Socio technical framework on collective intelligence

Decentralised Citizens ENgagement Technologies

Specific Targeted Research Project Collective Awareness Platforms

d-cent

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1 Introduction

What has fallen apart is the link of the human with the world. From now onwards that link will become an object of faith: it is the impossible that can only take place again in a faith. The belief does not direct itself towards a different world, or a transformed one. The human is in the world as in a pure optical and sonorous situation. The reaction from which the human is dispossessed cannot be replaced but for belief. Only the belief in the world can link the human with what it sees and hears. (Deleuze,1987).

If Deleuze was right, any attempt at transforming the world today would have to start by trying to recover it, by believing in it again, by recovering our confidence in our ability to affect it. This process may depend upon the practice of a new sensitive relation with the world: a growing awareness that it has been stolen from us, and that we can and must retake it.

The movements and revolts unleashed since 2011 in countries so diverse as Iceland, Spain, the United States, Mexico, Turkey or Brazil — movements that, sometimes, garnered very high levels of participation and social support — may be understood as attempts — brief ones, sometimes — of nurturing that belief, that awareness and that retaking. In different ways and with varying results, 15M, Occupy, Yosoy132, OccupyGezi or the "June protests" have tried to stop and revert the work of world expropriation executed, on a daily basis and over millions of people, through different political, economic and media circuits. For a long time now, representative democracy has fostered and ratified the expropriation of the citizenry from the necessary conditions of their participation in the political; the banking and financial systems, as well as big corporations, have done the same with the material conditions of their welfare, self-sufficiency, and even of their survival. Lastly, mass media have undermined the capacity to communicate, organize and see the world beyond the spectacle, while they contributed to the pursuits — not always aligned — of different factual groups, especially States, finance and corporate groups. For most of the movements mentioned above, networked communicative action (Castells 2012) and technopolitics (Toret et al., 2013) have been crucial. They appear as a set of preeminent practices of what may potentially be a multitudinous re-appropriation of the political, economic, and communicative spheres .

The tactic and strategic deployment of (socio)technologies for collective action has been a recurrent gesture of these movements. Experimentation and large scale citizen participation have gone hand in hand with a multitudinous deployment of information and communication technologies (ICTs). A poll in 17 countries of the 5 continents, carried out in 2013 by the communication lab of Lisbon University, coordinated by Gustavo Cardoso , points to the existence of a global tendency on this regard: millions of people across the world (especially in countries where protests and uprisings took place between 2011 and 2013) have developed political practices in and through social networks. At the same time, according to Manuel Castells (2014), between 50% and 80% of the citizens of the world do not feel represented by political parties and governments; they call into question the institutional rules of democracy. In this context, movements such as those mentioned above repose the very meaning of democracy in the contemporary networked societies that they themselves help to (re)constitute.

As we try to show throughout the text, these processes are not beyond problems and contradictions. Just as an example, companies such as Facebook, Twitter or Apple do not use open standards[1], preventing access to their content to those not using their software and, in so doing, promote a process of fragmentation and (multi)centralization of the web with objectionable consequences (Berners-Lee, 2010). Moreover, these companies are establishing terms of service in which corporate interest overrides that of users, and have become the new "mediators" of collective action. And yet, one cannot deny their role in facilitating the proliferation and circulation of images, videos and information that have characterized much of the interconnected revolts from 2011 onwards (Castells, 2012).

In this context, the D-CENT project tries to bring to the table a sociotechnical contract that prioritizes users´ rights, as well as a set of applications that potentiate processes of communicative, economic, and political reappropriation. The project originates from a reflection around some of the limits and challenges faced in recent years by movements (and democracies) across the world[2]. In particular, it begins with a concern for collective autonomy[3], intelligence[4], and action[5].

The framework that we present here offers a set of concepts, hypotheses, methods and questions that may help to articulate the study and comprehension of collective action and intelligence in network movements; movements and practices that may, in turn, shape the near future of democracy. Our exposition is divided in six chapters--the first being this introduction. The second is a brief recapitulation of some of the historic events and problems that have contributed the emergence of these network movements especially, 15M in Spain. In the third chapter, we analyze some of the available academic literature on network movements, in order to gather resources that may allow us to better analyze them. In connection to this, we develop a provisional, theoretical framework, making use of previous studies, concepts and methods. More importantly, we present some of the ones developed by the Data-analysis15M research group[6], a group of which we are part. In the fourth chapter we present some of the results of our study on 15M (Toret et al., 2013) and try to explore the notion of collective intelligence in relation to it. In the fifth chapter, we try to map some limits, dilemmas and challenges faced by technopolitical practices— focusing primarily, although not exclusively, on 15M. On the last chapter we sketch some conclusions derived from the previous framework and analysis, and connect them to the D-CENT project. We try to outline the possibilities that it may offer to ongoing grassroots movements. Ultimately, this conceptual and methodological framework aims to contribute to the D-CENT project — or similar ones — in their task of understanding and anticipating some of the processes that it purports to catalyze, as well as to feed into the development of some of its applications.

[1]Berners-Lee (2010, p. 83): "Not using open standards creates closed worlds. Apple's iTunes system, for example, identifies songs and videos using Uris that are open. But instead of "http:" the addresses begin with "itunes:," which is proprietary. You can access an "itunes:" link only using Apple's proprietary iTunes program. You can't make a link to any information in the iTunes world— a song or information about a band. You can't send that link to someone else to see. You are no longer on the Web. The iTunes world is centralized and walled off".

[2]For its development the project tries to collaborate with--and integrate people involved in--ongoing sociopolitical processes, and to build upon previous experiences and technologies.

[3]Be it autonomy in the area of technological infrastructure, data, etc. or on the plane of economics, which we do not address in this document.

[4]Through the development of applications for deliberation (such as YourPriorities: https://www.yrpri.org/home/world), or network (self)visualization (such as Flocker: http://flocker.outliers.es/).

[5]With the incorporation and development of platforms that enable organization, influence and participation in public institutions (such as Open Ministry: http://openministry.info/).

[6]The website of the groups is http://datanalysis15m.wordpress.com/

2 Contexts and crossroads for network movements today

In this chapter, we briefly outline some relevant features of our current predicament. We touch upon processes, crossroads and scenarios that intertwine (or take place before the distinction between) the social, the political, the economic, and the technological. In order to approach these matters, we recur to a narrative that is sociotechnical (Bijker, Hughes, & Pinch, 1987) in character. We try not to disconnect the struggles around web control, architecture and social data monitorization from an international scenario defined by the proof of blatant espionage between states, and of state surveillance over the citizenry. We try to see the struggles for democratization and citizen empowerment in relation to the tendencies towards oligopolistic fragmentation and centralization of the web 2.0.

Ultimately, the D-CENT project can be situated, on one side, within long term processes such as the rise of the network society (Castells, 1996) and the transformation of modern representative democracies, and on the other, in relation to concrete processes and problematics tied to social movements, network communications and the shapes of the internet.

2.1 Social, economic, and political crises

There is a growing consensus about the multifactorial character of the ongoing crisis (Krugman, 2009; Stiglitz, 2012; Lipietz, 2012; Marchellesi, 2013), which endangers the symbolic, material, and convivial frameworks of the affected societies. It is economic, social and political. Different factors have contributed to it, starting with the power of transnational finance and big business, which dramatically influences social dynamics (Boltanski & Chiapello, 1999; Harvey, 2003; Graeber, 2007), pervading the political and contributing to the ever growing distance between represented and their representatives, especially in Western democracies. This has been one of the key denunciations coming out of movements such as Occupy, 15M, or Yosoy132. It connects to a long term crisis of legitimation of modern institutions, and of modernity more broadly[7] , which in the European context takes a new shape with the recent financial crisis.

The crisis, officially started with the burst of the US subprime mortgage bubble in 2008, reached Europe in 2008 and its effects are still in full sway in various European countries (with a recoil of the EU's GDP and strong austerity measures in Spain, Greece, and Portugal). It expresses a logic of accumulation by dispossession (Harvey, 2009), tied to the power of finance. Existing political institutions are gradually emptied of their material force and their autonomy (starting with the economic). Decisions resulting

[7]Modern-born institutions such as the school, the University, the prison, the asylum, the family, the labor union, the party, the nation-state, or even science and technology, have been under intense scrutiny for the last decades (Illich, 1971; Foucault 1980; Laing 1981; Latour, 1987; 1993; Haraway, 1997; Guattari, 1989). These deep transformations have been thought under the banners of the "postmodernity" (Lyotard, 1979) the "control society" (Deleuze, 1997), "Imperium" (Hardt & Negri, 2000), globalization (Sassen, 1998; Stiglitz, 2003), or the "network society" (Castells, 2001). This has lead to what (Habermas 1975) defined as a legitimation crisis, although not in all of those areas.

from corporate powers, market dynamics and financial institutions (such as the IMF or the European Central Bank) seem to impose themselves over countries and their very constitutions[8]. Breaking with the post-World War II European welfare image, the State seems unable to display any protection of citizen rights against worsening economic and social conditions. Specially, but not only[9] in the Southern European countries[10], drastic austerity measures, rejected by social majorities, are passed in haste. This generates a growing feeling of disconnection between the population and public institutions[11].

The economic situation and the political one feed back into each other. What began as a primarily economic problem quickly became one of politics and governance. The management of the crisis becomes itself the origin or the confirmation of another crisis, that of the welfare state but, more essentially, of democracy. The perception of corruption and of lack of representativity of politicians skyrockets in countries like Spain[12]. Millions of people see their life expectations diminish in the face of rising unemployment, precarity, and cuts in social benefits. Meanwhile, privileges grow at the rate of social inequality[13]. This has been the context of networked movements such as 15M in Spain (and, to a large extent, Occupy in the US).

We do not want to suggest that movements are just a result of economic conditions. In fact, protests have risen in countries such as Brazil and Turkey, in an environment of economic growth. On the other hand, nothing of the magnitude of what happened in Spain, Iceland or Greece, has taken place in countries such as Portugal or Italy, countries with similar economic conditions. That said, in all of these European countries, economic and political problems (especially concerning political representation and legitimacy, usually in connection to corruption) have been at the root of a social unrest manifested on the streets. This social unrest, in countries with high rates of access to the Internet, has in several cases fueled processes of citizen empowerment, articulated into movements and citizen networks, ranging from the generational landmark of 15M in Spain to 'generacao a rasca' or 'que se lixe la troika', in Portugal. Social unrest and internet access are not enough, however. Neither Greece nor Italy have seen anything comparable to 15M (or even the just mentioned Portuguese case) in terms of multitudinous self-organization under the network movement form. Parties such as Syriza in Greece and the 5 Stelleovement14 in Italy (and many other factors that we cannot address here), may have prevented those possibilities. A first conclusion, then, is that nor economic conditions nor general social unrest nor, much less, technological enablers, are enough to ensure the emergence of network movements.

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[8] A paradigmatic case is the introduction of a "debt ceiling" article in the Spanish constitution, the first change ever to be introduced in the 1978 Spanish constitution.

[9] According to Eurostat (Feb 2013) in 2012 124 million people, 24.8% of the population in the 28 European Union member states were at "risk of poverty or social exclusion", a definition that includes relative as well as absolute poverty. In 2008 the number was 17%. http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/3-26022013-AP/EN/3-26022013-AP-EN.PDF),

[10] Europe exhibits a new poverty map. Greece lives "on the verge of humanitarian catastrophe," Spain reaches the number of three million people living with less than 307 euro per month, 18% of the population of Portugal is behind the poverty line, and in countries that were founders of the pan-european project, such as Italy, the number of poor people double between 2007 and 2012.

[11] In Spain, 80% of citizens think that politicians who only work for their interests and not those of citizenship, (Miquel y Campos, 2013)

[12] For a synthesis of the studies showing the worsening of the situation in the last few years, see http://blogs.elpais.com/metroscopia/2013/02/no-nos-representan.html

[13] For the case of Spain, one of the countries for http://www.elmundo.es/economia/2014/01/26/52e3fd00ca474197618b4577.html

[14] For a deep critique of the alleged network-logics of the 5Stelle movement, see Barassi & Treré (2014).

2.2 Network movements: some common characteristics

And yet, they happened. First in Iceland--although its relevance here is due more to the fact that it was the first movement within the current wave than a case of network movement. Soon after the beginning of the financial crisis, in 2008, wide social sectors organized protests every Saturday against their main banks, their National Central Bank and their Parliament. People gathered to denounce their role in the crisis that engulfed the country. Two years later, since the late days of 2010, huge citizen movements started to unfold in different countries, such as Tunisia, Egypt, Spain, and the United States in 2011, Mexico in 2012, or Turkey and Brazil in 2013. These movements have combined the taking of urban spaces in important cities with the organization of networks based on the use of ICTs.

The relevance of ICTs for the organization and expansion of these movements has been shown by different studies (Castells, 2012; Gerbaudo, 2012; Chock, 2013; Cardoso, 2013; Toret et al., 2013). The appropriation of social networks, stream channels, blogs, mailing lists and a broad array of other digital platforms and technologies for political action has generated huge processes of collective, citizen self-organization. Technologies have played a variety of roles in those processes[15]. They have supported many of the communication and interaction structures of these movements. They have afforded and facilitated or discouraged (Verbeek, 2006) and constrained a variety of practices--without ever determining their final shape, obviously. They did not "produce" or even "drive" collective action, though. It has been sociotechnical practices by people or —to put it slightly differently— assemblages (De Landa, 2006) or collectives (Latour, 1993, 1999) of people and technologies what has spurred mobilization and nurtured new public spaces. The primary subjects of these practices are networked collectives, and thereby they presuppose some (variable) technological elements or vectors.

These critical sociotechnical practices (that we analyze in more detail on chapter 4) turned social networks such as Facebook or Twitter into places of social and political criticism and organization. Now, we want to briefly review some of the common patterns or characteristics to be found in movements such as the Egyptian and Tunisian revolutions, Occupy and 15M, (these characteristics seem to be shared by OccupyGezi in Turkey as well as the "June protests" in Brazil, as shown by Malini & Pimentel, 2013). According to recent (if provisional) analyses by Manuel Castells (2014), there are a few traits that stand out. Below, we complement his analysis with some of the conclusions from our own (Toret et al. 2013) and others' work (Gutierrez, Pimentel, and Toret, 2013)--we avoid citations, in those cases. We recur to an alternation of citations and comments to structure the passage.

A first, general judgment by Castells is that "the movements are networked in many forms. The use of the internet and of mobile communication networks is paramount". He adds:

"The connection includes online and offline social networks, as well as networks formed previously and during the movement actions. The networks were connected within the movement and with other movements in the world, in the blogosphere, in the mass media and in society in general".

We believe one of the drivers of these network movements is the multiplication of what we call "technopolitical practices" (defined in chapter 3). These practices become hold by a "critical multitude"

[15]They could thereby be considered "different" in each case (Ihde, 2006)

of self-organized collectives. According to Castells, at the basis of these processes there is communication:

"Communicative action between networks is the base of collective action. This process of communication depends, naturally, on the forms of organization as well as on communication technologies, which change in history. What characterizes the communication forms of our time is their being based on a networked communication that can be operated instantaneously; it can be operated through mechanisms that allow us the interaction and communication of the global to the local; of the personal to the collective, in real time."

According to Castells (2009) a key, historic change that favors (and is favored by) this type of movement has come with the emergence of (socio)technologies and practices of "mass self-communication", characterized by the communication of many to many. People and collectives "living with" digital networks share their uneasiness and opinions on a large scale, and they do so with increasing autonomy from (and variable relations to) the circuits of mass media and political institutions They find ways to express themselves politically in the relational (communicative and interactive) spaces supported by ICTs. "Although these movements are usually rooted in urban spaces through occupations and demonstrations, their sustained existence takes place in the free space of the internet".

As has been suggested (Gerbaudo, 2012), the network spaces generated by these movements assemble urban and digital sites, people and technologies, in complex and shifting relationships (that actually contribute to redefine each of them). The ability of activists in these movements to combine activity on social networks with the taking of urban spaces helps them to both generate amplifying feedback loops, and to push from different sides potential mass media as well as police cordons that treat to isolate them from other publics.

Another feature, pointed out by Castells, is that "they do not need a leadership and a center of formal command and control, but neither do they need a vertical organization that distributes the information and instructions. This decentralized structure maximizes the opportunities of participation in the movement, taking into account that these networks are open, without defined boundaries, and that they reconfigure themselves continuously according to the level of popular participation". He continues: "they usually are leaderless movements, not for a lack of candidates, but for the spontaneous distrust of the majority of participants towards any form of delegation of power". He further adds: "an implicit norm is the self-government of the movement by the people in the movement".

Leadership on social networks is usually held by collective accounts and profiles. As our previous study shows, groups that have been promoters, triggers or referents in a given moment become the main, variable, "nodes of reference" for certain actions, topics, areas, etc. This leadership is temporal and distributed in character. There is not a single and persistent central actor, but rather shifting constellations of them, relieving and supporting each other. These forms have appealed to, and helped to organize, people not belonging to institutional political actors or organizations. Parties and unions have usually been absent from these processes, specially in countries such as Spain. They have tended to have a transversal character, without a clear ideological shape. At the same time, some of them have reached high levels of social support, going beyond minoritarian logics.

"These movements usually start in social networks on the internet, they become a movement when they occupy the urban space". Castells continues: "the movement always develops through the interactions between the space of flows of the internet and the wireless communication networks and

the space of the occupied places and of the symbolic objectives of the protest actions". He concludes on this point saying: "this hybrid space of cyberspace and urban space constitutes the space of autonomy".

Emotions have usually been key in the birth, expansion and later becoming of network movements. A strong emotional or affective stimulus is required to reconnect our feelings with those of others, and to bring about moods that predispose bodies and brains to act. The streamcasting of police violence against protesters has proven once and again to be an effective mobilizer of affections and emotions. Different episodes of this kind have made movements grow in reaction to the aggression, by a mixture of solidarity, empathy and outrage. The joy born out of the experience of togetherness, from the sharing of strong collective experiences, has been another galvanizer, driver or fuel for the movements. The move from individual, isolated frustration, fear or outrage to collective action implies processes of communication, inter-affection and acknowledgement of one another's experiences. As we show later (chapter 4), the combination of technology and affectivity-emotionality is a relevant feature of these movements, not only in moments of explosion, but also in generating processes of collective intelligence.

Network-movements have produced narratives and imaginaries, which have mutated along with collective action itself. They have surfaced over tweets, post, banners, slogans and ideas, from the innumerable intersections between thousands of machines, brains, and bodies. In many cases, they related to online cultures and communities--from Anonymous masks to network and democracy metaphors.

Another key feature has been the emergence of processes of collective thinking in real time (sometimes just in time) as well as new organizational forms. We analyze in detail in chapter 4. The collective organization and mobilization of abilities, knowledge and competences (one of Pierre Levy's definitions of collective intelligence that we discussed in chapters 3 and 4) is behind projects ranging from big, decentralized campaigns, to the taking of urban spaces, or the raise of new citizen initiatives such as the X party[16].

These movements have talked to each other too. As Castells remarks:

"The movements are local and global at the same time. They start in concrete contexts, for their own reasons... But they are connected with the whole world, they learn from the experiences of the others and, in fact, frequently they get inspiration from those experiences in order to mobilize".

Dynamics of resonance (Oikonomakis & Roos, 2013), circulation, or collaboration between movements have been widespread. Shared conditions, causes, technologies, practices, images, ideas, feelings or hopes have been some of the elements that have connected these movements in a variety of ways, which these lines can only begin to hint at.

As a recapitulation, these are some of the traits that characterize these network movements: sociotechnical practices tied to ICTs, and, thereby, a key role of ICTs themselves; mass (or multitudinous, as we suggest in the next chapter) self-communication; feedback loops between action online and offline, between digital and urban spaces; informal and temporally distributed leadership (when it exists); centrality of collective digital identities; affections and emotions as triggers and animators; various forms of collective intelligence; connection of the local and the global, including multiple forms of relation with other movements.

[16]The official website is accessible at http://partidox.org/what-is/

2.3 Prototypes of network democracy

Sometimes in parallel, sometimes in connection to the rise of network-movements, different experiments and prototypes of new forms of democracy have sprouted across the world in the last few years (Orszag, 2009; Ramírez-Alujas, 2011; Guemes, María Cecilia; Ramirez Alujas Alvaro, 2012). Civil society groups have not been the only actors recognizing their relevance or promoting them. Some official institutions, incluing governmentments, have been eager to explore (sometimes out of hype, others out of legitimate hope) the possibilities presented by new sociotechnical arrangements for improving democracy. These experiments have ranged from the early politics of "open government", "open data", and transparency, to most advanced proposals[17], which walk towards different forms of networked democracy.

In recent years, there has been an increasing number of institutional experiments with mechanisms enabling information spreading, prioritization, consultation, and cooperation between government and the citizenry. Some of these experiments try to answer to the exhaustion of the traditional forms representative democracy, mentioned in the previous chapter. Civil society, and sometimes, governments, take advantage of new protocols, ICTs and other technologies in order to potentiate public accountability, to make public administration more transparent, or to speed it up and make it more efficient. Sometimes, these new forms of democracy start by valuing, then trying to mobilize, and finally incorporating knowledge and competence from civil society for the betterment of governance, and of society more broadly. In other cases, participation is seen as a way of promoting sustained consent of the governed for decaying representative institutions.

Two relevant examples of this trend are Your Priorities in Iceland and the Digital Cabinet in Rio Grande do Sul, Brazil.

An interesting example of this that of Your Priorities[18] in Iceland. Its origins are grassroots, rather than government-promoted. After the rise of citizen protests against the management of the bank-generated debt crisis in 2008, a group of programmers developed Your Priorities, a software allowing citizens to prioritize ideas, proposals and topics for governments to implement or consider. For the local elections in Reykjavik, a new formation, The Best Party, took as its own the program coming out of the proposals crafted and selected by the citizenry via Your Priorities. The best party won the elections and incorporated Your Priorities to the institutional system. Prized in the 2011 European e-Democracy Awards 2011, Your Priorities extends today to the rest of Icelandic cities, and beyond. It is a prototype of what has been called "wikigovernment", that is, a government with citizen participation and control.

In the same vein of democratic innovation, the Digital Cabinet was born in Porto Alegre, the capital of Rio Grande do Sul. The city, well-known for being the location where the World Social Forum was born, has been the home of massive participatory budget policies. The Digital Cabinet is a space of digital interaction between government and citizenry. The project incorporates channels for participation, and establishing dialogues between government and the citizenry. The application is

[17] Two examples may be democracia en red from Argentina http://democraciaenred.org/ and the Digital Cabinet in Brazil http://gabinetedigital.rs.gov.br/

[18] The official website is available at https://www.yrpri.org

directly connected to the Governor´s office, which is experimenting with new platforms offering venues for citizens to influence public management, as well as to exert a bigger social control at the state level. As an example, in 2011 the government launched a public consultation on public health. After a sequenced participation process, with more than 1000 proposals and 100000 votes, the 50 most voted proposals are being worked through in collaboration with the public health cabinet.

These two proposals could be defined as forms of "wikigovernment". They are dispositives for citizen participation in the management of common matters. A wikigovernment allows citizens to prioritize the different initiatives presented by local, regional, and state governments and institutions.

These are two important examples of governance where feedback and citizen proposal mechanisms are put to work. Now we want to review three cases of what we may define as "wikilegislation", or citizen legislative power. These are procedures and dispositives allowing laws to be constructed openly and in a collaborative way, between governments and the citizenry. The first example is that of the Civil Framework developed by the Brazilian government. The second is the process for development and ratification of the recent Organic Code of the Social Economy of Knowledge and Innovation (WIKICOESH,) by the Ecuadorian government. The third is Open Ministry, in Finland.

The most advanced experience of wikilegislation to date is the Internet Civil Framework in Brazil. The government presented, through an expert team, a draft to which the citizenry contributes their amendments in several stages until an equilibrated legislation, resulting from all the inputs, is reached. Every text becomes a blog, open for comments. In the case of the Internet Civil framework, the process was opened for 50 days, time in which 1200 direct comments were received, including numerous contributions from institutions. The inputs made on paper (in offices habilitated *ex professo*) were digitalized. The document was almost 600 pages long. In order to ease the visualization, the information was available to the public in open data format and with support tools. This process of participatory and transparent lawmaking has come to be an international referent.

A second example, the Organic Code of the Social Economy of Knowledge and Innovation[19], is the draft--open to a collaborative amendment process via wiki--of a "star law" of the Ecuadorian government in their attempt at building a productive matrix based on an open and free knowledge society in Ecuador. The draft is on the web and is currently undergoing citizen amendment, for incorporating contributions to the forthcoming Ecuadorian law.

A third example is that of Open Ministry in Finland. Open Ministry[20] is a civil society organization that helps citizens and civil society movements formulate demands for policy changes into full-fledged law proposals using crowd-sourcing processes and ICTs. It provides mechanisms for people to propose legislative initiatives or to support initiatives from others. It is necessary to gather 50.000 digital and/or paper signatures for an initiative to be processed and considered in the national Parliament. The proposals are merited the same full process as bills from the government. The model became possible after the Finnish Constitution was amended in March 2012 making the right to put citizens initiatives into Parliament the newest constitutional right of Finnish citizens.

[19]The document is avaliable at http://coesc.educacionsuperior.gob.ec/index.php/C%C3%B3digo_Org%C3%A1nico_de_Econom%C3%ADa_Social_del_Conocimiento_e_Innovaci%C3%B3n

[20]The official english website is available at http://openministry.info/

Apart from making the point that these democratic dispositives are already working, it is important to notice that they have become international referents for how to face the challenges and limits of modern, representation-based democracy. The delegation of common matters to political parties and slow bureaucratic processes has proven unable of coping with the shifts and feedback of ever more complex societies (Beer, 1997; Beck, Giddens, Lash, 1994). The multi-layered incorporation of the competences and desires of large numbers of people and groups in the management of common matters seems to be a more hopeful near future for democracy.

Before closing this section, we want to make some comments on political parties that are already walking (in their internal organization as well as with their proposals and political programs) in that direction. The birth of the Pirate Party in Sweden (and its jump to other countries such as Germany), that of the Icelandic Best Party, the 5 Stelle movement in Italy, the Partido de la Red in Argentina, or the citizen network X party in Spain reveal an ongoing trend of new parties inspired by the logics and forms of functioning common among hacker and internet communities (Himanen, 2001; for a more nuanced approach, Kelty, 2008).

These network parties do not merely offer new forms of internal organization. They also promote conceptions and mechanisms that try to take away power from parties, while they intend to empower the citizenry and to provide it with more control and participation instruments. As the X Party suggests in its website:

"The real power has to reside in the citizenry and to be based in the distribution of control over government through multiple collaboration, monitoring, participation and decision making channels. Society works better if it incorporates the expert knowledge from the citizenry and the innovative power of its civil society. Now that the ICTs allow it, it's the time to include in the forms of governance society's ability to directly improve its institutions and laws".

These transformations, proposals and prototypes are a key reference for D-CENT. They share a logics of citizen empowerment via ICTs and innovative sociotechnical practices.

2.4 Network movements and the internet: a sociotechnical tale

Every project aiming at promoting citizen empowerment, collective action and intelligence via ICTs (there are, certainly, other venues) needs to either steer or stir the construction of the (socio)technologies to come. The processes to do so, though, are, as many in our current predicament, complex, even "exceedingly complex", to use Stafford Beer's (1959, p. 18) expression. Aware of this excess of complexity, in this section (which helps to introduce and frame the following two) we essay an excessively simplistic story, a sociotechnical tale. In it, ifferent actors and narratives conflict (and are reconfigurated) on various fronts, in processes where new forms of democracy are intertwined with the architectures and practices on the multi-layered and variously constructed "internet" (Zittrain, 2008; Morozov, 2013)[21].

[21] "The Internet" itself (if it "exists") results from narratives and practices of heterogeneous actors and processes, as remarked by Morozov, 2013.

First, a note on the "sociotechnical" character of the tale. Processes of technical development has been shown to be multifaceted, heterogeneous, heterotropic, and multiform, nothing like a *technica more geometrico demonstrata*. A long tradition of analysts have recurred to various approaches and notions such as dialectics (Feenberg, 1999), social construction (Bijker et al. 1987), construction (Latour, 1999) or co-production (Jasanoff, 2004), the basic common idea being that technological developments are intertwined with the old "social" within historically crafted fields of action. They are nor neutral nor pure, much less "objective" or "necessary". Technological developments are enmeshed in processes configured by asymmetries of power and forces (Noble, 1984), but also of technological momentum (Hughes, 1983), affordances (Verbeek, 2006), closure and black-boxing (Latour, 1987) and other conditions and framers of action at every moment.

Enough for the sociotecnical; now, the tale. We have seen how people in network movements have appropriated web 2.0 technologies to empower themselves and articulate collective action . And yet, the internet is not an univocal force of good, nor anything univocal, for that matter (Morozov, 2013). Its multiple layers, the interactions between them, and their concrete configurations can be seen[22] as shifting fields of relations (usually, of struggle) between different collectives, each of them trying to appropriate and contribute to the whole or parts of its becoming, at different times and with varying strength.

For the purposes of this brief story (which somehow helps to introduce the following two sections) about network movements and the becoming of the internet (more concretely, of the web 2.0), we will distinguish three logics, usually —although not always nor perfectly— embodied in three sets of groups : corporate, governmental, and citizen/activist[23]. When seen as three categories to classify groups or collectives, these are, clearly, internally multiple: different corporations have different and sometimes conflicting interests and priorities, and the same is applicable to parties and groups on the governmental set, and to collectives and individuals on the citizen/activist side. Sometimes, they play along different roles and logics, although some tend to predominate. As for the logics, they can exhibit different modes too (for example, the governmental logics can perform in securitarian, welfarist, state-peer, and still other modes). In the end, the interplays between different logics and group types, and whithin those, between different modes and concrete collectives (or actors), are basic for seeing more clearly the dynamics we want to explore.

From the viewpoint of network movements, a key (if not "the" key) internet layer is that of applications[24], where the "web 2.0." is being conflictually constructed (even as a concept[25]). As a first

[22]As pointed out by one of the main promoters of the image of "internet layers", Zittrain (2008, p. 67): "The exact number of layers varies depending on who is drawing the hourglass [n.b.: the shape of his model of the multilayered internet] and why [...]. On one basic view the network can be understood as having three layers. At the bottom is the "physical layer," the actual wires or airwaves over which data will flow. At the top is the "application layer," representing the tasks people might want to perform on the network. (Sometimes, above that, we might think of the "content layer," containing actual information exchanged among the network's users, and above that the "social layer," where new behaviors and interactions among people are enabled by the technologies underneath.) In the middle is the "protocol layer," which establishes consistent ways for data to flow so that the sender, the receiver, and anyone necessary in the middle can know the basics of who the data is from and where the data is going".

[23]These could be considered "ideal types" in Weber's (1904/1949, p. 90) sense. Although we believe a much thorough analysis would be necessary, and that some of these categories are increasingly obsolescent, we will use them for the purposes of storytelling.

[24]The story of how ARPANET, a publicly funded military network became, via combination with the NSFNET (a publicly funded civilian platform) and new sociotechnical practices, into the internet as the progressively privatized, civil but especially corporate network we today live with, could be read as an example of that.

taking on the matter, we can we want to start with its predecessor, the now called web 1.0. Its inventor explains how, in December 1990, what would become the World Wide Web

"[...] consisted of one Web site and one browser, which happened to be on the same computer. The simple setup demonstrated a profound concept: that any person could share information with anyone else, anywhere. In this spirit, the Web spread quickly from the grassroots up". (Berners-Lee, 2010)

Dismissing the slight *post hoc ergo propter hoc* tones, this passage will prove relevant, specially, in the next section. The World Wide Web was invented by Tim Berners-Lee as a universalizing information space (Berners-Lee, 2001). He did so as he worked for a public institution (CERN) and made his contribution open and non-proprietary. As we will see, this had far reaching implications.

On top and on the side of the Web, playing partly on the same layer[26] and partly on a layer above it, the so called "web 2.0" grows. It encompasses platforms such as Facebook, Youtube and Twitter. It has been constructed around companies and a business model that encourages content production and sharing... at the price of letting ownership over one's production and data (when not paying for service) to the web 2.0 companies. At the same time, these platforms have played key roles (with lights and shadows) in the construction of the most recent network movements. Movements have tried to put those platforms to work for their own, emerging, purposes.

This has been a case of action of activists making innovative use of applications, as they had done earlier, with the later called web 1.0, at the very edge of the web 2.0, during the height of the anti-corporate globalization movement. An interesting story to be told in detail has to do with how some mainstream applications and sites of the web 2.0, conspicuously Twitter, Flickr and Youtube, were created by people, and on the basis of software, coming from the alter-globalization and, particularly, the Indymedia experience (Halleck, 2003, for a brief introduction to Indymedia). These are the very platforms that, now corporatized (and thereby following a logics different from the ideal cit

izen/activist lOgics), are enabling different possibilities and dangers for the network movements.

Between the end of the 90s and the early 2000s, the activist platform Indymedia.org anticipated many of the characteristics that would be latter associated with the web 2.0. Indymedia was built as an architecture of open participation, with citizen input and management, producing information alternative to those of mainstream media.

The web, invented by a man working in a public ("superstate", EU) institution, who made it freely and publicly available, was brought to a new height of performance by activist programmers, journalists, and participants from any background, with little profit purpose and even less resources. They struggled to construct, as Berners-Lee did earlier, infrastructures "as" and "for" the common good (and, especially for the good of their causes).

[25]"The internet" is a variable and multiply interpreted fields of relations (conflictual ones, in many cases), as suggested by Morozov (2013). Berners-Lee (2006) considers the formula"web 2.0" "jargon" and suggest the WWW was collaborative —allegedly, the biggest novelty of the web 2.0— all along.

[26]And partially conflicting in both, the technological as well as ideological plane

Small, technology-based spin offs came out of those early technopolitical[27] processes. In their development they progressively entered the corporate logics and world. They took with them the concept of content production and sharing, they increased the user-friendliness and comfortability and mixed it with the proprietary-profit logics that has lead to what Berners-Lee decries as "Walled-Gardens". In these gardens, information blooms (with more or less order depending on factors such as the skills of gardeners, the rules of the garden, or the seeds and water available), and yet the ultimate ruler and proprietor of the data produced by the users are the companies offering their services.

The areas of technopolitical autonomy carved out by the alter-globalization movement had served as a springboard for developments in the application layer of the internet, which were to come relevant (although not in any deterministic sense and with too much "hype" around it, as shown by Morozov, 2010) for the next wave of protests, some years later. The implications of this will be analyzed in more detail in the next chapter, and throughout this document.

More recently, Edward Snowden's revelations have brought more forcefully than ever another actor (and logics) in this just-so story: the State. The story here can be synthesized as follows: web 2.0 companies have been partly willful cooperators and partly unaware enablers of the biggest surveillance system to date, ran by the National Security Agency (NSA). The securitarian mode of governmental logics (public funding for public good, a "welfarist" mode, may be another, among several possible ones) had pushed the world, thanks to the possibilities afforded by ICTs (configured under a particular mode of corporate logics) to the most recent version of George Orwell's Big Brother or Jeremy Bentham's Panopticon.

From the web dreamed and built by Berners-Lee and the alter-globalization movement, through the mediation of the web 2.0, up to the post-Wikileaks, post-Snowden scenario. In all of these steps, we want to emphasize the role and position of the logics and practices of citizen/activist collectives. We can partially read this in terms of Alain Touraine's theses around historic dynamics and social movements. Touraine (1978, p. 63) situated social movements at the very core of social life, which would be defined by the collective action of class actors trying to direct historicity, that is, the processes and institutions of society´s self-production. Much of this struggle[28] has been "multilayered" (we will come back to this notion, with a slightly different meaning and purpose in mind, later in the text), involving not only different layers of the internet, but also (new) public spheres, governments, companies and movements.

Some of the biggest socio-cultural transformations of the last fifteen years have come from platforms developed by previous activists, or on the basis of activist platforms; what we have dubbed the "post-Snowden scenario" results from the revelations of an activist, and involves all the mentioned layers. Definitely, not only the history of the internet and social movements are at stake but rather, in relation to them, dynamics in broader society. This is the general tale scenario where D-CENT (an EU funded, activist-led and inspired, software and sociotechnically-oriented project) wants to carve its own personage.

[27] For a definition of technopolitics, see chapter 3.

[28] We prefer to see these processes through the eyes of activists and the Science and Technology scholars mentioned above than through Touraine's, even if we have quoted him for his insistence in the centrality of movements to the assembling of society.

2.5 The architectures of the internet in dispute: the tendency towards fragmentation and centralization

According to different analysts — markedly, Tim Berners-Lee (1999, 2010) — we are witnessing a dangerous and twofold tendency, towards fragmentation and centralization, of the Web, specially because of the "choices" that companies such as Facebook, Twitter or Apple are making:

"You enter your data into one of these services, you cannot easily use them on another site. Each site is a silo, walled off from the others. Yes, your site's pages are on the Web, but your data are not. You can access a Web page about a list of people you have created in one site, but you cannot send that list, or items from it, to another site. The isolation occurs because each piece of information does not have a URI. Connections among data exist only within a site. So the more you enter, the more you become locked in. Your social-networking site becomes a central platform — a closed silo of content, and one that does not give you full control over your information in it. The more this kind of architecture gains widespread use, the more the Web becomes fragmented, and the less we enjoy a single, universal information space"[29].

The relevance of this question can be understood from different viewpoints. From the viewpoint of the future of the web and its implications for society in broad terms, or closer to our object, with regard to network movements. As mentioned above, the web, social networks (corporate and alternative) and the internet[30] are relational fields of struggle, as well as practice and narrative for movements (Castells 1996, 2012; Juris 2008; Alcazan et al. 2012; Toret et al 2013, Candón Mena 2013). Once their relevance is acknowledged, the key issue becomes that of diagnosing their current state, to understand its origins, ongoing tendencies, as well as their implications.

In 1990, Tim Berners Lee wrote a protocol that would become the kernel of the architecture of the World Wide Web. With it he tried to solve the problems of interoperability between computers within his institution, the European CERN, and between these and computers elsewhere. In retrospect, Berners-Lee (2010, p. 82) points out how the "the primary design principle underlying the Web's usefulness and growth is universality. When you make a link, you can link to anything." At the core of it there was the URI, or Universal Resource Identifier (what later became the URL or Uniform Resource Locator), that "allows you to follow any link, regardless of the content it leads to or who publishes that content. Links turn the Web's content into something of greater value: an interconnected information space." Universality, along with decentralization (you don't need an authorization from anyone to make a link), and openness[31] are the three design principles defining the cyberspace of the web.

As we mentioned above, after 20 years of development, the web has evolved into the "web 2.0", a term coined by Dardy Dinuci (1999), in a paper where she already anticipated the fragmentation of the web while stressing that, differently from the static character of its 1.0 version, it "will be understood not as

[29] Berners-Lee (2010, p. 82).

[30] Specially, if it doesn't exist as a unitary object but is rather constructed (Morozov, 2013).

[31] Berners-Lee (2010, p. 83) clarifies that "By "open standards" I mean standards that can have any committed expert involved in the design, that have been widely reviewed as acceptable, that are available for free on the Web, and that are royalty-free (no need to pay) for developers and users."

screenfuls of text and graphics but as a transport mechanism, the ether through which interactivity happens[32]".

At stake, as we have seen, there are things other than interactivity in the abstract. In 2013, 2400 million people had access to the internet. They generated most of the information available online. It is this production of the multitude (Hardt & Negri, 2004) that business 2.0 tries to tap into. As suggested by Berners-Lee (2006)[33], the web was collaborative all along, it aimed at decentralization and participation. Thereby the novelty may not be so much in the technology or only in the behavior of the users, but rather behind a new business model that comes to substitute that of the web 1.0.

In his definition of web 2.0., O'Reilly (2005) underlined the fact that "Network effects from user contributions are the key to market dominance in the Web 2.0 era". His sentence "data is new the intel inside" encodes the understanding that what makes the difference for business in the web 2.0 is to harness (and stimulate) the participation and communication desire of users. For this it is paramount to offer them the right incentives while imposing the right conditions for people not only to post their content (and leave their data) but also to give up to their rights over them in benefit of the web 2.0 companies. Later these businesses can reap the benefits of managing and selling those contents and data, as well as of providing and regulating uses and users.

Facebook claims to have surpassed, in only 10 years, the number of 1200 million active users. Only in 2013, Facebook produced 7872 millions of dollars in revenues, 1500 of those were pure profit. That is the result of their ongoing success in getting the most people in their "walled garden[34]", and of preventing (or making difficult for) them to control their stuff, starting with the possibility of easily taking it elsewhere.

2.5.1 Interoperability and portability vs fragmentation and centralization

As we pointed out above, the original web design principles aimed at promoting interoperability, which enables portability (data transference between sites and platforms). In the commercial web 2.0, there are few universal protocols, and that fact hinders both interoperability and portability. Each company builds its own environment or application programming interface (API). This delineates loosely connected ghettos, with the consequent problems for the management of one's own online data. This criticism also applies to some alternative social networks, but technical limitations and security concerns tend to be the drivers there. In the case of platforms such as Facebook, the purpose is clearly commercial and goes hand in hand with the application of policies of data ownership and management that may be deemed "abusive". An oligopolistic data market is generated over the "social web", which in the case of Google and, to a lesser extent, Facebook and Yahoo!, manages huge amounts of information.

[32]The term was later popularized by Tim O'Reilly in talks (http://oreilly.com/web2/archive/what-is-web-20.html) and articles "7 Key features of web 2.0"). A synthetic list of characteristics of the web 2.0 can be found (at www.webApprater.com. 2012-09-17. Retrieved 2014-03-17) and includes: 1-Folksonomy- free classification of information; 2-allows users to collectively classify and find information (e.g. Tagging); 3-Rich User Experience- dynamic content; responsive to user input; 4-User as a Contributor- information flows two ways between site owner and site user by means of evaluation, review, and commenting; 5-Long tail- services offered on demand basis; 6-profit is realized through monthly service subscriptions more than one-time purchases of goods over the network; 7-User Participation- site users add content for others to see (e.g. Crowdsourcing); 8-Basic Trust- contributions are available for the world to use, reuse, or repurpose; 9-Dispersion- content delivery uses multiple channels (e.g. file sharing, permalinks); 10-digital resources and services are sought more than physical goods; 11-Mass Participation.

[33]Berners-Lee (2006) considers the term web 2.0 "jargon" and suggest the www was collaborative all along.

[34]Tim Berners-Lee (2010, p. 82).

We do not suggests all is wrong with corporate social networks. They have proven valuable for different processes for network movements. They have been particularly relevant in the dynamics of viral diffusion and sharing of information. We analyze those dynamics in depth in chapter 4. Now we could remember Michel Bauwens's point about our relation with corporate social networks:

"We value the tools that enable us to share and we understand that managing those platforms has a cost and expectation of profitability. Therefore, we agree to profit-making with our attention via advertisement if it does not block the process of sharing". He adds, "if interferences cross a given, acceptable limit, we will rebel or move elsewhere". As we have seen, though, moving elsewhere may not be so easy, especially if users want to bring everything with them. And surely, people may be the most difficult element to mobilize from one network to another.

2.6 The post-Snowden scenario: massive vigilance and data control policies

If the view of the web 2.0 sketched in the previous section focused on groups situated in two of the logics and collective camps of our general narrative, namely, corporations and citizenry, this second scenario involves a third actor: the State, and a very particular mode of governmental logics.

In June 2013, an American programmer named Edward Snowden[35], earlier employee of the Central Agency of Intelligence (CIA) and the National Security Agency (NSA), made public (via The Guardian[36] and The Washington Post) a series of top secret, classified documents concerning several NSA[37] programs, including the massive vigilance programs PRISM and XKeyscore. The documents confirmed the suspicion that Wikileaks had instilled in the minds of many around the world, namely, that the American government monitors the activity of internet users at a mass scale, as well as that of other governments.

Snowden's motives help to outline this scenario: "Conscientiously, I cannot let the US government to destroy privacy, freedom on the internet and people's basic freedoms all over the world with this gigantic vigilance machine that they are secretly building". And the continues: "I don´t want to live in a society that does this type of things... I don´t want to live in a world where everything I do and say is registered. This is something I am not willing to support or admit".

The consequences of Snowden's revelations have been many, and of international depth. They have been so, not only because of their implications for diplomacy (direct and indirect[38]), but for the surveillance-and-control image of our society that it has projected publicly (thereby, to audiences broader than ever), as well as for the debates and initiatives rising to respond and transform it.

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[35] Timeline of Edward Snowden's revelations. Aljazeera, available at http://america.aljazeera.com/articles/multimedia/timeline-edward-snowden-revelations.html

[36] "NSA Files Decoded. What the revelations mean to you," available at http://www.theguardian.com/world/interactive/2013/nov/01/snowden-nsa-files-surveillance-revelations-decoded#section/1

[37] Interactive Graphics: The NSA's Spy Catalog, available at http://www.spiegel.de/international/world/a-941262.html

[38] The United States begun a criminal investigation over Snowden actions, as it did earlier with Julian Assange and Wikileaks collaborators. As an example of indirect effect, on July 3rd 2013 France, Portugal, Italy, and Spain denied landing to the airplane of the president of Bolivia, Hugo Morales under suspicion that Snowden was on board. This generated a subsequent diplomatic conflict between those European countries and several Latin-American ones.

Some of the first responses have come from other states. The president of Brazil, Dilma Rousseff[39], made public her uneasiness in a declaration at the UN Headquarters, pointing out that this was "a case of serious violation of human rights: the capture of information concerning business secrets, the espionage of citizens and the disrespect towards Brazil's and other countries' sovereignty". This made explicit the lack of security (and thereby privacy) of communications, as well as the growing inter-state distrust. She went further: "technologies of communication cannot be a battlefield for states. It is a moment to create the conditions to avoid the instrumentalization of cyberspace as a war weapon through espionage and sabotage, and the attacks against systems and infrastructures in other countries". She announced that "Brazil will double its efforts to provide itself with legislation, technology and mechanisms that will protect us from the illegal interception of communications and data". If competition between web 2.0 companies have brought about the rise of walls around platforms on the "application" layer, conflict between states may generate similar dynamics on other layers of the Internet. That is already the case of China, Venezuela40or Iran[41].

This politics of mass vigilance has been defined by Assange as a "militarization of cybernetic life[42]", and is turning the web not into the space of freedom dreamed by people such as Berners-Lee, but into a menace to it. The scenario opened by Snowden's revelations present a state (and, somehow, states in general) deploying systems of massive vigilance able to trace almost everything on the Internet, from search patterns on google to individual mails between activists. Since much of the activity on the internet takes place on US companies' platforms (Microsoft, Google, Facebook, Yahoo!), almost anything online is susceptible of being traced, surveilled, and stored.

These tendencies do not begin with Snowden's revelations, nor even with the NSA programs, but are somehow prefigured in the current construction of the web 2.0. As we mentioned above, the politics of data (as well as the rise of proprietary, closed software) in the web 2.0 are already a big step in this direction. The menaces to privacy (and indirectly, to connected rights such as freedom of speech), come not only from NSA policing but also from juridical initiatives such as CISPA[43], supported among others by Facebook and Google. For this reason, on top of strategies such as promoting a greater technological sovereignty (or, better, autonomy[44]) or tactics such as use friendly cryptography (increasingly common within movements), it is crucial to juridically fight initiatives affecting the layers and structures of the internet that enable and guarantee users' rights and possibilities (net neutrality would be a case in point, where big web 2.0 and activists appear sometimes aligned).

In this sense, Snowden' revelations feed into counter-vigilance dispositives and networks fighting against what seems to be the deployment of a global panopticon. As we mentioned above concerning the origins of the web 2.0, the internet and its multiple layers, the sociotechnical practices and cultures

[39]Dilma Rousseff's intervention at the UN meeting is available at http://www.youtube.com/watch?v=nz0V2qsPrt0

[40] Venezuela is, probably, the only state where the notion of "technological sovereignty" has entered official discourse. With a very different, non-statist sense, this notion is gaining traction among grassroots collectives in Europe, specially, in Spain. A first big compilation on the notion is forthcoming (Haché, 2014).

41A call for a more nuanced view of the fragmentation , by Maurer and Morgus, is available at http://www.slate.com/blogs/future_tense/2014/02/19/stop_calling_decentralization_of_the_internet_balkanization.html

[42]Criptopunks. Freedom and the Future of the Internet.

[43]*Cyber Intelligence Sharing and Protection Act* o *HR-3523*, better known as CISPA[1] is a bill being promoted in the US, which allows the exchange of information about Internet traffic between the US government and certain US companies.

[44]Otherwise, from and for the grassroots rather than top-down, from and between states.

growing (around) it, reshaping and reshaped by it, can be understood as (shifting, interrelated and mutually influencing) fields of conflict. State intelligence tries to control processes of collective action and intelligence ongoing within network movements, corporate intelligence aims at profiting (even innovate) from it. Activists try to make the most of those online social networks, among other things, to denounce and confront that state surveillance, while they try to build the autonomy of those new forms of intelligence around alternative infrastructures, and collectively ponder the implications of using commercial ones.

After this brief walk through the landscape crossed by network movements, and before getting into a more detailed analysis of the 15M case, we want to outline now a theoretical and methodological framework based on our previous work (Toret et al., 2013) that we believe helps in order to understand them. It also connects with some of the issues raised so far.

3 Theoretical and methodological framework

In this section we present a basic theoretical and methodological framework to understand some of the processes shaping network movements, specially some of the forms of collective action and intelligence that they embody. The aim of this framework is not only to forward the comprehension of these phenomena (as we try to do in the next section by analyzing the case of 15M) but also to feed —narratively, analytically and operationally— into the development of both the D-CENT project and software. The exposition below is divided in three parts. The first is a synthetic review of recent literature on social movements (with an emphasis on networked social movements), network and complexity science applied to this type of phenomena, and of literature on collective intelligence, which are the three main references for our approach. The second part of the exposition is a more specific presentation of the main concepts that help to articulate our viewpoint. The third, and final, part is devoted to outline some of the methodologies —many of them experimental in character— that connect to the concepts proposed in the second part, and are applied in the next chapter, where we deploy them to analyze the case of 15M.

3.1 Literature review

In the early years of the XXIst century[45], information and communication technologies (ICTs) have played relevant roles in numerous cases of multitudinous collective action. From the anti-corporate globalization movement (Juris, 2008) around the years 1999-2005, through the "popular power II" in Manila, that topped the Estrada regime in 2011, "the night of the messages" in March 2004 in Spain (Rheingold, 2004; Suárez, 2006), or the 2008 Obama presidential campaign (Castells, 2009), up to the most recent wave of protests encompassing the Tunisian and Egyptian revolutions (Amin 2012, Dabashi 2012, Majdoubi 2012, Bayat 2013), 15M (Castells, 2012; Toret et al., 2013; Candón Mena, 2013, Alcazan et al., 2012) Occupy (Juris, 2012) or the June 2013 protests in Brazil (Pimentel 2013, Malini 2013 Ricci, Arley 2013, Bastos, Recuero y Zago 2014), numerous studies have mapped and analyzed ICT-mediated collective action and movements from different perspectives. The relevance of ICTs seems to be transversal to different types of collective action, from social movements to insurgent politics (Castells, 2009). As we saw above, Castells (2012) describes what he calls "networked social movements" as a new type of social movement, characterized by a taking of the urban space enabled by the deployment of ICTs. According to him, this helps to potentiate and extend feelings such as outrage, breaking the fear and solitude that paralyzes individuals.

Different studies have analyzed, with more or less detail and rigor depending on the case, the new practices and interactions on the digital sphere (Benkler, 2006; Shirky, 2008), as well as in the new social movements in the internet age (Bouechler, 1999; Juris 2005, 2008; Lago & Marotais 2006, Sampedro 2010, Candon 2011). Rheingold (2002) coined the formula and described cases of "smart mobs", collective action coordinated in real time via ICTs. More recently, studies have shown that ICTs provide key advantages for activism, since it reduces the costs of convoking, organizing, and participating in

[45]We build here upon the bibliography gathered by Monterde (2012).

protests, while, potentially, it may diminish the relevance of co-presence for collective action (Earl & Kimport, 2011) —although this point varies widely across movements (for instance, Juris 2012 has shown debates on this regard, in the context of Occupy Boston).

For the last two years, different studies on the Egypt and Tunisian revolutions, 15M and Occupy have analyzed the role of social media in these movements (Cottle, 2011; Gerbaudo, 2012). On this regard, it is worth noticing the formation of collective identities in the process of sharing content and opinions through networks (Bennet and Segerberg, 2012). An interesting aspect of this analytical is the sheer quantity of studies that have tied these movements to network analysis and the network form, something taken by many in the movements themselves as a form of self-definition. In the specific case of 15M, we can find studies such as those of Borge-Holthoefer et al. (2011) and Morer (2012), connecting self-organization and complexity for analyzing interactions, community formation, and information diffusion in 15M networks. In turn, Manuela Lucas (figure 21) has mapped the most influential 15M accounts on Twitter, their interrelation. In the case of Occupy, we find similar studies, such as the studies by Gilad Lotan (2011; 2012) on Twitter uses.

The approaches have been varied. Some studies (Lindgren, 2011) have focused their attention on the linguistics and social dimension of messages, combining semantic, network and discourse analysis. More classical, social science methodologies have been hybridized with complex system analysis (based, primarily on the analysis of chemical and biological systems) in order to study digital networks, their structure and dynamics (Boccaletti, 2006; Borge-Holthoefer et al. a*, 2011, b* 2013, c* 2013; Morer, 2012), in an attempt to try to fathom the complexity of these movements. A key concept on this regard has been that of "emerging systems" (Stevenson, 2002; Haken, 1984; Kohonen, 1988; Bonabeau, Theraulaz, Deneubourg, Aron, & Camazine, 1997; Reynolds, 1987). Referring to models extracted from the natural sciences is a way to try to account for relevant aspects of collective behaviors and self-organized social processes. These approaches, connected with the tradition of analysis of complex systems (Luhmann, 1986, 1995), provide theoretical frameworks that prove useful in order to study processes of networked self-organization. They facilitate a general comprehension as well as a detailed analysis of the processes by which networked communication coordinates at different scales and through different channels to help to assemble coherent units of action, resulting in (and from) coordinated collective behaviors. They also allow distinctions to be drawn between various types of ICT-mediated forms of collective action. As our study (Toret et al., 2013) has shown, ICT networks have not only helped to construct collective action but, moreover, to weave the very meaning of action itself. This has gone hand in hand with the rise of new narratives and frameworks.

In this sense, one of the concepts and phenomena worth underlining is that of collective intelligence. Used by 15M activists (15M.cc[46]), in the current study we try to develop this notion in relation to qualitative approximations, very usual in the social movements' literature, as well as in connection with the more quantitative ones provided by systems theory, complexity and network science. Pierre Levy (1995, 1999) was one of the first authors in developing this notion in a systematic way, linking it to the literature in philosophy as well in the social and human sciences and to democratic processes to be

[46]The definition of the project in its website (http://www.15M.cc/p/english.html): "15M.cc is being developed collaboratively and forms an umbrella for projects relating to 15M, the movement which ignited the Spanish people's indignation on 15 May 2011. This project has three aims: first, to document and host all kinds of narratives concerning this movement; second, to provide tools so that users can create the story of their own 15M experiences; and third, to transmit the collective experience of this historic moment for Spain."

brought about in cyberspace. Later, the term has been used by authors in the field of computer science and of system design, be they sociotechnical (Heylighen, 1995, 1999), technological (i.e. routing internet traffic, Wolpert, Tumer & Frank, 1999; Wolpert, 2003; Segaran, 2007) or of other types (as an overview of the field, Wolpert & Tumer, 2008). Some aspects of this notion connect with a discussion (usually framed in terms of individual subjects) around "human intellect augmentation", which can be traced from the recent declarations of Google CEO, Eric Schmitt (Arrington, 2009) or works such as those of Clark (1999, 2010) and Smart (2012) back to those of Englebart (1962, 1990) and Licklider (1960) in the last century (Waldrop, 2001). Recently, Englebart (1995, 1999, 2004) has proposed the notion of collective IQ in order to measure social intelligence, and argued for the need to increase it.

The literature on collective intelligence is sometimes associated with the one built around similar notions, such as that of the wisdom of crowds (Surowiecki, 2005; Williams Woolley et al., 2010; Wellinder et al., 2010; Arazi, Morgan & Patterson, 2006; Moore & Clayton, 2008), with its own critical literature (Solomon, 2006; Lorenz et al 2011; Coleman & Blumler, 2011). Another neighboring tradition, also converging with the literature on social movements, is the notion of smart mobs (Rheingold, 2004). We will try to see the convergences and divergences of these various notions and literatures when we discuss the notion of collective intelligence.

3.2 Concepts

3.2.1 Networks movements

We use the generic name “network movements” to refer to the ICT mediated mobilizations that have taken place since 2011. We have enumerated some of their characteristics above. They exhibit what seem to be patterns of collective action in the network society. In these movements, the role of the internet and mobile communications technologies is paramount, but not primarily for digital practices but to tie “online and offline social networks, networks formed previously and others formed during the movement’s actions”. Communicative action in and between networks (through which those networks construct and reconstruct themselves) is the base of collective action in these movements. They construct feedback circuits between cyberspace and urban space, a “hybrid space made of cyber and urban space constitutes the space of autonomy, and its synergy is the basis of its energy”.

The relation is not only synchronic and genetic but also diachronic and strategic: these movements have “a stage of visibility with the taking of urban spaces through occupation and demonstration. Their continued existence takes place in the free space of the internet”. These movements develop some of the characteristics of previous movements, especially, those of —even if they are not exclusive of them (Pichardo, 1997)— the "new social movements" (Bouchler, 1995): “They do not follow personal leaderships, nor a formal center of command and control, nor a vertical organization distributing information and instruction. This decentralized structure maximizes the opportunities for participation in the movement. These networks are open, without defined limits, and continuously reconfigure themselves according to the level and mode of participation of the general population. They are characterized by the centrality of collective identities, whose leadership is temporal and distributed. As an alternative to big mass organizations, these identities and their associated collectives bring together people usually not involved in established organizations. They have tended to have a transversal character, without a clear ideological shape. Some of them have reached high levels and social support, going beyond minoritarian logics.

These movements are nurtured by emotional explosions, able to generate processes of self-organization on huge scales as well as collective intelligence dynamics (Castells, 2012; Toret et al. 2013).

The movements are local and global at the same time. They begin in a given context, with their own reasons but they are connected with the whole world, they learn from the experiences of the others and, in fact, they get inspiration from these experiences to mobilize (Castells, 2012). Some have talked of interconnected revolts.[47]

3.2.2 Technopolitics

These movements articulate themselves through what we call the "technopolitical" construction of networks and collective identities. Technopolitics can be defined as the tactical and strategic, multitudinous deployment of ICTs for the organization, communication and unfolding of collective action. This is a characteristic mode or pattern of collective action in network movements and, in a wider sense, of political and collective action in the network society[48]. The combination of increasing penetration of technologies for social interaction, with the perceived limits (sometimes perceived by comparison or clash with online practices) of the formal, institutional space for political participation, due to factors commented above (chapter 1), has stimulated the proliferation of technologically mediated practices for political intervention. In that sense, they embody and point towards de-intermediated forms of technologically mediated political action. They move across digital networks, urban spaces, and mass media landscapes (Juris, 2008).

The notion of technopolitics stands in contrast to updated notions of cyberactivism (Tascón & Quintana, 2012), clicktivism (Shulman, 2009; Karpf, 2012), as well as misguided if not self-serving talk (Morozov, 2010) about "Facebook and Twitter revolutions". It tries to help in articulating a structural, deep and situated view of the basic dynamics of the network movements.

Technopolitics may encompass forms of cyberactivism, but the key difference is that technopolitics is not limited to the digital sphere. It feeds from and into collective abilities for inventing forms of action that may take place or start on the internet but that are not confined to it. It enables and interconnects the taking of the public urban, digital and mass media spaces.

Technopolitics is not "clicktivism" (Shulman, 2009) or "slacktivism". These notions refer to practices limited to a mouse-game, lacking the complexity of situated analysis and ignoring the multiplicity of tactics and strategies that reduce the possibilities opened by technopolitics. Moreover, it has been suggested that, despite their limitations, these practices play roles similar to certain old activist practices.

The concept of technopolitics and our analysis, more broadly, tries to avoid that variety of (sometimes self-serving) internet-centrism (Morozov, 2010) underlying formulas such as "Twitter-Facebook Revolution". Corporate platforms are not agents but rather regulated spaces (with their own politics—Winner, 1986) that millions of people live with (Castells, 2009, p. 63). Furthermore, the multi-channeled and multilayered character of technopolitical communication and action (and of network movements themselves) prevents that type of reduction. Likewise, it blots out the role (and creation of)

[47] For instance, at the international research meeting on network movements held at UOC. More information available at http://civilsc.net/globalrev

[48] Although this notion has been previously used by Levy (1999), Rodotá (2000), and Sampedro (2008), in some cases in senses and situations similars to ours (Toret et al. 2013), we have tried to displace and enrich its meaning, reach, and depth.

multiple platforms and technologies based on free software, such as n-1.cc in Spain, YourPriorities in Iceland, or Occupy Together in the US; more broadly, it hides the richness of the ICTs ecosystems at work in these movements, not to say non-technological elements. On top of that, these type of formulae barely covers a techno-determinist approach that downplays the intelligent, political and variegated deployment of ICTs carried on in these movements.

We put the emphasis on the knowledge, competences and practices of the connected multitude on the finding of new assemblages and purposes for online platforms. If technopolitical action can be favored or limited by the design of the platform that it enrolls, it can also go beyond any design or use expectation. As suggested by Gibson (1984) and confirmed by well-established literature (Kline, 1996; Feenberg, 1999; Oroza, 2006), "the street finds its own uses for things". Technopolitics comes to combine political and (socio)technical innovation.

Putting it within a formula that isboth close and distant from resource mobilization theory and traditional in the analysis of social movements: technopolitics starts with the multitudinous realization of the political power of organization in networks via ICTs.

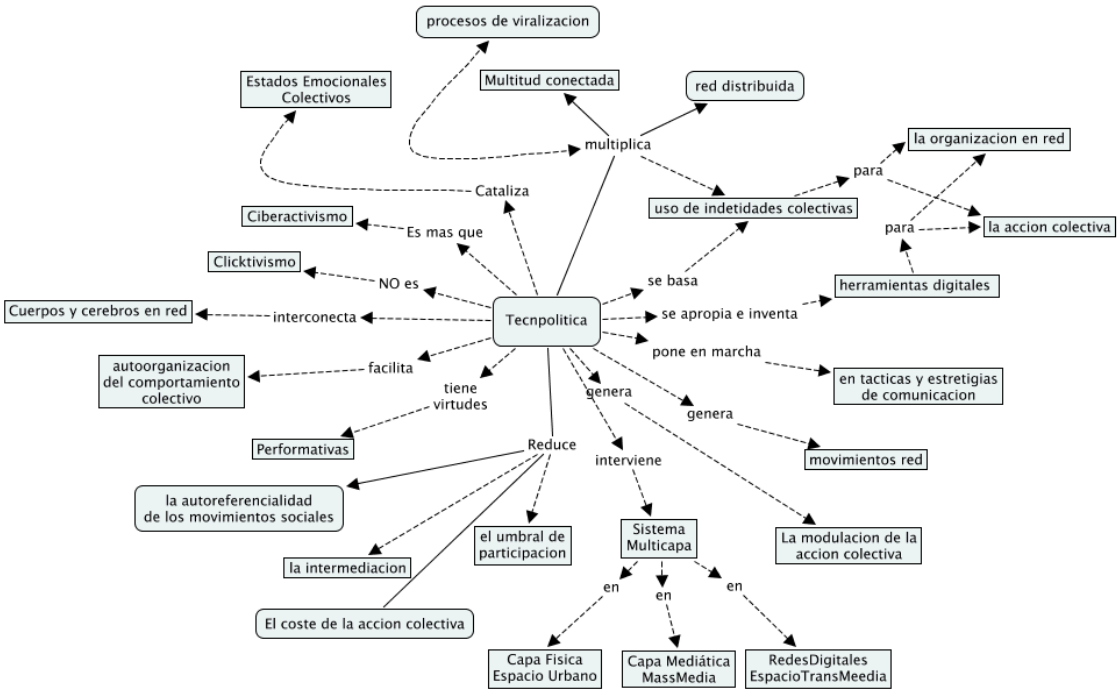


Figure 1. Conceptual map of technopolitics. Toret 2013

3.2.3 Mass self-communication

According to Castells (2014) we have moved from a media system characterized by the "emission of messages from one source to many receptors, with sparse interactivity, to a communication where multiple sources and receptors coexist... we are all sources and receptors at the same time". From the communication between two or more people, characteristic of interpersonal communication, or between one and many, idiosyncratic of mass communication, we has moved to communicative spaces where many can reach many potentially, "with a global reach", possibility that accounts for the "mass" in the label. Castells (2009, p. 55) justified his use of the term "self-communication" because "the production of the message is self-generated, the definition of the potential receiver(s) is self-directed, and the retrieval of specific messages or content from the World Wide Web and electronic communication networks is self-selected"[49]. This communication is — in the network movements— multimode and multichannel, where "multimodality refers to various technologies of communication. Multichannel refers to the organizational arrangements of the sources of communication" (Castells, 2009 p. 130).

We believe that the concepts of "multilayer" (Toret et al. 2013) and "feedback" (Wiener, 1948) are useful to consider the processes by which information, affects and action circulate not only through and between channels, but also between those channels or digital layers and the physical and urban layers.

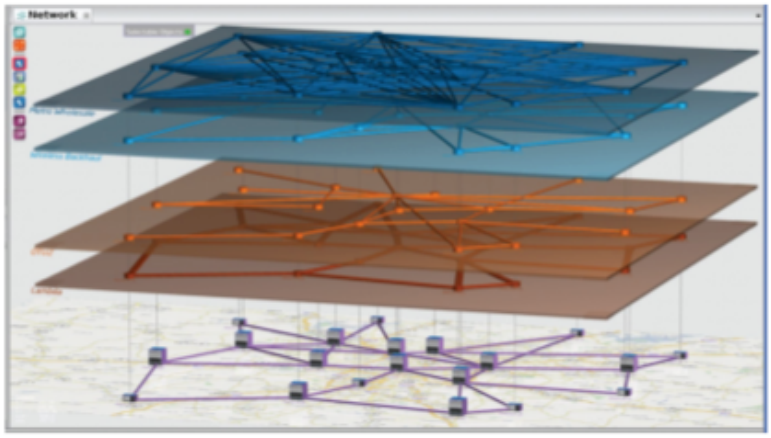


Figure 2: Multi-layer system street, Facebook, Twitter, mass media

This generates a kind of "extended cyberspace" or circuits that integrate digital channels (and, even, the old cyberspace as mere digital sphere) in wider dynamics. Technopolitical action moves across social networks-streets-media, it is thoroughly hybrid.

As we show below, the concept of self-communication is essential in order to understand the self-organization of movement networks. So much so, that, ultimately, it is required to go beyond the metaphor of the "mass", which appeals to the bodies' immobilism, towards that of "multitude",

[49] Castells (2009, p. 55): "The three forms of communication (interpersonal, mass communication, and mass self/communication) coexist, interact, and complement each other rather than substituting for one another. What is historically novel, with considerable consequences for social organization and cultural change, is the articulation of all forms of communication into a composite, interactive, digital hypertext that includes, mixes, and recombines in their diversity the whole range of cultural expressions conveyed by human interaction".

specifically, as "connected multitude", a concept that we define below and points towards an activation, an energy, understood in the etymological, Greek sense of *energeia*, as "being at work"[50]. Thereby, in our analysis we prefer to use expressions such as "multitudinous self-communication" or "self-communication of the connected multitude"[51].

3.2.4 Connected multitude

The concept of connected multitude can be provisionally defined as the ability to connect, group, and synchronize, through ICTs and around objectives, the brains and bodies of huge numbers of subjects, and to do so in certain sequences of time, space, emotions, action and language. From this viewpoint, technopolitics can be redefined as the capacity of connected multitudes, of networked brains and bodies, for self-organizing and self-modulating collective action.

This notion cuts across works going from Spinoza (1675)_to Rheingold (2004), Hardt & Negri (1996, 2004), or Pérez de Lama (2007). It helps us to stress the idea that there is not multitude if there is no connection or assemblage. We agree with Hardt and Negri's (2004, p. 100) differentiation of multitude from crowds, mobs and masses[52]. Nevertheless, taking distance from them, we conceive Rheingold's "smart mobs" as a possibility of self-organization of a connected multitude. In fact, it is a common phenomenon in actions, demonstrations, or campaign launches, where phenomena —clearly distinguishable— of swarming, virality, catalysis (Levi 2012; Toret et al 2103) are very common. We have tried to explore these phenomena of multitudinous connection through activity metrics (on Twitter), linguistic behavior, and networked emotivity. We have also reconstructed several concrete events. Through those cases and traces we try to find marks of an emergent, hybrid and autonomous subjectivity.

3.2.5 Collective intelligence

The notion of "collective intelligence" has singular ties to the history of 15M. it has been a formula common in the vocabulary and conversations of many activists, as we know from personal experience, and seems to be confirmed by different documents, interviews (such as those gathered in 15M.cc), etc. The concept is composed of two elements that we want to analyze sequentially, starting with "intelligence".

Following Levy (1999), a first entry into the concept is given by his interpretation of intelligence as reading or "working together (inter legere), as a union point not only of ideas but also of people 'constructing society'". We believe this view is heuristically more interesting than those that focus on some of the possibilities of intelligence only, emphasizing their cognitive aspects or —in its pragmatic versions— defining it as the "ability to solve problems" (Heylighen, 1999).When it comes to approaching

[50] Under this category, Aristotle included pleasure and happiness (eudaimonia), as well as activity and movement.

[51] Castells's use of the term "mass" tries to think the "reach", the "impact" of the communication. Ours puts the emphasis on the subject. The key to both, though is the notion of "self-communication". In the multitude that "self" is full of "alters".

[52] "The multitude, however, although it remains multiple, is not fragmented, anarchical, or incoherent... Since the different individuals or groups that make up the crowd are incoherent and recognize no common shared elements, their collection of differences remains inert and can easily appear as one indifferent aggregate. The components of the masses, the mob, and the crowd are not singularities--and this is obvious from the fact that their differences so easily collapse into the indifference of the whole. Moreover, these social subject fundamentally passive in the sense that they cannot act by themselves but rather must be led. The crowd or the mob or the rabble can have social effects-often horribly destructive effects-but cannot act of their own accord. That is why they are so susceptible to external manipulation. The multitude, designates an active social subject, which acts on the basis of what the singularities share in common". In our analysis, "sharing" processes will be analyzed piecemeally; on the other hand, the detailed study of the emergence of "the common" remains out of its possibilities.

the second half of the concept, to the "collective", we follow Bruno Latour (1993, 1999, 2005) in stressing the need of extending the notion to encompass actors other than humans. In our case, those actors range from servers (on the physical layer) and interfaces to hashtags and digital profiles (on the application or even the content layer)[53]. Collective intelligence cannot be cut off from the memory, communication, and information processing devices and circuits that make it possible as they shape (and are somehow shaped by) it. This shift in the meaning of the "collective" affects other classic notions in social movement analysis, such as those of collective action and identity, although we do not present that shift here.

In chapter four we discuss the notion of collective intelligence in relation to others, sometimes associated with it, such as that of "wisdom of the crowds" proposed by Surowiecki (2005). The so called wisdom of the crowds reveals itself when the disjointed opinions of a group are aggregated. Different cases show that the aggregated opinion, after statistical processing, can be more accurate than the opinion of a given expert. One of the causes of this result is that diversity and the number of opinions in a group (to a lesser extent, at least for the case of wikipedia, (Arazy et al., 2008)) make —when averaged— personal prejudices (even those of the experts in the group) to cancel each other out, which produces better results.

This approach to collective intelligence (or "wisdom", a certainly inappropriate concept for the phenomena at stake[54]) deploys a narrative and analytical perspective that following Levy and Deleuze and Guattari (1980) could be defined as "molar": it is based on a statistical reduction of error (or prejudice) in a given group of people. Otherwise, it is based on an operation or calculus external to the group, more than on internal approach to organizational forms of a given collective and the possibilities of the singularities that compose it, which are the focus of attention for Levy and, to a good extent, for our own approach. That said, after relieving the phenomenon from the historic-conceptual load of the notions of "wisdom" and "crowd", on chapter 4 we try to see how it may be a valuable entry point (via authors such as Morgan & Patterson 2005) into the dynamics behind actual or potential processes of networked content production (pad and wiki use, specially) as well as opinion and decision formation.

In a complementary way, we try to integrate in our analysis the phenomena that Rheingold (2003) tried to group with his notion "smart mob". We suggest this is a possible form of articulation of a connected multitude, exhibiting what has been defined as "swarm intelligence". We touch upon this in more detail in chapter 4, in the section devoted to collective intelligence.

3.3 Methodology: Data-analysis/Data-visualization

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

[53] These (f)actors do not play the same role nor do they have to have any role whatsoever in a given case or process.

[54] Since the ancient worlds, be it in Greece or China, "wisdom" has been distinguished from "intelligence", "knowledgeability", etc, otherwise, from matters of pure episteme.

connections, and patterns that emerge from data correlations about individual organizations, products, things or information itself.

A lively area of research within this area is social data mining which emphasizes the importance of social media analysis for mining structural data and studying the interaction amongst groups and users (Russel 2011; Barbier and Liu 2011; Asur and Huberman 2010; Pang and Lee 2008). With the increasing use of digital platforms for organization and decision-making, much information on people's everyday activities can be found by analyzing the use of social media interactions, since social media such as Twitter and Facebook are currently the main platforms where online social interaction takes place. Social data (i.e. data produced and shared by users and citizen groups) represents an important part of "big data" analysis and it is used to improve the way collective dynamics work, improving direct feedback among social groups as well as between institutions and citizens.

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

In the context of D-CENT, data-analysis and data-visualizations represent both a research method and an outcome of the project. Our group 15M Datanalysis has been developing methods for analyzing network data emerging out of the 15M movement in Spain. Giving an overview not only of the shaping of opinions and the diffusion of information in the 15M movement, but alsothe methods are also beginning to account for organizational forms, particularly political and communication systems emerging from the movement that respond to a network, and complex systems logic rather than to traditional hierarchical structures. The Spanish case remains a pioneering example of the depth and spread in the use of network technology in social movements.

By providing tools to grasp the emergence of various types of organizational forms and enabling an analysis of these processes over time, the methods we have developed offer an overview of the new forms of movements emerging in Spain.

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

1. Analysis of the networked movements' genealogy

We have analyzed the key political activities, as well as the historic construction of the 15M movement. We have done so through various methodologies: secondary data analysis, in-depth interviews; digital methods--such as analysis of flocks and migrations between hashtags in Twitter. Only part of those results are presented here. , a fuller version can be found in Toret et al. (2013), and on our website.

2. Analysis of network communication and collective consciousness and intelligence

We analyze the relationship between network communication, the emergence of processes of collective consciousness, and the network movements' characteristics. We describe what communication technologies are used, what kind of networks are built, the key elements and processes unleashing the emergence (or not) of collective forms of consciousness and intelligence and how this connects to a new culture of political action. To approach these dimensions of the network movements, we analyze how the movements' messages spread and are retransmitted at multiple scales, generating quick and viral contagion processes, as well as synchronized collective action. We also try to sketch the dispositives and practices contributing to processes of collective intelligence in these movements. This may provide new ways of understanding political organization. We propose analyzing and comparing:

The use of network communication tools,

Network movements' communication, organization, decision making, and action digital structures.

Methodologies: Digital Methods: Social Network Analysis and Hypertext Analysis.

3. Analysis of the emotions, language and vocabulary of the network movements

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

Here we analyze the role of emotions, virality and meanings flowing in the core of 15M during its early days. The next step in our research (currently under development) is to build a common software platform to extract concepts, entities, sentiments and emotions expressed in a text. We analyze the level of cohesion 15M´s language network, and the temperature and speed of its vocabulary in its first weeks.

Methodologies: sentiment analysis, scraping from Twitter (later, we will apply the same to Facebook fanpages), and narrative analysis.

4. Analysis of structural network topology

We also analyze the role of ICT in shaping conversations and communication processes. The objective is to see how network communication provides new ways of understanding political action and social organization, as it generates innovative forms of network organization or 'meta- organization'. Using social media data, we measure the centrality of each organizational node in different periods, tracing the evolution of 15M. We use metrics such as degree centrality and betweenness centrality to map the communities and the role that each node and edge plays in the network. This analysis results in the sketch of models to describe the optimal conditions for a distributed work system to emerge, to become self-aware, to activate cognitive and emotional mechanisms to foster empowerment and self-organization dynamics in the network.

Methodologies: network topology analysis.

4 The emergence of a network movement: the case of 15M

On May 15th, 2011, coordinated demonstrations in more than 60 cities in Spain took place. They did so without the support of any party or union, and shared an expressive slogan: "we are not commodities in the hands of politicians and bankers". According to a Gather Estudios report, 71% of the participants were not enrolled in a political party, union or social movement. The same report reveals that only 6% of participants did not have a profile in an online social network, while 82% of the people attending the demonstrations affirm to have learned about them in social networks. These general differences in belonging are tied to a phenomenon underlined by different studies (Candón Mena, 2013; Toret et al., 2013): social networks and the Internet afforded a de-intermediation with respect to political parties and unions, and favored the mobilization of thousands of people.

Real Democracy Now (DRY), a brethren of another platform of "pro citizen coordination and mobilization groups", born a few months earlier on Facebook and composed mostly by people lacking activist experience, was able to build a viral and inclusive campaign that contributed to the empowerment of thousands of anonymous citizens. It was born out of the confluence of relatively new groups, such as Unwellfare State, Anonymous, Don´t Vote for Them, Futureless Youth, the Platform for People Affected by Mortgages, and many others.

The "Take the Street" campaign provided the backbone for the organization of the May 15th demonstration. It was organized by more than fifty local groups, created *ex professo*. In many cases, those groups started online, they connected and extended through social networks, and met face to face afterwards. A complex combination of on and offline meetings helped to articulate the outrage, as it started to turn fear and isolation into collective empowerment, into a desire of change that reached thousands of people who moved from their "connected rooms" (Remedios Zafra) to meet in the streets.

The May 15th demonstration mobilized more than 130000 people, in spite of mass media silence (Casado, 2013). The first two days after demonstration, the informative following of the protest march was limited by media. Afterward opposite happened: demonstrations were the principal information on news programs, papers covers were occupied with photos of demonstrations, outside broadcasting units were installed in places like Puerta del Sol square in Madrid (Serrano, 2012). It had a transversal, citizen composition, and did not appeal to traditional left-right narratives and identities (Candón Mena, 2013).

It sketched a new imaginary, that of a common citizen space, which appealed to the recomposition of a disperse citizenry and of fragmented uneasiness (Fernández-Savater, 2013). Throughout this process, the centrality of different online networks and technopolitical practices were manifest (Alcazan et al., 2013; Candón Mena, 2013; Toret et al., 2013). So, we could note the intensification and multiplication of online activist practices, such as viral campaigns on Facebook, strategies for reaching trending topics on Twitter, the proliferation of streamings of protests, etc. On the other hand, language and culture

expressions tied to the Internet and to computers were very much present in the streets: Anonymous masks, banners and slogans (Error 404: democracy not found, #Spanishrevolution, etc.), projects such as democracy 4.0[55], and so on.

The logics of networked organization and communication (Juris, 2008; 2012) was translated into practices carried on in the urban space, generating innovation in the protest and collective action repertoires.

15M garnered a wide social support. Different polls, such as the ones carried on by Ipsos Public Affairs, showed that in 2011, between 850.000 and 1.500.000 people were heavily involved in 15M (taking part in assemblies, demonstrations and camps, or through social networks). Likewise, between 6 and 8.5 millions took "somehow" part in 15M activities. Out of a population of 47 million, around 34.000.000 declared to feel sympathy for the movement and its main ideas. In May 2013, more than 70% of the population maintained their interest or links to the movement.

4.1 Gestation and antecedents: 15M and Internet struggles

There is no doubt about the centrality of the camps in the first weeks of 15M. At the same time, it is important to reject those opinions that take their multiplication, and 15M itself, as a purely spontaneous phenomenon. It is necessary to analyze the months of preparation and its antecedents in order to understand its codes and becoming.

There are a number of movements that share with 15M different aspects of its logics and even its history: the alter-globalization movement between 1999 and 2000-s, the "night of the messages" in 2004, that paved the way for the defeat of the Popular Party in power in the Spanish national elections, or the movement for a decent housing, V for Vivienda, that used the "pass it" text through emails and forums in 2006. In all of them, the use of networked communication and the appropriation of technology for and into collective action anticipate what we define as "technopolitics", characteristic of 15M.

Not until the end of 2009, with the "Manifesto in Defense of the Fundamental Rights on the Internet", published on Facebook and supported by more than 240.000 people (most of them in a single day). It is under the menace of the polemical "Sinde Law", a law promoted by the SGAE (General Society of Authors and Editors) that allowed the administrative closing of webs without trial, when there was a quantitative proof of the existence of a critical social mass ready to defend a new common (or "expanded", in terms of Mexican anthropologist Rossana Reguillo) political space: the Internet.

A number of landmarks followed: the constitution of Red Sostenible[56], direct actions such as #LeySinde[57] and #SindeGate in December 2010, and the launch of the #NoLesVotes[58] campaign in early 2011. These events and processes paved the way for the emergence of 15M (from a historical, political and subjective point of view). They marked the constitution of a critical mass around struggles for freedom in the

[55] A project that attempted to combine representative and direct electronic democracy. More info available at http://www.demo4punto0.net/en/node/16

[56] An alliance of a big number of collectives and people that worked as a platform for the coordination of action in the struggle against the Sinde law. More info available at http://red-sostenible.net/index.php/P%C3%A1gina_Principal

[57] ARNAU: please 1 referencia

[58] ARNAU: please, referencia

Internet, which was gradually transformed into a critique of the bipartisan system, and of the political system more broadly. A series of abilities and experiences were garnered in the process, which ultimately fed into the practices and logics of 15M. Some quantitative analyses (Toret et al., 2013) show that 31% of profiles who used the hashtag #Spanishrevolution on Twitter in the early days of 15M had previously used the hashtag #Nolesvotes. Other studies (Candón Mena, 2013) and documentaries (15M.cc) have recognized this connection.

The economic crisis, along with the disrepute of institutions of political representation were surely crucial conditions in the emergence of 15M, but not suffice to explain the start and characteristics of 15M. The role of the critical mass gathered on and around the Internet, as well as the practices pervading it, were crucial in the unleashing and unfolding of the movement. Countries such as Italy, Portugal, or Ireland, culturally not so far from Spain, and under similar conditions of economic and social distress, saw no movements comparable to 15M in terms of strength and impact. Those conditions fueled emotions and affects that, articulated and amplified by the technopolitical networks and practices constituting the mentioned critical mass, were crucial for the unleashing of 15M, [as explained by Manuel Castells (2012)]

4.2 Explosion: exponential growth and self-organization

On the night of May 15th, after the demonstration, a few people —this time spontaneously— grouped and stayed in Puerta del Sol, in Madrid, where a few police charges and detentions took place. Those were "the first forty of Sol", and they wanted to extend the energy from the demonstrations earlier in the day, to persist in the protest. Some of them had fresh in their memory the events from Tahrir Square, in El Cairo, a few months back. This was their opportunity to do something similar, with local and regional elections only a week ahead. Then the idea of staying in Sol was launched. They improvised an assembly and started to organized in order to spend the Sunday night and continue the protest. In haste, they sketched a manifesto, opened an account on Twitter (@acampadasol) and launched its first tweet: "We have camped in Sol and are not leaving until we reach an agreement". From here, the hashtag #acampadasol starts to circulate on Twitter. It quickly became trending topic nationwide. People were called to sleep on the square or to support the camp from the morning onwards.

On May 16th, around a thousand people participated in the assembly. People in Barcelona and Valencia camped on symbolic squares too. The qualitative leap happened that very night, when the police tried to evict those sleeping in Sol. The particularity of that eviction was that the protesters decided to peacefully resist, and record with their smartphones and cameras what was happening, in order to force the police to act with moderation. The images sparked an extraordinary, viral diffusion and solidarity via social networks. In the convocatory of the day after (May 17th), around 20.000 personas, still moved by the demonstration of the day before, gathered to retake the square. In spite of the police cordon, Sol was retaken in a jubilous mood under the chant: "the revolution has started". The emotion of meeting, of conquering the public space together, and of starting the camp with some official allowance induced others across the country to take the main square of their cities. The precedent spread rapid and internationally, and up to 700 camp-nodes sprouted in cities around the world in less than ten days.

A mobilization that was organized and advertised online evolved, in a matter of days, into a complex fabric of camps that connected with each other via a huge digital structure. This structure was composed by thousands of personal and collective profiles on different networks, such as Twitter and Facebook, webs and blogs for every assembly, N-1.cc groups, mailing lists, streamings, pictures, forums,

pads, and much more. These platforms also helped to articulated the daily dynamics of every camp (citar artículo sobre concomitancia red-plaza en Sol). An ecosystem or constellation of networked collective identities[59] and practices emerged, defined by their self-organized behavior, without a central authority or formal leadership. As the analyses of Pablo Aragón (Toret et al., 2013) indicate, the 15M network on Twitter rose from 3.403 nodes in the days before 15M to 110.198 in the explosion stage of the days that followed it. The movement structured itself in the feedback space between the digital and the physical ones, through a sort of sociotechnologically structured contagion that spread across the country. The strong emotional mobilization was catalyzed and structured by (and into) practices and technologies, amplifying and amplified by the incipient networks emerging around the camps (generating a system of connected squares of sorts) as well as the Real Democracy Now platforms (website, Facebook fanpage, Twitter, local nodes, etc.).

On Sunday, June 12th, after 28 intense days of autonomous living (Bey, 1991) in hundreds of squares all over the country, hosting an enormous array of experiments, meetings, debates and actions, the camp in Puerta del Sol (and around the same time most of the camps) was lifted after a (not unanimous) assembly decision. The camps left behind a message "we don´t leave, we expand". With a demonstration on June 19th, that in places such as Barcelona was attended by more than 100.000 people, the migration into the neighborhoods and the online networks begun.

The movement did not stop here. It evolved and mutated. From it a plethora of projects grew, "the 15M brethren[60]". They have proliferated and extended in different fields and fronts of struggle that define, to a good extent, the political debate in Spain today. Many of the modes of 15M technopolitics (its practices, platforms and networks, organizational forms, strategies and tactics) have become a part, to a greater or lesser extent, of the activities (campaigns, actions, events, etc.) of collectives such as @15MPaRato, @iaioflautas, rodea el congreso, the citizen tides, the platform of people affected by mortgages or @toqueabankia.

With 15M, a process of reconstruction of the political begun. It has swept across society and bifurcated in a variety of projects, bringing new ways of doing and changing the rules of the game in a variety of fields: the citizen tides, in education and healthcare, @La_PAH, in housing, and the @Partido_X (one of the most interesting ones from the viewpoint of technopolitical innovation) in the political arena.

4.3 15M topology, emotions and language on Twitter

We want to present now some of the results of the work of the Datanalysis 15M group, of which we are members. Through various, sometimes experimental, techniques of data analysis and visualization, we have studied some phenomena that we believe are key in order to understand the workings of 15M as a network movement. Those techniques provide different metrics of topology, emotions and virality, as well as language.

4.3.1 15M networks topology

As we pointed out above, network movements such as 15M are characterized by the generation of multitudinous, self-communication networks. In these networks, messages are generated and circulated,

[59] Here we understand identities, in a provisional way, as connected to a "collective brand" tied to digital platforms, rather than in the intricate sense of Melucci (1996).

[60] The formula was coined in a journal article available at http://www.eldiario.es/politica/hijos-andan-solo_0_130887633.html

and we can trace their paths through analysis of network topology (Barabasi, 2012), data mining (O'Reilly, 2013) and visualization (Cairo, 2012). In the 15M case, Twitter was a key platform in these dynamics of networked communication (Alcazan et al.; Candón Mena, 2013; Toret et al., 2013). In the topological analysis carried on by the BIFI Borge-Holthoefer J, Rivero A, García I, Cauhé E, Ferrer A, et al. (2011) and Datanalysis 15M (Toret et al., 2013), we can observe 15M functional[61] (based on users' retweets) networks at different moments. By means of this type of analysis we have gathered a number of results.

As the BIFI's graphic shows, there was an exponential increase in node connectivity (links between user accounts) in the birth and explosion of 15M, between May 15th and 21st, 2011. The maturation process is not slow, nor linear, nor slightly progressive. On the contrary, it is abrupt and exponential.

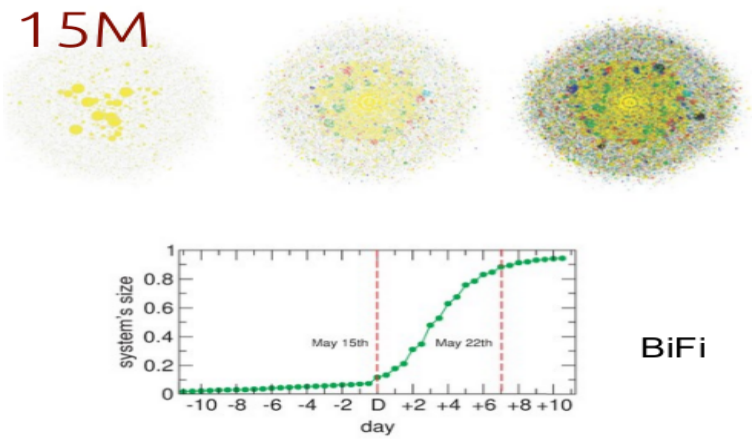


Figure 3: The study by BIFI reveals a phenomenon of exponential growth, characteristic of phase transition

According to the results of the work by Aragón (2012) the days preceding the bloom of the movement (the gestation dates, May 12-14th), the Twitter network is small, comprising only 3403 nodes (personal as well as collective accounts) and 6607 links. In less than a week, the images of the functional topology delineate a whole system, with 110198 nodes and 367440 links between them. It is the explosion stage, between May 15th and 22nd[62], 2011. This abrupt growth (tied to processes of "spontaneous" self-organization) indicates a process of emergence[63] and percolation[64].

Although spontaneous, this growth generates, reinforces and is articulated around big hubs, which acquires an enormous centrality in the becoming of 15M. In this case, the hubs are the

[61] Manuela Lucas (figure 21) has developed what we may consider an anatomical (based on users' "follows") image.

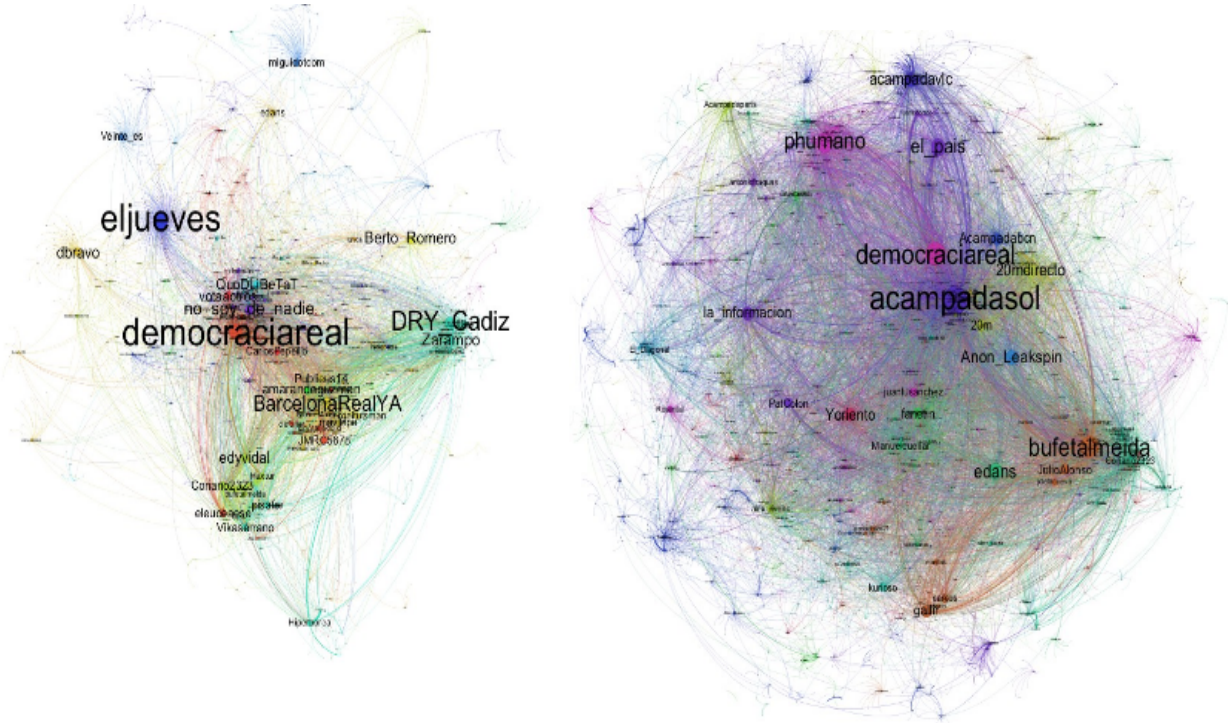
[62] The networks are constructed on retweets.

[63] The central idea is that global or macroscopic order is possible without the intervention of a central organizing agent (genetic, instructive, etc.). The distributed interaction among components of a network can amplify microscopic tendencies that generate an emergent order.

[64] Percolation is a phenomenon by which nodes in a network begin to connect among themselves and, suddenly, a critical mass appears connected as a whole; the system grows and appears in an abrupt manner, by exponential growth.

collective convoking the May 15th demonstration (Real Democracy, Now!) and the one structuring the second stage of the protest (Acampada Sol), which gain preeminence in the process

.F*igure 4 y 5: Diffusion network from the 15M gestation and explosion stage. Graph by Pablo Aragón*



The resulting networks have the properties of being scale free[65] (Barabasi & Albert, 1999) and small-world[66] (Watts & Strogatz, 1998). There are a few nodes with many connections (that, in this period, produce much of the information) and many nodes with few connections. This type of network exhibits a high level of resilience[67] and a higher speed and efficacy in information diffusion (a result of the small-world property).

Before ICTs, and especially social networks, it was not possible to develop communication networks (and thereby, social organizations) exhibiting free scale connectivity (although it was possible to establish small-world connectivity). Classic organizations (public administration, unions, armies, etc.) exhibit hierarchic structures, where the control and flow of information is asymmetric (see figure 2, on the left). At the same time, mass communication media (radio, television, press) exhibited (and today still tend to maintain at their core) a star-shape, with an unidirectional flow of information (Figure 1, center). The structure of communication in the assembly also tends to have a star shape, although, differently from the mass media structure, anyone can occupy the center, thereby generating a more complex form-

[65]Free scale networks exhibit are those where many networks have little connectivity (have sent or received few messages), while a few have very high connectivity. This mechanism is also reflected in the fact that the majority of the information (more than 50%) is generated by 10% of the users (following the so called "power law distribution"). These networks are very efficient in propagating information.

[66]There is a maximum of six degrees of separation (Milgram, 1967; Watts, 2006) between any pair of nodes in the network.

[67]The network exhibits greater resilience (it can withstand random attacks, since the damaged nodes would normally be either small or exchangeable, in case of being hubs.

through the intervention of working groups the structure quickly becomes much more complex, nested and even rhizomatic (Deleuze, 1980). More distributed forms of organization, such as those in neighborhoods or demonstrations display a lattice structure (Figure 2, right). These topologies gave rise either to structures where fluid participation and action is not possible (centralized and unidirectional structures, such as mass media or bureaucracies), or to distributed and decentralized organizations, which are not effective at big scales and lose operativity as they grow (such as assemblies or lattices). Free scale communication networks (figure 3) have become possible thanks to ICTs. Topologically, they have enabled the constitution of connected multitudes such as those organized in 15M (Toret et al. 2013).

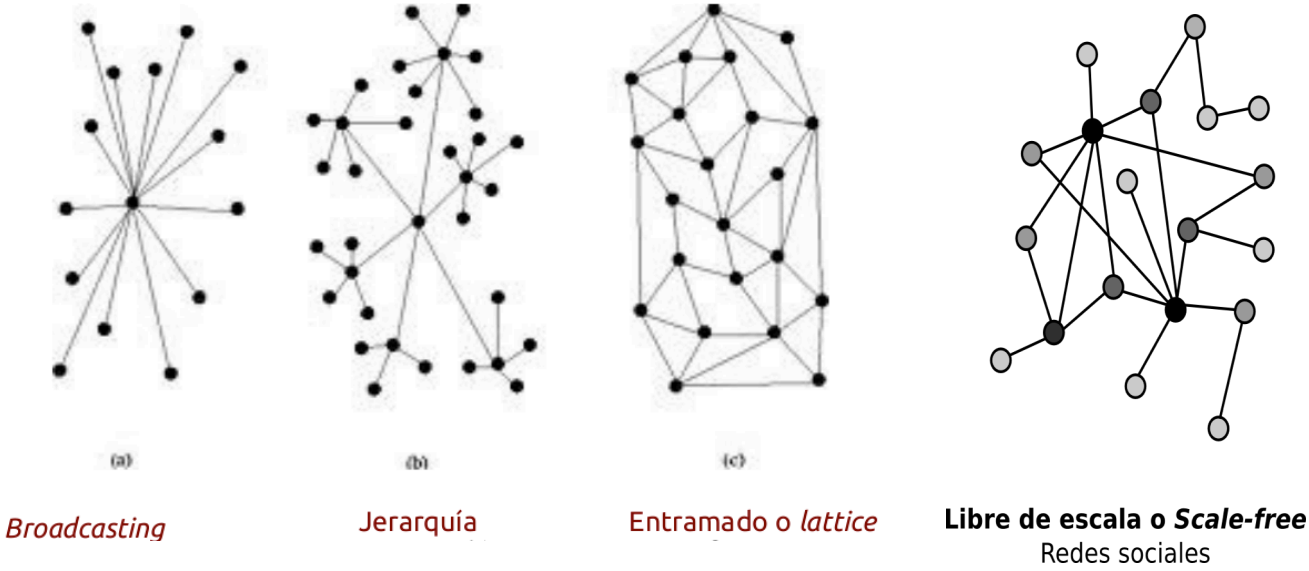


Figure 6. Typology of networks: (a) Broadcasting, (b) Hierarchy, (c) Lattice, (d) Scale-free

4.3.2 Analysis of affects and emotions in 15M

For the networks we just described, not only messages or information, but also affects, circulate[68]. By means of quantitative analysis tools developed by Oscar Marín[69] (applied to a Twitter dataset), also

[68] With the distinction between emotion and affect we want to account for several aspects of the phenomenon and of our approach to it: first, we believe that, when it comes to naming psychological processes, the concept of "emotion" fits better with most of the recent literature (Damasio, 1994, 1999; Lewis, 2005) that we want to connect to; secondly, this notion allows to account for the psychological aspects of the phenomena that we want to think through; thirdly, with the notion of "affect" we try to tie our narrative to a tradition running from Spinoza to Deleuze, which underlines the relational, corporal and performative dimension; to this we have to add the fact that ¨empowerment", which we believe is a basic notion to think much in the dynamic of affects in 15M, has a corporal and relational character, it speaks of the ability to affect the world, finally, we understand that it is affects (rather than emotions) what circulates through the networks of humans and machines that compose the connected multitude, these affects spark, or are decoded as emotions.

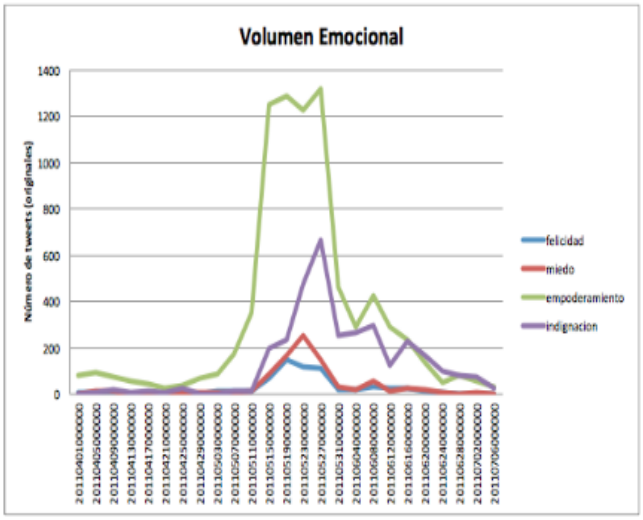
[69] Starting with techniques of natural language processing, network analysis, and text mining, we have tried to capture the 15M message from a double approach: the composition of its vocabulary and the affects/emotions associated to the messages. The technique employed for affect/emotions recognition is based in the detection of keywords associated to each of them in a given text or message. For validating the correctness of the measurement, we used a reference corpus with affects/emotions tagged by hand and metrics of success (precision and coverage, F1) adapted to this context. The metric of "affective/emotional" charge refers to the proportion of original messages with an affective component (detected following the protocol described in the previous paragraph) out of the total. Non original tweets (retweets) are not taken into account.

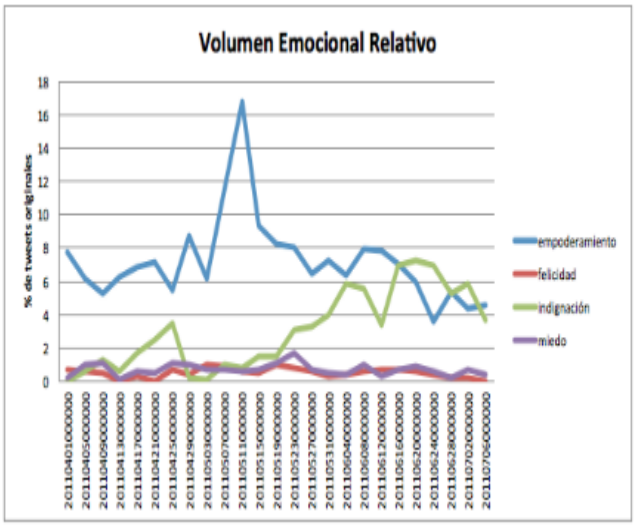
known as mood analysis, we have developed an experimental exploration of the affectivity (linked to language) in the first weeks of 15M.

In what follows, we expose the main conclusions of the analysis. In the figure below we display the evolution of affectivity in the period April-July, 2011. Some remarkable results are:

1. 15M tweets double the affective load of normal tweets. On average, around 13% of 15M messages had affective charge. For comparative purposes, we will point out that, with a sample of 10% of the messages that we captured on 2012 with geographic origin in the Spanish territory reveals an stable affective load of about 5.4% (less than half of the load in our sample). For this we suggest that 15M messages on Twitter have a clear affective component.

2. The affective charge skyrockets in the first weeks of May 2011, reaching a peak of 19%, and then stabilizing around 15% up to the end of June. The virality metrics indicate that an explosion took place by mid-May, coinciding with a temporal window of social and media agitation, and a strong affective load (around 15% on average).





Figures 7 and 8: Absolute affections/emotions volume, and relative affections/emotions volume.
By Oscar Marín Miró.

3. Empowerment and indignation are the dominant affects. We believe them to be a key principle of corporal activation for action as well as for information diffusion. Emotions and affects predispose for action, they enable the activation of consciousness (Damasio, 1999).

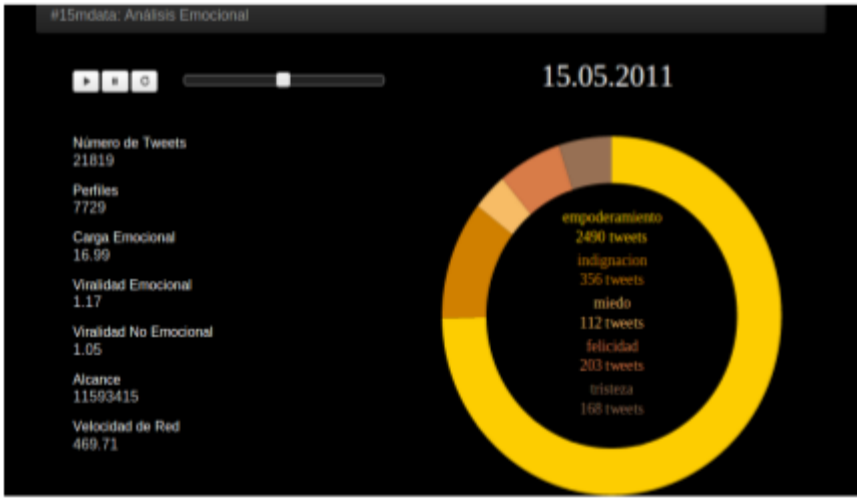


Figure 9: Affects/Emotions viewer, from May 15th 2011. By Oscar Marín Miró

As we suggest in the following chapter, the feedback between emotions and affects in the streets, squares and networks was at the base of processes of augmented activity in 15M. These episodes were mediated and amplified by processes of technopolitical interaction and multitudinous self-communication, through which the multitude (re)configures itself.

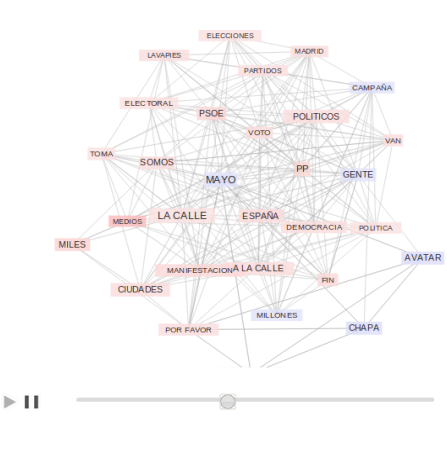
Emotions and affects are not cited much in certain theories and narratives of social change. Nevertheless, if 15M has taught us something is that emotions are key for unleashing political processes, processes that take advantage of networked distributed communication to become self-organized revolts.

Reasons, deliberation and planning are relevant to ensure the consistency of these movements. But without the circulation of affections, indignation and empowerment in this case, there is no possible mobilization or revolt. Emotional activation is tied to cognitive processes that, under certain conditions, end up in the emergence of phenomena of autonomy and collective intelligence.

4.3.3 Vocabulary analysis

Oscar Marín (2013) has carried on an analysis of 15M vocabulary on Twitter. It suggests that, in correlation with the emotional explosion occurred on May 2011, there emerged in (and with) 15M networks a new and cohesive vocabulary. Between May 15th and 29th, in these nascent networks "everybody speaks of the same"; some words appear very frequently and with a high level of co-occurrence. Marín's analysis shows the state of the 15M concept or mental cloud every four days.

In a period of several weeks, the vocabulary, index of an ongoing multitudinous conversation, changes while maintaining high levels of cohesion.



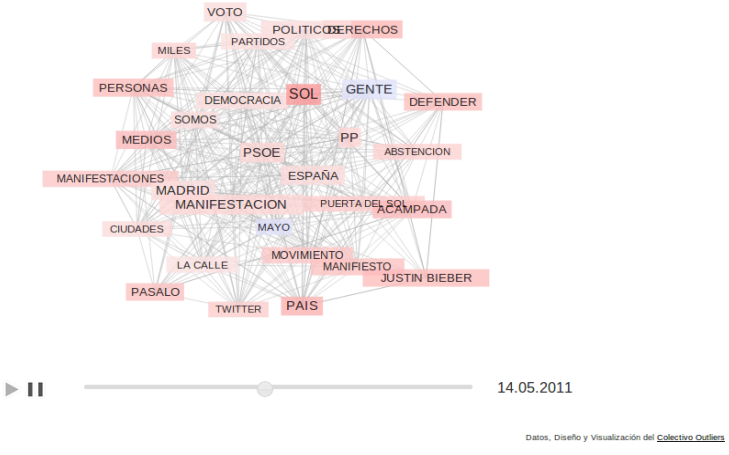
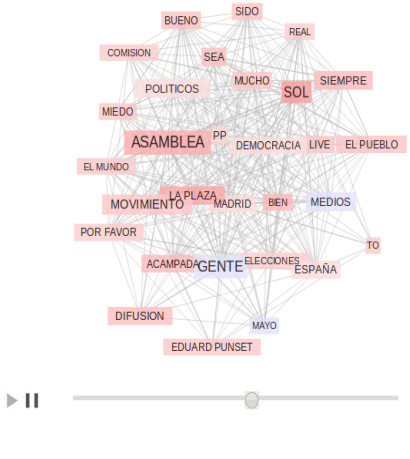


Figure 10 - 11: Network of the most used words in 15M tweets (in the figure, the data from May 22 and 26. Links connect concepts that appear more frequently together in tweets of the analyzed sample. Colors represent "temperature": warmer colors indicate new emerging words, whose use frequency is increasing. By Oscar Marín Miró and Outliers.



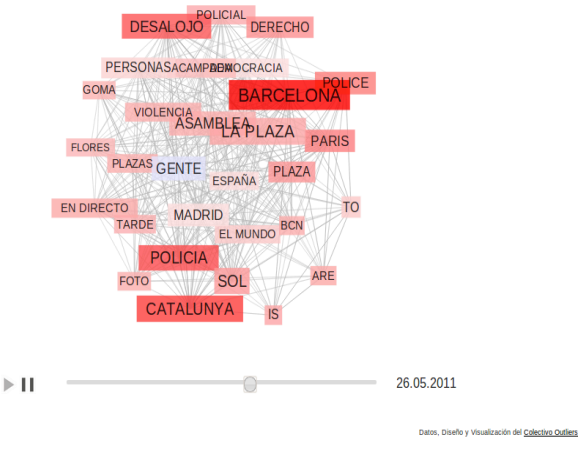


Figure 12 - 13: Network of the most used words in 15M tweets (in the figure, the data from May 22 and 26. Links connect concepts that appear more frequently together in tweets of the analyzed sample. Colors represent "temperature": warmer colors indicate new emerging words, whose frequency is increasing. By Oscar Marín Miró and Outliers.

The results of the analysis also indicate that, around the second week of May 2011, there is a "revolution" in the "15M message". Vocabulary is generated and shared at a very high speed[70], with a rise in its temperature[71]. This type of rises in temperature take place around events such as the

[70]The speed of a concept or, more graphically, its temperature (ranging from blue to red in color), is the variation of the its position in a temporal window relative to the previous one. Negative and positive speed mean that a concept is being used less or more. Its position is defined by its ranking (from more to less) within the list of words being used within the given temporal window.

[71]The rate of increase in the speed of a concept relative to the previous temporal window.

prohibition, dictated by the Electoral Junta, of any demonstration on the squares on the day before the local and regional elections of May 22nd, or the brutal attempt at evicting Catalunya Square on May 27th. These events focus all the attention of 15M networks. They contribute to articulating a 15M vocabulary, that shifts in relation to (sometimes proactively, others retrospectively) the events.

4.4 Data-analogy: 15M and the brain

As a necessary complementation to the work of data-analysis in the previous section, in the present one we will explore the possibilities of a data-analogy. Following an unpublished paper by Baradiarán, Aguilera and Toret, we try to connect some of the data exposed above to research in neuroscience, in order to explore some positive (and neutral) analogies (Hesse, 1966) as guides for interpretation and research.

In this section we borrow concepts and models from neuroscience and systems biology in order to sketch an interpretative framework that helps us to think through the new forms of networked organization and action developed in 15M.

The interpretative framework that we propose is not new, nor an isolated theoretical phenomenon[72]. In the 70s and 80s, the notions of self-organization & emergence reached wide scientific acceptance. A simple idea: that the emergence of global or macroscopic order is possible without the intervention of an organizing agent (genetic, instructive, etc.), but that the distributed interaction among components of a network can amplify microscopic tendencies to generate an emerging order. That notion has become the basis for explanatory models of phenomena ranging from laser physics (Haken, 1984) or far from equilibrium chemistry (Nicolis & Prigogine, 1977) up to neuronal networks (Kohonen, 1988) through the apparition of food search patterns in ants (Bonabeau, Theraulaz, Deneubourg, Aron, & Camazine, 1997) or bird flocks synchronized into a collective behavior (Reynolds, 1987). Beyond mere self-organization, what Keller (2007) calls "one-shot, order-for-free" we find systems that are structured by a combination of self-organized processes and constrictions (stigmergic structures, membranes, connectivity architectures, etc.) that operate as a scaffold in order to reach more complex forms of organization. Differently from the flock or the hurricane as self-organized phenomena, in these cases we see differentiation and functional integration, regulation processes, codes, articulated structures, etc. (Moreno, Ruiz-Mirazo & Barandiaran 2011).

These complex and mixed forms are of the type we have seen in 15M, and other network movements that have emerged since 2011. From processes of virality and spontaneous synchronization at large scales, such as the response to the attempt at evicting Catalunya square on May 27th, where bodies and attention are concentrated on a singular space-time, through the state-wide proliferation of camps, up

[72]The last 30 years have witnessed a profound transformation in different scientific areas, specially, in biology and cognitive neurosciences. It is a result of the success of complex systems theory and, in particular, of techniques for numerical simulation of nonlinear systems, in modeling and explaining the structure and dynamic functioning of various types of networks: metabolic, genetic, neuronal, ecologic, etc. s: metabólicas, genéticas, neuronales, ecológicas, etc. Neuroscientists and psychologists speak of self-organization (Kelso, 1995), neural assemblies (Fujii, Ito, Aihara, Ichinose, & Tsukada, 1996; Varela, 1995), self-organized criticality (Rubinov, Sporns, Thivierge, & Breakspear, 2011), of emotions as thinking enablers (Damasio, 1994)...

to more structured processes of the Real Democracy Campaign, or the later specialization and stabilization of initiatives such as la PAH[73] or the tides[74].

The analogy that we want to explore suggests that neurobiology is to psychology what technopolitical analysis is to the political sociology of 15M. The suggestion is that we can productively project analogies over the ways how different mental phenomena emerge from neurobiology, to the form in which 15M emerged from technopolitics. From the neurobiological activity psychological phenomena emerge, likewise, from technopolitical action (and the connective dynamics that it makes possible), multitudinous phenomena are born. This characteristic is typical of every complex system: phenomena at the macro level (structures, patterns, behaviors) emerge from relations and interactions at a micro-level.

We want to link the brain functioning analogy with the topology metrics, the vocabulary, and the affections in 15M networks.

4.4.1 Structural analogy between brain structure and 15M's communicative infrastructure

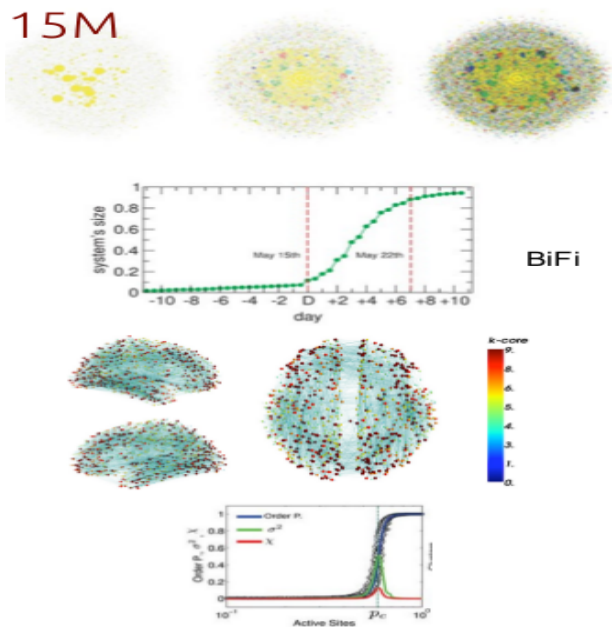
Here, we begin with a question, namely, one concerning the network anatomy/topology has enabled the connected multitude and what relation it has with the anatomy of the brain, as well as the phenomena of consciousness that it makes possible.

A series of key patterns or anatomic properties for neuronal self-organization have been characterized in neuroscience, which have their analogies in 15M. We have already explained that 15M networks are small-world and scale free, and that they facilitate percolation processes. These graphics display the similarities between percolation processes in brain activity and in 15M. In both cases we find transition phases, where suddenly a big part of the system suddenly activates.

[73]The PAH is the Platform of People Affected by Mortgages http://afectadosporlahipoteca.com/ perhaps the most solid of 15M related projects. Its members usually are people affected by mortgages, and organize to stop evictions and to collectively resolve their problems--as well as to offer mutual help. Currently it has more than 260 nodes.

[74]The "tides" are different movements born after May 15th 2011, specialized in different areas: the white tide in health, the green tide in education, and others, which have overflown the traditional union model, joining together service receivers, workers, and affected by cuts in these areas. Other tides, such as the purple one, composed by migrants, have still other organization forms.

Figure 14. Comparison of topology of 15M network's and topology brain network's.



Only when a system exhibits a given connective infrastructure (be it of a biological or technological type) can it afford the emergence of conscious activity. What we analyze in the following point is what it consists in.

4.4.2 Distributed consciousness and dynamic core

We are still far from being able to model and comprehend consciousness and the mind, but with the huge advances in neuroscience we are beginning to find some general principles of organization and essential characteristics of how consciousness may emerge from brain activity. we also find analogous processes in 15M.

After discarding the outdated images of a centralized control of the brain, views of consciousness as a type of emergent pattern in brain activity are on the rise. That is, consciousness does not happen in a specific area of the nervous system, but rather surfaces from the interaction among different parts collaborating among themselves.

According to the dynamic core hypothesis (Edelman & Tononi, 2001; Le Van Quyen, 2003; Varela, 1995; Varela, Lachaux, Rodriguez, & Martinerie, 2001), conscious activity emerges from moments when different neuronal areas connect to (and disconnect from) a dynamic unit of synchronization that acts as a reference pole for the rest of neuronal activity.

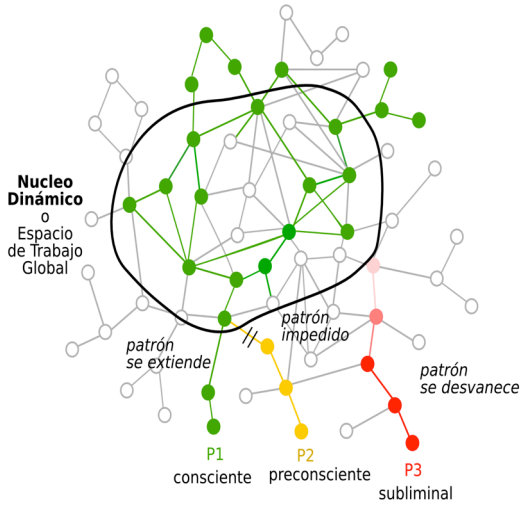
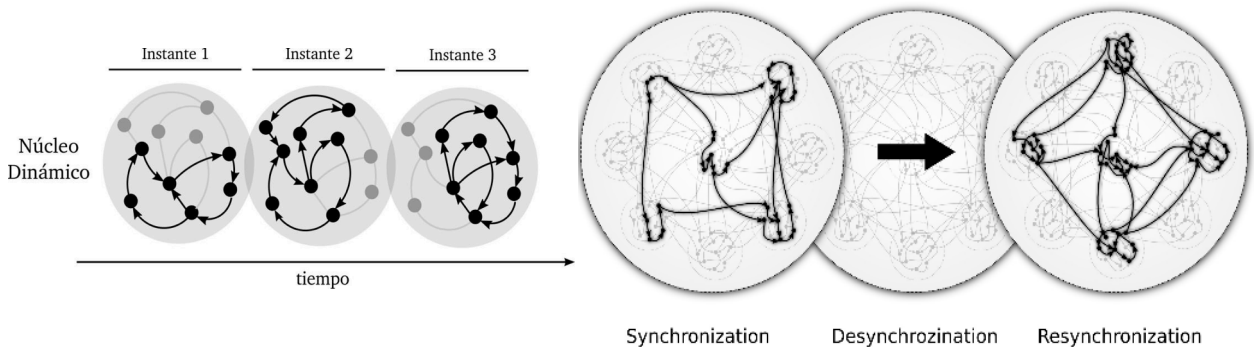


Figure 15. Neurodynamic conscious process (green, P1) accesses to the global workspace or generates a thalamocortical dynamic core. Preconscious processes (yellow, P2) are not able to spread and form a dynamic core by occlusion or obstruction by another conscious pattern, which prevents its extension. Subliminal processes (red, P3) vanish before having an option of becoming conscious (Dehaene, Changeux, Naccache, Sackur, & Sergent, 2006)

A dynamic core has the form of a network of neuronal activity, what is defined as "functional network". In the organization of the 15M networks we see a very similar phenomenon. We have a huge system (what we have called a network-system, Toret et al. 2013) where different functional and geographic areas are salient. They coordinate in different ways at different times, connecting and disconnecting at moments of global consciousness. The same neuron can participate in different dynamic cores at different times, as a personal or collective account may enter different dynamics in a movement at different times.

From the first call by Real Democracy Now, through the camps, the tides, the PAH, 15MpaRato up to Tokeabankia, the movement has put to work a series of dynamic cores that have served as reference poles around which processes of synchronization and coordinated action have taken place. Some of those poles were global, others, local; some lasted weeks, while others only days. Some have vanished only to reappear with increased strength. What they have in common is that all of them have been able to garner big segments of the population, not always the same ones, to act as a coherent unit, as a collective body or consciousness of sorts.

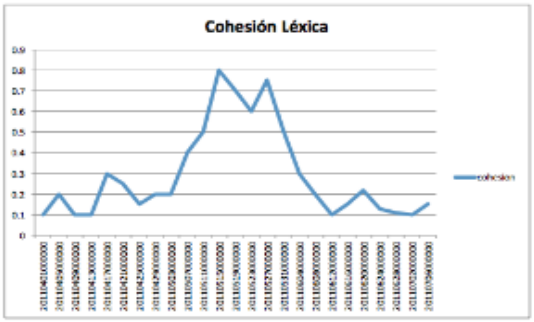
Figure 16: Scheme of the dynamic core as organizational form. Different parts of the system temporally synchronize,



dissolving afterwards and giving way to new configurations, without all the parts having to be synchronized all of the time.

4.4.3 Lexical emergence and cohesion, and collective perception

Conscious experience is composed by the integration of "semantic" elements in brain activity (Tononi & Edelman 2001). Barandiaran et al. have identified the lexical cohesion that characterizes what they analogically call moments of "consciousness" in social networks. The state and content of the 15M collective "consciousness" can be tracked by techniques of semantic and coherence analysis. The language cohesion and acceleration shown in the previous section show the discontinuous synchronization of collective conversations in every key moment of the movement. This can be taken as a potential indication of a shared, if basic perception of what happens. High levels of affectivity/emotionality seem to be correlated with vocabulary cohesion, what suggests a relation between affections and language becoming--and thereby with collective consciousness too.



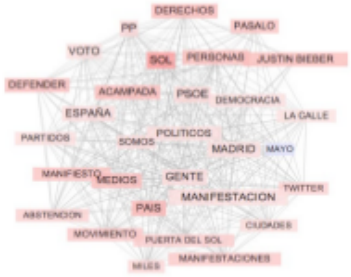


Figure 16 and 17. Lexical cohesion of the 15M language

At the same time, we can see how a vocabulary tied to the events emerges. It is interesting to see how this vocabulary tends to relate to previous moments and is stored in the multiple memory holders of the movement (from Twitter servers to activists brains and bodies), generating a shifting collective (short and long term[75]) memory.

4.4.4 Emotional and affective neurodynamics

For the last two decades, neuroscience has advanced in studying emotions and their relation to cognition and consciousness. In very broad terms, emotions appear related to the signals received by the brain from corporal changes (f.i. heartbeat acceleration), induced by an external or internal stimulus. In a way, the body has to "evaluate" the situation and modulate cognitive capacities in one direction or another. Thus the brain affects the body and vice versa in feedback loops that progressively construct emotional (or affective) states. The brain cortex is coupled to the autonomous nervous system (charged with body regulation) as it is to the environment via the senses and the motor capacity. This integration

[75]While the attention, measured by duration of conversations (say, around a given hashtag) tend to be ephemeral, people, databases (in many cases, proprietary, with the implication that such as situation implies), and a plethora of infrastructures help to keep a distributed and lasting, even if not always accessible (as in the case of Twitter databases) and thereby "forgetful" collective memory.

between neuro-sensorimotor loops (horizontal cortical axis) and neuro-corporal ones provides human experience with an emotional significance, able to modulate, amplify, select and recall a given experience with intensity.

Emotions play a key role in what Damasio (1999) calls *core consciousness*, which emerges in the moment when emotional circuits take part in the evaluation of a stimulus and its possible effects on the body, anticipating to a direct body response. Therefore, emotions amplify attention and reinforce the meaning of certain events, augmenting the capacities for learning, they maintain a cognitive state longer, etc. through the segregation of neuromodulators that reinforce connections, increase or decrease brain activity, etc. In particular, indignation is one of the most complex emotions in neurobiological terms (it requires the participation of very diverse brain regions). It fall within the family of moral or ethical emotions of social character (Haidt 2003, Damasio 2007) and it has been neurologically associated to a sense of social agenciality (Moll et al. 2007), otherwise, it is able to mobilize for an action that integrates sophisticated mechanisms of evaluation of the social context.

Here we find a strong parallelism with the corporeality of gatherings in the squares and demonstrations where the collective catharsis allows to reconnect and re-potentiate emotional, corporal and cognitive activity, to maintain the attention on a phenomenon, to reinforce connections and to generate collective memory. The study that we presented shows peaks of affectivity in the most significative moments, those of greater growth and strengthening of 15M connections. These peaks of affective/emotional activity are also characteristic of skin conductance (the most used technique for the physiological emotional activity) for diverse cognitive tasks.

Consciousness is not something fixed. It is dynamic, it synchronizes, de-synchronizes and re-synchronizes around new emotions, languages and environment.

4.5 Collective Intelligence

The analogy with the brain gets us closer to another central point in our exposition, namely, the one concerning the processes and modes of collective intelligence that we believe have appeared in 15M (and before) and will appear, probably modified, in future forms of technopolitical practice. It is relevant to point out that the notions of "consciousness" and, even more, "intelligence" are still in dispute (for a synthesis of critical arguments, Schlinger, 200); more importantly, the "collective" versions exhibit obvious differences with the "individual" (not the least, because the former presuppose the latter[76], and their relation). Unsurprisingly, there are diverse approaches to the topic. Since the point concerning collective consciousness has been already touched upon in the previous section, we will only punctually come back to it, especially when we refer to Miguel Aguilera's (2013) work on 15M's collective consciousness.

In this epigraph, we first distinguish three approaches to collective intelligence. Then we compile some general conditions for its emergence, which have been outlined by authors situated within these three approaches. More than trying to settle the matter, the first allow us to cast different possibilities. Finally, we conclude with a preliminary analysis of several types of processes of collective action, to which some

[76]We are aware of the limitations of the analogy with the brain, body, and emotions. Many of the phenomena just described, and the ones we explain below, may be accounted for by the presence of individual intelligences. We partially address this matter as we distinguish the "strict" and the "flexible" approaches to collective intelligence.

form of "smartness", "wisdom" or "intelligence" has been ascribed (in different senses and with varying legitimacy). Each of them will be illustrated by cases.

4.5.1 Collective intelligence: three approaches

When it comes to conceptions and cases of collective intelligence we would like to distinguish three approaches, of different value for our exposition. Before presenting them, we'd like to mention two points they share: the first is the interest in the possibility of technologically articulating intelligence (differently from the literature concerning the "wisdom of the crowds", and some of the versions of collective intelligence frequently hold by 15M activists, which in many cases do not attend to technology); the second, related with the first, is indicated in the very formulation of the concept, namely, their attention to collective forms of intelligence (departing from most of the literature on intelligence in modernity, centered around the individual subject).

The first approach that we want to bring into our argumentation may be defined as "philosophical-political". It is paradigmatically embodied in Pierre Levy's work (1993, 1999, 2011), and exhibits a markedly political and even emancipatory orientation. We share its political edge, although we try not to lean towards great narratives, as he does, and to sketch a better defined relation to scientific discourse[77]. Furthermore, Levy's insistence in underlining cyberspace, understood as a purely digital sphere, as the field of collective intelligence, separates his position from our interest in technopolitics as an activity that includes urban and physical space into a sort of augmented, circuited or civilized cyberspace[78]; in relation to this, in our analysis we do not superordinate knowledge (as he seems to do) to wills, affects, bodies, or action itself.

A second approach to collective intelligence that we draw upon may be defined as "cognitivist"[79]. It is composed by what we consider, for the purposes of our narrative, as two strands of literature: one on "human cognitive augmentation" (Licklider, 1960; Engelbart, 1962), which we label the "engineering branch"[80], and another on "extended mind" (Clark & Chalmers, 1998), which we label the "theoretical branch". This second branch ranges from positions describing the material, organizational, or cultural conditions of (distributed) cognition (Hutchins, 1999), to those that focus on the conditions for "supersizing the mind" in a stronger sense (Clark, 2010)[81]. The first, engineering branch (the one where the formula "collective intelligence" has been frequently used) begun as an anthropotechnic (Sloterdijk, 2001) narrative that defended the pertinence of, and explored technological possibilities for, operating

[77] Levy's (1999)general writing style and particular suggestions flirt with "hype" and may be exposed to some of the attacks by Sokal & Bricmont (1998, 1999).

[78] Cyberspace in the sense that it is defined by feedback, going back to Wiener's (1948) notion of cybernetics. The question of the relation between "spaces", that Levy (1999) poses in metaphysical terms (he speaks of anthropological, almost metaphysical spaces, causally disconnected, but related through desire), appear in our cases as an empirical matter, crucial in order to analyze technopolitical action, which points towards dynamics of inter-layer feedback and circuitry, see chapter 3.

[79] To be distinguished from the cognitivist tradition in philosophy of the mind. The term tries to help to situate an approach (rather than a tradition) and along a different context. As in the case of "consciousness" and "intelligence" there are different views on what the "cognitive" is (Halpin, 2014; Clark, 2010). Adam & Aizawa (2001) have suggested the cognitive is whatever the brain does.

[80] This engineering branch begins and culminates with the works of Engelbart and has unfolded in relation to various R&D US programs. According to Halpin, this imbrication has implied some lacks in terms of philosophical articulatio (in general, collective intelligence has been less studied than individual one, on both the engineering and the philosophical side). Since the 60s, they have developed different programs to explore and develop the possibilities of reaching a "human-computer symbiosis" (Licklider, 1960) and augmenting the human intellect (Engelbart, 1962).

[81] We draw upon a non-published paper by Harry Halpin as a guide into this literature.

and amplifying human intelligence (understood in bio-cognitive terms). Both branches[82], engineering and theoretical, tended to center their narrative on the individual (sometimes exclusively), although Engelbart (1995, 1999, 2003) has extended his attention towards the design of collective dynamics of intelligence, up to the point of proposing metrics of "collective IQ" (which, again, seems inspired by the old, individualist, much debated[83] IQ metric). In our approach, though, the figure of the "connected multitude" is as central to the narrative as the singularities assembled in and around it. A second point to note is the lack of interest on political matters of this second approach to collective intelligence, as compared to the first. This means that although the "philosophical-political" and the "cognitivist" approaches underline the role of knowledge, Levy gives a broad reading of it, as "savoir-vivre", as a form of life and construction of worlds, which must be, first of all, "valued"; the latter seems to focus on cognitive processes (even if extended to include materiality and even certain cultural conditions) and, in Engelbart's branch, is laden toward either biotechnological or sociotechnical engineering. For this, we may term this engineering branch as "technocentric" (if not "technocratic), to distinguish it from what we may deem as the "democentric" (if not "democratic") approach essayed by Levy.

That said, the decidedly empirical —even quantitative— character of the cognitivist approach connects with our interest in analogical data-analysis of collective action and consciousness, even if our metrics do not pretend to be "representational", IQ test style[84]. Likewise, we believe the suggestion that the mind is not only "in" the brain "in" the skull, as well as the attempt at mapping the conditions for its technological extension (we include, below, Halpin's suggestions), are valuable to approach collective intelligence[85].

Finally, a third approach to the concept of collective intelligence, that may be defined as "informational", "computerist" or "computer-centered", comes from the sphere of computation and systems design, be they sociotechnological (Heylighen, 1995, 1999), more frequently, technological (Wolpert, Tumer & Frank, 1999; Wolpert, 2003; Segaran, 2007) and, sometimes, of other types (for a synthesis of the area, Wolpert & Tumer, 2008). These works range from the analysis and design of data traffic, computational systems and artificial intelligence, to economic modelization and online collaboration optimization. We can situate this computer-centric approach (in some cases these works describe systems with computers only) to the notion of collective intelligence as an extreme possibility, covering mostly its infrastructural layers or forms (to the point where the polysemy of the notion becomes patent).

[82] If Levy (1999) never stops underlining the value and proliferation of singularities in collective intelligence processes, their insertion in the collective is similar to the one we suggest when using the concept of the multitude--see chapter 3, definition.

[83] For a introductory, if "interested", synthesis of the debate, Schlinger, Henry D. 2003 The myth of intelligence *The Free Library* (January, 1), http://www.thefreelibrary.com/The myth of intelligence.-a098315576 (accessed March 22 2014)

[84] Even if we understand our results more as "markers" or indicators in an analogical and constructed way rather than as fixed metrics of intelligence a la Engelbart.

[85] For Halpin, at "the heart of the Extended Mind Hypothesis is the unsettling notion that technology can count as part of the mind; this rather unsettling hypothesis contradicts those who would wish to restrict the mind to a sort of mapping with the human brain". This point suggests something partly subjacent to the brain analogy essayed above: 15M potentially allows to rethink the becoming of the connected brain and mind, as something whose processes can be carried out outside the skull. Nevertheless, in our work we try to underline the centrality of corporeality, affects, and emotions, which are not necessarily cognitive.

4.5.2 Collective intelligence: some general requisites

In this second point on collective intelligence we present some conditions of it, as framed by each of the three presented approaches. In that way we outline different ways of approaching those conditions, which cast light on the polyhedric (diversely constructed) notion and phenomenon of collective intelligence.

The exposition is divided in two parts. In the first we present some general, but "strict" conditions for the emergence of an extended mind, which may be required for the emergence of collective intelligence. That list is taken from Halpin's work and connects with the cognitivist approach. We then quote some proposed criteria for collective intelligence, which may be deemed more "flexible", coming from the "computerist" approach. Finally, we point out some conditions indicated within the "political-philosophical" one.

On the basis of the literature on "extended mind" (Clark and Chalmers, 1999) and a discussion that we cannot present here, Halpin has suggested four requirements that a technology would have to comply with in order to be considered "enabler" of an extended mind. Before enumerating them, it is worth noting his comment that

"no technology is guaranteed to be a cognitive extension, but is only given as one in lieu of a particular well-defined problem. Given that a multitude of technologies may count as cognitive extensions under differing conditions, the key point is that there is no "essence" of the human, but that the mind is constantly assembled from differing configurations of biological and technical components in a given environment that can be adequately described as a cognitively integrated whole".

According to Halpin, some general conditions for technologies able to support an extended mind and intelligence (understood as sets problem-solving and problem-specific capabilities) are:

a) being *portable*, defined in terms of whether or not the capability is accessible when needed. This does not mean they are always accessible,

b) being *robust*, so that capability is not only present when needed,

c) the third condition is that such a cognitive extension should *augment* existing capabilities by providing a genuinely new capability, significantly extend an existing capability, or replacing a missing capability.

d) Lastly, the capability must be *dove-tailed*, or in other words "evolutionarily co-adapted" (Clark, 2010).

Halpin's approach, which connects with both the "extended mind" and the "augmented cognition" branches mentioned above, is useful when it comes to outlining some general, strict conditions for collective intelligence, as understood within the "cognitivist" tradition. It defines the minimal conditions for individuals to "extend their minds" through technology, which seems to be a prerequisite for articulating wider processes of collective intelligence. Nevertheless, Halpin's requisites may be deemed "strict". A more "flexible" approach (which he discusses, and we situate within the same "theoretical branch" of cognitivist approaches) is afforded by the literature on distributed cognition (Hutchins, 1999). This notion may connect more easily with ours (and Levy's) perspective.

For us it is relevant to underline that, in the case of human-machine, as well as in humans-machines networks or systems (in their various permutations), the integration for collective action as well as intelligence is primarily performative or functional (Barandiarán et al., 2014; De Landa, 2006). As Halpin

notes, it does not presuppose incorporation or perdurability (for instance, the technology does not need to be a chip in the brain, it can be a mobile connected to the Internet or a pair of Google glasses). For collective intelligence processes, it may not even require a high level of robustness either--for some individuals, at least. This may be a possibility insofar as there are others who remain able and keep contributing to a given collective process.

As an example of this second, distributed cognition or "flexible" approach, we could briefly list some of Heylighen's (1999) suggestions concerning the conditions for the construction of a "Collective Mental Map". He points out that:

"A mental map is not merely a registry of events or an edited collection of notes, it is a highly selective representation of features relevant to problem-solving...a mental map consists of problem states, possible actions that lead from one state to another, and a preference function for choosing the best action at any moment."

Although we reject his recurs to the notion of "representation" ("tracing" would be both more accurate and conceptually economic) we find worth noting some of his design suggestions as well as his inspiration in stigmergic processes by which ants locate food. Back in 1999 he suggested three requisites for moving from the existing architecture of the web to one that enables the emergence of CMM:

"Three basic mechanisms of averaging, feedback and division of labor give us a first idea of a how a CMM can be developed in the most efficient way, that is, how a given number of individuals can achieve a maximum of collective problem-solving competence. A collective mental map is developed basically by superposing a number of individual mental maps. There must be sufficient diversity among these individual maps to cover an as large as possible domain, yet sufficient redundancy so that the overlap between maps is large enough to make the resulting graph fully connected, and so that each preference in the map is the superposition of a number of individual preferences that is large enough to cancel out individual fluctuations."

The basic intuition is the same underlying the "wisdom of the crowds" notion, which we have mentioned in chapter three and analyze in the following epigraph. After analyzing the different techniques available (in 1999)[86] he concludes listing three mechanisms for the development of a complex CMM:

1) Superposition of several individual contributions, to average out fluctuations away from the optimum;

2) Positive feedback between subsequent contributions, to amplify weak signals and accelerate overall development;

3) Division of labor with overlap in the domains of expertise, to allow a diversity of specialized mental maps to be integrated into an encompassing CMM.

To conclude this point on general requisites that the three approaches to collective intelligence have provided us with, we would like to stress Levi's (1999) points on the matter. In his political vein, his suggestions are much more oriented towards promoting dynamics of self and alter "acknowledgement" and the mobilization of people's competences, rather than to define the biotechnological conditions of

[86]Note to reader: new references to be included before final draft is concluded

an extended mind ("cognitivist approach"), or the technological design that may both codify it and contribute to its emergence ("computerist approach"). To see the difference with the latter, this passage may be enough:

"The wisdom of the other cannot be reduced to a sum of results or data. Knowledge, in the sense in which we are trying to promote it here, is also a savoir-vivre, it is inseparable from the construction and the inhabitation of a world"

Levi shows how in these "general requisites" for collective intelligence there would be more things to take into account than Heylighen's preoccupation for optimized search results or recommendations. Indeed, many social (even technopolitical) problems call, more than for optimized ways of getting solved by harnessing brute cognitive power (a la Engelbart, 1999), for intelligent collective ways of being avoided[87]:

"Not acknowledging the other in his intelligence is to deny his true social identity, it feeds his resentment and hostility, it sustains the humiliation, the frustration wherefrom violence is born. Nevertheless, when the other is valorized, according to the variegated spectrum of his knowledge, he is allowed to identify in a new and positive way, it contributes to mobilize him, to develop in him, on the opposite, feelings of acknowledgement that will facilitate the reaction, the subjective implication of other people in collective projects".

Furthermore, he defines collective intelligence in a way that somehow outlines what to do about it:

"It is an intelligence distributed everywhere, constantly valorized, coordinated in real time, which conduces to an effective mobilization of competences. We aggregate to this definition this necessary idea: the ground and objective of collective intelligence is the mutual acknowledgement and enrichment of people, not the cult of fetishized or hypostatized communities".

He then provides a concrete feature on this regard: the kinetic map or "cinemap". It embodies his notion of the centrality of self and alter acknowledgement (which may be understood as limitedly coded in "karma feedback" systems), and adds a "visual" layer to the CMM idea, which tends to work on the background (say, through an algorithm for recommendations), guiding users without presenting a collective image:

"A new location, orientation, and navigation instrument... A collective intellect carries on navigations in an inestable informational universe: a cinemap emerges from that interaction... it is not normed by averages or statistical distributions in the mercantile way. The cinemap deploys the qualitatively differentiated space of the attributes of all objects in the informational universe".

He continues: "events, actions, and people would be situated in the dynamic maps of a shared context, and would continuously transform the virtual universe within which they get meaning".

And further stresses that cinemaps are "of immediate practical use: localization, preparation of itineraries, strategies, coordination... it allows to read a situation, a dynamic configuration, a qualitative space of the common significations of the members of the collective intellect or the collective imaginary. Using a cinemap, a human group constitutes itself, precisely, into a collective intellect."

[87] We do not want to suggest that Levy's points about how those problems work or how to solve them are correct, only to stress the difference between various approaches to both problems and collective intelligence.

This view clearly challenges the existing systems of community visualization, including those that are currently more common in the field of data visualization. Supposing a cinemap in Levy's sense is needed or viable. To conclude, we move from his potential suggestions for design back to his political side. Taking distance from the ideal of an "optimized problem solving" system or an augmented brain or mind (although he evokes these ideas when talking about a forthcoming "hypercortex"), he suggest that "the ideal of collective intelligence implies the technical, economic, juridical, and humane valorization of an intelligence distributed everywhere with the aim of unleashing a positive dynamic of acknowledgment and the mobilization of competences."

4.5.3 Processes of collective action and collective intelligence: a few cases

Systematizing the necessary (much less the sufficient) conditions for the emergence of processes of collective intelligence is an undertaking that far exceeds the possibilities of this text. We just wanted to indicate some approaches to them , in order to illustrate the approaches as much as the conditions themselves. Those approaches would be differently (perhaps complementarily) connectable to design. Some of them converge in the last point of this threefold epigraph, where we want to briefly enumerate and discuss several types and historic cases. What follows is a preliminary analysis of three ideal types of processes of collective action, to which some form of "smartness", "wisdom" or "intelligence" has been adscribed (in different senses and with varying legitimacy).

As we saw in our definition of connected multitude, and have insisted when discussing the analogy of the brain, we believe that there is no intelligence when there is no collective (of humans and technologies) in action. Thereby, when we use the concept we are not trying to refer to a substance's faculty or property but to performances or emerging capacities. This means that different types of organization and multitudinous activity may manifest different intellective features, modes or aspects. Without aiming at completeness, we will distinguish three types of processes (which usually appear combined or nested, generating more complex ones) to which collective intelligence (or consciousness, smartness, or wisdom) have been attributed[88]: opinion and decision formation (for narrative economy purposes we will refer to this as "formation", when it doesn't obscure the passage), collaboration and action-mobilization. We try to think through each of them recurring to both academic literature on the topic as well as concrete cases.

The first type will be "formation". Here, we draw upon three cases: the application appgree and the literature around the "wisdom of the crowds", the platform YourPriorities in relation to the deliberation and consensus literature, and finally, our own analysis of opinion and decision formation in networked collective action.

The third type of process that we want to analyze here is action/mobilization. Using a concept presented in our theoretical framework, we want to start by distinguishing between "multi-layer" (the paradigmatic case being an ICT-mediated street action) or "mono-layer" (such as an urban action without ICT mediation or a campaign developed only on Twitter[89]).

A case of multi-layer action/mobilization is that of "smart mobs" descritas por Reinghold (2004). Usually following an aggregation (Juris, 2012) and swarming logics, this is a

[88] A parallel study could be carried out to study the conditions (social, cultural, disciplinary, etc.) and processes by which these attributions are made, justified, and accepted.

[89] In this case the action would be primarily communicative, or sef-communicative.

"real-time, modular and reconfigurable organization of individuals that get e-synchronized, enacting an instantaneous coreography (usually, involving avoiding or approaching a target) for achieving a given task or purpose". These "smart mobs" are able to solve problems (such as avoiding the police) and act coordinatedly on the basis of information only available via mobile devices. This is possible thanks to the position (multiple and distributed) and contribution (additive, and--or thanks to--ICT mediation) of the participants in the action (some of them potentially kilometers away). The action and problem solving is something that nor intellectual nor physically could be carried out by the participants separately or without communication. The connection takes place by different means, ranging from messages (sms, whatssap, twitter, etc.) to crowdsourced geolocalization applications such as Comunica.cc[90] or Sukie[91]. They usually have a lattice, and sometimes, a free scale topological structure; the difference is usually in many cases based on the application or technology being used. Some of the limitations of this kind of "smart" and collective problem solving, especially when it relies in sms or whatsapp, is given precisely for the topology that it tends to describe and its aggregation-centered logics, which limits its cooperation capacity and thereby richness of performances.

A case of mono-layer action, usually integrated in more complex, multi-layer ones, is the launch of a given campaign on Twitter. As Aguilera (2013)--whose argument we cannot present here in detail--has shown, metrics of multifractality show that activity around certain Twitter hashtags (prominently, the hashta #15MpaRato among the selected for the study) indicates the existence of self-organized criticality or pink noise, which when happening in the brain is considered "the characteristic noise of consciousness". Aquilera has used the term "catalysts" to characterize the work of the collectives modulating dynamics on social networks[92]. These collectives try to help in focalizing attention and conversation around certain issues or projects[93]. He believes that work implies also a process of "active listening", one of the basic practices uphold in 15M, as part of assembly process. Catalysis and pink noise are based on previous, somehow more basic processes of collective intelligence. They pressupose a phenomenon that has been defined as "stigmergy" (from the Greek "stigma", "mark", and "ergon", "action"). They presuppose hoarding dynamics afforded by hashtags and the practices built around them.

4.6 Technopolitical practices and self-communication

In this section we describe some of the pivotal technopolitical practices in 15M, focusing on the role and use of ICTs.

In 15M, participation via social networks was very high. According to a Gather studio[94], 82% of the respondents say they learned of the calls for the May 15th demonstration, and later ones, via social

[90] Put to work during the action for surrounding the Spanish parliament on September, 2012. Moen labelled as Voces25S. More info available at http://voces25s.wordpress.com/.

[91] Deployed in Occupy London Demonstrations. More info available at http://www.wired.co.uk/news/archive/2011-01/31/sukey-protest-app

[92] He takes the notion from Levi (2012) and Barandiaran (unpublished talk).

[93] In the case of 15MpaRato the objectiv was to bring Rodrigo Rato ex-minister of the Economy, ex-IMF director and responsible of Bankia, a savings bank, during fraudulent operations that affected thousands of deceived investors. A crowdfunding and a social media campaign was launched, which gathered the required 15000 euro in only 24 hours, and wide mass media atention. The case is still ongoing, and organizations (including official political parties have sued Rato afterwards, for similar reasons).

[94] Garher Estudios; Análisis del movimiento 15M, 2011. Disponible. en: http://www.gatherestudios.es/2011/05/23/encuesta-sobre-la-opinion-real-sobre-el-movimiento-social-democracia-real-ya/.

networks, 36% learned from friends and acquaintances, amigos 33% by hearing it on tv, and 21% read it on the news 29%. 89% of participants in 15M mobilizations had Facebook accounts, 53% on Twitter (a platform that experienced a clear increase in number of new users_during the protests) and 38% on Tuenti[95].

15M has been able to intervene in the public sphere, which in the network society is shaped by mass and social media (Habermas, 1980), changing its voices and actors. These new actors have circumvented different media blockages and been able to generate alternative circuits for generating and spreading their messages, frequently, through viral, multitudinous, open and participative, anonymous campaigns. With that it has also extended the centrality of digital social networks, challenging the tv hegemony.

Smartphones[96] or mobile communication devices have been a crucial element in the communication, coordination and action dynamics of 15M. They have enabled the integration of internet usage into the various types of urban, mobile actions of the movement. According to a study in the week between May 16th and 23rd, 2011, there was an explosion in smartphone data traffic., with peaks of a 20% increase. Smartphones have facilitated (eventual technical and sociotechnical problems notwithstanding) the practical connection between the street and the internet. They, along with the platforms (specially, WhatsApp and Twitter, but also other, activist ones such as Comunica.cc) have facilitated (or "augmented", in terms of Licklider, as we saw above) activists' comprehension (or construction, in a interpretative and pro-active sense) of different situations in real time. It has also enabled them to narrate (via services such as streaming, and, again, WhatsApp and Twitter) in a first person mode (be it singular or plural) the events on the terrain through forms of communication shifting between private conversation and peercasting[97]. As the image below suggests, we can apply to mobile phones an expression frequently used by 15M activists to refer to their bare hands in the face of the police: "these are our weapons".

Smartphones were crucial in an ecosystem of multiple media and practices, which generates a combinatorial effect that brings the possibilities beyond what any single one of them may achieve. The 17% increase in internet traffic from April to May of 2011, may be taken as an indirect, aggregate metric of the activity on these various platforms (Facebook, Twitter, streamings, etc.) through various venues (primarily computers and smartphones). In Spain, 80% of citizens think that politicians who only work for their interests and not those of citizenship . In 2011, Spain had a 64% of intenet penetration rate , and a smartphone penetration rate of 20% among the population (almost doubling the 11% average in Europe) . Spaniards spent 632,5 million of hours on the internet on May 2011, around 27 hours per week and 4 per day[98]. There is a clear increase in the use of social networks as well as news platforms, as well as instant messaging services. The sharpest increase took place on Twitter, Facebook y Windows Life Profile, in detriment of entertainment and gaming webs, whose traffic decays in this period. This

[95]Tuenti is a Spanish social network.

[96] España es el país líder en Europa en uso de 'smartphones' con un 66% de penetración, mientras que la media en EU5 (Inglaterra, Francia, Italia, Alemania y España) es del 57% .Ver más en: http://www.20minutos.es/noticia/1900266/0/espana-lidera/uso-smartphones/66-penetracion/#xtor=AD-15&xts=467263

[97]Peercasting is a "method of multicasting streams, usually audio and/or video, to the Internet via peer-to-peer technology. It can be used for commercial, independent, and amateur multicasts. Unlike traditional IP Multicast, peercasting can facilitate on-demand content delivery" Buford, John F.; Yu, Heather; Lua, Eng Keong (2008). *P2P Networking and Applications*. Morgan Kaufmann. p. 203. via wikipedia

[98]The source is the ComScore study on Internet use http://www.comscore.com/esl/Press_Events/Press_Releases/2011/7/comScore_Releases_O_view_of_European_Internet_Usage_for_May_2011 (last retrieval 20/08/2012).

does not only show an increase in the use of the internet, which may be 15M-related, but also towards a variation in "cognitive diets", that is, on peoples' use of their time on the internet.

One of the most interesting and productive tensions within 15M and other movements, such as Occupy, has been that between a multitudinous reappropriation of corporate social networks for collective action and the development and self-management of free platforms for the movement (García, 2012; Candón Mena, 2013; Roos et al. 2012). The multitudinous use of groups, fanpages and profiles on Facebook, Twitter as well as Youtoube channels, went hand in hand with the creation of websites, collective blogs, alternative social networks, and prototypes for different purposes, built with code and logics inherited from the free software culture. N-1.cc, stopdesahucios, Propongo, Democracia 4.0, Reddry, Takethesquare, Oiga.me, comunica.cc, and a long list are examples of this[99].

The free and self-managed, social network n-1.cc, born in 2008, received an exodus of 15M assemblies and collectives that are suspicious of or frustrated with Facebook as an internal organization space. The platform rose from 3,000 users on May 15th 2011 to more than 30,000 a month later.

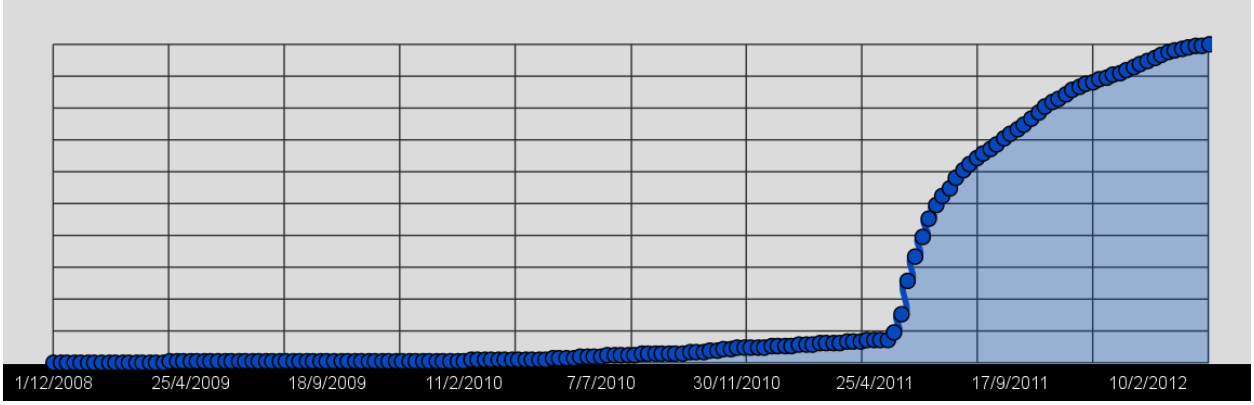


Figure 2: Graph of growing social network users n-1.cc linked to 15M. The growth of user profiles is exponential.

This was a landmark in the digital autonomy of the movement. Camps and nodes created there their groups, commissions, neighborhood and town assemblies. More than 400 groups were created, and 200 of them counted 45 members or more. An autonomous structure of mail management was created by collectives such as 15Hack, with 224 listservs, and a volume of around 2 million mails in the first few months of the movement.

We already underlined the roles played by etherpads in 15M technopolitical practices. A collaboration, web based tool for editing texts in real time. It allows authors to simultaneously modify the text and see the modifications by the rest, with the contribution of each of them marked in a definite color. The application allows checking and reproducing back and forth during the whole process of writing and editing. A chat window on the side allows discussion and conversation. The result is a sort of palimpsest built in real time, collaboratively. Etherpads have been profusely employed in 15M for writing communications, research documents, design campaign launches, and a long list of practices. As an almost default gesture for addressing a collaborative task, an etherpad is open and the people involved

[99] A list of these tools and their use in this context can be found in Alcazan et al. (2012), available free, in Spanish, at http://www.icariaeditorial.com/pdf_libros/Tecnopolitica,%20internet%20y%20r-evoluciones.pdf

start to work in view of everyone and with the possibility for any of them to modify and edit. This usually presupposes some level of group trust, as well as a netiquette for collaboration[100].

Equally important were the practice of streaming (and peercasting more broadly). It has allowed people to get involved in events at a distance. Moreover, they have helped to articulate a real-time, first person (in the singular and the plural, personal and collective) narrative on events, and, in relation to this, to prevent, defend from, or record police abuses. Streaming has contributed to different forms of distributed surveillance or sousveillance, vigilance from below.

Streaming is key to understanding the use of live communication in 15M. Dozens of 15M channels were set up. A culture of streaming, featuring prominently the figure of the streamer has been key in providing meaning and defense to 15M direct actions. In peak moments of Acampada Sol, its streaming channel audio reached 10 million views in only 3 days. 15M recurred to different forms of peercasting, "narrowcasting or broadcasting, depending on the purpose and characteristics of the intended communication practice" (Castells 2009, p. 55), generating or targeting diversified audiences, not only in terms of their interests or demographics but of their practices[101] (Tarrow, 2005).

Another remarkable feature of 15M technopolitical practices has been the deployment of collective identities[102]. These identities gain visibility in relation to certain digital profiles or Fanpages (such as real democracy now, acampadasol, or 15MpaRato) on Twitter and Facebook, but these are only two platforms within a wider technopolitical module of organization. Most 15M collectives (identities) are usually assembled a blog or web, Facebook group or Fanpage, Twitter profile, mailing list and/or a n-1.cc group, some of them with a related Youtube or streaming channel and all of them making profuse use of etherpads. This generated an ecosystem of sorts, with different, interrelated collectives whose identities are assembled upon and through different platforms and practices.

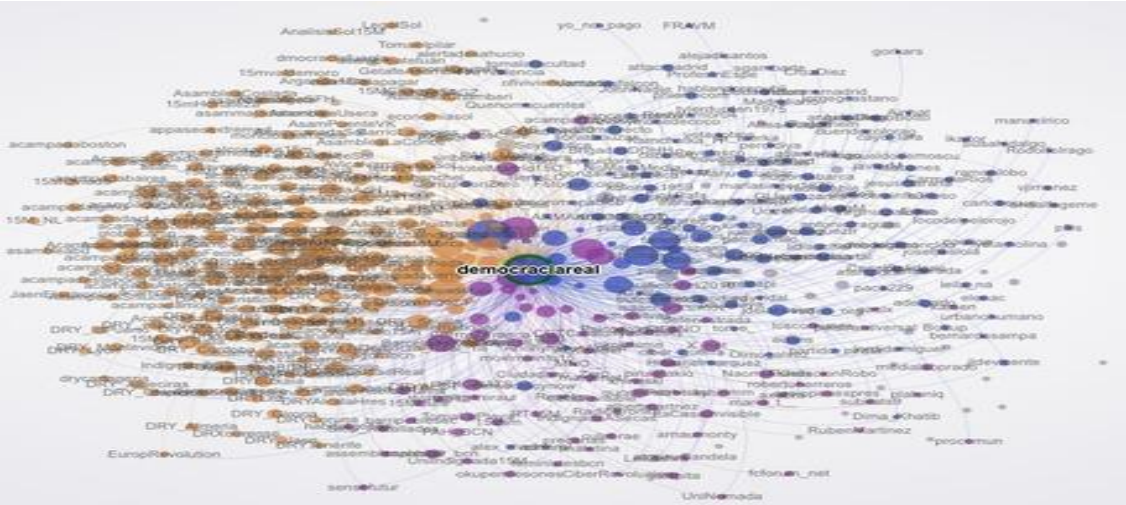


Figure 21. Map of the 499 accounts for following the #SpanishRevolution, by Manuela Lucas, available at http://www.manuelalucas.com/sre/

[100]The ways in which this is achieved go beyond the space of this work.

[101]Castell has described "creative audiences" (Castells, 2009). From the viewpoint of 15M, building on widespread notions such as that of "active listening", we could speak of "active audiences", when not "collaborative" ones.

[102]Here we provisionally use the notion of "collective identity" in a different, simpler sense than Melucci´s (1996). We are aware of the problematics around the notion but cannot address them here. For an activist view on collective identites and network tactics, see Levi (2012), available in Spanish at http://conservas.tk/tacticas/.

On the Twitter and Facebook layers especially, the digital structure of 15M appears as a system of networked collective identities that anchor processes of online participation and technopolitical practice. As we saw above, they follow a logic of collaboration and temporally distributed leadership, following multiple (thematic, conjunctural, competence based) leadership.

5 Limits of technopolitical practices and new technical needs of citizen networks

5.1 Limits of 15M technopolitical practices and network culture

On the basis of our description of 15M technopolitical practices, existing literature on 15M (Alcazan et al., 2012; Candón Mena, 2013; Toret et al., 2013; Arnau & Postill, 2013), and other movements such as Occupy (Juris 2012, Schock 2012 etc.), interviews to 15M activists (D-CENT Spanish Pilot, 15M.cc) as well as out of own experience in these processes, we have outlined some limits of these practices. The list of limits that we present, which does not pretend to be exhaustive, connects with the scenarios drafted in chapter 2, as it does with the next section, where we outline some challenges and dilemmas faced by movements in the network society. The list will allow us, later on, to situate and suggest possible lines of development for D-CENT.

5.1.1 Dependency on corporate social networks

Although we already noted above (Chapter 3) the multiple flaws of the "Facebook" or "Twitter revolution" talk, it is true that most of the technopolitical practices that characterized movements such as 15M, Occupy (Constanza-Chock, 2012; Juris, 2012) or Yosoy132 (Arditi, 2012; Monterde & Aragón, 2014) involved platforms such as Facebook, Twitter or YouTube. Although in cases such as the 15M movement a broad list of free and self-managed tools was experimented (Alcazan et al. 2012; Candón Mena, 2013; Toret et al., 2013), the massive and decisive usage of the two main social networks in the 15M, namely Facebook and Twitter, cannot be denied. This has a number of negative implications of various kinds, starting with the practices of the movement:

A reduction of users' technological sovereignty, or better autonomy, i.e. a reduction of the ability to make their own laws (Lessig, 2006), policies and even ways of life (Winner, 1986). Interestingly, the magnitude and pace of this reduction can be considered as an inverse of the "network effect", since the greater the number of users in heteronomous platforms, the harder it is to get out of them or, in other words, the greater is the incentive to begin or to continue using them. Connected to the previous point there is a centralization of power: what Castells (2009) defined as "network power" - or power to define the standards of the network, and therefore the game rules - and the "network-making power" - or the ability to create networks - around a key element of the movements' infrastructure. This is the reverse side of their contribution to the decentralization of power previously monopolized by the old mass media, via multitudinous self-communication processes.

Use and abuse of Facebook for organizational purposes (otherwise, functions for which these platforms are not designed) has generated significant losses of valuable information and a multitude of organizational problems, given by the difficulty of structuring and organizing information for a collective process. Collaborative work has also been severely affected, despite the importance of fan pages and (open and closed) groups to extend the molecular involvement in the protests. The limitation and

marketization of the outreach of Facebook posts (filtered by the company) adds another barrier, in this case, to one of the clear strengths of Facebook: its effectiveness for information diffusion.

Another problem with Facebook, from the perspective of its activist use, lies in the generation of communities and closed circuits, which often generate subjectivities continually reinforced in their views by the platform (advertisement and customized search) as well as by the communities to which one belongs. The risk in this sense is that these platforms can of reinforcing the phenomenon of "echo chambers" already observed in the blogosphere (Adamic, 2005). Self-confirming bubbles (a general tendency on the internet, as shown by Pariser, 2011) and niches, which amounts to another fragmentation not so much of the internet but of the socio-technical spaces built in interrelation with its multiple apps and webs. This may also lead to increasing polarization and decreasing shared spaces of critique. Then, there is the widespread diffusion of low quality content, a kind of "lowest common denominator" for sharing (Morozov, 2010; Lanier, 2010).

Censorship, especially in Facebook, was also given in cases such as some of the 15M's calls. Interestingly, some of these episodes generated a call effect (in the form of what is known as Streisand effect[103]).

There was a clear loss of security and privacy, with control over the information produced by users. This especially affects some of the basic tasks of activism, such as organizational communication. The extensive social penetration and the ease of monitoring and recording facilitated control and surveillance by government authorities (which included the identification and arrest of activists in different parts of the world for posting comments on Facebook[104]). The growth of the centralization of data and of the traceability of the behaviors have facilitated new forms of surveillance. The study of activists' activity in social networks by police means brought, by reducing the complexity and extent of interactions, to the identification and isolation of relevant profiles in struggles and calls associated with the protests[105]. These risks have not been (initially) much considered by activists[106] (although there were some voices that warned about these problems) as they were more concerned by the effectiveness of information diffusion than by security and privacy criteria. Here we can observe what we call the "outreach-diffusion-usability vs data control-ownership-security dilemma", which we address later.

On the other hand, the massive use of corporate social networks implies an indirect sponsorship of the Web infrastructures in their trend towards multi/centrism or fragmentation (Berners-Lee, 2010), which implies a manifest difficulty when moving between different spaces (or walled gardens) online. This in turn implies feeding corporations incurring in practices denounced by movements such as 15M and Occupy (without going any further, companies like Facebook or Google exploit European law to find the most lax fiscal environments)[107].

[103]The Streisand effect is an Internet phenomenon where an attempt to censor or conceal certain information fails or is even counterproductive to the censor, because it ends up being widely publicized, receiving more publicity than it would have if there was no attempt to silence it. The network interprets censorship as an attack on itself.

[104]Cases were observed in Syria, Egypt and Brazil.

[105]In Catalonia, the intelligence agency CESICAT has been monitoring and reporting to the Generalitat (Catalan government) on activists's activity on social networks. The information was revealed by Anonymous
http://www.lamarea.com/2013/10/28/anonymous-denuncia-que-la-generalitat-espia-activistas-en-twitter/

[106] The cyclop and the connected multitude https://www.diagonalperiodico.net/saberes/20634-ciclope-vs-la-multitud-distribuida.html https://www.diagonalperiodico.net/saberes/20509-big-data-espionaje-y-movimientos-sociales.

[107]Google, Apple, and Amazon pay minimum taxes out of the US
http://elpais.com/diario/2012/01/30/economia/1327878004_850215.html

At the same time corporate social networks indirectly, in unintended or unforeseen ways, foster behaviours that may undermine the foundations of activism itself, such as attention dispersion, the cult of immediacy (Carr, 2010) or its becoming "instantaneous, ubiquitous, safe and easy" (Borgmann, 1984). Going beyond what we mentioned above, we could note how code policies (Winner 1986) and laws (Lessig, 2006) not only become heteronomous but also contrary to the spirit and objectives of the activists. Definitely, different versions of Tenner's (1997) diagnostic about how and "why things bite back".

As several studies show, these movements were the first political experience for many activists. This experience was facilitated by a lowering of entry barriers (Earl & Kimport), which made possible the incorporation of many people and, at the same time, brought them to perceive these technologies as key to activism (indeed, fetishized by some until reaching formulas such as "Twitter" or "Facebook revolution", rightly debunked by Morozov (2010)).

5.1.2 Limits of the "adhesion culture"

Another criticism received by 15M and its use of social networks has pointed to its "adhesion and follower culture, a new form of fan culture, applied to technopolitical processes. Collaborative and deliberative processes lose centrality in the face of growing attitudes of "following" popular profiles. The "following" or "liking" (a page or profile), as well as the "sharing" or "retweeting" (a post or tweet options) constitute an affordance that favors simplistic dynamics of popularity, even when the possibility of entering into multi-directional, direct interactions serves as a counterweight to this tendency. This critique adds a further point: a good deal of the collective decision making and opinion formation is reduced to binary judgments and to an aggregation logics, framed in terms of "I like" or not, "I follow" or not, a given initiative or group. This logics implies to avoid deeper responsibility concerning the proposals presented.

Here a fragment of this critique by "Las Indias" collective. It directly refers to these tendencies in 15M, that they call the "fifteen-mism of the movement"[108] that reduces:

"The movement (which goes somewhere) to a mere «expression» of a generic discontent, which to each one will come for a reason and will propose--fruitlessly, since unanimity without identity is impossible--to solve it their own way. This «expressionism», heir of the adhesion culture, of the "like" of Facebook and of the book of stickers is the expression of the only basic consensus of the movement: irresponsibility. Deliberation without definition of "demos" cannot generate any consensus, but neither to decide, because democratically deciding a platform would require a previous commitment to accept the result on the side of the minorities. The result of a movement that doesn´t take responsibility for the proposals of its members, and members that are happy with the movement not moving for lack of unanimous decision about where to go, since that is what allows them to go on with the party of a "like/doesn't like" without having to assume any commitment whatsoever."

[108] http://lasindias.com/el-quincemismo-y-la-deliberacion

5.1.3 Failures in the connection between on/offline procedures, channels and spaces of decision making

In its explosion stage, 15M filled squares across Spain with assemblies following bottom-up consensus, from the grassroots, in every city, each of them claiming full autonomy. Actually, they were part of a network of camps and of an ecosystem of participation and a much wider social debate, which were not taken into account in any formal or articulated way. Part of this ecosystems ecosystem was on the networks. Nevertheless, the full integration of the networks and the square in deliberative processes was never reached.

Moreover, the assembly method had its own limits. It didn't support an scalable and fluid deliberation and decision making process. There was no formal, operative coordination in decision making between different camps. In spite of the "illusion of sovereignty" of every assembly in every square, many of the key decisions were not simply taken there, but rather resulted from much more complex and "hybrid" dynamics (Martínez Roldán, 2011). Actually, many of those decisions were launched via networks by collective identities (such as acampadasol, acampadabcn, DRY, etc.) or even personal ones, in order to see whether they had a good reception or not. Thereby, many decisions were took by opinion trends (hot and in real time) on social networks such as Twitter, due more to viral contagion than to any formal, assembly mechanism. This was especially true for decisions in short time frames. As an example, no formal assembly took of convoking demonstrations on Catalunya square on May 27th, when the police was trying to evict the camp. People did not wait for assembly sanctioning in order to organize solidarity actions all over the country that very day at 7pm.

This does not invalidate the value of the assembly for the socialization of problems, the gathering of opinions, emotions and bodies, the assembly as a space of enunciation, but the limits (in terms of efficacy, scalability, and operativity) in its role as a space for decision making cannot be overlooked. At the same time, networks and camps did not had proper tools to articulate decisions between the on and the offline. We could talk of a separation or non-adequation between the online dynamism and the offline slowness. There was no system able to optimize this complementarity, specially —as we have been pointing out— in decision making; an improved inter-layer circuitry for deliberation. To conclude, we want to underline that this was not a technical or technological problem and does not call for a merely technical solution, but rather for a complex, sociotechnical and organizational response (or set of them).

5.1.4 Difficulty for gathering, registering, and take charge of proposals.

One of the paradoxes of these technologically mediated movements--a paradox given the fact that platforms such as Facebook register and store all the content produced by its users--is the difficulty for organizing and conserving the (cultural) production of movements--what seems to contradict also the view of technology as a univocal carrier of order to reality, perhaps implicit in the very notion of "computer". This is not attributable to factors such as the lack of organization only, since it is not exclusive of network movements either. It rather seems that the tendency towards fading (in the double sense, of becoming trendy and soon disappearing with the coming of newer things) accelerates in spite of some of the affordances of computing systems. The culture of social networks, intertwined with features such as the "news feeds" and the "real-time-line", usually tends to be the culture of the ephemeral and instantaneous. Perhaps because of the centrality of corporate social networks and their users (with these particular cultures) in network movements, parallel to a relativization of the role of blogs, wikis, and other collective repositories, has resulted into an ecosystem with high level of

dissipation of cultural production. A culture prioritizing continuous and instantaneous production and consumption was preeminent, even though platforms such as n-1.cc or 15Mpedia[109], and projects such as 15M.cc have served as a countercurrent on this regard. Simple features such as "favoriting" (in Twitter, specially, but also in browsers), screenshots, or "recalling practices" from participants, have enabled different forms of memory (in many cases, for contributing to discussions in real-time, thereby fading away too).

In spite of these counter-currents, severe limits in the creation of collective memory could not be avoided, especially when it comes to documenting (for later access-and-sharing). That meant the loss not only of diagnostics, proposals and agreements but also of lessons concerning the problems of the movement itself. This connects with the ironies and counterproductivity of technology (Ihde, 2008; Tenner, 1997): the technologies that allow producing (and registering) in excess, produce excess of loss and noise. In networks, the browsing history, rather than the work stories, remains. We are not denying, though, the need of forgetting; the point is rather to profitably assemble these multiple tendencies.

On the other hand, different experiences with online proposing and voting[110], found themselves hindered by different problems. First they lacked groups and collectives that would give the necessary feedback to the proposals, secondly, and more importantly, they lacked a collective forces to take responsibility for the most voted proposals, process and give them notoriety, what negatively influenced the level (reward and thereby) of activity. This implied that these tools missed their objective, namely, to become dispositives employed in multitudinous decision making, and to lead to (at least) some implemented decisions--more than undecided desires.

Again, a crucial point to take is that the limits of these practices emerge from a multiplicity of conditions. They are not problems (even when not "wicked" in Berlin's, 2013 sense) amenable to technological fixes (Weinberg, 1967), since in cases like "Propongo" were not due nor to technological problems primarily nor even to sociotechnical practices, procedures and organizational forms, but also to workforce and access to relevant networks. That said, some of the problems of ephemerality are tied, within this process, to the design of dispositives and platforms, with their affordances and policies, sometimes hacked, others followed. In connection with the point 5.1.1, though this point may be tied to the closedness of proprietary software (which prevents people from adapting, say, Facebook to their needs) as well as to the policies of data appropriation within them (which imply an inevitable "memory loss" by loss of access). In synthesis, approaches to them should be, even when looking for technological contributions, depart from a sociotechnical, muliperspectivistic viewpoint.

5.1.5 Dispersion, distraction and overloading by multiplication of channels, tools, initiatives and informations

The increase in online participation and information production in network movements such as 15M has lead to various deleterious effects (denounced by some morozov, 2010; Lanier, 2010 as excessive in quantity and lacking in quality; Borgmann, 1999) . The lowering in the barriers for production and diffusion of information generates an information-saturated milieu. One of the effects is information

[109]Sin embargo han surgido posteriormente como 15M.cc o 15Mpedia http://wiki.15M.cc/wiki/Portada

[110]The platform "propongo" may be the most paradigmatic case on this regard http://propongo.tomalaplaza.net/

overloading, or "infoxication", typical in a media-dense environment, but especially so in moments of intensification of information production and consumption as movement peaks. Here the problem is not only for individuals, to read and be updated, in order to participate, but also the intense labor that it implies for groups, collectives and movements more broadly, which have not only to process much of it, but also are expected or required to maintain different channels properly cared for and sustained in time. Otherwise, on the one hand there is the task of processing information, on the other, the exigence of producing it or maintaining the conditions of its production and diffusion.

Multi-membership and multichanneling increases —and thereby potentially divides and disperses the capacity to respond to— the time-and-attention requirements. In principle (and in fact, in many cases) distraction, dispersion and overload go hand in hand. Without pretending to be exhaustive, some of the consequences that this information frenzy brings about are: firstly, noise, secondly, overloading, distraction and dispersion (Carr, 2010), thirdly, anxiety resulting from the inability process it (sometimes called "infoxication", Cornellá, 2011) or meet the requirements for doing so, fourth, burnout (Cox, 2011).

And the matter does not stop at information. The reduction of costs for launching initiatives has had a similar effect to those commented for information, but in this case with regard to initiatives. The structure of the movement, tied to the affordances of these platforms, meant that for the first months (even the first year) of 15M the number of spontaneous demonstrations, marches, actions, etc. was huge.

Another problem in 15M technopolitical practices (insisted upon by different activists in D-CENT meetings) is the wide dispersion of available technologies, each of them covering a narrow functionality. That implies having to manage large toolkits, and correlatively, the division of users among them. This has implied that valuable tools have been buried or forgotten among many others. Conflict and diversity, especially frequent among alternative tools, prevents monopolies, but also the standardization and simplification effect that this brings about. Ultimately, rather than benefiting from a sort of pluriarchic, equilibrated ecosystem, the results has sometimes been a cacophony, on the one hand, and the preeminence of just a few "winners" (usually, corporate platforms, not the least, because of the network effect), with a reduction of effective possibilities.

5.1.6 Absence or insufficiency of alternative tools for organization: the case of n-1.cc

In this point we want to make a point both reverse and complementary of the one we made in the previous one. Since the early weeks of 15M, there was a conversation, led by different activists, on the potentials and limits of Facebook. The limits related, specially, its data policy (privacy, data ownership, etc.) and its features for organization. An index of the existence of the conversation and a first conclusion from it was a "migration" to the alternative, self-managed platform n-1.cc[111]. The number of registered users in the platform rose from 3000 to 30000 between May 15th and June 15th, 2011. Later, on July 2011, Real Democracy Now developed its own platform, Reddry[112], in the same seedbed of

[111] http://wwwhatsnew.com/2011/06/02/n-1-red-social-del-movimiento-ciudadano-15M/
http://bitelia.com/2011/06/n-1-red-social-15M
http://www.cadenaser.com/sociedad/articulo/n-1-red-m/csrcsrpor/20110723csrcsrsoc_7/Tes

[112] The platform address is https://red.democraciarealya.es/ (accessed 23/03/2014)

networks, Lorea[113], although only for the members of this activist platform. By the n-1.cc had risen as the alternative social network of the movement, especially for internal organization purposes. The role of Facebook and Twitter as platforms for spreading information was rarely on dispute. Precisely this complementarity of n-1 and Facebook has been underlined by Gil Garcia (2013). He explains how 15M activists took advantage of n-1.cc´s privacy, security and architectural support of group work, while they worked with Facebook and Twitter for diffusion and access to information (both a result of their sharing-enhancer design and their huge user base).

N-1.cc infrastructure held a great part of the local assemblies and local nodes , but also groups without local base, of sectorial, thematic, state character, etc. More than 300 groups, with more than 50 users each, were registered.

Nevertheless, the network displayed deficiencies in several respects. In different conversations with users (including interviews for D-CENT), usability limits and a steep learning curve reduced the fidelization of new users. On the other hand, the platform's architecture, built on "elgg" code, firstly conceived as a social network approach to "e-learning"[114], proved not fully appropriate for the sharing and decision making needs of 15M activists. The aggregation of a decision making module in the second half of 2012 was a delayed response to a need already manifest in 2011. The lack of a news feeds, information recommendation, and interaction space comparable to Facebook and Twitter generated a (comparative) experience of isolation.

Limitations in material resources and collaborators in the development and maintenance implied temporal losses of service. The sum of these factors discouraged the use of a social network whose data policies complied with much higher standards than those of corporate ones. In any case, its workspaces allowed to develop projects in a more stable and organized way, something barely allowed by Facebook.

The niche or necessity of an alternative platform for the organization of these movements (for basically anything non reducible to information gathering and sharing) was a need extensible to Occupy, as well as to other network movements. The truncated Global Square[115] project was a symptom of this. The need was not filled by n-1.cc nor any other platform afterwards.

The dynamics here, again, were multifactorial. From axiologies (for instance: the evaluation of security and privacy compared to reach and usability) and the construction of collective habits and culture, netiquettes, etc. up to the political or material conditions, proven fundamental on this regard.

5.2 Network movements limits, challenges and scenarios

On the basis of the limits and potentialities of the network movements we described so far, here we want to draft a series of scenarios. In order to construct them we start with two premises: network movements are a sign of our time and have shown their potential to catalyze new forms of citizen empowerment, as well as for various vectors of democratization (future cases may show grimmer pictures on this regard), on the other hand, the present and future of the technological networks on which they rely are to be defined by construction and struggle.

[113]Further information can be found at https://n-1.cc/g/lorea (accessed 23/03/2014)

[114]Further information can be found at http://readwrite.com/2006/08/10/elgg#awesm=~ozhGHC9h2IY8Hu

[115](http://roarmag.org/2011/11/the-global-square-an-online-platform-for-our-movement/)

Now, we enumerate some scenarios that loom over these network movements. These scenarios have much of narrative constructs, but they help to situate and to understand various dynamics surrounding these movements and, moreover, D-CENT. The point is not (as it was not the point in sections 2.5 and 2.6 to give a complete picture of world politics, but rather a glimpse at the technopolitical becoming (actual or potential) of both network movements and D-CENT. The first three scenarios have been outlined in sections 2.5 and 2.6, so we will only briefly run through them. The fourth is derived from some notes gathered from our analysis of technopolitical practices in 15M. Now synthesized, these scenarios anticipate the counterscenarios and possibilities sketched in section 6.2, below. We can now move to the scenarios themselves.

5.1.7 Securitarian and vigilance scenario in State politics

The reactions to the movements born since 2011 have usually consisted in an increase in the control and repression of their practices. For this, states have combined legislative/juridical policies[116] with other, purely constabulary ones. This has been noted in reports by Reporters without borders and Amnesty International. One of their spokespeople and responsible for international right, Widney Brown: "States are attacking online journalists and activists because they know that these brave people know how to efficaciously use the internet to defy them".

The NSA case is paradigmatic on this regard. These policies range from the power to withdraw contents from webs without court warrant, to punishing practices such as mobilization calls via social networks, or legalizing the monitorization of online activities on a routine basis. As we commented (see chapter 2), these menaces are facilitated by the centralized structure of social networks and their (more or less aware) complicity or with the surveillance practices of governments, under the formal, legal umbrella of "preventing terrorist attacks". With similar, "public interest" arguments, censorship, even attempts at internet or social network shutdown, has been carried on in countries ranging from China and Egypt to, more recently, Turkey.

5.1.8 Extractive and corporate scenario in social networks

The massive appropriation of users´ data, and latter management and selling for practices such as targeted advertising, with numerous implications for privacy is the main characteristic of this scenario. The very culture of making public or networking intimate or private information somehow nurtures this, even though it seems that counterproductively, sometimes (young users seem to be more of these issues than their older counterparts). On top of that we find the barely understandable regulation of Facebook on things such as "porn" (sometimes feminist or lactancy material). And on a different layer of the internet, attacks to Net Neutrality[117] via international treaties such as Anti-Counterfeiting Trade Agreement (ACTA)[118] (and others to come) that punish practices of sharing in order to maintain, sometimes blatantly obsolete business models.

[116] As a sample of this, the so-called "clamp law" proposed by the Popular Party in government in SPain, even dubbed the "anti-15M law. http://politica.elpais.com/politica/2013/11/19/actualidad/1384872214_880594.html http://storify.com/Michel_theWolf_/ley-anti-15M) the recent telecommunications law in Mexico (http://www.jornada.unam.mx/2014/03/15/opinion/018a1pol , or the internet law in Turkey http://www.latercera.com/noticia/mundo/2014/02/678-566052-9-entra-en-vigor-polemica-ley-que-restringe-internet-en-turquia.shtml)

[117] Critical info on net neutrality, processes and debates around it are available at http://www.laquadrature.net/en/Net_neutrality

[118] Critical info on ACTA, processes and debates around it are available at http://www.laquadrature.net/en/ACTA

5.1.9 Fragmentation scenario (affecting the web and other layers of the internet)

This scenario is driven by the question of the interoperability between corporate apps and re-nationalization of the internet (efspecially on the application and physical layers) in the post-Snowden scenario. Here we have a combination with the previous two scenarios. With the corporate one, we end with dynamics hindering users and innovation interests (Berners-Lee, 2010). The governmental one may range from the censorship and control of webs and apps type essayed by China, built around "alternatives" such as Baidu, Qzone, or RenRen, to the protectionist approach to infrastructure in the face of US surveillance that may be read in declarations by Brazil or even EU representatives, or a mixture of both, as seems to be the case of Iran. Here, the responsibilities for data policies would fall upon the direct or indirect management of States (or super-states), some of them not renown for their respect for civil rights. This, again, would bring about a derive towards fragmentation.

5.1.10 Infodystopian scenario: propaganda, spamming, overloading, filtering

Governments, a clear case being that of so called Peñabots[119], of President Enrique Peña Nieto in Mexico, may recur to tactics of "spamming" for silencing or breaking online discussions. Similar tactics are expectable from companies and factual groups menaced by movements or social debates (Pfeifer, 2013). Above, we already mentioned the risks of infoxication and burnout. In recent protests, ranging from the Dignity marches in Spain on March 2014 to those against the Venezuelan government since earlier in the year; cases of fake, adulterated or misleading information about the conflict have been detected.[120] We can also have a filtering, extreme opposite of this, where people mostly rely on their (wider or narrower) trust networks only. The first problem with that may be reflected in the worries about the quality of information circulating in activist networks, shown by activists themselves (in different interviews for D-CENT), and how they have been looking for and using different web services and practices to try to distinguish it. A partially connected and broader risk is that of social networks (activist or not) may reinforce the phenomenon of "echo chambers" already observed in the blogosphere (Adamic, 2005). Self-confirming, filter bubbles (a phenomenon not uncommon on the internet, as shown by Pariser, 2011) and niches, which amounts to another fragmentation not so much of the internet but of the socio-technical spaces built in interrelation with its multiple app and web spaces. This may also lead to increasing polarization and decreasing shared spaces of critique. Then, there is the widespread diffusion of low quality content, a kind of "lowest common denominator" for sharing (Morozov, 2010; Lanier, 2010). All of these point towards a sketched, dystopic information scenario.

[119] Peñabots are networks of Twitter profiles that have an active presence in Mexican social networks, specially on Twitter, since 2012. More information on the topic, in Spanish, from journals as well as social movements is available at http://www.jornada.unam.mx/2014/03/03/opinion/021a2pol and http://yosoyred.com/2013/02/por-una-red-libre-quien-esta-detras-de-los-tt-de-odio/

[120] Some reports on the topic, in Spanish, are available for both the Venezuelan (with the opposition as alleged fakers) http://www.diariopopular.com.ar/notas/184157-venezuela-10-fotos-falsas-que-manipulan-la-informacion and http://www.pagina12.com.ar/diario/contratapa/13-240368-2014-02-22.html and for the Spanish case (with police as self-acknowledged authors) http://actualidad.rt.com/actualidad/view/123461-espana-policia-mentira-22m-fotos

5.1.11 The dilemma between usability, effectiveness, security and privacy

To address the challenges and threats to the network, and the needs of citizen networks and network-movements, it is important to explain a number of dilemmas and issues that they have, in function of their interests and positions. The viewpoints of users, activists from civil society, programmers and D-CENT promoters, are not the same. Although they have common goals, it is important to note that users from civil society have a greater interest and concern for their activities to spread and be accessible to as many people as possible and this often (so far) has been the main concern over issues relating to their privacy and security. Although concern for more security and privacy is growing, and we can show it by phenomena such as the recent mass migration from WhatsApp, after the acquisition by Facebook and after a fall of several hours, with Telegram gaining nearly 5 million new users in one day[121], it is still not the main concern of the average Internet user.

In 2011's network movements, the process of political participation linked to the use of technology has been guided by pragmatism for usability when spreading information -- although, as we have described, we have seen a massive tension between the reappropriation of corporate technologies and networks, and autonomy and invention of new free tools (technological sovereignty), infrastructures and devices. The emphasis was on what we might call viral policy with respect to what might be called deliberative politics, as activists and civil society are more concerned that their information is disseminated and reaches a greater number of people, without being in principle concerned by the consequences of showing their political-public activity under the eye of surveillance. Thus they found themselves in a paradoxical situation with "need for security" (private invisibility) and need for visibility (public visibility) of the activity. I.e., a contradiction between the orientations of persons more concerned by security, data control and the promotion of free tools and infrastructures, and the 'naive' and carefree character of massive techno-political practices, based on user-friendly interfaces. However, the abusive conditions of service policies can lead to phenomena such as what occurred in the 15M, with attempts of mass migration towards civil and free software platforms. This points out a path that can be reopened at any time. It seems that the users will consider usability, possibilities of interaction and platform effectiveness as a condition for any migration.

This dilemma is a crucial matter that D-CENT has to face: the compatibillity of both concerns and both goals, building devices that meet the needs of effectiveness and outreach of online activism, together with data protection and security of users and a strategy for Web decentralization and advocacy of users against the trend towards securitization and surveillance from both states and corporations.

[121] http://www.theguardian.com/technology/2014/feb/24/telegram-messaging-app-whatsapp-down-facebook

6 Conclusions: D-CENT: (socio)technical responses to some challenges of network movements

As a closure to this exposition, we want to essay some conclusions, which include some reflections on the possibilities of D-CENT. Before that, we want to briefly recapitulate our journey so far. We started with a general introduction of the context of network movements. Then we sketched a theoretical framework, which included both concepts and methodologies. Later we recapitulated some of the results of our studies on 15M, with an emphasis on three points: emotions, collective intelligence, and technopolitical practices. We then moved to outline some of the limits of technopolitical practices in 15M. Now, we want to extract some conclusions and outline some scenarios and challenges for both, network movements and D-CENT.

This final chapter is divided in three parts. Firstly, we enumerate some general conclusions on 15M as a prototype of network movement, which probably anticipates similar ones to come. Secondly, we elaborate some reflections on network movements (with an emphasis on collective intelligence and the limits of technopolitical practices) that may suggest potential lines of development for D-CENT. Thirdly, we connect to the scenarios developed in chapters 2 and 5 in order to outline some pressing crossroads, dilemmas and challenges of our current predicament, some of which D-CENT may speak to or respond.

6.1 General conclusions regarding the 15M movement

We have characterized 15M as the creation of a network-movement based on a variable network topology, with mobile frontiers (defined, but mixing with the environment and reconfiguring with events), hybrid, cyborg (connecting machines, humans, virtual and physical entities) that constructs and reconstructs itself in sudden and ephemeral ways. Under certain circumstances, it manifests itself in sequences of activation and action that generate a connected multitude, a collective body that endures through time and can extend itself in space.

Based on these results, we offer provisional conclusions in relation to 15M:

The centrality of the connection between social networks on the Internet and human networks on the streets for the emergence of new forms of communication, organization, and collective action. This centrality has been crucial in the gestation, explosion and development of 15M. Technopolitics oscillates between the massive re-appropriation of the use of digital platforms and the collective invention of new uses and platforms. This has represented a drastic reduction of the cost of collective action, an increase in the impact of campaigns launched in digital networks, and a greater capacity for constructing the meaning of what happens in real time. 15M political culture on the Internet is characterized by the centrality of collective identities and anonymity. Collective political identities pose a challenge to the

political party system as well as to mainstream media networks. These collective identities are connected to a new political space, which is nurtured by a critical mass defined by its networked collective intelligence.

The technopolitical tactics of connected multitudes represent a new grammar of collective action and open new possibilities for political intervention to wide spectra of the population. Those practices construct a symbiotic potential between the street and the net able to cross the information barriers posed by big mainstream media. That nurtures social autonomy. The importance of emotions for 15M activation, reflected in the high emotional charge of tweets, is key in the formation and explosion of the movement. Affectivity and emotionality have also been fundamental for nurturing the energy of the 15M, as well as for facilitating swarming and catalytic phenomena. The imbrication of emotions and technologies (that articulate with and provide feedback to them) has allowed the connection of the network-movement as a whole. In the peak of its influence, 15M changed the patterns of consumption and production information and emotion. This generated intense common experiences and identities.

6.2 Network movements, alternative scenarios, possibilities, and D-CENT

After analyzing the practices of a network movement such as 15M, which we consider prototypical of a series of recent movements and others to come in the forthcoming years, we want to elaborate some considerations for the D-CENT project. We want to do so in connection with the scenarios presented above (in section 5.1). The selection of scenarios was not random. The point was not to think every aspect of our current predicament, but those into which D-CENT may best situate, integrate itself and play in. As a complement to those scenarios, we want to enumerate some possibilities, of a more promising character, which may emerge as responses to them. What comes below may seem like a D-CENT wish list, but some of those desires are already being worked through.

The relations between scenarios and possibilities are multiple. While some of these possibilities are already being realized by different collectives, projects and practices, others appear in a more diffuse horizon; sometimes, bordering with science-fiction, prefiguring what is not possible yet. This is not detrimental, but rather essential to them, since an basic feature of the processes that we are talking about lies in their renegotiation of the boundaries between the unthinkable and the thinkable, the impossible and the possible, the scientific and the fictitious. Besides, the securitarian and corporate scenario outlined above are not that far from the Big Brother empire sketched by Orwell or Huxley, as life with the internet is not far from the cyberspace imagined by Gibson.

These relations between scenarios and possibilities can be articulated around six (dis)positions or logics, from the viewpoint of the network movements: of resistance, of counterattack, of hacking, of symbiosis, of improvement or development, and of alternative construction. The mere "acceptation" of the four scenarios may count as a seventh possibility, but we do not believe it necessary to attend to it, since it identifies itself with the scenario itself given in each case. This (dis)positions imply a relation to what exist, but their sense, direction and strenght vary from one to the other[122]. In order to give content to

[122] While in the first five cases the reference to the existing scenario, and to their central actors, occupy the front stage, in the sixth the front stage is occupied by the alternative desired. While the first two are fundamentally negative positions and the last two, positive, the two in the middle are defined by their polivalent logics.

each of them, we can revise the scenarios mentioned above and draft some of the possible answers (or possibilities that answer or emerge in relation) to them.

As responses to the security and surveillance scenario, several possibilities can be outlined, some of them are already existing. Given the dystopic character of the scenario, most of them, even when they are constructive, are defined by their negativity. To start with, the growing interest for cryptography represents a resistance tactics against the strategies of cryptoanalysis and omnireading forwarded by NSA projects. Initiatives such as Wikileaks (and Snowden's) go a step further: the try, on the one hand, to counterattack NSA-type of program through a tremendous campaign of revelation and public debate and, on the other, they try to infiltrate the enemy, or that enemies move to the side of defense of citizens' rights (differently of what seems to be many corporations' positions) and thereby debilitating the securitarian side (in what sometimes may count as a hacking tactics). Wikileaks and the Snowden case are examples of one form of what has been defined as "sousveillance", or vigilance from below. In a similar way, activists in recent movements have used different dispositives for audiovisually registering police action and being able, in this way, to denounce repressive practices (the assumption being that they may even prevent them in the short or long run, by the menace of registering and public outcry, but also generating risks derived from a bloated feeling of security or immunity). Exhibiting a different logics, the proposals for developing a network democracy through experiments as the ones mentioned above (in chapter 2.3), belong to a broader construction-of-world, which is not negatively limited to scenarios such as the securitatian one. Nevertheless, the mechanisms of control and transparency over state institutions that they aim at may transform the very bases of the securitarian scenario.

Resuming: as a counter-image or counter-scenario to that of security and surveillance rule, different ongoing initiatives (from Wikileaks to experiments in network democracy) may outline an scenario of "sousveillance".

In the case of the corporate, extractivist scenario, reactions may range from resistance positions (as in the case of users that minimize their interaction with and within the application or network matter, or, more drastically, avoid their use) up to the development of alternatives potentiating "technological sovereignty", as it was the case of n-1. In this setting, D-CENT aims at providing technical alternatives that promote autonomy, users' control over their information and online identities. Our analysis on this regard indicates that, following a logic of complementarity or symbiosis, it would be key that alternative applications are not primarily focused in competing, at least at the beginning, with the big, commercial social networks in functions such as information spreading and reach (an example of this has been, precisely, n-1 in 15M, as pointed out by Gil García, 2013). D-CENT developments rather may focus in improving upon technologies enabling internal organization of collective action, as well as management and documentation in an optimal way, or integrating and working through new applications for democracy, for decision making to the improvement of online communication—being aware that the results of these app-improvement will depend on net-etiquettes, people's sociotechnical practices, etc. Integrating, knowing how to cooperate between or incorporating in wider technosystems the best features of commercial apps and social networks is key, so that there feeling of "loss" at the design level is minimized; other loses, such as those of community reach, are difficult to avoid if the relation to their commercial alternatives are posed in terms of exclusive alternative, and should be understood as both problematic and fundamental, not solvable by the recourse to a self-righteous moral judgment of those who keep using corporate platforms.

Another point, even more important, which seems to be integrated in the D-CENT approach, is the relative to the contract (or terms of service) with the users, in this case rather framed as citizens than as consumers. On this point, the D-CENT sociotechnical contract may appear as an alternative, not as a complement, in the juridical plane, to the current monopoly of the "extractivist" format from which most of the web 2.0 benefit. Under certain circumstances, this contract may be interpreted as exhibiting a counterattack, conflictive logic or (dis)position; the users would move from a position of reappropriation through the (unexpected) political use of commercial platforms such as Facebook (in a gesture oscillating between hacking and "improvement" of its capabilities and possibilities) and the transformation of the conditions upon which a good part of the web 2.0 business grows. This may come to be a new, fine standard in the terms of service. The idea of a new sociotechnical contract also points towards the potentiation of what has been defined as technological sovereignty (Haché, 2014), or, with a slightly different sense, we may call technological autonomy (both far from the "autonomous technology" landscape outlined by Winner, 1977).

In this way, in the face of the corporate, extractivist scenario, an alternative one (driven by principles such as autonomy or sovereignty) emerges, defined by new sociotechnical contracts and constelations.

In the case of the fragmentation and centralization scenario in sevearl internet layers (specially the web), possibilities are also multiple. The text by Halpin that we mentioned in section 4.5.2 pointed towards a possible recovery (or improvement) of the web that does not only resists its fragmentation but that also affords the emergence of forms of collective intelligence. Agains the idea of a divided web, under a process of incremental schizophrenia, Halpin appeals to a future where its reintegration enables augmented and collective intelligence. From its own position, D-CENT (or similar projects) connects to this ideal through its insistence in open standards, universality and. In one word, the web 1.0 principles.

Against the current tendencies towards fragmentation and centralization in several layers of the internet, resulting from the corporate as well as state action (as we tried to suggest in section 5.2), a reintegration or composition dynamics (and scenario) that promotes new forms of collective intelligence will depend on the strength of network movements for its (currently apparently far) potential unfolding. Lastly, we can get onto the possibilities opening in the face of the infodystopian scenario. The logics of mere resistance may lead to the proliferation of filters, towards skepsis or ataraxia, or towards the partial or total withdrawal from networks. Usually, this would take an individualist form, since it is collectives themselves, in many cases, what generates the various forms of noise and overload commented when we sketched the infodystopian scenario. As we saw when enumerating the limits of technopolitical practices, the proliferation of tools and channels has sometimes had deleterious effects; along with the multiplication of information and actions (to which they are usually related) have been the source of innumerable frustrations, as pointed out frequently in D-CENT interviews and gatherings, 15M.cc, personal conversations, etc.

Beyond mere resistance, constructing more equilibrated information ecosystems seems to be a possibility following a more positive and propositive logics, between the symbiosis, the improvement of what already is and the construction of alternatives. Integrating, or facilitating the adapted integration of different tools, dispositives, platforms (including those contributing to resistance), etc. may be a small contribution from D-CENT to the emergence of such an ecosystem. Tool quality evaluation mechanisms or quality seals, as well as their integration into organic and adaptable repositories or stores, may be a relevant contribution on this regard. In this type of repository, applications helping with information authentification (for instance, through meta-data evaluation), could fill some of the needs mentioned in

various D-CENT interviews, in order to cope with the growing quantity of (mis)information and fake information. In general, apps that filter while they try to prevent (to the technical extent possible) the emergence "self-confirming bubbles", would also be relevant to dispel the infodystopia.

Far beyond this, from a more decidedly alternative logics, models such as the IEML language and the semantic sphere proposed by Levy (2011)--which would have to be constructed as a layer on top of the content and application layers of the Internet—to bring a step forward the existing forms of collective intelligence. In this sense, some of the user friendly, analysis and visualization tools developed by Oscar Marín, member of the Datanalysis15M group (which include a real-time network visualization and an affection/emotion analyzer with an adaptable linguistic corpus) are early steps in this direction. Big data techniques, rethought not only in their use but also in some of their epistemic foundations, appropiated by the movements and to their qualitative complexity, could be very valuable when it comes to metabolizing the huge quantities of information generated by network movements every day. Their integration in alternative platforms may be, we believe, of value for activists and collectives trying to comprehend and modulate (or catalyze) processes of collective action and intelligence—as we saw in chapter 4. These applications would have to take into account the (variable) multilayer structure of network movements, the relevance of affects and emotions, language, and other components that we tried to gather in chapter 4; otherwise, through visualization of distributed activity it may be possible to map ongoing processes, interest grouping, emotions, and vocabularies, etc. A platform may include tools facilitating collective (self)consciousness and selfmodulation of collective action and intelligence. We should be aware, though, that results may be ambivalent, since reflexivity may generate dynamics of growing complexity and instability (as suggested, in the case of markets, by Soros, 2003).

The deepening of the study and modelization of these processes may become crucial when it comes to open up (dis)positions towards information (and any infodystopia) that go from resistance or symbiosis towards the construction of alternatives. Two keys on this regard, on the one hand, to who are the actors or collectives implied in the development of these (socio)technologies (including those of analysis) from both the political as well as the epistemic perspective. The possibility, in the case of data-analysis tools, is that of appropiating them from the grassroots and incorporating them into an activist logics, against the panoptic configuration of big data under a governmental state logics or a mercantilist one under a corporate approach. More broadly, the close collaboration with movements (via lean methodologies and activist incorporation in the project), which at the root of D-CENT, may not reach the requisites reclaimed by advocates of technological sovereignty (otherwise, of "technologies developed from and for civil society, Haché, 2014) but may connect to them in its attempt at promoting a new governmental logics, moving away from any securitarian mode to a more collaborative one (like--say--the state-peer, in Michel Bauwen's style).

To conclude: against the infodystopian scenario, a number of more optimistic alternatives point towards new informational ecosystems, or even to infoutopias, such as that of a hypercortex and a reflexive collective intelligence built on top of the internet (Levy, 2011).

After outlining some possibilities in relation to the four scenarios, we want to make some comments on the network movements' dilemma that we mentioned above, namely, that between security, privacy, (we may include openness and decentralization too), on the one hand, and usability, efficacy and reach, on the other. We believe that the resolution of this dilemma—not in the sense of solving it, but of taking decisions on it—requires promoting the reappropiation that we spoke of in the Introduction. The projects that we have mentioned throughout the study require technologies adaptable to variable needs.

In this sense, the sociotechnical nurturing of autonomy, not only through free (thereby adaptable) software development, but also of the competences and incentives required for its growth within activist collectives, is paramount. Against the current expropiation from much of their technological base that network movements suffer from today, the point would be to put the basis for a sociotechnical reappropriation. With regard to the dilemma, collectives and individuals should be able to have access to technologies with both high usability levels, stability, etc. while they get their privacy and security ensured. One of the ways to reach this is that the connected multitudes (not all the singularities within them) gain the resources (in parameters ranging from competences to economics) to generate those technologies, be it via projects of D-CENT type or in more autonomous (or sovereign, Haché, 2014) ways. In a sense, the dilemma does not become an apory, a road without way out; in another sense, some aspects of it, such as the tension between privacy and publicity, between invisibility (of the intimate and personal) and visibility (of the causes) may be unsolvable. Likewise, the tension between what we do with technologies and what technologies do and do to us[123], between appropiation and expropiation, between autonomization and heternomization or alteration, seem inevitable too.

As a counterpoint to, or a way of reconceiving and reconstructing, the previous four scenarios, we may propose a fifth, rather obvious one: that of network democracy (and movements). Prototypes of democracy mentioned in section 2.3, forms of collective intelligence briefly presented in section 4.5 and the technopolitical practices enumerated in 4.6 (as the whole of chapter 4, on 15M) help us to think the characteristics, processes and conditions, between real and ideal,of this scenario. For this, we will not get into details here. This is the main frame that allows to galvanize the various logics and (dis)positions, from resistance to construction of alternatives, with this last one as the main pole of reference. To our minds, this should be (in interference with the previous four) the one giving a general guide to D-CENT developments: otherwise, catalyze processes and technologies that enable and incentivize network democracy. This would be, albeit limited and contextual, a potential contribution to technopolitical articulation of democracy in the present context of crisis of representative institutions. The possibilities here range from collective autonomy (various forms of self-managed projects and networks) to the reappropriation of the political up to its existing institutions. As movements reappropriated (even if ambivalently) commercial platforms, they may, perhaps, try to do something similar (surely, with very different tactics) with existing public institutions. This is the expectative of experiments such as the X party in Spain, Better Reykjavik in Iceland, or the Digital Cabinet in Brazil. Here the point would be—connecting with the little tale we sketched in section 2.4—of shifting the equilibria between various collectives and logical modes in those institutions, as well as outside them. Obviously, everything is still to be done here; there is no "click" nor clicktivism possible, or desirable, in this sphere.

6.3 A D-CENT conclusion: a technopolitical tale

The multiple scenarios delineated in the previous section (con)figure the becoming of collectives, logics, and shapes of the internet, as we mentioned in section 2.4. As we did there, here we want to essay another just-so story, a conclusion tale.

Each scenario and its possible alternatives or counterscenarios point towards a different composition of a given technopolitical constellation. Every constellation or assemblage is composed not only by

[123]"We shape our buildings, and afterwards our buildings shape us", apuntaba Winston Churchill con respecto a la Casa de los Comunes, como recuerda Borgmann, 2006

collectives (say, governments, movements, or corporations) and (socio)technologies (say, the internets, with its layers), but are also made of and by affects and emotions, identities, narratives, modes of collective intelligence (real or possible), and a long and recursive "etc." Every precarious, historic arrangement brings about the preeminence of certain scenarios, along with affective economies, configuration of the layers of the internet, and compositions of groups, logics and subjectivities. All of these things reconfigure themselves in relation to one other. This technopolitical becoming cannot be defined anymore only as a field of struggle (much less, if we understand it under the nineteen century format of class struggle) but rather as a process of ontological emergence, of proposition of worlds, a process still conflictive, indeed, and exceedingly complex. It is in this light where the challenges and possibilities, not only of network movements, but also of D-CENT, can be better situated.

As we have seen, D-CENT may affect the juridical as well as the content and the application layers by proposing a new sociotechnical contract; it may affect those layers too via possible technological developments. But it may be more interesting, for the purpose of this conclusion, its condition as contributor and symptom of the strengthening of a possible scenario, in which a new technopolitics of dissent, decentralization and even decency—to continue with the wordplay—gain leverage. D-CENT (or similar projects) could be seen as a partial contribution to a scenario where the securitarian and the extractive-corporate logics are contested. In the end, it may connect to broader dynamics, to new forms of intelligence, action and production, tecnopolitical (more than technological) autonomy or even sovereignty.

This is a possible story. But network movements hold different perspectives and narratives inside and around them. They generate their own stories (sometimes silenced or lost, others viralized), identities and metaphors, appropriate and inappropriate.

In this poliedric historical scenario (or set of them), projects such as D-CENT appear as one small and morphing seed. And yet, similar ones in Brazil[124], and prototypes such as the ones outlined in 2.3, may suggest an increasing interest from governmental institutions on this regard[125]. Network movements, democracy and autonomy may counterweight the securitarian and extractivist-corporate scenario. At the same time, old forms of state sovereignty and conflict, as well as an increasing fragmentation of the internet (not to say various forms of infodystopias), may result from new geo(techno)political balances.

As already indicated in the introduction, the potential of the forms of network movements (and democracy) to come may be defined in terms of their ability to forward a reappropriation of the (shifting and blurring) political, economic and media spheres. In spite of their limitations, movements such as 15M have played a relevant role in advancing this possibility. There are experimental labs, where new assemblages of practices and technologies, albeit incipiently, may prefigure and anticipate a possible network democracy, in its multiple forms, with its lights and shadows.

[124]The twitter profile of the project is available at https://twitter.com/LabHackerCD

[125] We leave aside the potential pitfalls of this sort of arrangement, and arguments against it, from the limitations derived from top/down bureacratic structure, timings, and incentives, to the problems related with winner-picking, up to the obliteration of many struggling, already ongoing alternative projects. Here, again, an alternative is that of (socio)technological development from and by civil society groups, suggested in Haché (2014).

Coming back to the beginning, to Deleuze, the challenge may be, precisely, in retaking the world, in the capacity not only to believe in it, but also to affect it. As Marx and Engels appreciated time ago, in a very different scenario, there is a whole world (or, as the Zapatistas later said, many worlds) to win.

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