decode

Impact and economic sustainability of DECODE Ecosystem and future development

Project no. 732546

DECODE

DEcentralised Citizens Owned Data Ecosystem

D2.6 Impact and economic sustainability of DECODE Ecosystem and future developments

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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 Credentials

API - Application Programming Interface

BSD - Berkeley Software Distribution

CC0 - Universal - Public Domain Dedication Creative Commons License

CC BY - Attribution Creative Commons License

CC BY-SA - Attribution-ShareAlike Creative Commons License

CC BY-NC - Attribution-NonCommercial Creative Commons License

CC BY-ND - Attribution-NoDerivs Creative Commons License

CC BY-NC-SA - Attribution-NonCommercial-ShareAlike Creative Commons License

CC BY NC- ND - Attribution-NonCommercial-NoDerivs Creative Commons License

DDDC - Digital Democracy and Data Commons DECODE pilot

FLOSS - Free Libre Open-Source Software

FOSS - Free and Open-Source Software

GAFAM - Google, Apple, Facebook, Amazon and Microsoft

GDPR - General Data Protection Regulation

GPL - General Public License

IoT - Internet of Things

LGPL - Lesser General Public License

MIT - Massachusetts Institute of Technology License

NGO - Non-Governmental Organisation

P2P - Peer to Peer

SSE -Social and Solidarity Economy

1. Introduction

The present document has two main goals. On the one hand, the evaluation of the DECODE pilots' impact in terms of socioeconomic sustainability; and on the other, to draw a set of recommendations to consolidate the project ecosystem and its future development. The report has different connections with other DECODE's reports or research linked to the project[1].

The commons balance developed in the deliverable D2.1 "Multidisciplinary framework on the commons-oriented sharing economy", is presented as an analytical framework to propose the socioeconomic sustainability of DECODE ecosystem. The development of this report has been coordinated with the two deliverables focused on the evaluation of the pilots: D5.7 "Final Report on pilots Amsterdam and sustainability plans" and D5.9 "Final report on the Barcelona Pilots, evaluations of BarcelonaNow and sustainability plans", in order to try to avoid overlapping. Finally, the conclusions and recommendations of this report are connected to other reports, such as D1.12 "Policy impact of architecture and pilots' implementation", D5.3 "Data analysis methods and first results from pilots", D5.2 "CityOS connection", and D5.4 "Prototype Data Visualisation Tool".

1.1 Structure

This report has five main parts. After the introduction, the second section of the document summarises the main learning results of the application of commons balance developed in report D2.1. "Multidisciplinary framework on commons-oriented sharing economy". This framework focuses on the analysis of six dimensions: governance, economic model, technology, data policies, social responsibility and impact. These pro-democratic qualities of digital platforms have been tested empirically in a sample of one hundred cases with a presence in the city of Barcelona. The sample included a mix of platform experiences to reflect the heterogeneity of the platforms, taking into account projects promoted by different types of actors (public administration, companies, cooperatives, communities without legal format), in diverse areas (cultural, tourism, mobility), goals (knowledge co-creation, community engagement, business) and economic models (profit and non-profit oriented).

The third and fourth sections provide the methodology used to assess the socio-economic impact of the five DECODE pilots and the results obtained through the application of such methodology.

In the following section, the six dimensions of the commons balance, the learning results of the application of the common balance tool and the results obtained through the pilots' assessments have been matched to draw recommendations useful for the sustainability and future development of DECODE ecosystem. Following the commons balance structure, the recommendations are organised into three main groups: governance and economic model, technological and data policies, and social responsibility and impact.

Afterwards, a set of final remarks are pointed out to highlight the main points of DECODE ecosystem futures. Finally, the appendix includes the pilot evaluation survey used to assess the pilots impact and economic sustainability and the main references used by the development of commons balance framework.

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[1]Fuster Morell, M. i Espelt, R. (2018). How much are digital platforms based on open collaboration? An analysis of technological and knowledge practices and their implications for the platform governance of a sample of 100 cases of collaborative platforms in Barcelona. OpenSym 2018, París, 22 i 24 d'agost de 2018. ACM Digital Library.
Espelt, R. i Fuster Morell, M. (2018). Quina relació hi ha entre el model econòmic d'una plataforma d'Economia col·laborativa i la seva governança?. 3r Congrés d'Economia i Empresa de Catalunya: Cap a un model eficient i equitatiu. Barcelona, 17 de maig de 2018.
Fuster Morell, M.; Espelt, R. (2018). A Framework for Assessing Democratic Qualities in Collaborative Economy Platforms: Analysis of 10 Cases in Barcelona. Urban Sci (ISSN 2413-8851). 2018, 2, 61.

2. Commons-based models

Despite the core of deliverable D2.1 "Multidisciplinary framework on commons-oriented sharing economy"[2], the commons-based models' multidisciplinary framework, two parts configure the document. On the one hand, the whole material, and argumentation on the necessity to overcome current frameworks of sustainability with a multidisciplinary perspective. On the other, a state of the art with different disciplinary analysis: environmental sustainability perspective, gender and discrimination perspective, from an economical business model perspective, and a final part provides a state of the art from a public policy perspective, in concrete, with a legal and regulatory analysis and public policy innovations perspective (see section 6 References).

Departing from the commons balance, briefly exposed in section 2.1, the results of its application in a sample of 100 cases (section 2.2) are presented in section 2.3. The conclusions of this research, together with the feedback obtained through the pilots' assessments, allow us to provide some recommendations for the future DECODE platform deployment and scaling.

2.1 Commons balance
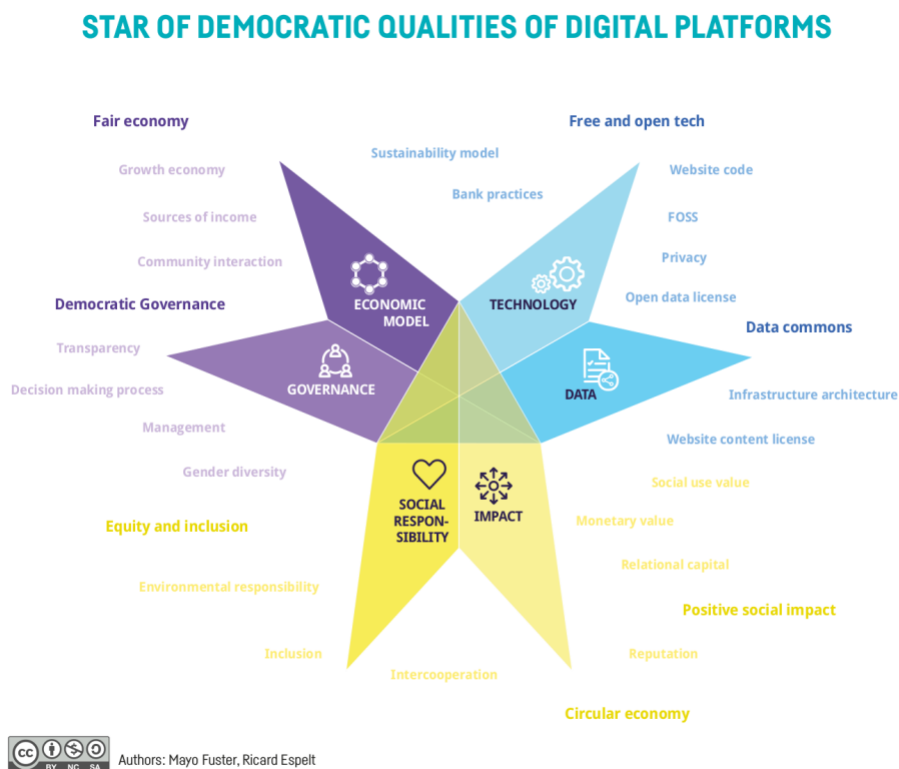
Figure 1: Commons balance assessment tool.

The commons balance is an analytical tool that helps to characterise digital platforms, differentiate models by visualising their commons qualities and provide insights into the sustainability implications of their design and performance from several perspectives. This commons balance considers the dimensions of governance, economic strategy, technological base, knowledge policies, and social responsibility towards the externalities of the platforms.

The framework of pro-democratic qualities[3] aims to address current challenges of digital platforms regarding the

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[2]D2.1 "Multidisciplinary framework on commons oriented sharing economy":
https://decodeproject.eu/publications/multidisciplinary-framework-commons-collaborative-economy
[3]See section 6. References to check the sustainability specific literature references used to build the theoretical framework of the commons balance assessment tool.

lack of analytical tools to distinguish models and analyses, sustainability and impact.

2.2.1 Governance

Regarding platform governance, several dimensions of governance and the extent to which they adopt an open modality were considered. In that sense, governance among value creators at the platform interaction level (matching platform functionalities with the grade that users can participate) and governance regarding platform provision (considering legal constitution, policies of participation and transparency) were evaluated:

1) In regards to the openness of the management of contributors, the following were considered: 1.1) the ways users can contribute to the platform content, if it is possible to create new ways of generating content, and whether it is possible to create content or (only) offer/demand/rate products or services; 1.2) the policy of platform participation: whether participation is open without filters, moderated before publication, or moderated after publication; 1.3) the possibility of user interaction: if users can communicate among themselves or create groups; and 1.4) if the platform considers different types of user accounts or a single type open to any user.

2) In terms of the openness of the election of administrators, the following were considered: if the users can self-appoint themselves as administrators; if administrators gain privileges automatically through participation; and if administrators are elected from among the general community, by other administrators, or by the infrastructure provided.

3) Decision-making with regard to community interactions, including whether or not there are formal or informal systems for community decision-making, and if the definitions of the formal rules and platform policies are open to user contributions.

4) The type of legal entity and the options for community members to engage with each type of legal entity. Public administration, university, foundation, association, cooperative, business company, or without legal format were considered.

5) Finally, in regard to governance linked to economic management, the following were considered: 5.1) economic transparency (if the economic balance is accessible to the community or if it is provided publicly); and 5.2) openness in deciding the destination of project benefits (if only project owners or the whole community have channels to be informed of and manage the benefits).

2.2.2 Economic model

At the time of studying the different digital platform models, the link between the orientation of the economic benefits and the social impact of the activity, the economic sustainability of the project, and the financing models were considered:

1) Economic orientation, taking into account: 1.1) the type of legal entity and the potential economic return that is established with the community in relation to its financing model (from more to less community): public administration, university, foundation, association, cooperative, commercial company or without legal format; 1.2) the distribution of the economic benefits: reinvested in the project, divided between the proprietors or other options; 1.3) the growth model: organic, that is to say, escalating economically without impacting on the governance model; reproductive, that is to say, replicating the model or speculative, that is to say, with the will to achieve maximum growth and then sell the project; 1.4) the commercial character of the platform, considering whether monetary exchanges between users are: never, almost never, sometimes, often or almost always; and 1.5) the use or not of banking services ethics.

2) Regarding sustainability, whether the economic balance of the initiative is positive or not was considered to evaluate its sustainability.

3) Regarding the platform's financing models, the type of resources used will be studied, namely: private capital, public financing, non-monetary internal donations, external non-monetary donations, family savings, organisation of events, research programs (H2020), commercialisation of the brand, microfinance, prizes, by-products or derivatives, free resources, training programs, premium services, quotas, alternative currencies, bank credit, merchandising, advertising, monetary donations and commercialisation of data.

2.2.3 Technological policies

Technological practices and policies openness refer to the adoption of software and technological architecture that favour freedom and openness.

The type of license used by the platform has been used as an indicator. The criteria to categorise the licenses is formulated depending on their degree of favourability to openness, or "freedom". In this case, we have prioritised the robust licenses (copyleft), such as GPL and LGPL, that allow freedom to be maintained throughout the entire chain of users, from its author to the end-user, for which they make use of copyleft, forcing derivative work to be maintained with the same copyright regime as the original. Then, in the degree of openness, the permissive software licenses, such as MIT and BSD, that make the distribution of the work more flexible, either as free or private were placed. Finally, all rights reserved or contents without a license were located.

Regarding technological architecture, two indicators were adopted. First, the type of technological infrastructure on the platform. These were categorised from more open to less, considering, at the same time, reproducibility (the availability of source code as FOSS) and distribution (which would range from p2p to federated to centralised). As: 1) Peer-to-peer (e.g., BitTorrent); 2) Centralised reproducible FLOSS, but not federated (e.g., Media wiki); 3) Federated (e.g., Kune); 4) Centralised in one entrance point (e.g., Wikia); and 5) Centralised but not reproducible because one node is exclusively provided by the platform owner and proprietary (e.g., Facebook). The other indicator considered was the use of a blockchain (Yes/No) with the objective to decentralise the platform's technological architecture and open up community participation.

2.2.4 Data and knowledge openness

Regarding knowledge platform policies, two types of elements were adopted: content and data. The content element refers to the type of user-generated content license. The license used and their categorisation from more open/free to less were: 1) Public Domain; 2) CC0; 3a) CC BY; 3b) CC BY-SA; 4a) CC BY-NC; 4b) CC BY-ND; 5) CC BY-NC-SA; 6) CC BY-NC-ND; and 7) All rights reserved or No license. In this case, the possibility to share only by author recognition (CC BY) and the possibility to keep the same license attributions (CC BY-SA) were balanced. In the same sense, the possibility to create author recognition non-commercial derivatives contents (CC BY-SA) and author recognition with no derivatives (CC BY-ND) but potential commercial contents were equated.

Regarding open data policies, the indicator adopted is the ability to access data generated by users, taking into consideration their agreement. The options considered were (from more open to less): 1) API without restrictions; 2) Full data export (data dump); 3) Freely downloadable as a whole; 4) API with some restrictions; 5) Freely downloadable in part; and 6) Not possible to export, copy, or access any API.

2.2.5 Social responsibility and impact

These dimensions are related to any source of awareness and responsibility regarding the externalities and negative impact such as social exclusion and social inequalities, regarding the equal access of people from all backgrounds in an equitable and impartial way. In addition to this, social responsibility and impact also involves the inclusion of gender, compliance with health standards and safety standards that protect the public; and the environmental impact, the impact in the policy arena, and the preservation of the right to the city of its inhabitants and the common good of the city; the protection of the general interest, public space, and basic human rights such as access to housing.

2.2.6 Summary

On the basis of the common balance, commons-based models can be defined as a tendency, a set of qualities, and a modality of digital platforms, regarding both the design and the performance of the process. The commons-based model is characterised by a common approach regarding the dimensions of governance, economic strategy, technological base, knowledge policies, and social responsibility of the externalisation impact of the platforms. In this regard, the sharing-oriented platform economy is characterised by: (1) favouring P2P relations, in contrast to the traditionally hierarchical command and contractual relationships detach from sociability, and merely mercantile exchange, and the involvement of the community of peers generating in the governance of the platform; (2) it is based on value distribution and governance among the community of peers, and the profitability is not its main

driving force; (3) it's developed over privacy-aware public infrastructure, and results in the (generally) open-access provision of commons resources that favour access, reproducibility and derivativeness; and finally, (4) the responsibility with the externalities generated by the process.

2.2 Empirical testing

The framework, developed in D2.1 report, has been tested empirically in a sample of 100 cases with a presence in the city of Barcelona. A "codebook"[4] for data collection, a set of indicators related to the analysis variables linked to the five dimensions described (Governance, Economic Model, Technology Policies, Data Policies and Social Responsibility and Impact), was employed. Data collection was based on two methods: web collection and structured interviews.

2.2.1 Digital ethnography

Departing from the codebook, web data collection was based on digital ethnography of the 100 digital platforms selected cases. The information was retrieved by surfing the internet and the use of metric tools like Alexa and Kred.

2.2.2 Structured interviews

Structured interviews with the managers of fifty of the one hundred digital platforms cases were performed. The contact details of the managers were retrieved from the platform website (sometimes through the generic mail of information). The goal of the interview was to explore the model of the platform, especially its economic model, and amplify the web collection data. The structure of the interview follows the codebook indications (phone collection questions). The answers were collected on an online survey filled in by the same interviewer.

2.3 Learning results

In this section, we have summarised the main results[5] of this empirical test to afterwards contrast and enrich the pilots' assessments.

According to the results, as a whole, a commons-based model platform is characterised by: (1) favouring peer-to-peer relations in contrast to the traditionally hierarchical command and contractual relationships detached from sociability, and mere mercantile exchange, and the involvement of the community of peers generating in the governance of the platform; (2) it is based on value distribution and governance among the community of peers, and the profitability is not its main driving force; (3) it is developed over privacy-aware public infrastructure, and results in the (generally) open-access provision of commons resources that favour access, reproducibility and derivativeness; and finally (4) the responsibility with the externalities generated by the process.

[4]DECODE codebook

[5]Fuster Morell, M. i Espelt, R. (2018). How much are digital platforms based on open collaboration? An analysis of technological and knowledge practices and their implications for the platform governance of a sample of 100 cases of collaborative platforms in Barcelona. OpenSym 2018, París, 22 i 24 d'agost de 2018. ACM Digital Library.

Espelt, R. i Fuster Morell, M. (2018). Quina relació hi ha entre el model econòmic d'una plataforma d'Economia col·laborativa i la seva governança?. 3r Congrés d'Economia i Empresa de Catalunya: Cap a un model eficient i equitatiu. Barcelona, 17 de maig de 2018.

Fuster Morell, M.; Espelt, R. (2018). A Framework for Assessing Democratic Qualities in Collaborative Economy Platforms: Analysis of 10 Cases in Barcelona. Urban Sci (ISSN 2413-8851). 2018, 2, 61.

The results of the commons balance application demonstrate the relevance of the dimension considered. Considering the basis of the data that pro-democratic qualities in platforms are not irrelevant nor prevalent, as seen in around one-third of the sample, the cases which tended to be more democratic in one dimension also tended to be less in the other dimensions. This suggests that a segment of the overall platform ecosystem could be characterised as more democratic, while a larger segment is not based on any of the methods of openness considered. The results showed a connection between the indicators that define knowledge and technology policies, which, at the same time, are intertwined with governance and the economic model. In that sense, the investigation suggests that democratic openness in technology and data areas tends to also be reflected in other governance and the economic model.

The results of the analysis of each of the dimensions also provided interesting insights:

2.3.1 Governance

Regarding the governance, it was observed that the majority of platforms allow users' participation, publishing without many constraints and facilitating the creation of groups in order to promote new content or offering, demanding, or rating products or services. At the same time, the majority of platforms, with a varied type of legal entities, involve the community in the decision-making process. Most of the platforms have economic balance accessible by their members and part of them have spaces where the community can decide the destination of benefits. In addition, the correlation between the subdimensions of governance demonstrates how important the type of entity is in the way that contributors are managed and which is the platform economic model in terms of who decides the destination of economic benefits and its transparency.

2.3.2 Economic model

Focusing on the economic model, digital platforms have a rich and varied universe, balancing organisations that have a more and pro-public community character and more private and pro-market ones. Despite this, the majority of platforms do not encourage economic exchange, reinvest their benefits and do not have a speculative approach. At the same time, ethical banking services, public funding and non-monetary donations have a great role in the model of sustainability. This highlights the importance of volunteer work and is linked to the mutual society for the sustainability of initiatives, and the creation of communities around the projects as the central capital for the viability of projects.

On the other hand, the role of public policies is important, since almost 2 out of 3 projects receive public funding. For example, some projects have been granted support from Barcelona City Council through a match-funding campaign, which allows projects to obtain sources from public administration and the community around the project. In this sense, the link with research is also an important element for economic sustainability. While traditional models of funding (bank loans, merchandising, advertising, donations, etc.) have less presence, some new types of businesses, like the commercialisation of data, have hardly been explored. In relation to internal economic correlations, we observe how legal entity impact in the model of funding and the large interactions among the different types of funding.

2.3.3 Technology and data policies

Focusing on technology policies, the majority of platforms are private but open licenses are also represented. Two factors may explain this result. The first is the desire to restrict the use of the website's software to the platform owners. The second is the low level of attention to software, content license, and open data exportation in the growing cooperative platform model (cooperatively owned, democratically governed businesses that establish a digital platform to facilitate the sale of goods and services). In the same sense, technological architecture balances open and closed models, while projects are exploring blockchain, especially those which promote open code. At the same time, data policies replicate private licenses content and non-downloadable data domination.

2.3.4 Social responsibility and impact

In regard to social responsibility and impact, even though most of the platforms have social and ecosystem responsibility, considering inclusion or collaborations with other actors (focusing on local) of their sector, the gender gap is sizable and environment attendance is dismissed. Correlations show a great connection between the size of

the community and their active participation.

2.3.5 Learning results summary

One of the main observations is the key role of the platform governance model, which has a strong correlation with the economic model and technological and data policies (which are also intercorrelated). Therefore, a first major conclusion is that the more democratic the governance of a platform is, the more democratic its economic model will be. The analysis variables used to study this connection have reinforced this correlation, especially with respect to the community's participation. Thus, the generation of spaces, whether formal or informal, to promote democratic governance and promote transparency are key elements for generating sharing economy platforms based on the common good.

Another major conclusion regarding dimension interactions is the disconnection between the social responsibility and impact dimension and the rest of the dimensions analysed. The traditional disconnection between open commons and social and solidarity spheres can explain this.

In sum, the results of this investigation suggest a better proliferation of pro-democratic governance economic models than technological, knowledge, and data ones. The results also highlight the interrelated strength of these four dimensions in the promotion of the open collaborative ecosystem. In addition, the results point to a disconnection between social responsibility and impact and the other dimensions.

3. Impact of the pilots

3.1 Introduction

The following two sections provide an overview of the socio-economic impact of the DECODE pilots and their possible future implementation. They specifically deal with the outputs of each pilot, lessons learned, and the scalability and sustainability of the DECODE ecosystems.

As a result of the task performed in the deliverable D1.1 "DECODE scenarios and requirements definition report", two main DECODE pilots were selected to be implemented in Barcelona. First, Digital Democracy and Data Commons (DDDC), which is a participatory process oriented to test and implement DECODE technology to the digital participation platform Decidim with the aim to promote better user awareness and data control, as well as to build a local data commons network. The second pilot selected was Citizen Science Data Governance (IoT), which aims to enable communities to support IoT data gathering and allow them to control what information is shared, with whom, and under which conditions. In order to connect both pilots and to ensure and simplify the task of showing DECODE's aims and functionalities, BarcelonaNow was developed as a meta pilot to enable citizens to explore and match the data generated through the Barcelona pilots with Barcelona City Council data and other external open-access data, using interactive dashboards. The BCNow pilot is not officially a pilot in itself, but part of the official activities undertaken for the two Barcelona pilots (IoT and DDDC). However, a lot of work was conducted on this component before the pilots started, and we believe that sufficient impact has been achieved that BCNow is worthy of its own section within this deliverable.

Two other pilots were carried out in Amsterdam: Claim Verification 18+, which use Attribute Based Credentials (ABC) in order to give citizens access to personal data that is stored in the municipal database, and allows them to share these data in a different context, on- or offline; and Gebiedonline, which aims to build a more privacy-preserving local social network, developing a feature to allow users of the Gebiedonline platform to have granular control over the data they share.

3.2 Methodology

The results presented are based on both quantitative and qualitative data collected during the design and implementation processes. A final evaluation survey (see 6.1 Pilot evaluation survey) has been submitted to the pilots' leaders in order to gather feedback and comments, as well as to build a set of metrics through which to assess the overall socio-economic impact of the project. More specifically, the questions posed were aimed at exploring the following five main dimensions for each of the pilots: goals achievement; tangible and intangible outcomes; community engagement and social impact; economic impact and sustainability; scalability and future implementation. Other information has been collected by directly participating in the workshops and meet-ups organised during the project. Additional qualitative data were gathered through in-depth interviews with participants in the pilots. The analysis carried out in this report on the impact of the pilots also formed the basis of the evaluations being delivered by the D1.12 deliverable - "Policy impact of architecture and pilot implementation" (forthcoming) - for which partners have shared notes and resources. The D1.12 deliverable will also contain impact evaluations, building on findings here. However, the evaluations in D1.12 will have more of a focus on the implications of the DECODE technology for creating and sustaining data commons.

It is necessary to make an important premise, drawing a distinction between the pilots implemented in Barcelona and those in Amsterdam.

In the first case, it was relatively easy, through direct participation in the various events organised within the framework of the pilots, to collect feedback, personal observations and inner perspectives through open interviews with participants and online surveys carried out by those responsible for the pilot's design and implementation. This is especially true in the case of the IoT pilot, which is characterised by the presence of a fairly compact community of participants, who have mainly met face-to-face at regular time intervals.

It is instead less true in the case of the DDDC pilot, where there were more participants but the identities of people participating in the various meetings altered almost continuously. This may have been due to the inherent nature of the platform on which the DDDC instance has been built (i.e. Decidim), to which thousands of members are registered and one of whose distinctive features resides precisely in the hybridisation between physical and virtual participation. In any case, the overall number of initiatives and their advertisement both internally to the DECODE project partners and to Barcelona's civil society and stakeholders has ensured the achievement of a satisfactory level of participation and an understanding of the diverse stages of pilot development (the DDDC pilot had a Decidim-based website set up for the pilot[6] that facilitated the publicity effort).

Review of the pilots carried out in Amsterdam were less intensive than in Barcelona. This is a reflection of both the technical focus of the project (mainly based on the BCN cases) and the locality of researchers.

3.3 Results

3.3.1 Digital Democracy and Data Commons (DDDC) [Barcelona]

A full description of the pilot, with detailed information about goals, implementation steps and developed tools, can be found in D2.5 "Technopolitical Democratisation and Digital Commoning: the Case of the Digital Democracy and Data Commons (DDDC) pilot" and D5.6 "Deployment of Pilots in Barcelona". Additional information is available on the pilot website[7]. All the resources produced during the different stages of the pilot including 18 documents related to the technical, economic, legal and political frameworks are also available in the aforementioned website.

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[6]More details can be found at the following link: https://dddc.decodeproject.eu/processes/main/
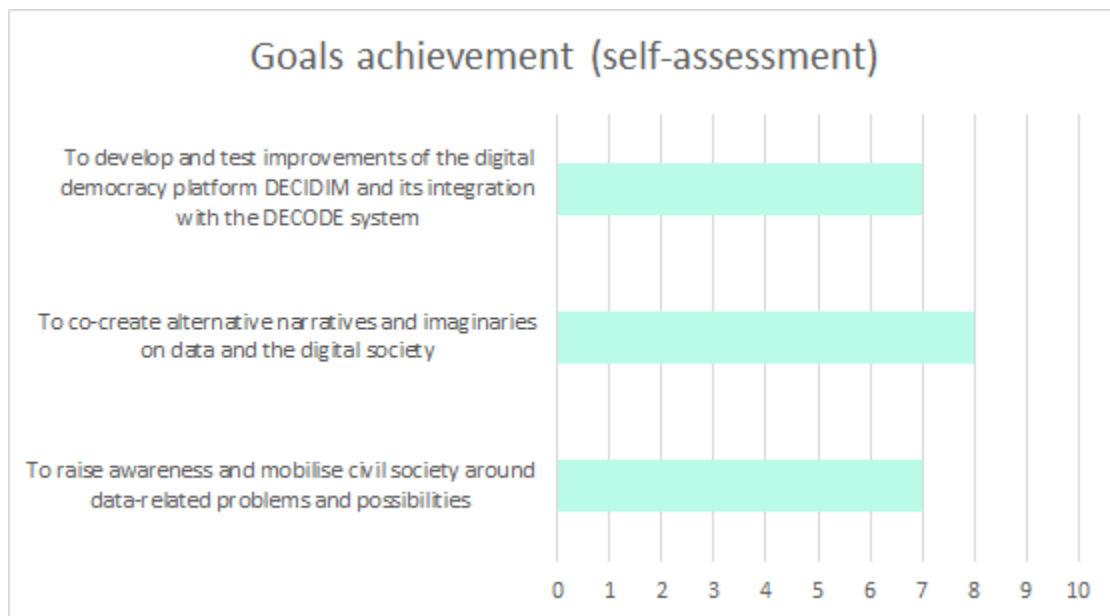[7]https://dddc.decodeproject.eu/

Figure 2: Answer provided by DDDC pilot representatives to the question: "Please briefly describe the three main goals of the pilot and how much they have been reached on a scale from 0 to 10".

3.3.1.1 Community engagement and participation[8]

The pilot was designed and implemented through a participatory process which involved different social actors from civil society, as well as the public and the private sector. Individual citizens had the opportunity to actively participate in the pilot through both online and offline channels.

Before the beginning of the participatory process, users were actively involved through a long term agile development process, which included face-to-face meetings and other online dynamics. More than 20 people contributed to the development and testing of the DECODE app in agile UX sessions, providing feedback and directly participating in the creation of its structure and contents. More details on this process can be found in D5.9 "Final report on the Barcelona Pilots, evaluations of Barcelona Now and sustainability plans".
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In terms of the participatory process, that was run from October 18th 2018 to April 15th 2020, more than 200 people were reached through a set of face-to-face activities carried out in order to engage the community. The following activities were realised: 3 workshops, with a total number of 76 participants; 4 meet-ups with 111 participants; 1 seminar attended by 11 people. 5 presentations in public events have also been organised, in order to present the pilot to a broader audience, with an average attendance of 30 people each.

The activities were open to all citizens, without any restriction. No prior selection criteria were followed, although a set of target communities and potentially interested people were identified at the beginning of the project (see D2.5 "Technopolitical Democratisation and Digital Commoning: the Case of the Digital Democracy and Data Commons (DDDC) pilot") which, as assumed, became the early adopters of the developed tools.

A sociodemographic survey addressed to 33 participants was conducted during the initial steps of the project in order to find out more about them, their neighbourhoods and their opinion regarding data management and exploitation in today's digital economy. The information collected was used to define strategies to increase the

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[8]A more detailed presentation of the pilot can be found in D5.9 "Final report on the Barcelona Pilots, evaluations of Barcelona Now and sustainability plans". We briefly summarise here some of its general aspects only.

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inclusiveness of the process and plan the following events, which were released in areas of the city characterised by lower participation and socioeconomic levels.

As of October 19th 2019, online participation through the DDDC platform resulted in 223 users, 97 proposals, 118 votes, 86 comments, 8 meetings and 2 petitions. These numbers are provisional, as two more events are planned for November 2019. The final numbers in terms of participation will be registered in D.5.9 "Final report on the Barcelona Pilots, evaluations of Barcelona Now and sustainability plans".

3.3.1.2 Outcomes and potential future benefits

The pilot fostered the rise of an open and participatory space for discussion, learning and action around data commons and digital democracy. Participants had the opportunity to collectively discuss the legal, economic and social aspects of the problems related to data control and exploitation, as well as to test the DDDC tools for deliberating on data policies and to envisage new commons-based forms of digital economy.

The activities held during the design and the deployment of the pilot had a clear impact in terms of community building, leading to the birth of a network of local organisations working in the field of data from critical perspectives (the Barcelona Data Commons Network[9]).

The pilot also provided the opportunity to design and test a tool for awareness (the Data Control Wars toolkit). Finally, it contributed to the development of an alternative narrative on data management, by collecting proposals for a collaborative manifesto (Data Commons Manifesto[10]) which has been signed on DDDC - Decidim in a secure and transparent manner, using the DECODE technology[11].

The developed tools offer practical solutions for privacy protection and for the improvement of transparency and democracy in the field of personal data management. In particular: the DECODE app[12] provides users with more control of their data, offering the possibility to share it in a secure manner with other platforms; the DECODE ledger contributes to transparency and non-tamperability of democratic processes in Decidim; the combination of Decidim with the DECODE system helps to reduce surveillance and data-based mass persuasion; the BCNNow dashboard[13] helps people to easily visualise and use their data in Decidim democratic processes, fostering data empowerment and collective intelligence.

All of these tools can play a key role in the near future, as they provide concrete responses to urgent problems relating to data sovereignty, privacy and security. They can also contribute to reducing surveillance and data-based mass persuasion, producing concrete results in terms of empowerment.

The impact of the specific pilots need to be seen in the context of the broader public policy work carried out by the City of Barcelona (in particular by the Chief Technology and Digital innovation Office and the Municipal Data Office) to establish a new ethical framework for diigtalisation centred around the concept of data commons and data sovereignty: https://www.barcelona.cat/digitalstandards/en/

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[9]The Web page, under construction, can be found at https://datacommons.barcelona/es/
[10]Available at: https://dddc.decodeproject.eu/processes/main/f/13/
[11]For a deep understanding and account of DECODE technology, please refer to the following deliverables: D3.6 "Smart Rules implementation, evaluation of prototypes and integration"; D3.9 "IoT privacy-enhancing data sharing: integration with pilot Infrastructures"; D3.10 "Implementation of blockchain platform and ABC in DECODE pilots"; D1.11 "Final version of DECODE architecture, documentation and sustainability"; D4.14 "Final DECODE app release - App published on multiple platforms"; D4.15 "Integration of all DECODE components tested in real world pilots and future sustainability roadmap".
[12]See: D4.14 "Final DECODE app release - App published on multiple platforms".
[13]See: D5.3 "Data analysis methods and first results from pilots".

3.3.1.3 Next steps

A set of activities related to the pilot have already been scheduled for the upcoming months, according to the following three main axes:

In terms of DECODE-Decidim integration, there are plans to further test the technology within the Decidim community and the Barcelona Data Commons network in the context of the Laboratory of Innovation in Democracy and its future line of action-research on Data and Democracy. In terms of outreach and cultural dynamisation, the next step is the public launch of the Barcelona Data Commons network and the organisation of events by its members. Actors within the network plan to further the development and use of the Data Control Wars toolkit in public events (the next, planned for October 27th).

In terms of policy impact, in the forthcoming months, there will be conversations with the Barcelona Data Office for exploring the possibilities of extending the democratic/citizen-driven interventions in the field of city data policy governance. Barcelona City Hall has already released one of the most innovative data policy, within the context if the digitalisation process carried out by Barcelona's CTO Francesca Bria (2016-2019): https://www.barcelona.cat/digitalstandards/en/data-management/0.1/summary. The DECODE project and the data commons approach are explicitly mentioned here: https://www.barcelona.cat/digitalstandards/en/data-management/0.1/objectives:

"*The current situation of municipal data has to be transformed in order to turn it into a public asset, or **data commons**, with defined governance and rules that are created from the perspective of data as a common asset….In order to promote and direct this concept of data commons, the City Council has to be able to propose and offer innovative solutions and ideas concerning data relating to the general public. ….Finally, we have to be able to show specific examples of the application of this data commons concept to city residents, in order to ensure their support for our work. This also has to be achieved while recognising the need to return the control of this data to the city residents who produce it, so that they can decide what they want to keep private and what they want to share, and with whom and under what conditions. This vision, based on the concept of the general public's data sovereignty, will take the form of experimental projects, such as DECODE (see below) and in the integration of new technologies, such as distributed registries or blockchains and data encryption*" (Bria, F. et al. 2018 Barcelona City Council).

This data governance plan based around ethics, privacy and security by design mentioned explicitly *data commons and data sovereignty* as part of the city's main goal. This approach is now part of the Cities Coalition for Digital Rights, a broad alliance of cities outing forward citizens-centric and rights based principles and policies for the smart city development: https://citiesfordigitalrights.org This is a very important policy result, where DECODE approach and pilots had a critical role.

3.3.2 Citizen Science Data Governance - IoT [Barcelona]

A detailed description of the pilot can be found in D5.6 "Deployment of Pilots in Barcelona". Other relevant information about the tools and technology implemented is reported in D3.7 "Data submission interface for sensor data owners" and D3.9 "IoT privacy-enhancing data sharing: integration with pilot Infrastructures". The software developed for the pilot is open source and freely available[14].

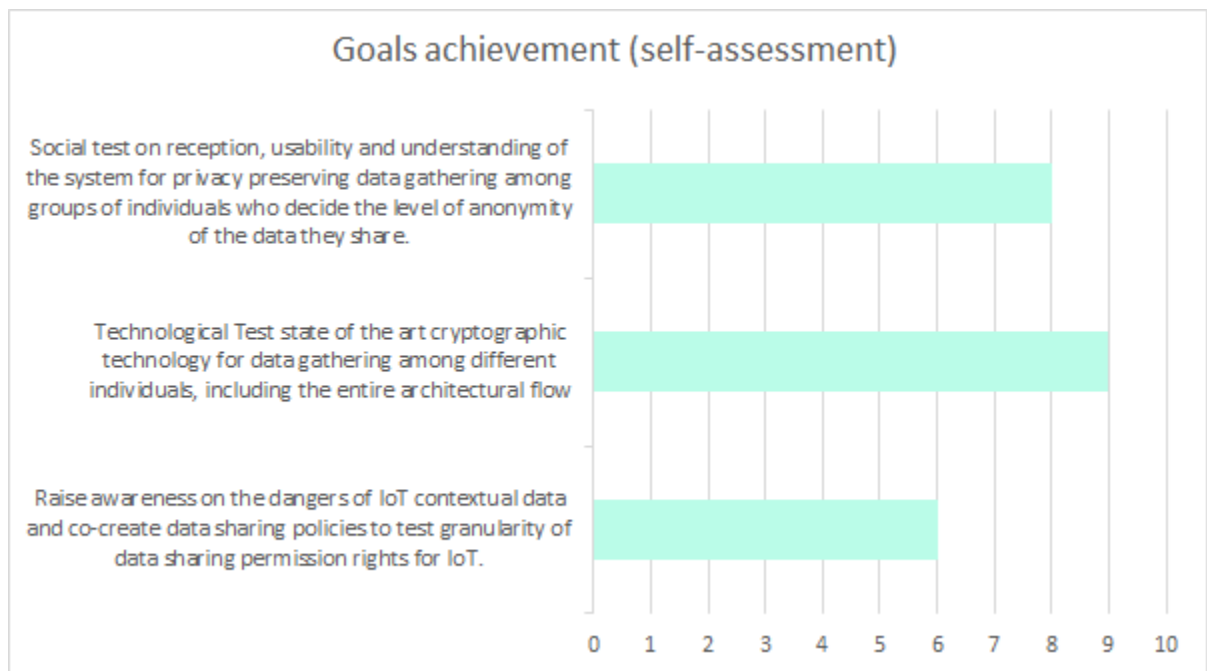
[14]https://github.com/DECODEproject

Figure 3: Answer provided by IoT pilot representatives to the question: "Please briefly describe the three main goals of the pilot and how much they have been reached on a scale from 0 to 10".

3.3.2.1 Community engagement and participation

The community engagement process was performed according to a well-defined framework, already tested in another European project (MakingSense). The activities realised were aimed at presenting the pilot, exploring policies for data sharing and their impacts, onboarding technology, playing around with the data, presenting the results and wrapping up the work done.

6 workshops with an average attendance of 25 people and 2 presentations in public events with more than 100 participants took place during the implementation of the pilot. In addition, the pilot team held a set of UX sessions in order to gather feedback from the users about the developed tools.

The pilot helped strengthen the synergies between a group of neighbours which had already interacted with the MakingSense project. The participants in the activities were people worried about issues related to IoT crowdsourcing, digital democracy and data sovereignty. The users were selected among these, according to criteria aimed at ensuring an even distribution in terms of place of residence, gender and age. They actively participated in the pilot, providing feedback on the usability of the technology and comments which contributed to the development of the project.

The City Council participated in the coordination of the pilot, providing materials and personal support throughout the duration of the project.

More detailed information about community engagement, including a set of metrics which describe the participatory process and the comments provided by people involved in the pilot, are currently being processed and will be included in the upcoming D5.9 "Final report on the Barcelona Pilots, evaluations of Barcelona Now and sustainability plans".

3.3.2.2 Outcomes and potential future benefits

The pilot provides a practical example of how the IoT can be used to engender social value and to enhance data

democracy. The developed tools allow people to co-create and share data that can contribute to addressing relevant social issues, such as public health and climate change, without compromising their privacy.

The actions performed increased the tech literacy of the participants as well as their awareness with regards to problems related to data sovereignty. Participants gained knowledge about the technological, economic and social implications of the IoT. They learned how to use it in a safe and effective manner, to protect their privacy and to avoid the information they provide being externally exploited in a way which might negatively affect the community.

The pilot also contributed to the development of a technically feasible and scalable model which allows individuals to share data while retaining a level of granularity over it. Furthermore, it provided a concrete example of how to create collective datasets which do not need to rely on a centralised infrastructure.

The developed tools offer practical solutions for community empowerment, providing people with secure access to quantitative and objective data to be used for supporting social campaigns for environmental justice. The data can be also used for research purposes, especially for feeding studies on urban health.

The developed infrastructure can be applied in many other fields including context which involves the management of sensitive information such as in the case of health and political data. It is also important to note that the outcomes of this pilot can also be useful for the entire IoT industry, as it represents one of the unique implementations of data protection for IoT devices deployed on private houses.

3.3.2.3 Next steps

The next goal is to fully integrate the developed tools into the SmartCitizen infrastructure, making it possible to run them as a default option.

A public presentation of the outcomes of the pilot will be held in Turin within the next few months. The aim is to promote the pilot in a broad community of developers who may be interested in applying and further implementing it in different contexts.

Some members of the pilot community are also participating in two other citizen science enterprises: CitieSHealth[15], an H2020 EU project involving five European cities (Barcelona, Utrecht, Ljubljana, Lucca, and Kaunas), which aims to collect environmental data using inventive manners in order to tackle citizens' health concerns; Salus Coop[16] is working to enable citizens to control their own clinical data in order to share it safely and thus spur innovation in health research. The technological tools developed within the DECODE project and so far tested with low-risk data may, therefore, be applied, with the necessary adaptations, to more sensitive data, creating a data commons with enormous beneficial potential on research and scientific advancement in the medical field, and, by extension, on collective well-being.

3.3.3 Barcelona Now [Barcelona]

A full description of the pilot, with detailed information about goals and implementation stages, can be found in D2.5 "Technopolitical Democratisation and Digital Commoning: the Case of the Digital Democracy and Data Commons (DDDC) pilot" and D5.6 "Deployment of Pilots in Barcelona"[17]. All interested people can explore and use the tool developed by simply logging in as a guest[18]. The first prototype developed for the pilot received the Best Demo Award at The Web Conference 2018 (former WWW conference), the major international venue on the topic of the World Wide Web.

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[15] http://citieshealth.eu/
[16] https://www.saluscoop.org/
[17] Other related deliverables are the following ones: D5.1 "Barcelona Open Data, Sentilo and IRIS API available"; D5.3 "Data analysis methods and first results from pilots"; D5.2 "CityOS connection"; D5.4 "Prototype Data Visualisation Tool".
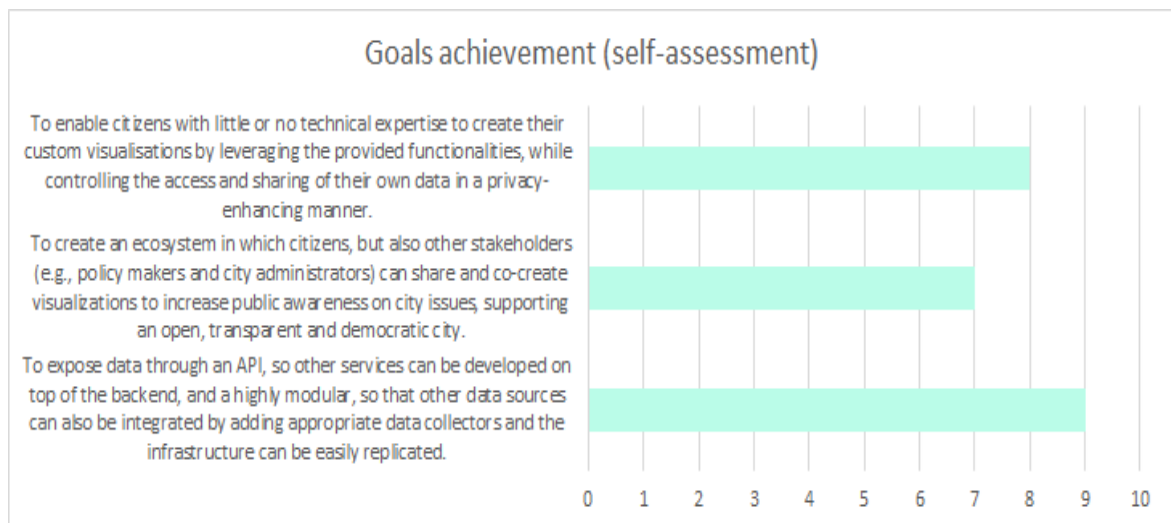[18] http://bcnnow.decodeproject.eu/

Figure 4: Answer provided by BCNow representatives to the question: "Please briefly describe the three main goals of the pilot and how much they have been reached on a scale from 0 to 10".

3.3.3.1 Community engagement and participation

Users have been engaged during the different events organised for the DDDC and IoT pilots. The pilot goals and capabilities were also presented in public events (WebConf 2018, Maker Faire 2018, Smart City Expo World Congress 2018, Data Transparency Lab conference 2018, Barcelona pilots kick-off, IoT pilot launch and DDDC Finale). In addition, UX sessions were held in December 2018 with 9 members of the Smart Citizen community[19]. Results were positive, with high levels of efficiency and effectiveness[20].

Users actively participate in the development of the pilot, providing feedback which allowed significant improvements to be made. In particular: frontend components have been made resizable to fit on mobile devices; geo-clustering features have been added to avoid data overload/overlap; relative dates have been modified so that updated data can be displayed by default.

The Barcelona City Council was directly involved in the pilot and played a crucial role providing access to data from its own sources including ASIA[21] (Aplicatiu de Sistemes Integrats d'Atenció), IRIS[22] (*Incidències, Reclamacions i Suggeriments*), ODI[23] (Open Data Infrastructure), CityOS[24] (City Operating System), and Sentilo[25] (open source sensor and actuator platform).

Some numbers of BarcelonaNow are: more than 200 monthly visits to website, 21 available datasets (IoT datasets are double, one for the raw data and the other for the simplified data); 5 dashboards of open data; 6 dashboards from data commons (see D 5.9 Final report on the Barcelona Pilots, evaluations of BarcelonaNow and sustainability plans).

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[19] https://smartcitizen.me/

[20] For more details, please refer to D5.9 "Final report on the Barcelona Pilots, evaluations of Barcelona Now and sustainability plans".

[21] http://www.bcn.cat/publicacions/la_municipal/n_68/lm_33.htm

[22] http://www.bcn.cat/iris/eng/index.html

[23] http://opendata-ajuntament.barcelona.cat/en

[24] http://ajuntament.barcelona.cat/imi/es/proyectos/city-os

[25] http://connecta.bcn.cat/connecta-catalog-web/

3.3.3.2 Outcomes and potential future benefits

The pilot created an ecosystem in which citizens, but also other stakeholders (e.g., policymakers and city administrators), can share and co-create visualisations around relevant city issues in a transparent, secure and democratic way. The developed tool provides concrete responses to the problems related to data control and exploitation, offering, at the same time, a practical instrument which can serve as a resource for public policymaking.

More specific outcomes of the pilot are: Making Sense members are now able to explore their data through private access control; data about gentrification in Barcelona are available in the system; the different sources of Barcelona City Council can be aggregated in a single dashboard without requiring technical skills;

The available instance of BarcelonaNow can be exploited by different entities (local institutions, schools, universities, research centres, civic organisations) to monitor the current state of the city of Barcelona. At the same time, the integration of BarcelonaNow with the IoT pilots is an illustrative example of how relevant information about sensitive issues can be obtained without compromising citizen privacy.

The developed infrastructure is based on a user-friendly interface which can also be used by citizens with little or no technical expertise. Furthermore, the pilot relies on a versatile technology which can easily be adapted to other settings and fields. Other communities with sensible data (e.g. health) could benefit from this privacy-oriented data exploitation model. Other city councils could also replicate it for their urban data silos.

3.3.3.3 Next steps

Eurecat[26] is planning to use the system as a resource for data visualisation in ongoing and future research projects. Despite currently having some limits[27], since BCNNow has been designed so as to be easily replicable and economically affordable, it can prove to be an extremely valuable tool in the hands of both European policymakers to implement concerted measures on pollution, mobility and housing, and of the general citizenry to inform herself and potentially take individual or collective action[28]. In addition, its integration into Decidim's data visualisation capabilities has already been discussed on several occasions and may lead to further strengthening of the platform's level of innovation[29].

3.3.4 Claim Verification 18+ [Amsterdam]

A full description of the pilot, with detailed information about goals, implementation steps and tools developed, can be found in D5.5 "Deployment of Pilots in Amsterdam". Online resources (including articles, videos, tools and recommendations) have been produced throughout the duration of the pilot[30].

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[26]https://eurecat.org/en/
[27]See: D 5.9 "Final report on the Barcelona Pilots, evaluations of Barcelona Now and sustainability plans".
[28]*Ibidem*.
[29]*Ibidem*.
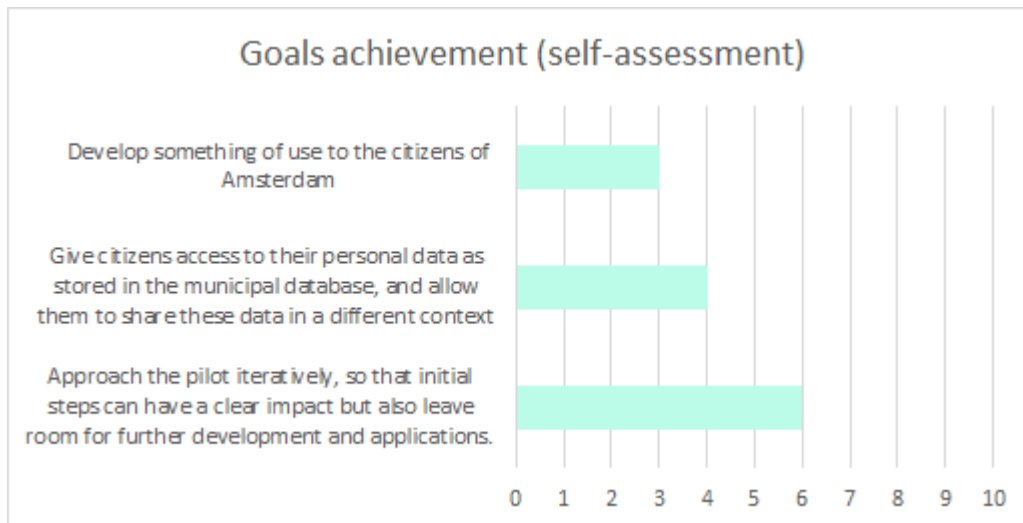[30]Available at: https://policylab.waag.org/

Figure 5: Answer provided by Claim Verification 18+ representatives to the question: "Please briefly describe the three main goals of the pilot and how much they have been reached on a scale from 0 to 10".

3.3.4.1 Community engagement and participation

The development of this pilot was largely handled by the municipality of Amsterdam, this being one of the partners of the project. The pilot team held a series of workshops in cities across the Netherlands to promote the DECODE mission, as well as to galvanise the public debate around data sharing and privacy protection.

Participation in the workshops was open to citizens, public administrations, and developers.

Two public events were organised in order to test the technology developed for the pilot. A soft launch with local citizens and public administrations took place on 18 December 2018 at the CTO office in Amsterdam. A second demo was held at the "State of the Internet" event at Pakhuis de Zwijger on 15 January 2019. These public tests were followed by an internal day of usability tests.

More detailed information regarding the community engagement process will be provided in D5.10 "Update on community engagement report".

3.3.4.2 Outcomes and potential future benefits

People who participated in the events which were realized during the different stages of the pilot increased their level of awareness with regard to problems related to data sharing and privacy protection. They gained knowledge about Attribute Based Credentials (ABC) and had the opportunity to test the technology developed for the pilot. This mainly consisted of a prototype (The Passport Box) for data minimisation via ABC.

The developed tools allow sharing of verified individual attributes without having to provide more personal information than is strictly necessary to close the transaction. They represent a concrete solution for increasing privacy protection and people control over personal data, which provides citizens with more flexible options for data sharing.

The pilot can provide a fundamental contribution to the future outreach of the DECODE ecosystem since it has paved the way for the concrete possibility to incorporate into this a whole range of city services.

3.3.4.3 Next steps

Many further applications of ABC-based tools are possible. Some of these are already under development within the Amsterdam municipality such as an ABC-based city pass. Other operational implementations of the technology developed for the pilot are expected in the upcoming months.

3.3.5 Gebiedonline (GO) [Amsterdam]

A full description of the pilot, with detailed information about goals, implementation steps and technology developed, can be found in D5.5 "Deployment of Pilots in Amsterdam". Materials (including interactive online resources and a video series) have been created during the design and the implementation of the pilot[31].
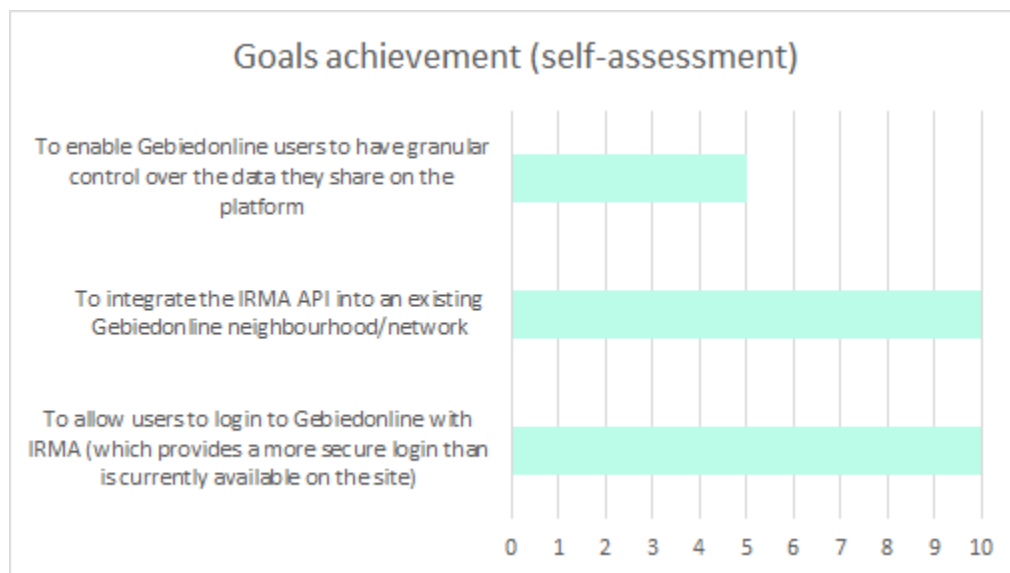
Figure 6: Answer provided by Gebiedonline pilot representatives to the question: "Please briefly describe the three main goals of the pilot and how much they have been reached on a scale from 0 to 10".

3.3.5.1 Community engagement and participation

The pilot had three target groups: public administrators, tech professionals, and citizens. In order to reach them, a range of educational and awareness-raising workshops were realised during the first stages of the project through the Digital Identity Lab (https://policylab.waag.org/). The community engagement process included 4 public events and 4 meet-ups which served to promote the pilot, as well as to inform the participants about ethical, political and technical issues related to data ownership and management.

Participation in the development of the technological aspects of the pilot required very complex and specific knowledge. As a consequence, it was not possible to widely involve the community in this process. Nevertheless, the technical solutions adopted were oriented to meet the needs of the Gebiedonline community and have been largely driven by the feedback provided by the users throughout the development process.

Policymakers were involved at multiple levels. The team held consultations with them both before and during the implementation of the pilot. They participated in the events organised and contributed to the outreach of the pilot.

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[31]Available at: https://policylab.waag.org/

Interviews with users and other actors involved in the pilot are currently being realised in order to evaluate the whole participatory process. Results will be provided and discussed in the upcoming deliverable D5.10 "Update on community engagement report". The same deliverable will contain more detailed information regarding users and logins number.

3.3.5.2 Outcomes and potential future benefits

People involved in the pilot gained knowledge about issues related to information privacy. They had the opportunity to collectively discuss the political, economic and technical dimensions of the problems related to data control and exploitation. They increased their level of awareness with respect to these issues and learned about new concrete solutions for protecting their digital identity.

The Gebiedonline case study worked as a good example to describe and communicate the benefits which can derive from a wider diffusion of the DECODE ecosystem, as the pilot has been able to provide concrete responses to the needs of a well-established community.

Significant improvements have been made to Gebiedonline which can now rely on a safer login method. New solutions to protect digital identity are currently available thanks to the technology developed for the pilot. This technology can reinforce trust and enhance wellbeing in communities, allowing people to share personal experiences within their neighbourhoods and ask for social support without compromising their privacy.

3.3.5.3 Next steps

Other organisations (particularly social media platforms) could take up the technology developed for the pilots towards protecting users' digital identity. Various municipalities within the Netherlands have already shown interest in the project and in the uptake of the tools developed.

4. Recommendations for the future DECODE ecosystem deployment and scaling

Starting from the evidence resulting from the assessment of the five pilots and the learning results of the application of the commons-based models' balance in one hundred digital platforms, the conclusions have been organised as key frames. The main goal is to link each dimension with recommendations to give a wide perspective for the sustainability, specifically focused on the economy, of the DECODE ecosystem and its development.

In correlation with the pro-democratic dimensions' axis, the recommendations are organised in three groups: 1) Governance and economic sustainability; 2) Data and technology policies, and 3) Social responsibility and impact.

The previous sections have shown a connection between some of the dimensions. Thus, even though we have organised the recommendations following the commons balance structure, almost all dimensions are intertwined.

4.1 Governance and economic model

4.1.1 Promote democratic governance to ensure democratic economic sustainability

One of the main findings of the analysis in D2.1 "Multidisciplinary framework on the commons-oriented sharing economy" is the correlation between the governance and the economic sustainability of a digital platform. The construction of a local community around the different spots of DECODE technology implantation should be a key point to assure its sustainability.

4.1.2 Facilitate the generation of democratic communities around pilots to promote open technology

Research has suggested that democratic openness in relation to technology and data tends to also be reflected in the governance and the economic model. Consequently, the creation of a community around the results of the pilots should be a strong point to promote open technology projects derived from DECODE technology.

The creation of the community could depart from the different instances around the pilots with the goal to configure a meta-organisation (confederation of instances) like it has started to happen in the case of Barcelona with the BCN Data Commons Network (connecting members from different pilots).

4.1.3 Generate an ecosystem of funding mainly supported by public money and the community involvement

The first two recommendations point out the role of the community around DECODE; however, the role of public policies will be key since most of the commons-based platform projects have some form of public funding. The research in D2.1 "Multidisciplinary framework on the commons-oriented sharing economy" has also suggested the relevance of new models of funding like crowdfunding. Crowdfunding is a type of funding model that requires community engagement. Matching both approaches, the role of public policies and crowdfunding, form a new funding model, match funding[32]. Projects get money from the engagement of the community and public money, accordingly: for every euro a project gets from the community, one euro is granted by the public administration. For example, some projects have been granted the support of Barcelona City Council through a match-funding campaign[33], which allows projects to obtain sources from public administration and the community around the project. Most of the projects are candidates to incorporate Decidim. Indeed, Barcelona City Council has provided grants to organisations of the Social and Solidarity Economy (SEE). Through the grant, SSE organisations can adopt Decidim as a tool for their internal decision-making processes.

4.2 Technological and data policies

4.2.1 Promote open technological and sovereign data policies

The research results have demonstrated a connection between technological and data policies. This highlights the importance of promoting open technological policies to favour open knowledge. In addition, the results point out that the majority of digital platforms are private, even though open licenses are also represented. The lack of attention to software, to content license, and to open data exportation in the growing cooperative platform model may explain this fact.

The City of Barcelona has pioneered novel and forward-looking technology policies that have data commons and data sovereignty at its core. They released the ethical digital standards and a specific ethical data management

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[32]Matchfunding: Crowdfunding governed by the Principle of Co-responsibility http://fundacion.goteo.org/blog/matchfunding-crowdfunding-bajo-el-principio-de-corresponsabilidad?lang=en
[33]Conjuntament. Matchfunding campaign promoted by Barcelona City Council: https://en.goteo.org/call/conjuntament

policy informed by the DECODE's approach[34]. These policies are a world-wide reference for digital cities and have been very influential in the creation of the Cities Coalition for Digital Rights supported by the United Nations[35]. This kind of policies have been referenced by policy makers and decision-makers at municipal and EU level and are seen as the foundation for a European approach around data sovereignty that can promote the development of next generation internet technologies that are decentralised, privacy-enhancing and protect people's fundamental rights.

In parallel, the DECODE technology has been adopted by Decidim, which is used at the same time by a growing number of cooperative platforms. Thus, DECODE technology may be a way to expand the value of digital commons in the sustainability of the platforms.

4.2.2 Promote a clear aggregation of standards to ensure privacy

The results of the research and the pilots' assessments have highlighted the importance of involving the community in the governance of their data. Consequently, the aggregation of all data under fair agreements (or other legal tools) to ensure anonymisation should reinforce the confidence of the DECODE community around data usage. DDDC pilot is a good example of this. At first, users are aware that the data they provide during their use will remain on their phones. Secondly, when users sign a petition, they are able to decide if they want to share their data: date of birth, area of residence and gender (each field can be decided to share it or not).

4.2.3 Enhance participants' understanding of the technologies being developed and adopted in the pilots

The understanding of complex techniques such as cryptography and technologies like distributed ledgers often remains limited to a small group of experts, persisting as indecipherable for the general public. Considering them as black boxes, the desire to deepen their functioning is often held back by a sort of 'instinctive discouragement'. However, as stated by one of the IoT pilot's participants who was complaining about his low level of knowledge around the operation of the back-end interface, "*more informed participants may contribute better*". To dedicate time to an even basic education of participants regarding technological aspects which, although thorny, represent a pivotal part of projects such as DECODE, appear to be essential in order to increase the involvement and commitment of the community.

4.3 Social responsibility and impact

4.3.1 Include quadruple helix approach

The design process of the DDDC pilot, based on multi-stakeholders (taking into account quadruple helix) encounters three working areas (regulation, governance and economic sustainability) and provides a clue about the possibilities of generating a community around the pilot. The participation of the different stakeholders may reinforce the adoption and development of DECODE technology.

4.3.2 Connect DECODE with existing communities

Some communities already exist and are key elements for the DECODE technology engagement. For example, in the case of DDDC, the close relation with the Decidim community has facilitated great feedback during the implementation of the pilot. This is something especially relevant when we analyse the membership of the Decidim community, which is integrated by actors of the quadruple helix.

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[34] Ethical Data Management Directive, Barcelona City Council:
https://www.barcelona.cat/digitalstandards/en/data-management/0.1/summary
[35] Cities for Digital Rights Coalition: https://citiesfordigitalrights.org

Even the implantation of DECODE can promote new communities. This is also the case for pilots in Barcelona, where a local network, the Barcelona Data Commons Network[36] addresses these issues from civil society. The creation of the Barcelona Data Commons Network links to the sustainability of the pilot because it constitutes a task force to promote the proliferation of data commons. Currently, the network is establishing its goals and governance. In spite of that, the organisation will be a spot of intercooperation to aware citizenship about the relevance and value of digital data and the necessity to promote a common space of governance of the data commons. This is especially appropriate because Decidim is currently increasing its use in organisations linked to Social and Solidarity Economy (i.e. Som Energia[37], the largest renewable energy cooperative in Catalonia).

4.3.3 Gamify the experience of engaging and testing DECODE app

Some role-play dynamics have been used during IoT and DDDC pilots. In the case of IoT, throughout #DataConfessions participants pointed out their data usage. In relation to Data Control Wars used during DDDC, participants took the quadruple helix point of view. This means, to think of themselves as a GAFAM platform, as a researcher, as a public administrator, and as a part of organised citizens (NGOs, unions, etc.). The request to build strategies during the different game rounds delves deep into the strengths and weaknesses of each actor and highlights the value of data from different perspectives: citizens' rights and their connection with the GDPR to protect them, economic value and the new tentacles of capitalism to lead our lives as consumers, and the data control and its concentrated governance (undemocratic), even if it refers to open data. The reactive positions of data usage and the control of the big tech companies (GAFAM) that dominate the cyberspace have promoted reactions among participants to try to stop data-based surveillance and data-based mass persuasion. At the same time, the role-play has aided further understanding of the configuration of data commons. This means, to take into account a holistic vision about data and going beyond permanent debates, like the need to open data and propose data sovereignty.

Thus, the introduction of the DECODE app in new groups could take into account the gamification of the approach to DECODE values and, at the same time incorporate some games to introduce the DECODE app. For example, the Data Control Wars toolkit may be a tool to improve awareness regarding data and a way to introduce the DECODE app. At the same time, it can be a way to imagine future stages to counteract data-based surveillance and data-based mass persuasion and, propose strategies around data sovereignty.

4.3.4 Develop narrative and data visualisation to engage citizenship

According to the experience of the pilots, it is crucial to draw attention from the media. During the presentation of the DDDC pilot, the Data Commons Manifesto was presented which may increase the interest of more citizens in this field and, in consequence, spread the use of the new DECODE app.

In the same sense, the BCNNow dashboard used in IoT and DDDC pilots should help people to easily visualise and use their data in democratic processes which may contribute to data empowerment and data-enriched collective intelligence and action. For example, the combination of Decidim with the DECODE system should help reduce surveillance and data-based mass persuasion in democratic processes.

4.3.5 Prioritise face-to-face meetings, possibly increase their proximity over time, and augment the time devoted to debate and exchange of views

In the case of the DDDC pilot, it was possible to notice a gap between the level of participation detected during one of the first DDDC encounters[38] and the lower level of online activity (number of comments, support, new proposals) around the proposals that had been collected during the above-mentioned meeting and subsequently published on the

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[36]A civil society network, organised during the process of the pilot development, with the aim to engage the organisations of Barcelona which are close to the principles of DECODE.
[37]https://www.somenergia.coop/
[38]https://dddc.decodeproject.eu/processes/main/f/4/meetings/4

platform39. This suggests that *in praesentia* meetings are generally more suited in the context of participatory processes. In the case of the IoT pilot, more than one participant pointed out that the time lapse between one meeting and the other was too long. This was due to inevitable delays in the development of the technical components, which however affected both the quantity and the enthusiasm of participants. If similar problems should arise in future projects, in order to foster participants' involvement and keep their morale high, extra meetings could be organised among the 'official' ones, with a view to foster open discussion around the relevant issues raised by the pilot's rationale and participants' possible doubts and questions. This latter issue has been defined as a weakness in the overall set up of the pilot by more than one attendant. and it is certainly also tied to the time and financial constraints that generally characterise European projects. Clearly, in order to increase the number of sessions devoted to the promotion of in-depth debates aimed at raising awareness and interest within the citizenry with regard to such complex topics, specific funds as well as a reasonable amount of time should be provided.

4.3.6 Building a community of stable participants gathered around a collectively perceived matter of concern and a consequent clearly defined goal

The conception of the DDDC pilot followed an implementation line with clear objectives and led to the drafting of a Manifesto40 on digital sovereignty which, in the form of a petition, was signed (through the DECODE app) by approximately thirty people at the pilot's final event41. However, as previously mentioned, it was not possible or not considered as a priority to build a solid and close-knit community of participants who would attend the various steps of the pilot on a continuous basis. An emergent local network of actors from civil society and the cooperative sector focused on building critical views and practices around data could probe a lasting social impact of the pilot. Reversely, one of the fundamental prerequisites of the IoT pilot was the presence of a community of participants that was as steady as possible in terms both of time and size. The participatory commitment required, consisting of the installation of sensors in their homes and attendance in various structured workshops, can be considered more meaningful than that demanded of the DDDC pilot's participants. As already pointed out, if this aim has been achieved despite the difficulties posed by the delays in the development of some technical components, a weakness in terms of identification of a clear and shared matter of concern to be addressed has emerged. In the Making Sense project some of the inhabitants of Plaça del Sol, demonstrating that the levels of noise pollution detected by their SCKs were above what was recommended by the World Health Organisation, had prompted the Barcelona City Council to take resolution measures. In this pilot, since participants did not expect any policy change and were not affected by a real common issue, they seemed more interested in exploring individually the 'behaviour' of their own sensors. Paraphrasing one of the participants: "*My feeling is that eventually, we were more motivated to understand what we were sensing rather than worrying about governing the data*". The community appears, therefore, to have functioned more as a great test-bed for the legal and technological solutions developed within the DECODE project than as a fertile ground for their co-creation and real understanding.

4.3.7 Define a methodological reference framework for an orchestrated impact assessment

Establish a reference framework for the collection of both qualitative and quantitative data that proves to be generalisable and, at the same time, adaptable to each pilot experimentation, in order to make easier and more meaningful comparisons between different experiences. Such a methodological approach requires coordination and collaboration between almost all the research axes of the project's consortium, starting at least from the moment in which the pilots enter the implementation phase.

39https://dddc.decodeproject.eu/processes/main/f/5/
40https://dddc.decodeproject.eu/processes/main/f/13/
41https://dddc.decodeproject.eu/processes/main/f/4/meetings/18

5. Final remarks

The structure of this report showed the complexity of tackling the impact and economic sustainability of DECODE. The holistic approach of commons balance has facilitated the analysis and the assessment of the different issues that compasses the characterisation of a digital platform. The configuration of an ecosystem around the different pilots of DECODE, avoid the possibility to plan future development and project sustainability only taking the economic model into account. In our point of view the DECODE ecosystem and future development cannot ignore: the relevance of the community (engagement of participants to maintain/amplify the interest in the project); the quadruple helix approach (a holistic approach to DECODE technology and its sustainability); and public policies support (in terms of legal regulation but also with funding future development).

It is also crucial to consider the impact that the DECODE project has had outside the cities where the pilot experimentations were conducted. For example, over the course of the last three years, important results have been achieved in the context of the Cities Coalition for Digital Rights, where Barcelona and Amsterdam are the founding members and have been spreading the DECODE approach to more than 60 cities that joined the Coalition supported by the United Nations.

DECODE had also a strong impact at European level, thanks to the strong work done by the project coordinator and by all partners to promote data sovereignty and data commons that has been recognised in the mainstream media (e.g. Financial Times[42] and by high level European policy-makers[43]. Today the European Commission's new Agenda for Europe explicitly mentions digital sovereignty as one of the central's aims for the next years: https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf

Additionally, DECODE is mentioned as one of the main EU's efforts to promote data sovereignty and is a flagship project in the European Blockchain Strategy and is a key part of the Next-Generation Internet project. In particular, Dyne is one of the three consortium's partners of the LEDGER[44] H2020 project. Started in late November 2018, the project supports research groups, hi-tech start-ups and SMEs relying on research contributions and decentralised technologies, helping them to develop Minimum Viable Products embedding privacy-by-design, trustworthiness, reliability, and openness as core values. Being in charge of mentoring the technical part of the project, the Dyne team are training the 16 winning entities that emerged from the selection process, showing them how to integrate the technologies developed and tested within DECODE, such as Zenroom, DECODE, OS and the technologies developed in the various pilots of DECODE.

Dyne has also recently joined Sovrin[45] (an open-source project creating a global public utility for self-sovereign identity on the Internet) as one of the Network's Stewards. It has become a member of the ISO/TC 307 Committee for Blockchain and distributed ledger technologies standardisation[46], and a corporate member of the independent, global, open-source software community OW2[47]. Moreover, memberships to Hyperledger[48] (a Linux Foundation's umbrella project of open-source blockchains and related tools) and Cosmos[49] (an ecosystem of blockchains that can scale and interoperate with each other) are pending approval. In addition, Dyne is in conversation with a number of players in the cryptography and blockchain space (among which hubii[50] and Xymba[51]) in order to help them implement Zenroom in their cryptographic flow and blockchain applications and ecosystems.

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[42] The people, not governments, should exercise digital sovereignty: https://www.ft.com/content/9ca5b0b2-0f64-11ea-a7e6-62bf4f9e548a
[43] Altmaier's cloud initiative and the pursuit of European digital sovereignty: https://www.euractiv.com/section/data-protection/news/altmaiers-cloud-initiative-and-the-pursuit-of-european-digital-sovereignty/
[44] https://ledgerproject.eu/index.php/about-ledger-project/
[45] https://sovrin.org/
[46] https://www.iso.org/committee/6266604.html
[47] https://www.ow2.org/view/Main/
[48] https://www.hyperledger.org/
[49] https://cosmos.network/
[50] https://www.hubii.com/
[51] https://www.xymba.xyz/#/hello

Finally, on the occasion of the 2019 DECODE Symposium[52] held in Turin on November 5th and 6th, DECODE demonstrated to have achieved a very strong impact in the global community working at the intersection between digital policy, economy and technology, but also regarding the general debate around the need to democratise the digital economy and give back democratic control of data to citizens.

At technical the demonstrations of Zenroom's integration and operation was carried out by Riddle&Code[53], Europe's leading company for blockchain interface solutions, as well as by Caelum Labs[54], a company based in Barcelona developing blockchain-based prototypes and ideas for businesses and public administrations.

[52]https://decodeproject.eu/events/our-data-our-future-radical-tech-democratic-digital-society
[53]https://www.riddleandcode.com/
[54]http://caelumlabs.com/

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7. Appendix

7.1 Pilot evaluation survey

Name of the pilot: _____

1. Goals and outcomes

1.1 Please provide a short description of the three main goals of the pilot:

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1.2 On a scale from 0 to 10, where 0 is "not at all" and 10 is "very much", how much do you think that each of the aforelisted goals has been reached?

GOAL 1	0 1 2 3 4 5 6 7 8 9 10
GOAL 2	0 1 2 3 4 5 6 7 8 9 10
GOAL 3	0 1 2 3 4 5 6 7 8 9 10

1.3. Please provide a list of the tools and other tangible outputs produced:

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1.4. Please describe any other intangible outcomes produced, explaining how they relate to the goals of the pilot:

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1.5. If any, please mention other important findings/results of the project which are not strictly connected with the prefixed goals (unintended outcomes):

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1.6. Please provide a list of the goals that were not reached, and specify which impact this had on the overall outcome of the pilot:

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2. Community engagement and participation

2.1 Please check which of the following activities has been carried out in order to engage the community and provide related information:

Kind of activity	YES/ NOT	Number of events realised	Expected total number of participants	Actual total number of participants	Average age of the participants	Gender ratio
workshops						
meet-up						
seminars						
press-conferences						
presentations in public event						
other (specify)						

2.2 Based on which criteria did you define your target participants and how did you reach them?

2.3 On a scale from 0 to 5, where 0 is "very bad" and 5 is "very good", what is your overall perception of the participatory process?

| 0 1 2 3 4 5 6 7 8 9 10 |

2.4 Have you already taken any action to measure and evaluate the participatory process? If yes, please share your results:

2.5 If any, please provide additional information that you consider useful in order to describe the community engagement strategy which has been adopted in the pilot:

3. Technology development and implementation

3.1 Please provide the following information about the technical infrastructure of the pilot:

Start date design process	
Number of expected users	
Start date of DECODE's tools distribution and adoption	
Number of actual users	
Number of potential users	
(if applicable) number of visits to website	
(if applicable) number of downloads	
(If applicable) number of devices distributed	

3.2 If available, please provide other key performance indicators of the pilot:

3.3 Please provide a short description of the user engagement process and explain the role played by the users:

3.4 Did you make any significant changes in the technological infrastructure based on feedback from the users? If yes, please provide examples:

4. Social impact

4.1 Please list up to 3 relevant social issues that the pilot intended to address:

4.2 On a scale from 0 to 10, where 0 is "very low" and 10 is "very high", how do you consider the overall participant level of awareness with respect to each of the aforementioned issues?

Before their involvement in the project:

ISSUE 1	0 1 2 3 4 5 6 7 8 9 10
ISSUE 2	0 1 2 3 4 5 6 7 8 9 10
ISSUE 3	0 1 2 3 4 5 6 7 8 9 10

After their involvement into the project:

ISSUE 1	0 1 2 3 4 5 6 7 8 9 10
ISSUE 2	0 1 2 3 4 5 6 7 8 9 10
ISSUE 3	0 1 2 3 4 5 6 7 8 9 10

4.3 Please provide concrete examples of how the results achieved can be useful in order to find possible solutions to the afore listed issues:

4.4 Please describe how the tools developed can be used to empower people, to protect their privacy and to improve transparency and democracy in the field of personal data management:

4.5 Did you get any concrete support from the municipality in the development of the project? If yes, please specify:

4.6 Which role could the municipality play in a future implementation of the project?

4.7 Please add any other information that you consider useful in order to describe the social impact produced during the design and the implementation of the pilot:

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5. Economic impact and sustainability

5. 1 For each of the following stakeholders, please briefly describe the economic benefits related to the project:

	Benefits derived from the project	Potential benefits from a wider implementation of the pilot
NGOs		
Individuals		
Municipality		
Other actors of the public sector		
Local committees		
Private companies		
Academic Sector		
Project implementation partners		
Other Civil Society actors		

5.2 On a scale of scale from 0 to 10, where 0 is absolutely not, how adequate were the financial resources available for the implementation of the pilot?

0 1 2 3 4 5 6 7 8 9 10

5.3 If available, please provide any detailed information about the cost involved in a long-term implementation of the project:

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5.4 How could these cost be covered in the long run?

[ ]

5.5. Please list the enabling and inhibiting factors of the project's economic sustainability:

ENABLING FACTORS	INHIBITING FACTORS

6. Future implementation and final remarks

6.1 Are the tools developed in the project currently being used in a different context?

[ ]

6.2 Which are other possible uses of these tools?

[ ]

6.3 Please describe any steps that are planned for the future implementation of the project (if any)

[ ]

6.4 Which aspects of the project do you think were most successful?

[ ]

6.5 Which aspects of the project do you think need to be improved?

[ ]

6.6. Are there any other important lessons that you learned? Please specify: