Project no. 610349

D-CENT

Decentralised Citizens ENgagement Technologies

Specific Targeted Research Project

Collective Awareness Platforms

D1.1   Project Methodology

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

Contents

1. Executive Summary

This Deliverable describes the overall project methodology, including the case for adopting a Lean UX methodology, user centered and design thinking methods that couple social design with technical iterative development focused on addressing a wide variety of community needs. Revealing latent needs, motivations and patterns of users' behaviors in different European socio-economic contexts and developing technological solutions that solve real problems is the core objective of D-CENT methodology. The methodology adopted by D-CENT is based on ongoing iteration and testing with actual user groups and is thus light on documentation and analysis. During the duration of the project, there will be a continuous iteration in identifying real problems faced by users, and developing the adequate technical solutions that present a good user uptake and diffusion of the proposed solutions. Communities will in this way provide continuous input to the technical design and implementation. The Lean UX methodology is applied early on during the development process and continues throughout the duration of the project, providing actionable metrics that will be reported and assessed in D1.3 at the end of the program. In order to engage large citizens' communities in different European contexts throughout the project duration, a flexible coupling between the social design (identifying community's latent needs, analyzing their socio-economic condition, mapping the institutional ecosystem and the organizational objectives) and the technology design (technical requirements and specifications, platform architecture and features) has been chosen.

D-CENT adopts a multidisciplinary mixed methods approach for the research and development process. The user-centered lean UX methodology and design-thinking methods are integrated with the socio-economic Action Research approach gathering in-depth community insights, and finally data-analysis and visualization methods can provide easy to read analysis and mapping tools. The methods selected to capture the impact of each pilot area will be developed in conjunction with each technical solution, ensuring it is appropriate for the stage of development of the approach. The focus is on engaging users' communities early in the process in order to reach the critical mass, knowledge and innovation that will increase the adoption and scalability of new technology solutions. This approach speeds up the identification and exploration of existing and new user needs, which leads to experiment new socio-economic models (e.g. currency as commons and direct democracy) with high impact based on community returns on innovation.

In each pilot implementation, we will seek to establish a theory of community resilience and change at the outset, taking predicted impact of network effect into account. This methodology will result in a strong coupling between user-centric social design of pilots (Task 1.1) and the technical design of Pilots (Task 4.2). The design will place emphasis on experimenting and learning as a way of developing appropriate, useful technology in collaboration with civil society actors, policy makers, and other key stakeholders. We will use the approach of strengthening communities and social movements within local use case areas, but also in terms of a virtual community of interested stakeholders who can feed in to later stages of testing and development.

2. Introduction to D-CENT methodologies

This section describes the D-CENT approach to meeting the project objectives. D-CENT applies an interdisciplinary research approach based on literature, stakeholders' inputs through user-centered Lean UX methodology, Participatory Action Research to gather insights from case studies, and data-driven network analysis.

The overall objective of D-CENT is to accelerate both the understanding and effective practice in the use of large-scale collective platforms to support citizen empowerment and re-imagine the democratic process, unlocking the potential of more empowered citizens by developing a suite of decentralized, privacy-aware, and easy to adopt open-source tools that will enable any community platform to make the most of 'network effects', so that it can:

- gather and store data contributed by citizens and community groups in a federated way that allows sharing and inter-operability across different social networks
- represent and effectively use an extended range of data, deploying intelligent analytics and visualization systems that help users to be made more aware of issues and possible solutions, using collective deliberation and judgment
- build on existing best practices to develop better tools for collective decision-making, linking these to offline groups where real-world changes can be delivered
- develop tools to grow alternative, sustainable economies, including virtual currencies that enhance awareness of the implications of actions and decisions
- ensure that people are in full control of their data, maintaining privacy and trust in the systems they use

The way D-CENT will adopt these methods in practice through a series of lean inception workshops, case studies and iterative development is described in Section 3. D-CENT employs mixed methodologies in order to most effectively achieve the key aims of the project: Lean UX development, Participatory Action Research and Data Analysis.

The overarching methodology principles guiding D-CENT are:

1) Engaging all stakeholders in the development process. Identify the key citizen groups and communities to ensure that there is strong involvement of users, NGOs and other representatives of civil society in the development of D-CENT.

2) Agile and Lean UX Methodologies. Instead of being stuck in a "one-size fits all framework", stakeholders will be engaged using iterative lean methodologies by opening existing codes and collaborative projects, learning and experimenting with continuous users' feedback.

3) Multidisciplinary approaches. D-CENT integrates methodologies from different disciplines and that pro-actively takes action and mobilizes key stakeholders by appealing to different disciplinary

insights and different social networks. For instance design methods, computer science, social sciences and network analysis will be adopted and integrated in the project.

4) Sustainable solutions. Design decentralized and sustainable solutions that can be reused across Europe and beyond. D-CENT will explore sustainable models to make sure that D-CENT solutions are adopted by thousands of people across Europe and that the code is maintained beyond the scope and duration of the project.

5) Open Participation. All initiatives will be open to any stakeholders and the partners will make an active effort to fully engage with key identified communities and the general public. Moreover, all results from the research will be fully available in open formats and open standards and will allow other open source developers to integrate their solutions and build on top of D-CENT.

In order to accomplish the D-CENT deployment objectives a mix of different methodologies will be adopted and will be introduced in depth in this document:

1. User-centered Agile and Lean UX
2. Design thinking methods including empathic design and service design
3. Participatory Action Research and socio-economic analysis to gather community insights and assess impact
4. Data Analysis and Visualizations and Network Analysis

The adopted methodology will build upon the partnership's considerable track record in developing Lean user-centered, data-driven methodology, and appropriate measures of impact for social innovation projects. The adopted Lean UX methodology will span across the whole program, and will inform the design and development of the other work packages, in particular the technical design and implementation. The methodologies outlined below are designed to ensure a coordinated approach to prototyping and experimentation, while understanding and monitoring real-world network effects. Large-scale citizen groups will be consistently engaged during the iterative development of technical solutions; measures of impact will be customized and simplified to better fit with real-world conditions of pilot-sites. It is expected that taking this approach will help generate more accurate and insightful results.

One of the most frequent problems in EU research and development projects is the low up-take of scientifically innovative solutions amongst users and citizens across Europe after the technologies are developed in closed R&D laboratories. In order to address this issue, D-CENT will define the use cases in terms of community requirements and non-functional technical features by fully engaging community groups through lean inception workshops and iterative testing to record latent needs and specific solutions that address the problems identified by the communities. The focus will be on engaging users' communities, in order to reach the critical mass, accumulating knowledge and learning that will increase the adoption and promotion of new solutions. This approach speeds up the identification and exploration of new user needs, which leads to experimenting new participatory models with high impact based on community returns on innovation.

The methodologies employed in the D-CENT project start from the assumption that users and communities are sources of innovation themselves. D-CENT adopts an iterative, user-driven and lean methodology which is able to gather and integrate users' inputs throughout the all duration of the development phase. For instance, empathic design using field observations and action research techniques will be also employed to identify latent user needs in order to develop hypothesis and features that the users cannot express they need or, in some cases, solutions that communities have difficulty envisioning due to lack of the possibilities offered by current technologies and platforms. Learning users' unarticulated needs through a process of keen observation on the ground and interpretation often leads to breakthrough technology designs, shortening product development cycle. Prototypes (Minimal Viable Products), fast testing and refinement are forms of learning processes that increase effective outputs of solutions. An iterative testing process aggregates actionable metrics and frequently leads to further rounds of more targeted experimentation that result in better user adoption. Users' inputs will serve to develop the social design (Task 1.2) that will directly inform the technical design specification of the D-CENT platform (Task 4.2).

The picture below illustrates the overall D-CENT Agile methodology, focused on mass user engagement, and outlining the interdependencies amongst the other Research Work Packages:
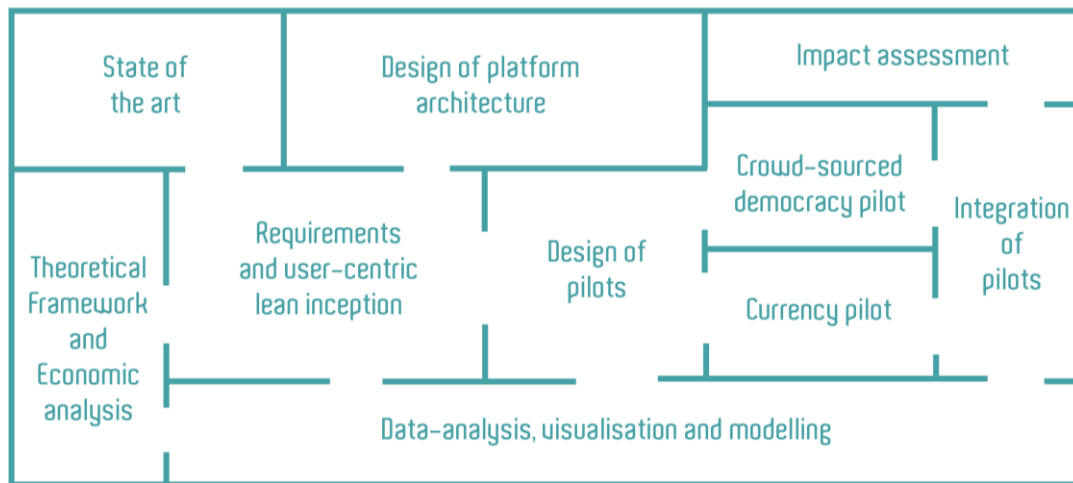
Fig1: D-CENT Agile and Lean Methodology

2.1. User involvement in the development process: grounding D-CENT in the literature

2.1.1 Users as a source of innovation

Involving users in the design and development of technological systems has long been a central matter in science and technology research (Bijker et al. 1987; Lamb and Kling 2003; Oudshoorn and Pinch 2003). Studies in the innovation field have elaborated the concept of demand as a source of innovation as a result of the old debate between the demand pull and technology push model, arguing that uncertainty and the barriers to the adoption of new goods or services can be overcome either by increasing consumers' knowledge or by redesigning the goods so as to reduce the barrier (Schmookler 1966, Myers and Marquis 1969, von Hippel 1982, 1986 Lundvall, 1988, 1992, Rogers 1995, Rothwell et al. 1974; Kline and Rosenberg, 1986). Lundvall and Freeman have been pioneers in putting forward an innovation model centered around user-producer relationships; a conceptualization that developed as an alternative to the science and technology push model and demand pull model of innovation and that evolved in the what became known as the 'innovation system' approach (Freeman 1987, Freeman and Lundvall, eds. 1988, 1992). Lundvall argues that the firms need to access information about users' needs and that innovation will depend of the "type" of users: he distinguishes between 'professional users' that are actively searching for new ways to solve problems, in the form of training and 'learning-by-doing' and the 'consumers' that are supposed to have a more passive role (1985).

Literature emphasizing the importance of network externalities and increasing returns has drawn attention to the demand side of innovation (Malerba, 2005). From an economic perspective, the importance of consumer behavior in innovation has been fully recognized because "it may include the presence of information asymmetries and imperfect information with respect to new markets and submarkets as well as routines, inertia, habits on the part of consumers" (Malerba 2005:10). Furthermore, "the knowledge and mental frameworks of consumers and users greatly affect innovation and performance" (Malerba, 2005:10)

The importance of the user side has also constituted a focus of research on diffusion of innovation. Rogers, in his model of diffusion, analyses individuals' behavior in reaction to new products and processes and investiages the reasons why some innovation diffuses and others fail. According to Rogers, diffusion is a two way process of convergence and interaction in which the 'adoption' of new ideas will bring beneficial results for users and 'social change' (Rogers, 1995:6). For diffusion to happen, participants have to share information and knowledge to reach shared meanings and understandings. However, Rogers suggests that there are both positive and negative consequences that are not previously planned by the producer. This uncertainty creates a kind of tension between producer and users expectations in terms of planning an innovation and its actual use in everyday practices (Rogers 1995).

In more recent innovation literature there are multiple concepts, methods and tools describing users' involvement in the development process, emphasizing the role of users' expertise and knowledge for innovation success (Alam, 2000). Some authors argue that participation of end-users in the innovation

process should happen from the initial development phase, either involving lead users (Von Hippel 1986, 2005; Lettl, 2007) or lay users (Lüthje and Von Hippel 2005). According to Von Hipple, knowledge is distributed and "sticky", meaning that the locus of innovation shifts to where it is the stickiest because it is costly and difficult to move between locations. If users' knowledge is sticky and tacit users and producers can better share knowledge, producers will be able to more easily and cost-effectively locate knowledge and assimilate information about users' needs, finding new solutions to innovation problems.

Lead users are considered to be ahead of the majority of other users with respect to an important market trend so that they develop a new solution better addressing their needs before the manufacturer. Von Hippel (1986) defines lead users as "users whose present strong needs will become general in a market-place months or years in the future. Since lead users are familiar with conditions which lie in the future for most others, they can serve as a need-forecasting laboratory for market research. Moreover, since "lead users often attempt to fill the need they experience, they can provide new product concept and design data as well" (1986:791). Von Hippel's lead user studies have been applied in a variety of industrial settings, notably by the adhesives company 3M, to surface unidentified product innovations with future market potential. According to Von Hippel between 10 per cent to nearly 40 per cent of users, depending on the sector, develop or modify products in a wide range of fields. Therefore, according to this stream of research, lead users' innovations have better commercial potential (Franke and Von Hippel 2003, Franke and Shah 2003; Thomke and Von Hippel, 2002). According to Von Hippel and Katz, by equipping users with appropriate user-friendly toolkits, users can design their own need-related innovations. This means that with the help of specific toolkits, users are enabled to develop new product innovations (Von Hippel and Katz, 2002).

To understand the dynamics behind users' participation and collaboration it is important to consider both the motivations and the incentives. Benkler (2006) argues that with the digital economy a radical change is happening in the way information, production and exchange is capitalized. The digital economy represents a new system that is based on a decentralized authority and functions through "social frameworks" rather than through only the coordination mechanisms based on property (Benkler, 2006). For example, looking at the "motivation structure" in open source software and online collaborative projects like wikipedia it can be argued that people invest time and energy in projects because they develop social relations, trust and reputation (Benkler, 2006). According to Weber open source development is based upon key elements such as "the motivations of individuals, the economic logic of a distinctive production process, and a set of social and political structures that maintain coordination and manage complexity" (Weber, 2000:25). It is therefore argued that, since "innovation by users appears to increase social welfare", policymakers should support and encourage user-driven innovation, supporting licenses such as Creative Commons license for creative products and General public License for open source software (Baldwin and Von Hippel, 2009:27).

To fully understand all the implications of the role of end-users in shaping innovation it is important to mention the social construction of technology perspective, which has been critical of innovation literature for its technological determinism (Pinch and Bijker 1984; Bijker and Law 1992; Molotch 2003; Mac Kenzie & Wajcman 1985; Akrich and Latour 1992; Oudshoorn and Pinch 2003). Taking as a starting point in the social constructivist perspective applied in the research on sociology of scientific knowledge (Berger and Luckman, 1966), the authors argue that users are agents of technological change. This

perspective has led to an understanding of technological artefacts and technology frameworks that are socially produced.

In Pinch and Bijker's (1984) social construction of technology approach (SCOT) users are considered as one of the social groups that should be considered as 'shaping agents' of new technology;capable of changing the meaning of technologies through the construction of a shared 'technological frame' that characterize the relationship between designers and users (Kline and Pinch 1996). Scholars have conducted several empirical case studies to study how technologies are enacted by people's everyday practices (Akrich,1992; Bijker, 1992). Indeed, attention is paid to the mutual ways in which technologies and users 'co-construct' each other (Oudshoorn and Pinch, 2003). Other scholars in management and organization studies have analyzed the importance of the co-evolution between technologies and their enactment by users during their practices and processes. According to this 'situated' perspective, users 'co-construct' technologies, and social structures so that technologies are constructed in use through an interactive process (Orlikowski and Scott, 2008).

Finally it is worth mentioning Castells (2003) as he describes the importance of the "hacker culture" in spreading and shaping Internet culture, especially because of the rise of the "free and open source software" movements and their contribution in the emergence of online communities and collaborative organizational and business models. "Open access and the freedom to innovate and 'modify' and even 'the inner joy of creation' are the fundamental of the hacker culture (Castells 2003:47).

2.1.2 Design–thinking and service design to engage communities

User-centered innovation is often driven by design activities and *design thinking*, and involves tools and methodologies developed and used by designers. According to Brown, design thinking is "embodied thinking- embodied in teams and projects and in the physical spaces of innovation" (Brown, 2009). This perspective emphasizes the importance of exploratory and iterative processes that are at the heart of the creative process. Designers are left with the difficult task to facilitate the innovation process through inspiration, ideation, and implementation (Brown, 2009). This is why Brown argues that design needs to move upstream in the organizations where decisions are taken and that in organizations everyone should learn to employ design-thinking.

Involving and understanding end-users is a crucial element of the design process. Brown emphasizes the importance of investing in systematic, human-centered design-based innovation, because "just as products become more like services, services are becoming more like experiences" (Brown, 2009). Designers ask themselves questions on how to reconfigure existing systems transforming physical design solutions to achieve broader, human-centered objectives, and empowering individuals with a degree of control over the systems and services they use.

Verganti gives a semantic explanation of design-driven innovation, looking at the role of design as "a discourse on possible new design languages and meanings" (2006:155). He defines the design process as "continuous dialogue on socio-cultural models (foreseen and desired) and their implications for patterns of consumption, meanings, and product languages" (2006:169). Therefore in Verganti's analysis what really matters is a product's symbolic value and the role of designers as 'interpreters' of meanings that can shape the way people think and interact with products.

Krippendorff (1989) from a product semantics perspective reinforces this view; arguing that the word design comes from the Latin designare meaning "making sense of things" (1989:9). He described how design needs to manage four main contexts that are related to the symbolic value of products: the operational context (including product identity, qualities, motivations, states, dispositions and logic; the sociolinguistic context (including user identities, signs, content of communication and social relationships); context of genesis (including all stakeholders involved in the development cycle, and the ecological context (including competition, and technology) (Verganti, 1992).

Manzini (Manzini, 2006) points out the transformation in the role of the designer towards a 'facilitator' who is able to translate people's needs into technically feasible and sustainable products and services. Manzini's definition implies a conceptualization of the centrality of user experience as a new unit of analysis that informs the design process, together with the application of social sciences methodologies to the design research in order to investigate problems in real life settings.

Service design methods will be employed in the process of identifying and engaging stakeholders and mapping key activities in the D-CENT pilots (See Ecology maps in Fig10 and Fig11). These methods borrowed from design thinking techniques, will be employed during the inception workshops scheduled for each D-CENT pilot in Iceland, Spain and Finland. Stakeholders will include a broad range of actors, such as; citizens, social movements, interest groups, policy-makers at City and National level, public officials, and open source developers. Service design as a practice generally results in the design of systems and processes aimed at providing a holistic service to the user. It provides numerous benefits to the end user experience when applied to a variety of applications. This cross-disciplinary practice combines numerous skills in design, ethnography, management, and process engineering. Consciously designed services like the ones envisioned by D-CENT incorporate users' needs and deeper motivations and attempt to create new socio-economic value in society based on inclusive participation and empowerment. By involving citizen groups in the design of new services that goes beyond simple empirical data collection, we will engage them in every D-CENT pilot since the very early stages of the development process and in the wider European context in order to understand how to harness these solutions to solve social issues across Europe. Through a mix of design-driven methods and action research D-CENT will develop an in-depth understanding of unarticulated user needs and unidentified capacity through lean workshops, interviews, and observations. This will help identify problems and enable opportunities for collaboration and innovation to be realized.

3. Participatory Action Research to gather insights from communities

D-CENT employs Participatory Action Research (PAR) as a complementary approach to the Lean method. The PAR approach is developed specifically for situations in which the studied communities are also the intended beneficiaries of the research. Thus, by literally placing the researchers in the shoes of the communities of users, a higher level of understanding and knowledge can be obtained of the conditions, frustrations and experiences of these communities and how they change over time. The PAR approach thus proves very effective in unraveling the everyday practices, as well as the obstacles and frustrations of communities butperhaps most importantly, it is a cyclical approach aimed at continuously producing and validating knowledge about and for social and institutional change.
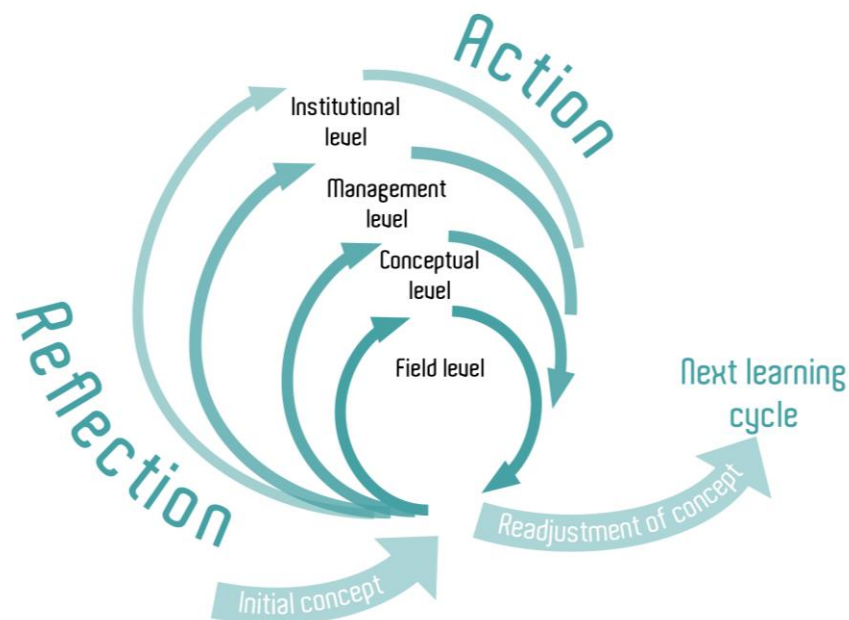
Fig2: Repeated cycles and levels of action, reflection and learning Participator Action Research.

The two fundamental aims which distinguish PAR from other approaches are firstly, that the research is conducted with the explicit aim of being of practical use for a group or community, and secondly that the group or community is empowered through the research by participating in the process and contributing their own knowledge and experiences (Johnson and Duberley, 2000). Strictly speaking PAR is not a method but an approach and as such is based on a set of principles rather than a given set of methods.

3.1 PAR main principles

"Participatory research is defined as systematic enquiry with the collaboration of those affected by the issue being studied for the purpose of education and taking action or effecting change."

(Green et al (2003:419)

Participatory action research and the associated "family" of research methods (including Participatory Research and Action Research) is built around a series of cycles, each feeding into the next as new knowledge and experiences are gained. The cycles are employed over longer or shorter periods of time, but repeatedly throughout the project, continuously validating and adjusting the outcomes and findings.

Fig3: The PAR cycle

3.1.1 Learning from experience

The continuous cycles of the PAR approach encourage a process of learning from experience where action and reflection are employed regularly.

3.1.2 Collaborative

PAR is collaborative in nature and communities are considered co-researchers, contributing their knowledge to the overall research. Thus, rather than the researcher as a detached observer, the AR

researcher is understood as and acts like as a kind of consultant to the community, engaging in reflection with the community rather than in isolation (Alan Bryman, 1989: 149 - 155).

3.1.3 Empowerment

Producing knowledge and outcomes that are meaningful and useful to the community is central to the AR method; this happens by acknowledging and engaging communities in the reflection and analysis process, validating and making sense of their experiences and knowledge.

3.1.4 Building theory

The PAR process is flexible and iterative. In other words, the shape and focus of the research might change according to changes taking place "on the ground". As new questions and new understandings arise through the process of action and reflection, the "diagnosis" and understanding of the problem being addressed might change, reshaping the course of action in return. The research thus takes place through "iterative cycles of planning, acting, observing and reflecting." (PAR handout)

3.1.5 Action

Finally, PAR is intended for conditions where there is a need for action, where a given community has concrete needs, is addressing a specific issue or is aiming to instigate change. The research then takes the stated goal of the action as its guiding principle and is evaluated based on to what extent it is addressing and aiding the community to reach that goal. As the research is cyclical and iterative the goal might change or transform itself over time.

3.2 Action Research in D-CENT

In response to the impact of the current financial crisis on the credit economy we saw the spreading in Europe of different complementary value and currency systems implemented at local level. Alternative currencies represent, at one level, forms of endogenous creation of money in relation to the emergence of social needs based on local and knowledge-intensive economies. There are now new monetary innovations working in over 5,000 communities around the world to face a diverse array of economic and social issues (e.g. credit crunch, education, elderly care, unemployment).

On the other side, we have the question of building interoperable and decentralized technological platforms able to support and coordinate the circulation and scaling of alternative currencies and to coordinate them with other levels of governance. This Task will be led by the Centre d'économie de la Sorbonne with the participation of Nesta and Dyne, and will investigate through an action research methodology, the most significant experiences of alternative currencies, mutual credit schemes and virtual social currencies in Europe, such as the case of the sonantes (previously named bonùs, the alternative currency in Nantes), and other experiences based on specific institutional architectures that are in action in various Italian Regions, in Spain, and the older experience of the Swiss bank WIR. The research methodology will be based on a combination of field surveys, interviews with local stakeholders and analysis of the economic, social and territorial data. Centre d'économie de la Sorbonne will investigate and will compare in a historical and theoretical perspective, the Toulouse case

(http://solviolette-www.b4.catalyz.fr/) the Nantes case (http://www.sonantes.fr/) and the Sardinia case (http://www.sardex.net/). Nantes policy makers have taken inspiration from the Swiss WIR as well as Sardex entrepreneurs, where the alternative currency (Sardex) has been promoted bottom-up starting from a circuit of trade credit.

With the toolkit for designing complementary currencies driving action research, Dyne will investigate virtual currencies such as Bitcoin, a digital currency that dis-intermediates banks from the process of exchanging money. The technical study of the Bitcoin protocol and its developments will be coupled with findings in fieldwork relevant to the design and development of Freecoin and Threadgate, the monetary/payment system and the geo-localized digital market place of the D-CENT Platform, respectively. Participatory Action Research (McNiff, 2002) can be seen as a series of (trial and error) teaching/learning procedures applied in cycles describing an upward spiral whose aim is to openly and transparently monitor the progressive process of knowledge creation and best practices' transmission. Indeed, the LEAN User Experience methodology is perfectly attuned with the principles driving action research more in general.

For instance, Dyne recently conducted qualitative action research at Banco Palmas, the leading Community Development Bank in Fortaleza, Brazil. In partnership with the National Secretariat of the Solidarity Economy – SENAES/MTE, Instituto Palmas (the institution in charge of dissemination of this CDB model throughout Brazil) has published a training guide for the Multiplication of the Methodology framing the foundation and management of a CDB in view of strengthening of the Brazilian Network of Community Development Banks (SENAES in collaboration with Istituto Palmas, 2011). Alongside with this case study from the global South, examples from European alternative and complementary co-managed digital currencies such as the Cyclos-based Zuiderling (http://www.dezuiderling.nl) or the version of Bitcoin with *demurrage*, i.e. Freicoin and FreiMarkets (http://freico.in) will inform the research methodology for D-CENT with regards to the implementation of the social digital currency within federated communities and the financial/crypto-currency alphabetization of users of the D-CENT Platform.

Nesta will provide insights on complementary currencies focusing on Sterling backed Local Currencies which support local economic exchange/resilience (Bristol Pound http://bristolpound.org/), Local Economic Exchange Systems (LETS), and Time Backed currencies which build communityand collaborative consumption platforms that reward volunteering and can be used as mechanism for co-production. Processes of innovation of the current democratic and decision-making mechanisms should take into consideration the need to redefine value relationships, in order to support and expand cooperative economies that can lead to true behavioral and social change. This is crucial also to analyze new frameworks for building and managing the new institutions of the commons. Such perspective leads to an analysis of the "social experiments" regarding alternative currencies that is focused on the problem of the social cooperation.

4. Agile and Lean principles
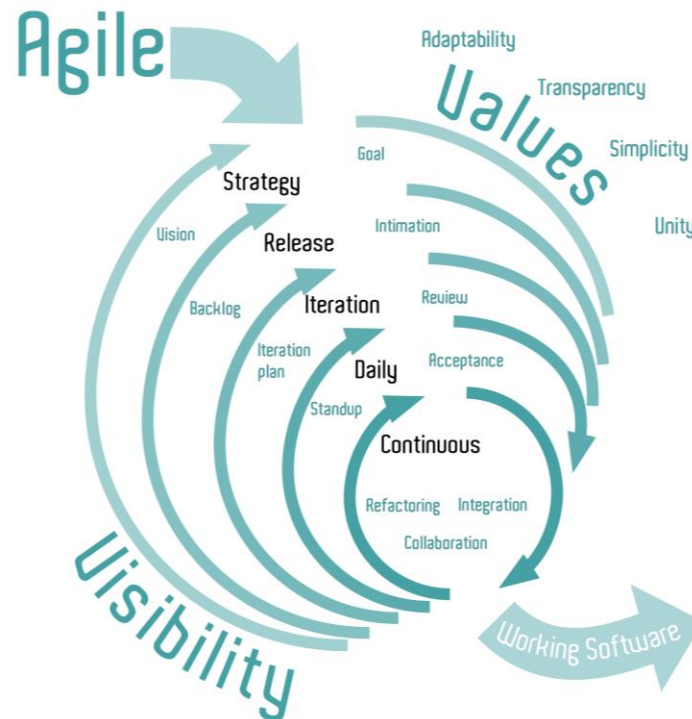
Fig4: The cycles of the Agile method

There are several similarities across the Agile and LeanUX methods, with many using a combination of the two to reach a balanced and effective collaboration between technical and design teams. Within Agile, the method of Scrum has been one of the most popular forms of Agile structured around two week sprint sessions during which self-organized teams design and develop an iteration. At the end of each sprint a retrospective session is held during which reflections are made on how the process went.

Customer data is gathered and user stories developed at the beginning of the sprint sessions in order to articulate the goal of the session. These usually follow the syntax of: *As a* [user type], *I want to* [accomplish something], *so that* [some benefit happens]. This ensures that a concise need or problem is identified that might from the aim of the sprint session.

In a similar manner, lean employs "hypotheses statements" which follow the syntax of: *We believe that* [by doing this/building this feature/creating this experience] *for* [these people/personas] *will achieve* [this outcome]. *We will know this is true when we see* [this market feedback, quantitative measure, or qualitative insight].

Lean thus includes a final statement aimed at ensuring that the stated hypothesis is in fact measurable which functions as an extra measure against unrealistic aims or aims that reach beyond the scope or timeframe of the iteration. Below we explain some of the core lean and agile principles as they have been adapted employed in the D-CENT methodology:

4.1 Elimination of waste

One of the core principles of LEAN and Agile is the elimination of waste. Waste is considered anything that does not contribute to the final "product", this is primarily aimed at preventing extensive speculative or predictive planning that might not stand up to testing with users. The elimination of waste by rapid and repeated iteration and user testing marks the main difference between the LEAN/Agile methods and the more standard "waterfall" method of producing detailed specifications based on assumptions which are not tested until the final instance before implementation. With the LEAN/Agile method, assumptions are articulated where the Lean method places a lot of weight on testing these assumptions with users or in real-world situations on a continuous basis. The main aim is the elimination of time spent developing and documenting to specifications that might be flawed. This *making-over-analysis* bias in the Lean method is based on the concept that the most valuable answers come from users testing ideas in the real world rather than from extensive analysis and documentation.

Another important principle which ensures the elimination of waste is by working in cross-functional teams with maximum face-to-face communication. This minimizes time otherwise spent on documentation and detailed specifications by prioritizing face-to-face as the main method of communication between team members working on the different aspects of the project.

4.2 Cross-functional teams

Cross-functional teams are made up of each discipline involved in creating the D-CENT platform. The team should be in continuous communication during the iteration stages in order to ensure the creation and re-creation of a shared vision and avoid the development of "silos". Early and continuous collaboration between disciplines ensures greater efficiency and circumvents the need for time-consuming and extensive documentation. The other characteristic of team-work following the LEAN methodology is making the team problem focused rather than focused on a given set of features.

Features tend to be based on a set of assumptions but by focusing on the problems that needs solving these assumptions can be continuously tested, saving time spent on implementing features that might not solve the problem.

4.3 Rapid iteration and Minimal Viable Products

Rapid iteration of small batch sizes implies avoiding large time-consuming deliverables that might hold the team and process up and instead aiming to create rapid proto-types that users as well as the team can feed back on. These are also called *Minimal Viable Products* (MVPs) that are defined and produced in order to move more quickly towards testing, learning and improving the products. An MVP can be low, medium or high fidelity, and can start as simply as a sketch on a piece of paper. The main aim of the MVP is to come up with the smallest, fastest and easiest proto-type in order to retrieve the information and feedback needed to be confident to carry on down a given path of development.

4.4 User centricity

User-centricity means bringing the user into the design process earlier rather than later. The success of the design is dependent on whether it serves the actual needs of the users, so the earlier and more frequently that they are able to provide feedback the better. The whole team should be involved in engagements with users so that understanding is fostered amongst the whole team and a shared vision of the problems that need to be solved is continuously (re)created. User-centricity however does not imply building precisely what the user asks for, but rather to unravel the underlying frustrations and problems that the user is expressing in order to create new hypotheses to be prioritized and tested through MVPs. User centricity thus implies running continuous experiments on and with users, involving them in the development process early on. This counter-intuitive process of having users interacting with low-fidelity or incomplete "products" early on is what characterizes LEAN.

4.5 The Lean UX cycle
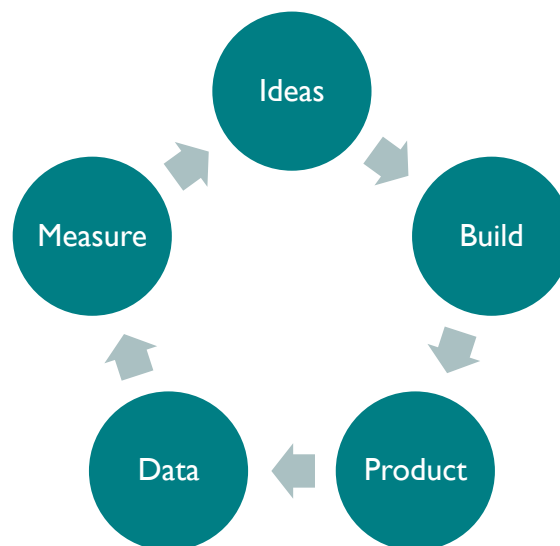

Fig5: The Lean UX cycle

4.6 Continuous discovery

The LEAN method is thus a method of continuous discovery where the cycle is repeated several times throughout the development stage. It implies engaging the user in the design process on a regular basis and involving the entire team in each new iteration, continuously fostering a shared understanding of the problem being addressed and the proposed vision of how this will take place. Discovery takes place "in the field", having users engage with the ideas, designs and prototypes at all stages of development.

5. D-CENT Lean UX development process

5.1 Lean Inception: "Don't build things people don't want"

The first iteration phase consists of three lean inception workshops in the each pilot country. The goals of these workshops are to define a shared vision amongst the D-CENT partners, develop hypotheses to be tested, determine user profiles, test hypotheses with users, and arrive at problem statements in order to develop the first MVPs.
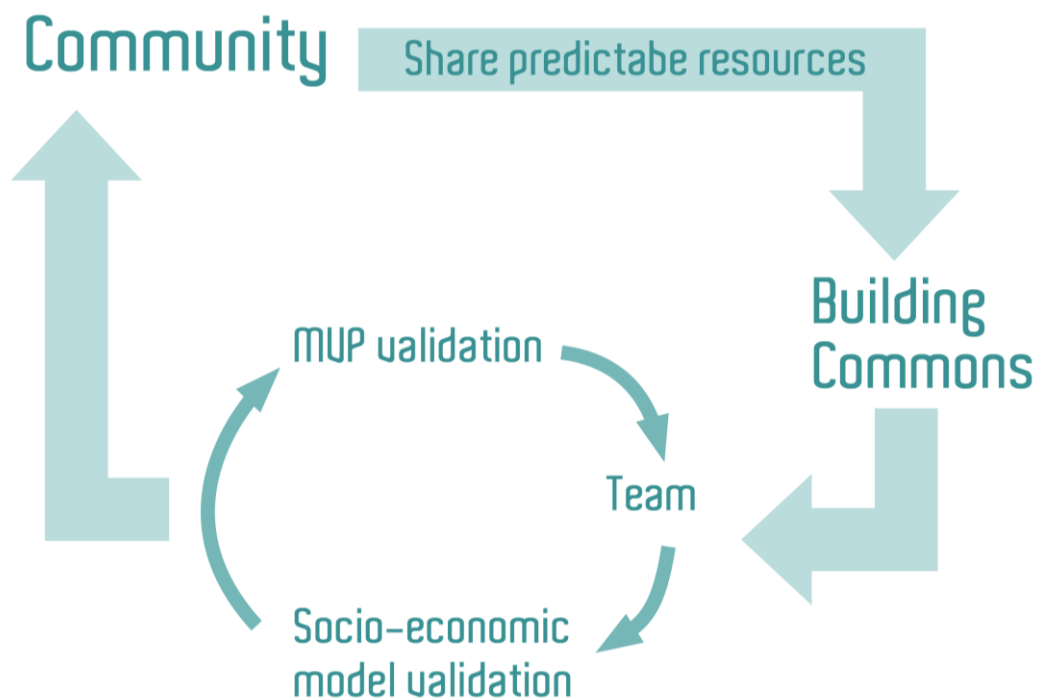
Fig6: The D-CENT adaptation of the Lean business cycle

Each of the target D-CENT user-groups are living, working and organizing in very different contexts, operating in ecologies of informal and formal, institutional and non-institutional dynamics. While the Icelandic use-case scenario is aimed at the general citizenry, lead users have been identified amongst current users of the Your Priorities platforms developed by D-CENT partner Citizens Foundation in Reykjavik. Developed in response to the financial collapse and the subsequent crisis of legitimacy of the political establishment of Iceland in 2008 the platform became widely used during the municipal elections in Reykjavik with a subsequent ongoing collaboration with the City Hall. Collaborations are also taking place between the Citizens Foundation and the Icelandic Pirate Party for the development of a national online direct democracy tools. The lead users in Iceland thus span active citizens and information

activists, as well as users deeply embedded in institutional structures in the town hall as well as the parliament.

In Spain the lead-users have been identified amongst some of the largest and most dynamic movements currently active that have emerged since the financial crisis. The PAH (Plataforma de Afectados por la Hipoteca) movement was formed in 2009 when the Spanish housing bubble burst and many families were facing evictions. It grew rapidly after managing to resist a number of evictions through popular pressure, negotiations and direct action and is now a movement that spans the country, organized horizontally and through assemblies held by independent local nodes. On a national level the main target of the PAH movement has been the unpopular Spanish mortgage legislation (Dowsett 2013) in which debtors who have been evicted are nevertheless liable to pay back their mortgage debt. In the spring of 2013 they managed to gather more than 1.5 million signatures(Reuters 2013) in favor of changing the legislation, the demands of which were not fully met by the Spanish ruling party PP, fuelling further anger towards the party and gaining support for the PAH(ibid). The PAH movement has been rapidly growing, with actions becoming more ambitious and horizontal communication, deliberation and decision-making needs becoming more sophisticated.

Active in the 15M mass-movement mobilizations in 2010, the PAH movement is an example of a wave of new social movements emerging out of the crisis in Spain, with the common aim of radically transforming the scope and scale of democracy. Other lead user groups for the D-CENT platform thus include *Iaioflautas*, an action network of pensioners organized in nodes spanning the country, who currently organize against financial institutions and in support of other movement groups in demonstrations; the recently established research foundation, *Fundación de los communes*, conducting research for and by the new Spanish social movements; *Red Ciudadana - Partido X* a political party that emerged out of the 15M movement with the core aim of reforming the electoral system in Spain using tools to implement direct democracy in parliament. Also included amongst the Spanish lead-users are the local currency and exchange groups *Intercanvis* and *Ouishare*.

In Finland lead-users are identified amongst groups who have initiated a "Citizens Initiative" through interviews during the Lean Inception session due to take place in Helsinki in March. Ever since the Citizens Initiative was launched in early 2012 Finnish citizens who have voting rights in the country have been able to submit proposals for new legislation or for setting an agenda to address certain issues on the Ministry of Justices' website (https://www.kansalaisaloite.fi/fi). If the proposed initiative manages to gather over 50,000 signatures in their favor the Finnish parliament is obliged to consider and vote on the proposal. Hundreds of proposals have been submitted, however, very few have the capacity to reach the threshold of 50,000 supporters to merit parliamentary proceedings. D-CENT will thus aim at addressing the challenges faced by the identified lead-users in their aims of influencing parliament.

The three pilot countries have been selected in order to test tools in contexts of diverging stakeholders and power compositions: The Finnish case is deeply embedded in institutional frameworks adapted and supported in the Government through the Citizens Initiative; the Icelandic case, while having its roots in social movements and pressure groups emerging in response to the Financial crisis, the drive for direct democracy has since been incorporated into existing institutions such as the City Town Hall and to a certain degree in Parliament; finally, the Spanish case is strongly based in social movements and

grassroots practices often excluded or with only limited recourse to traditional power structures and current democratic institutions.
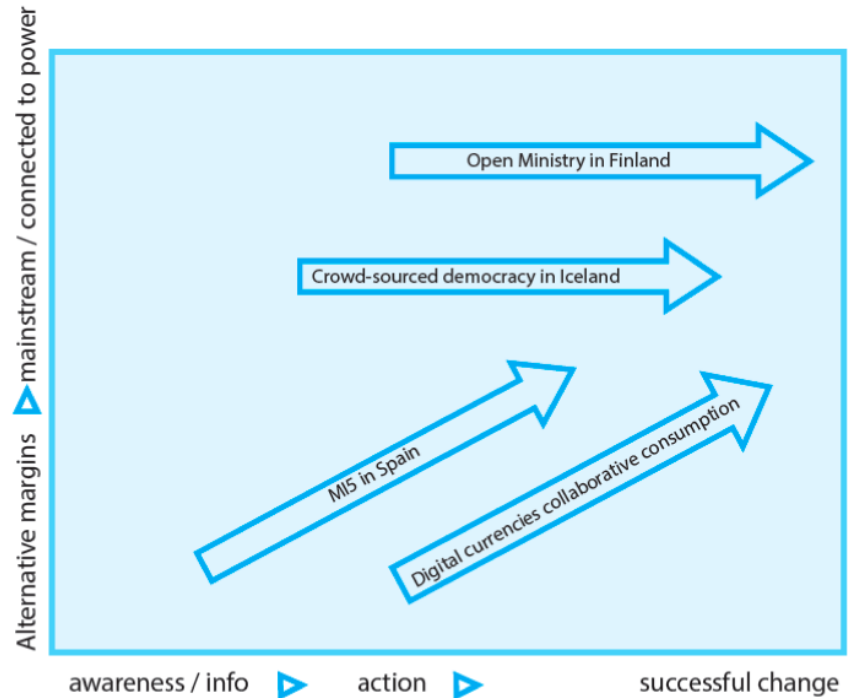
Fig7: Demonstrating the development towards successful change and proximity to traditional institutions of power

With these differences in mind, the common aim across the pilots remains the transformation of democratic processes, opening them up to citizen's participation. In Fig8 several stages are identified in the democratic process in which this "opening up" and democratization can take place. These stages can be identified in each of the different pilot cases and therefore provides a useful roadmap for testing the possibilities of shifting power structures in diverging contexts. Following on from this, in order to grasp the local contexts several stages of ecology maps are drafted, both in preparation for and as out-comes of the Lean Inception sessions taking place in each pilot country (outlined below). The ecology maps aim to contextualize the main user groups in each country within the processes and frameworks that they operate in and identify their main aims and targets in order to visualize points of tension, difficulties and possibilities. These maps also serve the purpose of articulating the boundaries and limitations of influence as some frustrations are beyond the scope of the development of new digital tools. Thus, in order to better identify goals and frustrations within the scope of D-CENT, one of the core principles of Lean is employed – *outcomes rather than output*. By shifting the focus from the production of a given feature to the solution of a given problem allows for a better understanding of which problems are solvable through the development of new digital tools, and which are in fact problems that lie outside the scope or need of intervention. Once again, this process is aimed at reducing waste. "Don't build thing people don't want" is at the core of the Lean Inception sessions in each pilot country.

Fig8: Democracy as Open Ecosystem

User hypothesis

Name:

Age:

Gender:

Job:

Group:

Role in group:

1. What are your main problems/needs/frustrations (money):

2. Do you have resources that you are currently not able to use/distribute/employ:

3. What is money/ what should money be or provide to you: (How D-CENT might address these needs)

Hypothesis statement

We believe that by

for

we will acheive

We will know this is true when we see

Fig9: Persona and hypothesis statement card used during D-CENT Lean inception workshops
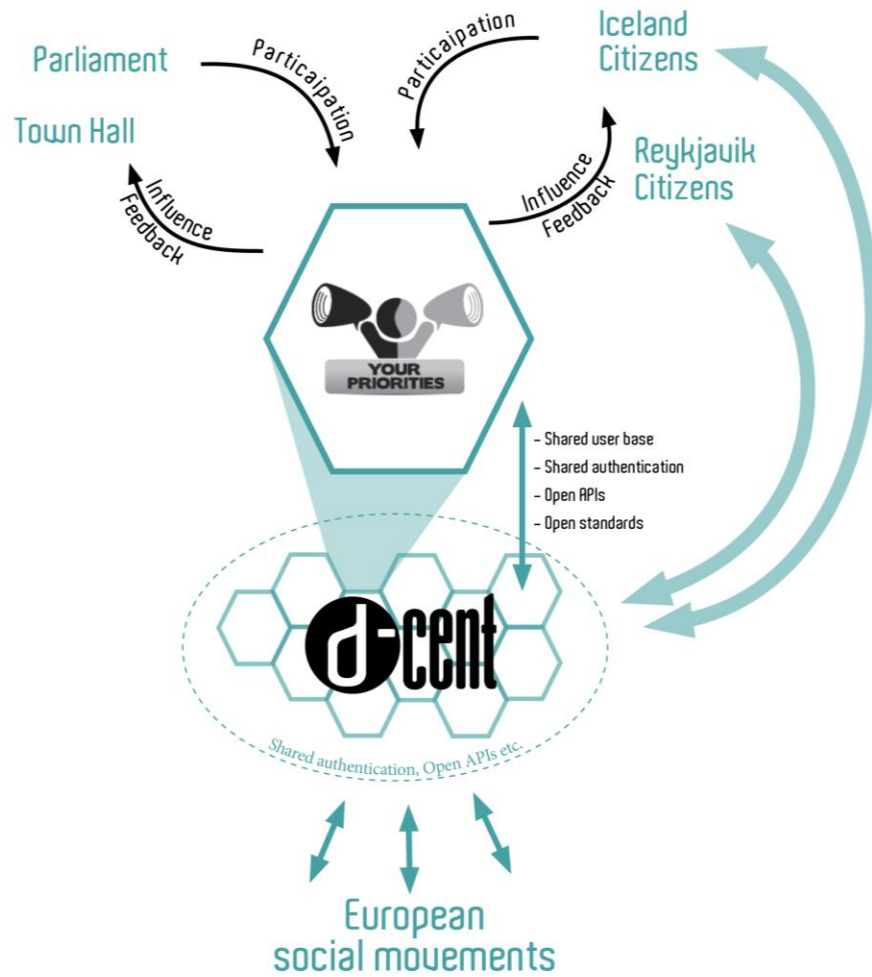
Fig10: Ecology map 1 of Icelandic pilot

5.2 Iceland Lean Inception Workshop

Two and a half days were spent in Reykjavik, Iceland with representatives of NEO leading the workshop and participation from the main project coordinators (W3C and NESTA), a representative from the Finnish pilot Open Ministry and local partners IMMI and the Citizens Foundation. The aim of the

workshop was to develop a shared vision, create initial hypotheses and gather user data by testing the hypotheses in the field as well as commit to an initial MVP.

The morning of the first day consisted of developing an overview of the local context and preparing for the user workshops in the evening. This was followed by a session led by NEO with the aim of declaring basic assumptions: who are the users and what "problems" will D-CENT be addressing for the users. This served the purpose of developing shared vision as well as articulating user-types and hypotheses to be tested in the evening session.

For the evening session current users of the Betri Reykjavik and Betra Island Your priorities platforms had been invited by the Citizen Foundation to an evening at their offices where semi-structured interviews were conducted and recorded by members of each project partner present. This served the purpose of ensuring a broader understanding of the Icelandic user-base amongst the project partners and to begin the process of creating hypotheses to be tested for the Icelandic pilot. The initial round of interviews was primarily centered on users of the Betri Reykjavik and Betra Island platforms in order to draw conclusions from already existing tools

On the second day additional interviews were conducted at the Town Hall amongst administrative staff working on or having experiences using the Your Priorities platforms. In the afternoon the team split with half discussing the technical architecture, and the other half conducting additional interviews at the parliament with MPs.

The morning of the final day consisted of sharing the experiences gathered and dividing up remaining tasks and discussing the Icelandic MVP. NESTA gathered documentation and the interview material; audio recordings and notes and proceeded in the days following the Reykjavik workshop to produce an ecology map and develop user hypotheses for the Icelandic use-case scenarios that will be defined in D 1.2.

Data-gathering related specifically to the alternative currencies tranche is taking place in Iceland via an online form which is already employed in Spain (see page 28 below) and in development for the Icelandic case. The form will also be used in order to supplement user-interviews on the democracy side after an initial analysis of the data gathered from the Icelandic Lean Inception workshop identified further user-demographics to be included.
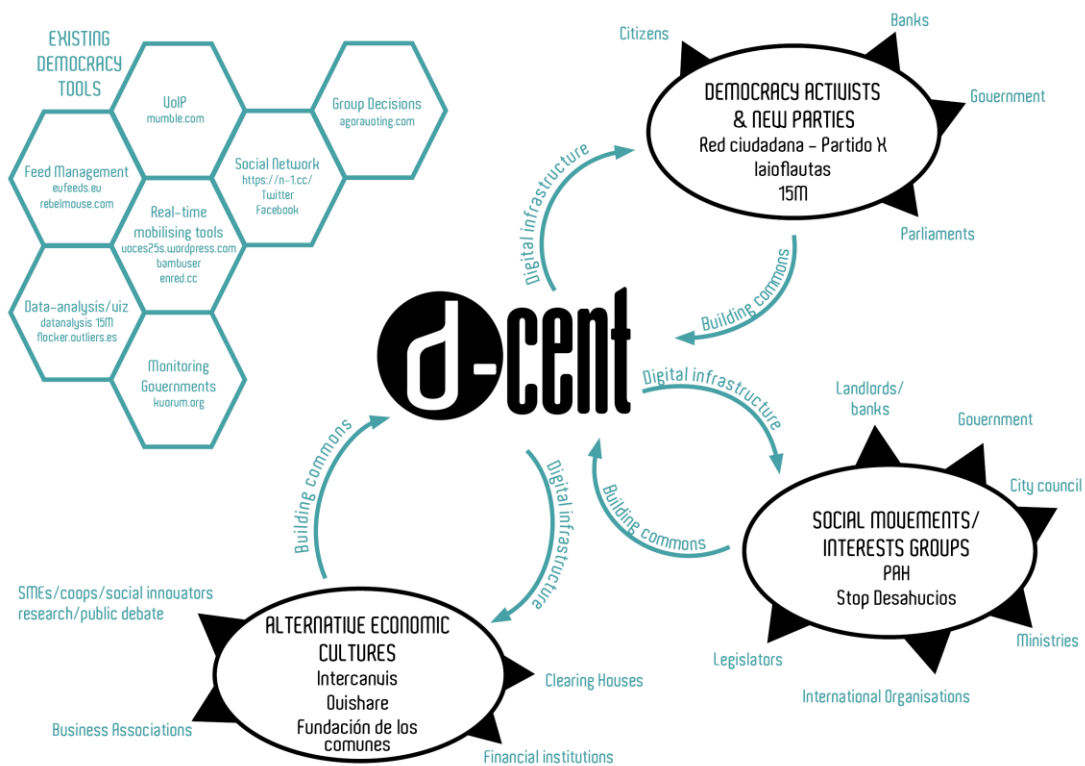
Fig11: Ecology map1 for Spanish pilot case, showing Democracy tools currently used in Span, clusters of local lead user groups, their relation to D-CENT and main targets.

5.3 Barcelona Lean inception Workshop

The Barcelona session spanned a total of six days, organized by UOC with material prepared by NESTA, and involved project partners from all three pilot countries and representatives from NEO and the W3C. The aims of the workshop were to develop an understanding of the Spanish local context across all partners, explore overlaps and common needs amongst users as defined through the previous workshop in Reykjavik, create hypotheses and use-case scenarios for the Spanish context and begin testing these hypotheses to arrive at an initial MVP.

The evening of the first day consisted of introductions and setting of the workshop objectives amongst the project partners. The second day consisted of a "General Assembly" with representatives from all the lead user groups organized by the UOC. The general assembly began with a presentation of D-

CENT by NESTA followed by a presentation by UOC to contextualize D-CENT for the Spanish context. This was then opened to presentations, discussions and questions by the local groups, who explained the main activities and main objectives of their groups, and shared their stories and experiences of frustrations experienced with existing digital tools. The invited groups included national campaign groups, such as PAH, democracy activists involved in local 15M groups, as well as local alternative currency initiatives. The session was video and audio documented in order to form part of the development of working hypotheses and provide background for the use-case scenarios. After the General Assembly, initial user hypotheses were drafted to be tested in further in-depth interviews during the subsequent days.

The morning of the third day consisted of a follow up discussion from the General Assembly and a discussion of the D-CENT architecture and design. In the afternoon in-depth interviews were planned with members of the lead user groups represented at the General Assembly, with technical discussions taking place simultaneously creating an ongoing feedback process between information gathered through user interviews and the technical discussions. Interviews were conducted for both the currency and democracy tranches. The following morning consisted of continued discussion of the D-CENT architecture in relation to the development of MVPs. User hypotheses were developed from the interviews already conducted and prioritized in relation to the development of an MVP for the Spanish pilot. In the afternoon further in-depth interviews took place, feeding directly into a simultaneous discussion and decision-making on an initial MVP for the Spanish context.

The next day consisted of collating and drawing conclusions from interviews conducted in order to refine hypotheses statements and further develop user-profiles and use-case scenarios. A set of metrics was agreed on in order to test the MVP with a set time-line and achievable goals: from the initial launch of the MPV and for the duration of one month, timestamps for each (anonymized) user, timestamps of logins and finally timestamps of the clicks on the main tools of the MVP (specified in page 30 below) will be gathered for analysis. The afternoon consisted of a final round of in-depth interviews and collation of all interview material. The final day of the workshop consisted of an overall discussion, (re)creating a shared vision across the team and dividing up remaining tasks. The interview material, hypotheses statements and documentation was collated by NESTA as coordinator to ensure the material is available across partners and for the development of use-case scenarios and user profiles for Deliverable 1.2.

Finally, through the interviews conducted with active organizers in local alternative currency groups a collaborative method was developed in which these groups would incorporate online questionnaires to be put to their wider communities. The questionnaires would gather data related to both the concrete practices of these groups, any frustrations they might be experiencing, their ability to use, distribute or employ resources and finally their broader outlook on the role of money in their practices.

Fig12: An example of the online questionnaires adopted by local Spanish alternative currencies groups in order to gather further data for the D-CENT currency tranche.

5.4 Helsinki Lean Inception Workshop

The Helsinki Lean Inception session will take place over three days early in March with the core aim of arriving at an MVP for the Finnish case. A central aim of the Finnish D-CENT pilot is to make it easier for citizens who propose a Citizen Initiative to reach the 50,000 thresholds of supporters needed in order to be considered in the Parliament. Underlying this aim is a set of ideas and assumptions which will be tested in user-interviews and subsequently by developing and testing an MVP. The ideas and assumptions have been grouped into two types:

(a) Tools to aid the core group who is proposing a citizens initiative to self-organize and be able to prepare their proposal and the campaign plan in preparation for launching a 6 month campaign, during which they need to reach 50,000 supporters. These include tools for communicating, co-editing, deliberating, polling and task management.

(b) Tools for the group to be able to implement their campaign plan effectively for the duration of the 6 months. This includes problems such as how to activate passive people? How to delegate tasks between core organizers, new supporters, and different geographic areas?

The tool-sets that the campaign groups have been using so far have been a mix of ad hoc online tools. For this reason the interviews will initially focus on the experiences that groups have had with these tools so far, in order to identify any problems and to test the above hypotheses a) and b). Interviews with a wider selection of potential users will also be conducted, including members of other citizen activist groups, in order to identify common needs and frustrations, gaging the wider relevance of D-CENT. Finally, interviews will be conducted amongst city and national level politicians who form an important part of the wider ecology that the D-CENT democracy tools would be situated within.

5.5 Minimal Viable Products (and low-fidelity proto-types)

The MVP helps us to begin the learning process as soon as possible and with the minimum effort in order to test our working hypothesis that has been developed during the Lean inception workshops with users. An MVP can be complex early prototypes complete with problems and missing features or very simple, low-fidelity tests to start the development process. Following the lean methodology the best choice is opting for a simple product with only the necessary features to attract enough users to get feedback from them on the hypotheses being tested.

As an outcome of the Lean inception sessions in Iceland and Spain, MVPs for each of the cases were decided on in order to begin the process of testing, measuring and gathering concrete user feedback. In the case of Iceland the existing Betri Reykjavik platform was agreed on in order to take advantage of its existing user-base for testing and measuring features envisioned for a national scale platform. A key area of testing in the Icelandic case is proxy voting methods such as liquid feedback. A set of metrics will be implemented and gathered for the Icelandic MVP in order to conduct the testing and gain regular behavioral and quantitative feedback from users.

An MVP for Spain was arrived at through the user interviews when a soon-to-be-launched android application was introduced by a representative of the PAH during the user interviews. The android app was designed specifically for the PAH movement consisting of four main features: a tool for mapping actions and targets, a newsfeed, an instant messaging system and a real-time voting system. A collaborative relationship was immediately established with the developer and a set of metrics were devised in order to gather data on user behavior. The aim will be to measure and learn which features might be integrated into the D-CENT platform, optimized and made available for users beyond the PAH movement. The metrics have been set to register the user timestamp, timestamp for logins and finally, timestamp for clicks on each of the four main features of the app.

An MVP for the Finnish case is anticipated to come out of the Lean inception session in Helsinki, taking place 3rd-6th of March 2014. Metrics will be devised in a similar manner as the Icelandic and Spanish case to gather data and learn which features should be developed further and integrated into the D-CENT platform for scalable and generalized use.

6. Iterative Feedback and Pilot experimentation

As outlined in the previous sections, D-CENT builds on Europe's largest experiments in digital democracy – the Open Ministry crowdsourced legislation linked into Parliament in Finland, the participation democracy websites Better Reykjavik and Better Iceland in Iceland, and 15M, one of Europe's most dynamic social movements in Spain. These experimented enabled by digital platforms show how millions of citizens can become engaged in deliberation and decision-making. So, when D-CENT platform is launched, it already has a potential user base of thousands of active people in the three pilot countries.

Lean UX Innovation was chosen as main methodology for software development. Following the methodology, user-stories will be developed, iterating the software development rapidly with short user-feedback cycles as the pilots deploy the software. Thus, this flexible and adaptive process will result in innovation as the outcome of active user participation and adoption. However, due to the high risk involved, the software development will be guided by a careful project plan and detailed baseline technical specifications (see WP 4- D4.2; D 4.3; D4.4). Software integration will be done via a rich set of APIs for loosely coupled components. Closely coupled core work will be done in Ruby, a programming language that specializes in quick iterations with user-driven feedback but also capable of scaling (the original Twitter was designed in Ruby and some of the same programmers are involved in D-CENT).

As explained in Section 5 of this document, each feature will be designed using a process commencing with an inception event and then rapid beta iterations with users in pilots as given in the lean development process. Every feature will be built using detailed test-cases and unit-tests, as will be documented in D 1.2, in addition to being measured on an ongoing basis by employing user engagement metrics that pay careful attention to changes in engagement with user interface and experience. The objective of this particular implementation methodology is to ensure that the final results of the project have a large number of users and a critical mass of citizens adopting the D-CENT solutions.

Finally, every pilot will adapt and translate the local social norms and conventions involved in decisions making, deliberation and social currency. These pilots involve taking into account political and cultural norms and institutions that cannot simply be technically implemented but require careful work with the local adaptations of the applications by the communities. This process requires making sure the Lean UX can clearly incorporate the differences in value and decision-making processes given between different communities embedded in very diverse socio-economic contexts and with a wide variety of political and socio-economic objectives.
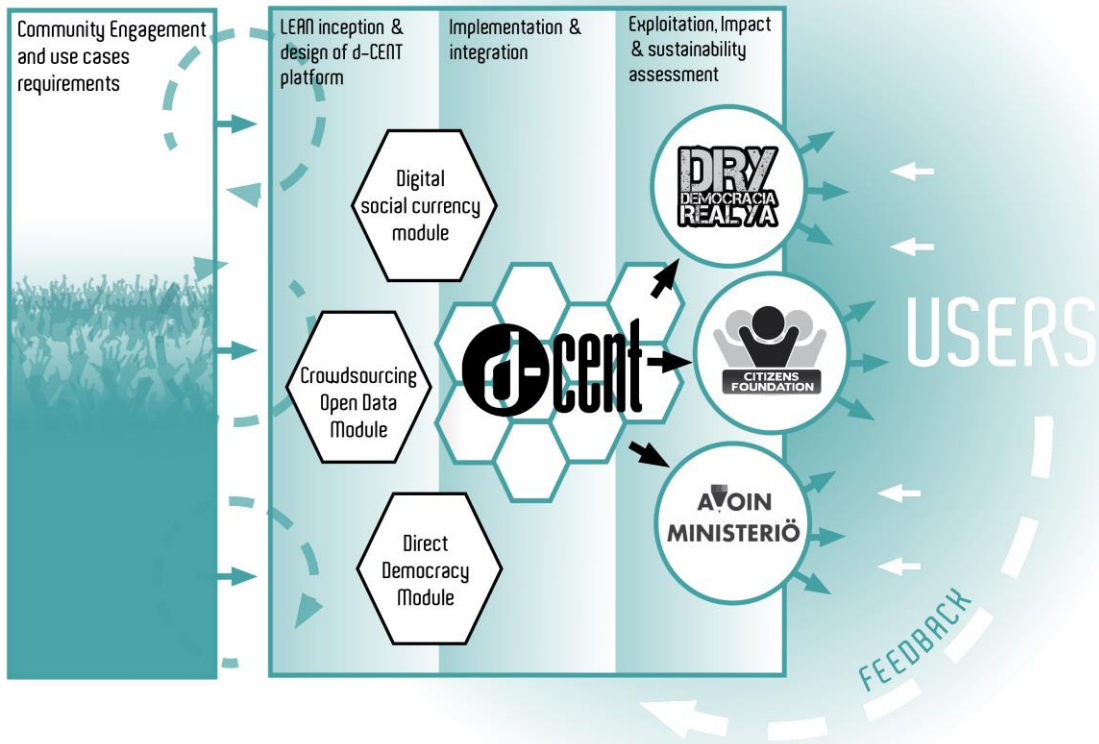
Fig13: Stages of D-CENT

7. Data-analysis, Data-visualization and Network Analysis
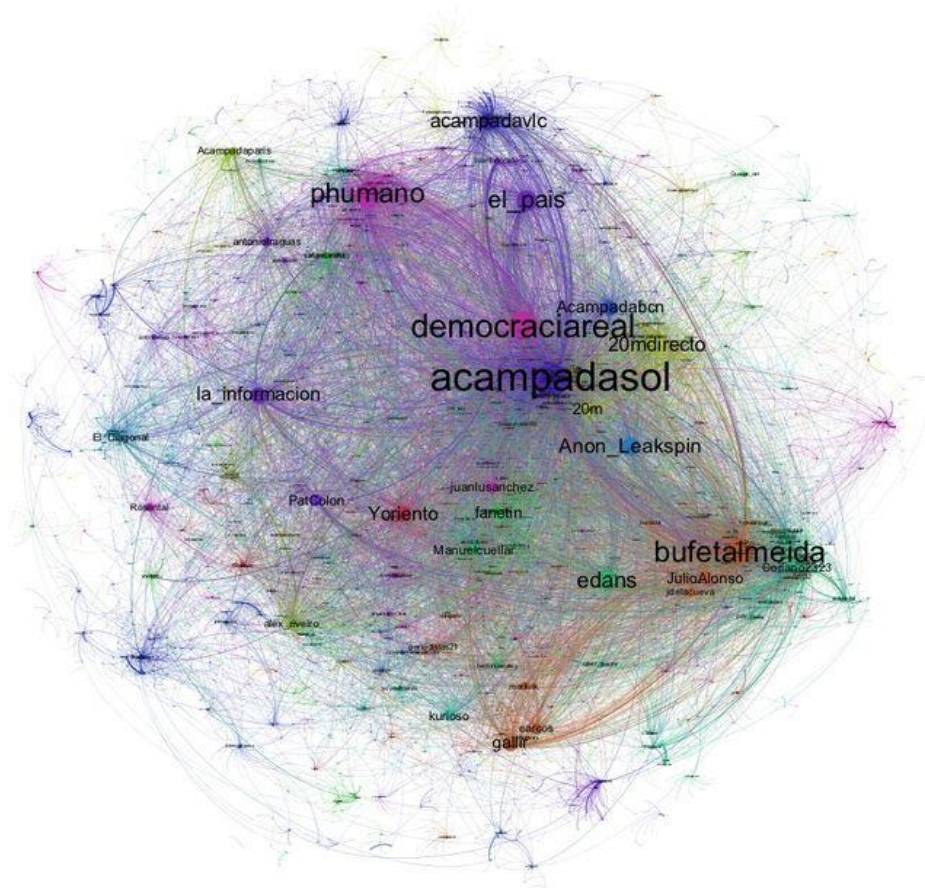
Fig14: Diffusion network from the 15M explosion stage. Graph by Pablo Aragón

Big data analytics is becoming a very valuable technique for innovative digital organizations, proving to be a key component in the overall organizational strategy. Just to give an idea of the volume of data currently generated, 2.5 billion gigabytes of data are created every day (with Twitter alone generating *Terabytes* of data on a daily basis), while the data generated globally is expected to grow to reach 35 *Zettabytes* in 2020 (Gants and Reinsel 2012). Furthermore, the use of big data to collect and analyze information, along with the ability to release information to the public through open data formats can help both government and organizations make more strategic, evidence-based decisions. The value of big data comes from the relationships, connections, and patterns that emerge from new data correlations

about individual organizations, products and things or information itself. A lively area of research within this area is social data miningwhich emphasizes the importance of social media analysis for mining structural data and studying the interaction amongst groups and users (Barbier and Liu 2011; Asur and Huberman 2010; Pang and Lee 2008). With the increasing use of digital platforms for organization and decision-making,

 and since social media such as Twitter and Facebook are currently the main platforms where online social interaction takes place, much information on people's everyday activities can be found by analyzing the use of social media interactions

Social data (i.e. data produced and shared by users and citizen groups) represents an important part of "big data" analysis and it is used to improve the way collective dynamics work, improving direct feedback among social groups as well as between institutions and citizens.

The potential scope of social media analytics can be broad and cover emerging and perceived issues; top influencers in terms of authors, blogs, forums; key themes driving user sentiment over time; *affinity analytics*; trending topics; word distribution (percentage of conversations associated with a particular word); names of products or services driving positive and negative sentiment for a specific topic; and key themes that are opportunities to enhance user perception. This analysis in turn can be used to define specific action items, define group priorities, and even improve organizational strategy. Although social media analytics tools can analyze huge numbers of people and organizations, taking into account diversity of countries and languages while guaranteeing statistical validity, these techniques are still immature, and in rapid progress. Such tools could potentially complement or replace traditional user surveys and allow for more frequent monitoring potentially at lower cost using open source solutions and respecting user's privacy. Due to the fast development of this technique for analyzing significant patterns in human communication and behaviors across domains, new questions have started to emerge from the debate among scholars about the use of methodological frameworks, the theoretical assumptions, regulation and biases that bid data implementations can reveal (Boyd and Crawford 2012).

7.1 Data-analysis in D-CENT

In the context of D-CENT, data-analysis and data-visualizations represent both a research method and an outcome for the D-CENT project. Since 2012, the Spanish D-CENT partner at the UOC/IN3, the 15M DatAnalysis group, has been developing methods for analyzing network data emerging out of the 15M movement in Spain. Giving an overview of not only of the shaping of opinions and the diffusion of information in the days of the 15M movement, their methods are also beginning to account for organizational forms, in particular political and communication systems emerging from the movements that respond to a network and complex systems logic rather than to traditional hierarchical structures. The Spanish case remains a pioneering example of the depth and spread in the use of network technology in social movements. The work of the 15M DatAnalysis group will thus feed into multiple levels of the D-CENT development via the Spanish pilot, and it will be later extended to the analysis of the other pilots across Europe.

Initially, by providing tools to grasp the emergence of various types of organizational forms and enabling

an analysis of these processes over time, the methods developed by the 15M DatAnalysis group with UOC/IN3 will provide an overview of the new forms of movements emerging in Spain. Secondly, the tools themselves will be fed directly into the D-CENT platform as data analysis and visualization tools to be adapted for a diverse set of user groups. Interaction data will be extracted from different social media platforms such as the microblogging services (e.g. Twitter), social news sites (e.g. Menéame), wikis (e.g. Wikipedia), social networks (e.g. Facebook) and other social media platforms.
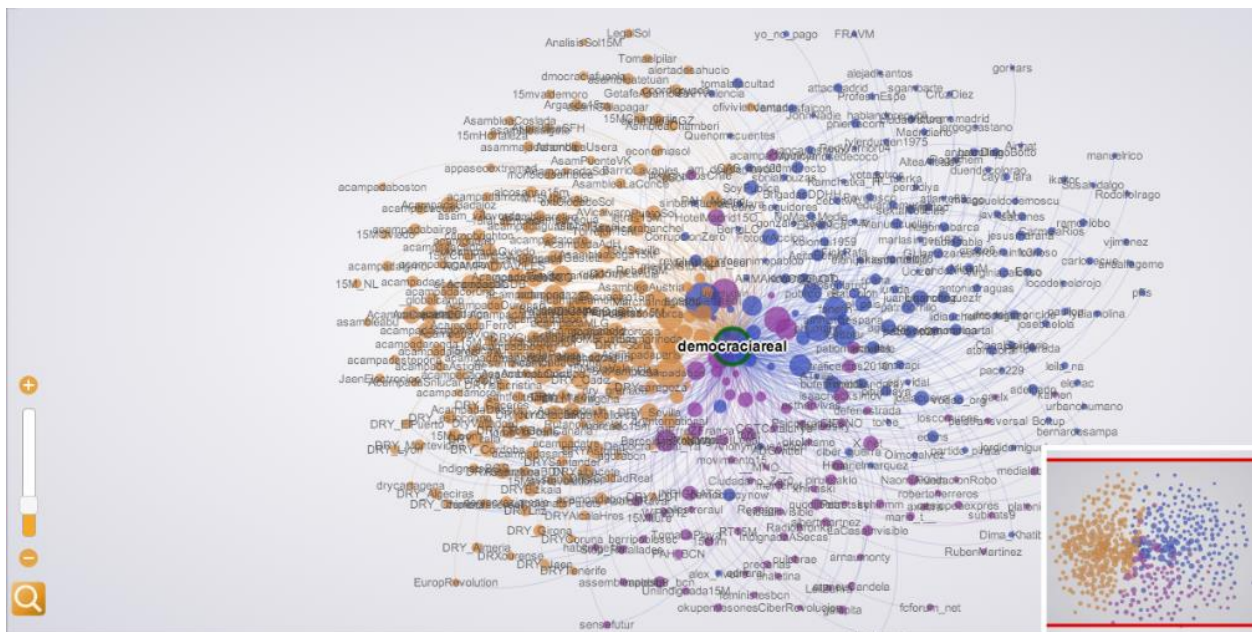

Fig15: Twitter collective accounts of M15 Source http://www.manuelalucas.com/sre/

Numerous methods for analyzing data are being developed in response to the immense quantities of data produced through online networks every day. However, accessibility remains an issue, at the level of interpretation and analysis. Below we mention the main areas of data analysis explored within the D-CENT project:

7.1.1 Analysis of the networked movements' genealogy

D-CENT will analyze the key political activities and mobilization of citizen movements, highlighting the relationship between each organization in order to identify the connection amongst movements and their activities. The flows between the people who have been involved in other organizations and their engagement in the wider network of movements will be analyzed. At the same time, the content generated by each movement (posts, updates, decisions, pictures, etc.) will be mapped taking into account the influence of their predecessors. Proposed methodologies: secondary data analysis, in-depth Interviews; digital methods such as analysis of flocks and migrations between hashtags in Twitter.
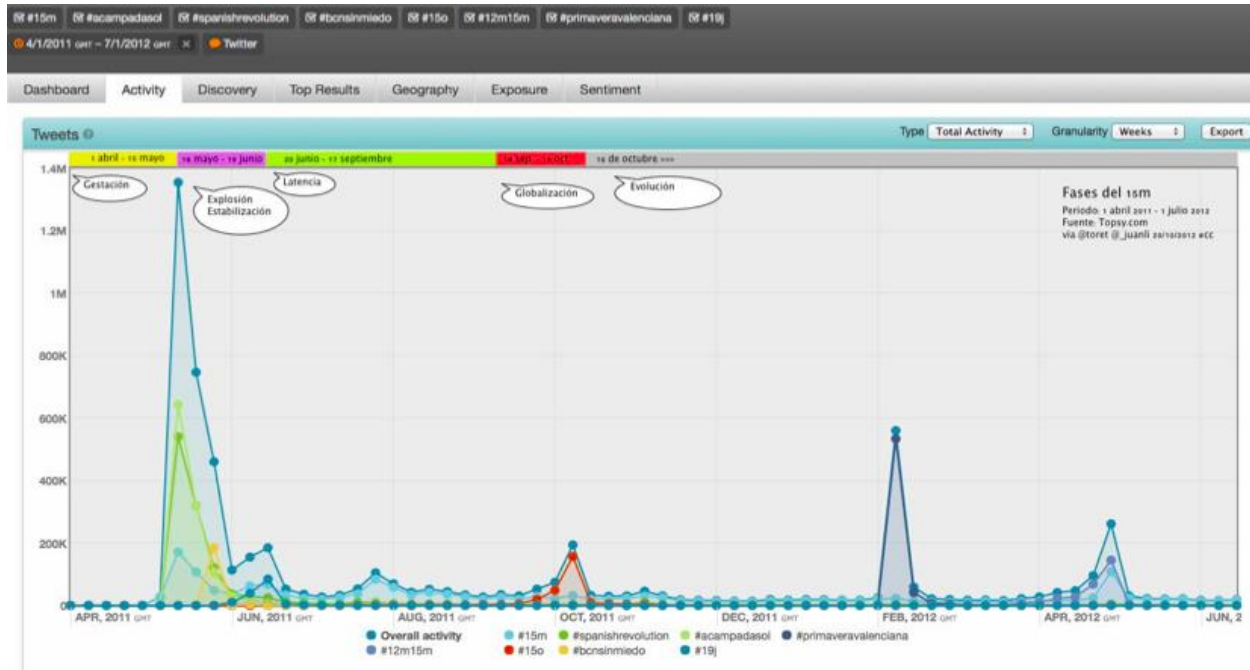
*Fig16: **Topsy** graphic with 15M stages and its activity peaks. Elaborated by Joan Linares and Javier Toret*

7.1.2 Analysis of the network communication and collective intelligence

Within the D-CENT project, we will analyze the relationship between the role of network communication, the emergence of processes of collective intelligence, and the network movements' characteristics focusing on the Spanish pilot with the aim of extending this kind of analysis to other citizen movements in Europe. It will be necessary to know which communication technologies are used, which kind of networks are built, the key elements and processes unleashing the emergence (or not) of forms of collective intelligence, and how this connects to a new culture of political action. To approach these dimensions of the network movements we will analyze how the movement messages spread and are retransmitted at multiple scales, resulting in quick and viral contagion processes, as well as synchronized collective action. WE will also attempt to sketch the *dispositives* and practices contributing to processes of collective intelligence in these movements. This may provide new ways of understanding political organizations. We propose analyzing and comparing:

- Uses of network communication tools,
- Network movements' communication, organization, decision-making, and action though digital structures,
- Network movements' physical spaces, as well as practices taken from the street and urban space and their relation with network communication.

Proposed methodologies: Digital Methods: Social Network Analysis and Hypertext Analysis.
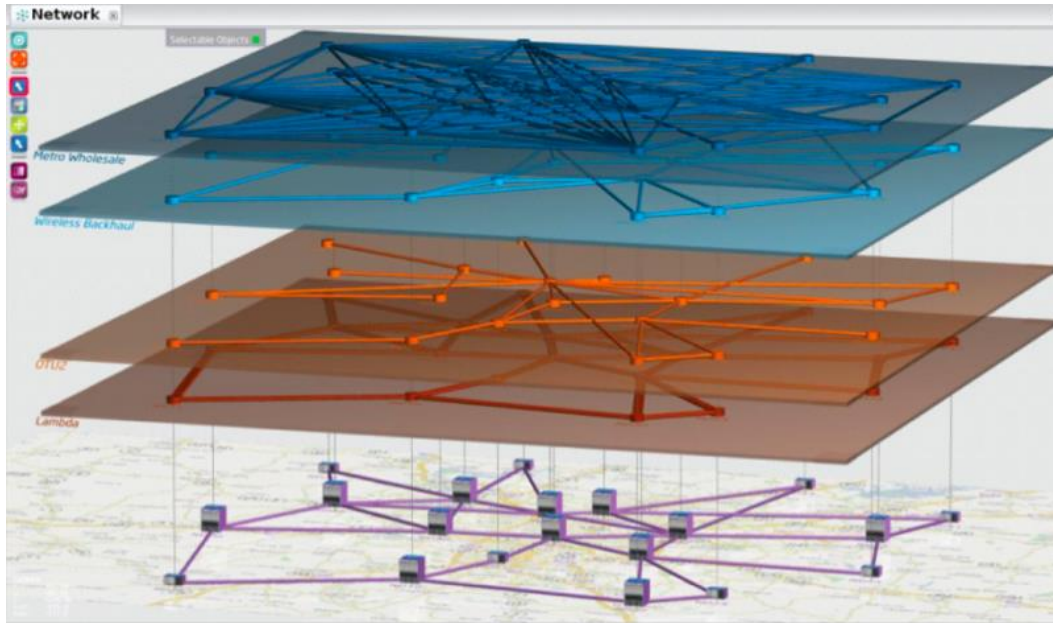
Fig17: Multi-layer system: streets, Facebook, Menéame, Twitter, Massmedia

7.1.3 Analysis of the emotions, language and vocabulary of the network movements

A promising stream of research is developing in the emergent field of sentiment analysis that semantically analyses opinions and affective expressions in texts. There are a variety of tools available, such as *listening crowdsourcing tools*, which analyze online conversations on social media websites such as Facebook, LinkedIn, Twitter, blogging sites and wikis. Sentiment analysis can be used to assess positive or negative sentiment trends for selected topics overtime, as well as across organizations and topics. More in-depth sentiment analysis can highlight specific keywords used during conversations, and also shed light on users' sentiments, filtered by type of activity, transactions, opinions, or other selected dimensions.

In the context of D-CENT, the role of emotions, the virility and the meanings flowing in the core of each network social movement will be analyzed. The objective is to build a common software platform to extract concepts, entities, sentiments and emotions expressed in a text. As part of this work, a web app will be built in order to (a) improve the accuracy of the dictionaries and the platform via crowd sourcing, and (b) share the work with the community (what dataset was used, the result of the analysis, conclusions, etc). With these tools, finally, text analysis (Named Entity extraction, concept extraction, lexical networks, and sentiment and mood analysis) will be free for everyone to use and to improve. This will foster linguistic analysis beyond the pure and tedious task of text mining. We will analyze the level of cohesion of of different movements, their language network, and the temperature of their vocabulary. Proposed methodologies: sentiment analysis, scrapping the Facebook fan-pages and narrative analysis.
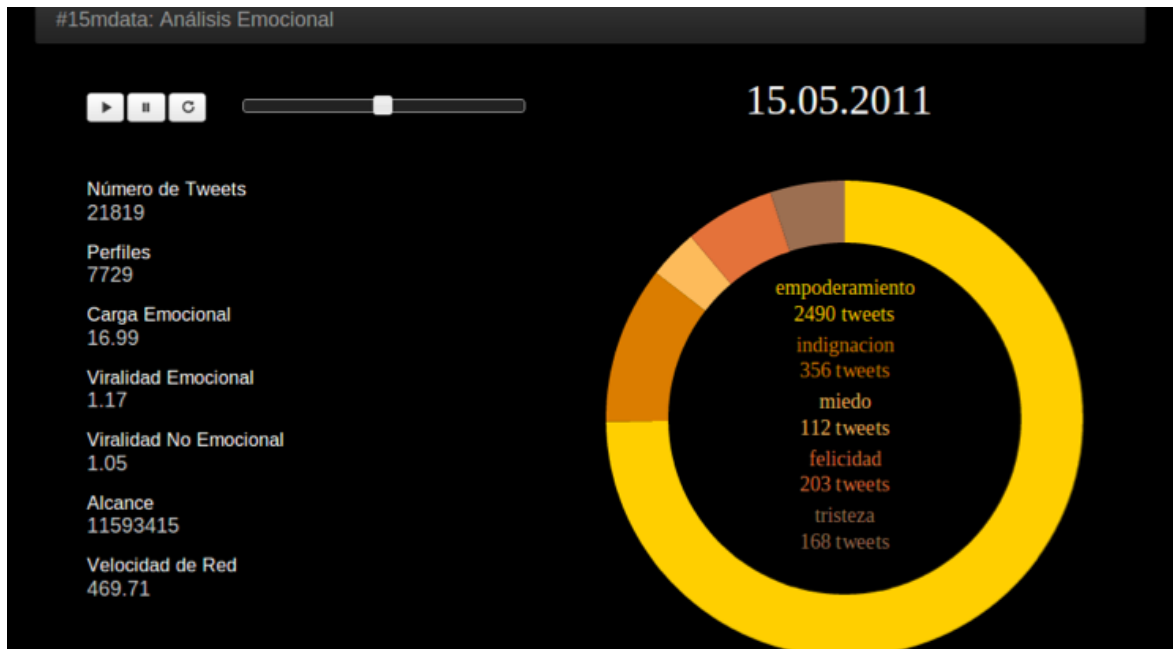
Fig19: Sentiment Analysis M15, Data Analysis M15 Group

7.1.4 Analysis of structural network topology

The role of ICT in shaping conversations and communication processes will be analyzed. The objective is to see how the network communication provides new ways of understanding political action and the social organization, as it generates innovative forms of network organization or 'meta- organization'. This type of analysis will be carried out in Task 2.2 and Task 2.3 (D 2.4) with the ultimate objective of defining models of participation and collective action of connected citizens that exploit the network-effect of the D-CENT platform. Using social media data we will measure the centrality of each organizational node in different periods, tracing back the evolution of each network movements. We will use metrics, such as degree centrality and betweenness centrality, to map the communities and the role that each node plays in the network. Furthermore, the diverse analysis techniques and results illustrated above will be combined and integrated, in order to get a deep understanding of the interplay among different factors, such as the network structure, propagation dynamics, individual behavior of different kinds of actors, leadership dynamics, and emotional contagion as well as coordination and self-organization mechanisms. This analysis will result in the definition of models to describe the optimal conditions for a distributed work system to emerge, to become self-aware, to activate cognitive and emotional mechanisms to foster empowerment and self-organization dynamics in the network. These typology models will be validated on data collected in T2.2, as well as on the usage of the platform, with data from T5.1, providing inputs for the design and development of the social awareness platform in conjugation with task T1.2, as well as continuous feedback on its usage in the pilot cases.

8. Methodology validation and impact assessment: Build-Measure-Learn feedback loop

The Build-Measure-Learn feedback loop is the core of the Lean model, and minimizing the total time through this feedback loop is the core of the method. The first step, as described above is to enter the build phase as soon as possible, which is something D-CENT has done early on during the project through user workshops and building a minimal viable product (MVP). The MVP enables a full turn of the Build-Measure-Learn loop with a minimal effort and the shorter development time (between one to two weeks). The MVP is the first prototype to be immediately tested with real users to gauge their reactions. Then we enter the measure phase to analyze in a quantitative and comparative way the usage of the prototype using key metrics that help us improve the product and iterate the development, improving features that people use and need. The actionable metrics gathered during the early prototype phase help to analyze user behaviors with the application, measuring (i) user acquisition and user sign up: (ii) activation and engagement (iii) Retention and continuous usage (iv) referral and sharing.

The real challenge is to determine that we are building tools that communities want and that we are doing it in the least possible waste, in terms of both resources and time. This process allows the team to create *learning milestones* which are alternative to traditional product milestones and that are integrated within the set D-CENT project Milestones. Learning Milestones are useful to internally assess the progress accurately and should be coupled with good actionable metrics. This helps us to realize soon if our hypotheses are not working and we need to come up with a new strategy ensuring less waste of time and resources.

The D-CENT hypothesis is that participants who engage in online platforms experience an increase in offline social capital, increasing community resilience. We will thus monitor online engagement throughout the project, analyzing the impact that this has upon offline levels of social capital (Task 1.3). Assessing the impact of D-CENT in general means monitoring the way in which grassroots citizen movements dynamically grow and can sustain over time through the smart use of collective platforms for democracy and empowerment. We will thus develop indicators and metrics to be tested on the use cases, measuring behavioral influence and dynamics of change. This impact assessment work will be synchronized with the work in WP3, which provides the socio-economic framework and analysis as a basis on which to construct novel indicators: concepts such as self-governance of the commons and alternative economic cultures.

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