcelona City Council identify problem areas and identify suitable resolutions.

Technically, the elected pilot in this category would be expected show a proof of concept on how a decentralized data storage and access rights ledger with dynamic permissions (in the sense that citizens can revoke access) could be used to support distributed sensing approaches. This includes the data sharing part, but also the decentralized (or at least hashed) data storage solutions of highly non-scalable IoT sensing data streams. The infrastructure should entail a component for storing distributed, high throughput data, and another ledger to store a register of the data in the platform (and its access).

Proposal by Eurecat

Dashboard

The candidate pilot had the objective to create an open ecosystem in which data from different sources could be combined, processed and visualized to improve public awareness. Specific use cases were to be developed to provide citizens with easy visual interfaces to explore data about specific city relevant issues. In the end, this combined with Decidim open democracy pilot, became "iDigital / BCNow".

Proposals by UOC (Dimmons Research Group)

Collaborative Economy

UOC (Dimmons Research Group) have undertaken extensive research into the collaborative economy, and therefore proposed six different potential applications of this use-case with community groups in the following areas:

- Housing
- Local Business
- FemProcomuns
- Sustainable Mobility / Clean Air
- The Good Data (Internet Data)
- Citizen Sensing

The following selection matrix criteria was used by IMI to help assess pilots:

	Helpful	Harmful
Internal	**Strengths** • Based on existing technology • Partners are experts in their domains • Build on previous experience (D-Cent) Project and consortium • Knowledge of local groups to start a seed of "early adopters"	**Weaknesses** • Lack of alignment in agendas of partners • Lack of technical knowledge in pilot design

External	Opportunities	Threats
	• Growing concerns on data privacy owned by large corporations • Large spending of public administrations on opaque services • Lack of accountability of public data decision making • Barcelona City Council Commitment	• Lack of adoption by end-users, because no problem perceived or poor user experience • Lack of adoption by developers (complicated development of apps) • Lack of incentives to maintain decentralized structure • Frontal opposition of big companies (but this is second stage, it means project is successful)

Table 2: Selection Matrix for Pilot Candidates

4.3) Pilot Selection Results

The choices made by IMI for ranking the projects were based on: Partner preference, problem to be addressed, feasibility (technological and societal) and impact.

4.3.1) Pilot 1: iDigital and BCNow

This proved to be the one most aligned with the Barcelona City Council needs and partner needs. Also the one with the highest potential for success with promising involvement of the larger part of users. It could start immediately with a suitable agile approach, and could leverage on the Decidim platform. As a result, iDigital / BCNow was selected as the first pilot for Barcelona. The next subsection details the pilot.

4.3.1.1) Initial Pilot Assessment

Overall Description and Problem to be Solved

The pilot aims to solve existing Decidim needs regarding safe identification for users while being sensitive about sharing private user data to extract valuable information about city concerns that might later be used to propose data-driven policies in the city. Finally, the project can be used to fuel and accelerate the pace at which the Municipality is opening its data infrastructure to public use.

Technical Description

The objective of the pilot is to build a framework that combines existing Barcelona City Council infrastructure with the DECODE platform to generate an environment that allows citizens to participate in a data-informed decision process on city issues via the Decidim platform. The pilot involves the creation of a space where citizens, researchers and SME's can share data-based insights in a transparent way to propose new policies to be decided by the community. They will do so by combining public data sources, open data and private data coming from citizen usage of the Decidim platform via their informed consent.

The DECODE pilot will provide the following capabilities:

- Safe and secure access to the Decidim platform
- Rules for data sharing / data "donation" by citizens
- Public registry of projects involving private data
- Public registry of products / research and results that make use of citizens' data at any stage

The pilot should be an example of how the data commons can be used to generate synergies and data-informed proposals that benefit all the involved actors.

Requirements

For this project, many of the needed pieces already exist, except for the DECODE infrastructure itself and the "Barcelona Data-Research Portal". Data sharing rules, and the connections among the different involved infrastructures will also be developed.

Task for MVP

The minimum viable product (MVP) for the project consists of:

- Security module for Decidim platform user identification
- Minimal App for users to decide data sharing rights and who has accessed their data

- Minimal visualization of Decidim data and knowledge extraction to show to users that "donated" their data

Partner description

Three main partners are envisaged: The team behind the Decidim platform, Barcelona City Council and Eurecat.

Community

The targeted community is all the users of the Decidim platform, as well as any research institution interested in urban matters (like Eurecat, UB), data journalists, data service related industries and developers (Data Beers BCN, BCN Analytics Hub) and app developers and hackers willing to use the Metadecidim data and DECODE platform to develop new services. Also citizens willing to learn / use data analysis techniques and share them on the community website.

Challenges and SWOT analysis

General SWOT aspects are shown in Table 1 on page 19. Below, we list examples of specific challenges that can be expected:

- **Public awareness**: Citizens might not understand the need for their data to be secure and safe, and it the process of registering is too complicated, they might lose interest.
- **Timescales**: The project is ambitious (it could be extended to other private and sensitive data streams, not only Decidim) yet the last part involving tangible results might not reach the citizens in a feasible time, making them lose interest or not perceive the use of the infrastructure.
- **Digital literacy**: The pilot needs an engaged community around the data analysis site with a certain degree of digital and scientific literacy to understand/contribute to the visualizations and data analysis performed.

One of the strengths of the pilot is that is shows how sensitive personal data can be used for the public good, shaping the form of the "data commons". Also, the full system could be extended to other cities (as it will be fully open source) and extended to private companies' use of personal data or other municipal services. Also, since the project does not involve hardware, it is highly scalable and can potentially reach a very large audience. Finally, it will not be complex to engage a community around the data analysis website, since Barcelona hosts a quite large community on the research, business and activist data domains.

4.3.1.2) Pilot Inception Report

Introduction

Decidim is an online platform which enables participatory democracy with the aim of building an open, transparent and collaborative city.

Key enabling factors:

- **Transparency in data storage and user entitlements**: Enable users to control where their data is stored, choose what identifying information is shared and the granularity of access levels for that information.
- **Auditable petition signing process**: As a provider for enabling citizens to make collaborative decisions, there should be a way to audit and verify transactions in the system in a reliable manner.

Requirement Specification

"As a user I want to sign a petition in a secure, transparent and auditable process, and control the granularity of access to personal information I share with my petition."

Inception

A three-and-a-half day pilot inception was conducted in Barcelona on May 2–5, 2017, to create a shared understanding between the DECODE partners and community stakeholders. The inception aimed to explore the user and technical requirements for the Decidim and Dashboard pilot.

DECODE partners and community stakeholders in attendance were:

- IMI
- Eurecat
- TW
- Decidim
- UOC (IN3 Research Group)

The inception consisted of a number of workshops, each of which explored a different aspect of the project. Following an outside-in, user-led approach, the first day and a half of the inception focused on understanding the users and user requirements. The third day was split into two tracks: user research and technical workshops. The final day focused on feeding back what we had learned, and project management.
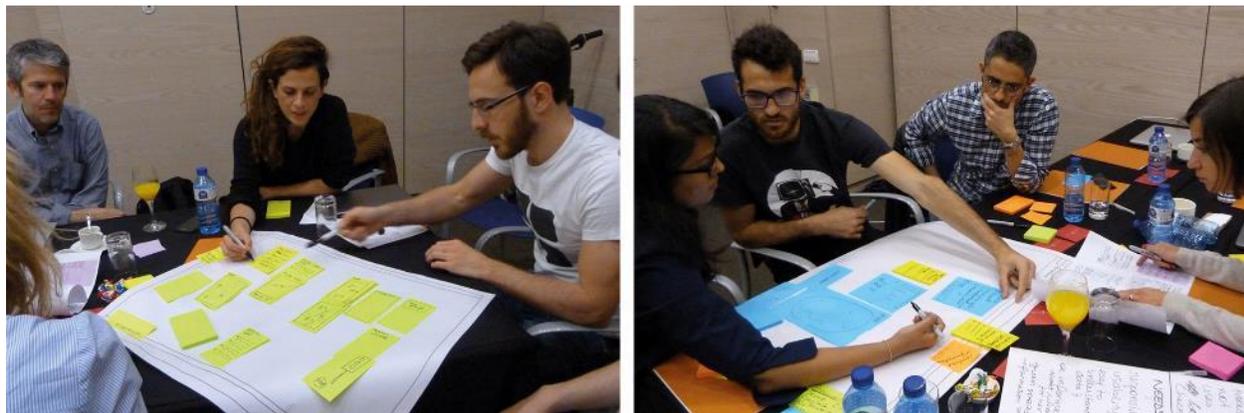
Workshops

Below is a table of the workshops that comprised the inception. Outside of the workshops, user research was also conducted with the community.

The presentation slide deck containing more details about this inception is available from consortium partner ThoughtWorks.

Workshop	Objective
Proto-Personas	To define user types and motivations. Personas are used throughout the inception to help focus on the end user.
Empathy Maps	To increase understanding and empathy with the end user, an empathy mapping session invites the participants to consider what a user sees, hears, thinks and feels, says and does in a particular scenario.
Elevator Pitch	To build a shared understanding of the problem domain for all participants and to isolate key elements of the vision and objectives.
Customer Journey Mapping	To develop an initial understanding of what the high-level user journey might look like, including a review of the current as-is journey.
Pilot Requirements	To brainstorm and output general high-level pilot requirements.
Trade-Off Sliders	To provide a framework for making trade-off decisions in alignment with stakeholder priorities and to prioritize their needs and requirements in relation to the pilot's.
As-Is Technical Context Mapping	To build a high-level understanding of the current technical architecture of the Decidim platform.
To-Be Technical Context Mapping	To ideate on potential integration points between the as-is technical architecture and the DECODE platform.

RAIDs	To capture things to 'watch out for' when transitioning into delivery, including risks, assumptions, issues and dependencies.
Engines and Anchors	To understand opportunities that will drive the project forward (engines) and to understand possible risks or issues that could hold the project back (anchors).

Table 3: Inception Workshops

Inception Workshops

Proto-Personas and Empathy Maps

The proto-personas were created with Decidim and members of the DECODE team. The personas were used throughout the inception to focus discussions around the end users.

Two proto-personas were created. "Joanna", a user of Decidim, and "Carme", a user of the Dashboard. An empathy mapping session was then completed for each.

The proto-personas are part of the preliminary work on approaching the project with the end-user in mind, and will be updated and validated with research as the project progresses.

JOANNA - PROTO PERSONA

BEHAVIOURS

Doesn't want to be an activist, but wants to be participate
Cares about neighbourhood but doesn't get involved
Exercises regularly (Active)
Uses public transport
Not a geek, unfamiliar with platform
Doesn't get involved because she feels excluded / unwelcome
Doesn't know about platform/it's impact so doesn't use it
Doesn't see the feedback on the Decidim platform
Hasn't thought about privacy too much
Busy. Wants to participate but not fully commit time

DEMOGRAPHICS

30 - 45 years old
Devices: Desktop/Laptop (Primary), Mobile
Lives in Gracia, Barcelona
Has a university degree
Doesn't have kids (yet), lives with partner
Income: €1000 - €2000
Has a FB account

GOALS, NEEDS, PAIN POINTS

Goal: Understand outcome of the interaction with platform
Want: Have an impact on the community decisions
Need: Understand how to use public services 'CAU'
Pain Points: Rising house prices
        'touristic' AirBnB apt near her home
        rising prices of commodities
        air quality

"Joanna" – Decidim User

CARME, PROTO PERSONA

BEHAVIOURS

Engaged with local community
Works a lot
Driver
Takes care of kids
Not a heavy tech user
Uses phones and tablets
Files complaints
Checks data

DEMOGRAPHICS

40 years old
Middle class
Public sector
Lives in Poblenou, Barcelona
2 kids (4 and 1)

GOALS, NEEDS, PAIN POINTS

Needs - responsive, usability/easy to understand data, to be informed about things relevant to her, green spaces, information on schools
Goals: convenience, efficiency, being heard, be updated, share data with neighbours
Pain Points: - time, parking, traffic, air quality

"Carme" – Dashboard User

Empathy Mapping for "Carme" and "Joanna"

Elevator Pitches

An Elevator Pitch session was conducted for both Decidim and the Dashboard.

Customer Journey Mapping

The customer journey mapping session, illustrated below, allowed the group to consider and discuss different aspects of the new customer journey and how it might look. These sessions were the first step towards identifying the to-be customer journey for the pilot.
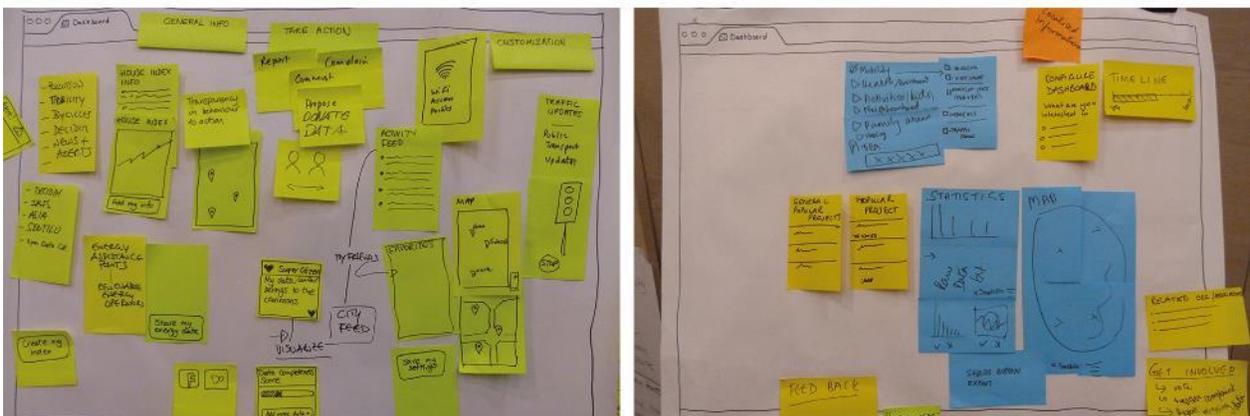
User Research and Interviews

During the inception, the team attended a Decidim meetup to observe the community. Four user interviews were conducted in Poblenou, Barcelona and involved speaking with people on the street. These interviews were conducted in Spanish. Poblenou was selected as this was the assumed home of "Carme", one of the proto-personas. The questions focussed on the following themes:

- Demographics (estimated by the note taker rather than asked directly)
- Internet usage habits
- Interest in local issues
- Attitudes
- Knowledge of Decidim

The full list of questions can be found in Appendix Section 1 – User Research Questions.

Since the inception, an online questionnaire has been created to explore peoples behaviours and attitudes to data privacy and sharing. In addition to the above mentioned themes, it contains the following:

- Attitudes to data sharing
- Attitudes to voting

The full list of questions can be found in Appendix Section 1 – User Research Questions.

This research will help us to start validating the proto-personas.

Pilot Requirements

Decidim

"As a user, I want to sign a petition in a secure, transparent and auditable process, and control the granularity of access to personal information I share with my petition."
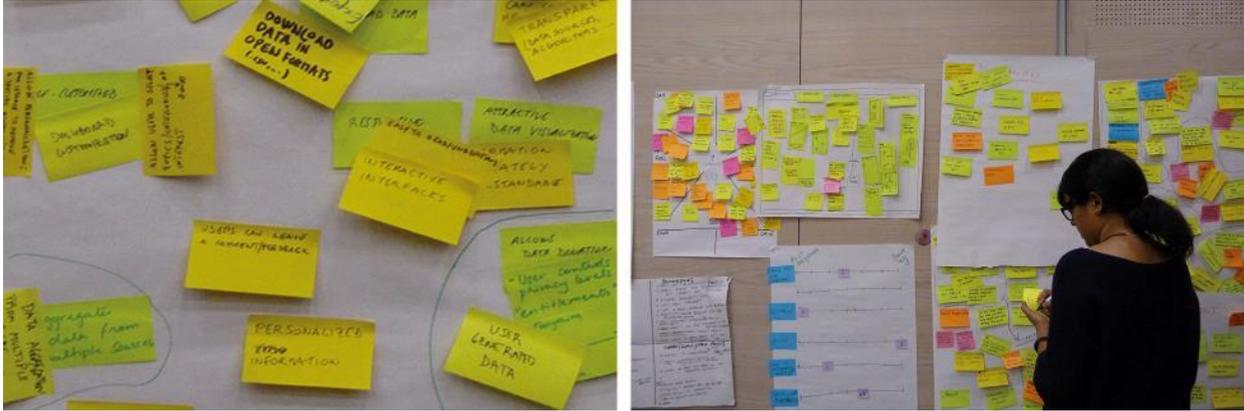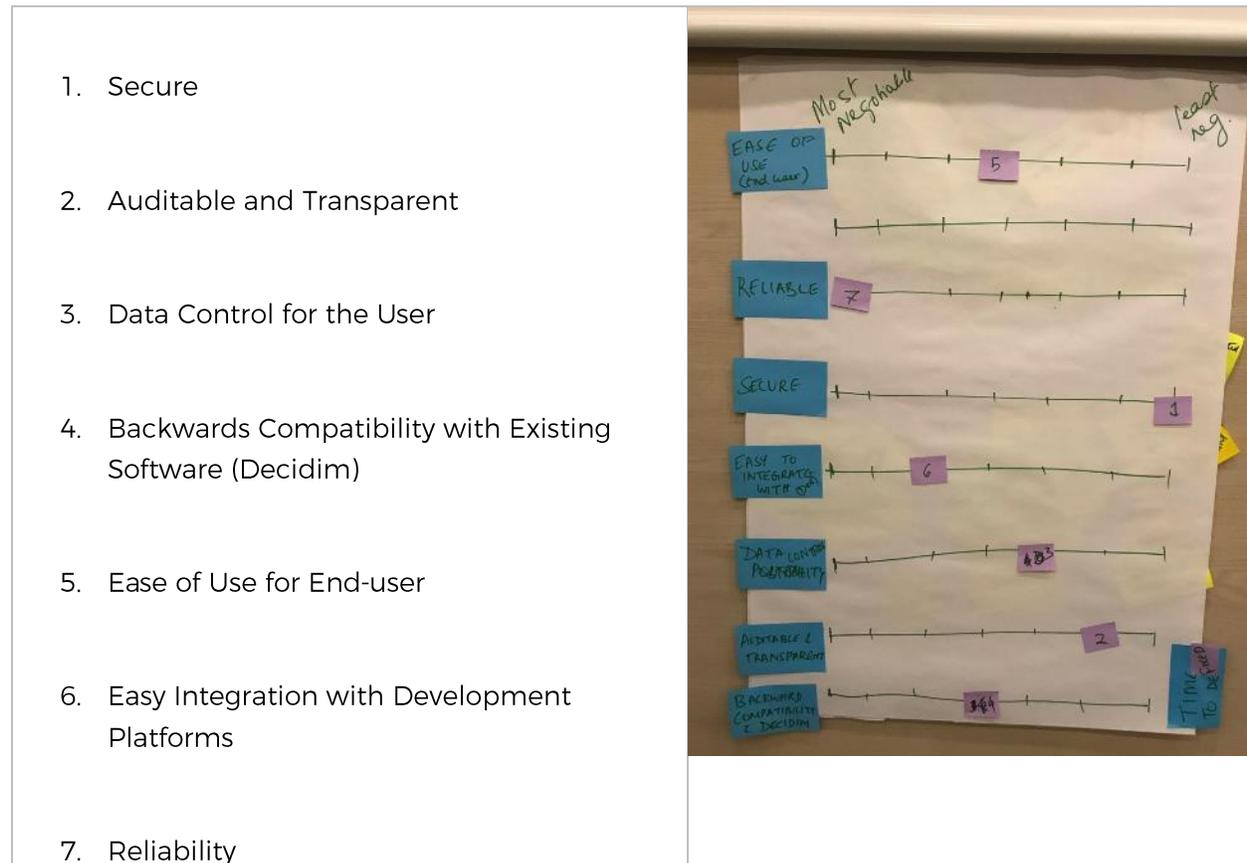
Secure Petitions Technical Workshop

Dashboard

"As a user, I want to view a dashboard of citizen-generated data."

In this context citizen-generated data refers to the following:

- Personal data that belongs to the individual citizens such as age, gender, political opinion.
- Data that belongs to the public such as the one available through the Barcelona Open Data Portal such as local community topic
- Data of the commons i.e. data that is donated to the public by individual citizens for example healthcare data.

Trade-off Sliders

1. Secure

2. Auditable and Transparent

3. Data Control for the User

4. Backwards Compatibility with Existing Software (Decidim)

5. Ease of Use for End-user

6. Easy Integration with Development Platforms

7. Reliability

Technical Context Mapping

The technical analysis, including 'as-is' context mapping can be found in the Appendix – Section 4. Discussion about "to-be" architecture also took place, and the outcomes have been fed into discussions about the technical architecture at the regular Technical Coordination meetings.

RAIDs

The RAID session generated a list of all identified Risks, Assumptions, Issues and Dependencies. The output has since been collated into a working RAID Log for the pilot.

Engines and Anchors

The output of the Engines and Anchors session identified areas that could either help propel the project forward, or slow the progress of the project.

4.3.2) Pilot 2: IoT Pilot Involving #CitizenSense

We have identified an active community, and can integrate with other European projects with a high potential to achieve and could enable citizen direct participation. Although small, it is manageable and not excessively complex, which makes it an ideal project candidate.

4.3.2.1) Initial Pilot Assessment

Context

The development of readily available sensor technology and the democratization of access to smartphones are transforming the way we, as citizens, use data in a variety of circumstances. Some might be related to business, but other uses can be found for this data. Recently, numerous initiatives have emerged that leverage large-scale sensing of data for research— typically, these are grouped under the umbrella of CitizenScience.

These projects may use on-board sensors from smartphones (or IoT sensors also), and look for citizens' help for research purposes, while maintaining fair use of the data. The problem with these projects, though, is that often they are backed by very limited budgets, that in the end do not allow for the democratic—and safe—use of potentially highly intrusive data.

Also, these projects are targeted at groups of citizens motivated by science. Since these groups tend to be hard to find, it is interesting for such projects to pool together and share potential user bases that, although scarce, are highly likely to engage in more than one project.

In Barcelona, some of these initiatives were pooled under the "Oficina de Ciència ciutadana". This initiative, however, lacks a common base of data sharing practices—one that respect the choices of the users. DECODE could provide these initiatives (and further ones) with a platform for the data handling side of the projects, establishing a real data commons pool of data for scientific research.

There is already work in progress to publish all the datasets concerning the Citizen Science office, via the Open Data Barcelona portal, so this could be an opportunity to connect DECODE to the Open Data infrastructure.
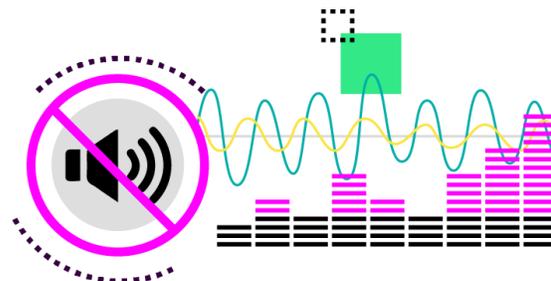
Aim

The pilot would be a proof of concept for how a decentralized data storage and access rights ledger, with dynamic permissions (in the sense that citizens can revoke access), could be used to support distributed sensing projects. This includes the data sharing part, but also the decentralized (or at least hashed) data storage solutions of highly non-scalable IoT sensing data streams.

General Proposal

Deploy a blockchain-based, distributed infrastructure, based on certified nodes that allow for the sharing of IoT citizen-sensed and contributed data, for research purposes. This infrastructure should have two building blocks: one for storing distributed, high throughput data; and another ledger to store a register of the data in the platform (and its access).

Overall Description & Problem to be Solved

Data from citizen science projects (and scientific projects in general) should be public, but it is hard to find, manage and access. What is more, the data producers (citizens), are often unaware of the usages of their contributed data, and are even unaware of the results of their contribution (for instance a scientific paper). The aim here is to build a decentralized data storage and data access ledger that would allow to:

- Cut data maintenance costs of individual projects
- Store data access and regulate its use, allowing users to revoke access rights at any point in time
- Register outcomes related to data provided by any device/user
- Register user "donors" to pool them for other data science services
- Register research projects for potential donors to find

Technical Description

The pilot will offer a platform for individual users to share their data in a "liquid" way, with the option to know who has accessed their data, when and for what purpose, and to revoke rights of access via smart contracts. In particular, the platform should interact with the apps developed for the #SmartCitizenKit and store the data and the data permissions in a secure and transparent way. The developed platform would not be specific to the pilot, but should have a well documented API and serve as example for future CitizenScience projects.

Requirements

- DECODE Hubs to store the data access permissions, that should be connected to the infrastructure where the actual IoT data is stored.
- DECODE Node running on DECODE OS that would mediate access of specific CitizenScience project to the DECODE Hubs.

- Web interface for data visualization of data access and results from crowd-sensing as well as publication of related research and media attention and community building.

Task for MVP

To have a minimal viable product that would ensure success of the project we would need at least:

- Infrastructure ready to regulate data access via smartcontracts
- Integration of a project (#SmartCitizen) app into the infrastructure
- Minimal community of users using the integrated app

Partner Description

A clear partner here would be research groups involved in the citizen science office of Barcelona. A candidate should be chosen for a project which has not started and potentially reaches enough people. Alternative, adaptation to current active initiatives such as smartcitizenkit could be envisaged. After contacts with the Making Sense project, they have a community of over 50 users that have started a IoT project based on Noise Pollution in "Plaça del Sol", in Gràcia. This is one of the oldest neighbourhoods in Barcelona, located fifteen minutes walk from the city centre. They are interested in the solution we could develop, and the project is due to end in October 2017, so even if the calendar is tight, a collaboration could be envisaged here.

Community

The targeted community would be all citizens already involved with crowd-sensing projects and their respective projects. These can be found via the Citizen Science Office and the Making Sense Community in Barcelona but also through contacts in the Citizen Science Association (a worldwide organisation).

Challenges and SWOT Analysis

In this case, several problems are to be solved on both the technological and partner aspects of the project.

- **Technological**: It is unclear how to manage and query a distributed database that holds large scale data such as IoT sensing data in a decentralized way, which would require large flows of data (and large flows of writing to the block).
- **Incentives**: Adapt existing APPS for usage in this platforms has an associated cost. Typically, #citsci run on small budget, hence there would be large resistance to adapt to a new infrastructure. Also, current (large) projects in Barcelona rely on sponsors that leverage the data being generated by the users, so they might be reluctant to share it.
- **Reach**: #Citsci projects typically engage a discrete number of participants (~10/100), so the impact for the project selected for the pilot would be small.
- **Technological**: All the requirements of this use case could be made without going through blockchain technology, except for the permission handling.

4.3.2.2) Pilot Inception Report

Introduction

Following on from the "Making Sense" EU project, the IoT sensing pilot tackles issues of real concern for the residents of Barcelona. In particular, a number of residents of Gràcia have been using sensor devices to monitor intrusive noise levels in their homes.
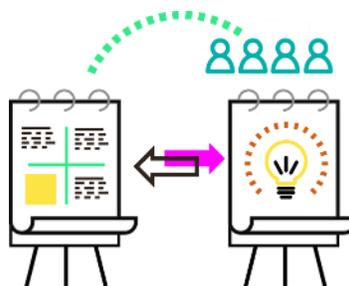
Inception

A three-day pilot inception was conducted in Barcelona between June 14–16, 2017, to create a shared understanding between the DECODE partners and community stakeholders. The aim of the inception was to start exploring the user and technical requirements for the Making Sense pilot.

DECODE partners and community stakeholders in attendance:

- IMI
- Eurecat
- UOC (Dimmons Research Group)
- Thingful
- TW
- Making Sense
- Dyne

The inception consisted of a number of workshops, each of which explored a different aspect of the project. Following an outside-in user led approach, the first day of the inception was dedicated to understanding the Making Sense users and their requirements. The second day was focused on understanding the potential technical requirements necessary to meet the user needs. The final day of the inception focused on project management, such as risk assessments and ideations on improving collaboration between DECODE and the pilots.

Inception Workshops

As with the previous inception the three days consisted of a number of workshops. Separate user research was also conducted with the community.

The agenda for the workshops was the same as the previous inception (see section 5.3.1.2) with the exception of switching the Elevator Pitch workshop to a Press Release workshop. The object of the Press Release workshop is to build a shared understanding of the problem domain for all participants and to explore ways to communicate the vision and objectives to a non technical audience.

The presentation slide deck containing more details about this inception is available from consortium partner ThoughtWorks.

Proto-Personas and Empathy Maps

The proto-personas were created with representatives from Making Sense and members of the DECODE team and were used throughout the inception to focus discussions around the end users.

Two proto-personas were created, "Montse" and "Aina", both Making Sense users. An empathy mapping session was then completed for each.

The proto-personas are part of the preliminary work on approaching the project with the end-user in mind, and will be updated and validated with research as the project progresses.
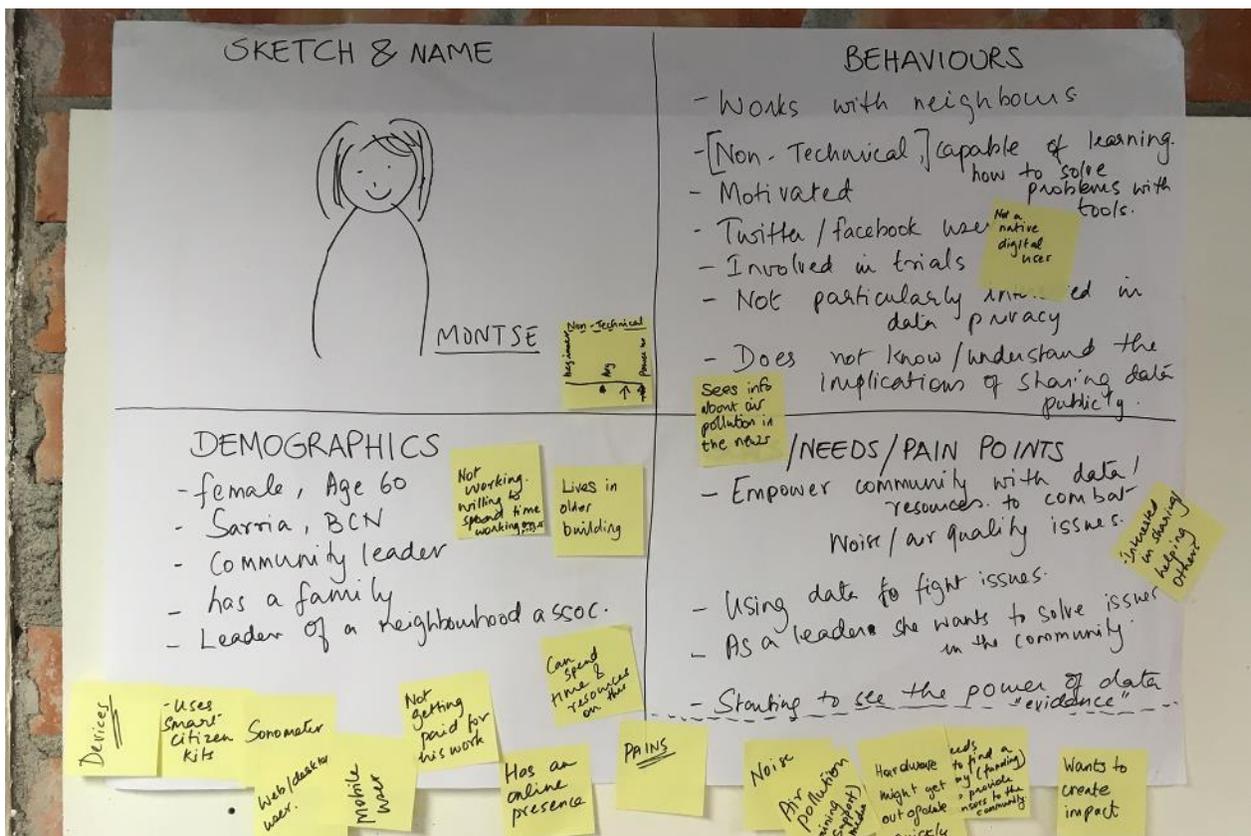
"Montse" – Making Sense User
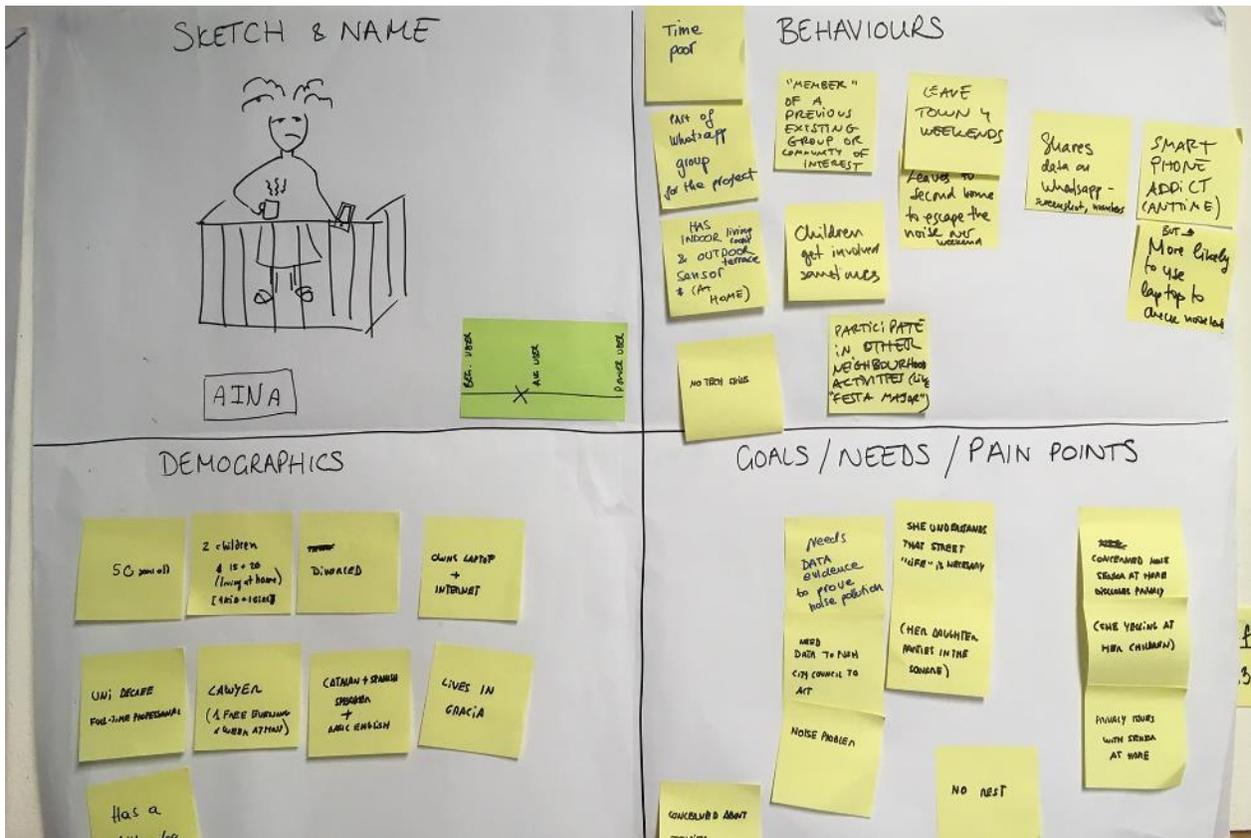
"Aina" – Making Sense User

Empathy Mapping for "Montse" and "Aina"

Press Releases

This workshop was designed to foster a discussion on the benefits of joining the DECODE platform to a wider public.
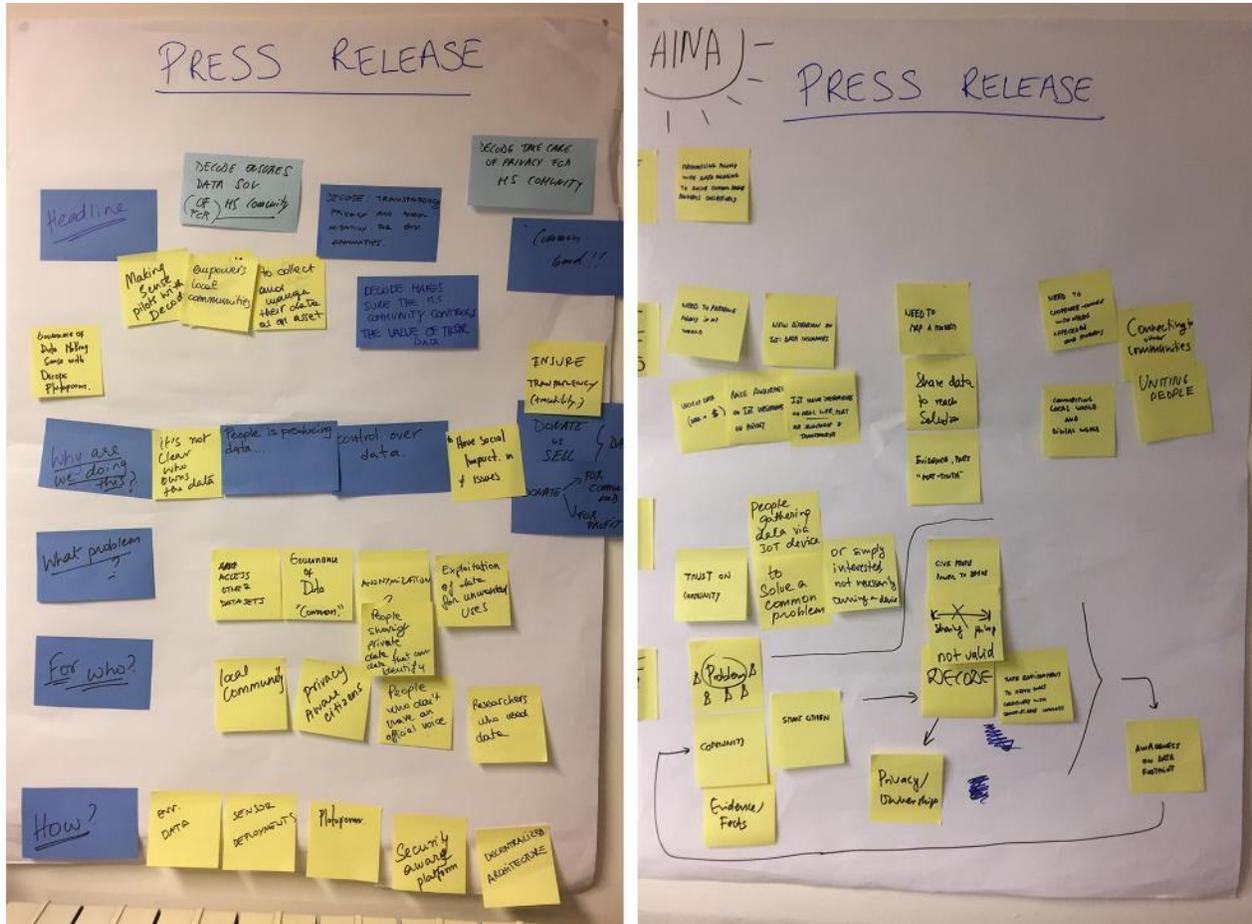
Press Release Workshop

Customer Journey Mapping

Making Sense demonstrated the current on-boarding process for a new user as well as the functionality and current features available on Making Sense. The details of this process were documented, and specific areas were discussed in detail by the group. The output of this discussion laid the groundwork for the technical sessions that followed by highlighting the potential integration points with DECODE as well as the different aspects of the Making Sense on-boarding.
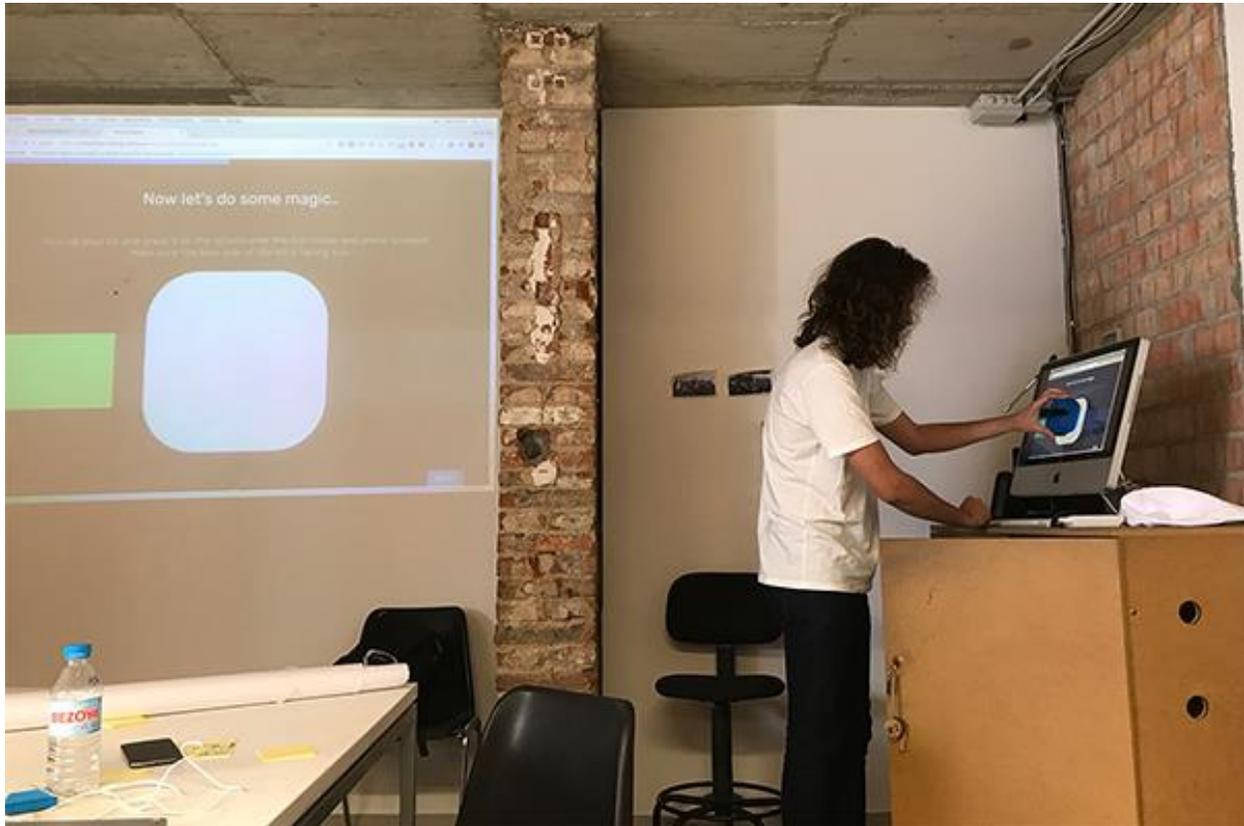
Onboarding a Smart Citizen Sensor

User Research and Interviews

Prior to the inception, some DECODE team members met with the local Plaça del Sol Making Sense community at one of their meetups. The meetup explored an upcoming event to raise awareness of noise pollution in Plaça del Sol. Attendees included a mixture of Plaça del Sol residents, Community Champions and members of the Making Sense project.

Following the meetup, invitations were extended to visit three members of the community to observe their sensors in situ and to talk to them about using the hardware and taking part in the Making Sense project. This included a member of the Community Champions and two members of the Plaça del Sol community. Two had a single sensor, used in an outdoor environment and the other had two sensors measuring both indoor and outdoor noise levels.

Smart Citizen Kit[1]   Smart Citizen
Dashboard[2]

Community Champions are hyper-engaged participants who have been part of Making Sense for a while and are involved in co-creation methodologies with Making Sense. The users interviewed highlighted their interest in learning more about the technology side of Making Sense. The Community Champions also work with other communities including Plaça del Sol, helping with onboarding. It was interesting to note that the users interviewed were still actively using their sensor to monitor noise in their local area.

Those Plaça del Sol community members interviewed were involved in their local community prior to getting a sensor in their home. One user explained that they primarily use the data they collect for the community meetups. The Plaça del Sol community members also mentioned that they now have the data to 'show' their problem with noise.

All of the users interviewed actively used their sensors for monitoring noise levels and expressed interested in assisting the DECODE project in the future.

Pilot Requirements

"*As a user I want to be in control of my data.*"

"*As an IoT platform provider I want to give users a transparent, secure, traceable, collaborative platform.*"

The cross-functional requirements to be fulfilled by the pilot are listed below.

- Data Access Traceability
- Data Transparency
- Data Integrity
- Reusability

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[1] Smart Citizen Kit –https://www.flickr.com/photos/smartcitizen/19503915770/

[2] Smart Citizen Dashboard https://www.flickr.com/photos/smartcitizen/24344857446/
CC BY-NC-ND2.0   Courtesy of Smart Citizen

- Integration with Data Sources
- Usability / UX
- Availability
- Data Access
- Privacy
- Security
- DECODE Integration

Trade-off Sliders

1. .UX

2. Privacy / Data control

3. Data Access (Search, Query)

4. Security

5. Data Integrity / Transparency

6. Modularity / Reusability
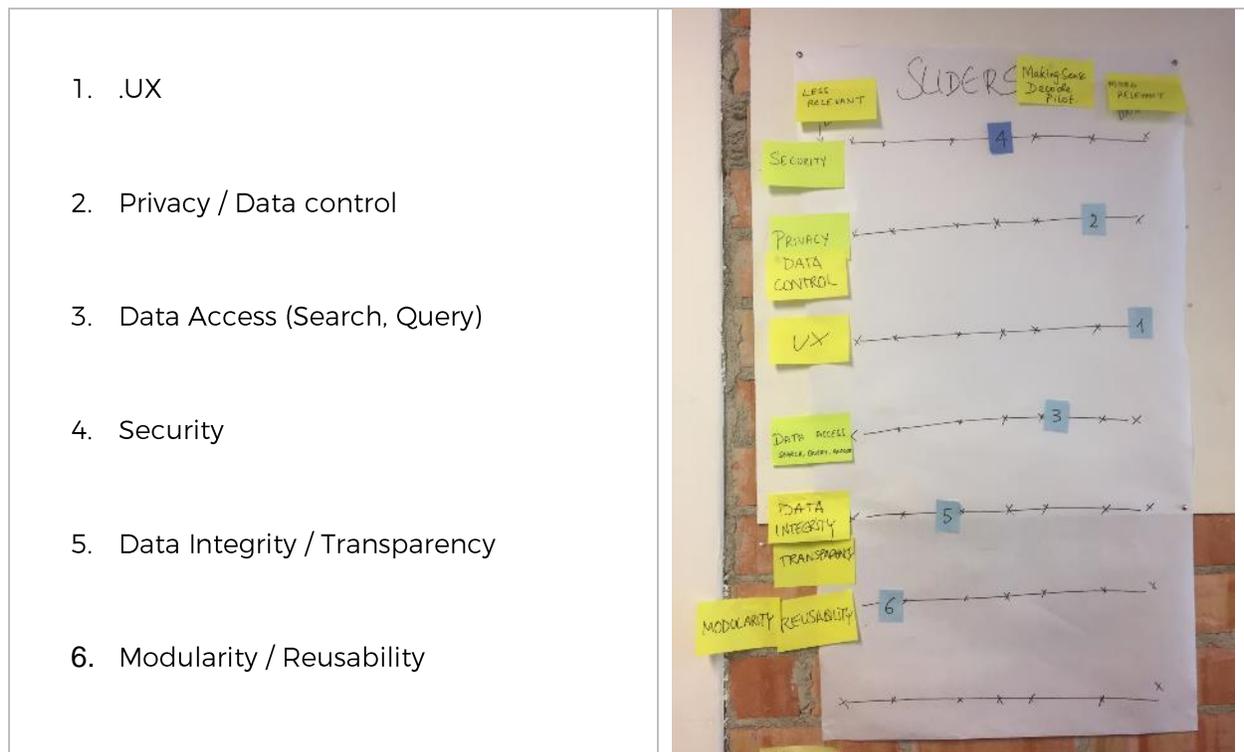
Smart Citizen Kit and Platform

Making Sense is composed of an IoT device and a data-driven platform which supports UI components such as the smart citizen website and individual pilot dashboards.

The Smart Citizen kit contains an IoT device which is comprised of an Arduino chip, with a noise sensor, and a minimal web service that communicates to the Smart Citizen platform.
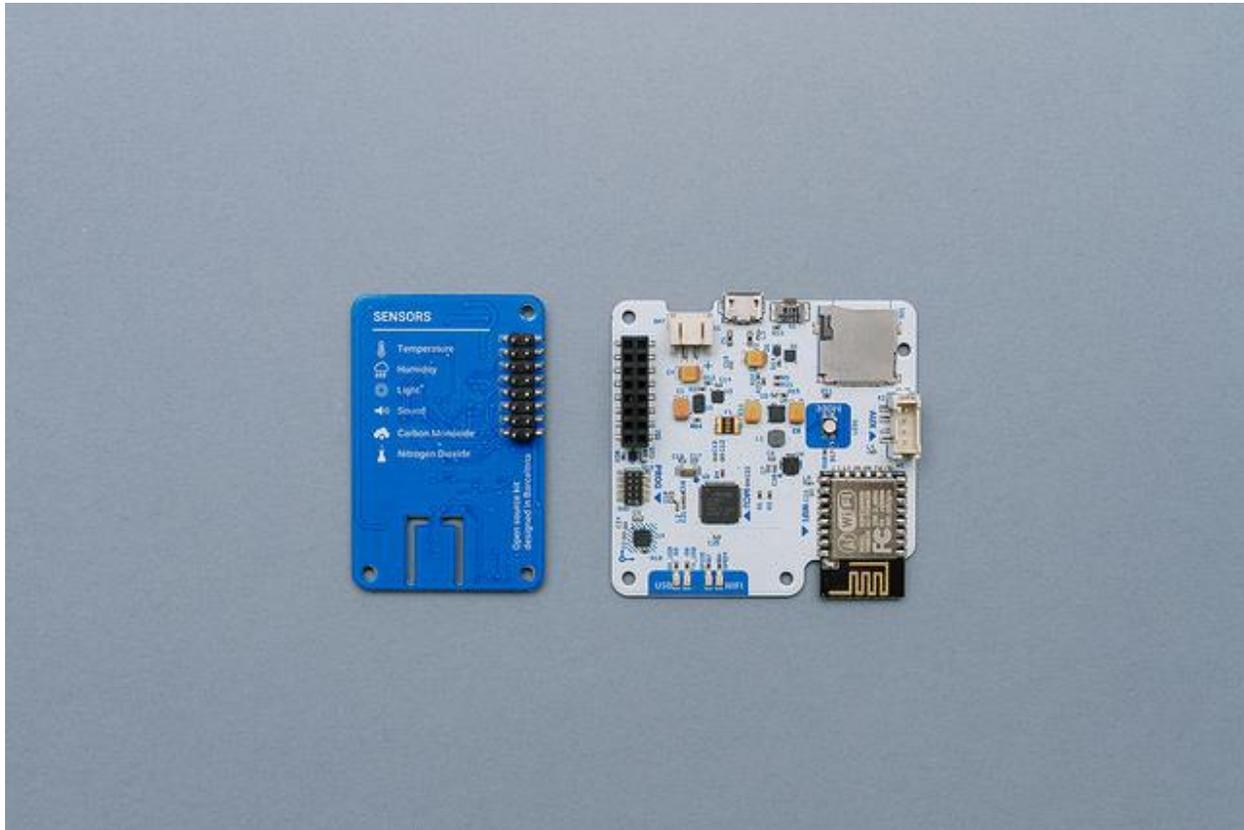
Smart Citizen Sensor – CC BY-NC-ND2.0 Courtesy of Smart Citizen
https://www.flickr.com/photos/smartcitizen/32610607596/

Technical Context Mapping

The technical analysis of the current platform along with a roadmap for the implementation of the pilot can be found in the Appendix – Section 4 Technical As-Is Context Mapping.

RAIDs

The RAID Session generated a list of all identified risks, assumptions, issues and dependencies. The output will be collated into a working Risk Log for the pilot.

Output of RAIDs Session

Engines and Anchors

The output of the Engines and Anchors session identified areas that could either help propel the project forward or slow the progress of the project.

Engines and Anchors Session

5) Amsterdam Pilots

Amsterdam partners created a preliminary list of communities that would potentially have a relevant use case for the DECODE project and might be willing to engage in the pilot.

Waag Society then made a list of selection criteria and devised an Open Challenge (see Appendix 2 for details of Open Challenge) as the most effective and participatory method to reach out to active communities. The results of the Open Challenge and cases from the Amsterdam Municipality were researched in further detail. A Discovery Session was then held over two days in Amsterdam on June 8–9, 2017. Partners in attendance were: IMI, Dyne, Amsterdam Municipality, ThoughtWorks and Waag Society. This series of workshops, facilitated by ThoughtWorks, helped define the selection criteria, interview stakeholders, and discuss uses cases and technical issues. Additional insights from Dyne into the local communities in Amsterdam was welcomed and contributed towards the decision making. The learning from IMI's experience of having already undertaken an extremely thorough selection process was especially valuable. The input of all the partners was instrumental in driving the discussion to a conclusive result.

During the Discovery Session, the partners reached a consensus on the selected pilot communities and use cases. The inceptions for the two pilots were provisionally scheduled following discussion with all the partners present. They will take place from 10th - 15th July 2017.

5.1) Pilot Selection Process

The steps for selecting the DECODE pilots for Amsterdam were:

- The methodology for discovery as set out by IMI in Barcelona was used as a starting point
- All Amsterdam partners submitted additional criteria / aspects which would be relevant for selection
- Several meetings were held to explore the policy context, both in Amsterdam and The Netherlands, to discuss linking with municipal and national strategies and policies regarding blockchain, looking at both general and specific use cases
- Communities were polled about the most important criteria, using the online form for the challenge and basic desk research
- Waag Society organised the two-day discovery session (June 8–9) in Amsterdam where representatives from the partners involved—IMI, Dyne, ThoughtWorks, Amsterdam City Council and Waag Society—came together
- During this session:
  - Municipality arranged product owners to present their internal use cases
  - Two challenge participants were invited to present their use case in more detail
  - The consortium partners composed a prioritized list of pilots with whom we would do the two inceptions
  - In one case Dyne and ThoughtWorks advised an additional technological infrastructure and architecture review for a potential pilot following it being shortlisted. Dyne kindly agreed to carry out this out before the end of June 2017 in order to mitigate further delays.
- Inceptions for Amsterdam pilots were then scheduled in accordance with availability of partners and stakeholders from selected communities.

5.1.1) Open Challenge

Since the DECODE consortium agreed to treat user-centric design as a priority, Waag Society proposed that the users / communities should come to us with their issues—not the other way around. To achieve this Waag Society held an Open Challenge. Communities had three weeks to register their interest and fill out a basic form stating their community and use case.

The challenge was published on the websites of Waag, Dyne and promoted via email, newsletters, social media and via Waag Society's own network, and by word of mouth.

Details about the challenge advertisement can be found in Appendix 2.

Specific organisations were approached:

- Maak je Stad competition
- Pilot List

- Municipal Departments
- PEP project Radboud University

By the deadline of June 5, 2017, nine communities had applied to the online challenge, with an additional two use cases coming in from the municipality.

5.1.2) Selection Criteria

For each community and its use case, we collected information on the following criteria. Criteria are approached holistically (rather than along a positive / negative axis). They were grouped broadly into three categories, as follows:

Values / DECODE Scope

What features or services from DECODE might this pilot need benefit from? Identity management, safe sharing of personal data, entitlements, assessing reputation or the support of collective governance?

What is the inherent ambition of the community? Does the case offer opportunity for broad and wide technology transfer enablement?

Is there a good and attractive narrative, which is likely to encourage enthusiasm and energy around the pilot? Is there mutual trust?

Ground / Community

A mature community of considerable size might mean uses cases and user needs are quite clear and can be relatively easy to define and/or implemented in existing processes. On the other hand, size and legacy infrastructure and routines might make a younger community more attractive.

More practical issues were also considered: stakeholders' availability for inception and agile development trajectories? Likelihood of the developed concepts having long term lasting benefit and being sustained from the community itself?

The balance in assessment of community maturity was mirrored on a technological level. Assessment happened based on whether the community had any software or service up and running (prototype or fully operational) and whether we could have any pre-knowledge on the openness / aptness for interchange with DECODE infrastructure.

Operations

Technology partners evaluated whether the data involved in a pilot could likely be handled with the foreseen DECODE infrastructure. Key factors in this consideration were:

- The frequency with which data is written to, stored in and shared with the system
- The way that systems communicate with each other

- The frequency with which systems are updated (for example, in real time or once per day)
- Aggregation functions over data—for example, summarising functions such as statistical calculations. In which systems is this aggregation performed, and which systems should have access to the raw data (privacy by design)?
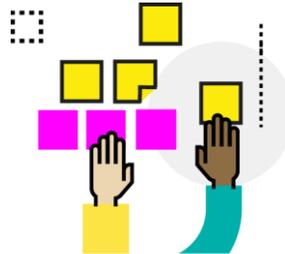
Further criteria were the possibility of a link between pilots in Barcelona and Amsterdam, the risk of accidentally exposing private data, feasibility in project time scale, and the link with current municipal policy priorities.

5.2) Candidate Pilots

A provisional list was created by Waag Society as shown below, and discussed with the consortium partners based in Amsterdam.

- FairBnB – A decentralised short-stay rental platform
- Peerby – A decentralised DIY tool-sharing platform
- Stadspas – Anonymized benefits card for low/medium income citizens
- Sensemakers – an IoT makers community in Amsterdam
- Tree Wifi – Bird house offering AirQuality monitoring and community Wi-Fi
- Amsterdam Smart Citizen Lab - Citizen sensing air quality / noise pollution / water quality
- Neighbourhood Apps – Decentralised, anonymised messaging for neighbourhoods
- Common Mutual Fund (Broodfonds) – Members of a bread fund group (self employed/freelance workers) who fall sick receive donations from the other members in their group, the total amounting to a net monthly income
- Energy Coop – Decentralised management of green energy cooperations
- Amsterdecks – Water quality management combining official and citizen science

5.3) Pilot Selection Results

Partners involved in the Discovery Sessions decided to do one community-based pilot and one municipal service pilot. The possibility that new opportunities arise during the course of the pilot was left open. Similarly, there could be a pivot from one pilot to another.

The partners involved in the DECODE Amsterdam Pilots (Waag Society and AMS City Council, including DYNE as a technical key partner in Amsterdam) jointly decided on the following two pilot choices:

- Combining the FairBnB Community and Short Term Rental Register in Amsterdam
- Gebiedonline
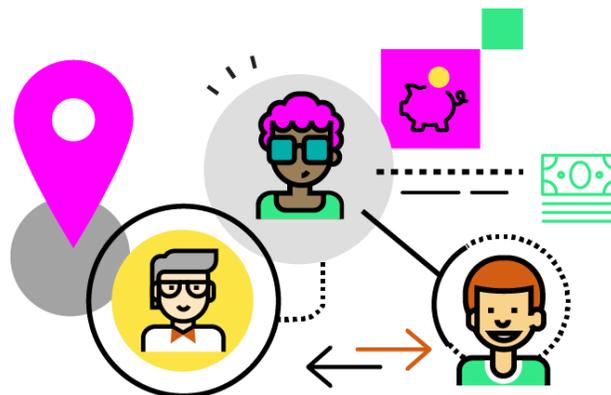
The following will take place at a later date, when there is reason to pivot within the project, or when DECODE offers features that can be made available to these pilots relatively easy:

- IoT / RIVM: The Dutch National Institute for Public Health and the Environment is working on a platform for collecting Citizens measurements of the environment
- Schluss - personal data vault: https://schluss.org
- Citypass Amsterdam: a physical card issued by the municipality to two target groups: lower income households and retired citizens.

There may also be opportunity in the future to combine work with Barcelona pilots on IoT and undertake joint initiatives.

The other pilot applications will not be considered.

5.3.1) Pilot 3: Holiday Rental Register / FairBnB

5.3.1.1) Holiday Rental Register (Amsterdam Municipality)

Holiday rentals of private homes and apartments have exploded in recent years, as a consequence of a boom in tourism in general. The benefits of this, however, tend to be less obvious than the adverse impacts that arise from increased use of public and common space and infrastructure in the city. The classic bureaucratic instruments to curb the number of visitors to a city are to increase tourist tax and to limit the number of hotels in the city. The advent of sharing platforms such as AirBNB (US), Wimdu (DE) and others is undercutting both these instruments.

Following these developments, the Amsterdam Municipality has, since 2012, developed policies which aim to regulate holiday rental of private properties. An evaluation of these policies in 2016 concluded both the enforcement of these regulation should be strengthened, and action taken against illegal holiday rentals increased.

The municipality is considering the introducing a compulsory register for holiday rental of private properties. The City Council will decide on these new regulations in July 2017. If the council agrees, the new register will need to be active by Oct 1, 2017. To develop this service, internal and external contractors will be procured to deliver a (classic, centralised) first registration service embedded in the city website.

As partner in DECODE, the Amsterdam Municipality has committed to be product owner for the (almost) parallel development of a similar service on top of the DECODE Infrastructure. If and when suitable and successful, this service may both replace the first version as a municipal application and be an exchange with other P2P distributed sharing platforms (such as FairBnB, see below).

Terminology[3]

The municipality has several categories of short-term/holiday rental. Since these use various combinations of Dutch and English words it is quite easy for confusion to arise. Three closely related categories are listed here, this case is only applicable to the first category.

- Holiday Rental ("Vakantieverhuur"): non-commercial and short-term rental of property by the resident. Maximum 60 nights/year. Rules apply, permit or registration is not required.

This use case was therefore not about:

- Short-Stay Rental: rental of a property for a minimum of seven nights and a maximum of six months, periods may be consecutive and owner does not need to be the resident. Permit required.
- Bed-and-Breakfast: regular rental of a part (max. 40%) of the residency for (almost) hotel like services. Registration, health and safety rules and regulation apply.
- Hotels: heavily regulated, official policy is no new hotel permits are released in the city centre.

Overall Description and Problem to be Solved

Enable the Amsterdam municipality to gain trust and experience with running part of their services/infrastructure on or via the DECODE infrastructure.

Enable citizens to submit data once, share these data many times whilst remaining in control of their data.

Enable open, P2P based sharing platforms such as FairBnB to interact with data collected by the city.

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[3] For more info (in Dutch) see: "Wat is het verschil tussen shortstay en vakantieverhuur?" at https://www.amsterdam.nl/veelgevraagd/?caseid=%7BDB74D98B-5515-4205-AB86-8AE634DD89E6%7D

Specific Overall Objective of Pilot

Prove DECODE can support a city wide register.

General Proposal

A web application that enables Amsterdam residents to register rental periods with the municipality.

Technical Description

- Front-end application is a(n embeddable) form on a webpage. This form collects/supports:
  - User authenticates as an Amsterdam citizen
  - User registers the address of residency in Amsterdam
  - Users registers period for which the holiday rental is arranged
- The collected information can be used:
  - To give both user and city information on the balance of the 60 nights/year permitted
  - For additional policy/data analysis
  - To share data with or integrate with a service like FairBnB, which may submit a record with the Municipal Register as a step within the process where two peers reach consensus
- Additional checks may be required:
  - Check whether the user is a resident with the City, via the Municipal Personal Records Database
  - Check whether the address is valid with the Cadastre
- Requirements for implementation with the city have to be made specific.

Community

Resident 1: wants to offer her apartment for holiday rental, likes the sharing aspect of the concept and wants to do it legally and responsibly, but without too many complications.

Resident 2: sees neighbourhood flooded with tourists and wonders if the 60/nights a year cap is actually enforced. Would like to see some aggregated statistics on neighbourhood level.

Department of housing: wants to have statistical insights helping them to enforce the rules and regulations.

FairBnB developer: would like to enable a community of people such as herself and Resident 1, with full respect of all regulations.

Challenges

- Even a small and careful pilot can only be done with some form of integration / exchange with municipal legacy systems

- Issue is politically sensitive
- Use case for blockchain is depending on exchange with FairBnB
- Sustaining commitment from all departments involved requires work.

5.3.1.2) FairBnB

The FairBnB community started as a meet-up in Amsterdam in 2016, supported by Waag Society. Meet-ups were attended by roughly 50 people, with a list of 300 people registered as interested. Key-figures in the community decided to go ahead with the idea and incorporated a stichting (foundation)—a Dutch legal entity with limited liability—with a board.

FairBnB is working on a vacation rental platform which offers three advantages over existing sites: transparency, co-ownership and added value for the neighbourhoods.

The foundation established by the FairBnB community in Amsterdam will be Product Owner for an MVP of a peer-to-peer vacation rental platform. It is owned and managed by a cooperative of users and neighbours, who collectively decide how to reinvest any profits in local projects that ease the impact of tourism, protect residency and fight gentrification. These neighbours will also collaborate with hosts and guests to ensure a meaningful and community-driven experience for visitors.

FairBnB is a cooperative platform where citizens, landlords, guests and local businesses come together to organize distributed hospitality, to share the advantages of short-term house renting and minimize the negative aspects.

An MVP would be a certain Amsterdam neighbourhood which registers available places to rent and advertise them, peer-to-peer, offering a platform for both neighbourhood feedback and sharing generated value with the community.
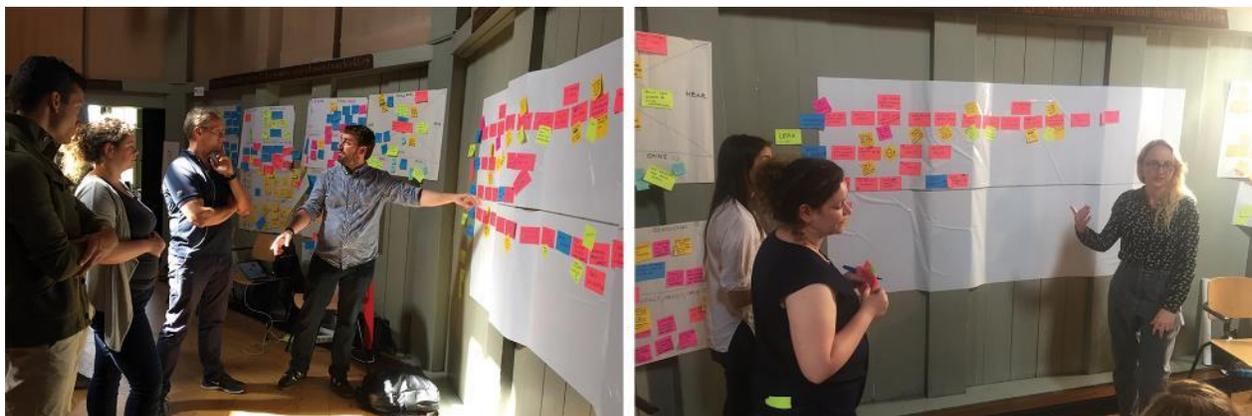
Representatives from FairBnB Discussing a Proposed User Journey

Overall Description & Problem to be Solved

A P2P platform for community aware (short term) sharing of housing.

Specific Overall Objective of Pilot

Prove DECODE can support decentralised P2P initiatives.

General Proposal

Collective ownership: Our platform is owned, not by anonymous investors, but by those who use it and are impacted by its use: hosts, guests, local business owners, neighbours. Created and governed by citizens, FairBnB will keep profits in communities and ensure decisions are made for the good—not the exploitation—of neighbourhoods.

Democratic governance: Collaboration and consensus are at the heart of our model. FairBnB will provide a space where community members can come together and collectively decide how the platform will be run in their neighbourhood. FairBnB will work with local government to promote regulations that encourage sustainable tourism.

Social sustainability: In order to rebuild community, profits will be reinvested in social projects that counter the negative effects of tourism. Locals will vote to support those projects they want to see in their neighbourhoods: food coops, playgrounds, green projects, community cafes.

Transparency and accountability: FairBnB is committed to open data and compliance with local and regional legislation, which will be balanced with the privacy and security needs of platform members.

Technical Description

Significant research has been done into the concept of FairBnB (sometimes prototypes are called FairBed or Houseweb). This gives us access to extensive descriptions of concepts, architecture and a prototype:

- A prototype developed by UVA students (based on the social aspect of our platform)
    - Concept description, including architecture overview, business model and development budgets
- A report on social and technical design requirements for identity and reputation verification in a privacy-preserving, accommodation-sharing application. This is available from Waag Society
    - In this paper the model of how Airbnb designs for trust is criticized and a prototype of an alternative accommodation-sharing application, Houseweb, is provided. Houseweb uses blockchain technology and a network approach to verify identity and reputation
    - Includes personas/user journeys and mock-up screenshots
- A presentation and summary of this thesis is available from Waag Society.

Community

The community personas are the same for FairBnB as for the Holiday Rental Register:

Resident 1, Resident 2, Department of housing and technical developer.

Challenges

- Legal issues: most residential properties exist with a complicated set of ownership and regulations, involving housing cooperations, Home Owner Associations (VVE), mortgage restrictions
- Liability/insurance: the risks stemming from legal issues cannot be born by any DECODE party. Insuring P2P transactions is not impossible but it is far from a commodity service
- Success: the real-estate boom in Amsterdam is a risk in itself, which may lead to system-overload, abuse or other hostile scenarios.

5.3.2) Pilot 4: Gebiedonline (Neighbourhood Online)

Gebiedonline (GO) is an advanced online neighborhood platform that is cooperatively run and owned. Many neighbourhood platforms (like Whatsapp groups or Nextdoor.com) lock their earnings to Silicon Valley. To contribute structurally to the local community and (local / circular) economy, it is important that ownership of these neighbourhood platforms lies with end-users.

The platform is managed by a cooperative, with technical development and support delivered by Michel Vogler, who has a small software company in Amsterdam (Crossmarx). There are currently 5,000 participants in IJburg (a neighbourhood in Amsterdam with approximately 40,000 inhabitants). From this first success, GO then expanded to other cities. Every decision has to be made from within the community.

Overall Description and Problem to be Solved

Neighbourhoods have a need for a fair, sustainable, non-extractive digital platform. The platform would enable people, groups and organizations to view events taking place in the area, share news, exchange and borrow products and services, and to meet people.

Gebiedonline has proven to be a strong and successful concept, but is missing features on security and is not sufficiently privacy aware.

Discussing Gebiedonline During a Workshop

Specific Overall Objective of Pilot

Use cases mentioned to date, which will undergo further research and validation during the inception:

- Have a 'stamp of approval' that enables participants to verify neighbours are genuine residents
- Certification for any voting/polling services created
- Neighbourhood "Amsterdam Oost" intends to use GO to allow citizens to prioritize certain co-creation experiments. This could benefit from both iDigital (current Barcelona pilot) and your priorities (from D-CENT).

Technical Description

Gebiedonline facilitates offline, real contact by inhabitants of neighbourhoods. GO uses a Java platform, which the tech supplier uses for approximately 50 clients. The entry point is very open: anyone can register at or inspect the platform.

Challenges

- The licensing of the front-end is open source but not released and no license has been chosen, the platform is not open source. In practice, accessibility is restricted to peers only
- Very competitive market: user appetite for 'another' Slack/Messenger/WhatsApp channel may be limited.

5.4) Planned Pilot Inceptions

Agreement was reached between the partners involved in the inceptions for Amsterdam pilots. It was decided that due to logistics issues and the similarity of some parts of the chosen pilots, it would be possible to combine the inceptions into a series of sessions running over a single week. The dates planned for the workshops for the projects FairBnB community and Short Term Rental Register, together with Gebiedonline, are July 10–15, 2017.

Group Discussions at the Pilot Inceptions at Waag Society

The presentation slide deck containing more details about this inception is available from consortium partner ThoughtWorks.

6) Approach to the Evolution of Scenarios, Pilots and Use Cases

6.1) Lean and Agile Methodology

Lean methodology originated in the manufacturing industry, but has subsequently gained a huge following in the startup community[4]. It is now used by <u>successful enterprises</u>[5] of many types to build software-based products. The main benefits of lean and agile methodologies are that they can be used to answer the a critical question for developers: How do we move fast at scale?

The thinking behind the lean methodology does not relate solely to the technical aspects of any given project: it is the involvement of end users of a product that is crucial. The lean methodology harnesses both the cultural and technical forces that are accelerating the rate of innovation.

What's more, lean ties in well with the ethos of the agile methodology, as set out in the '<u>agile manifesto</u>[6]'. The manifesto states: "Simplicity--the art of maximising the amount of work not done--is essential"[7]. What that means in practice is a focus on priorities and the avoidance of work that has <u>no value to end users</u>[8].

The <u>lean and agile methodologies</u>[9] are ideally suited to the DECODE project: rapid innovation and prototyping leads to the early implementation of pilot projects in the two cities within months of starting agile projects. The broad areas of pilot interest—IoT, collaborative economy and democracy—can be explored in a swift, low-cost manner with a '<u>Minimum Viable Product</u>'[10] or MVP.

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[4] Lean Startup: <u>http://theleanstartup.com/#principles</u>

[5] Lean enterprise: <u>https://info.thoughtworks.com/lean-enterprise-book.html</u> How High Performance Organisations Innovate at Scale

[6] Agile Manifesto: <u>http://agilemanifesto.org/history.html</u>

[7] Principles behind the agile manifesto #10: <u>http://agilemanifesto.org/principles.html</u> - "Simplicity, the art of maximising work not done, is essential"

[8] <u>http://theleanstartup.com/#principles</u> "The lean startup isn't just about how to create a more successful entrepreneurial business...it's about what we can learn from those businesses to improve virtually everything we do. I imagine lean startup principles applied to government programs, to healthcare, and to solving the world's great problems. It's ultimately an answer to the question 'How can we learn more quickly what works, and discard what doesn't? z- Tim O'Reilly, CEO O'Reilly Media"

[9] Agile vs Lean: https://martinfowler.com/bliki/AgileVersusLean.html

[10] Minimum Viable Product: <u>https://en.wikipedia.org/wiki/Minimum_viable_product</u>
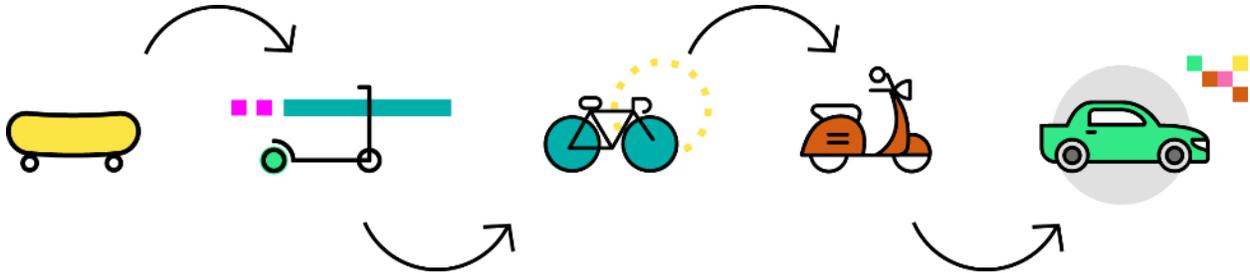
The best approaches being taken forward over the course of the three years can then be validated with the involvement of users and communities to improve the products. A long period of time for testing, for roughly the second two years of the project, will ensure adoption by large enough numbers of people to meet the ambitious project goals detailed in section 4.1 of this document.

6.2) Architecture Discovery Methodology

The nature of the DECODE project is such that many elements are exploratory. While the project has a high-level vision for the technical architecture, many of the concrete architectural decisions will be made as the understanding of DECODE platform and the user requirements evolves.

The project will take an evolutionary approach to refining the architecture. That means principles and constraints are defined as clearly as possible at the outset, based on the knowledge available. These are then explored through the building of the software, with design decisions based on feedback from that activity. As we build software, we gain more knowledge which refines our direction further. This can be thought of as a variant of the 'build, measure, learn loop" from the Lean Startup thinking. Starting firmly in the world of requirements both from a user and cross functional perspective is also often referred to as an 'Outside In'[11] approach.

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[11] https://en.wikipedia.org/wiki/Outside%E2%80%93in_software_development
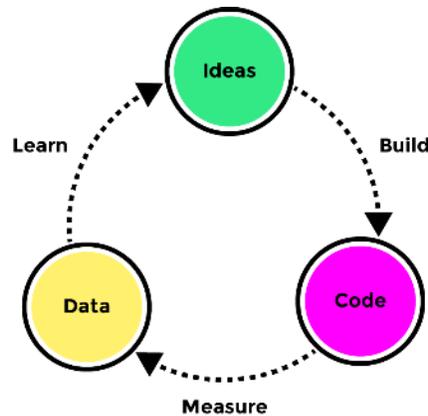
Figure 1: The build, measure, learn loop

There is also a strong feedback loop between how the understanding of the requirements evolves, how this shapes the architecture and how this enables us to make more concrete design choices. This is because our understanding of constraints improves as we progress.

The core focus of this deliverable (D1.1) is to illustrate and report on the use cases and requirements that will be executed as pilots for the DECODE project. This section provides an overview of the method that will be used to facilitate this evolving, adaptive architectural design.

In order to facilitate this decision making process within the consortium, ThoughtWorks (the Technical Leader) leads a group of consortium members called the "Technical Coordination Office". This is a group consisting of the consortium partners, who are involved in the technical deliverable parts of the architecture, for example D4.1 – the DECODE OS SDK. The ongoing discussions and decision making of this group will be captured in a white paper, which will be published iteratively in due course. Ultimately this will be the core technical definition for the DECODE architecture.

6.3) Phased Approach for Evolution of DECODE Architecture

Based on extensive industry experience, ThoughtWorks has developed a phased approach for the DECODE project that will be used to refine the concrete architecture. The naming of the latter phases is inspired by the UK Government Digital Services design manual.

- Phase 1 – Architectural Prototypes
- Phase 2 – Architectural "Scale Model"
- Phase 3 – Alpha DECODE Platform
- Phase 4 – Beta DECODE Platform
- Phase 5 – Live DECODE Platform

Guiding this work we have a set of principles and architectural themes.

6.3.1) Principles

- Gain information for decision making by **thinking in code**
- Seek rapid feedback loops to **validate decisions**
- Build something that works then **iterate**

6.3.2) DECODE Architectural Themes

When this document refers to the 'DECODE architecture' it is referring to the broader scope of architecture including all components, hardware across all work packages and tasks. At a high level the themes and their associated tasks (as defined in the DECODE proposal) are listed here:

- Distributed Ledger (T1.1, T3.6)
- Entitlements (Policy and Implementation) (T3.1)
- Data Ontologies (T3.2)
- Privacy Controls (Cryptography) (T3.4)
- Smart Rules (T3.5)
- Hardware (T4.2)
- DECODE OS (T4.1, T4.3)
- User Experience (T4.4)
- Integration with DECODE applications (T4.5)
- Continuous Delivery tooling (T4.5)
- Testing and Validation (T4.5)

Many of these themes will be linked to specific software components that will be developed by consortium members or re-used from open source projects.

The 'DECODE Architecture' is a description of the fundamental characteristics and composition of the 'DECODE components'. Together the components provide what is described as the 'DECODE Platform'.

6.4) Phase 1 – Architectural Prototypes

This phase has been active since the first few weeks of the project. At this stage the process for selecting concrete pilots had not been completed, however the proposal indicated four use cases which gave direction. ThoughtWorks conducted an analysis exercise which led to a model of participant interactions (Figure 2).
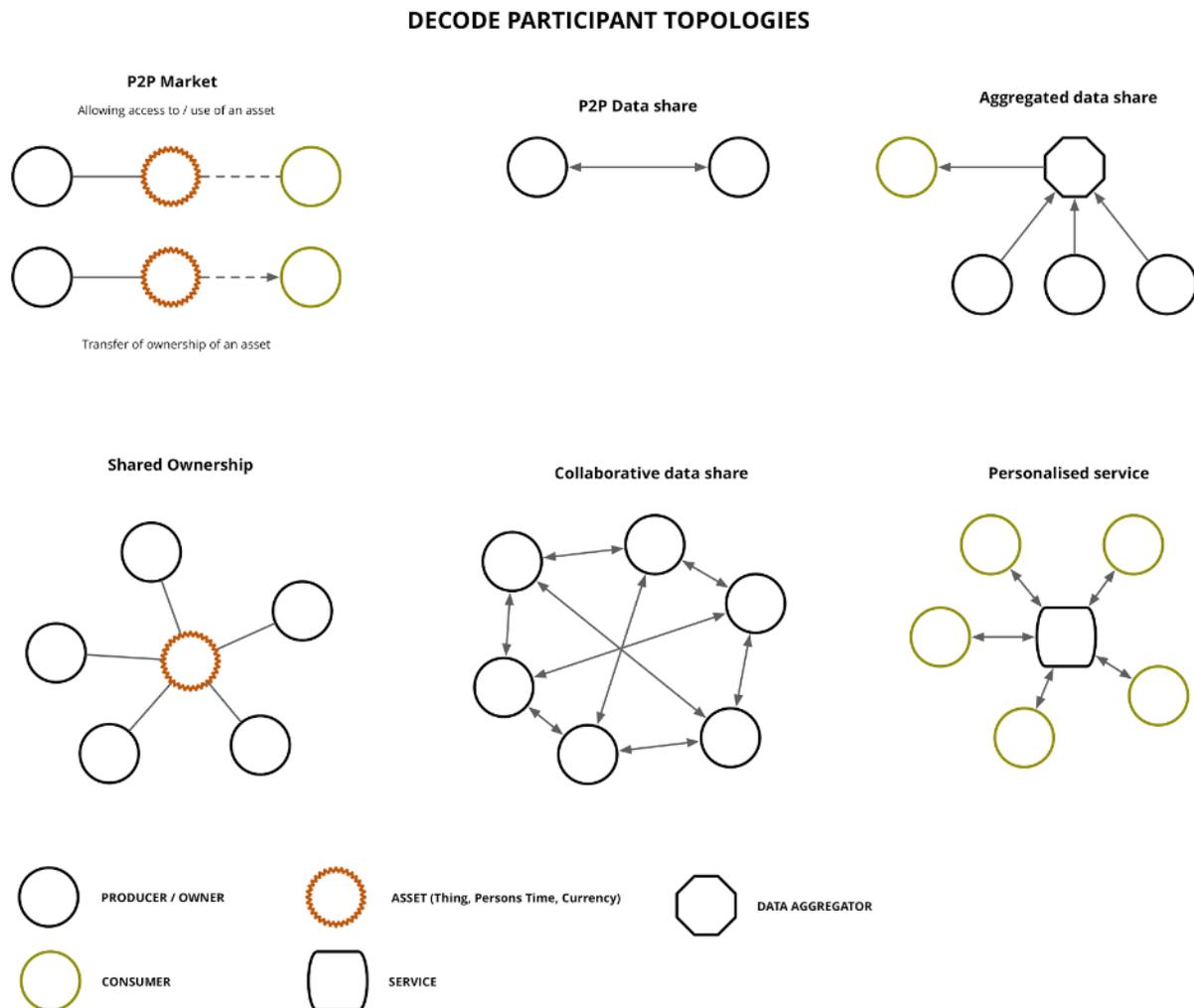

Figure 2 Models of participant interactions

The ThoughtWorks team brainstormed many different concrete use cases to arrive at these topologies. Our results were based on our own ideas and those collected from previous interactions with consortium members. It should be noted that a particular use case might involve multiple topologies but is likely to have a core resonance with one in particular. For

example, a data commons scenario in which participants contribute data to a common data set would be an example of the Aggregated Data Share. However, the application from which that data is derived may also involve peer-to-peer data sharing or transactions.

Participatory Citizen Sensing and connecting IoT devices to DECODE emerged as one core use case. The others included the Collaborative Economy/Hospitality and Open Democracy (as defined in the DECODE proposal). By considering these themes and the topologies, three scenarios were created that could then be used to further explore the nature of DECODE and its architecture.

The three scenarios are:

1. Air Quality monitoring (citizen sensing, aggregated data share)
2. Peer-to-peer Marketplace (P2P market, P2P data share)
3. Petitions (collaborative data share, aggregated data share)

The approach is to take each of these scenarios and develop a lightweight MVP application for them with working code. These are referred to as 'Prototypes'; which are distinct from 'Pilots'. The latter are much closer to a real world application, which feature concrete use cases and interactions with real citizens—and their data. Decision making through the development of the prototypes will be used to inform the architecture which will eventually support all the selected pilots.

The prototypes will be used during Phase 2 to build a 'Scale Model' of the DECODE architecture (see section 3.4 - Phase 2 - architectural scale model, of this document).

The scenarios have been expressed as three prototypes which are detailed in the following sections:

- Prototype 1 - Air Quality App
- Prototype 2 - Marketplace App
- Prototype 3 - Petitions App

At the time of writing, the first two of the prototypes have been completed and the third one has recently started.

What Is the Value Proposition of the Prototypes?

The prototypes serve several purposes:

- To evolve thinking around the functional domains that will be encountered in the pilots
- To provide working MVP software against which the platform can be tested
- To provide exemplars for developers who want to integrate with DECODE, or build their own applications
- To serve as a discussion tool and focal point amongst the technical partners to facilitate decision making and design
- To provide a foundation for Phase 2, the construction of an architectural scale model

6.4.1) Prototype 1: Air Quality App
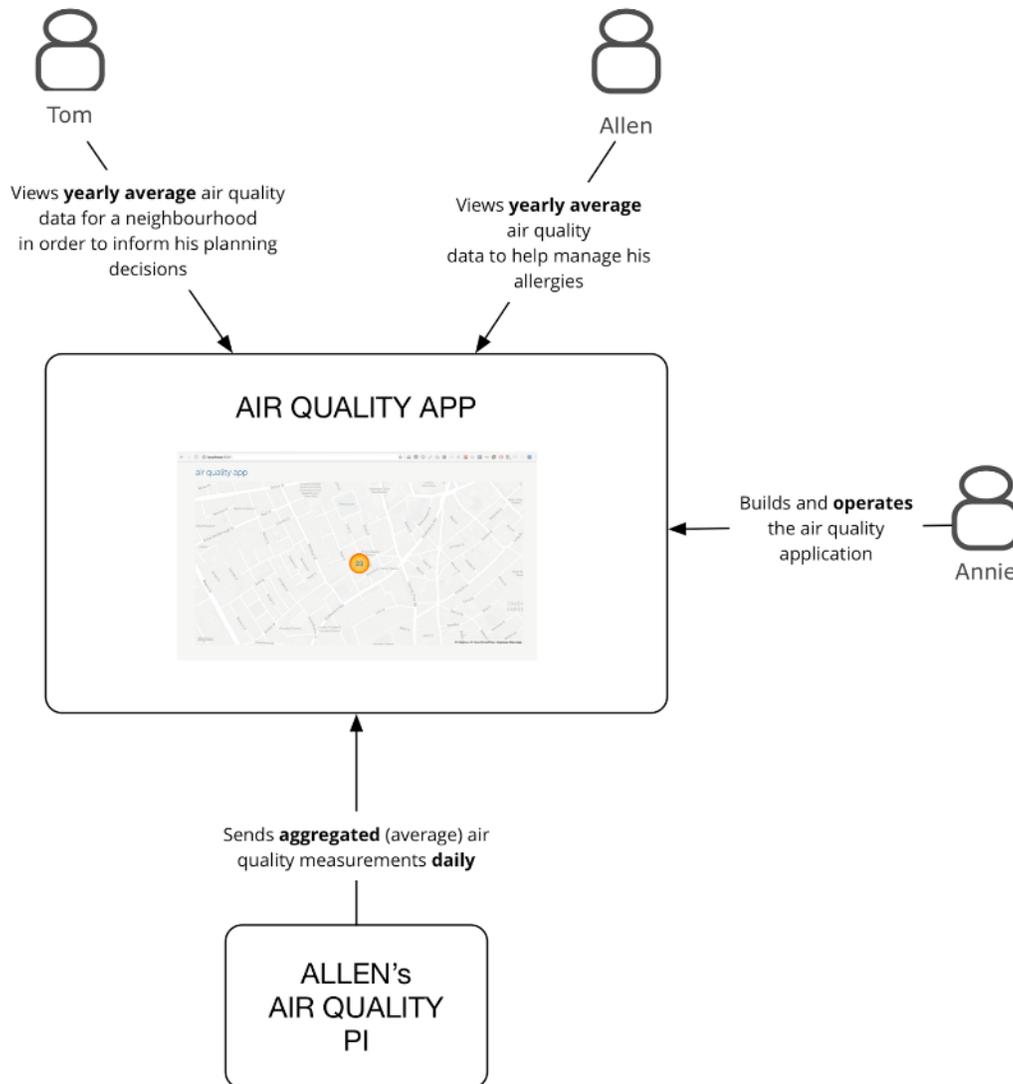
Name

Air Quality Monitor

Context Diagram

Figure 3: Context Diagram for Prototype 1

Use Case

Participatory Citizen Sensing

Participant Topology

Aggregated Data Share

Description

The Air Quality App provides a map-based view of average air quality over the past year. It is derived from information received from in-field sensors. For the MVP, a single sensor was connected to a Raspberry Pi, which then sends air quality data to a website that displays the data.

The website displays an aggregation function of the data to show the yearly average for a particular sensor. This aggregation happens in two parts. Firstly, the raw data stream is stored on the sensor device (Raspberry Pi) and a daily average is sent once per day to the website. The website stores this data and displays an aggregated yearly average.

Architectural Relevance

- Processing and standardising data from IOT devices (with collaboration from DECODE partner Thingful)
- Interacting with hardware devices (e.g. Raspberry PI, grove board)
- Large streams of data
- Aggregation of data in a central location
- Privacy issues relating to data streams and meta data (for example, precise street address of the sensor)
- Privacy by design through aggregation at source of the data (the central aggregator doesn't need access to the full dataset from the device).

Proto-Personas

- 'Allen', the 'allergy sufferer'. Allen owns an IoT device to monitor air quality to combat his allergies
- 'Tom', the 'town planner'. Tom needs information about air quality in different neighbourhoods of the city to inform his actions
- 'Annie', the 'ethical hacker'. Annie is a software developer, who has implemented an application to visualise air quality information.
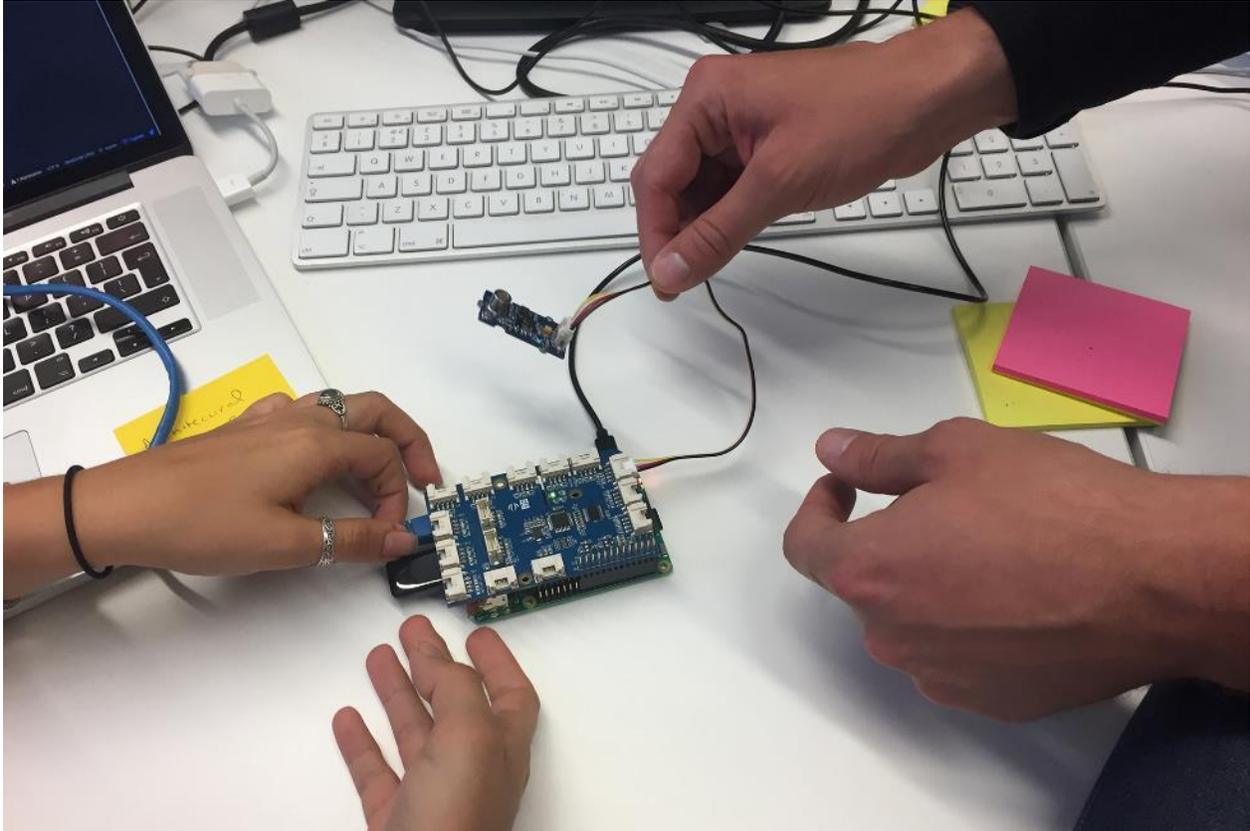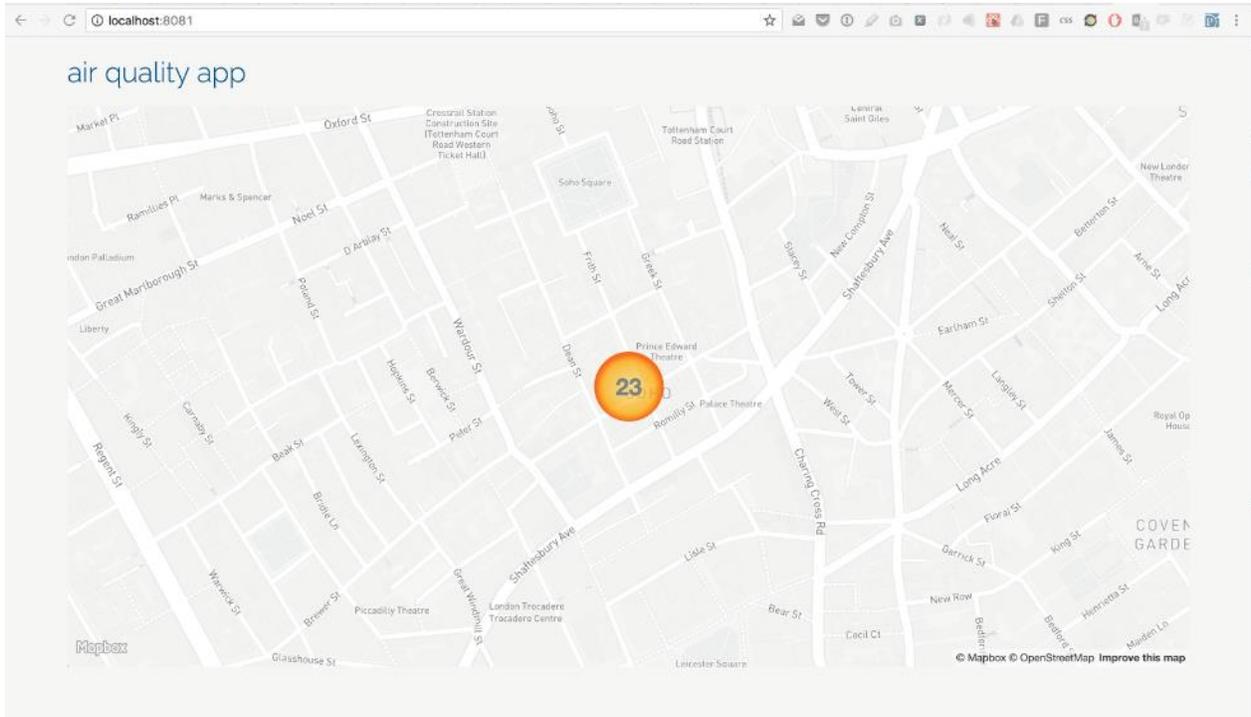
DECODE Team Members Working on the Sensor for Prototype 1

User Requirements

As Allen the allergy sufferer, *"I want to be aware of the air quality in my area so that I can manage my allergies."*
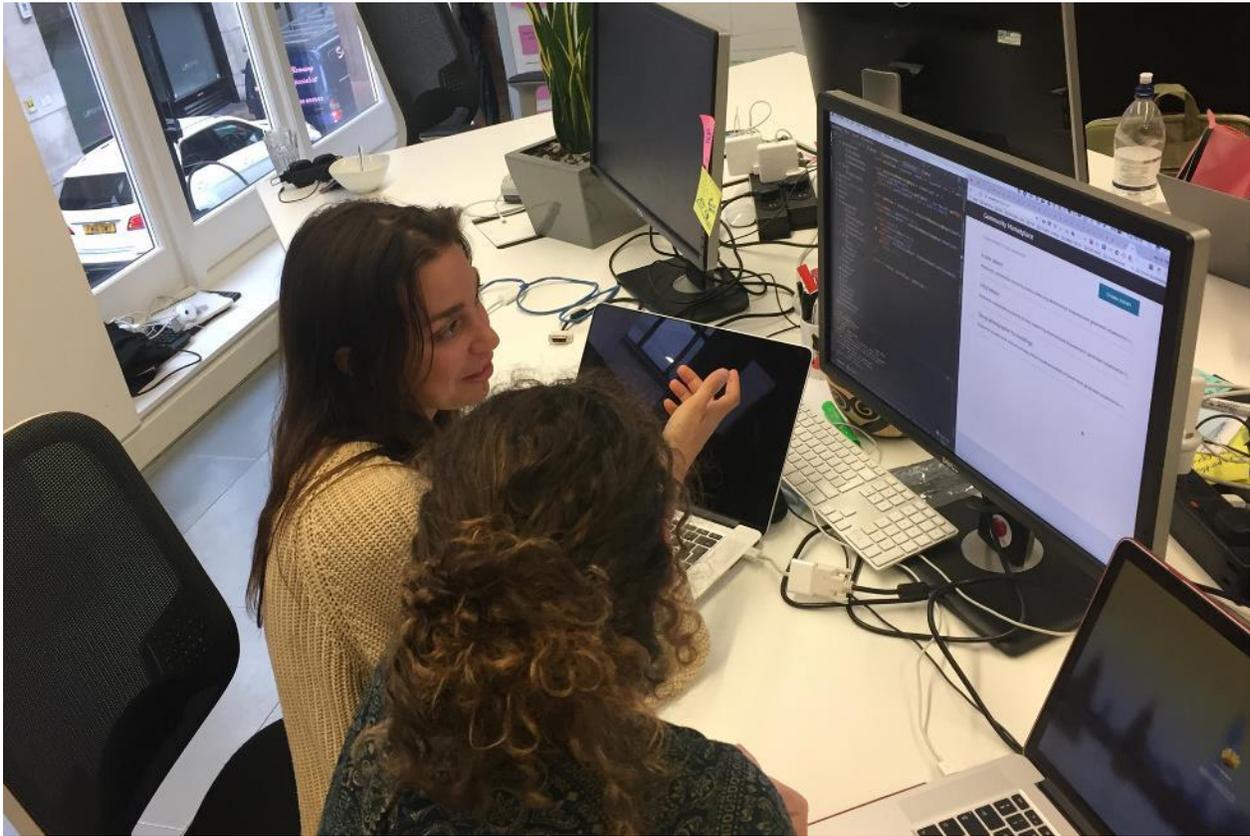
As Tom the town planner, "*I want to be aware of the air quality in a particular area so that I can make informed planning decisions".*

As Annie the ethical hacker, "*I want to be able to easily build an application which makes use of IoT sensor data".*

Screen from the DECODE Air Quality Prototype

6.4.2) Prototype 2: Marketplace App

DECODE Team Members Working on Prototype 2
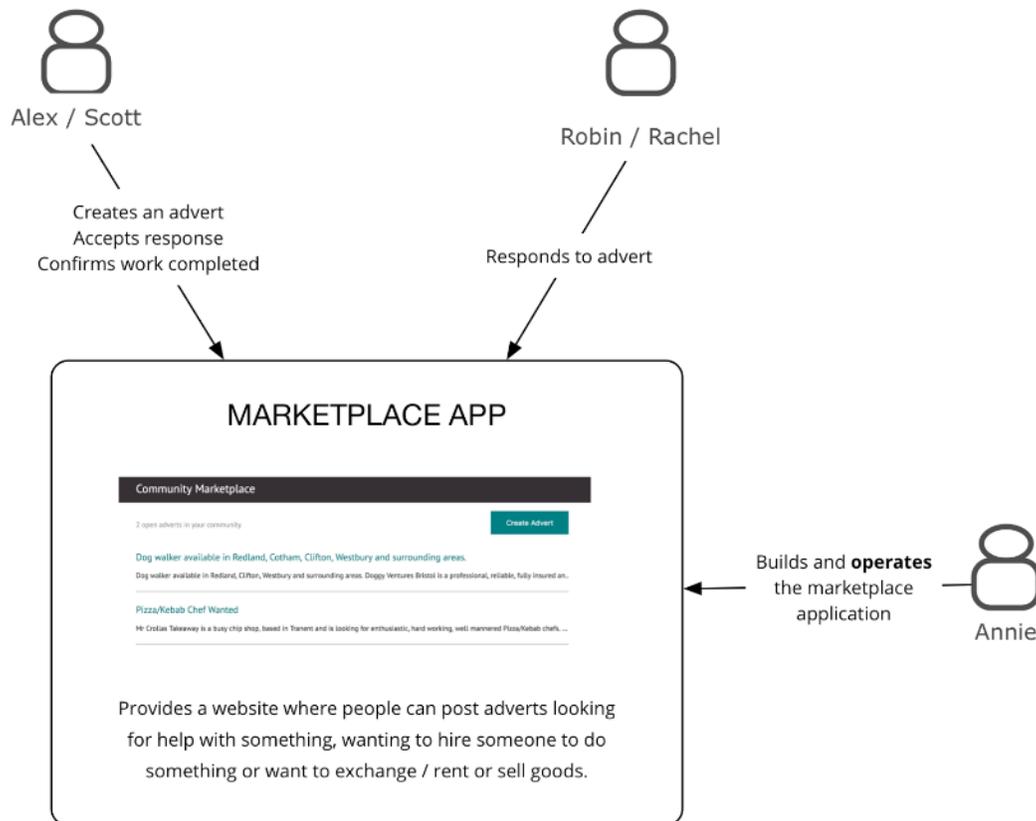
Name

Community Marketplace

Context Diagram

Figure 4: User Interactions with the Community Marketplace

Use Case

Collaborative Economy/Hospitality

Participant Topology

P2P market, P2P data share

Description

This prototype provides a website where people can post adverts looking for help with something, wanting to hire someone for a task or wanting to exchange, rent or sell goods. Other users can then reply to these adverts. It can be thought of as the equivalent of a community notice board.

The application allows participants to track of the state of the advert as a 'contract'. If the user posts an advertisement, they become an advertiser, with the ability to view their advertisement and filter the responses by accepting or rejecting them and marking the accepted ones as complete. If the user posts a response, they can track the status of the response. The MVP provided a basic 'contract' evolution of:

Post an Advert

- Responses are received
- Advertiser can accept or reject responses
- Once the task / exchange is completed Advertiser marks it as 'Complete'

Architectural Relevance

- Representation of a multi-stage contract between two participants (ultimately related to 'Smart Rules' in the DECODE platform)
- Exploring the domain of a peer to peer marketplace

Proto-Personas

In this prototype there are two types of interaction that can occur, exchange of goods and exchange of services (which we represent as someone looking for help with something or wanting to hire someone to do something). There are two personas for each interaction type to represent each side of the 'peer to peer contract'.

Exchange Goods

- Alex, the 'advertiser'. Alex prefers to reuse and recycle things instead of throwing them away. Alex needs to be able to recycle or sell unwanted items.
- Robin, the 'responder'. Robin has recently moved to the area and wants to furnish his home. Robin needs a place to find and purchase furniture locally.

Looking for Help / Wanting to Hire Someone

- Scott, the 'service requester'. Scott has two dogs and has started a new job, which means he commutes to the city. Scott wants to advertise for a dog walker, for when he is at work.
- Rachel, the 'responder'. Rachel is keen to help others in the local area where possible. Rachel needs a place to find opportunities to help others.

App Developer

Annie, the 'ethical hacker'. Annie is a software developer, who has implemented a application to allow users to post and respond to advertisements.

User Requirement

As Alex the advertiser "I want to be able to offer my unwanted items to other people in my community so that I don't feel bad throwing them away".

As Robin the responder "I want to be able to find furniture for my new home that is in my local area so I can easily collect it myself. I want to be able to communicate with the advertiser so I know where to collect the items from".

As Scott the service requester "I want to be able to advertise my need for a local dog walker so that I can be sure my dogs are always looked after if I have to work late. I want to be able to see who has responded before I commit to a person".

As Rachel the responder "I want to be able to find opportunities to help other people in the local area so that I can make good use of my spare time. I want to be able to discuss how I can help before meeting in person".

Community Marketplace

2 open adverts in your community

Create Advert

Dog walker available in Redland, Cotham, Clifton, Westbury and surrounding areas.

Dog walker available in Redland, Clifton, Westbury and surrounding areas. Doggy Ventures Bristol is a professional, reliable, fully insured an..

Pizza/Kebab Chef Wanted

Mr Crollas Takeaway is a busy chip shop, based in Tranent and is looking for enthusiastic, hard working, well mannered Pizza/Kebab chefs. ...

Community Marketplace

Dog walker available in Redland, Cotham, Clifton, Westbury and surrounding areas.

Dog walker available in Redland, Clifton, Westbury and surrounding areas. Doggy Ventures Bristol is a professional, reliable, fully insured and environmentally friendly dog walking and pet sitting service in Bristol. We are currently looking for more dogs to add to our small pack around this area. Solo walks or group walks (4 dogs maximum) available. £9 for a 1 hour shared walk. For more pricing details please see our website, email or call Catherine

Pending responses

I really need a dog walker. Please call me.

Reject | Accept

I might need one

Reject | Accept

Hide advert

Screenshots of early iterations of the Marketplace App

6.4.3) Prototype 3: Petitions App

Name

Secure Petitions

Context Diagram
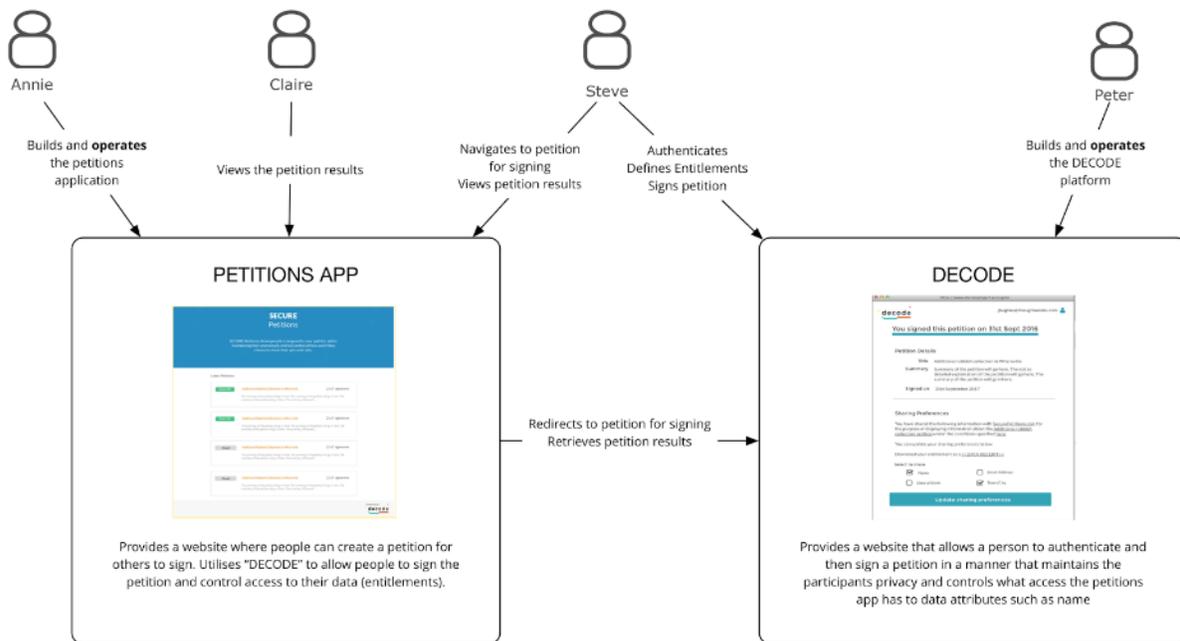

Figure 5: Creating Petitions

Use Case

Open Democracy

Participant Topology

Collaborative data share, aggregated data share

Description

This provides a website where people can create a petition for others to sign. It utilises another website, 'DECODE' to allow people to sign the petition and control access to their data (entitlements). The DECODE website represents the future DECODE platform that the participant will interact with to complete some key actions. The hypothesis for this is that in order to provide the strongest privacy design, data should be kept separate. This would mean that data owned by the participant could not be present in any form on the petition system, unless the participant had explicitly granted all entitlements.

Architectural Relevance

- Explore the domain of petitions, a theme within citizen democracy
- Explore the UX impact of a participant interaction with multiple systems and entities (the petition app and 'DECODE')
- Begin to explore the UX challenges of representing entitlements
- Provide a basis to explore the technical implementation of entitlements, for example 'D3.2 Data access and Transaction model'
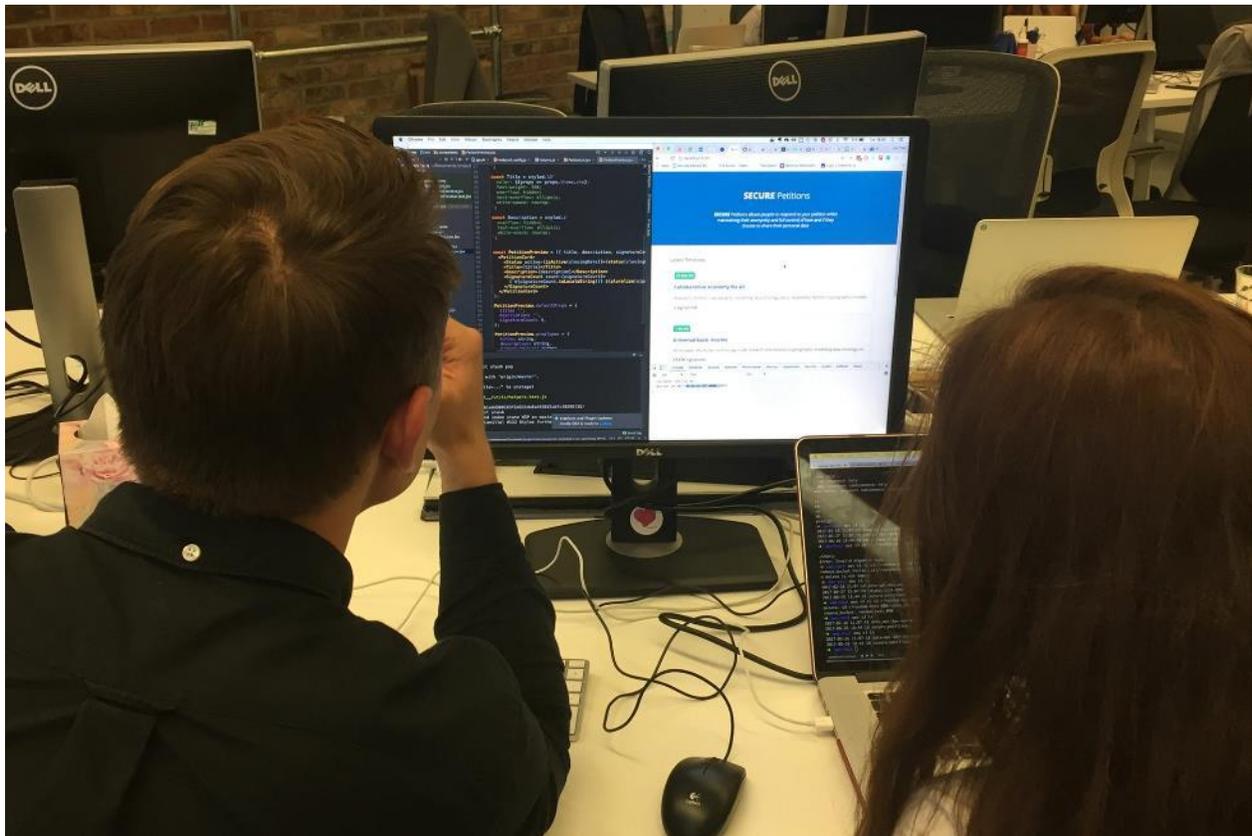
DECODE Team Members Working on the Petitions App

Proto-Personas

- Claire, the 'petition creator'. Claire is very active in her local community. She wants a place to create petitions to gather support for the issues she is interested in.
- Steve, the 'petition signer'. Steve is concerned about issues in his local area, particularly affecting his children. He wants a place to sign petitions to show his support of the issues.
- Annie, the 'ethical hacker'. Annie is a software developer, who has implemented an application to allow people to sign petitions and control visibility of their data.

User Requirements

As Claire the petition creator, I want to be able to create an online petition about topics which I believe are important to my community so that we can gather support to make changes for our benefit.

As Steve the petition signer, I want to be able to sign petitions about issues that affect me so that my voice can be heard in helping to resolve these issues.

As Steve the petition signer, I want to know exactly what personal data will be shared before I sign a petition. I want to be able to choose whether or not to sign the petition based on my personal sharing preferences.
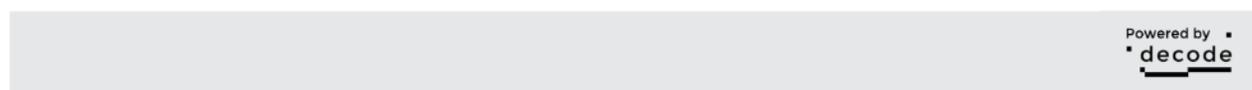
Screenshot of early iterations of the Petitions App

In this phase the prototype applications built in the earlier stages of the project will be used to explore key areas within the DECODE platform and how they may evolve towards concrete implementations. This is what we refer as the "Scale Model". It will allow experimentation with different options and help focus decision making.

Focus will be around the responsibilities of the components and their integration points. For example, in the case of the petitions prototype, exactly what data will be stored in the distributed ledger? This will inform our thinking both in design of the platform and of the Pilot projects.

6.5) Phase 3 – Alpha Platform

In the 'alpha' phase, the platform will be made available for the early build stages of the pilot projects. It will contain a concrete selection of components and design strategies, and would allow for small-scale testing of the selected pilots. As the pilots evolve towards their launch, the platform will move into the 'beta' phase.

In the alpha phase, the goal is to use technologies that work but are not required to represent the complete ambition of DECODE. For example, either a lightweight version of a component may be introduced, or an existing open source technology chosen to make progress, with the expectation that this will be replaced during later phases.

6.6) Phase 4 – Beta Platform

In the beta phase, the platform will have all of the required functionality to support the four pilots and will have a reasonable developer experience. The beta phase will last the duration of the execution of the pilots and will constantly evolve the features of the platform. Where the alpha phase will concentrate on functionality, the beta phase will concentrate on increased scalability, operability and other cross-functional requirements. The beta phase will also evolve any areas of particular interest such as zero knowledge proofs.

6.7) Phase 5 – Live Platform

It is anticipated that the platform will remain in "beta" for some time, as more use cases and apps are onboarded. The live phase represents a point at which the platform has matured significantly to be open to all developers to use it with minimal instruction. It would be considered to be a fully tested and proven system. We strive for sustainability of the project outcomes, so that they continue to have impact even after the project end.

7) Conclusion

The process for establishing user requirements for the four pilots —and the preliminary version of the platform—has been an insightful and rich experience. It has enabled us to appreciate the differences and similarities between the user communities in the pilot cities, Barcelona and Amsterdam.

So for instance, we have identified common challenges that affect all communities, such as collaboration, housing and citizenship. This ensures that the DECODE approach is general enough and is readily transferable to other countries and citizens.

But it has also been important to incorporate a sufficiently wide range of technical challenges, in order to demonstrate DECODE's capabilities. For instance: showing the ability to handle specific data challenges from the information gathered from in-city noise sensors; or handling privacy-related data challenges arising from online voting. The four selected DECODE pilots satisfy these requirements.

Agile methodology has forced us to conduct intensive user research to fully understand the challenges. User surveys, conducted locally in Amsterdam and Barcelona, highlighted real-world problems the users faced. That ensures that DECODE does not operate on untested assumptions. Agile methodology also guided the development of the prototypes that were used to continuously validate technical performance and suitability of the platform with its underlying architecture.

The requirements explained in this deliverable enabled us to start the first versions of the pilots and the alpha phase of the underlying platform. The requirements will evolve and will be validated throughout the lifetime of the project—this will ensure that DECODE adapts to the users' current problems and delivers the right technology at all times.

During the pilot discovery session in Amsterdam, timeline to progress with the Amsterdam pilots were defined. Hence, the selected pilot candidates of Amsterdam, FairBnB-Rental Register and Gebiedonline are subject to full agile inception process in the second week of July. In this way, both Amsterdam and Barcelona pilots will reach the same level of pilot specification both in terms of technical and user facing components. Consortium partner Dyne has supported the partners leading the Amsterdam pilots towards finding the optimum schedule and setup for the inceptions. Moving forward DECODE will be progressing with its four pilots in Amsterdam and Barcelona, which will also accelerate the development of the underlying DECODE technical platform.

8) Glossary of Terms

Proto-personas: Proto-personas are a variant of the typical UX personas, the distinguishing factor is that that they are not initially the result of user research. They are outputs of brainstorming sessions with participants involved in a group or a workshop with some domain knowledge and gut feeling about the generic use cases for the product. These form a prototype which is then verified with user interviews.

9) Appendix

1) User Research Questions

A user research questionnaire was distributed to a cross-section of people resident in Barcelona. Below are the specific questions that were a part of the questionnaire.

1.1) User Interviews – Poblenou, Barcelona

Demographics

Q. Are you a resident of Barcelona?

Q. Age / Gender / Location

Internet Usage Habits

Q. How often do you go online?

Q. What devices do you use to go online with?

Q. What time of day are you most likely to be online?

Interest in Local Issues

Q. Are there any issues within Barcelona that you are particularly interested in knowing more about?

Q. Where would you look for information on these issues?

Attitudes

Q. How important is it to you to keep your data secure online?

Q. How often do you vote?

Q. What sort of things or issues do you vote on?

Q. How important is it for you that how you vote is/stays anonymous?

Q. Which organisations do you think store your personal data?

Q. What do you think about organisations storing your data?

Q. What do you think happens to your data when you no longer require a service?

Q. What do you think about your DNI, NIE, Passport Number? (Do you think it is secure?)

Q. If you needed to prove your identity securely online, what sort of information would you expect to provide?

Knowledge of Decidim

Q. Have you heard of Decidim?

Q. What do you know about it?

1.2) Online Questionnaire for User Research

Demographics

Q. Are you a resident of Barcelona?

A. Yes/No

Q. How long have you lived in Barcelona?

A. Less than 1 year / 1–5 years / 5–15 years / 15 years+ / All my life / Not Applicable

Q. If you haven't always lived in Barcelona, where are you originally from?

A. Catalonia / Spain / Elsewhere

Q. What is your age?

A. 18–29 / 30–39 / 40–49 / 50–64 / 65+

Internet Usage Habits

Q. How often do you go online?

A. Scale 1–5 (1 Never, 5 All of the time)

Q. Which of the following devices do you use?

A. Phone / Tablet / Desktop-Laptop / Other

Q. What times of day are you most likely to be online?

A. Morning / Afternoon / Early Evening / Late Evening / Other

Interest in Local Issues

Q. Are there any issues within Barcelona that you are particularly interested in knowing more about?

A. Air quality / Traffic / Parking / Energy Prices / Schools / Public transport-Taxi-Uber / AirBnB-Touristic / Outdoor space / Other

Q. Where would you currently look for information on these issues?

A. Google / Twitter / Local Council / Local News / Other

Attitudes to Data Sharing

Q. How important is it for you to keep your personal data secure online?

A. Scale 1–5 (1 Not important at all, 5 Extremely important)

Q. How comfortable would you be sharing the following information about yourself?

A. Scale 1–5 (1 Not comfortable, would not share with anyone/organisation, 5 Very comfortable, would share with anyone/organisation)

Sub Categories of Questions:

Personal data, Professional data, Financial data, Political opinions, Location data, Home sensor data, Device (e.g. phone) sensor data, Health data

Q. What influences how comfortable you are sharing your data?

A. Free text field

Q. What sort of organisations do you think store your personal data?

A. Free text field

Q. How do you feel about organisations storing your data?

A. Scale 1–5 (1 Extremely unhappy, 5 Extremely happy)

Q. Is there anything else you would like to tell us about how you feel about sharing data online?

A. Free text field

Attitudes to Voting

Q. Do you ever vote (community, locally or nationally)?

A. Yes/No

Q. How important is it that your vote is anonymous?

A. Scale 1–5 (1 Not important at all, 5 Extremely important)

Knowledge of Decidim

Q. Have you heard of Decidim?

A. Yes/No

Q. If yes, what do you know about it?

A. Free text field

2) Challenge Advertisement for Amsterdam Pilot

DECODE Challenge: Let your idea become reality!

Decentralized Citizen Owned Data Ecosystem

Are you fed up with the amount of information Facebook, Google and Yahoo collect about you, unsolicited? Would you like to log in without giving these companies access to your data? Do you have ideas to use blockchain as an alternative to these data addict multinationals? Do you see the internet of the future as being decentralized and distributed?

Tell us your idea, what issues you're facing and how we can help you. Might your idea be the Amsterdam pilot for this European project?

What are we looking for?

We are looking for an idea or initiative that has an issue with online identity management, privacy, access rights, reputation or sharing and storage of data. Do you want:

- An easy but also partly anonymous way to log-in for your users?
- Allow participants to share their data without their privacy being compromised?
- allow members to reach a deal without them people knowing each other very well?
- Do you have time and energy to develop an app or service with your group or community?

Pilots within one or more of the following themes are a plus: Digital Democracy, citizen measurements sharing economy.

What do we have to offer?

The winner of the challenge gets development capacity for designing and building your own app or application. We will organize workshops and design sessions to explore the use cases with users and stakeholders. If this stage is successful, your app will be built in a number of iterations and tested as a first version (MVP). The pilot is organized by Waag Society, ThoughtWorks is in charge of design and development.

The pilot takes place in the framework of the project DECODE and will use the services of the DECODE platform being developed at this time. The intellectual property of your idea remains yours and all software is developed open source. DECODE project strives for an open, transparent and decentralized Internet.

DECODE

DECODE(Decentralized Citizens Owned Data Ecosystem) is a European project in which we want to demonstrate through pilot projects in Barcelona and Amsterdam that decentralized solutions based on Internet block chains, openness and accessibility to form an effective alternative to existing platforms. This need for a new internet have many causes. The centralization of power in a few large parties put pressure on civil rights. With all the consequences for the freedom, privacy and online rights of all citizens around the world. DECODE is trying to offer an alternative in the way software is designed and used. The ultimate goal of DECODE is to reduce the digital sovereignty to the users of the Internet.

http://decodeproject.eu/

3) Technical Details of the Architectural Prototypes

3.1) Prototype 1 – Air Quality App

Technical Components

The data consumer is not a complex application that is composed of a stateless UI component that displays the annual average of air quality readings that it receives for a given location. The location is hardcoded to be a point in Soho in London where the Raspberry Pi was gathering data from.

Hardware

- Raspberry Pi
- GrovePi and Air Quality Grove Sensor. The plug-and-play board enables us to quickly prototype with a variety of sensors and requires minimal effort in installation and configuration

Software (running on the Raspberry Pi)

- Driver (script): It reads the sensor reading data and uses HTTP protocol to POST the readings to the Node every 60 seconds
- Node. Stores the readings and calculates the average for the day
- Transmit (script). Using HTTP protocol GETs daily readings from the Node and POSTs them to the Data Consumer application.

Data Consumer (Air Quality App)

There is an API that aggregates and calculates an annual average from the the daily average readings it receives from Raspberry Pi.

3.2) Prototype 2 – Marketplace

The prototype entails two main components:

- a data capture device (in the scenario, it is for Allen the allergy sufferer) to gather raw data from the environment
- the data consumer application (in the scenario it is developed by Annie for Tom the town planner)
- API (Express Node.js web application framework). Provides a simple and robust HTTP interface to store data using MongoDB. Each advertisement and reply gets assigned a unique link with a unique uuid value. It's the current simplest representation of a smart contract.

- UI (React) provides front end for the Marketplace app. Powered by the reusable React components with separate stylesheets and provides interface for users to view, post and reply to advertisements.

3.3) Prototype 3 – Petitions

Technical Components

This prototype is composed of a petitions website (Secure Petitions), and a model of a hosted DECODE application.

The Secure Petitions website can be seen from a technical viewpoint as a dashboard of information. Secure Petitions application only has data about the petitions themselves, and redirects users to the DECODE application to sign petitions securely and manage entitlements associated with the data shared. This is implemented in a NodeJS and React.

In this prototype, the DECODE application is a second website that provides an interface to sign petitions. It does user management, entitlements and action of signing happens instead within the DECODE application. This mechanism ensures that all user data is safely and securely handled only by DECODE.

At the time of writing, the implementation of this prototype is currently in progress. The technology stack might be subject to change depending on the requirements of the prototype.

- DECODE API: Handles DECODE user management, petition signing and entitlements.
- DECODE app: Displays the DECODE log-in and entitlements UIs.
- Petitions app: Displays the petitions and allows a user to click on a 'Sign button'

4) Technical As-Is Context Mapping

iDigital / BCNow Inception
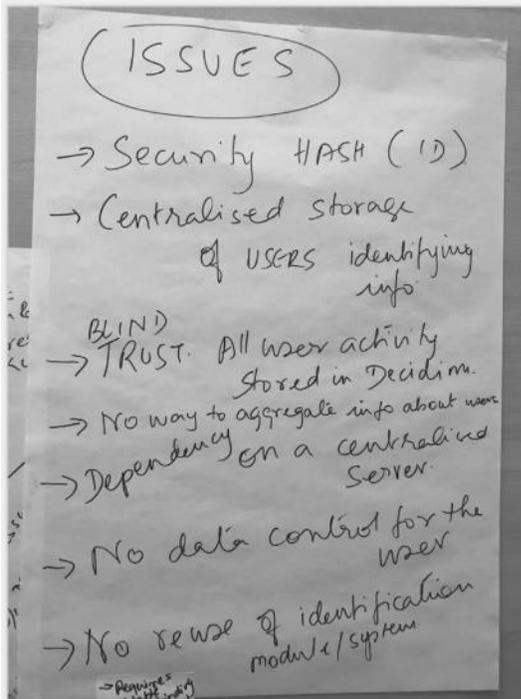
OBSERVATIONS

- ❏ Security of the system relies on the HASH of the citizens national ID
- ❏ Centralised storage of user's identifying information
- ❏ Blind Trust required from the users
- ❏ All user activity is stored 'in' Decidim
- ❏ No way to aggregate data about users
- ❏ Dependency on a centralised server
- ❏ No data control for the user
- ❏ No reuse of identification provider
- ❏ Requires auditable and legally binding system for governance data

IoT Pilot Involving #CitizenSense Inception