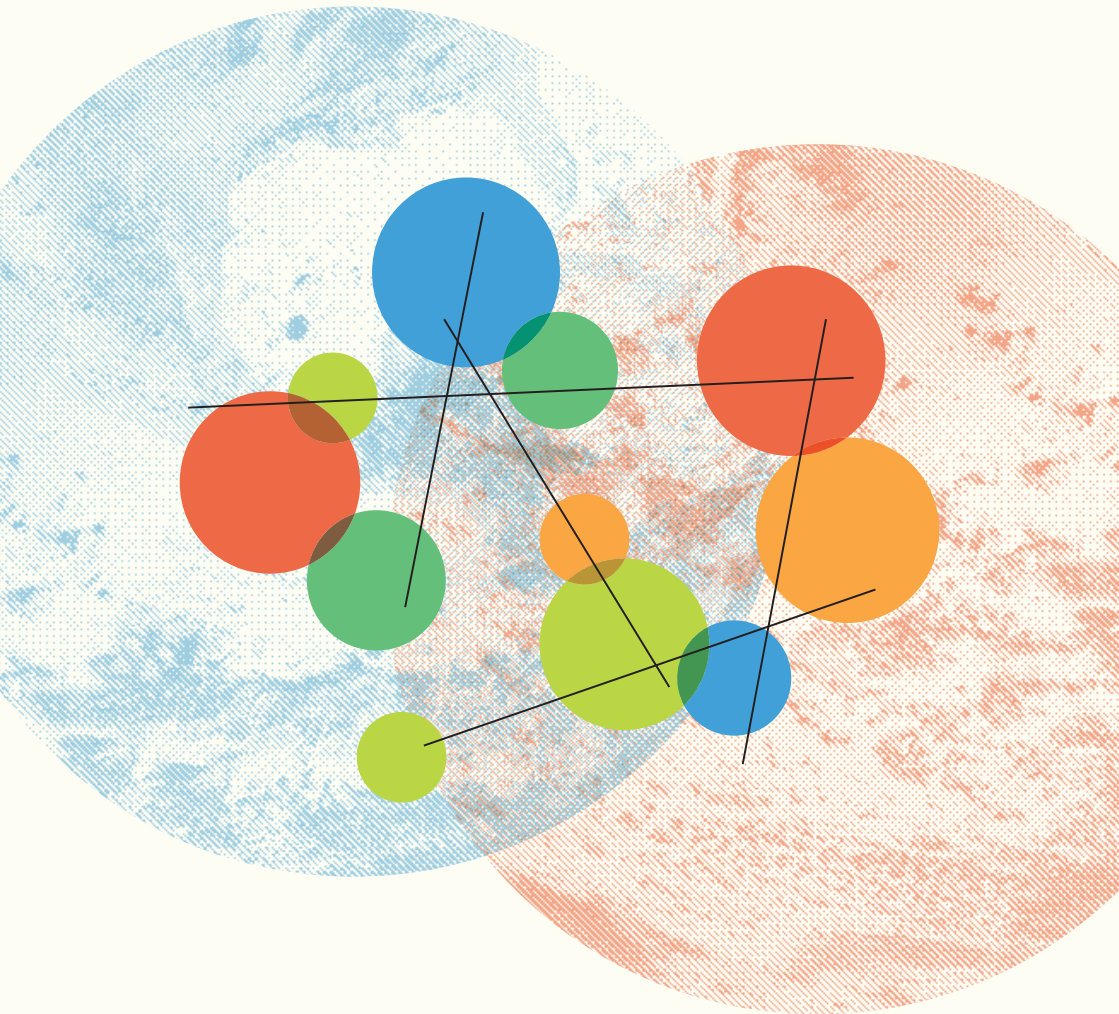


Collective Awareness Platforms for Sustainability and Social Innovation: **An Introduction**



Foreword

In just three decades, the internet has evolved from an experimental tool for researchers to a pervasive, omnipresent backbone for society and the economy. In my eyes its main strength, and unprecedented characteristic, is hyperconnectivity, which is the ability to network people, ideas and data across boundaries of any nature: geographical, cultural, disciplinary, linguistic, social, economic.

All of the most innovative ideas, from Skype to Wikipedia, from online cartography to app stores, had a very quick, viral spreading. Their impact was as much game-changing as it was unpredicted just a few months earlier.

Indeed, hyperconnectivity opens up a new field where successful ideas have nothing in common but their unpredictable, bottom-up nature and the ability of exploiting network effects at any level. Trying to understand where the next big game changer can emerge, in 2012 we launched a research initiative called Collective Awareness Platforms for Sustainability and Social Innovation (CAPS). The objective was to explore new solutions at the confluence of social networks, knowledge networks and networks of things. It was a broad concept and was very far from the traditional approach to research funding, which normally requires well focussed technological horizons. And its implementation was made possible only thanks to the foresight of Robert Madelin, the Director General of DG CONNECT.

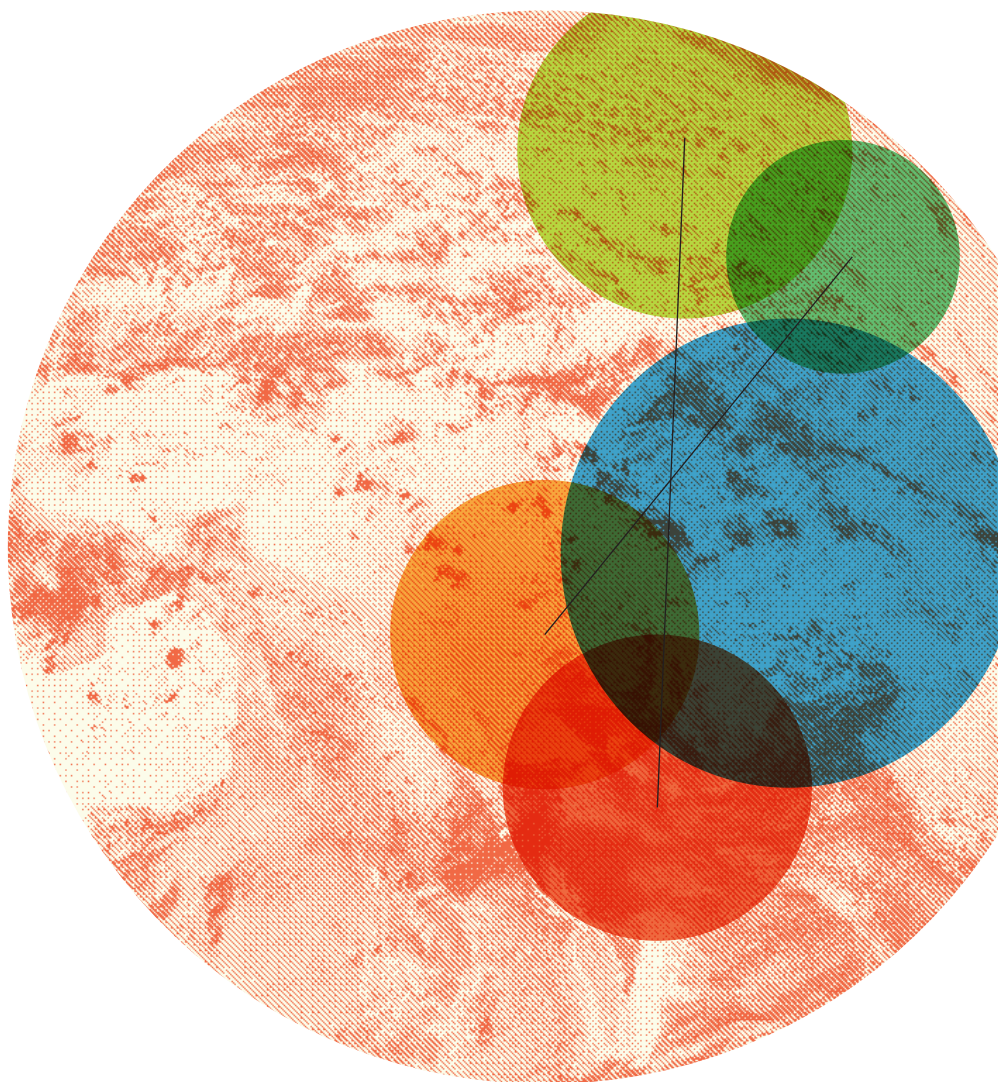
Nowadays, the need to reinforce societal resilience and sustainability is becoming more and more pressing. We are therefore launching a new call in this area, in order to stimulate new, bottom-up and grassroots solutions based on new forms of collaboration enabled by the internet.

I like to think that a book sprint is a very good example of how people can collaborate in innovative ways for the common good, for sharing knowledge especially with newcomers to fast growing fields such as CAPS. In other words, a way of 'walking the talk' in the broad area of social innovation, for which I warmly thank all the colleagues who co-authored this publication in a few intense days of work.

I trust that you will find this book as refreshing, concise and stimulating as I did, and I encourage you to contribute to further revisions not only by writing but also by doing, in the framework of the many new initiatives that are being launched in these days.

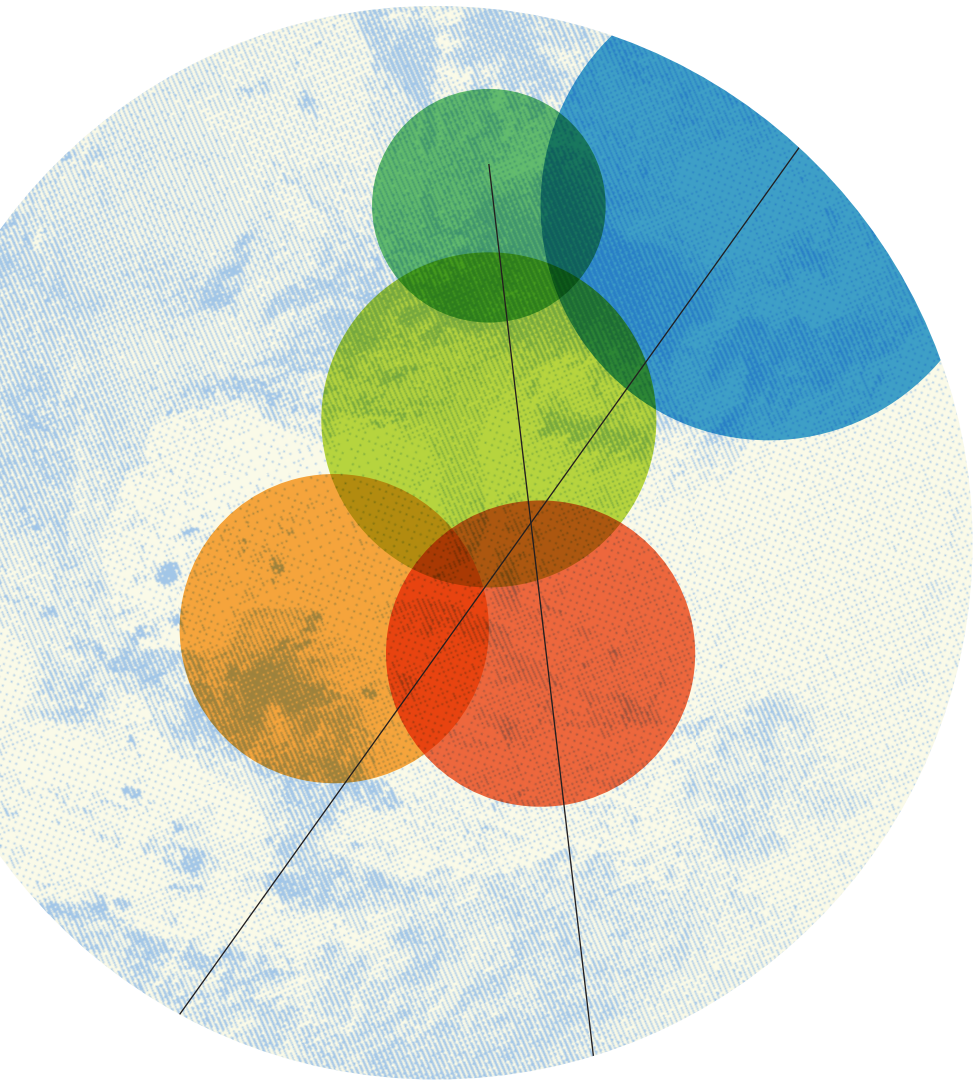
Fabrizio Sestini, Scientific Officer, European Commission's DG CONNECT

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1. Introduction



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About this Book

This book was written in three days during a Book Sprint collaborative writing session, from May 5 to May 7, 2014, in Nice, France. This session was executed within the framework of the BS4ICTRSRCH - Book Sprints for ICT Research project in cooperation with CAPS2020, coordinated by Sigma Orionis.

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<http://booksprints-for-ict-research.eu>

FLOSS Manuals Foundation

FLOSS Manuals creates free documentation about free software. It is an online community of some 4-5 thousand volunteers creating manuals in over 30 languages.

<http://www.flossmanuals.org>

Book Sprints

Book Sprints is a rapid development methodology for producing books in 3-5 days. The methodology was founded by Adam Hyde of BookSprints.net.

<http://www.booksprints.net>

CAPS2020

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<http://caps2020.eu>

<http://caps-conference.eu>

Sigma Orionis

Sigma Orionis is the coordinator of CAPS2020 Coordination and Support Action and CATALYST project. Since its creation in 1984, Sigma Orionis has strived to make an effective contribution to a stronger 'research - innovation - market' process through its research activities, its studies and its consultancy services.

<http://sigma-orionis.com>

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Silke Georgi has a background in political science and law in Germany, the United States and the Netherlands. She is responsible for International Affairs at SOZIALHELDEN e.V., a Berlin-based non-profit organisation that creates innovative social projects, including Wheelmap.org, an online, crowdsourced map for finding wheelchair accessible places worldwide.

Dr. Antonella Passani is a sociologist with a cultural anthropology background. She has been involved in ICT European projects for the last ten years investigating technology as an enabler for socio-economic and cultural change. She is experienced in working in interdisciplinary environments and, within the CAPS community, is the scientific coordinator of the support action IA4SI—Impact Assessment for Social Innovation. She coordinates the Innovation, Society and Social Capital research unit at T6 Ecosystems, a research SME based in Rome, Italy.

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Structure of the Book

This book is the result of a three-day Book Sprint, a collaborative writing session, and is intended as an introduction to Collective Awareness Platforms for Sustainability and Social Innovation (CAPS). The acronym is a working definition referring to an interdisciplinary research and action programme for social innovation. This programme aims at tackling societal challenges through innovative and empowering online platforms.

The rationale of the book is to provide an entry point both to the ongoing EC funded CAPS projects and to the main nodes of a CAPS initiative. It is both an informative and an operational instrument, aimed at:

- Defining the CAPS action field.
- Creating awareness around CAPS and disseminating the CAPS projects' core activities.
- Stimulating the birth of new CAPS initiatives.

Based on their own interests, the reader of this publication can choose for themselves a section from which to start reading, their own place to dig into the book: the general interest reader may want to start from section 2 'Framing CAPS', whereas practitioners may take section 3 'Overview of the First CAPS Projects' as their starting position, to jump into CAPS future and existing tools. The book has multiple layers that the reader can engage with and make use of.

Considering the three-day time limit during which this book had to be completed and the fact that not all CAPS projects were able to be present during the writing session, this publication cannot be considered to be an exhaustive, nor a scientific, publication. It addresses all the individuals and organisations interested in discovering CAPS as framed by the European Commission FP7 call and in moving on to develop new projects or add value to existing ones. The authors hope that the reader will be inspired in their everyday practice as a professional, as well as their life as a citizen, and engage actively in CAPS topics.

2. Framing CAPS



What is CAPS?

The acronym CAPS stands for Collective Awareness Platforms for Sustainability and Social Innovation. The European Commission (EC) first used this label in 2012, in the context of the Seventh Framework Programme of research in order to identify a new group of research projects and, in some sense, a new area of research (Sestini, 2012). Previously, in 2011, The 1st Dialogue on "Platforms for collective awareness and action" chaired by DG Connect General Director Robert Madelin took place in the framework of the "Internet and societies: new innovation paths" conference. The event was organised with the support of the PARADISO FP7 project coordinated by Sigma Orionis (<http://sigma-orionis.com/can-caps-change-the-world/>). The European Commission defines CAPS as follows:

'The Collective Awareness Platforms for Sustainability and Social Innovation (CAPS) are ICT systems leveraging the emerging "network effect" by combining open online social media, distributed knowledge creation and data from real environments ("Internet of Things") in order to create awareness of problems and possible solutions requesting collective efforts, enabling new forms of social innovation.

The Collective Awareness Platforms are expected to support environmentally aware, grassroots processes and practices to share knowledge, to achieve changes in lifestyle, production and consumption patterns, and to set up more participatory democratic processes. Although there is consensus about the global span of the sustainability problems that are affecting our current society, including the economic models and the environment, there is little awareness of the role that each and every one of us can play to ease such problems, in a grassroots manner.'

<http://ec.europa.eu/digital-agenda/en/collective-awareness-platforms-sustainability-and-social-innovation>

This is the definition used as a policy instrument by the EC in the ICT (Information and Communication Technology) domain of the research programme, but what if the single words and concepts are analysed individually? What can be gained in terms of understanding CAPS-related phenomena and CAPS-oriented projects? This question will be unravelled in the following few paragraphs, leveraging the interdisciplinary and multi-faceted language that is embedded in CAPS initiatives.

The first of the words used is *collective*, which refers to the possibility of people doing things together. Such a concept has been expressed in many ways in the social sciences and in philosophy, talking about groups, publics, spheres, networks, scenes, communities, and so on. Any of these concepts has specific conceptual implications and suggests particular social dynamics. Fortunately the term 'collective', chosen by the EC, resonates with recent research-work in the field of science and technology studies. For example, for Bruno Latour (2004), 'collective' is a general term indicating an association of human and non-human entities that can, later on, be attributed the shape of a public or a network. From this perspective, the term 'collective' points to the fact that it is important to distribute awareness production between human beings and technologies,

and that a CAPS initiative should be careful of how this happens. When we refer to the collaboration of human and non-human actors we can think of data being gathered by engaging both citizens and sensors, and the process of making sense of the information they both provide.

In such a distributed conceptualisation of collective life, *awareness* can be interpreted as 'an understanding of the activities of others, which provides a context for your own activity' (Dourish & Bellotti, 1992; 107). As a form of understanding, awareness requires access to information and, for awareness to be leveraged in practice, the way in which people acquire information is a crucial topic. From this perspective, fostering awareness, one of the keys of CAPS, means questioning the way information is filtered and organised, trying to avoid the consequences of the power and social dynamics of phenomena like the ones described by Parisier (2011): that filtering now works on the basis of marketing strategies and through invisible technologies, as it segregates internet users into small-scale groups that share professional and leisure interests. The understanding and transparency of filtering mechanisms is probably the core element of awareness in CAPS initiatives.

Merging these two terms, the picture that emerges of *collective awareness* is one of the distribution of information on the activities of other participants, being human or technological ones, that will allow the contextualised, situated emergence of sustainable and socially innovative practices.

Web platforms are the locus on which the CAPs projects focus on enabling the dynamics of collective awareness construction. The use of the term 'platform' could be reasonably interpreted as a detachment from the walled gardens or closed systems of profit-driven ICT development in favour of more open, participatory-oriented practices. From this point of view a platform becomes an infrastructure for action in the face of societal challenges; it is a socio-technical solution that is composed of multiple ICT tools, such as websites, forums, social networks, collaborative platforms, deliberating tools, data visualisation, etc.

The first of the societal challenges the EC is focusing on with the action of CAPS is sustainability, originally understood as centring attention on the environment as a biological system that is able to endure and remain diverse. The issue at stake is to maintain a viable environment now and into the future through a wide array of practices that support reduction of well-known ecological problems, like energy and water consumption, land use, etc. The concept of sustainability has been extended, however, to include social and economic sustainability as a necessity for assuring future generations a quality of life that is at least comparable to the one available now.

The last concept included in the CAPS acronym is *social innovation*, which deserves its own paragraph. In fact, the topic of social innovation is itself central in the actual CAPS projects.

— Social Innovation and Digital Social Innovation

A starting point for the examination of the term 'social innovation' is the definition proposed by Murray, Caulier-Grice and Mulgan (2010) in *The Open Book of Social Innovation*. Here, the authors define social innovation as new products, services or methods that tackle pressing and emerging social issues which, at the same time, transform social interactions promoting new collaboration and relationships.

In this definition social innovation represents both *product* and *process* innovation: it is said to generate a new product/service by changing, at the same time, the way in which this product/service is produced. It benefits society 'twice', that is, by proposing a solution to a specific problem and by offering new social links and collaboration opportunities. Social innovation initiatives should be 'social' in two ways: on the one hand they should benefit society by opening innovative solutions to social issues and, on the other hand, they should engage the society in developing such innovation. In other terms, social innovation generally refers to the necessity of engaging and including citizens in the process of change.

However, social innovation is not synonymous with social change. Social changes occur every day and can be positive or negative (for example, the growing attention on environmental issues, or, the low birth rate in some European countries) while social innovation only refers to positive innovation that, as in the definition proposed by Philip, Deiglmeier and Miller (2008), is meant to be 'more effective, efficient, sustainable, or just than existing solutions'. In this sense, social innovation as a term embodies the desire for a more equal, sustainable and fair world. What this does mean, is that in practice it needs to be considered on a case-by-case basis. What can be said, is that social innovation is not a value-free term as it is, by definition, progressive in the sense of being pro-change and also positively seeks to create such change.

The term is becoming increasingly popular and has been taken up by policy makers so that social innovation programmes, funds and initiatives are promoted by many national and local governments. Although the concept is becoming fashionable, it does not mean that it is new.

The term 'social innovation' is not new, but rather, it emerged after the French Revolution, but with different connotations (Godin, 2012). On the one hand social innovation was synonymous with radical socialism represented by thinkers such as Fourier, St-Simon, Proudhon, and called for a drastic and fundamental change of social order. On the other hand it was linked to social reforms and social justice. Examples of this second connotation are the introduction of a general education system, the legislation of unions and the recognition of new rights. At the end of the nineteenth century, social innovation lost its revolutionary appeal and became an adjective for 'alternative to the norm', non-conformist: anything new in society. In this sense, social entrepreneurship and the cooperative movement of the '60s can be seen as important examples of social innovation too.

Over time, the concept of social innovation became less frequently used and the term 'innovation' was more commonly attributed to technology. Social innovation re-entered theoretical writing in the 1960s and '70s, and only in the last ten years or so, has it attracted

a consistent interest among scholars. Here, social innovation re-emerged as a term that contrasted with technological innovation. In this view, social innovation indicates a call for action, for more attention to be attributed to the social aspects of innovation, which have been perceived as neglected by the hegemonic role of technology.

It is interesting to notice therefore, that in the CAPS domain, social innovation is not in opposition to technological innovation but, on the contrary, technology is seen as a fundamental tool for enabling, supporting and multiplying social innovation. Collective awareness platforms are socio-technical solutions, which rely on interdisciplinary approaches and methods (see chapter 'Collective Awareness Platforms'). For stressing this characteristic of the CAPS initiative the term 'Digital Social Innovation' is also used (the term is used by a research project titled *Digital Social Innovation* led by NESTA and financed by the EC, and also used by the Young Foundation).

Other terms such as 'open innovation', 'open evaluation' and 'open transformative government' are also linked with CAPS. The paradigm of 'openness' transforms the way innovation was traditionally conceptualised. Innovation is no longer created in a closed lab, in the R&D department of a firm, but is co-created by different stakeholders who share the knowledge, risk and benefits of the innovation. Firms, governments and research labs open themselves to the socio-economic content, multiplying their collaborative link and sharing their knowledge in order to develop solutions in a collaborative way. This is clearly linked with the central role that citizen/user-engagement plays in the CAPS projects (see chapter 'Engaging Communities'). In this sense, the actors of social innovation can be multiple, including governments, civic society organisations, research centres and universities and, of course, citizens. The relationships and power dynamics that characterise social innovation initiatives is a research and political challenge that, again, needs to be approached on a case-by-case basis, but which cannot be neglected.

Examples of digitally-enabled or supported social innovation already exists on the web. Among others it is possible to mention Avaaz, which defines itself as 'A global web movement to bring people-powered politics to decision-making everywhere'; Laborvoices, which allows companies to get information about their suppliers in developing countries; Safecast, which—after the March 2011 earthquake in Japan— provided data about radiation by using a sensor network; and Goteo, a Spanish social network for crowdfunding and distributed collaboration (services, infrastructures, micro-tasks and other resources) for encouraging the independent development of creative and innovative initiatives that contribute to the common good, free knowledge, and open code. Finally, we can mention Code for America, which brings together politicians and technologists to address citizens' needs. In the section 'Existing Tools and Communities that the CAPS Projects Build from and Collaborate With' of the chapter 'Collective Awareness Platforms', we provide an extended (albeit non-exhaustive) list of over 60 digitally-enabled social innovation tools and communities on which the first CAPS projects build and collaborate with.

— How CAPS Can Be Useful for Citizens

Why should people participate in CAPS initiatives and use CAPS platforms? Societal impact is a key factor to be considered in any technological development but in CAPS initiatives there are some specific motivations why citizen engagement and social profitability are key.

First of all, CAPS initiatives are tackling societal challenges, therefore people more affected and involved with such challenges could benefit from participation. It could be reasonably stated that, as long as deliberately changing the world we live in is a political action, CAPS projects provide people with the means to foster their own political programme, whether it be environmental sustainability, open government and better decision-making or changes in consumption practices, etc. Nevertheless, this explicit political programme, as in many research activities, can be promoted only if those involved show methodological rigour and respect for results that diverge from those expected. In the end, it is a matter of following the suggestions of classical sociologist Max Weber: research-oriented activities should combine a situated, subject-based, choice of topics and issues with an extremely rigorous methodological and descriptive orientation.

Secondly, as CAPS is oriented towards facing societal challenges, people can have a direct benefit in their lives independently from their own political agenda (and in the absence of it). For example, forms of collaborative consumption that promote sustainable economics and socially responsible companies, can be of use for people in order to just find the information they need. The example of the WIKIRATE project, funded by CAPS, makes this clear: collecting information on corporate social responsibility can help consumers make choices based on their own set of preferences. Moreover, the project explicitly addresses, according to the model of Wikipedia, the existence of different levels of contribution. For the general public the existence of CAPS initiatives can be a way to gain better-organised information on some topics, a way to directly engage with the dissemination of information, or a way to participate in the production of information. Only in this last case do we have the idea of a partial convergence of the agenda of users with those of CAPS' promoters. As such, it is possible to state that CAPS can benefit more people, and the general public, in many ways, as it is promoting themes and issues in the contemporary public sphere.

In such a perspective, CAPS initiatives should not be seen as only technology-based, or focused solely on building 'online communities', but rather as part of the everyday life situations of the groups of people the initiatives target as their user base, the same everyday life improved by the CAPS initiatives.

— Barriers and Enabling Factors of CAPS

From what has been said above, it should be clear that citizen participation and engagement are the key aspects of CAPS initiatives. The chapter 'Engaging Communities' directly addresses this issue. Here it is worth mentioning the possible barriers and enabling factors for citizen participation because what may appear to be a straightforward process, is in fact, a complex social dynamic.

For example, these barriers include: the second level of the digital divide (not access to the internet, but rather the lack of skills to use it); transparency and trustworthiness of promoters; the institutional and working conditions of potential users which might influence the time available for participation; expectations of initiative sustainability; and last but not least the different languages spoken in Europe and around the world.

In turn, considering now the enabling factors, the main lever a CAPS initiative can have is its capability for tackling social issues perceived as relevant, un-addressed, and urgent by many people. For example, CAP4ACCESS takes the needs of people with limited mobility as a starting point and engages them and the general public in developing a collaborative map of public locations that are accessible to them. Another related lever is to start a CAPS initiative with the actual participation of already-existing networks of interest and communities. One of the main problems of ICT research projects has always been that of establishing a sufficient user base and bootstrap for the technology developed. In CAPS the approach is the other way around: an initiative should start out from existing needs or existing groups. In both cases an effective engagement and communication strategy, the topic of the next chapter, is crucial in order to achieve success.

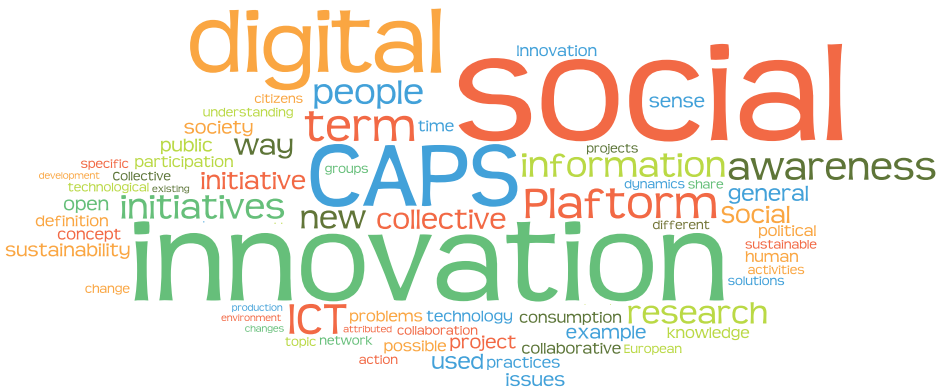


Figure 1
Tag Cloud of This Chapter

Research Challenges

CAPS projects develop solutions for tackling social issues, and at the same time, are also research projects investigating different questions. In fact, they develop digital social innovation solutions *because* they address important research questions—and it is a good thing that they do so.

Some of these questions are analytical, exploratory questions, while others are oriented more towards action or assessment. Among the first type of questions is an interest in understanding how collective awareness emerges, how citizens react to media messages regarding pressing global issues, and how specific online communities interact, self-govern and make sense of their collaborations.

Another important area of analysis is related to data security, protection and data sharing in the use of online social networks and the value proposition and business models that surround personal and sensitive data.

With reference to more action-oriented research questions we have, first of all, questions related to how best to engage communities and citizens, especially those that are not already aware, or not sensitive to, certain social and environmental issues. In fact, one of the main risks, and an important aspect to consider, when talking about citizen engagement is the danger of engaging only those people who are already engaged in an issue, thereby deepening the gap between those already participating and those left-behind. Possible factors for discrimination such as age, gender, sexual orientation, cultural background and disabilities, as well as factors such as income, educational level and geographical urban/non-urban location, can play an important role in strongly influencing the capability of people to participate in debate and access knowledge. Often, despite having the aim of creating a universal or neutral tool or process, what emerges is a solution that reproduces the segregation practises of the society in which the solution has taken shape.

Moving from citizen engagement to the data that these citizens produce on the web, intentionally or unintentionally, a main research question is how to make that data reliable, trustworthy and meaningful? To this end CAPS projects study manners of visualising behavioural patterns and information diffusion, of supporting and improving collaborative sense-making, and of improving the cross fertilisation between official and unofficial statistical data.

In addition, CAPS projects support existing communities by intensifying the analysis and the development of governance and sustainability models in order to improve their resiliency and growth.

Another area investigated by CAPS researchers is related to the topics of democracy, political debate and political and social participation in general. Projects are studying how best to use socio-technical solutions for providing representation, for information-based decision-making processes and for furthering equality. This topic is of course related to that one mentioned above concerning information access and sense-making and also

includes efforts for improving the communication and exchange between science and citizens, and among information holders and others.

Finally, we should mention the research questions related to behavioural changes which span the range from understanding the main psychological, social and cultural processes involved, to the actual development of platforms supporting citizens' empowerment and the spreading of sustainable and fair consumer and production models.

— Reading the European Commission Perspective

If we look at CAPS research lines not only from the point of view of the actual, existing, projects but also from the perspective of the funder of such projects, the EC, we can find another story about the research questions related to CAPS. This is proof of the complex, interpretive character of project emergence in the context of EU funding. Even though this interpretive process can be seen as a basic and very positive process, it nevertheless makes sense to reconstruct the research questions previewed by the EC when the CAPS research domains were established.

Looking at both the 2013 and the forthcoming 2014 call for proposals, what becomes immediately clear is their experimental character, oriented toward locating digital tools in real world cases in order to test the tools' ability to scale to large social groups. Such a mixture of technologies and social issues is the starting point of the need for multi-disciplinary approaches and working groups ('consortiums' in EC language). The techno-social issues taken into consideration are among the most relevant ones in contemporary society, including topics such as digital identity, anonymity, ethics and privacy, network neutrality, access, open governance, new economic and value models, user-generated knowledge, visualisation of digital (open) data, and copyright.

All such topics involve the understanding of collective forms of behaviour and of self-regulation that promotes collective intelligence in decision-making, by strengthening the collective capabilities of problem solving, knowledge sharing, and collaborative storytelling. In particular, the concepts related to collaboration and cooperation, both related to the technological domain and to the empowerment of people, are of particular interest in understanding how to support bottom-up, effective, widespread approaches for tackling societal challenges. This makes it possible for awareness to emerge as a result of peer collaboration and of other processes that should be investigated in particular in their ability to encourage creativity and participation. A starting point for this investigation could be the analysis of best practises, as well as the inquiry into good models for digital social platforms, including models questioning users' motivation, incentives for their participation, their growing reputation, and the relationship with distributed network effects. Such modelling and questioning should be oriented towards the development of societally, environmentally, and economically sustainable approaches in the face of specific threats to their sustainability. Moreover, the experimental approach requires that such models of democracy or of the economy are oriented towards the creation of and the engagement with effective experiments of social innovation, promoting their scalability and transferability.

Such social innovation experiments should try to be increasingly multi-stakeholder, with a community-wide participation at the local and European level, as well as being oriented towards suggesting models for effective participatory innovation.

The last relevant set of research question is an experimental approach concerned with assessing the effectiveness of projects, through both qualitative and quantitative indicators, as well as in their ability to connect to policy making and current regulations.

— More Research Challenges

This section deals with the key themes of current research on the digitalised world that are also relevant for CAPS. It is however not an exhaustive list, but rather an attempt to identify previous research which finds a new empirical domain in CAPS.

Among the research topics and premises of CAPS is the concept of 'network effect'. This is the positive correlation between the willingness to use a specific technology and the number of actual users. It is an effect similar to the ones identified by classical sociologists Gabriel Tarde (1890) or Georg Simmel (1957), who stressed the dynamics of imitation and fashion in the widespread adoption of social behaviours. Studied extensively in economics, the network effect has also been used to analyse company behaviour, showing how being embedded in a network can provide benefits as long as the participation in the network does not obscure new possibilities (Uzzi, 1996). Analysing, identifying and mapping the dynamics of networks is a research task that can be viewed from different theoretical and methodological perspectives. For this reason the network effect is one of the themes to be explored through CAPS projects.

Another research question that underlies present and future CAPS concerns the reasons why people participate in collaborative online activities. For example, when designing a CAPS platform for awareness-raising on environmental issues, researchers may choose to introduce reward mechanisms. In order to develop an effective mechanism, in addition to looking at what is already used on the web and how it is successful, it is also necessary to dig deeper and investigate the multiple, and in some cases contradictory, motivations for online participation, collaboration, sharing of ideas and the expression of personal and political opinions.

Such motivations can be related to individual psychological drivers and/or be influenced by the socio-cultural reality in which people live and which they shape and re-shape continuously. It is probably not even correct to speak of participation as an abstract concept, as any online community can put in place different incentive systems for fostering users' participation, not all necessarily linked to similar motivations.

There are communities, like the one of Wikipedia, that show reward mechanisms based on credibility, recognition and respect, that are not too different from the reward mechanisms of the scientific community (Forte & Bruckman, 2005). As within the scientific community, there is an intrinsic motivation, related to the interest in collaboratively identifying and publishing

information on a topic. The feeling of efficacy has also been seen as an important motivating factor (Bandura, 1982). By contributing to a group with entries of high quality, a participant has the feeling of positively supporting the community and, in this way, perceives themselves as an efficacious person (Bandura, 1982).

At the same time, contributing and being recognised by peers appears to be a motivating factor in itself. Recognition also generates power dynamics that can lead to one having more influence in the community. At a more general level, being an active participant in an online community is linked to an identity dynamic, which is to say that being part of a community, being recognised, and having responsibility in the community become part of the user's identity. It is also possible to consider if this might be linked to narcissistic aspects that, according to some authors, contemporary society promotes and supports. There are several social theories of self which investigate these aspects of motivation. In general terms, it is possible to say that according to this approach self-identity is influenced by the expectations of reference groups (Stryker, 1986). According to this perspective, a person tends to play the role attributed to them and expected of them by their community of belonging, in this way assuring themselves a sense of belonging and recognition.

Reciprocity is considered to be another important aspect related to participation. In this sense, online users provide their knowledge expecting other users to do the same. It is possible to see online interactions through the lens of gift theory (Mauss, 1935), according to which a gift is a medium used in building a social relationship and implies mutually-obligated transactions. In other words, a gift, in the case of online platforms giving valuable information or advice, is characterised by an underlying assumption, usually unstated, that an obligation exists to repay the gift at a certain point in the future.

Participation in work-related communities such as LinkedIn groups and other professional networks can trigger different motivations. These include an increase in social capital, i.e. the immaterial wealth derived from having links with certain people as a means to reach other people, in order to develop new working opportunities, collaborations and so forth (Portes, 1998). Following this perspective, belonging to a network is a value in itself as it multiplies the opportunities to enlarge one's own network and to 'use' it for addressing emerging necessities.

In this short review of research on the motivational factors driving people to participate in online activities we have not yet mentioned altruism, which is seen by some as an intrinsic characteristic of human beings, which also plays a role in the dynamics of sharing and contributing in online groups (or, rather, digital collectives which are deeply connected to digital technologies [e.g. Rossi & Teli, 2009] as mentioned in the chapter 'What is CAPS?').

Digital collectives have been defined in many ways, including some of the following: virtual communities (Rheingold, 1993), networked publics (Boyd, 2008), commons-based peer production projects (Benkler, 2006), and recursive publics (Kelty, 2008). The way digital collectives work, from sharing social norms to producing the technology they use, from collaboration to competition, is the subject of much research and is still an area of continuous exploration for practitioners and research scholars alike. The character of online groups is defined in correlation with the research methods enacted to study them (De Paoli & Teli, 2011).

In any case, the focus is on the social dynamics that hold the groups together, on the groups' re-framing of general issues, and on their establishment of new organisational models. The first example of such reflections has been Free and Open Source Software, which has been investigated from many theoretical viewpoints, from transaction costs (the theory that explains the shape of organisations on the basis of the costs necessary to conclude a transaction), to critical theories (the ones concerned with the emancipation of human beings), and by almost any discipline dealing with human social organisations (e.g. law, economics, anthropology, sociology, history). In many cases, the focus has been on understanding the trajectories of the transformation of these organisations, their institutionalisation in stable forms, and their relationship to social enterprises (e.g. Murillo et al., 2013).

It is beyond the scope of this book to argue for one particular interpretation among the many but what should be underlined is the complexity of the models available to interpret digital collectives, models that are therefore one of the crucial research arenas in the realm of CAPS.

The last subject to be addressed is related to the way in which CAPS carry out their research. The previous paragraphs discussed the topics and challenges on which CAPS is working; this paragraph deals with the relationship among the different disciplines represented in the domain.

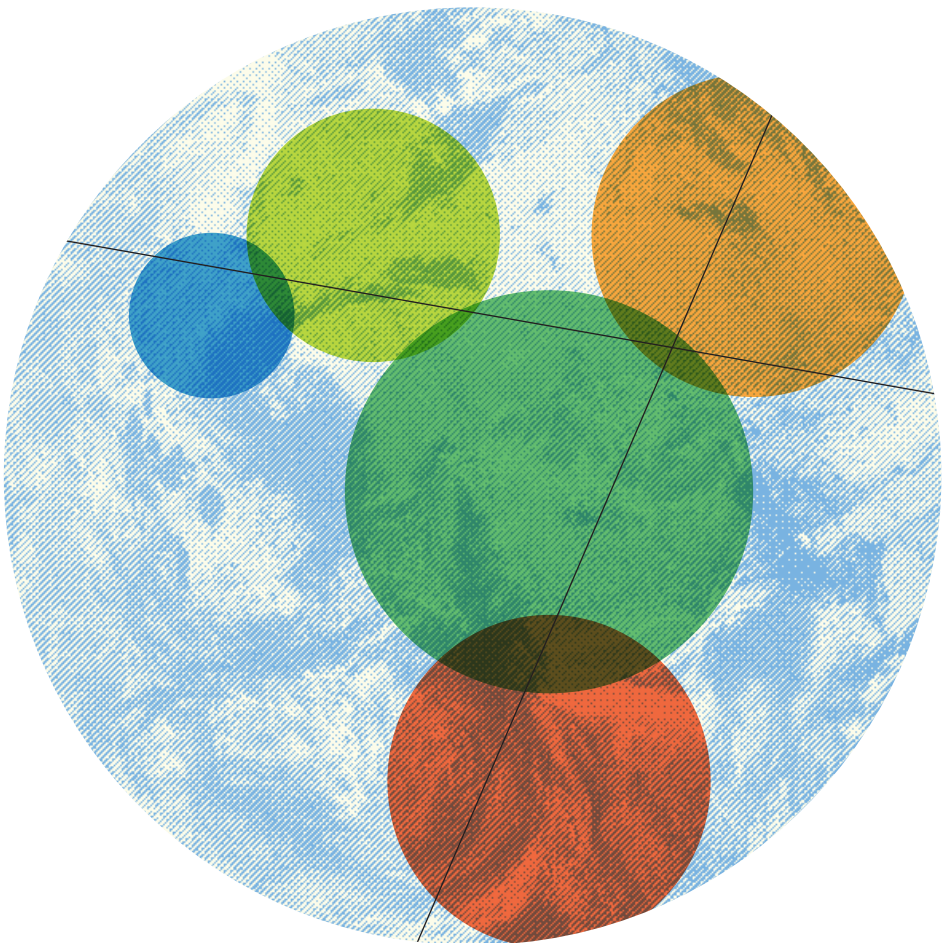
According to recent conceptualisation, the relationship among different disciplines can take three shapes: multidisciplinary, interdisciplinarity and transdisciplinarity. The first term indicates the juxtaposition, sequencing and coordination of different research lexicons, agendas and methodologies. A typical multidisciplinary team will be made up of people belonging to different disciplines who divide their work by exploring specific disciplinary topics without crossing their disciplinary boundaries.

Interdisciplinarity implies a step forward: to integrate different perspectives on a common problem, which is not understandable under the lens of a single discipline. Interdisciplinary teams are characterised by continuous interaction and by the development of a common language, not necessarily new in itself but used to link discipline-specific topics and to foster reciprocal understanding. This leads to a blending of disciplinary boundaries.

Finally, transdisciplinarity is a form of transcendence and transformation of traditional disciplines which creates a research area and objects that cannot be seen and recognised through usual approaches. This last option fosters the hybridisation of theories and methods, promoting their full conceptual integration, and the emergence of researchers who cannot be framed in pre-existing academic terms (Klein, 2010).

CAPS projects are certainly multidisciplinary by nature and the tendency is to carry out research in an interdisciplinary or transdisciplinary way. This is a difficult but promising task for all researchers involved in the domain. It is also a self-reflexive research topic in itself, one that is certainly interesting to explore.

3. Overview of the First CAPS Projects



Introduction to the First Round of Funded CAPS Projects

Network effect, collective efforts, ICT systems, interdisciplinary approach: one may wonder if and how the universe of the CAPS projects funded by the EC with Call 10 is reflecting these unavoidable fundamentals. The core component of the CAPS world is made up of research projects for Grassroots Experiments and Pilots, which have a really strong application component. These projects tackle either specific social challenges:

- Removing barriers to inclusion: [CAP4ACCESS](#)
- Raising collective awareness about environmental challenges: [DECARBONET](#)
- Enabling citizens to rate companies on corporate social responsibility: [WIKIRATE](#)

Or provide tools to facilitate an online debate and social innovation:

- Collective intelligence and analytics platforms to improve community deliberation: [CATALYST](#)
- New tools for direct democracy, participation, and new economic models: [D-CENT](#)

The projects all build from existing large-scale communities and/or widespread needs, leveraging their network effect and developing new solutions. Their action spectrum is large, but is of course not exhaustive of all the topics suitable to be addressed by CAPS. This is why the following four Coordination and Support Actions exist, to facilitate interaction between them and other existing CAPS-related initiatives:

- [CAPS2020](#): organises annual CAPS events
- [IA4SI](#): provides tools to evaluate their impact
- [SCICAFE2.0](#): promotes new collaboration models
- [WEB-COSI](#): increases trust in collectively-generated statistics

Moreover, the study on Digital Social Innovation in Europe (DSI) is dedicated to crowdmapping and analysing actors and networks. The framework is completed by Seed Funding for Social Innovation Activities (CHEST), which offers €3 million in funding for digital social innovations through three open calls for European citizens and organisations.

The realm of CAPS, of course, goes beyond the Call 10 projects. Many activities across the world can be defined as CAPS, such as those mapped by DSI. The European Commission funds projects related to the CAPS universe via other calls.

This, for instance, is the case with:

- [USEMP](#) (User Empowerment for Enhanced Online Presence Management)
- [P2PVALUE](#): techno-social platform for sustainable models and value generation in commons-based peer production in the Future Internet

These two are funded under the FP7 Objective 1.7 Future Internet Research Experimentation (FIRE) of the 2013 Work Programme. Finally, CAPS are an important topic for internet science, a research domain dedicated to the understanding of techno-social issues. In this field, the Network of Excellence in Internet Science (EINS), recently funded the FOCAL project (Foundation for Collective Awareness Platforms) which will study CAPS projects with a special focus on trust, security and engagement issues.

The CAPS EC funded projects pool is indeed a network of networks, building from existing collective innovation frameworks and pushing them further, developing methods and tools that can be used by all interested stakeholders.

Project Acronym	Project Full Title	Project Website
DECARBONET	A Decarbonisation Platform for Citizen Empowerment and Translating Collective Awareness into Behavioural Change	http://www.decarbonet.eu
CAP4ACCESS	Collective Awareness Platforms for Improving Accessibility in European Cities & Regions	http://myaccessible.eu
CATALYST	Collective Applied Intelligence and Analytics for Social Innovation	http://catalyst-fp7.eu
WIKIRATE	Wikirate	http://wikirate.org
D-CENT	Decentralised Citizens Engagement Technologies for direct democracy and economic empowerment	http://dcentproject.eu
P2PVALUE	Techno-social platform for sustainable models and value generation in commons-based peer production in the Future Internet	http://www.p2pvalue.eu
USEMP	User Empowerment for Enhanced Online Presence Management	www.usemp-project.eu
IA4SI	Impact Assessment for Social Innovation	http://ia4si.eu
CHEST	Collective enHanced Environment for Social Tasks	http://www.chest-project.eu
FOCAL	Foundation for Collective Awareness Platforms	
WEB-COSI	Web Communities for Statistics for Social Innovation	www.webcosi.eu
CAPS2020	CAPS2020	http://caps2020.eu http://caps-conference.eu
SCICAFF2.0	SciCafe 2.0	www.scicafe2-0.eu

Goals and Challenges

CAPS can be described as non-commercial, open platforms, connecting citizens to each other in the framework of a societal thematic. CAPS are indeed not an objective per se, but they are a lever to break into an issue (be it local or global) through the empowerment and the engagement of citizens. The section on 'Framing CAPS' defines CAPS and their main research questions. What is important to stress here is how CAPS concretise these premises into goals and challenges.

CAPS aim to provide citizens with a more effective way to:

- Adopt more sustainable behaviours and lifestyles, based on better information (extended awareness).
- Contribute to a low-carbon economy, for instance by lending, exchanging and reusing goods at scale, across geographic boundaries (collaborative consumption).
- Get facts/evidence from citizens for better decision-making, at personal or institutional levels (e.g. crowdmapping).
- Develop alternative collaborative approaches to problem solving (crowdsourcing, crowdfunding, participatory design, collective intelligence, collective decisions).
- Actively engage, innovate and act, individually or collectively, towards societally, environmentally, political and economically sustainable approaches and solutions to tackle societal challenges: growth and employment, environment, climate change, health and education, inclusive societies, well-being, etc.

Making a project to tackle societal needs implies framing the needs and putting in place sets of tools and practises to achieve actual results. The first step in making a set of goals concrete is to define the targeted stakeholders and end users. This choice consequently defines the language, the engaging levers, the scale and the tools of a collective awareness initiative. Stakeholders are persons and organisations interested in the project activities and outcomes. At the bottom line we find end users, the people who will ultimately be made aware and who will use the services and solutions produced through a CAPS initiative; they must benefit from the whole process. Addressing and engaging researchers will in some ways be different from doing so with people with disabilities. The chapter following 'CAPS Stakeholders and End Users' describes the typologies of stakeholders and end users addressed by CAPS projects to date.

There are many tools and methods for tackling a societal challenge efficiently and in line with the CAPS fundamentals, such as openness, transparency, social relevance and inclusion. The methods and tools, which are presented in the chapter 'Collective Awareness Platforms', have the power to amplify the impacts of a platform in the process from idea to action.

CAPS Stakeholders and End Users

— Stakeholders

Stakeholders are organisations, categories of people or individuals who have an interest in the CAPS projects and their outputs. This section treats stakeholders and end users separately. Even though end users are also project stakeholders, the distinction is that end users use the project outputs directly, while stakeholders benefit from project outputs in an indirect way. Stakeholders will be informed of the project's progress and can, to a certain extent, influence the development of the projects.

Stakeholders will tend to belong to one of the following four groups: research, business, civic society, and policy and government.

On the right-hand page is a figure visualising the main stakeholders of the CAPS projects.

— End Users

CAPS projects raise awareness among their users and mobilise different categories of users. Below is a list of possible users; the same person can of course belong to more than one category. The list illustrates the diversity of topics and social issues touched by CAPS projects:

- Social innovation organisations and networks
- Citizens, social movements and activists
- Researchers
- Companies
- NGOs, associations and charities
- Software developers
- CAPS projects
- Citizens

Of these, citizens are the most relevant users, also in quantitative terms. They can be further described as follows:

- Citizens with disabilities and mobility impairments, elderly and their caregivers, and parents using strollers for their children.
- Citizens with an interest in environmental issues and in initiatives concerning ecology and conservation (e.g. individual energy consumption, making more sustainable lifestyle choices, ecological consumption).
- Citizens and companies interested in corporate social responsibility-related issues.
- Citizens with an interest in politics and citizenship (e.g. digital democracy, open government).

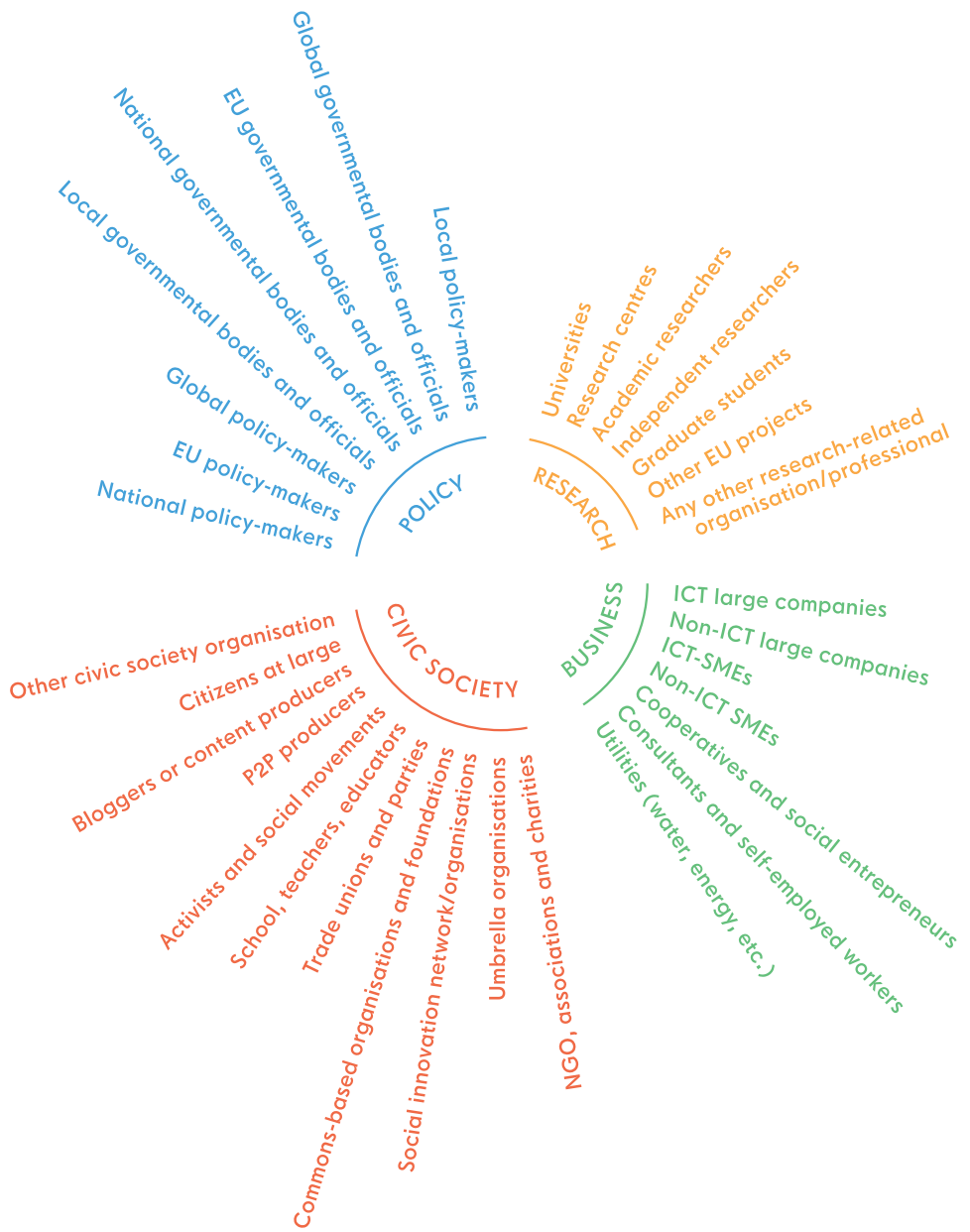


Figure 2
CAPS Stakeholders

- Citizens and initiatives active in commons-based peer production and sharing economy (e.g. Wikipedia).
- Users of online communities interested in knowing more about their data and in defending their online rights.
- Students and citizens interested in statistics and in knowing more about GDP measurement initiatives.

— Who Is behind CAPS?

CAPS projects involve a large spectrum of private and public companies, universities and research centres, online platforms and NGOs. All of these groups are concerned with citizen engagement, sustainability and social innovation, and they bring to their CAPS projects technical know-how, their expertise in engaging a broad audience, and their knowledge of a broad array of areas.

- ATHENS TECHNOLOGY CENTER SA - Athens, Greece
- AYUNAMIENTO DE ELCHE - Elche, Spain
- CAMBRIDGE UNIVERSITY - Cambridge, UK
- CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS - Thessaloniki, Greece
- CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE - Paris, France
- CERTH - Thessaloniki, Greece
- COLLABORATING CENTRE ON SUSTAINABLE CONSUMPTION AND PRODUCTION - Wuppertal, Germany
- COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES - France
- CONSIGLIO NAZIONALE DELLE RICERCHE - Roma, Italy
- EDGECASE UK LTD NEO - UK
- EMPIRICA GESELLSCHAFT FÜR KOMMUNIKATIONS- UND TECHNOLOGIEFORSCHUNG MBH - Bonn, Germany
- ENGINEERING INGEGNERIA INFORMATICA S.P.A. - Rome, Italy
- ESADE FOUNDATION - Spain
- ESSRG - Budapest, Hungary
- EUCLID NETWORK - London, UK
- EUROKLEIS SRL - Rome, Italy
- EUROPEAN INSTITUTE FOR PARTICIPATORY MEDIA EV - Berlin, Germany
- FONDAZIONE AHREF - Trento, Italy
- FORUM VIRIUM HELSINKI OY - Finland
- FRAUENHOFER-INSTITUT FÜR INTELLIGENTE ANALYSE- UND INFORMATIONSSYSTEME - Sankt Augustin, Germany
- FUNDACIO PER A LA UNIVERSITAT OBERTA DE CATALUNYA - Spain
- GRASIA RESEARCH GROUP, UNIVERSIDAD COMPLUTENSE DE MADRID - Madrid, Spain
- GRASS COMMONS - Colorado, USA

- GREEN ENERGY OPTIONS LTD - Hardwick, UK
- HW COMMUNICATIONS - UK
- I-GENIUS, WORLD COMMUNITY OF SOCIAL ENTREPRENEURS - London, UK
- IGOPNET.CC RESEARCH GROUP ON INTERNET, POLICY AND COMMONS, AUTONOMOUS UNIVERSITY OF BARCELONA - Barcelona, Spain
- IMAGINATION FOR PEOPLE - France
- IMINDS VZW - Brussels, Belgium
- INTERNATIONAL MODERN MEDIA INSTITUTE - Iceland
- ITALIAN NATIONAL STATISTICAL INSTITUTE - Rome, Italy
- LULEÅ UNIVERSITY OF TECHNOLOGY, CENTRE FOR DISTANCE-SPANNING TECHNOLOGY - Sweden
- LUNARIA, SOCIAL PROMOTION ASSOCIATION - Rome, Italy
- MAPPINGFORCHANGE - London, UK
- MODUL UNIVERISTY VIENNA - Vienna, Austria
- NESTA - UK
- OPEN KNOWLEDGE FOUNDATION LBG OKF - UK
- ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT - Paris, France
- P2P FOUNDATION - Amsterdam, The Netherlands
- PNO CONSULTANTS LIMITED - Cheadle Hulme, UK
- POLIBIENESTAR, UNIVERSITY OF VALENCIA - Valencia, Spain
- PURPOSE EUROPE - London, UK
- RADBOUD UNIVERSITY - Nijmegen, The Netherlands
- SIGMA ORIONIS - Sophia Antipolis, France
- SOZIALHELDEN E.V. - Berlin, Germany
- STICHTING DYNE. ORG - The Netherlands
- T6 ECOSYSTEMS S.R.L. - Rome, Italy
- THE EUROPEAN RESEARCH CONSORTIUM FOR INFORMATICS AND MATHEMATICS - France
- THE OPEN UNIVERSITY - Milton Keynes, UK
- THE UNIVERSITY OF SHEFFIELD - Sheffield, UK
- THE UNIVERSITY OF ZURICH - Zurich, Switzerland
- THE WAAG SOCIETY - The Netherlands
- UNIVERSITÀ DEGLI STUDI DI MILANO - Milano, Italy
- UNIVERSITÄT HEIDELBERG, GEOGRAPHISCHES INSTITUT - Heidelberg, Germany
- UNIVERSITY COLLEGE LONDON, ACCESSIBILITY RESEARCH GROUP - London, UK
- UNIVERSITY OF FLORENCE - Florence, Italy
- UNIVERSITY OF READING - Reading, UK
- UNIVERSITY OF SURREY - Surrey, UK
- VELTI - Greece
- WAAG SOCIETY - The Netherlands
- WIKIRATE E.V. - Berlin, Germany
- WIKITALIA - Rome, Italy
- WIRTSCHAFTSUNIVERSITÄT WIEN - Vienna, Austria
- WWF SCHEIZ - Zurich, Switzerland
- ZENTRUM FÜR SOZIALE INNOVATION - Vienna, Austria

Synergies between Projects

This chapter summarises the synergies emerging among CAPS projects both in terms of research activities and socio-technical tool development. As the figure below shows, there are multiple synergies, each of which with a specific goal that will be briefly described in the next paragraphs. The synergies were mapped out during a CAPS meeting in February 2014, where all projects were requested to think about and draw out potential or actual collaboration links. Clearly, synergies grow and change as projects proceed in their development, so this figure should be taken as a starting point for visualising contiguities and synergies among CAPS projects. Within the CAPS domain, there are four projects which have the specific goal of coordinating and supporting the others by offering services, networking tools and processes, and meta-analysis. These projects are WEB-COSI, CAPS2020, IA4SI and SCICAFE2.0. These projects, by their very nature, are developing synergies with all or most of the CAPS projects.

More specifically:

WEB-COSI makes a Wiki of progress statistics available and fosters the use and improvement of quality of non-official statistics beyond GDP statistics.

IA4SI provides CAPS with a self-assessment methodology for socio-economic and environmental impact analysis. All CAPS project are engaged in the development of the methodology and related online tools. IA4SI also develop an online platform through which CAPS projects outputs will be presented for opinion gathering of European citizens.

SCICAFE2.0 develops and deploys a multi-modal participative engagement platform (Citizens' Say) integrated with crowdsourcing tools which can be used by all CAPS projects.

CAPS2020 involves all projects in the organisation and realisation of CAPS' annual international events and promotes synergies between them.

DSI is a study that shows synergies with all CAPS projects as well as maps CAPS projects as Digital Social Innovation experiences and analyses them. Similarly, **FOCAL**, also studies CAPS and specific topics within this domain such as privacy, security, rewards and engagement.

USEMP aims at empowering social network users with regards to the sharing of their personal data and its potential economic value. The results of the project can be beneficial for many CAPS initiatives and will generate interesting synergies at the level of research and development. USEMP also shows synergies with all projects because it furnishes typologies of commons-based peer production and a directory of cases. Of course, other (if not all) projects can create synergies on top of their research outputs because the domain is very interconnected in terms of research questions as shown in the chapter 'Research Challenges'. Such synergies will emerge in the future, as research activities advance.

D-CENT: As shown in the figure above D-CENT connects with CATALYST because they both study and develop deliberation tools.

CAP4ACCESS: shows synergies with CATALYST and IA4SI in terms of exploring and harmonising assessment procedure and metrics.

CATALYST: already collaborate with DECARBONET in the development of visual analytics and online deliberation tools to discuss behavioural change issues related to energy saving and environmental sustainability. CATALYST can provide CAP4ACCESS with collaborative annotation tools for mapping accessibility. Moreover CATALYST provides tools for community managers that can be useful for USEMP purposes. In the field of innovative rating systems CATALYST shows synergies with WIKIRATE and D-CENT on tools for e-democracy and participation, and with WEB-COSI in terms of analytics and visualisations.

CHEST shows potential synergies could emerge with IA4SI, and from their collaboration on the impact assessment approach to be used on the crowdfunding platform of CHEST. IA4SI shows interesting synergies with USEMP and P2PVALUE as both study alternatives to classical econometric models of value generation and representation, which would be beneficial for the IA4SI methodology. Moreover, CHEST can represent an important gate for funding for online innovative communities engaged in D-CENT, CATALYST, DECARBONET and SCICAFE2.0 projects. CHEST calls for digital social innovation ideas and projects which can, in fact, support the growth and sustainability of grassroots initiatives represented in CAPS projects.

DECARBONET has already collaborated with CATALYST, and also shows potential synergies with P2PVALUE in terms of research activities on collaborative core technologies and with D-CENT with reference to XML-based activity streams and information integration.

WIKIRATE recognises potential synergies with P2PVALUE because they study P2P production, which is one of the themes of WIKIRATE. This project, along with D-CENT, is developing a reward mechanism using the WIKIRATE platform by evaluating the possibility of using the community currency which, along with DSI, could constitute a gate for more potential users.

CAPS domain is also interconnected with other research groups within and outside the EC. Among others, the synergy between CAPS and EINS, a European network of excellence for Internet Science, deserves to be mentioned.

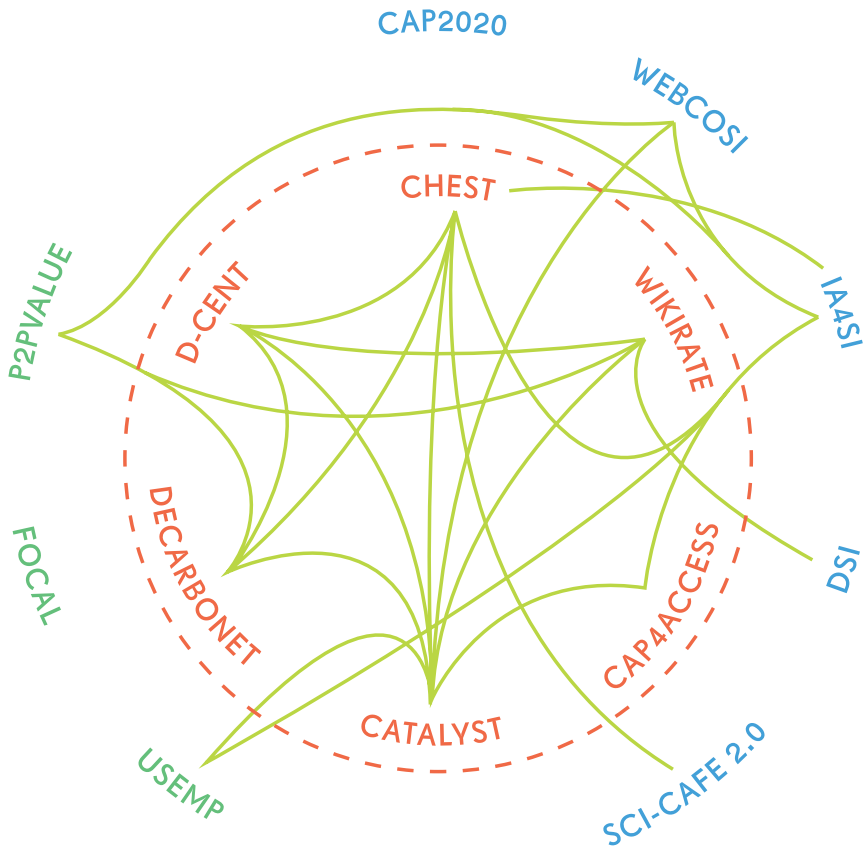


Figure 3
Synergies between CAPS Projects

Collective Awareness Platforms

— Engagement Platforms

From Existing Projects and Tools to Future CAPS Engagement Platforms

The first round of CAPS projects provides a variety of engagement platforms for social innovation which build from existing tools, technologies and communities deeply grounded in real-world settings. In this chapter we survey and list the existing tools and communities that the CAPS projects build from and collaborate with (see 'Existing Tools and Communities that the CAPS Projects Build from and Collaborate With' below). This list could be used as a useful data source to identify the type of organisations, technologies and movements with which CAPS projects are already engaging.

We now present an overview of the main tools that the CAPS projects are developing and that will be delivered at the end of the projects' funding period (see Figure 4 below). This overview consists of a clustering of the funded CAPS projects under 14 emerging categories. The clustering is based on available public documents of CAPS projects and on the knowledge available among the authors, who are also part of the CAPS community. It has to be noted that CAPS projects are still in the early stage of development, therefore a more in depth, precise analysis of the solutions they offer to their stakeholders will only be possible later on in the projects' development lifecycle. This mapping cannot, therefore, be considered exhaustive, but should be considered a useful entry point for getting a first understanding about the typologies of socio-technical solutions that the projects will provide in the near future.

The 14 categories are summarised in the following graphic (Figure 4) and are more fully described and detailed in the next section. This clustering considers the main 'innovations' produced by the projects. More comprehensive outputs of each project will then comprise the ways in which these 'innovations' can be transferred, reused and made available to stakeholders through various exploitation strategies. The term 'innovation' is used here with reference to both totally new outputs, such as products and services, and to improved socio-technical solutions, such as the integration of pre-existing systems, the adaptation of a technology to a new field of application, and the provision of a more effective version of a pre-existing tool based on the improvement of one or more of its components (OECD, 2005).



Figure 4
CAPS Tools in Development



— CAPS Tools Emerging Categories Descriptions

The 14 categories illustrated above (Figure 4) can be described by specifying the motivations and needs that drive the development of the tools and by providing a short overview of the type of technologies that will be developed by each CAPS project. In the narrative below, the CAPS projects will be referred to by citing their acronym. A list of these acronyms together with project titles and URLs is provided in the chapter 'Introduction to the First-Round of Funded CAPS Projects'.

Analytics and Visualisations

Web 2.0 social computing principles motivate the importance of placing useful, usable analytic tools in the hands of users themselves, balancing the traditional focus on 'executive information dashboards' serving the needs of only a few senior stakeholders. CAPS projects provide different types of social innovation analytics together with the visualisations needed to make analytics usable and understandable by different end user communities. CAPS analytics and visualisations, for instance, include: social network analytics and visualisations (structure and dynamics of peer-to-peer networks, e.g. the roles that people play in collective endeavours—CATALYST project), discourse analytics and visualisations (the meaningful but contestable relationships that may be forged between ideas from many people: De Liddo et al, 2012—CATALYST project), disposition analytics and visualisations (the habits of the mind that can be nurtured, e.g. building resilience and creativity: Buckingham Shum & Deakin Crick, 2012—CATALYST project), analytics and visualisations on user behaviours (DECARBONET project), and engagement analytics and visualisations for evaluating different facets of participative engagement in social innovation initiatives (CAPS4ACCESS, CATALYST, DECARBONET, IA4SI, WEB-COSI projects).

Collective Assessment

When many people coordinate each other through the use of digital technologies, one of the issues that emerges is how do they evaluate the results of their collective production effort? Such evaluation can be delegated to algorithms, like in the case of Google PageRank, where search results are ordered according to different criteria such as relative relevance, search histories, etc. If such dynamics are based on human interactions and collaboration more than on automatic ordering, then a set of questions arises about the criteria on which ordering should take place, on the relative role of different users in rating activities, and on the economic sides of such social process.

This is a key aspect of many CAPS projects, dealing with the need to promote a collective assessment of the information produced by the end users. The solutions previewed are many, like systems for polling or voting (SCICAFE2.0), the development of theories of reputation and ranking systems (WIKIRATE), the implementation of such systems (WIKIRATE, CATALYST), or the connection between personal data, economic value, and currencies (USEMP). Moreover, assessment of the CAPS projects themselves is key to these projects, with the contribution of IA4SI aiding in such a collective endeavour.

Crowdsourcing

The widespread adoption of digital technologies have made it easier to reach out to larger groups of people with a high-level of knowledge of specific topics, e.g. software development capabilities, social innovation concepts, etc. The ability to reach out to highly skilled people who can contribute freely, or at a low cost as in the case of Amazon's Mechanical Turk (Kittur et al., 2008), to specific tasks is known as the phenomenon crowdsourcing (Howe, 2006), or outsourcing to the crowd.

Such problem solving activities have a certain level of overlapping and theoretical problematisation in relation to what is called peer production, but in this context, what is interesting is the kind of tools CAPS projects are developing to support problem solving dynamics, such as collective mapping (CAP4ACCESS), deliberation (CATALYST), crowd voting (CHEST), social currencies (D-CENT), directories of initiatives (P2PVALUE), statistical data collections (WEB-COSI), and reputation and rating systems (WIKIRATE).

e-Democracy, e-Participation, Direct Democracy

Collective intelligence and collective action is increasingly triggered and mobilised by online communities' interaction. Specifically, in the field of e-government and public engagement (Macintosh, 2008), several community engagement initiatives (such as Global Voices, America Speaks, liquidfeedback.org, Avaaz.org, Change.org, etc.) show that there is an increasing need and interest in finding ways to gather and aggregate people's ideas, resources and actions in a way that makes these better explored and reused by others.

CAPS projects focus on advancing research and practices to improve citizen participation in public engagement processes. This includes and most importantly consists of testing e-democracy (OECD, 2003), e-participation (Macintosh, 2009) and direct democracy methods and tools, with real communities in several EU contexts. CAPS community testbeds and grassroots initiatives aim at enabling more direct engagement in democratic decision-making, thus improving understanding and tooling for e-democracy, direct democracy and political empowerment research (CATALYST, D-CENT, SCICAFE2.0).

Geo-mapping, Geo-Planning, Geo-Navigation

CAP4ACCESS will be developing methods and tools aimed at two societal challenges: 1) informing people with mobility impairments on the accessibility of public places and routes and 2) raising general awareness of barriers to accessibility. Given the widespread use of the internet and mobile devices, these tools will serve to empower members of the disabilities community to be able to more fully take part in society while at the same time create opportunities to remove barriers to accessibility. Specifically, CAP4ACCESS will use the power and versatility of online maps and mobile devices for collectively gathering and sharing spatial information for improving accessibility for persons with limited mobility. The instruments to be developed will involve community mapping, collective tagging of public places and routes, participatory sensing of barriers and features of the built environment, and routing for persons with limited mobility.

Motivation & Engagement

Technically conceiving of the technology of tools and platforms is not a sufficient enough condition with which to explore the potential of social media for tackling social challenges. The issue of how to engage people with social innovation as users of the collective awareness platforms must also be a target of CAPS' developments. Understanding the reasons why people use (or don't use) such technologies, what influences the perception, adoption, and continuous usage of such technologies, and developing strategies to motivate people to be engaged, are some of the approaches adopted by CAPS projects. DECARBONET, for instance, has evaluated the impact of social dynamics like competition and collaboration, and also gauged public and tangible feedback of engaging users with online discussions (Piccolo et al, 2014). CATALYST relies on the power of argumentation within a social group as a motivational force, and like SCICAFE2.0 allows users to track other users' engagement.

New Economic Models

The transformation of societies and economies following the diffusion of digital technologies, with increases in productivity, the redistribution of international divisions of labour, and the emergence of new professions, has questioned the way the world economy has been organised, the way business can be done, and the way income and wealth are redistributed. Moreover, purely digital phenomena such as financial high-frequency trading instruments or the digital currency Bitcoin are suggestive of the idea that economic transformation could be extremely deep. This is the reason why many CAPS projects are questioning the existing economic models and testing trials of new economic models, be it new sustainability initiatives for social innovation activities (CHEST), new distributions of social currencies in relation to social movements (D-CENT), new value models and theories (P2PVALUE), or new valuation practices of personal data (USEMP).

(Open) Data Integration

Each social network has a different affordance for users. Twitter, Facebook and other widely-adopted social systems format the content in different ways, suggesting to users to attribute different meanings and ways of use. Integrating user-generated data from different media, analysing the content as well as user participation, and providing insightful visualisations are some of the complex tasks related to data integration addressed by CAPS projects.

D-CENT, WIKIRATE, and WEB-COSI are focused on open data integration by providing different standards, tools and methods for data federation. DECARBONET and D-CENT work on the modelling of social media data for mining and presenting it in an aggregated way. CATALYST, DECARBONET, and WIKIRATE are also together in that they aggregate data from different social media sources (such as Facebook, Twitter and emailing systems).

Online Deliberation—From Group-Based to Large-Scale

Recent events have given evidence to the fact that communities can be created and mobilised by engaging in online dialogues mediated by social media platforms, for example the Arab Spring uprisings organised through Facebook, or the use of Twitter for emergency response. Even though society seems to urge technologies to facilitate and

empower widespread collective deliberation, social media platforms, as well as the more targeted platforms for e-democracy, provide unstructured conversations where data is not presented in a way that makes it easy for other people (or machines) to make sense of (or extract) the rich social and technical knowledge, which is embedded in the dialogue. The Theory of Scholarly Discourse (Gilbert and Mulkey 1984), dialogue mapping (Conklin 2006) and argumentation (Walton 2009, Walton and Reed 2009) suggest that by structuring several forms of discourse, such as dialogue and debate, with specific models and tools, discourse can be used by groups to build shared understandings, explore solutions to complex problems, and make better informed collective decisions.

CAPS projects aim to build on these theories and on the existing technologies for online debate in order to design, develop and test new platforms for online deliberation in real communities. These consist of new tools for: human sensing and content harvesting (CATALYST project); idea creation, sharing and exchange (CATALYST, SCICAFE2.0 projects); collective sensemaking and structured online debate (CATALYST project); idea prioritisation and assessment (CATALYST, CHEST projects).

CAPS online deliberation tools respond to the increasing need and interest in finding ways to gather and aggregate people's voices in a way that makes these voices better and more widely listened to, explored, understood, and reused by others. The objective is to build awareness of social issues and put those voices into truly effective conversations in order to build social change.

Peer Production and Collaborative Knowledge Creation

As the costs for accessing and manipulating information have been reduced by the widespread adoption of digital technologies, the possibilities for the emergence of new forms of collaborative production, mainly in the domain of knowledge work, have emerged. Yochai Benkler (2006) defined such modes of production as commons-based peer production (CBPP), which is one of the topics of CAPS projects. While the project P2PVALUE makes it one of its main focuses, for example by providing a directory of CBPP projects and initiatives, other projects, like SCICAFE2.0, WEB-COSI, and WIKIRATE, actually leverage some of the characteristics of this mode of production in delivering their results, from statistical data (SCICAFE2.0) to scientific themes (SCICAFE2.0), and passing through knowledge on corporate social responsibility (WIKIRATE).

The academic debate on such topics is lively (e.g. with a dedicated journal, the *Journal of Peer Production*), as CBPP can be read as a third way of managing production, neither market nor state managed, and CAPS projects are an extremely interesting field with which to explore the theme.

The tools provided by CAPS projects deal with the actual organisation of productive efforts in the digital domain, such as value mechanisms (P2PVALUE), knowledge construction (SCICAFE2.0), rating and reputation systems (WIKIRATE), and data quality discrimination (WIKIRATE and WEB-COSI).

Privacy-Aware Tools and Applications

Privacy-aware systems have evolved over the last decade from privacy-enhancing technologies (PETS) which were largely seen as an add-on capability or layer integrated with information systems as a design afterthought, to a new paradigm of privacy-by-design as championed by the Information and Privacy Commission of Ontario, Canada (www.privacybydesign.ca), and most recently to privacy-by-co-design by the European VideoSense Centre of Excellence (www.videosense.eu) and by the Kanatara Initiative for systems to support lifestyle identity management (www.kantara.org). Personal data ecosystems (PDE) has recently been developed by the World Economic Forum and further elaborated by the Ontario Information and Privacy Commission and others. It is important to note the crucial role CAPS can play with respect to privacy issues. Socio-ethical and privacy-preserving practice in both design of systems and in their governance, including internet governance, is a complex co-design challenge that can be strongly supported by CAPS. This can be done in providing the requisite participative engagement to discuss the evolution of privacy regimes and how governments and enterprises can operate on a global scale to influence the privacy standards of network-centric systems and the related internet governance issues worldwide.

Three CAPS projects, namely FOCAL, USEMP and D-CENT have included privacy-related issues in their research agenda as follows:

D-CENT will see the development of new open-source, decentralised and privacy-aware digital tools and applications for direct democratic and economic empowerment. Digital rights are perceived as key issues that D-CENT will address, ensuring that people are in full control of their data, maintaining privacy and trust in the technology they use.

FOCAL is motivated by privacy concerns about the data and location of the end users that contribute to CAPS. It is thus concerned with the analysis of privacy, reputation and trust in social networks.

USEMP will build upon the notion of PDE and may in fact assume a personal data vault to provide a secure environment for effective control over relevant data.

Social Networking & Social Media Enhancement

The confluence of network-centric systems, mobile telecommunications, semantic web and web 2.0, as well as the emergence of the growth of networked media, in particular the creative media industry and prosumers sharing media for entertainment, has contributed to a thriving ecosystem of online social networks (OSN) serving various business models and personal interests for the citizens ranging from specialist interest groups to social meeting places. It is clear that this ecosystem should be exploited maximally to serve the European citizen and economy by linking it to the Internet of Things (IoT), sensor network and cloud services in order to support open online social media and distributed knowledge co-creation thus maximising the network effect, using sharing to support social innovation.

The following CAPS projects support this vision as follows:

- **CAPS2020** liaises with all CAPS stakeholders, including organisations developing similar projects in other regions of the world. It organises annual events which will be key milestones in the present CAPS booming period, supporting the CAPS community in addressing issues of common interest, to develop synergies between initiatives, and to discuss the CAPS research roadmap for Horizon 2020.
- **D-CENT** (Decentralised Citizens ENgagement Technologies): Together with citizens, social movements, and developers, is creating a distributed social networking platform for large-scale collaboration to solve social problems and allow full citizen participation in the democratic process. The project will study possible implementations of liquid democracy: collective deliberation, decision-making, and the pros and cons of proxy voting.
- **USEMP** will develop a set of tools allowing users of online social networks greater control over the personal data they share within the network while also providing them with tools to enable the use of their data by entities outside of the OSN, for example, in the form of licensing agreements.

— Existing Tools and Communities That the CAPS Projects Build from and Collaborate With

1. **Adhocracy** <http://trac.adhocracy.cc> Adhocracy is a policy drafting tool for distributed groups. It enables members of organisations or the public to compose or vote on documents that represent the policy of the group.
2. **Assembl** <http://assembl.org> Assembl is a web application that enables hundreds to thousands of people to work together with the goal of creating a single, tangible product. The way Assembl works allows large numbers of people to discuss and debate in a manner that elevates the intelligence of the group. The key to this is the methodology that accompanies the application.
3. **BitcoinD** <https://en.bitcoin.it/wiki/BitcoinD> BitcoinD is a program that implements the Bitcoin protocol for command line and remote procedure call (RPC) use. It is also the first Bitcoin client in the network's history. It is available under the MIT license in 32-bit and 64-bit versions for Windows, GNU/Linux-based OSes, and Mac OS X.
4. **Book Sprint** <http://booksprints-for-ict-research.eu> Book Sprint is a collaborative process that brings together a small group of people to develop and produce a book in 3-5 days. There is no pre-production. The group is guided by a facilitator, from zero to published book. Books are of high-quality content and available immediately via print-on-demand services and e-book formats.
5. **BuddyCloud** <http://buddycloud.com> Buddycloud is a publish-subscribe architecture with real-time updates.

6. **CitySDK** <http://www.citysdk.eu> CitySDK is creating a toolkit for the development of digital services within cities. The toolkit comprises of open and interoperable digital service interfaces as well as processes, guidelines and usability standards. CitySDK enables a more efficient utilisation of the expertise and know-how of developer communities to be applied in city service development. Apps and tools for CitySDK are developed in cooperation with the Code for Europe fellows (see www.codeforeurope.net).
7. **CKAN** <http://ckan.org> CKAN is a powerful data management system that makes data accessible—by providing tools to streamline publishing, sharing, finding and using data. CKAN is aimed at data publishers (national and regional governments, companies and organisations) wanting to make their data open and available.
8. **Climate Quiz** <https://apps.facebook.com/climate-quiz> A Facebook application in the tradition of "Games with a Purpose" for Measuring Environmental Knowledge.
9. **Cohere** <http://cohere.open.ac.uk> Cohere is a visual tool to create, connect and share ideas, and back them up with websites. By using Cohere people can support or challenge each other's ideas and discover who—literally—connects with your thinking. Cohere demo movie: <https://www.dropbox.com/s/qxyzun4fbtbcbe6/Cohere-Movie-Catalyst.m4v>.
10. **ColorVote** <http://colorvote.com> Poll system that enables one to detect ideas—Condorcet voting, binary voting, fungible voting.
11. **Crabgrass** <https://we.riseup.net> CrabGrass is a software libre web application designed for group and network organising, and tailored to the needs of the global justice movement.
12. **Deliberatorium** <http://cci.mit.edu/klein/deliberatorium.html> The Deliberatorium is a technology designed to help large numbers of people, distributed in space and time, combine their insights to find well-founded solutions for such complex multi-stakeholder multi-disciplinary ('wicked') problems such as sustainability, climate change policy, complex product design, and so on.
13. **DemocracyOS** <http://democracyos.org> DemocracyOS is a user-friendly, open-source, vote and debate tool, crafted for parliaments, parties and decision-making institutions that will allow citizens to get informed, join the conversation and vote on topics, exactly the way they want their representatives to vote.
14. **Diaspora*** <https://diasporafoundation.org> diaspora* is a privacy-aware, decentralised social network which puts users in control of their data security and was touted by the media as a 'Facebook killer'.

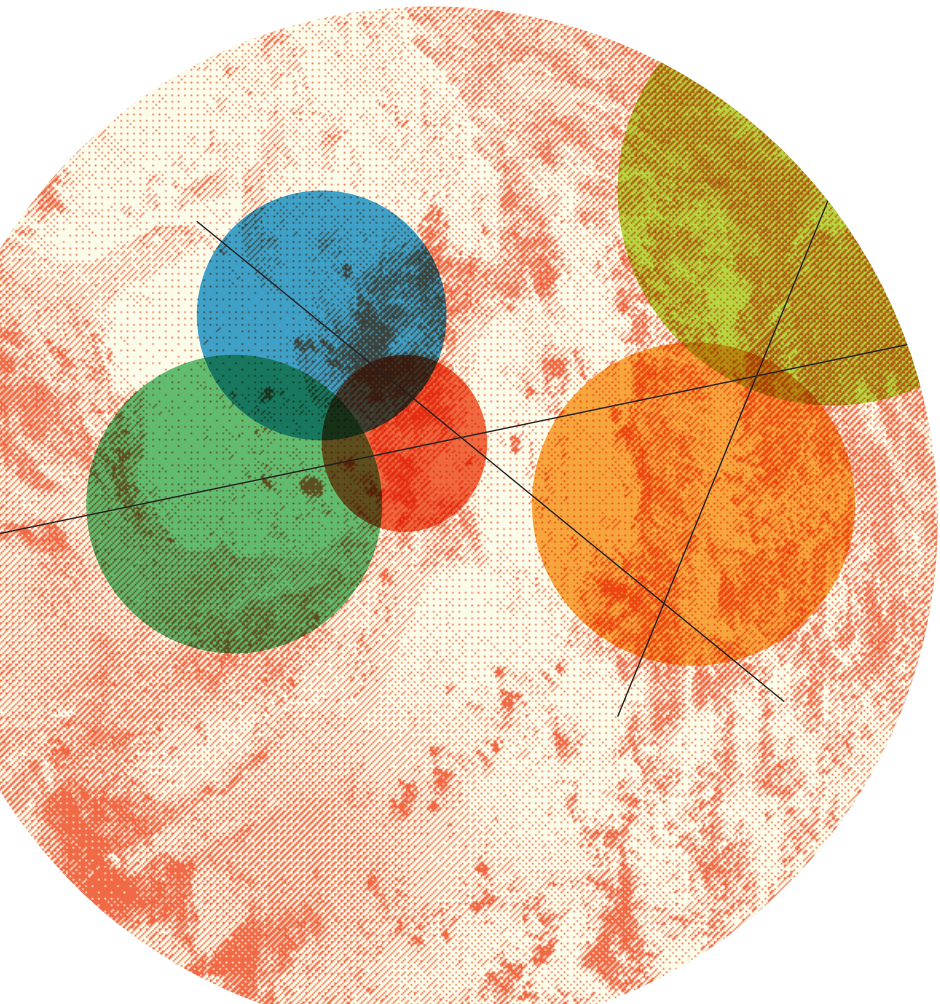
15. **EdgeRyders** <http://edgerydereu/page/home-mb-ano> Edgerydere is a global community and boutique consulting company. The community focus on social innovation, smart communities, resilient societies and economies, deploying ad-hoc networks of citizen experts around client's needs.
16. **Elgg** <http://elgg.org> Elgg is an award-winning social networking engine, delivering the building blocks that enable businesses, schools, universities and associations to create their own fully-featured social networks and applications.
17. **Evidence Hub** <http://evidence-hub.net> The Evidence Hub is a collaborative knowledge-building (specifically evidence-building) web platform. It was designed in KMi by the team developing the concept of 'Contested Collective Intelligence', where it is important to understand different perspectives and support quality debates.
18. **GEO Smart monitor devices** <http://www.greenenergyoptions.co.uk/products-and-services/products> A set of In-Home Displays, smart plugs and web visualisation of energy consumption.
19. **Global Network on Sustainable Lifestyles** <http://vision2050.net> The GNSL is a global platform of practitioners and experts that come together around the joint commitment of enabling more sustainable lifestyles.
20. **GNUNet** <https://gnunet.org> GNUNet is a framework for secure peer-to-peer networking that does not use any centralised or otherwise trusted services.
21. **GreenApes** <https://www.greenapes.com/en> greenApes is a gamified social media platform where you can build your sustainable profile and become a source of inspiration for your peers and the whole world. greenApes rewards green living with the mission of promoting sustainable lifestyles.
22. **Groupmap** <http://app.groupmap.com.au> An application that enables the user to have a visualisation in the form of a heuristic map.
23. **Intertwinkles** <https://intertwinkles.org> InterTwinkles is a platform built from the ground up to help small democratic groups to do *process* online. It provides structure to improve the efficiency of specific communication tasks like brainstorming and proposals.
24. **Kune (Apache Wave)** <http://kune.cc> Kune, which means 'together' in Esperanto, is a network of interconnected sites, where you can communicate, share, collaborate with others and create your web spaces easily.
25. **Libbitcoin** <http://libbitcoin.dyne.org> Libbitcoin is a community of developers building the open-source library, tools and implementation necessary for a free, independent and vibrant Bitcoin.

26. **Liquid Feedback** <http://liquidfeedback.org> LiquidFeedback is an open-source software, powering internet platforms for proposition development and decision making.
27. **Loomio** <https://www.loomio.org/?locale=en> Loomio is free and open-source software for anyone, anywhere, to participate in decisions.
28. **Mailpile** <https://www.mailpile.is> Free and open-source web mail client with user-friendly encryption and privacy features.
29. **Media Watch for Climate Change** <http://www.ecoresearch.net/climate> It tracks the latest news and social media coverage on climate change and related issues. The dashboard provides interactive means to access this repository, to analyse the perceptions of various stakeholders, and to identify and track emerging trends.
30. **Metamaps** <http://metamaps.c/> Metamaps.cc is a free and open-source web platform for changemakers, innovators, educators and students. It enables individuals and communities to build and visualise their shared knowledge and unlock their collective intelligence.
31. **Meu Rio Imagine** <http://imagine.meurio.org.br> Meu Rio is a digital interface for civic engagement. Anybody living in Rio de Janeiro can log on to the website and denounce a problem and launch a campaign to fix it. The issues are usually targeted and very local, such as the price of a ferry ticket or the cutting of a tree on a specific street.
32. **OpenAhjo** <http://dev.hel.fi/apis/openahjo> OpenAhjo is an API and a UI for accessing the decision-making material of the city of Helsinki.
33. **OpenMinistry** <http://openministry.info> The Open Ministry (Avoim ministeriö) is about crowdsourcing legislation, deliberative and participatory democracy and citizens initiatives. It is a non-profit organisation based in Helsinki, Finland. OpenMinistry helps citizens and NGOs with national citizens' initiatives, EU citizens initiatives and develop the online services for collaborating, sharing and signing the initiatives.
34. **OpenStreetMap** <http://www.openstreetmap.org> OpenStreetMap is built by a community of mappers who contribute to and maintain data about roads, trails, cafés, railway stations, and much more, all over the world.
35. **Parlement & Citoyens** <https://www.parlement-et-citoyens.fr> Parlement & Citoyens enables parliament members and citizens to work together on societal issues and to write law propositions together.
36. **Picocoin** <https://github.com/jgarzik/picocoin> A small bitcoin client.
37. **Pump.io** <http://pump.io> Social server with an ActivityStreams API.

38. **PyBossa** <http://pybossa.com> PyBossa is a free, 100% open-source framework for crowdsourcing. It enables you to create and run projects where volunteers help you with image classification, transcription, geocoding and more.
39. **Reddit** <http://www.reddit.com> Social networking service and news website where registered community members can submit content, such as text posts or direct links. Only registered users can then vote submissions 'up' or 'down' to organise the posts and determine their position on the site's pages. Content entries are organised by areas of interest called 'subreddits'.
40. **Rollstuhlrouting** <http://rollstuhlrouting.de> Tool for tagging and navigating wheelchair-accessible routes.
41. **Sharelex** <http://www.sharelex.org> ShareLex is a collaborative platform conceived to create and share juridical solutions.
42. **Slashdot** <http://slashdot.org> Slashdot is a website based on, and runs, the Slashdot-Like Automated Story-Telling Homepage software.
43. **Status.Net** <http://status.net> Free and open-source social software.
44. **Succeed Together** <http://www.succeedtogether.eu/en> A company that is creating a semantic engine which allows groups of 500 to 3000 people to answer questions qualitatively, and the engine crunches the answers in real-time and produces results that are at first glance, very good.
45. **Talkmap** <http://www.talk-map.com> Visualisation tool allowing moderation by reconfiguring maps.
46. **Twister** <http://twister.net.co> Twister is a fully decentralised P2P microblogging platform leveraging from the free software implementations of Bitcoin and BitTorrent protocols.
47. **Ushahidi** <http://ushahidi.com> Non-profit tech company that specialises in developing free and open-source software for information collection, visualisation and interactive mapping.
48. **Utopia** <http://www.utopia.de> German community platform to discuss sustainable lifestyles built on the Symphony CMS.
49. **Utopia Docs** <http://getutopia.com> Collaborative web annotation tool for PDF files.
50. **Wagn** <http://wagn.org> Wagn is a Wiki Platform.
51. **Wasa2il** <https://github.com/smari/wasa2il> Direct democracy system.

52. **Wikiprogress** http://www.wikiprogress.org/index.php/Main_Page Wikiprogress is a global platform for sharing information in order to evaluate social, environmental and economic progress. It is open to all members and communities for contribution—students and researchers, civil society organisations, governmental and inter-governmental organisations, multilateral institutions, businesses, statistical offices, community organisations and individuals—to anyone who has an interest in the concept of 'progress'.
53. **YesWiki** <http://yeswiki.net/wakka.php?wiki=Accueil> YesWiki is a software application made for creating and managing your website, in a collaborative way. YesWiki is Free Software written in PHP language under the GPL licence, used for creating and managing an internet or intranet website.
54. **Your Priorities** <https://www.ypri.org/home/world> Your Priorities is an e-democracy web application designed by the non-profit Citizens Foundation to help groups of people speak with one voice. Your Priorities won the European e-democracy Awards in 2011 and numerous Icelandic awards for innovation and participation.

4. Starting Out



Societal Challenges

Societal challenges are associated with problem situations or issues that arise from tensions in some aspect of social life or the environment that may threaten the safety and sustainability of a social group and, possibly, the wider world.

Global warming, implications of population ageing, the digital divide and security issues across the internet, are examples of problems experienced across nations, to a greater or lesser extent, that are apparently beyond individual control, but that also impact local contexts and thus have to be resolved.

These problems often have a harmful effect on the social, economic and political health and well-being of citizens, and can threaten the fabric of society by destabilising its democratic structures, norms and relationships, and above all, its social cohesion.

In order to tackle societal challenges it is necessary to study the nature of the problem situation or issue, the players and stakeholders involved, and the objectives to be pursued through the solution.

The problem may involve a single sector of the society or different types of stakeholders, and may be located in different social, political and economic contexts.

The root causes of the problem may be recognised by many, but structural and societal constraints may complicate the adoption of certain solutions. These constraints can be related to the lack of public support or to side effects, for example, that have been deemed to be politically inexpedient.

Tackling a problem involves negotiating a way through the requirements and preferences of the stakeholders involved. This requires eliciting the most deeply valued needs of the various subgroups, each in its own context, and analysing the impact of the problem in relationship to their interests.

Through participatory research, it is necessary to clarify the context and boundaries of a problem as it is experienced by a social group. Local or general solutions can be developed by negotiating acceptable trade-offs, through targeting a balance in terms of benefits for the subgroups involved.

There are various tactical and strategic levels at which a problem solution can be tackled. These include but are not limited to: local ad hoc solutions to manage the problem situation; limiting the spread of the problem and containing its adverse impacts; impact mitigation, contingency and failure recovery management; remedial steps to directly tackle the root cause of the problem; anticipation of the problem situation to prevent or pre-empt it; and transformative steps to ensure that the context and/or tipping point of the problem solution will never recur.

Framing the Challenges

It is understood that one cannot change what one cannot control and it is impossible to control what one cannot measure. To tackle increasingly complex societal problems we must be able to influence the problem situation. Such ability is critically dependent on an accurate situation assessment for which enabling models must be built. We need such models of the processes for simulation and for decision-making. Yet we cannot refine, let alone shape, the models if we cannot build such models in the first place.

The internet-based physical and digital ensemble, including the Internet of Things, today can enable us to obtain the required measurements, to perform semantic fusion of data that can make sense of the underlying causal processes of a problem situation (i.e. the models of the problem space), and to assess the extent and scope of the impacts of a problem as it affects society.

In this way, decision support systems enable simulation to support enhanced situation-awareness, enhanced decision support, efficient contingency and mitigation management responsive to problem situations.

By converging cloud services, mobile telecommunication and Web 2.0 technologies, the collective awareness platforms will support wide spread participative engagement, consensual solution building and co-creative innovation.

Thus it is clear that technology can enhance our ability for problem resolution. Collective awareness platforms can support improved models of participative engagement for building a consensus and for finding solutions proposed by people at the grassroots level. Technology thereby can help us to become better comers.

In such a perspective, it is important to define the boundaries of a problem in terms of the extent it affects citizens and societal structures directly or indirectly. This process of scoping the problem must then be rooted in the identification of the contexts, and in the forms the problem is instantiated. Contextualising the problem is a prerequisite for effective and efficient resolution.

The first step is to identify the interplay of influences in the origin of the problem and how it manifests in various contexts of citizens and societal life. In this way it should be possible to characterise the relationship between the involved actors and how the problem impacts their most valued interests.

The problem can be further contextualised according to each involved actor, their roles, responsibilities, objects, spaces, places, processes and their patterns-of-relating to the problem and its impacts, e.g. the trade-offs that they may entertain and those they would not.

Finally, the impacts can be considered and analysed to arrive at a further classification of different contexts and its implicated actors. The impacts, however, must be considered in two levels:

- Primary or direct impacts.
- Secondary impacts, which includes side effects, cross-effects (Badii 2008) and associated human affects in terms of harm, hurt, loss of privacy, dignity, stigmatisation, inequitable treatment.

This process of analysis then leads to a consensus solution in various local and global layers.

Engaging Communities of Interest

Communities of interest are at the core of CAPS developments. These groups may be geographically bound to one location or they may be widely dispersed, but they are all centred around a common interest. The participatory research approach involves them in the conception/development process to reveal some common, shared concerns as well priorities and needs that may be unique for one particular segment.

How to approach and mobilise these target groups will be different depending on the role they are given within a CAPS project. Some CAPS projects address localised and contextualised social problems within the community of interest, while others bring to light global problems, but presented and addressed from specific perspectives.

— Identifying Target Groups Priorities

To positively impact a social group, identifying the priority real-life issues they face and understanding some of the problems they are coping with are crucial steps. Not explicitly going through this process may lead to solving a non-existent problem.

Local organisations or institutions somehow related to the community of interest may help in paving the way to establish a dialogue between people. Community leaders who are trusted can also act as spokespeople or ambassadors for the CAPS project, establishing a sense of trust between the users and researchers. Workshops, seminars, interviews, surveys and online platforms are examples of strategies that can be applied to dialogue. The best strategy for establishing the dialogue differs according to the social groups and to the project, but it is clear that people will only take part in it if they trust and believe in the positive impact to their lives.

— Making People Aware

The importance of pressing societal issues is not easily perceived in everyday life. Broader and longer-term issues, which are not directly contextualised in the reality of social groups, require promotion to start the raising awareness process. Making sense of the issue is a preliminary requirement for people developing an interest in, and motivation for, it. Preventive healthcare and climate change are examples of such societal concerns whose urgency must first be made clearly evident in order to engage people.

Even when they experience the consequences of climate change, people, for instance, usually do not correlate their own individual behaviour with these outcomes. They may realise that purchasing choices and energy consumption on a large-scale may have a global impact, but it is not usually part of their own concern. Raising awareness that these broad and sometimes very complicated issues do concern them as individuals, and that their behaviour does have an impact, is necessary in order to bring about any kind of engagement.

Identifying those people already concerned with these societal issues and engaging them first is a possible strategy for fostering social innovation.

— Other Stakeholders

Proposing solutions for specific groups' issues is not only a technical matter in the CAPS context. Other stakeholders influence and can also be influenced by any change triggered by a technological development. The role of these stakeholders, such as policy makers or regulators, must be taken into account through a participatory research approach (see chapter 'CAPS Stakeholders and End-Users').

— But What is Engagement?

Both in the dictionary and in the context of CAPS, the term 'engagement' has several meanings. Being 'engaged' with a collective awareness platform refers to being an active and frequent user of this platform, but it also refers to leveraging this platform to achieve a social change.

From the online perspective, Yates and Lalmas (2012) define 'user engagement' as 'the phenomena associated with wanting to use that application longer and frequently'. The engagement is then mostly a consequence of the platform's interactive design.

Engagement can also be a measurement of participation within a digital platform based on, for example, the number of people a user interacts with, the time a user spends using a platform, and how frequently he/she is connected.

When targeting social change, engagement can be associated to the participation in collective or collaborative activities, and to civic engagement, as defined by the American

Psychological Association as 'individual and collective actions designed to identify and address issues of public concern' (APA, 2014).

By merging these concepts, the target *engagement* in the CAPS scenario involves gathering people through technology to create collective knowledge which can lead towards social innovation and offering them tools and channels for self-organising themselves in a sustainable and resilient way.

Engaging people is then a challenge that embraces the understanding of motivational forces, be those intrinsic, related to psychological needs, or extrinsic, influenced by the sociocultural reality.

Empowerment

The Oxford dictionary defines the verb 'to empower' in the following way: 'Make (someone) stronger and more confident, especially in controlling their life and claiming their rights.' There are many, much more complex definitions of the term, a number of which refer specifically to the empowerment of marginalised communities. The bare bones definition of the Oxford dictionary, however, coincides with the understanding of 'empowerment' in the context of CAPS projects, which seek to empower European citizens in general, whether they belong to a marginalised community or not.

By making one's voice heard through collective awareness platforms, it is possible to change other people's minds or behaviours, to influence public policy, or to make an impact on one's own life through collective action—hence for exercising power that does not always come as a matter of course to 'regular' citizens.

— Personal Efficacy

Sometimes the lack of connection between global issues and individual's immediate context is the main reason why people do not feel powerful enough to act towards a societal change.

The climate change issue is an example of this phenomenon. Although public concern for this issue has risen dramatically in the past few years, a very small percentage of the population is actually taking action (EESI, 2007). Reasons for this encompass the feeling that climate change impacts distant people and places, and that individual actions and choices are not relevant enough to make a difference.

Empowering a user in this sense means tackling the lack of personal efficacy—i.e. the belief that one's own actions will not make a difference and one's voice will not be heard. By connecting individual actions with both positive and negative global consequences, as well as supporting people in sharing this perception among their social group, are crucial aspects needed to trigger actions towards a desired change.

— Actions toward Social Innovation

Providing information is not enough to trigger social innovation. An effective change happens when new ways of perceiving the world and acting are shared and established into a social group.

Beyond changing their own behaviour, users must influence others, and social media boosts this process.

Engagement strategies must provide an incentive to self-report achievements and changes in behaviour. To close the loop, users must feel empowered to transform acquired information into action, and to then generate and share more information among the social group.

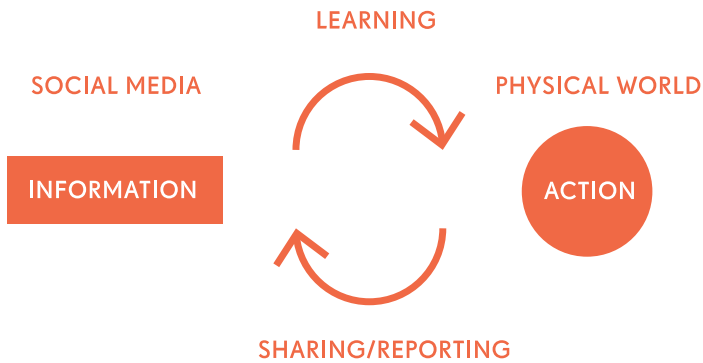


Figure 5

Loop Information <-> Action

5. Strategies



Strategies for Promoting Engagement

In order for the CAPS projects to be able to provide sustainable solutions, it is important that enough members of the communities of interest stay engaged in the collective platforms for a significant period of time. This means that ways must be found to keep people interested so they will want to keep coming back. Unsuccessful experiences, for example, of exploring the potential of social media to reach a goal are not rare: the difference between 'reach' and 'engagement' is substantial when we look at the impact of an initiative (be it a commercial or a political one) using the web as a principal channel. Providing an adequate tool is definitely an important step, but engaging people to actually adopt the tool has been a constant concern even for governments and policy makers.

It is not always necessary to invent the wheel anew. By looking at tools, methods and strategies of engagement that are working, or have worked in the past, a great deal can be learned for the development of an engagement initiative. However, there is no ready-made solution for this.

It will be necessary to offer different strategies of engagement that are attractive for different kinds of people. What motivates people to be engaged differs according to sociocultural aspects, age, research context, etc. Various behavioural studies from psychology and social science have been carried out to understand this dynamic.

For some people a motivational factor may be the sense of community that they experience by working towards a common goal with other like-minded people. For others, being engaged in a cause that is personally important to them will be significant. In the case of the CAPS projects, the goal, however, is to also reach a wider audience including those who may not be so intrinsically motivated at the outset. They may, for instance, find a gaming aspect of the tools provided to be appealing. The impact of gamification, competition, collaborative work, public and even tangible feedback are examples of strategies that have been evaluated to promote engagement and consequently bring about a change in behaviour (Piccolo et al., 2013). The feeling of participating in something that is cool and innovative, for example, can be a powerful motivator, especially for a younger, internet savvy audience. The broad range of computer games and apps that appeal to the users of internet devices are a valuable resource for understanding what motivates a large segment of the population. Social media channels and blogs are also very powerful tools for engaging communities of interest over a longer period of time, and will play an important role in the engagement plans of the CAPS projects.

Barriers in Attempting to Manage Problem Situations

As societal challenges emerge and collective solutions are needed, there are elements of human knowledge construction practices that participate in the achievement of collective construction. In this chapter, we address some of these in relation to human judgement and decision-making.

The starting point is that human judgment is related to inevitable memory recalls (Badii 2000, 2008). This essentially means that human memory is not a continuous recording of all experiences and their effects at the time of their occurrence. In fact, human memory privileges certain aspects of experiences at recall. This means specific salient experiences at particular epochs in the course of serial experiences are better remembered than others, including experiences of pleasure and pain. This means we are particularly susceptible to the influence of duration, sequence and timing, and the relative severity of exposure to adverse or desirable effects when we remember things.

This selective memorability of certain facts can influence human judgment about related issues at a later date. Our lived experience is an artefact of our recallable memory to-date. This in turn influences our interpretation of the salience of certain events and thus their memorability. In this way the cumulative effect of our memory over our lifetime results in an increased subjectivity in our interpretation of phenomena in our environment and of problem situations in particular.

It follows that human judgment and decision-making differ among humans depending on their memory of the effects of a problem situation. When involving stakeholders in a CAPS initiative, this element mixed with others (practical arrangements, power situations, etc.) could make it difficult for stakeholders themselves to articulate their feelings and preferences consistently, or completely and accurately. Such articulation is deeply connected to value judgments and value languages, as the collective lived experience of a community, its cultural history and shared values, are reflected in the metaphors, idiomatic expressions and clichés that characterise the value language the members of the community use in their expressions of problem solutions. Such language can tacitly or explicitly encode feelings of uneasiness that can be related to a problem situation. Each community of interest has its own evolving (sub-)language which at least in part encodes their value system, their personal and community of interest constructs, and their patterns of seeing, believing and relating to the self and to others. One understands and appreciates the values of a community of interest through their expressions and their (sub-)language by which they refer to their needs, and privilege their aspirations. Understanding the value language of the involved parties is thus a prerequisite to establishing shared meaning and finding possible solutions to the problem situation.

Moreover, a facilitator has to focus on the expressions of the involved individuals so as to elicit their interpretation of the problem situation and their needs and wants. However, as

the involved parties will provide a variety of subjective accounts of reality, multiple realities and incongruent meanings can result from the initial stage of the definition of a problem situation. The conflicts and ambiguities in the interpretations of the parties involved is a source of complexity which needs to be framed and tamed in order for sense-making to become possible.

In fact, as everyone sees things in their own way, the prisms of culture and personal constructs shape the involved parties' particular patterns of seeing and modes of belief of what constitutes their own reality. Accordingly, involved parties can make assumptions on cause and effect, the roots of the problem situation, and who or what is responsible for what. Such perceived assumptions are historical facts, and are one of the definitions of terms like ambiguity, and one of the origins of conflicts.

— Solving Ambiguity and Conflicts

Problem situations on a global scale, which the world as a whole is confronted with, such as pollution and global warming, environmental sustainability, energy and food security, antibiotic resistance against new mutations of pathogens, and cyber and physical security protection against terrorism, etc. tend to exhibit the characteristics of what has long been recognised as the wicked or messy type of problem situation (Rittel & Webber, 1973; Ackoff, 1981). This is because such problem situations can be replete with ambiguity and conflicts in so far as they transcend the domain of jurisdiction of sovereign states. It is not always clear what or who may be responsible for what facet of the problem, what the parties' bottom lines are, *what* needs to be done, *how* it needs to be done and by *whom* it needs to be done.

However, not only global scale problems fall outside the control of a single society. In fact, many societal problem situations can exhibit variable degrees of messiness when they are first encountered and the apparent ambiguity is at its highest. The choice of an appropriate methodology for problem analysis and participative engagement can be tricky since this stage exposes the facilitator to the risk of a circularity of bad interpretations. This is why the facilitator needs a methodology to assess the problem situation so as to be able to select the best methodology for tackling it.

The first step toward problem resolution must be a dialogue with the involved parties to identify the narratives of causation and ambiguity. By inviting all the involved parties to speak, the facts of the problem situation can be revealed. This can be aided by analysing the people's expressions to reveal value judgments, (in)consistencies and causal attributions (Kirk, 2002). In this way the extent of agreement amongst the parties will gradually be increased on the way to finding a consensual solution to the problem solution. This will also involve leaving the room to agree, to disagree, and to strike mutually acceptable trade-offs. In the end, some way has to be found to take into account all of the shades of opinion whilst avoiding the kind of paralysis brought about by endless indecision unjustified by the established facts.

There are a number of examples of theories and development methodologies that have tried to face such complexity. For example, Participatory Design (Simonsen & Robertson, 2012) questions the way steps should be taken to address a design problem in specific contexts. The UI-REF (see 'Requirements' chapter), a normative ethno-methodological framework, is consistent with advocacies of most observers (e.g. Wilson) as the way into the domain of attainable solutions. Another notable example of the various approaches that have been advocated for managing problem situations is Total Systems Intervention (TSI). This advocates that the methodology to tackle problem situations should be based on two dimensions: 1) the complexity of the situation, being simple or complex, and, 2) the nature of the relationships between those involved, i.e. unitarian, pluralistic or coercive (Flood and Jackson, 1991). The last example cited here is the Soft Systems Methodology (SSM) (Checkland & Scholes, 1990; Lewis, 1992) which offers cognitive mapping of the problem situation aided by Rich Pictures deployed in Strategic Options Development and Analysis (SODA) (Eden, 1999) or in Strategic Assumption Surfacing and Testing (SAST) (Mason and Mitroff, 1981).

Establishing and Facilitating the Dialogue

Once the target groups and the issues relevant for them have been identified, the next step will be to facilitate a dialogue with the members of the communities of interest on those issues and their possible solutions. Offering appropriate platforms to carry out this dialogue is a key role of the CAPS projects. An important aspect of these platforms will be the creation of space for innovative solutions offered by the communities themselves. People who deal with the issues in their own lives on a regular basis are uniquely suited for coming up with ideas for practical and viable solutions, much more so than most policy makers or researchers who are not personally affected by the issues.

A natural consequence of opening a discussion on pressing issues and problems to a wide audience is that conflicting ideas and opinions are bound to surface. The collective awareness platforms will at times need to be used for mediating these conflicts and for finding a common ground despite the differences. Guiding the discussion towards consensus is a role that can be played both by members of the community of interest as well as mediated by tools or researchers.

At a certain point, when the participants have been given sufficient time and space to present their ideas, to air their differences, and to have their say, it will be necessary to find the right moment to wrap up the discussion so that appropriate strategies for dealing with the issues can be implemented.

It is vital that the dialogue with stakeholders is given the highest priority, as it is this dialogue that sets the CAPS projects apart by creating a collective awareness.

— Dealing with the Sociocultural Diversity

Each community of interest involved in the CAPS projects has different sociocultural contexts. A multitude of factors may differ among them, such as predominant age, gender, religion, nationality and language, physical and mental abilities, standard of living, level of education and whether those being addressed belong to the 'majority' or to a marginalised segment of the population. This diversity must be considered when defining engagement strategies. To fulfill an inclusive and universal approach, another very important factor that the CAPS projects have to take into account is whether the community of interest being addressed is, on average, internet savvy or not. How familiar people are with technologies must be considered in designing engagement strategies and the participatory working dynamics.

Elicitation of Requirements

In moving from the understanding of a social situation to a technical requirements elicitation, it is necessary to have methods, tools and instruments to decode values, motives, languages, and other aspects related to the people involved.

Various methodologies have been proposed for usability requirements engineering, evaluation and impact assessment. As set out in the previous chapters, the UI-REF methodological framework is outlined here as one of the possible strategies for getting requirements, since it has already been implemented in a number of EC-funded projects including the SCICAFE2.0 CAPS project (www.scicafe.2-0.eu).

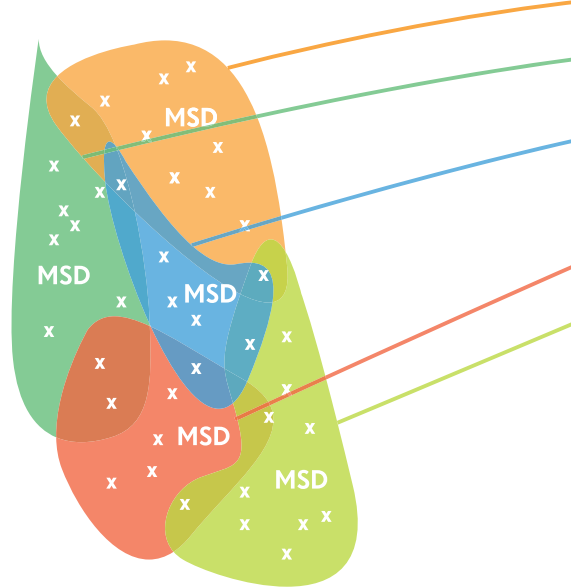
UI-REF stands for User-Intimate Integrative Requirements Elicitation and Usability Evaluation Framework (Badii, 2008). Due to its holistic character, UI-REF can be used as a normative ethno-methodological framework incorporating other methods and instruments, such as empirical ethnographic approaches, cultural probes, laddering, online self-report, action research, nested-video-assisted situation walkthrough, virtual user, and gaming enabled role-play approaches to arrive at a high-resolution requirements elicitation, conflict resolution and prioritisation, and to support the evaluation in terms of usability and efficacy of a proposed solution to a problem situation.

Based on the fundamental assumption that things are most valued and therefore most defended in the context that they are most useful, UI-REF sets out a highly context-sensitive analysis in terms of framing and taming the complexity of the problem situation and also for mapping (sub)contexts. These (sub)contexts consider which specific needs of specific actors are most deeply valued, as well as the (sub)contexts where impacts of the problem are deemed by the actors to affect them adversely, mission-critically and intolerably. This allows a mapping of zones of possible trade-offs from the various partners within a negotiation-centric approach to consensus solution seeking considering a multitude of aspects related to the actors, such as their role responsibilities, goals, patterns of behaviour, etc.

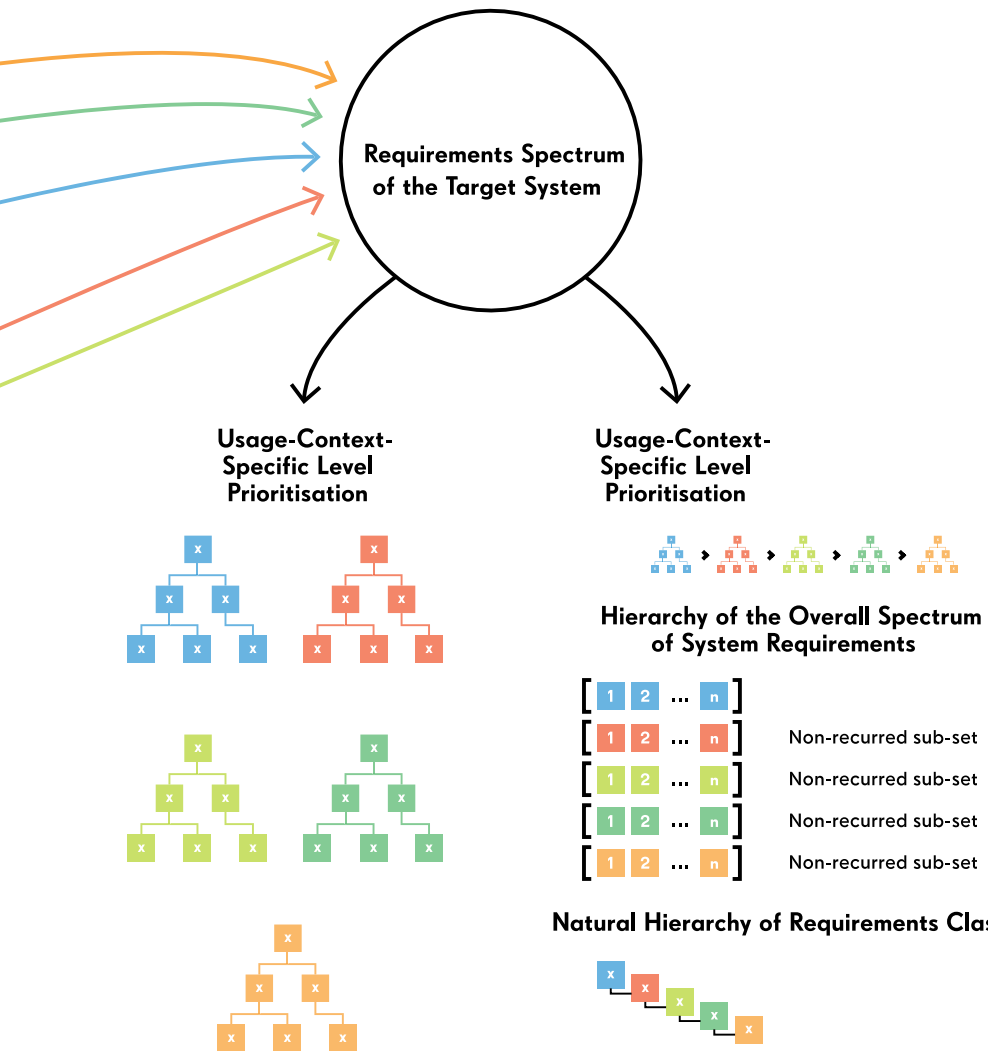
The process starts by acquiring the domain knowledge about the problem situation, and all the actors and entities involved as well as their respective attributes, etc. Then a selection of the above methods can be deployed as appropriate in conjunction with a Collective-Awareness Tool, for example, Citizen's Say in order to support the participative engagement of the stakeholders, as in the SCICAFE2.0 project.

The first goal is to support shared meaning and deeper understanding of the values, motives, needs, pinch/hurt points and trade-off tipping points of each stakeholder group in each relevant context of their exposure to the problem situation.

Figure 6
Context Structuring



The pivotal step in this phase is the study and analysis of names and value-languages of the parties involved. Figure 6 below depicts the context structuring and coupling of the most deeply valued needs to the (sub)contexts relevant for each particular exposure as assisted by defining the key semantic differentiators of the problem contexts (context switches) and the prototypical actors' needs hierarchies in each of the identified prototypical contexts of the problem situation.



Evaluation and Holistic Assessment

How frequently, the length of time, and the way people have used the social platforms are important measurements for evaluation. The user experience related to the collective awareness tools are also important indicators, but they are not enough to express the engagement with a social issue.

Bridging digitally-mediated activity with actions in the wider world of social relations is the main challenge to providing consistent engagement evaluations. Integrating quantitative data with content analysis of self-reports is a possible way to evaluate, but it is also important to find ways to measure activities in the physical world that reflect the impact of technology.

— Evaluation and Assessment of Impacts of Candidate Solutions

Trying to evaluate what a solution delivers to citizens involves a holistic approach, and involves relating the solution to people's life experience. The criteria should therefore be situated in the local context, but what we can do now is to list some criteria that include the safety and ethical safeguards. For example, a CAPS initiative should be aware of :

- Assurance of no harm or hurt, which includes both physical safety considerations as well as ensuring that the individual exposed to the solution does not suffer from any negative emotional consequences that amount to hurt feelings.
- Privacy-dignity-reputation, which includes respecting the conduct of both the system in terms of its performance specification as well as the manner of its operational deployment.
- Gendered design to ensure that the solution is aware of gender differences where these might be relevant to the exposure of individuals to the solution.
- Avoidance of any classifications by the system which may expose its operation to the risk of stereotyping, stigmatising or inequitable treatment of any persons exposed to the solution.

Additionally, the socio-ethical organisational and societal impacts of the solution performance will need to be factored in based on a methodological framework. For example, many psycho-physiological research results relating to Human Judgement and Decision-Making Theory (JDM), notably pleasure and pain recall, and, Learning Theory (for example as reported in Badii 2000, 2008) have investigated human memory biases that underpin a methodological approach to evaluation and impact assessment that remains aware of

memory biases at individual and organisational levels. This is justified for example by observations such as: a user's view on the usability of a device is not frozen in time but is subject to a dynamic change over time.

It follows that there is a need for an evolving evaluation scheme, e.g. the Dynamic Usability Relationship-Based Evaluation (DURE) method (Badii 2000, 2008) which takes account of the dynamic relationship that can develop between the stakeholders and the solution as illustrated in Figure 7 below.

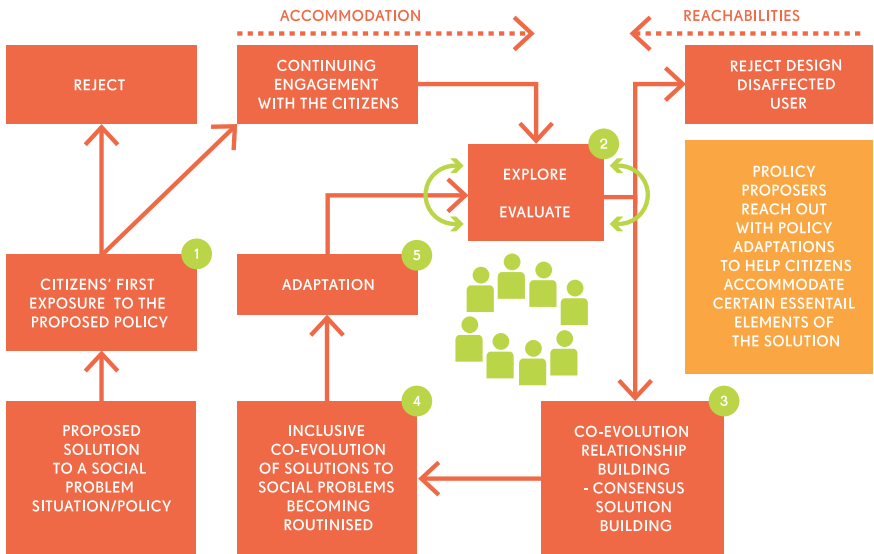


Figure 7
Solution Acceptance, Rejection and (Mis-)Appropriation Cycles by Stakeholders

Among the actual CAPS projects, SCICAFE2.0 deploys the UI-REF framework which provides for a DURE-enhanced evaluation and impact assessment of approaches to participative engagement. In this frame, the usability of a solution is perceived as a cumulative human impression that can be re-called by a user to indicate his/her pattern of relating to a particular solution.

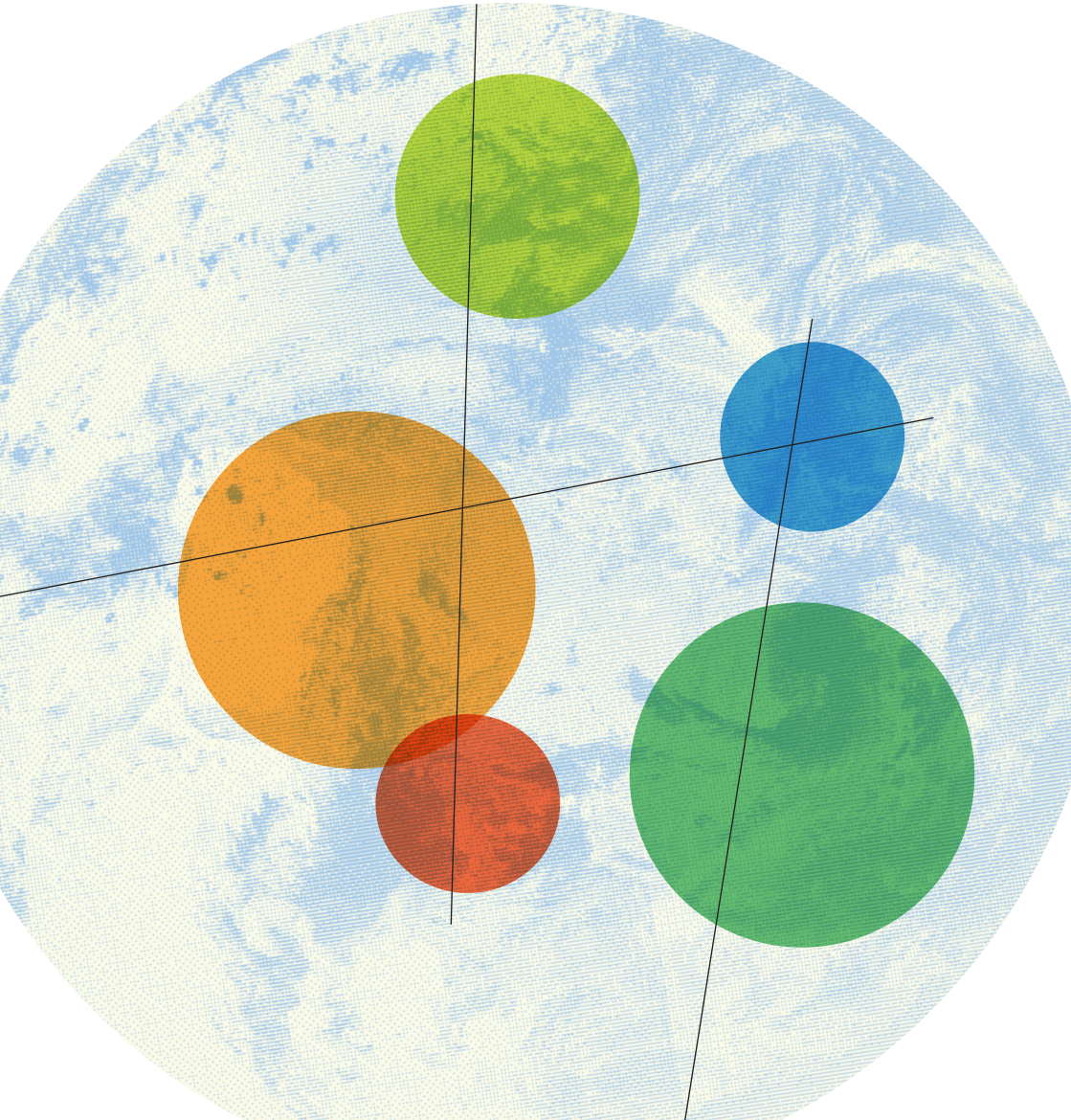
This means that as the patterns or causes of user dissatisfaction can be variable and ever-changing, a static measure of usability and its investigation as such on the basis of fixed criteria will be inadequate in revealing the roots and routes of a user's perceived (dis)satisfaction, thus pointing to the precise causes of usability issues that a user has perceived, remembered and thus been affected by.

For example as per UI-REF-based requirements of co-design and evaluation criteria which need to be applied on a wide scale should incorporate:

- Key Performance Indicators (KPIs): these are the metrics for the assessment of the level of the achievement the priority requirements delivered by the solution.
- Quality of Experience (QoE): measured both during after the use experience.
- Effects: these are the intended impacts to be measured.
- Side Effects: these are the secondary, unintended, effects arising from the primary effects of the solution.
- Cross Effects and Affects: these are collateral secondary effects arising in other domains beyond the domain of the problem situation for which the solution has been devised.
- Holistic Impact Assessment: this will include the assessment of societal and organisational dimensions.

Such a kind of evaluation can be deployed with a combination of as many techniques as possible, e.g. online self-report, card-sorts, laddering, nested-video interviews/cognitive-walk-throughs. The results of the data and evidence collected in such a way can be used to articulate the relationships between the different kinds of effects.

6. Conclusion



Conclusion

The aim of the CAPS projects is to promote positive social change. The most effective way to achieve this is through sustainable changes in citizens' everyday lives, in their communities and at the political level. In order to bring about real change on a political level it is of course essential to influence policy makers on the local, national and international level. How this is approached in the context of the CAPS projects is the subject of the following section.

— Influencing Policy Makers

The introduction of a collective awareness platform within a social group can be understood as a system with three layers: the technical, formal and informal layers. Figure 8 illustrates this model, which is based on organisational semiotics (Liu, 2000), a set of methods and tools for analysing information systems, and Hall's (1959) understanding of a societal culture.

By following this approach, it can be said that the technical layer is the technology to be introduced in the CAPS projects, surrounded by the formal and informal layers. The formal layer refers to policies and everything that is regulated by rules and laws. The informal level represents the cultural aspects that shape how people perceive the world and their country, relate to each other and to technology, and so on.

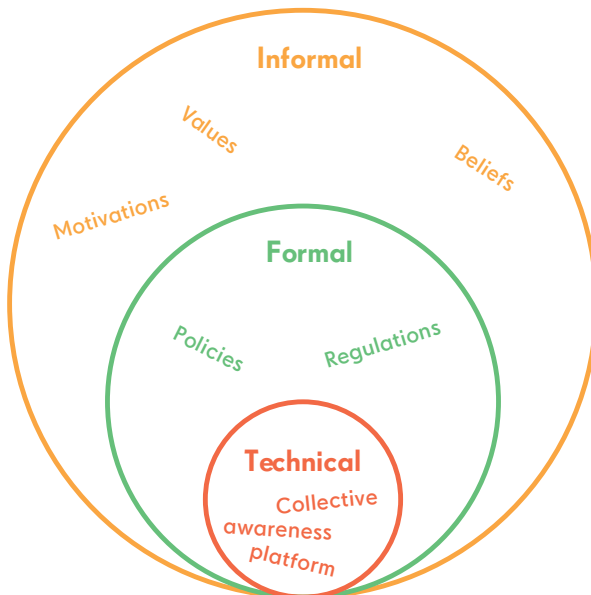


Figure 8
3 Layers

This illustration shows the influence which the different layers have upon each other. On the one hand the design of the technology must take into account existing policies and regulations as well as people's motivations, values, beliefs, etc. On the other hand the use of collective awareness platforms as a technical divide can allow users and stakeholders to exert an influence on the other layers.

The real-time visualisations of digital content provided by DECARBONET (Figure 9) exemplifies how user-generated information in different social media channels can be used by NGOs and policy makers to understand how specific topics, for example climate change, air pollution, and carbon footprint, are being perceived and discussed within society.

The effect of CAPS is twofold: if on one hand they may contribute to shaping and canalising bottom-up instances, on the other, they may support the emergence of awareness and expand the base of people interested in a specific topic. This combined action can have a disruptive influence on policy makers, contributing to the emergence of requests that—having a large base and coming from the citizens in a structure format— can no longer be ignored by the political agenda.

It is the case for Right2Water, a European Citizens' Initiative (ECI) that succeeded in gathering more than the one million signatures (as requested by the Treaty of Lisbon) to call directly on the European Commission to propose a legal act in an area where the Member States have conferred powers onto the EU level. The initiative invites the European Commission to propose legislation implementing the human right to water and sanitation as recognised by the United Nations, and promoting the provision of water and sanitation as essential public services for all. This important achievement was made possible by engaging European citizens in a sign-in campaign centralised on the initiative web.

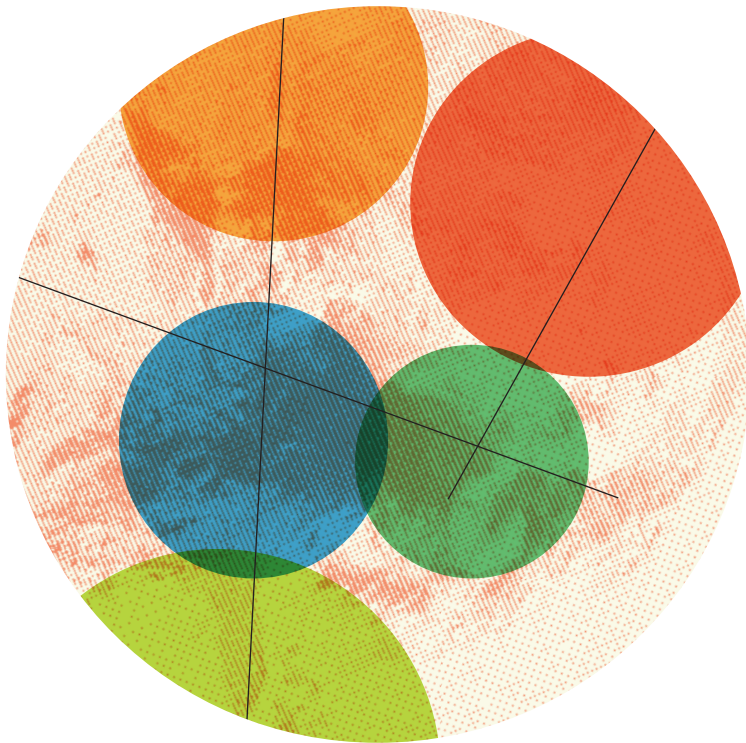
— Outlook for the Future

The CAPS projects introduced in this book are the first projects to be funded under the CAPS programme and at the point of writing are still in their initial phase. This representation of the current situation of CAPS initiatives is only a starting point and indicates the direction of things to come. When the research and development results are available it will be easier to further refine the definition of CAPS, their research agendas and their potential application domains. This will also be further refined as more authors who were not able to contribute to this book sprint will provide their expert views in the future.

This book has the aim of providing the reader with useful information and encouragement to develop their own CAPS initiative. Taking examples and inspiration from projects that are up and running, the reader is called upon to develop a vision for adapting these examples to issues close to their own heart.

Acting in the technical domain with an interdisciplinary approach, which includes in its analysis social, cultural, economic, and political elements, CAPS projects are reflecting a well-known dynamic in the study of peer production, making the failure of 'business as usual' practices visible, and envisioning alternative European societies.

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