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PhD Thesis

A Multi-Dimensional Approach
for Framing Crowdsourcing Archetypes

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"It always seems impossible until it's done."

Nelson Mandela

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Abstract

All different kinds of organizations – business, public, and non-governmental alike – are becoming aware of a soaring complexity in problem solving, decision making and idea development. In a multitude of circumstances, multidisciplinary teams, high-caliber skilled resources and world-class computer suites do not suffice to cope with such a complexity: in fact, a further need concerns the sharing and 'externalization' of tacit knowledge already existing in the society. In this direction, participatory tendencies flourishing in the interconnected society in which we live today lead 'collective intelligence' to emerge as key ingredient of distributed problem solving systems going well beyond the traditional boundaries of organizations. Resulting outputs can remarkably enrich decision processes and creative processes carried out by indoor experts, allowing organizations to reap benefits in terms of opportunity, time and cost.

Taking stock of the *mare magnum* of promising opportunities to be tapped, of the inherent diversity lying among them, and of the enormous success of some initiative launched hitherto, the thesis aspires to provide a sound basis for the clear comprehension and systematic exploitation of crowdsourcing.

After a thorough literature review, the thesis explores new ways for formalizing crowdsourcing models with the aim of distilling a brand-new multi-dimensional framework to categorize various crowdsourcing archetypes. To say it in a nutshell, the proposed framework combines two dimensions (i.e., motivations to participate and organization of external solvers) in order to portray six archetypes. Among the numerous significant elements of novelty brought by this framework, the prominent one is the 'holistic' approach that combines both profit and non-profit, trying to put private and public sectors under a common roof in order to examine in a whole *corpus* the multi-faceted mechanisms for mobilizing and harnessing competence and expertise which are distributed among the crowd.

Looking at how the crowd may be turned into value to be internalized by organizations, the thesis examines crowdsourcing practices in the public as well in the private sector. Regarding the former, the investigation leverages the experience into the PADGETS project through action research – drawing on theoretical studies as well as on intensive fieldwork activities – to systematize how crowdsourcing can be fruitfully incorporated into the policy lifecycle. Concerning the private realm, a cohort of real cases in the limelight is examined – having recourse to case study methodology – to formalize different ways through which crowdsourcing becomes a business model game-changer.

Finally, the two perspectives (i.e., public and private) are coalesced into an integrated view acting as a backdrop for proposing next-generation governance model massively hinged on crowdsourcing. In fact, drawing on archetypes schematized, the thesis depicts a potential paradigm that government may embrace in the coming future to tap the potential of collective intelligence, thus maximizing the utilization of a resource that today seems certainly underexploited.

Table of Contents

List of Figures

List of Tables

1. Introduction

All different kinds of organizations – business, public, and non-governmental alike – are becoming aware of a soaring complexity (Sterman, 1994) in problem solving, decision making and idea development; such complexity could be ascribed to the intricacy of systems, to the brisk pace characterizing the technological evolution in numerous domains, and to many global and local urgent issues becoming every day more pronounced. In a multitude of circumstances, multidisciplinary teams, high-caliber skilled resources and world-class computer suites do not suffice to cope with such a complexity: in fact, a further need concerns the sharing and "externalization" of tacit knowledge (Nonaka, 1994) already existing in the society. In this direction, participatory tendencies flourishing in the interconnected society in which we live today lead "collective intelligence" (Levy, 1997) to emerge as key ingredient of "distributed problem solving" systems (Brabham, 2008a) whose output can significantly enrich decision or creative processes traditionally carried out '*intra moenia*' by experts. Organizations embracing this paradigm have the chance to reap the benefits in terms of opportunity (i.e., achievements of results otherwise unattainable), time (i.e., shorter delivery of such results) and cost (i.e., less consumption of economic resources for such results).

Along this trajectory of 'smart openness', the evidence that "it has become impossible to restrict knowledge and its movement to castes of specialists" (Levy, 1997) has generated momentum around novel distributed, plural, and collaborative dynamics which make researchers aware that 'crowd' and its derived concepts are not merely Web 2.0 catchy buzzwords. Conversely, harnessing the crowd could become a strategic model to attract an interested and motivated platoon of stakeholders: as a result, the crowd is rapidly becoming a "resourceful problem solver" (Wexler, 2011) in organizations and businesses, finding always new application in unlocking inventive conundrums and often exploiting various forms of social networks to accomplish tasks in a human-wise way (La Vecchia & Cisternino, 2010).

Following the crowdsourcing paradigm, plenty of initiatives have recently called on the crowd, both in the private and public sector.

In the governmental realm, among many groundbreaking initiatives, one in particular may set the template for public bodies: in 2011 Iceland tore up the rulebook by embarking on an experimental form of constitution-making from below (Blokker, 2012) leveraging non-structured, non-hierarchical involvement of ordinary citizens, with a strong use of Web 2.0 tools to promote participation and transparency (Bani, 2012). The idea of drawing up a new constitution through crowdsourcing took shape in a very

defining moment, when the country was recovering from the financial crisis that saw the collapse of its banks and government. By resorting to social media, citizens had the opportunity to share their ideas regarding what the new document should contain. In creating the new 'bill of rights', the council (i.e., constituent assembly to which 25 individuals were elected from a roster of 522 candidates from all walks of life) posted draft clauses on its website[1] every week and the public commented underneath or joined a discussion on the council's Facebook page or via the official Twitter account (Siddique, 2011). The significant level of take-up, coupled with qualitative results obtained in leveraging distributed citizens' wisdom and acumen, positions Iceland ahead of the curve in spreading crowdsourcing in the public sector for policy purposes. Slightly different is the overseas scenario that may be glimpsed in the USA, where crowdsourcing effort has mostly been geared toward problem solving. In this specific realm, as part of the Open Government Initiative[2], the Barack Obama administration has called for new forms of collaboration with stakeholders to increase the innovativeness of public service delivery. For instance, federal managers are employing a new instrument called Challenge.gov to apply the open innovation paradigm – coined in the private sector – to crowdsource solutions from previously untapped problem solvers and to leverage collective intelligence to tackle complex social and technical public management problems (Desouza, 2012; Mergel & Desouza, 2013). This experience is not a *unicum* in USA, since NASA and InnoCentive have established a joint NASA Open Innovation Pavilion providing the public with the opportunity to solve difficult problems facing the USA space program in human health and performance. Solutions to these crowdsourced challenges do not only benefit space exploration, but may also further the development of commercial products and services in the fields of health and medicine, industry, consumer goods, public safety, computer technology, and environmental resources (Bingham & Spradlin, 2011). Taking a similar perspective, various public agencies, based in USA and not only, have sponsored Kaggle competitions that engage data scientists across the globe to solve pressing societal problems via data crunching, Big Data analytics and predictive modeling: it is not uncommon that breakthroughs coming to light as outputs of such challenges have what it takes to make a real difference in the world, sometimes outstripping years of 'traditional' academic research (Eggers & Macmillan, 2013).

Dissimilar nuances but equal success could be found in the private sector: in fact, also in the entrepreneurial world crowdsourcing is getting a foothold, turning into a powerful tool that has profoundly influenced the way even 'Fortune 100' do business (Howe, 2008). In this sphere, one of the proverbial examples of the "open business model"

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[1] http://stjornlagarad.is/

[2] http://www.state.gov/open/

(Chesbrough, 2006; Chesbrough, 2007) enabled by crowdsourcing regards Procter and Gamble (P&G). In order to rejuvenate P&G from a notoriously secretive and insular corporate culture (Liu & Porter, 2010), in 2000 the CEO Alan George Lafley resolved to put innovation back at the company's core, in a period when only 15% of the innovation efforts met profit and revenue targets (Brown & Anthony, 2011): instead of boosting the R&D spending, Lafley paved the way for structuring a new innovation culture, shifting from internally focused R&D to an open R&D process and establishing the "Connect & Develop" strategy (Sakkab, 2002; Dodgson, Gann, & Salter, 2006; Huston & Sakkab, 2006). The attempt to exploit internal research through significant collaboration with outside innovators, in particular via crowdsourcing open calls, has obtained encouraging results. The ambitious goal of creating 50% of P&G's innovation with outside partners, set in 2005, was surpassed in 2007 and R&D productivity soared 85% without large increases in spending (Osterwalder & Pigneur, 2010).

Even though crowdsourcing has morphed from much-ballyhooed 'hype' to consolidated *modus operandi* – of which cases at the forefront mentioned above constitutes only the 'tip of the iceberg' – some mechanisms and implications are still surrounded by ambiguity and vagueness giving life to a sort of 'veil of Maya' separating analysts from a clear comprehension of the concept of crowdsourcing as well as of its implementation principles. This haziness can be also found out in the strand of literature devoted to crowdsourcing for which the reader is referred to section 2.

The presence of these gaps represents excellent 'food for thought' that stimulates my intellectual curiosity and nourishes my research reflection geared towards exploring novel manners for formalizing crowdsourcing models. Indeed, the *mare magnum* of promising opportunities to be tapped, the inherent diversity lying among them, and the enormous success of some initiative launched hitherto have grabbed my attention inspiring the scientific reasoning around combining different *modi operandi* in a comprehensive framework: this research direction seems to be appropriate for shedding light on the intricacy of crowdsourcing practices without losing the *fil rouge* connecting all of them.

For the purpose of summarizing the intended contribution of this PhD thesis, the research questions that triggered my reflection could be formulated by considering three interrelated perspectives.

First of all, in spite of the paucity of definitional precision and the dearth of contributions meant to schematize distributed problem solving models in a systematic way suitable to be generalized (Estellés-Arolas & González-Ladrón-de-Guevara, 2012), a plethora of successful crowdsourcing cases can be collected and examined through empirical observation of real world examples. The absence of an adequate and recognized backdrop for exploring the various ways in which value may be created resorting to crowd-based dynamics renders single crowdsourcing cases tesserae of a

mosaic whose overall design cannot be clearly glimpsed. This stimulates a first general yet fundamental research question representing the 'North Star' to be followed in the investigation of the burgeoning panoply of crowdsourcing real cases: '*How to systematically categorize crowdsourcing models in view of the distinctive traits of real word examples?*'.

Secondly, in principle any non-trivial problem can benefit from crowdsourcing (Doan, Ramakrishnan, & Halevy, 2011); this includes tasks that range from pure routine to complicated ones (Kleemann, Voß, & Rieder, 2008), passing through creative tasks or those related to innovation where uniqueness has value *per se* (Schenk & Guittard, 2011). This enormously broad spectrum of application suggests that crowdsourcing may be seen – at first sight – as a flexible tool for addressing various problems in organizations and business (La Vecchia & Cisternino, 2010). As a consequence, the multi-faceted contribution that crowdsourcing practices are supposed to bring to organizational intelligence (Albrecht, 2002)[3] – both in cases of profit and no-profit organizations – may drive the researcher's attention towards logics of value creation unlocking the potential of crowd and transforming it into concrete benefits that could be internalized by organizational stakeholders. The resulting research question can be phrased as follows: '*How to transform the crowd into value?*'.

Thirdly, taking stock of the PADGETS[4] experience, lessons learnt could stimulate a reflection that goes beyond traditional reasoning in the field of public management. Drawing on the in-depth examination of various *modi operandi* having their roots outside the governmental boundaries, a thought-provoking research question may be formulated regarding the paradigm that government may embrace in the coming future to tap the potential stemming from crowd involvement in a bewildering array of tasks: '*Bureaucracy (in line with Weber's theorization[5]) has been the governmental platform of the 20th century. What novel platform(s) may support governments in the 21st century?*'.

In order to address afore-mentioned research questions, the thesis aspires to provide a sound basis for the clear comprehension and systematic exploitation of crowdsourcing.

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[3] Organizational intelligence is defined by Albrecht (2002) as brain power 'writ large', i.e., the capacity of an organization to mobilize all of its available brain power, and to focus that brain power on achieving its mission. Previous contributions on this topic are provided by Allee (1997) and March (1999).

[4] PADGETS is a research project financed in the context of the 'ICT for Governance and Policy Modelling' call of the 7th European Framework Program of Research (FP7). During my three-year experience in the consortium, I have operated under the affiliation of Politecnico di Torino (DIGEP Department). Website: http://www.padgets.eu.

[5] To say it in a nutshell, Weber's ideal-typical bureaucracy – seen by the author as indispensable to maintain order, maximize efficiency and eliminate favoritism in the modern state – is characterized by hierarchical organization, written rules of conduct, impersonality, specialized division of labor, employment based upon qualifications, and promotion based on achievement judged by the organization (Gerth & Wright Mills, 1998).

Concerning the first research question, moving from 'wow' to 'how', the study explores new ways for formalizing crowdsourcing models with the aim of distilling a brand-new multi-dimensional framework for categorizing different crowdsourcing archetypes. Among the numerous significant elements of novelty brought by this framework, the prominent one is the 'holistic' approach which combines both profit and non-profit, trying to put private and public sectors under a common roof in order to examine in a whole *corpus* the multi-faceted mechanisms for mobilizing and harnessing competence and expertise which are distributed among the crowd.

Looking at how crowd may be turned into value to be internalized by organizations (i.e., second research question), the thesis examines crowdsourcing practices in the public as well in the private sector. Regarding the former, the investigation leverages the experience into the PADGETS project through action research – with the aim of contributing both to the practical concerns of people in an immediate problematic situation and to the goals of social science (Rapoport, 1970) – to systematize how crowdsourcing can be fruitfully incorporated into the policy lifecycle. Concerning the private realm, a cohort of real cases in the limelight is examined – having recourse to case study methodology – to formalize different ways through which crowdsourcing becomes a business model game-changer.

Coming to the third research question, the two perspectives (i.e., the public and the private ones) are finally coalesced into an integrated view acting as a backdrop for reasoning about next-generation governance models massively hinged on crowdsourcing. In fact, drawing on archetypes schematized, the thesis depicts a potential paradigm that government may embrace in the coming future to tap the potential of collective intelligence, thus maximizing the utilization of a resource that today seems certainly underexploited.

Concluding these introductory comments, the thesis is structured into eight chapters. Chapter two provides a theoretical background to the present work. Chapter three touches upon the methodology underpinning the present research endeavor. Chapter four focuses on the foundations of the multi-dimensional framework and on main archetypes stemming from this framework. Chapter five illustrates crowdsourcing at work in the governmental realm, paying particular attention to the PADGEST scenario. Chapter six, for its part, shines a spotlight on the business-side of crowdsourcing. Chapter seven attempts to outline an integrated view of crowdsourcing acting as foundation for molding the paradigm that government may embrace to harness collective intelligence in light of an 'extended governance' model. Finally, chapter eight provides some conclusive remarks as well as some directions for future research.

2. Theoretical Background

2.1 The Concept of Crowdsourcing

The locution 'crowdsourcing', as every Internet meme typical of the Web 2.0 era, started as a neologism (a compound contraction of 'crowd' and 'outsourcing') and rapidly propagated through the World Wide Web gaining an astonishing popularity in its heyday. According to Google Scholar, today there are more than 16,000 research articles – mostly in the computing and business disciplines – using the term 'crowdsourcing' (Brabham, 2013a). Moreover, the concept seems to gain traction also in practitioners' circles, given that in Gartner Hype Cycle 2012 crowdsourcing has been depicted on the rise, on the way to approach the 'celebrity' peak[6] (Figure 1).
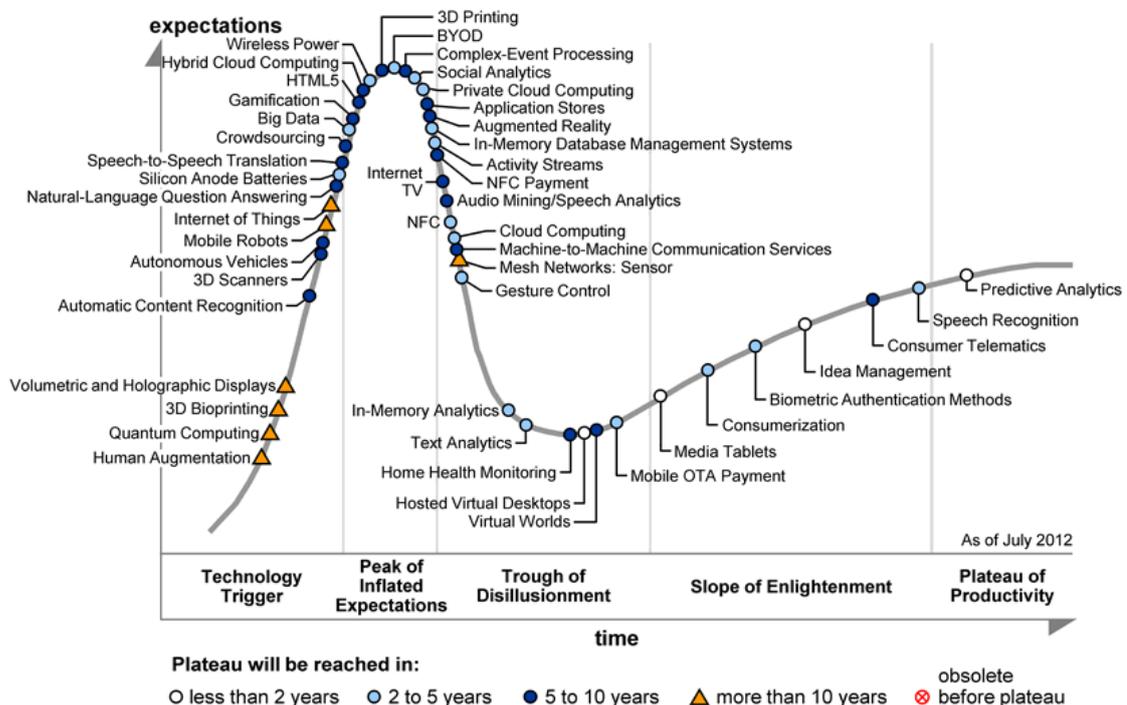
Figure 1 – Gartner Hype Cycle for emerging technologies 2012 – Source: Gartner

The earliest definition was coined by Howe (2006) in the June 2006 issue of Wired magazine: "*Simply defined, Crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call. This can take the form of peer-production (when the job is performed collaboratively), but is also*

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[6] https://www.gartner.com/doc/2100915

often undertaken by sole individuals. The crucial prerequisite is the use of the open call format and the wide network of potential laborers".

From the dawn of its short existence, the word 'crowdsourcing' has been used for a wide group of activities that take on different forms (Vukovic & Bartolini, 2010; Schenk & Guittard, 2011). The adaptability of crowdsourcing allows it to be an effective and powerful practice, but makes it difficult to define and categorize. In fact, apart from the first seminal attempt by Howe (2006), there is not an agreed definition: conversely, there is a variety of definitions, which look at crowdsourcing from discrete points of view.

The extensive work conducted by Estellés-Arolas and González-Ladrón-de-Guevara (2012) – mainly based on academic papers, books and technical reports – pinpoints several dozens of original definitions of crowdsourcing. Such definitions have been integrated with a selected list of definitions collected by me during the literature review phase. The resulting long-list is presented in chronological order in Table 1.

Author(s)	Definition(s)
Howe (2006)	Crowdsourcing is the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and general large) network of people in the form of an open call. This can take the form of peer-production (when the job is performed collaborative), but is also often undertaken by sole individual. The crucial prerequisite is the: use of an open call format, and the wide network of potential laborers. Crowdsourcing is the application of open source principles to fields outside of software.
Brabham (2008a)	Crowdsourcing is a strategic model to attract an interested, motivated crowd of individuals capable of providing solutions superior in quality and quantity to those that even traditional forms of business can.
Brabham (2008b)	Crowdsourcing is an on-line, distributed problem solving and production model already in use by for profit organizations such as Threadless, iStockphoto, and InnoCentive.
Chanal and Caron-Fasan (2008)	Crowdsourcing is the opening of the innovation process of a firm to integrate numerous and disseminated outside competencies through Web facilities. These competences can be those of individuals (for example creative people, scientists, engineers) or existing organized communities (for example OSS communities).

Howe (2008)	Crowdsourcing is a business practice that means literally to outsource an activity to the crowd.
	Crowdsourcing is the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call.
	Crowdsourcing is just a rubric for what is a wide range of activities.
	Crowdsourcing is the mechanism by which talent and knowledge is matched to those in need of it.
Kleemann, Voß, and Rieder (2008)	Crowdsourcing is a form of integration of users or consumers in internal processes of value creation. The essence of crowdsourcing is the intentional mobilization for commercial exploitation of creative ideas and other forms of work performed by consumers.
	Crowdsourcing is the outsourcing of tasks to the general Internet public.
	Crowdsourcing is a profit-oriented form that outsources specific tasks essential for the making or sale of its product to the general public (the crowd) in the form of an open call over the Internet, with the intention of animating individuals to make a contribution to the firms production process for free or significantly less than that contribution is worth to the firm.
Porta, House, Buckley, and Blitz (2008)	Crowdsourcing is about enlisting customers to directly help an enterprise in every aspect of the lifecycle of a product or service.
Yang, Adamic, and Ackerman (2008)	Crowdsourcing is the use of an Internet-scale community to outsource a task.
Di Palantino and Vojnovic (2009)	Crowdsourcing involves a set of methods of soliciting solutions to tasks via open calls to large-scale communities.
Vukovic (2009)	Crowdsourcing is a new on-line distributed problem solving and production model in which networked people collaborate to complete a task.
Whitla (2009)	Crowdsourcing is a process of outsourcing of activities by a firm to an on-line community or crowd in the form of an 'open call'.
	Crowdsourcing is a process of organizing labor, where firms parcel out work to some form of (normally on-line) community,

	offering payment for anyone within the 'crowd' who completes the tasks the firm has set.
Buecheler, Sieg, Füchslin, and Pfeifer (2010)	Crowdsourcing is a special case of such collective intelligence.
Burger-Helmchen and Pénin (2010)	Crowdsourcing is one way for a firm to access external knowledge.
Heer and Bostok (2010)	Crowdsourcing is a relatively new phenomenon in which Web workers complete one or more small tasks, often for micro-payments on the order of $0.01 to $0.10 per task.
La Vecchia and Cisternino (2010)	Crowdsourcing is a tool for addressing problems in organizations and business.
Ling and Mian (2010)	Crowdsourcing is a new innovation business model through Internet.
Liu and Porter (2010)	Crowdsourcing is the outsourcing of a task or a job, such as a new approach to packaging that extends the life of a product, to a large group of potential innovators and inviting a solution. It is essentially open in nature and invites collaboration within a community.
Mazzola and Distefano (2010)	Crowdsourcing is an intentional mobilization, through Web 2.0, of creative and innovative ideas or stimuli, to solve a problem, where voluntary users are included by a firm within the internal problem solving process, not necessarily aimed to increase profit or to create product or market innovations, but in generally, to solve a specific problem.
Oliveira, Ramos, and Santos (2010)	Crowdsourcing is a way of outsourcing to the crowd tasks of intellectual assets creation, often collaboratively, with the aim of having easier access to a wide variety of skills and experience.
Ribiere and Tuggle, (2010)	Crowdsourcing consists of making an open on-line call for a creative idea, or problem solving, or evaluation or any other type of business issues, and to let anyone (in the crowd) submit solutions.
Vukovic, Lopez, and Laredo (2010)	Crowdsourcing is a new on-line distributed production model in which people collaborate and may be awarded to complete a task.
Alonso and Lease (2011)	Crowdsourcing is the outsourcing of tasks to a large group of people instead of assigning such tasks to an in-house employee

	or contractor.
Bederson and Quinn (2011)	Crowdsourcing is about people being paid to do Web-based tasks posted by requestors.
Doan, Ramakrishnan, and Halevy (2011)	Crowdsourcing is a general-purpose problem solving method.
Grier (2011)	Crowdsourcing is a way of using the Internet to employ large numbers of dispersed workers. Crowdsourcing is an industry that is attempting to use human beings and machines in large production systems.
Heymann and Garcia-Molina (2011)	Crowdsourcing is getting one or more remote Internet users to perform work via a marketplace.
Kazai (2011)	Crowdsourcing is an open call for contributions from members of the crowd to solve a problem or carry out human intelligence tasks, often in exchange for micro-payments, social recognition, or entertainment value.
Sloane (2011b)	Crowdsourcing is one particular manifestation of open innovation. It is the act of outsourcing a task to a large group of people outside your organization, often by making a public call for response. It is based on the open source philosophy, which used a large 'crowd' of developers to build the Linux operating system.
Wexler (2011)	Crowdsourcing is a focal entity's use of an enthusiastic crowd or loosely bound public to provide solutions to problems.
Erickson, Petrick, and Trauth (2012)	Crowdsourcing is the use of large groups of individuals to perform tasks commonly performed by employees or designated agents.
Estellés-Arolas and González-Ladrón-de-Guevara (2012)	Crowdsourcing is a type of participative on-line activity in which an individual, an institution, a non-profit organization, or company proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task. The undertaking of the task, of variable complexity and modularity, and in which the crowd should participate bringing their work, money, knowledge and/or experience, always entails mutual benefit. The user will receive the satisfaction of a given type of need, be it economic, social recognition, self-esteem, or the development of individual

	skills, while the crowdsourcer will obtain and utilize to their advantage that what the user has brought to the venture, whose form will depend on the type of activity undertaken.
Poetz and Schreier (2012)	Crowdsourcing outsources the phase of idea generation to a potentially large and unknown population in the form of an open call.
Saxton, Oh, and Kishore (2013)	Crowdsourcing is a sourcing model in which organizations use predominantly advanced Internet technologies to harness the efforts of a virtual crowd to perform specific organizational tasks.

Table 1 – Timeline of crowdsourcing definitions

Going beyond mere definitions, the thorough literature review carried out by Estellés-Arolas and González-Ladrón-de-Guevara (2012) delves into eight characteristics (marked from *a* to *h*) whose analysis may be help to partially dispel the vagueness surrounding a fast-evolving concept still in its infancy. A synthesis of the extensive discussion is reported in the following paragraphs.

To start the round-up with who forms the crowd (*a*), the bulk of the authors agree *ictu oculi* in defining the crowd in a general manner, providing information such as composition, type of people, heterogeneity, or the skills possessed. Crowd is portrayed as a generic mass of individuals: people (Vukovic, Lopez, & Laredo, 2010; Bederson & Quinn, 2011), large group of people (Howe, 2006; Howe, 2008; Liu & Porter, 2010; Alonso & Lease, 2011; Poetz & Schreier, 2012), individuals (Chanal & Caron-Fasan, 2008; Kleemann, Voß, & Rieder, 2008), members of the crowd (Kazai, 2011), general Internet public (Kleemann, Voß, & Rieder, 2008). Some authors specify further the origin or grouping of the crowd: consumers (Kleemann, Voß, & Rieder, 2008), customers (Porta, House, Buckley, & Blitz, 2008), voluntary users (Mazzola & Distefano, 2010), Internet-scale community (Yang, Adamic, & Ackerman, 2008), organized and on-line communities (Chanal & Caron-Fasan, 2008; Whitla, 2009).

Regarding the number of people involved, the majority of the authors make reference to an indeterminate and large group of individuals, a group of people that do not necessarily know each other, and a loosely bound public (Wexler, 2011). Following this path, crowdsourcing depends on broad anonymous 'masses' found on the Web, with the expectation that a large-scale virtual crowd can outperform a handful of professionals (Saxton, Oh, & Kishore, 2013) subcontracted in accordance with traditional outsourcing schemas (Lacity, Khan, Yan, & Willcocks, 2010). With respect to this interpretation, the only exception has to do with permanent on-line communities, where there is a greater possibility of the people knowing each other. Although many contributions coincide when the crowd is profiled as a large group of individuals, the optimum

number of people depends on the crowdsourcing initiative, due to the fact that the information needs to be filtered and evaluated (La Vecchia & Cisternino, 2010). There are initiatives, such as in the case of the Icelandic Constitution (Siddique, 2011), where the optimal size has been approximately 330.000 people, while in others it is a few thousands, like in the Lego case (Howe, 2008). There are also cases in which the size of the crowd is limited (e.g., those within a company, those that deal with confidential information, or those that are directed towards customers of a certain company).

Moving from 'quantity' to 'quality' of participants, various visions coexist. Kleemann, Voß, and Rieder (2008) identify the crowd as users or consumers, considered the essence and the 'engine' of crowdsourcing. Schenk and Guittard (2011) find the nucleus of the crowd in amateurs (e.g., students, young graduates, scientists or simply individuals), although they do not set aside professionals. Authors such as Heer and Bostok (2010) identify the crowd as a cohort of Web workers engaged through micro-task markets aimed at lowering the cost of recruiting participants. Even though task traded in afore-mentioned micro-task markets are repetitive and rudimentary, some authors affirm that crowdsourcing certainly requires a smart, well-trained crowd (Howe, 2008).

In relation to the knowledge possessed by the individuals within the crowd, each initiative needs a specific one, thus limiting the number of participants. For example, in the case of Amazon Mechanical Turk (i.e., website where any given person can make micro-payments in return for generally repetitive work) the proposed tasks do not generally require people with special skills; the same thing occurs in cases where users have to provide an opinion on a given product. However, the tasks proposed on platforms that allow organizations to propose R&D problems whose resolution implies an economic recompense (e.g., InnoCentive, P&G Connect & Develop, Kaggle) need a more educated crowd. It follows that the heterogeneity of the crowd depends upon the type of initiative considered: whilst some of them require the wisdom of a heterogeneous crowd (Surowiecki, 2004) in which each person brings personal knowledge, in other cases the heterogeneity is not so important, such as in the translation tasks proposed by Amazon Mechanical Turk.

Therefore, to conclude, the crowd refers to a group of individuals whose characteristics in terms of number, heterogeneity, and knowledge are determined by the requirements of the crowdsourcing initiative.

After shedding light on whom forms the crowd (*a*), Estellés-Arolas and González-Ladrón-de-Guevara (2012) propose a reflection what the crowd has to do (*b*).

With this respect, at a first glance, a polarization seems to be evident. A first platoon of authors considers that the crowd should just undertake tasks (Yang, Adamic, & Ackerman, 2008; Di Palantino & Vojnovic, 2009; Vukovic, 2009; Whitla, 2009; Heer & Bostok, 2010; Liu & Porter, 2010; Oliveira, Ramos, & Santos, 2010; Alonso &

Lease, 2011) specifying at times the difficulty or size of these tasks (Heer & Bostok, 2010), a given characteristic such as being done via the Web (Bederson & Quinn, 2011), or of being human intelligent tasks (Kazai, 2011). Conversely, the other group asserts that the crowd has to solve problems (Brabham, 2008a; Brabham, 2008b; La Vecchia & Cisternino, 2010; Doan, Ramakrishnan, & Halevy, 2011; Kazai, 2011), both for companies or public bodies. In this second school of thought, creativity is frequently considered as vital ingredient: in fact, some authors make a general reference to the development of a new product, Kleemann, Voß, and Rieder (2008) speak of the exploitation of creative ideas, while Poetz and Schreier (2012) contemplate idea generation.

Regardless the complexity of the problem, Vukovic, Lopez, and Laredo (2010) as well as Heer & Bostok (2010) emphasize that a generic crowdsourcing task must be divisible into lower level tasks, each one of which can be accomplished by individual members of the crowd. Furthermore, it is pivotal to indicate that the tasks undertaken need to have a clear objective. For example, in InnoCentive, money is offered in exchange for the solution for a well-specified problem ('challenge') while in Threadless users have to design and rate t-shirts. In light of this principle, the production of user-generated contents (Cha, Kwak, Rodriguez, Ahn, & Moon, 2007), unless there is a secondary purpose, does not imply a crowdsourcing action. In this way, a user uploading a video to YouTube and sharing it is not performing a crowdsourcing initiative[7], while it is when a user uploads a video to any given platform to participate in initiatives.

Regarding what the crowd has to do, it can be concluded that the crowd needs to carry out the resolution of a problem through the undertaking of a task of variable complexity and modularity that implies the voluntary contribution of work, knowledge, experience, or money (in the borderline case of crowdfunding, that in outside the scope of the present thesis).

In exchange to activities that the crowd performs, remuneration or, more in general, return – tangible or intangible – appears physiological. Given the relevance of this aspect, it is surprising that few definitions mention what the crowd gets in return (*c*). While Kazai (2011) talks about social recognition and entertainment value as recompense, the rest of the authors that talks about the recompense identify it with money (Kleemann, Voß, & Rieder, 2008; Whitla, 2009; Heer & Bostok, 2010; Bederson & Quinn, 2011). In reference to the level of recompense, Herr and Bostok (2010) specify the recompense as micro-payments of the order of $0.01 to $0.10 per task, as it occurs in the case of Amazon Mechanical Turk; on the flip-side, in other cases, such as InnoCentive, the prizes can even reach the level of a million dollars. One of the characteristics that differentiate people included in the crowd is that they have to

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[7] An in-depth discussion on the contours of crowdsourcing is conducted in following sections.

be compensated because they are acting voluntarily (La Vecchia & Cisternino, 2010). Some authors suggest that the best situation would be that in which the reward is not material and that instead the motivation to participate is similar to that in open source communities, i.e., passionate about the activity and participating for fun (Stewart, Huerta, & Sader, 2009).

In regards to real motivations of the crowd to participate, various studies have been carried out: a summary of prominent related findings is provided in following sections. These studies suggest different motivations that fit some of Maslow's (1943) individual needs: the financial reward, the opportunity to develop creative skills, to have fun, to share knowledge, the opportunity to take-up freelance work, the love of the community and an addiction to the tasks proposed. In this way, as elucidated by Estellés-Arolas and González-Ladrón-de-Guevara (2012), the recompense would vary depending on the crowdsourcer, but would always look to satisfy one or more of the individual needs mentioned in Maslow's (1943) pyramid: economic reward, social recognition, self-esteem, or to develop individual skills. Talking about returns, it is worth to highlight that the free use of a user-generated contents service cannot be considered recompense, as seen in Delicious or YouTube. According to Estellés-Arolas and González-Ladrón-de-Guevara (2012), this is because in those cases the user does not have to undertake a concrete task (except for the registration) to be able to use the services[8]. It is also important to emphasize that the actual reward is always given by the initiator of the crowdsourcing initiative (i.e., crowdsourcer): there can be secondary rewards, like social recognition from other crowdsourcing participants, but these rewards are not the main ones, and are not required to be present.

All in all, it can be concluded that users obtain satisfaction of a given necessity, whether it be economic, social recognition, self-esteem, or the development of individual skills.

In every crowdsourcing initiative, the initiator represents the fulcrum of the ecosystem. With respect who is the initiator (*d*), the 'mainstream' of authors identify this individual – implicitly or explicitly – as a company (Chanal & Caron-Fasan, 2008; Kleemann, Voß, & Rieder, 2008; Porta, House, Buckley, & Blitz, 2008; Whitla, 2009; Burger-Helmchen & Pénin, 2010; Alonso & Lease, 2011). Hence, it is weird to realize that only few definitions, such as the ones formulated by Howe (2008) and La Vecchia and Cisternino (2010), also include institutions or organizations without specifying whether they are companies or not; in this sense, Bederson and Quinn (2011) refer to requestors, without specifying any characteristics. Although it is certain that the crowdsourcer is in many cases a company (Converse, Sony, L'Oreal are examples par excellence), it can also be a public organization, such as the FBI[9] or the European Union[10], writers, such as

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[8] As explained in next paragraphs, all the variegated realm of user production can be considered extraneous to crowdsourcing, in line with the stance taken by Brabham (2013c).
[9] http://www.fbi.gov/news/stories/2011/march/cryptanalysis_032111

Howe (2008) who used crowdsourcing to design the cover of one of his books, or individuals, such as those cases of crowdfunding where any given type of professional can seek funding. This is to say that crowdsourcing does not only suggest a business model for companies, but is also a potential problem solving tool for the government and the non-profit sector (Brabham, 2008a).

Therefore, it can be concluded that the crowdsourcer can be any given entity that has the means to carry out the initiative considered, whether it is a company, institution, non-profit organization, or an individual.

Being a company or a no-profit entity, what does the initiator get in return (*e*)?

A cohort of authors agrees that crowdsourcers get the result they seek for a given task (Howe, 2006; Howe, 2008; Di Palantino & Vojnovic, 2009; Vukovic, 2009; Heer & Bostok, 2010; Heymann & Garcia-Molina, 2011; Kazai, 2011) with some being more direct and indicating that this result implies the resolution of a problem (Brabham, 2008b; La Vecchia & Cisternino, 2010; Mazzola & Distefano, 2010; Doan, Ramakrishnan, & Halevy, 2011; Wexler, 2011). In addition, a glimpse of the literary landscape reveals that the rest of the authors can be considered as being a part of one of three groups: those that identify what the crowdsourcer gets with knowledge, those that identify it with ideas, and those that identify it with a given type of added value. In the first case, whilst Howe (2008) indicates that crowdsourcers obtain talent and knowledge, Burger-Helmchen and Pénin (2010) indicate that they obtain external knowledge. Other authors also include knowledge, but in an implicit form: for example, Oliveira, Ramos, and Santos (2010) indicate that crowdsourcers obtain access to skills and experience, and Chanal and Caron-Fasan (2008) make reference to disseminated outside competencies. The authors of the second group identify the achieved object with ideas, with Kleemann, Voß, and Rieder (2008) going further and discussing commercial exploitation of creative ideas. Kleemann, Voß, and Rieder (2008), for their part, could be included also in the third group, whose authors identify the achieved benefit with a given type of added value: value creation (Yang, Adamic, & Ackerman, 2008), increased profits, as well as product and service innovations (Vukovic, Lopez, & Laredo, 2010).

The governance of the resulting ecosystem hinges on the recognition of the type of process (*f*) underlying crowdsourcing practices.

In regards to the type of process addressed by crowdsourcing, there are authors who identify it as an outsourcing process (Kleemann, Voß, & Rieder, 2008; Whitla, 2009; Liu & Porter, 2010; Oliveira, Ramos, & Santos, 2010; Sloane, 2011b; Poetz & Schreier, 2012) – as it happens with Amazon Mechanical Turk – and others as a problem solving process (Brabham, 2008b; Porta, House, Buckley, & Blitz, 2008; Mazzola & Distefano,

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[10] http://ec.europa.eu/transport/its/multimodal-planners/index_en.htm

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2010) via a distributed on-line process, such as in the case of InnoCentive. Still others indicate that it is a production model (Brabham, 2008b; Vukovic, Lopez, & Laredo, 2010) with a quintessential example being Threadless, while there are others who are inclined to consider it as a business model or practice (Howe, 2006; Ling & Mian, 2010) or a strategic model, relating without hesitation crowdsourcing to the business area (Brabham, 2008a). There are also scholars that see crowdsourcing in the guise of a process of organizing labor (Whitla, 2009), as a client integration process (Kleemann, Voß, & Rieder, 2008), or as an open innovation process (Chanal & Caron-Fasan, 2008; Sloane, 2011b); in the last circumstance, in particular the overlap existing between crowdsourcing and open innovation is blurred (section 2.5).

From all the previous affirmations, numerous common points running through the various contributions can be taken: crowdsourcing is an on-line process that is distributed by the very nature of the Internet and it always involves the participation of the crowd.

The first seminal definition proposed by Howe (2006) indicates the open call (*g*) as *condition sine qua non* for the existence of crowdsourcing. In spite of this initial emphasis, only ten documents (out of 209) taken into consideration by Estellés-Arolas and González-Ladrón-de-Guevara (2012) make reference to the use of an open call. This bibliography sometimes tends to consider that the call meant to bring together the potential participants should not be limited to experts or preselected candidates, or that participation should be non-discriminatory (Schenk & Guittard, 2011). If this holds true, it implies that everybody can answer the call: individuals can participate in addition to firms, non-profit organizations, or communities of individuals (Burger-Helmchen & Pénin, 2010). With this in mind, the call should be molded to the concrete crowdsourcing initiative. Whitla (2009) clearly explains this by indicating that the call can be of one of three types:

- A true open call where any given interested party can participate.
- A call limited to a community with specific knowledge and expertise.
- A combination of both, where an open call is made, but those who can participate are controlled.

The last characteristic covered in the paper written by Estellés-Arolas and González-Ladrón-de-Guevara (2012) is the medium used (*h*). With this respect, the connection between crowdsourcing and Internet as enabling infrastructure is discussed in section 2.3.

Drawing on the eight building blocks previously hinted at, Estellés-Arolas and González-Ladrón-de-Guevara (2012) formulate a definition that "covers any type of crowdsourcing initiative has been created". This rich definition – reported in Table 1 –

discerns whether a given activity is crowdsourcing or not, and formalizes a theoretical base through the reduction of semantic confusion.

For the purpose of the present thesis, I do not intend to coin a brand-new definition of crowdsourcing to add to the multitude already present in the literature, as this is not felt to generate significant value. However, to conclude this introductive review, I deem appropriate to extrapolate a nucleus that acts as prelude for the following chapters. In the vision I have selected, the term crowdsourcing describes a new Web-based *modus operandi* that harnesses solutions (usually having a creative nature) stemming from a distributed network of individuals through what amounts to an open call for proposals. Thus, crowdsourcing is a form of outsourcing not directed to other companies or organizations but to the crowd. Taking the cue from Surowiecki (2004) and Nambisan and Sawhney (2007b), a crowd can be defined as a large set of anonymous individuals whose anonymity entails that an organization cannot "build its own crowd" (Schenk & Guittard, 2011) in a stable and proprietary way.

2.2   The Contours of Crowdsourcing

Crowdsourcing is a relatively recent concept that encompasses many practices. This diversity leads to the blurring of the limits of crowdsourcing that may be identified virtually with any type of Internet-based collaborative activity, such as co-creation or user innovation.

For instance, Zhao and Zhu (2012) consider Wikipedia to be an undisguised example of crowdsourcing and, to reinforce this assumption, Howe (2006) connotes crowdsourcing as "Wikipedia for everything". In the same vein, Geiger, Rosemann, and Fielt (2011) situate all kinds of user-generated content systems – spanning the gamut from YouTube to Wikipedia – under the umbrella of crowdsourcing, choosing the moniker "crowd creation systems". Also Huberman, Romero, and Wu (2009) include a plethora of Web 2.0 tools (e.g., Digg, Flickr, YouTube, Wikipedia) in the crowdsourcing realm. Content production based on crowdsourcing is described in that paper as "a group of people that attempts to provide a common good in the absence of a central authority": taking the stance of the authors, the common good is in the form or videos, music, or encyclopedic knowledge that can be freely accessed by anyone generating a dilemma in each contributor exemplified by the well-known tragedy of the commons (Hardin, 1968).

Also O'Reilly and Battelle (2009) tend to meld crowdsourcing and Web 2.0 into a unique *corpus* since they theorize crowdsourcing as an approach through which a large group of people can create a collective work whose value far exceeds that provided by any of the individual participants. In their view "the Web as a whole is a marvel of crowdsourcing, as are marketplaces such as those on eBay and Craigslist, mixed media

collections such as YouTube and Flickr, and the vast personal lifestream collections on Twitter, MySpace, and Facebook".

Opposite point of view is held – among the others – by Kleemann, Voß, and Rieder (2008). The essence of crowdsourcing, as illustrated by them, lies in the intentional mobilization for commercial exploitation of creative ideas and other forms of work performed by consumers. In authors' vision, "other Web 2.0 based activities that do not integrate users into a firm's value creation process are related but peripheral to crowdsourcing".

The abundance of definitions and interpretations also means that crowdsourcing cannot be coherently classified, as explained by Andriole (2010), who situate crowdsourcing in the midst of other Web 2.0 technologies, almost on a par with RSS filters, wikis, blogs, virtual worlds and social networks.

A first systematic attempt to demarcate the crowdsourcing area is the one performed by Estellés-Arolas and González-Ladrón-de-Guevara (2012). Making reference to the distinctive traits of their definition (reported in Table 1), the authors validate such a definition using a collection of examples in the limelight: Wikipedia (collaborative on-line encyclopedia), InnoCentive (on-line platform where money is offered in exchange for the solution of problems), Threadless (Internet t-shirt company, whose designs are created and selected by users), Amazon Mechanical Turk (platform where crowdsourcers can propose tasks that are offered in exchange for money), ModCloth (Internet clothing shop that allows its users to give opinions on and vote for clothing designs before their sale), YouTube (Internet video platform), Lánzanos (Spanish website were people gives money for participating in different projects, receiving rewards for their participation), Delicious (social bookmarking system), Fiat Mio (initiative begun by Fiat through which a car has been created following the suggestions of users), iStockPhoto (Internet image sale platform), and Flickr (platform that allows the uploading and tagging of photographs). Results obtained by Estellés-Arolas and González-Ladrón-de-Guevara (2012) show that some crystal clear cases of crowdsourcing exist including InnoCentive, Threadless, Amazon Mechanical Turk, Lánzanos, iStockPhoto, ModCloth and Fiat Mio. For example, in the case of ModCloth, the crowd can be easily identified (i.e., ModCloth customers from any part of the world), as well as a task (i.e., to rate dresses), a recompense (i.e., recognition given by the company to opinions of users and opportunity to influence the selection so that the user will find clothes that s/he likes), a crowdsourcer (i.e., the company ModCloth), the compensation (i.e., cost saving and efficient use of resources, among others), the participative process (i.e., the process implies the conscious participation of the crowd), the open call (i.e., the call via their website) and the use of Internet. On the other hand, a set of exemplars do not fall under the banner of crowdsourcing. In the case of Delicious, for instance, six characteristics are not validated: a task with a clear goal, the

recompense received by the crowd, the crowdsourcer, the benefit it receives, the participative nature of the task and the existence of an open call. Concerning the company behind Delicious (i.e., AVOS Systems), it does not act like a crowdsourcer and it does not receive a benefit from the work of the crowd. Regarding the open call, there is no one since it is a free service usable by anyone. Furthermore, it cannot be said to be a participative process in which all the users are seeking the same end goal: the use of the site is mainly individual, thus the platform makes use of the collective intelligence to interconnect and exploit the information. For these reasons Delicious – as well as another slew of Web 2.0 services – cannot be considered a crowdsourcing example.

A clear definition of the crowdsourcing contours, that I am going to adopt as reference for following chapters, is schematized by Brabham (2013c). In his framework, the crucial distinction between crowdsourcing and other, similar forms of on-line participatory culture and user-generated content activities is that crowdsourcing entails a mix of top-down, traditional, hierarchical management process and a bottom-up, open process involving an on-line community. In crowdsourcing arrangements, the *locus* of control must reside between organization and on-line community rather than primarily in one or the other (Figure 2). An example of a high degree of organizational control that made insufficient use of the on-line community's input is the 'vote for your favorite flavor' marketing contest, such as Mountain Dew's DEWmocracy campaign in USA; conversely, examples of a high degree of on-line community control with insufficient organizational directive are Wikipedia or open source software projects such as Mozilla Firefox (Brabham, 2013c).
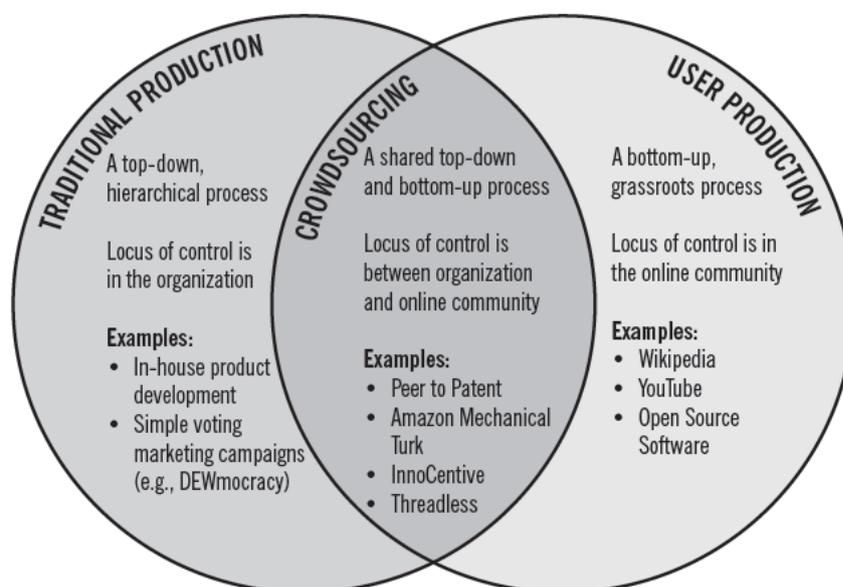
Figure 2 – Crowdsourcing as a blend of traditional top-down production and bottom-up user production – Source: Brabham (2013c)

2.3 The Enabling Role of the Internet

In the crowdsourcing paradigm, where boundaries between organizations and their environment have become more permeable, organizational intelligence (Albrecht, 2002) could be enhanced by facilitating cross-border interactions between organizations and a kaleidoscope of heterogeneous stakeholders such as scientists and experts in various fields, but also novices or volunteers in other circumstances.

The untapped potential lying in the resulting assemblage of individuals could be unlocked only by deploying adequate connection systems. In this field, the Internet infrastructure has become the cornerstone of the crowdsourcing model since it provides the means for individuals around the globe to commune in a single frictionless environment; this enabling role of the Web is considerably expanded by scholars such as Terranova (2004), according to whom the Web is "not simply a specific medium but a kind of active implementation of a design technique able to deal with the openness of systems". A plethora of users spreading throughout a geographical terrain could be effectively aggregated via Web technologies giving life to a powerful (albeit decentralized) hotbed of innovation practices and insightful suggestions. This virtuous dynamics leverages the so called 'collective intelligence', masterly defined by Levy (1997) as a "form of universally distributed intelligence, constantly enhanced, coordinated in real time, and resulting in the effective mobilization of skills".

The notion of collective intelligence, coupled with the Internet infrastructure, has what it takes to become an actual game-changer capable of unlocking an enormous potential. According to Bonabeau (2009), this is the emerging era of "Decisions 2.0", when 'solve', 'explore', 'understand' and 'listen' have now taken on a whole new meaning. Thanks to recent technologies, including many Web 2.0 applications, organizations can now tap into 'the collective' on a greater scale than ever before. Indeed, the increasing use of concept such as information markets, wikis, crowdsourcing, 'wisdom of crowds', social networks, collaborative software and other Web-based tools constitutes a paradigm shift in the way that organizations make decisions. For many problems that a company faces, there is potentially a solution out there, far outside of the traditional places that managers might search, within or outside the organization. The trick, though, is to develop the right technological tool for locating that source and then tapping into it. Indeed, although a success like Wikipedia might look simple on the surface, that superficial simplicity belies a complex underlying mechanism for harnessing the power of collective intelligence.

Taking a macro perspective, the transformative role of Internet is at the hearth of a new art and science of collaboration that has gained a foothold with the moniker "wikinomics" (Tapscott & Williams, 2006). Even if this wide-ranging paradigm goes far beyond crowdsourcing, it is worth to be mentioned because 'wikinomics' terrain is a

fertile soil for the fruitful worldwide involvement of a platoon of interested participants and solvers via crowdsourcing practices. While hierarchies are not vanishing, profound changes in the nature of technology are giving rise to powerful new models of production based on community, collaboration and self-organization rather than on hierarchy and control. Smart companies are encouraging, rather than fighting, the heaving growth of massive on-line communities. As a growing number of firms see the benefits of mass collaboration, this new way of organizing will displace the traditional corporate structures as the economy's primary engine of wealth creation

Trying to single out concepts related to crowdsourcing in this visionary book, first of all openness – that has an essential role in 'wikinomics' – is *contidio sine qua non* for establishing a culture inclined to adopt crowdsourcing. Making reference to firms, Tapscott and Williams (2006) explain that today companies that make their boundaries porous to external ideas and human capital outperform companies that rely solely on their internal resources and capabilities. People and institutions that interact with firms are gaining unprecedented access to important information about corporate behavior, operations and performance. Openness, wisely combined with other ingredients may result in 'recipes' that Tapscott and Williams (2006) describe as seven new models of mass collaboration. Two of them, in particular, are Internet-enabled archetypes that represent the ideal *loci* for crowdsourcing practices. 'Ideagoras', *portmanteau* of the modern English word 'idea' and the ancient Greek word '*agora*', are places on the Internet where large numbers of people or businesses gather to exchange ideas and solutions. Much like the bustling *agorae* that sprang up in the heart of ancient Athens to facilitate politics and commerce among the burgeoning Athenian citizenry, modern-day 'ideagoras' such as InnoCentive make ideas, inventions and scientific expertise around the planet accessible to innovation-hungry companies. In the roster of new models of mass collaboration, also 'platforms for participation' make their appearance, inviting unprecedented participation in value creation. Such open Web platforms take advantage of mass collaboration and embodies all of the 'wikinomics' principles (i.e., openness, peering, sharing, and acting globally). Though the early examples are entirely based on the Web as 'connecting tissue', according to Tapscott and Williams (2006) nearly all businesses can become open platforms, with enough imagination and ingenuity.

In line with Tapscott and Williams (2006), also Shirky (2008) emphasize Internet as 'connecting tissue' able to radically change group dynamics and organization in modern socio-technical systems (Sommerville, 2007). Albeit without explicitly mentioning crowdsourcing, Shirky (2008) discusses what happens when people are given the tools – thanks to the Internet – to do things together, without needing traditional organizational structures. With this respect, social and technological drivers generated by Web 2.0 applications and social media platforms have brought with them new organizational

forms, through the capacity of the Internet and its users to 'organize without organizations'.

From a global perspective, Internet has transformed the lives of human beings and social relationships in contemporary society (Fuchs, 2013): ecological, economic, political, and cultural systems are becoming more pervasive, connected, interrelated and responsive, taking also advantage of new forms of cooperation and competition advanced and supported by the Internet. Digital technologies have profoundly revolutionized the economics and the market structure in a wealth of industries (Benjamin & Wigand, 1995): the ability to crunch huge amount of data in real-time and the rapid data circulation through digital systems not only mean that distance appears to shrink and time seems to collapse, but also that negotiation costs, search and information costs are brought down in an unprecedented way. Since such categories of costs are facets of transaction costs (Dahlman, 1979), digital technologies oblige scholars to rethink the equilibrium between the two basic mechanisms for coordinating the flow of materials or services through adjacent steps in the value-added chain, i.e., markets and hierarchies (Coase, 1937; Williamson, 1975). By reducing the costs of coordination, information technology leads to an overall shift toward proportionately more use of markets – rather than hierarchies – to coordinate economic activity. Malone, Yates, and Benjamin (1987) explain this fact by means of an analytic framework that clarifies how an overall abatement in the 'unit costs' of coordination would reduce the importance of the coordination cost dimension (on which markets are weak), thus leading to markets becoming more desirable in some situations where hierarchies were previously favored looking at asset specificity and complexity of product description. In terms of innovative potential, better explained in section 2.5, thanks to the burst of information technologies and to their ability to decrease unit costs for coordination, organizations are implementing, increasingly rapidly, new links for relating to each other and thus radically change innovation patterns: organizations have now the opportunity to open up their 'innovation funnel' moving from closed-door R&D labs to the entire world seen as an open-door innovation lab.

To come full circle, the enabling role of the Internet – seen as general evidence – has to be connected to the specificities of crowdsourcing. Concerning the existential dependence of crowdsourcing on the Internet, there is unanimity among scholar (probably a *unicum*): the indispensable medium for crowdsourcing is the Internet (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). In fact, the importance of the Internet in crowdsourcing has been emphasized by numerous authors (Howe, 2008; Kleemann, Voß, & Rieder, 2008; Andriole, 2010; Burger-Helmchen & Pénin, 2010) some of whom even affirm that Web 2.0 is the technological basis upon which crowdsourcing is developed and operates (Vukovic & Bartolini, 2010; Vukovic, Lopez, & Laredo, 2010) given the level of collaboration that can be achieved (Howe, 2008).

In the crowdsourcing realm, state-of-the-art Web-based technologies, of which Web 2.0 is the current manifestation, are used to find and control the potential large-scale 'crowd' of workers, negotiate contracts, and monitor work progress in real time. Although the idea of crowdsourcing in itself may not be entirely new – at least in prototypical form – advanced Internet technologies have made crowdsourcing practicable for an immeasurably wider audience, at a larger scale, for a greater number of products and services, and at greatly enhanced speed (Saxton, Oh, & Kishore, 2013). This indisputable status of game-changer that the Internet has acquired is corroborated by the emergence of Web 2.0. A paradigm leveraging collaboration, bidirectional interaction and massive participation effectively allows organization to tap into these large-scale, latent virtual work forces in a way that was previously impossible. Advanced Web technologies have, in effect, enabled organizations to reach and search a tremendous number of potential workers at low cost and, as a result, any organization big or small can take advantage of these technologies to outsource a wide variety of organizational tasks to an on-line crowd. A unique strength of the social Web is thus its capacity for collectively extracting the tacit knowledge latent in the crowd's brain, and for aggregating it into a structured and usable knowledge format. Unlike conventional knowledge management systems (e.g., Internet portals or intranets), which process information from the perspective of a handful of business professionals, the social Web platform virtually opens the system to the on-line community to aggregate the crowd's collective intelligence, becoming a global 'operating system'. What the crowdsourcing model is able to do is harness these key features of advanced Web technologies to fulfill previously difficult and costly organizational endeavors: ultimately, crowdsourcing applications effectively funnel the crowd's energies with a clear orientation and with a set of goals to be achieved (Saxton, Oh, & Kishore, 2013).

2.4 Crowdsourcing and Open Source

At a first glance, the open and distributed nature of crowdsourcing recalls, in many aspects, the open source paradigm. This immediate intuition seems to be partially corroborated by researchers, indeed the connection between the two concepts has been alluded in many studies.

A very general (and weak) connection is built by Brabham (2009), according to whom as open source production on the Web has proven itself as a collaborative method for designing superior software products, the crowdsourcing model may prove itself as a superior method for participatory design. Other vague analogies have to do with the involvement of the community. For instance, prior to the advent of crowdsourcing, some scholars describe open source mechanisms using expressions that subsequently

would have sound quite familiar with the crowdsourcing jargon, being oriented towards the participatory grassroots production of knowledge.

Foray and Zimmermann (2001) theorize that software is a particular economic good whose production can be self-organized and decentralized. By the same token, Raymond (1999) presents the 'bazaar style' development mode as antidote to the old-fashioned 'cathedral-building style' of software development. In the novel *modus operandi* brought by Linus Torvalds, the open source kingdom is made up of a great babbling bazaar of differing agendas and approaches that allow the network to be everything and everywhere: not just the Internet, but the people doing the work form a distributed, loosely coupled, peer-to-peer network that provides multiple redundancy and degrades very gracefully.

When crowdsourcing came to light, other scholars proceed along similar guidelines, making again reference to the vital role of the community. For instance, the open source-like approach has been classified by Osterloh and Rota (2007) as a special case of "collective invention" (Allen, 1983), i.e., first tentative locution adopted to describe a case of what von Hippel and von Krogh (2003) call the "private-collective" innovation model. Collective invention describes situations in which economic actors willingly reveal their innovations to an interested public – with no fear of Arrow's (1971) information paradox – so that others can learn and develop these innovations further (Henkel, 2006). Even though this principle that "a company gains power by giving it away" (Gloor & Cooper, 2007a) may sound counterintuitive and even nonsensical, it may become the rationale underlying "swarm business" (Gloor, 2005), another category in which the open source community may fit (and sometimes crowdsourcing as well). As with no central direction, bees self-organize to build nests, feed and nurture offspring, gather food and even decide on their next queen, similarly, groups of humans (or organizations) swarming together for a common purpose can constitute a powerful collective mindset that unleashes tremendous creativity, spurring exciting and valuable innovations. Members of a swarm typically reject the traditional business notion of building shareholder value as the basis for their decisions and actions: in its place, the swarm works toward the collective interest of stakeholders, which is broadly defined as any party that can affect or is affected by the innovation. From a business perspective, this includes more than just shareholders but also employees, customers, suppliers, partners and even competitors: although companies' actions are hardly driven by pure magnanimity, in the sprawling *milieu* of the swarm, revenues may likely come from unexpected places in surprising ways (Gloor & Cooper, 2007b). Owing to its distinctive traits, the 'swarm' model appears in line with the open source ecosystem seen as a massive social movement in which contributors, developers, governments, and firms collaborate to create a public good that shapes society (Holtgrewe & Werle, 2001; von Krogh & Spaeth, 2007).

Coming back to notion of free and open source software, Dahlander and Magnusson (2008) mention its genesis among the quintessential examples of "distributed innovation process", in which firms can benefit from the creative ideas of individuals residing outside the company. In free and open source environments, innovations are developed by communities of distributed individuals: this organizational pattern testifies that traditional means for handling external input from other companies (e.g., contracts) cannot be easily applied.

Other analogies may take the cue from motivations that lead developers to contribute their time and effort to the development of open source software. One of the most compelling aspects of open source software projects is that they are predominantly based on voluntary contributions from software developers without organizational support in a traditional sense[11] (Moon & Sproull, 2000). A number of empirical studies has shown that open source developers have both intrinsic and extrinsic motivations[12] (Deci, 1972) for contributing to its development (Hars & Ou, 2002; Lakhani & Wolf, 2005; Roberts, Hann, & Slaughter, 2006; Wu, Gerlach, & Young, 2007). The structured approach proposed by Von Krogh, Haefliger, Spaeth, and Wallin (2012) groups open source developer motivations into intrinsic motivation, internalized extrinsic motivation, or extrinsic motivation. Pure extrinsic motivations include careers – through signaling behavior (Lerner & Tirole, 2002) – and pay. A 'grey area' lying in between regards internalized extrinsic motivations: some motivations are, in fact, by definition extrinsic but developers could internalize them, so that they are perceived as self-regulating behavior rather than external impositions (Deci & Ryan, 1987; Roberts, Hann, & Slaughter, 2006): these internalized extrinsic motivations include reputation, reciprocity, learning, and own-use value. Intrinsic motivations, for their part, encompass ideology, altruism, kinship amity, enjoyment and fun. A prevalence of intrinsic motivation – apparently intuitive – is outlined by Lakhani and von Hippel (2003) who link feelings of competence and fun to willingness to help other developers. This school of thought also views motivation in relation to reciprocity, such as giving software

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[11] Taking a longitudinal perspective, it is worth noting that a more recent study endorsed by the Linux Foundation (Kroah-Hartman, Corbet, & McPherson, 2009) declares that over 70% of all Linux kernel development is demonstrably done by developers who are being paid for their work. The list of companies participating in Linux kernel development includes many of the most successful technology firms in existence. None of these companies are supporting Linux development as an act of charity; in each case, these companies find that improving the kernel helps them to be more competitive in their markets. As a result of this sponsorship mechanism, Linux has a broad base of support which is not dependent on any single company. Even if the largest contributor were to cease participation tomorrow, the Linux kernel would remain on a solid footing with a large and active development community.

[12] A contribution that partially drifts away from the traditional intrinsic/extrinsic schema is the one proposed by Bonaccorsi & Rossi (2006). They distinguish between economic, social, and technological motivation, building on a taxonomy proposed by Feller and Fitzgerald (2002).

patches as 'gifts' to the community (Bergquist & Ljungberg, 2001; Wu, Gerlach, & Young, 2007) or reciprocal helping behavior (Lakhani & von Hippel, 2003).

On the whole, Hertel, Niedner, and Herrmann (2003) provide a synthesis able to reasonably capture prominent relevant aspects previously highlighted. In their study, authors focus on the following motivations:

- Intrinsic motivation ('fun to program') and personal challenges to improve existing software for own needs.
- Social comparison motives such as competition with other developers (either within open source projects or between open source projects and commercial software projects) and/or the interest to build a reputation that might be helpful for their occupational career.

On balance, even though the mix of motivation for open source developers may have some commonalities with the one leading solvers to enter the fray in crowdsourcing endeavors, the monetary incentive – rare in open source (Lakhani & Wolf, 2005) and frequently present in crowdsourcing – constitutes the glaring difference.

Despite being mainly applied to software development, the open source paradigm can be seen as an overall philosophy for product development in general: an example in this vein is provided by Ågerfalk & Fitzgerald (2008), who envisage the use of the open source development model as a global sourcing strategy ('opensourcing') opposed to traditional domestic outsourcing. The study reveals open source morphing from community of individual developers to community of commercial organizations, primarily small to medium-sized enterprises: the resulting off-shore outsourcing model leverages openness, trust, tact, professionalism, transparency, and complementariness to establish a partnership of shared responsibility in building an overall collaborative ecosystem based on reciprocity and symbiosis (Dahlander & Magnusson, 2005). In addition, the common ground succinctly depicted inspires also strong statement by Howe (2008), who defines crowdsourcing as "the application of open source principles to fields outside of software", and by Sloane (2011b), according to whom "crowdsourcing is based on the open source philosophy".

However, it is relevant to ascertain that remarkable differences (Brabham, 2008a) in terms of value appropriation, motivation of participants, and transparency of solutions, oblige scholars to decouple the two concepts without overlooking their mutual influences.

To sum up, while open source community is chiefly based on 'copyleft' principles (Mustonen, 2002; De Laat, 2005), organizations resorting to crowdsourcing can make traditional use of IPR, for examples by patenting their outputs, and have the faculty to protect results of the interaction with the crowd, thus limiting the transparency on solutions generated. This holds because – unless different agreements among parties –

problems solved and products designed by the crowd become the property of the seeker, who has the chance to turn large profits off from the crowd labor (Brabham, 2008a), sometimes calling morality of the crowdsourcing into question (Bruns, 2007).

Finally, to reconcile the two concepts of open source and crowdsourcing – which are sometimes close and sometimes far – a visual approach is proposed by Schenk and Guittard (2011). Their conceptualization (Figure 3) considers open source as an application of the crowdsourcing production mode rather than a similar concept; open source also borrows from a pool of other tendencies, where the 'user innovation' approach (von Hippel & von Krogh, 2003; von Hippel, 2009) stands out.
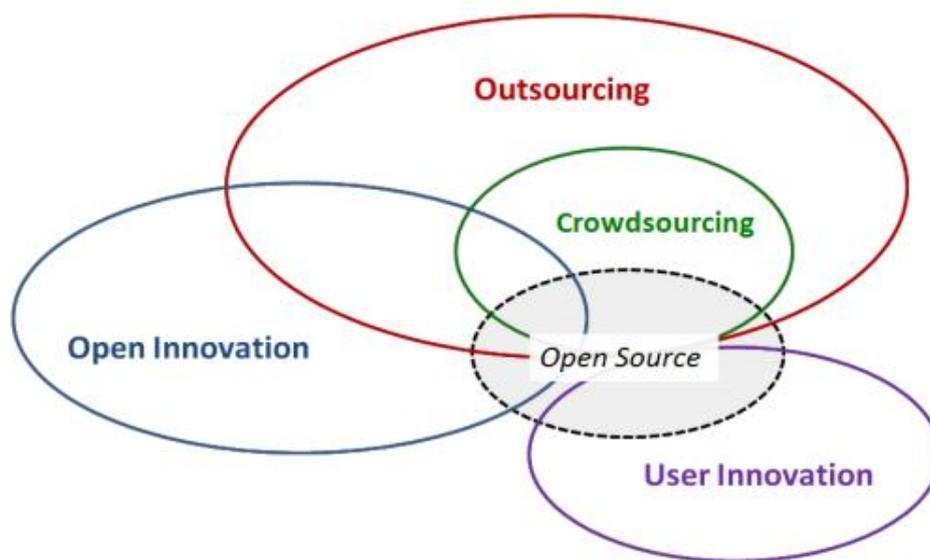
Figure 3 – The interplay between crowdsourcing and other related concepts – Source: Schenk and Guittard (2011)

2.5 Crowdsourcing and Open Innovation

Broadly speaking, distinctive traits of crowdsourcing render the paradigm applicable to plenty of diverse purposes. In particular, crowdsourcing as a full-fledged tool for harnessing collective intelligence has gradually become a propellant for catalyzing innovation actions in private sector enterprises operating in a global scenario in which firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology (Chesbrough, 2003). New R&D practices consisting of seeking innovative ideas or solutions outside have been described by various authors by means of different nuances that could be encompassed under the label 'open innovation', suggested by Chesbrough, a trailblazer in this field. The overarching conceptual architecture of open innovation could be assumed as extremely general and flexible: a helicopter view of open innovation

portrays an opening up of the innovation process, both upstream, with the exploration of external sources for innovation opportunities, and downstream, with the use of those opportunities at different stages of the innovation process and through multiple channels (Chanal & Caron-Fasan, 2008). This evolution has led to a new metaphor of the 'innovation funnel' (Figure 4) characterized by a porous surface that allows a bidirectional percolation of contributions which are the fruits of the recourse to open-market innovation, i.e., an approach that uses tools such as licensing, joint ventures, and strategic alliances to bring the benefits of free trade to the flow of new ideas. By systematically opening their innovation borders to vendors, customers and even competitors, companies are increasing the imports and exports of novel stimuli (Rigby & Zook, 2002): improvements in the speed, cost and quality of innovation endorse the open innovation systems as the key to the knowledge-based economy competitiveness (Chen, 2008).
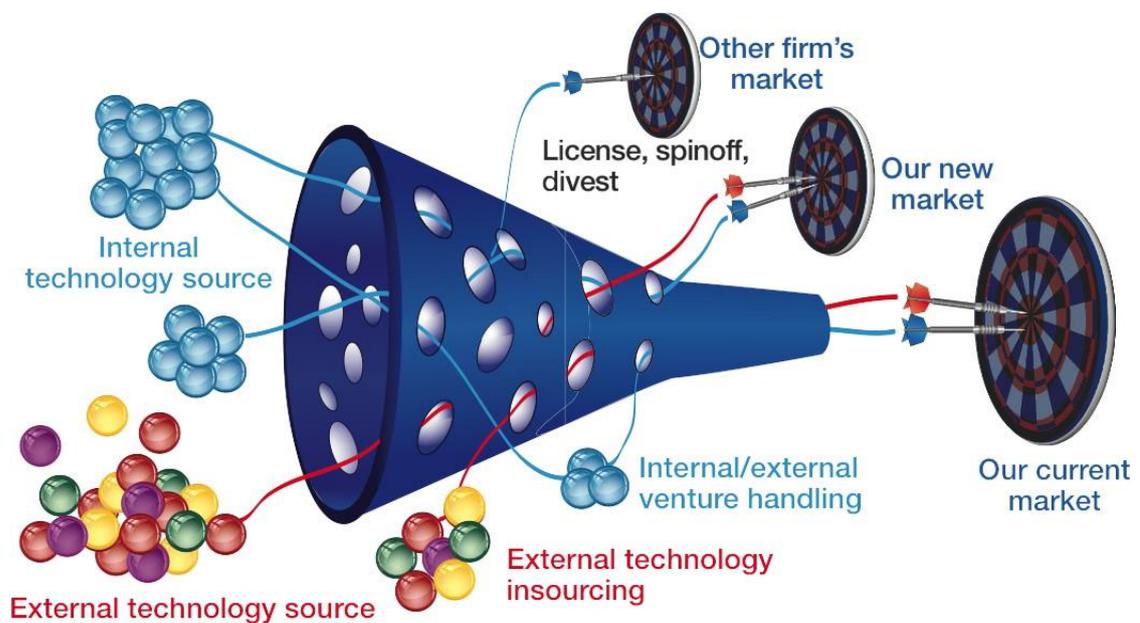
Figure 4 – Metaphor of the 'innovation funnel' characterized by a porous surface

Hence, open innovation practices allow the diffusion of knowledge, removing the need to reverse-engineer products or circumvent patents (Reed, Storrud-Barnes, & Jessup, 2012). This involves both inside-out movements of ideas and technologies, also referred to as the "knowledge/technology exploitation" (Lichtenthaler, 2007; Lichtenthaler, 2008a; Gassmann & Enkel, 2004), and outside-in processes of acquiring external sources of innovation, also called "technology exploration" (van de Vrande, de Jong, Vanhaverbeke, & de Rochemont, 2009) or "technology acquisition" (Lichtenthaler, 2008b). In this perspective, firms that embrace the open innovation paradigm may have two kinds of openness: 'outbound openness', if they are willing to reveal information or

sell technology to the external environment, or 'inbound openness', when they are interested in capturing technologies, ideas and concepts originated outside the boundaries of organization's R&D facilities (Frey, Lüthje, & Haag, 2011). Focusing on the latter, it emerges clearly how crowdsourcing is an effective open innovation approach in this sense, because it allows firms to maximize the breadth of external contributors and to reduce transaction costs by choosing the 'buy' approach instead of the 'make' one[13].

As per other associated concepts such as Web 2.0 or open source, also for open innovation consensus does not exist on its relationship with crowdsourcing (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). In fact, whilst some authors unequivocally identify crowdsourcing with open innovation (Chanal & Caron-Fasan, 2008), others state the exact opposite (Schenk & Guittard, 2011).

Regarding the first group of authors, stepping into this long-standing debate, Chanal and Caron-Fasan (2008) discuss the presence of "new R&D practices consisting of seeking innovative ideas or solutions outside via the Web", making reference to a variegated nomenclature, including "open innovation" (Chesbrough, 2006), "Connect & Develop" (Sakkab, 2002; Huston & Sakkab, 2006) and "The Global Brain" (Nambisan & Sawhney, 2007b). In this conceptualization, crowdsourcing assumes the semblance of outsourcing, generally defined as a mean of procuring – from external suppliers – services or products that are normally part of an organization (Heizer & Render, 2008). Based on this background, Chanal and Caron-Fasan (2008) characterize crowdsourcing as the opening of the innovation process of a firm to integrate numerous and disseminated outside competencies through Web facilities. Competencies gathered in this way can be those of individuals (e.g., creative people, scientists, engineers) or existing organized communities (e.g., open source software communities). Along this trajectory, also in everyday parlance, cases in which open innovation and crowdsourcing seem to overlap are everything but rare.

The opposite school of thought, albeit recognizing that open innovation and crowdsourcing fall within the same paradigm (Albors, Ramos, & Hervas, 2008) according to which knowledge is distributed and the opening of a firm's R&D processes can be a source of competitive advantage, clearly posits the dissimilarities lying between the two approaches. With this respect, Schenk and Guittard (2011) formulate two prominent differences.

The first difference is that open innovation focuses exclusively on innovation processes while crowdsourcing does not: looking at the blurred contours of crowdsourcing from a practical perspective, Estellés-Arolas and González-Ladrón-de-Guevara (2012) classify

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[13] The influence of transaction costs on 'make or buy' decisions is discussed by Walker and Weber (1984).

crowdsourcing as an open innovation process in InnoCentive but not in the case of Amazon Mechanical Turk, where it is mere outsourcing process without any particular creative contributions brought by the crowd.

The second key difference is that open innovation describes B2B interactions between firms (e.g., partnerships, IP selling and licensing, R&D marketplaces, incubators), while crowdsourcing refers to links between a firm and the crowd, intended as an amorphous entity whose composition is extremely heterogeneous (see section 2.1).

In order to find a way in the maze succinctly depicted above, the contribution of Sloane (2011b) seems to be precious. He describes a Copernican revolution in which the concept of capturing ideas in a hub of collaboration is coupled with the outsourcing of tasks to a large group of people or community. In this scenario, crowdsourcing becomes a critical building block of open innovation on a par with co-creation and user driven innovation, thus rendering it "one particular manifestation of open innovation" (Sloane, 2011b). Similar conclusions are reached also by Schenk and Guittard (2011), who support the existence of a 'part-of' relationship: crowdsourcing is a way to implement outside-in knowledge flows with the crowd acting as a particular knowledge provider. More recently, Saxton, Oh, and Kishore (2013) mention open innovation as an area of outsourcing that can reap the benefits of crowdsourcing. If the substance takes precedence over the form, the idea conveyed is that crowdsourcing may be considered in the guise of a way to implement open innovation (Marjanovic, Fry, & Chataway, 2012).

On the whole, it emerges clearly how crowdsourcing is an effective open innovation schema in terms of 'inbound openness', since it amplifies the breadth of external contributors. Moreover, crowdsourcing has the potential to generate favorable impact on transaction costs. Going beyond simple 'make or buy' considerations, crowdsourcing has what it takes to alleviate 'dynamic governance costs' (Langlois, 1992) with respect to 'canonical' outsourcing. Since in crowdsourcing the remuneration is based on outputs rather than on 'headcount pricing', the monitoring of crowdsourcing solvers is more agile and usually concentrated in a limited timeframe compared to outsourcing workforce. The leaner governance model of crowdsourcing is also ascribable to more schematic negotiation – rarely personalized – required to cope with 24/7, global and heterogeneous solvers taking the place of a single contractor (outsourcee).

Howbeit, for the sake of completeness, it must be remembered that the crowdsourcing approach should not be considered as a *panacea* to be depicted *erga omnes* as hegemonic in unlocking inventive conundrums.

Discussing 'pros & cons' of inbound innovation, Dahlander & Gann (2010) pinpoint some general drawbacks of open innovation which can affect also crowdsourcing. Regarding adoption, as put by Laursen and Salter (2004), there are substantial variations in the degree to which firms embrace open innovation (and, by analogy, crowdsourcing)

since the degree of openness varies according to external sources of innovation as technologies mature (Christensen, Olesen, & Kjær, 2005; Gassmann, 2006). In terms of performance, based on a study on the industrial robotics industry, Katila and Ahuja (2002) suggest that some firms over-search and that there is a curvilinear relationship between innovative performance and their search for new innovations. Laursen and Salter (2006), for their part, extend this reasoning by looking also at external sources of innovation: this analogy renders this principle potentially applicable to the crowdsourcing terrain, at least for the portion related to innovation.

As obvious, this non-linearity in innovative performances is not only caused by exogenous factors (e.g., technological maturity): to this end, internal absorptive capacities play a fundamental role in the exploitation of crowdsourcing for innovative purposes. In fact, the ideas offered by the crowd could have a lot of potential, but the company might not have the capability to utilize and execute them in the best possible manner due to the organization's internal product development system (Aitamurto, Leiponen, & Tee, 2011). As explained in the seminal contribution by Cohen and Levinthal (1990), the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. In particular, hurdles on the way to the internalization of external sources may be framed in a dynamic perspective drawing on cognitive and behavioral sciences: the development of absorptive capacity, and, in turn, innovative performances are history-dependent or path-dependent. Although many of the companies harnessing crowdsourcing are relatively young, a learning curve phenomenon cannot be overlooked: Bower and Hilgard (1981) suggest that memory development is self-reinforcing in that the more objects, patterns and concepts that are stored in memory, the more readily is new information about these constructs acquired and the more facile is the individual in using them in new settings. In the midst of a wave of external stimuli, the "learning to learn" skills (Ellis, 1965; Estes, 1970) are at the heart of a fruitful 'inbound openness': in fact, weak dynamic capabilities (Teece & Pisano, 1994; Teece, Pisano, & Shuen, 1997) fatally hinder the ability of organizations to sense the need to change and then reconfigure internal and external competences to seize opportunities created by rapidly changing environments.

Placing specifically the spotlight on crowdsourcing, in front of the question "to crowdsource or not to crowdsource?" (Ranade & Varshney, 2012), the choice has to carefully consider the nature of the task that is outsourced to the crowd (Kazman & Chen, 2009; Thuan, Antunes, & Johnstone, 2013). Burger-Helmchen and Pénin (2010), for example, suggest that crowdsourcing contests are not suitable for tasks that require large interaction between the seeker and solvers. Malone, Laubacher, and Dellarocas (2010) pinpoint that the crowd should be used for tasks that can be subdivided. To corroborate this constraint of crowdsourcing, Afuah and Tucci (2012) note that modular

problems are particularly conducive to collaboration-based crowdsourcing, taking a position supported by other studies (Kittur, Smus, Khamkar, & Kraut, 2011; Kulkarni, Can, & Hartmann, 2012). In addition, Muntés-Mulero, Paladini, Manzoor, Gritti, Larriba-Pey, and Mijnhardt (2013) claim that tasks with sensitive information – including privacy, security, and intellectual property – are not suitable for crowdsourcing.

Finally, the observation of crowdsourcing practices conducted by Burger-Helmchen and Pénin (2010) through the lens of transaction cost theory (Coase, 1937; Williamson, 1975) leads to the conclusion that the paradigm under examination is a credible solution only when knowledge is strongly codified, thus reducing coordination and learning problems, and concrete possibilities of protection could be put into action to overcome problems of opportunistic behaviors.

2.6 Crowdsourcing and Wisdom of the Crowd

To conclude this introductory theoretical background, it is also paramount to differentiate crowdsourcing from a related phenomenon, the 'wisdom of crowds'.

The wisdom of the crowd is the process of taking into account the collective opinion of a group of individuals rather than a single expert to answer a question. A large group's aggregated answers to questions involving quantity estimation, general world knowledge, and spatial reasoning have generally been found to be as good as, and often better than, the answer given by any of the individuals within the group (Yi, Steyvers, Lee, & Dry, 2012).

The classic wisdom-of-the-crowds finding involves point estimation of a continuous quantity. At a 1906 country fair in Plymouth, eight hundred people participated in a contest to estimate the weight of a slaughtered and dressed ox. The statistician Galton (1907) observed that the median guess, 1207 pounds, was accurate within 1% of the true weight of 1198 pounds. An intuitive and often-cited explanation for this phenomenon is that there is idiosyncratic noise associated with each individual judgment, and taking the average over a large number of responses will go some way toward canceling the effect of this noise, as it happens – statistically speaking – with the central limit theorem: crowd's individual judgments can be modeled as a probability distribution of responses with the mean centered near the true mean of the quantity to be estimated (Surowiecki, 2004).

This process, while not new to the information age, has been pushed into the mainstream spotlight by social information sites – such as Wikipedia[14] (Niederer & van Dijck, 2010), Web resources that rely on human opinion (Baase, 2008) and tools based on folksonomies (Lux & Dosinger, 2007) – and even by TV shows. A well-known example has to do with 'Who Wants to Be a Millionaire?', international television quiz show which offers a maximum cash prize of one million pounds for correctly answering successive multiple-choice questions of increasing difficulty. In this format, three lifelines (i.e., 'Ask the Audience', 'Phone-a-Friend', '50/50') are presented at the beginning of the game in order to aid contestants. 'Ask the Audience', in particular, calls for a an aggregation of individual independent answers giving life to a final 'collective answer': audience members use touch pads to designate what they believe the correct answer to be and the percentage of the audience choosing each specific option is displayed to the contestant.

Albeit being apparently intuitive, the 'wisdom of crowds' phenomenon has been repeatedly placed in a nebulous 'tag cloud' expressing a broad gamut of nuances. For instance, according to Eckert, Niepert, Niemann, Buckner, Allen, and Stuckenschmidt (2010), 'far-flung genius', 'distributed intelligence' and 'innovation communities' are exemplary descriptions of the phenomena best characterized as 'wisdom of the crowd'. Malone, Laubacher, and Dellarocas (2009) make reference to well-known Web sites such as Google, Wikipedia and Threadless to portray large, loosely organized groups of people working together electronically in surprisingly effective ways. According to these authors, this *modus operandi* may assume plenty of nomenclatures, considering 'wisdom of crowds' au pair with radical decentralization, crowdsourcing, peer production, collective intelligence, or 'wikinomics'. Bernstein, Klein, and Malone (2012), for their part, conceive a 'global brain' – combining citizen science, predictive algorithms, open idea ecologies (i.e., where crowds of people share, recombine, and refine each other's creative outputs), etc. – without any distinction between individual task-focused 'geniuses' and activities tracing millions of Internet users.

To dispel this vagueness, the 'wisdom of crowds' has to be rigorously characterized by defining a set of distinctive features. To have a 'wise' crowd, in Surowiecki's (2004) framework, there are four prerequisites:

1. cognitive diversity, by which each individual involved has some private information;

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[14] It is worthwhile to remind that it is still an open question whether the success of Wikipedia results from a 'wisdom of crowds' type of effect in which a large number of people each make a small number of edits, or whether it is driven by a core group of prolific 'elite' users – a.k.a. "coolfarmers" (Iba, Nemoto, Peters, & Gloor, 2010) – who do the lion's share of the work in view of a Pareto-like power law distribution (Kittur, Chi, Pendleton, Suh, & Mytkowicz, 2007).

2. independence, wherein each person's opinion or decision is not influenced by those around them;

3. decentralization, through which individuals can specialize and tap into local fonts of knowledge;

4. aggregation, which stresses the importance of structural mechanisms for translating many private opinions or decisions into a collective decision.

Coming to the comparison, while examining these four prerequisites in relation to defining elements of crowdsourcing, it comes immediately that the two phenomena overlap in certain respects but diverge in other important ways.

Although both phenomena explicitly rely on the presence of the crowd – in particular, crowdsourcing operationalizes crowd wisdom by leveraging the collective intelligence of on-line users toward productive ends (Brabham, 2009) – not all manifestations of crowdsourcing are examples of the 'wisdom of crowds'.

To start, many of the 'mundane' tasks outsourced to the crowd (e.g., transcription services, bookkeeping) are not designed to tap into the crowd's wisdom or opinions but rather its skills. Moreover, many of the knowledge-building, innovation, or solution manifestations of crowdsourcing do not employ symbiotically the four prerequisites of wise crowds. There is almost always element #1 (i.e., diversity) as well as element #3 (i.e., decentralization). However, there are not always elements #2 or #4, i.e., independent decision making and aggregation of opinions.

Most notably, many of the crowdsourcing sites that appear – at first blush – designed to tap into the crowd's collective wisdom fail completely on element #2. For instance, on most of the consumer rating sites and investing sites, as well as many of the idea-generation sites, users can only add their opinion/rating after seeing the existing ratings. This is a stark violation of the 'wisdom of crowds' concept (Saxton, Oh, & Kishore, 2013).

Finally, crowdsourcing platforms having a competitive nature frequently are not compatible with element #4 of the 'wisdom of crowds' rulebook. While 'wisdom of crowds' tends to leverage the aggregation, and sometimes the average, of a collection of independently-deciding individuals whose collective answer is likely to make certain types of decisions and predictions better than individuals or even experts, crowdsourcing can weed out aggregation due to the seekers' decision not to turn private judgments into a collective decision. When solvers compete for the best solution in problem solving (e.g., InnoCentive), seekers may choose among various offerings (i.e., solutions in lieu of opinions) usually obtained from the external environment through a challenge: the selection process entails a one by one evaluation of submitted solutions thus single contributions are neither added together nor combined.

3. Methodological Notes

Taking a helicopter view on the research conducted, it is not difficult to find out the predominance of qualitative research methodologies.

On the contrary to the 'pure' scientific paradigm – according to which positivists go forth into the world impartially, discovering absolute knowledge about an objective reality in which the researcher and the researched are independent entities (Cohen, Manion, & Morrison, 2007) in light of the ontological position of realism – qualitative research methodologies adopt the interpretive paradigm. In view of this approach, knowledge and meaningful reality are constructed in and out of interaction between humans and their world and are developed and transmitted in a social context (Crotty, 1998): therefore, the social world can only be understood from the standpoint of individuals who are participating in it (Cohen, Manion, & Morrison, 2007).

Looking at the breadth of the spectrum characterizing qualitative inquiries – encompassing *inter alia* biography, phenomenology, grounded theory, ethnography, case study, action research (Creswell, 1998) – the research I conducted calls for two of them in particular.

3.1 Action Research

Regarding the study of crowdsourcing in the public sector – necessary to answer part of the second research question "*How to transform the crowd into value?*" – the 'obvious' choice has been action research. Reasons supporting this option are multifarious.

First of all, action research is about "research in action, rather than research about action" (Coghlan & Brannick, 2009). In fact, researchers not only observe phenomena, but they intervene and participate in the subject under study seeking for resolution of important social or organizational issues together with those who experience these issues directly by joint collaboration within a mutually acceptable ethical framework (Rapoport, 1970). This role of researcher as actor and agent of change in action research contrasts the position of detached observer in positivist science (Evered & Louis, 1981) and also marks the difference with other methodologies of qualitative inquiry in which the researcher does not participate in changing events (e.g., case studies, ethnography). An approach calling for 'research in action' fits with my direct involvement in the PADGETS consortium. The activity in this *milieu* has entailed intensive fieldwork activities amid practitioners and end users – ideally the entire society – who are affected

by a nagging issue, i.e., the presence of 'wicked[15] societal problems', and has encouraged the development on new promising solutions to tackle such an issue (Ferro, Loukis, Charalabidis, & Osella, 2013c).

This PADGETS setting is in tune with another peculiar trait of action research that is the responsive contribution to the practical concerns of people in an immediate problematic situation (Rapoport, 1970). In fact, action researchers work on the epistemological assumption that the purpose of academic research and discourse is not just to describe, understand and explain the world but also to change it (Reason & Torbert, 2001).

Furthermore, the symbiotic interaction with both academician and practitioners during the project lifecycle has made it necessary to opt for a methodological approach based on the coexistence of theory and practice. With this respect, the desired outcomes of the action research approach are not just solutions to the immediate problems but are important learning from outcomes both intended and unintended, and a contribution to scientific knowledge and theory. By mingling action and reflection, the ultimate goal is to make the action more effective while simultaneously building up a body of scientific knowledge (Coghlan & Brannick, 2009). This mindset has represented the driving force of my research path that has been characterized by a synthesis of world-class theoretical studies disseminated at academic level and fieldwork aimed at putting research results into action.

During my experience, in view of the numerous interactions occurred with the social context for the purpose of understanding and interpretation (Neuman, 1997), the research work has not followed a sequential design process ('waterfall model' in software engineering parlance) but an iterative and incremental pattern. This aspect demands a research methodology that proposes an iterative cycle of problem identification, diagnosis, planning, intervention and evaluation of the results of action in order to learn and to plan subsequent interventions (Susman & Evered, 1978; Checkland, 1991; Dickens & Watkins, 1999), following a spiral of steps that has characterized action research since its inception: Lewin (1946), generally credited as the person who coined the term 'action research', argues that each step of the methodology is composed of a circle of planning, action and fact-finding about the result of the action.

Finally, although action research came to light in the context of 'pure' social sciences, around the turn of the millennium it gained acceptance and recognition also in the fields of information systems and software development thanks to its unique ability in

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[15] In the well-accepted definition formulated by Rittel and Webber (1973), 'wicked' problems are class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing.

mingling research and practice, so research informs practice and practice informs research synergistically (Avison, Lau, Myers, & Nielsen, 1999). In the IT sector, conventional systems analysis approaches, such as structured analysis and data analysis, emphasize the 'hard' aspects of the problem domain, that is, the certain and the precise. A hard approach is prescriptive and might be applied fairly on 'systems' which can be 'engineered', a.k.a. "computer-based systems" (Sommerville, 2007). Defying such rules 'written in stone', the school of thought headed by Checkland (1981) argues that systems analysts need to apply their craft to problems that are not well-defined. Researchers need to understand the ill-structured, fuzzy world of complex organizations – dubbed by Sommerville (2007) as "socio-technical systems" – whose problems lack a formal definition (Checkland, 1999). People are what make organizations so complex and different, and people are far different in nature from data and processes: people have different and conflicting objectives, perceptions, and attitudes and people change over time. Acknowledging the dissatisfaction with conventional information systems development methodologies – frequently due to the failure to include human factors – 'hard' thinking focused on complicated system has to be blended with 'soft' thinking dealing with complex systems in order to make sure the process of inquiry into real-world is itself a system for learning. Taking into account the fact that the output of PADGETS project is an information system and that software design and development have represented a vital body of activity for the consortium, the gradual reconciliation between 'hard' thinking and 'soft' thinking under the aegis of action research has further incentivized my methodological choice. Action research, in fact, has the potential to create a common ground between various *formae mentis* within a heterogeneous research team turning diversity into a multiplier: in my experience, action research and, more in general, qualitative inquiries applied to an IT project have contributed to create a fruitful osmosis between me and software engineers who have joined forces in the pursuit of successful results.

3.2 Case Studies

If action research constitutes an actionable approach oriented to problem solving in social and organizational settings when researcher's participation is vital – as it has happened with the study of crowdsourcing in the public sector thanks to the unique PADGETS experience – case studies have been selected to perform a well-grounded empirical inquiry concerning crowdsourcing in the business sector (required to appropriately answer the portion of the second research question not addressed by means of action research). Reasons for moving in this direction are numerous.

First, case studies are considered most appropriate as tools in the critical, early phases of a new theory, when key variables and their relationships are being explored

(Eisenhardt, 1989; Yin, 1994). In the case examined by the present thesis, in particular, little consensus exists in the literary landscape about key variables which could be used for explaining the viability of crowdsourcing as 'engine' of business models in the private realm.

Second, case studies are typically carried out in close interaction with practitioners (Gibbert, Ruigrok, & Wicki, 2008). The domain under investigation caters well to this principle because the potential communities of interest lie well beyond the academic sphere. Entrepreneurs, executives and business developers – besides being potential informants – are extremely interested in research findings in order to receive fruitful insights concerning strategic, tactical and operational aspects of crowdsourcing worth of commercial exploitation. Policy makers, for their part, are not neutral in light of the opportunity to discover promising crowdsourcing practices apt to successfully overcome the sectorial barrier in order to bring new ideas and competences into the a public sector that frequently lacks management competencies, resources and organizational flexibility to leverage the benefits of collaboration (Tapscott, Williams, & Herman, 2008).

A third cornerstone regards data availability. While case studies may, and often do, use quantitative data, a key difference with other research methods is that case studies seek to study phenomena in their contexts, rather than independent of context (Pettigrew, 1973). Looking at the specific domain under investigation, it is characterized by a relatively limited amount of business actors to be examined as units of analysis and that fact is coupled with a tremendous paucity of quantitative data to be elaborated. As a result, in view of these roadblocks, the proposed approach is not geared to formulate "causal laws that can be used to predict general patterns" (Neuman, 1997): in lieu of 'golden rules' to be applied *erga omnes*, the proposed research aspires to grasp diversity and heterogeneity lying in the analyzed sample, understanding and interpreting phenomena that are characterized by a certain vagueness not easy to be dissipated.

Aspects peculiar to crowdsourcing call for exploratory case studies due to the absence of rich and consolidated theories in the field as well as to the lack of convergence on key variables to be considered and their reciprocal relationships (Tellis, 1997). Each unit of analysis examined through case study methodology is a company whose core business is centered on crowdsourcing, regardless the industry it belongs to. The case design is based on a "multiple case design" logic (Yin, 1994) in which the presence of several contexts under examination is oriented towards heterogeneity rather than replication. In terms of distribution of units of analysis, the embraced approach is "holistic" (Yin, 1994), thus a single unit of analysis exists per each case. Selected companies are the result of a logic that follows a mixed approach combining empirical sampling with theoretical sampling: whilst the empirical sampling allows to concentrate

on exceptional cases of success or popularity, the theoretical sampling is geared towards the collection of a 'structured' sample in light of prearranged *a priori* research purposes.

3.3   The Recourse to Modeling Techniques

In addition, it is worthwhile to mention that the methodological portfolio chosen for my research endeavor entails also the recourse to various modeling techniques.

Concerning simulation and modeling in social sciences, System Dynamics (Forrester, 1961) has been adopted in the PADGETS scenario as technique and language to build a model aimed at simulating *in vitro* patterns according to which distinct socio-demographic clusters of social media users (and potentially 'solvers') reciprocally influence each another – paving the way for crowdsourcing dynamics – in view of intertwined social connections and resulting 'viral' contagious phenomena. Apart from technical reasons pertaining to implementation summarized by Boero, Ferro, Osella, Charalabidis, and Loukis (2012), the choice has fallen on System Dynamics due to the ability to accept non-linearities and feedback loop structures that are inherent in every complex system (Sterman, 2011) especially in case of social systems and public policy applications (Sterman, 2000).

Moving from the public to the private sector, the design of business models based on crowdsourcing requires additional modeling tools: to formalize the outlined archetypes I have resorted to state-of-the-art ontologies well-recognized among both academics and practitioners. While some ontologies have an enterprise-centric view, e.g., Business Model Ontology (Osterwalder, 2004) and STOF (Bouwman, de Vos, & Haaker, 2008), which portrays the architecture chosen by the firm to implement the business logic, others prefer to embrace the network-centric vision, e.g., e3-value (Gordijn, Akkermans, & Van Vliet, 2001) and Value Network Analysis (Allee, 2000), which focuses on the entire ecosystem where a multitude of actors exchange value in many guises. With reference to their concrete application, constructs in this vein may be analogized to a '*lingua franca*' that guarantees a rigorous approach for defining business models as well as a clear and exhaustive mapping of entities, relationships among them, rules and constraints.

4. The Multi-Dimensional Framework

4.1 The Foundations of the Framework

When organizations decide to pursue a strategy of external sourcing of knowledge and technology, different options are accessible. They may enlist knowledge brokers, both virtual and non-virtual (Verona, 2006), they may start interacting with innovation communities, or may decide to post challenges on Internet-based innovation platforms (Frey, Lüthje, & Haag, 2011). As highlighted by Nambisan and Sawhney (2007a), there is no single best way for sourcing innovation from outside the organization: numerous useful methods are available, each with differing attributes and benefits. Pisano and Verganti (2008) point out how "collaborative innovation is not a single approach but takes a wide variety of forms. As companies increasingly team up with outsiders to innovate, they confront critical and complex choices about whom to join forces with and how to share power with them". Such variety in options has incentivized scholars to investigate the dimensions that describe the modalities to perform external sourcing of innovation. A comprehensive overview of the most relevant studies in this field is presented as follows.

Pisano and Verganti (2008), Pater (2009), Diener and Piller (2010), and Sloane (2011a) propose the degree of openness (everyone can join it vs. selection process) as one of the key dimensions. The governance structure (hierarchical vs. flat) is investigated by Nambisan and Sawhney (2007b), and Pisano and Verganti (2008). Focusing on platforms, Boudreau and Lakhani (2009) suggest the degree of control over the platform (high control by the platform vs. high autonomy of external parties) and the motivation for innovators to participate (extrinsic vs. intrinsic). Feller, Finnegan, and Hayes (2008) choose in their framework the configuration (direct vs. mediated) and the focus (intellectual property vs. innovation capability). The ownership of solutions (owner vs. owner and contributors) is depicted by Pater (2009), while the innovation space (defined vs. emergent) is illustrated by Nambisan and Sawhney (2007b). Moreover, Sloane (2011a) distinguishes between the type of instructions given to participants (none vs. directed), while the type of knowledge which needs to be acquired (need vs. solution) and the initiation of the interaction (open call vs. open search) are proposed by Diener and Piller (2010). Geiger, Rosemann, and Fielt (2011), for their part, opt for the nature of external elements (homogenous vs. heterogeneous) and the treatment of external elements (individual vs. aggregated).

From the researches above illustrated, emerging archetypes can be drawn. Pisano and Verganti (2008) propose a framework containing four ways through which firms may collaborate on a given innovation project: Elite Circle, Innovation Mall, Innovation Community, and Consortium. The governance structures for open innovation are portrayed by Feller, Finnegan, and Hayes (2008): Solution Brokerage, Solver Brokerage, Solution Hierarchy, and Solver Market. Pater (2009) focuses on co-creation, by suggesting Club of Experts, Crowd of People, Coalition of Parties, and Community of Kindred Spirits. Nambisan and Sawhney (2007b) recommend four broad approaches that companies may use "to unlock the power of network-centered open innovation": Orchestra, Creative Bazaar, Jam Central, and Mod Station. Geiger, Rosemann, and Fielt (2011) coin ideal-types of crowdsourcing systems: Crowd Processing Systems, Crowd Rating Systems, Crowd Solving Systems, and Crowd Creation Systems. Saxton, Oh, and Kishore (2013) propose an assorted cohort of crowdsourcing models: Intermediary Model, Citizen Media Production Model, Collaborative Software Development Model, Digital Goods Sales Model, Product Design Model, Peer-to-Peer Social Financing Model, Consumer Report Model, Knowledge Base Building Model, and Collaborative Science Project Model.

Shining a spotlight on the public sector, Nambisan (2008) pinpoints four archetypal roles for the government in collaborative innovation (i.e., Innovation Seeker, Innovation Champion, Innovation Integrator, Innovation Catalyst) while Brabham (2012a) and subsequent follow-ups (Brabham, 2013b; Brabham, 2013c) shape four crowdsourcing types (or archetypes) stemming from a problem-based perspective (i.e., Knowledge Discovery and Management, Distributed Human Intelligence Tasking, Broadcast Search, Peer-Vetted Creative Production).

Although afore-mentioned studies have outstandingly contributed to create a better understanding of procedures and processes enabling the provision of ideas and technologies from external sources, many of them have their roots in a general view of the paradigm of open innovation without referring closely to the approach proposed by the crowdsourcing model. Apart from a few exceptions, in the literary landscape synthetically described, authors address their effort towards the categorization of models which could emerge all along the breadth of the spectrum generated while organizations (usually private sector companies) team up with outsiders to innovate in multiple guises (e.g., partnerships, IP selling and licensing, R&D marketplaces, incubators, lead user methods). The resulting paucity of reference to the crowdsourcing paradigm in this strand of literature is coupled with a further evidence that the reader could come across in the writings devoted to crowdsourcing: in this realm, the potential underpinning crowdsourcing practices has often been alluded to in terms of anecdotal evidence through an abundance of exemplary cases which sometimes seem to be hackneyed. In spite of some early (and lucid) attempts to define abstract typologies of

crowdsourcing in the form of taxonomies (Rouse, 2010; Geiger, Rosemann, & Fielt, 2011), the overall progress in this direction appears as still tenuous. In fact, with the exception of some works in the vanguard, a common thread running through 'mainstream' crowdsourcing studies is a generally held 'humanistic' and 'polyphonic' view: whilst the former characteristic refers to a descriptive and sometimes contemplative method, the latter one denotes that research perspectives may vary noticeably according to phenomena of interest to each scholarly discipline, without a path of convergence: as admitted by Brabham (2012b), crowdsourcing's terrain is odd, its scholars far-flung, and its disciplinary location varied. As a result, on the whole, authors operating in the crowdsourcing sphere do not seem to be prone to schematize distributed problem solving models in a systematic way suitable to be generalized. Looking at afore-said gaps from the researchers' viewpoint, they represent excellent 'food for thought' stimulating scholars' intellectual curiosity and nourishing the research reflection geared towards exploring novel manners for formalizing crowdsourcing models. Accepting such a challenge, the approach proposed aims at mapping the crowdsourcing landscape giving life to a multi-dimensional framework for categorizing different archetypes.

4.2 The Selected Dimensions

The adoption of a multi-dimensional approach poses a conundrum for researchers, since it obliges them to gauge the most significant axes on which the overarching framework hinges. In the present study the choice has fallen on the motivation that pushes the crowd to answer the open call and the organizational model chosen for external solvers. The reasons that have led me to prefer these two dimensions instead of others come from a careful analysis of the literature in this field, and from the evidence gleaned from the empirical research that has been accomplished on crowdsourcing Web platforms.

With regard to the motivation dimension, it has been since the rise of the open innovation paradigm that scholars have started to investigate the motives that drive people to participate collectively into innovation projects (Bogers, Afuah, & Bastian, 2010; Frey, Lüthje, & Haag, 2011). Researches performed in the last ten years have provided a vivid illustration of such incentives: even though the monetary reward is the most intuitive, it is not always the best solution to motivate members in open communities (Antikainen, Mäkipää, & Ahonen, 2010).

In the realm of open source, for example, von Hippel and von Krogh (2003) argue that the motives that mostly trigger the contributors in software coding are the possible future exploitation of the work performed for personal/business use, the learning and the enjoyment experienced during the programming. The learning as a personal advantage is also depicted by Lakhani and von Hippel (2003), who in addition propose the

opportunity of gaining reputation as an incentive to give public helping. Lerner and Tirole (2002) suggest that another significant incentive is the one related to a future job career and the possibility to access the venture capital market. In a context of new product development, Füller (2006) highlights how curiosity and the test of personal capabilities may work as supplementary purveyors of stimuli. In the end, among the most important motivations we may find also altruism, care for community and attachment to the group, firm recognition, social support, social capital and peer recognition (Antikainen, Mäkipää, & Ahonen, 2010). It is noticeable that even though the types of motivation are several, and may differ according to the kind of innovation community (Ståhlbröst & Bergvall-Kåreborn, 2011), it is always possible to recognize two distinctive typologies of motivations (Deci, 1972): the intrinsic motivations, which collect the incentives intrinsically linked to the activity itself, such amusement, curiosity, enjoyment while working and social responsibility, and the extrinsic motivations, that imply a reward separable from the task, and which are generally represented by monetary rewards, career opportunities and personal information needs (Füller, 2006; Frey, Lüthje, & Haag, 2011). In the present research the focus is on such distinction, and I propose the extrinsic and intrinsic motivations as the two ends of the motivation axis.

Concerning the other dimension, i.e., the organization of external solvers, also in this case the foundations of my choice may be found in recent literature in this field. I have already mentioned in this essay the four different types of collaborations proposed by Pisano and Verganti (2008). In the same context of collaborative innovation, Sawhney, Verona, and Prandelli (2005) focus their attention on the paramount importance of communities of creation, and in particular the role of Internet as a platform for a valuable collaborative co-creation with customers. With this respect, Boudreau and Lakhani (2009) propose two ways to organize external innovators: collaborative communities vs. competitive markets, putting in evidence how the former ones are more oriented towards the intrinsic motivation, while the latter ones tend to reward extrinsic motivations. In the present thesis, for the ends of the axis that refers to the organization of external solvers I propose the competition, a modality in which the innovation seeker may choose among various offerings – usually obtained from the external environment through a 'challenge' – and the co-creation, a modality in which the crowd produces the output in a choral way. My proposal, however, stands out for the following reasons: I added the competition & co-creation in between the two extremes of the *continuum*. In fact, from the analysis conducted directly on the crowdsourcing platforms, I noted that in some cases it is not possible to strictly label them as competitive or co-creative due to a sort of 'grey area' characterized by the coexistence of both modalities. For this reason I decided not to treat such platforms as exceptions, but to elect them as worthy examples of crowdsourcing.

4.3 The Characterization of Resulting Archetypes

As deducible from Figure 5, the combination of the two dimensions representing the building blocks of the framework allows to shape six alternative archetypes of crowdsourcing built with the idea of minimizing 'within variance' intra-archetype and, simultaneously, of making the 'between variance' appreciable.

Archetype are numbered from 1 to 6 and labeled in this order: Gold Prospectors' Kingdoms, Beauty Contests, Inventors Hotbeds, Social Think Tanks, Virtual Factories and Geek Hangouts. Whilst some models are inherently apt to support non-profit initiatives in a participatory and socially-rooted way (examples par excellence in this vein may be found in quadrants 2, 4 and 6), others seem to be the right propellant for business endeavors in which the pursuit of profit constitutes the 'North Star' to be tenaciously followed.
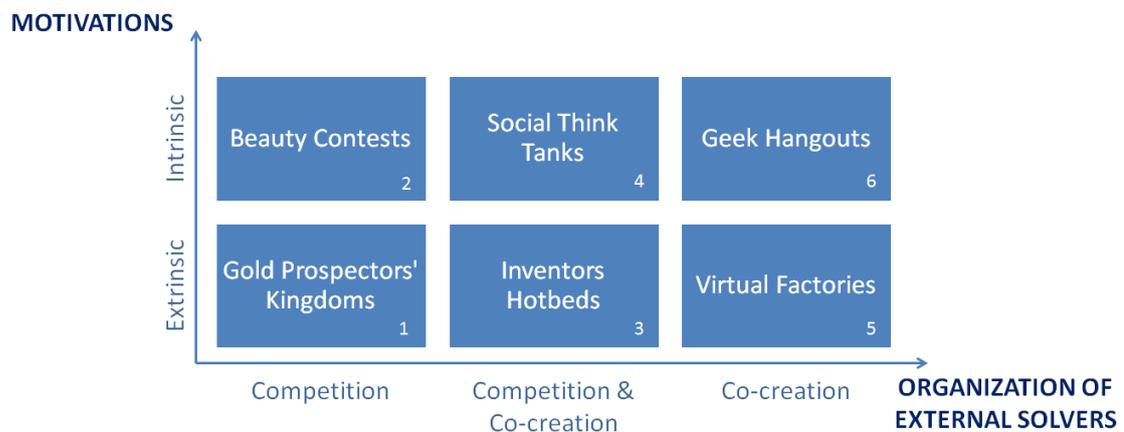
Figure 5 – The multi-dimensional framework

Before delving into archetype description, it is necessary to state beforehand that platforms which act in the landscape of open innovation as mere innovation marketplaces (e.g., Yet 2, Inpama, Innoget, Projektwerk and some weird exemplars such as Coffee & Power), do not find place in my analysis. In fact, such platforms allow a matching between demand and supply in a '1-to-1' relationship. Conversely, the concept of crowdsourcing entails an action of a company or institution entrusting a function to a generally large network of people according to a '1-to-n' relationship, either in case of collaborative or competitive modalities: in light of this choice, I excluded such marketplace platforms from my framework. Different reasons cause also the exclusion of companies providing full-fledged consultancy services in the open innovation sector (e.g., IdeaConnection): in this circumstance, it appears arduous to detach crowdsourcing from other dissimilar but overlapping business lines.

Archetype	Name	Examples from the real world
1	Gold Prospectors' Kingdoms	P&G Connect & Develop, InnoCentive, Hypios, NineSigma, Innorealize, Ideaken, Innovation Exchange, Crowdspring, DesignCrowd, 99designs, Mypitch, Choosa, Poptent Media, IdeaBounty, Redesignme Connect, Zooppa, Freelancer.com, Elance, oDesk, Guru, Twago, BlurGroup, Heineken Ideas Brewery, TopCoder, Kaggle, Challenge.gov
2	Beauty Contests	Open Planet Ideas
3	Inventors Hotbeds	Quirky, Threadless
4	Social Think Tanks	Foldit
5	Virtual Factories	Clickworker, CrowdSource, CloudCrowd, CrowdFlower, Amazon Mechanical Turk, MobileWorks, Trada, Smartling, Lionbridge Enterprise Crowdsourcing, uTest, Samasource, Thinkspeed, 10EQS, CapSEO, CloudFactory
6	Geek Hangouts	OpenIDEO, One Billion Minds, Icelandic Constitution, Ushahidi, PADGETS

Table 2 – Selected examples for each archetype

While in Table 2 are indicated the most known examples taken from the real world (without any claim to be exhaustive), a brief description of each archetype is reported as follows.

Gold Prospectors' Kingdoms (quadrant 1). This archetype is characterized by the presence of an organization that seeks to obtain solutions from the crowd to its R&D or creativity problems in a competitive way. Two business logics may be found at the basis of this configuration: one is confined to the company's turf (e.g., 'Connect & Develop' by P&G), while the other is referred to a two-sided market (Rochet & Tirole, 2004) in presence of an external intermediary (e.g., InnoCentive). In the first case, the seeker organization is aimed at engaging outside partners (i.e., solvers) in order to spark corporate innovation processes taking place within the enterprise for the purpose of cranking out compelling products and services to be offered to target customers. Along the lines suggested by Gassmann and Enkel (2004), the underpinning "outside-in" rationale entails the internalization of the fruits of innovation whose *locus* of creation is decoupled from the *locus* of commercialization. In the second case, the enterprise managing the platform is an intermediary, while the two sides of the market are

represented by seekers (who are charged) and solvers (who are funded): the intermediary operates as a 'knowledge hub', connecting organization having research or creativity problems to be solved without incurring prohibitive search costs and talented solvers from around the world who are eager to solve such 'challenges' (i.e., well-defined problems whose solutions generate value for the seeking organization). Once a challenge has been advertised and the deadline has elapsed, only the winning solver is rewarded with a cash prize defined *ex-ante* by the seeker.

Beauty Contests (quadrant 2). As in the previous case, a challenge is the trigger that provokes the active participation of the crowd. Though, unlike before, the hallmark is the social responsibility: solvers are incentivized to propose solutions to problems concerning the social good, receiving no monetary reward for their contributions. A bird's eye view of the archetype shows the presence, from one side, of individuals or organizations willing to start and support a not-for-profit challenge, and, on the other side, of solvers who are encouraged to give solutions on current themes that may regard, for instance, issues on environment, global sustainability and health. Typically an external organization stands in between the two, with the role of intermediary and manager of the platform that hosts the contest. In this configuration, even if the mechanisms are the same of a challenge, the most competitive aspects are 'smoothened' by the absence of monetary rewards, which are substituted by the opportunity to gain recognition among the crowd and the possibility to being noticed by a prestigious firm. In such a scenario, the platform's staff has the role of facilitator in the process of acquiring the solutions, giving public feedback on solvers' proposals and encouraging the community to vote and to comment collected solutions.

Inventors Hotbeds (quadrant 3). The habitat portrayed in this model is the variegated realm of collaborative product development, where the community interacts with a dedicated in-house design team to bring products from idea to market, supporting creators' endeavors. The presence of a vibrant community allows members to cover diverse roles in different situations, i.e., inventors, influencers and even customers. This archetype is distinctive because within the community coexist both the logics of competition and collaboration. Members wearing the hat of innovators may submit their idea to the platform manager who, in turn, publishes the concept making it available to all community members who could – like in a contest – rate the idea and determine (sometimes in conjunction with the platform owner itself) its business potential. Subsequently, winning ideas undertake the path of product development that, despite being conducted and coordinated by the platform owner, is curated by financially-vested community members who can collaboratively contribute with precious tips and concrete actions of research and design: thus, the collective intelligence fuels and addresses the product development from the dawn of the internal R&D process till the first appearance on the market. The logic underlying this model relies on the innovator

community that, under the adroit guidance of the platform owner, becomes a hectic breeding ground of creativity – being decisive for the definition of the product development roadmap – as well as a club of early adopters looking forward to purchase bleeding-edge solutions collectively invented.

Social Think Tanks (quadrant 4). Sometimes the right propellant that moves the crowd is the curiosity to test personal skills, such as knowledge and competencies, mixed to the desire of having fun while doing this. The right way to have them at the same time is not to compete in a challenge, but rather to play in a game. The use of video game elements – such as levels and scores – in non-gaming systems in order to improve the participants' experience and engagement is what is now called "gamification" (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). Thanks to gamification techniques, the crowd can be attracted and motivated to solve various problems, regarding for instance the science field or the sphere of academic research. The leverage in this case is not represented by tangible rewards, since curiosity, involvement, enjoyment while working and skills-testing take the lion's share. As happens in a game, the harsh competitive aspects are mitigated by the opportunity to create collaborative alliances with other solvers in order to proceed collectively towards the victory.

Virtual Factories (quadrant 5). Although the majority of tasks that are sourced from the crowd are usually linked to problem solving issues and classified as knowledge-intensive, also repetitive and rudimentary tasks (such as short text translations, categorization and tagging of digital materials, basic content moderation) could be positioned under the umbrella of crowdsourcing. Provided that not all cases falling into this category pertain to unsophisticated and tedious activities – given the presence of companies providing business planning and execution, SEO services and 'virtual assembly lines' for Big Data processing – 'ordinary' tasks constitute the 'hard core' of the realm known with the moniker of "micro-task market" (Kittur, Chi, & Suh, 2008): in such a value ecosystem, orders are split into small tasks that are entered into a common system in which users can select and complete them for some reward. Such dynamics depicts a business scenario where requesters and a cohort of individual workers form a two-sided market in which the former category is charged in order to fund the latter one. By means of the resulting marketplace platform, customers have at their fingertips a global, on-demand, scalable and always-on workforce, weeding out cumbersome operations of coordination (e.g., order decomposition, micro-task assignment, micro-task supervision, quality check). Such activities are performed in a centralized way by the platform owner in light of a sort of 'virtualization' of the labor: as computing virtualization disentangles the operating system from the hardware, in like manner labor virtualization decouples the workforce from the employer. This renders the workforce provision highly flexible thanks to an 'elastic scaling' of the brain power

(here the comparison with cloud computing is again incisive): the workforce, even if not much poetic, could be associated to a 'commodity' available on-demand.

Geek Hangouts (quadrant 6). The collaboration taking place in a flat governance structure is at the heart of this configuration: a group of people decides – autonomously or as reaction to a stimulus – to create a community for developing an initiative pertaining to a common specific interest. Such a community is open to all people from the external environment who share the same interests and yearn to collaborate with the original team participating proactively with a personal contribution. This is the archetype in which the influence of open source flavor is most evident due to the presence of a community of "kindred spirits" (Pater, 2009) that takes collectively part to a work whose underlying innovation process is globally distributed. Communication among the members is enabled by the presence of tools such as blogs, wikis, *fora* and social media channels which facilitate the exchange of ideas and maintain vivacious the discussion within the community. Often, the presence of an on-line work environment facilitates the progress of activities and keeps available the history of progresses, also to encourage feedback and comments coming from the community. The contributors are acknowledged, so they have the possibility to gain visibility and reputation among the crowd. The incentives are far from the monetary reward: here we can find fun, self-learning, enjoyment while working and, above all, social responsibility.

5. Crowdsourcing in the Governmental Realm

5.1 Stakeholders' Engagement in Public Governance

In the second decade of the millennium, European governments are confronted with a number of long-term trends.

The combined effect of an increase in the rate of change and in the level of interdependence and interconnectedness − among regions, activities and groups − is leading to a fast-evolving and unpredictable world where what happens in one corner or at one level may have consequences for what occurs at every other corner and level (Rosenau, 1995): society and economy are becoming more and more interconnected and unstable than ever (Mureddu, Misuraca, Osimo, & Armenia, 2012). As pointed out by Taleb (2007), we live in the age of "Extremistan" when 'black swans' thrive in the midst of "tipping points" (Schelling, 1971; Granovetter, 1978; Gladwell, 2000), "cascades" and "power laws" (Barabási, 2002), in a world that not only is flat (Friedman, 2005) but also hot and crowded (Friedman, 2008).

Afore-mentioned systemic phenomena, occurring in a society that may be seen in the guise of an "imperfect gas" (Marczyk, 2009), have a remarkable impact on individuals, who are the 'atoms' of such a society. The concept of "liquid modernity" proposed by Bauman (2000) represents a useful attempt to frame this condition of bewilderment that marks the current age. According to the Polish sociologist, in fact, social forms and institutions no longer have enough time to solidify and cannot serve as frames of reference for human actions and personal long-term life plans to the extent they served in the past, so individuals have to find other complementary ways to organize their lives. Individuals have moved away from a 'heavy' and 'solid', hardware-focused modernity to a 'light' and 'liquid', software-based modernity. This passage, he argues, has brought profound change to all aspects of the human condition. The new remoteness and un-reachability of global systemic structure, coupled with the unstructured and under-defined, fluid state of the immediate setting of life-politics and human togetherness, calls for the rethinking of the concepts and cognitive frames used to narrate human individual experience and their joint history.

In this scenario, it goes without saying that cross-cutting issues that characterize our age can be addressed only through the collaboration of all the groups of society, including the private sector and individual citizens. A push towards a more participatory and inclusive style of policy making poses significant challenges in terms of striking the right balance between openness and control, defining new and appropriate styles of

management and, finally, integrating participatory activities into existing decision making processes.

Moreover, a forecast, for years to come, of low economic growth and financial instability is leading to tighter budget constraints and less room for mistakes in the allocation of tax payers' money for governments' action.

The concurrence of such socio-economic, institutional and financial trends calls for a reconceptualization of current governance and – given that in nowadays' "information age" (Castells, 2010) technology in the "new normal" (Hinssen, 2011) – e-Governance models.

Looking at the last term, there is no doubt that e-Governance has become in recent year a fashionable topic in academe. Despite this remarkable evidence, 'governance' is still a problematic word. In fact, there is no agreed definition of the word 'governance', which appears as a very versatile term used in connection with several contemporary social sciences, especially economics and political science. Many papers on the subject fail to define it and those definitions that do exist differ significantly, as reported by Bannister & Connolly (2009).

Such uncertainty seems to amplify when the prefix 'e-' is put before, since it implies the exploration of some questions surrounding the impact of the Internet on governments and public administration. Indeed, in order to arrive at a working definition of e-Governance, it is paramount to delve into whether ICT change, eliminate or modify existing aspects of governance and/or it create new problems and challenges.

One of the early difficulties the academy has dealt with is the ambivalence (or more accurately multivalence[16]) of the meaning(s) of e-Governance; such uncertainty is testified by a plethora of alternative definitions, each of which is focused on peculiar traits of the multi-faced concept of e-Governance.

In this *mare magnum*, some authors focuses attention on the fact that one view of e-Governance entails an intense nexus with e-Democracy, particularly in terms of consultation and its mechanisms. A definition that could be encompassed under this strand is the one provided by Marche and McNiven (2003): "e-Governance is a technology-mediated relationship between citizens and their governments from the perspective of potential electronic deliberation over civic communication, over policy evolution and in democratic expressions of citizen will".

A different perspective is reported by Bose and Rashel (2007): "e-Governance is a process of reform in the way governments work, share information, engage citizens and deliver services to external and internal clients for the benefit of both government and

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[16] To exemplify the foretold multivalence, looking at prevalent literature and definitions hitherto known, Misuraca, Reid, and Deakin (2011) come to identify three main conceptualizations of e-Governance: 1) e-Governance as customer satisfaction; 2) e-Governance as processes and interactions and 3) e-Governance as tools.

the clients that they serve". In this case, the underlying vision is more operational and pragmatic, since the focal point is the application of ICTs to deliver government services, exchange information, perform transactions and integrate various standalone systems and services.

Furthermore, a pure 'institutional' vision is provided by Misuraca, Reid, and Deakin (2011): according to international organizations, "governance is the exercise of political, economic and administrative authority necessary to manage a nation's affairs. Governance is the process of decision making and the process by which decisions are implemented (or not implemented). Within government, governance is the process by which public institutions conduct public affairs and manage public resources".

In general, striving to put dissimilar visions under a common roof, it becomes visible that governance connotes far more than just rudimentary functioning of government[17]: governance is what the government does in the exercise of its management, power and policy[18]. With this respect, by looking at the evolution undergone by the concept of governance over the last fifteen years, it is possible to notice a gradual shift in focus from a mere application of administrative and political authority towards a bidirectional discourse with a diversified constituency who is more and more recognized as an authoritative interlocutor in the process of value creation for society (Ferro, Caroleo, Leo, Osella, & Pautasso, 2013).

Taking into account the quality of a country's governance, it emerges that this concept reflects the degree to which its institutions and processes are transparent and accountable to the people and allow them to participate in decisions that affect their lives; furthermore, the afore-mentioned concept seems to be related to the degree to which the private sector and organizations of the civil society are free and able to participate. Reasoning at an abstract level, considering governance as a "multi-faceted compound situation of institutions, systems, structures, processes, procedures, practices, relationships, and leadership behavior in the exercise of social, political, economic, and managerial/administrative authority in the running of public or private affairs", good governance is the "exercise of this authority with the participation, interest, and livelihood of the governed as the driving force"[19] (Kauzya, 2003). As a result, the governance is good when it is responsive to the will of the people and the legitimacy of the government comes from its citizens. Governance is healthy when open, democratic

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[17] Migrating to the electronic world, the concept and practice of e-Governance further encompasses e-Government: according to Johnston (2010), the e-Governance concept, in fact, covers three distinct, yet related fields of application (e-Administration, e-Government, e-Democracy).

[18] According to Misuraca, Reid, and Deakin (2011), governance is a universal force in all societies, being able to overcome governmental boundaries: individuals exercise governance in their daily lives and relationships, as corporations and states govern their decisions, interactions and activities.

[19] This definition incorporates also the definition of governance by the United Nations Development Program.

institutions allow full participation in political affairs and when human rights protection guarantees the right to speak, assemble and dissent.

A more pragmatic approach is the one proposed by Ferro, Caroleo, Leo, Osella, and Pautasso (2013) according to whom good governance should attempt to achieve two important operational objectives: produce effective decisions – i.e., make the best use of information to optimize decision making – and provide adequate incentives: given that all individuals act in their own self-interest, good governance should provide the incentives that produce the best/desired outcome.

Taking the position of OECD (2001), good governance has eight major characteristics or dimensions: it is participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law.

At a European level, five principles underpinning good governance have been outlined in the White Paper on European Governance (European Commission, 2001):

1. Openness. The Institutions should work in a more open manner. Together with the Member States, they should actively communicate about what the EU does and the decisions it takes. They should use language that is accessible and understandable for the general public. This is of particular importance in order to improve the confidence in complex institutions.

2. Participation. The quality, relevance and effectiveness of EU policies depend on ensuring wide participation throughout the policy chain, from conception to implementation. Improved participation is likely to create more confidence in the end result and in the institutions which deliver policies. Participation crucially depends on central governments following an inclusive approach when developing and implementing EU policies.

3. Accountability. Roles in the legislative and executive processes need to be clearer. Each of the EU Institutions must explain and take responsibility for what it does in Europe. But there is also a need for greater clarity and responsibility from Member States and all those involved in developing and implementing EU policy at whatever level.

4. Effectiveness. Policies must be effective and timely, delivering what is needed on the basis of clear objectives, an evaluation of future impact and, where available, of past experience. Effectiveness also depends on implementing EU policies in a proportionate manner and on taking decisions at the most appropriate level.

5. Coherence. Policies and action must be coherent and easily understood. The need for coherence in the Union is increasing: the range of tasks has grown; enlargement will increase diversity; challenges such as climate and demographic change cross the boundaries of the sectorial policies on which the Union has been built; regional and local authorities are increasingly involved in EU

policies. Coherence requires political leadership and a strong responsibility on the part of the institutions to ensure a consistent approach within a complex system.

As can be seen from the above list of criteria, the participative dimension plays a vital role in the perspective of good governance, since the participation demonstrates considerable potential to change the broader interactions between citizens and government, improving the overall quality of engagement and decision making whilst widening the involvement of all citizens (European Commission, 2009).

If participation regards the 'how' (i.e., how to achieve a better governance), there is no doubt that the means are represented by policies.

Policies have traditionally been the means by which societies – through their governments – bring their founding principles and constitutions down-to-earth. Sometimes codified in law, sometimes less formally set out in direction-setting statements, government policies turn ideas and visions into the means through which they establish and maintain order, shape social and economic destinies and promote justice among citizens.

In most countries, policy making has always been a static, top-down process (Tapscott, Williams, & Herman, 2008). Politicians study issues, seek counsel from a select group of advisors, deliberate and enact laws on the population's behalf. Most citizens are on the periphery, playing no role other than casting a ballot every few years. In early democracies this system made sense; citizens did not have the education, time, resources, or communication tools to offer meaningful advice to government between elections. But it also gave well-connected insiders undue influence over elected officials and senior bureaucrats who crafted the policies.

But, as put by Tapscott, Williams, and Herman (2008), times have changed: the increasingly complex social, political and economic environment demands more sophisticated policy development processes. Governments no longer have sufficient scope, resources, information or internal competencies to respond effectively to the policy needs of a complex and fast-changing global environment. Policy makers must now seek out new partners and participants to help identify problems and create innovative solutions. This 'call for action' is somehow driven by public decision makers' desire to overcome an obstacle having its roots in one the inherent characteristics of policies.

According to Rittel and Webber (1973), the design of public policy in most domains is a 'wicked' problem, whereas science has to deal with 'tame' problems. The search for scientific bases for confronting problems of social policy is bound to fail, because of the nature of these problems, which is characterized by high complexity and many stakeholders with different and heterogeneous views of the problem, values, concerns

and interests. Moreover, the situation is complicated by the paucity of opportunities to learn by trial-and-error due to the facts that every attempt counts significantly and every attempt to reverse a decision or to correct for the undesired consequences poses another set of 'wicked' problems. Owing to such traits of public policy making process, several circles of deliberation occur: stakeholders interact, raise issues concerning the problem under discussion, propose solutions and argue about advantages and disadvantages of them, finally resulting in a better understanding of the problem (Charalabidis, Gionis, Ferro, & Loukis, 2010).

From a knowledge management perspective, in these deliberations valuable tacit knowledge possessed by the stakeholders is transformed into explicit knowledge by means of the so called "externalization" (Nonaka, 1994). Explicit knowledge can be processed, disseminated and combined with other relevant knowledge that public organizations possess, in order to formulate better policies and regulations for addressing social needs and problems and deliver better services to citizens and enterprises. For these reasons a new model of democracy has emerged, which is termed "participatory democracy" (Pateman, 1970), combining decision making by citizens' elected representatives with citizens' participation, with the latter not replacing but supporting and enhancing the former.

However, despite rosy expectations and fervent impulses coming from the scientific community, the way government's consultation currently works never satiate the appetite of policy makers. Stepping into the shoes of policy makers, there is no doubt that so far governmental consultations have not seemed to make a dent in the public policy process. In the past ten years, a plethora of experiments aimed at creating a more open, transparent and inclusive government has been documented in Europe and abroad, which have used different technologies and various methodologies to purport to highly heterogeneous policy goals. In spite of the lack of systematic evaluation, a common trait to those experiments is that they have involved a very small minority of citizens with respect to population as a whole (Molinari & Ferro, 2009). Reasons behind the notable difficulties for citizens' input to have a clear impact are pointed out by Johnston (2010). Typically, a formal consultation gives citizens a brief opportunity to offer comments in response to a limited set of questions with the consultation document itself usually doing its best to hide the difficult policy choices that are being made and so promote a particular way forward as the only sensible choice. When the consultation period ends, policy makers are hit by an onslaught of textual comments, some disagreeing with the government's policy objectives, some challenging their analysis of the problem, some suggesting new measures incompatible with what the government is proposing, some arguing for adjustments to the current plans. Moreover, the designated 'official' spaces are largely unknown to the general public due to the high costs of promotion and the slow pace of dissemination and this goes hand in hand with the presence of 'entry

barriers': tools adopted are frequently not appropriate or usable only by an affluent and acculturate minority (Ferro & Molinari, 2010).

Therefore, new mechanisms are required to enable a public decision process open, transparent and participative in which citizens' contribution is a paramount ingredient characterized by a significant impact.

As explained by Johnston (2010), there are a number of ways the situation could be changed. One is by opening up the policy process in the way in which citizen input does not come in short bursts but is spread over the whole process. Another is developing new and better tools for aggregating citizen input: policy makers who are operating nowadays need to move away from textual comment as the default form of contribution towards tools that give a clear picture of what everyone responding to the consultation thought. The key reason for aggregation lies in the fact that a change in the reduction of the granularity increases the chance that the input will be listened to and have an impact. So far, most of the innovation around government consultation has been about making the process more attractive and engaging for citizens: currently governments need also to innovate in making the input more compelling and useable by policy makers who are willing to reap the benefits of a more meaningful way of engagement.

Along this trajectory, the rise of social computing has recently attracted significant interest from both the practitioners' and scholars' communities, in view of its potential applications to the public sector of the future. Social computing – defined by Shirky (2008) as a formidable tool for collective action coordination which may turn a small piece of local news into an issue of national or international concern in a matter of hours (if not minutes) – Web 2.0 *et similia*, in fact, could represent a cornerstone in the field of public sector innovation, paving the way to a more reactive, informed, open, transparent and collaborative government.

The analysis conducted by Molinari and Ferro (2009), based on the conceptualization of a new 'ladder of participation'[20], shows how Web 2.0 provides a number of useful levers that should be adopted to tackle some of the problems encountered in the first wave of government digitalization, such as the lack of orientation towards creation of value for the final user, the focus on automation rather than on innovation, and the consequent low levels of take-up/participation. In particular, the increased capabilities of Internet users to create contents, coupled with the birth of social networks, which have encountered dramatic success in terms of take-up, have driven the development of more and more virtual spaces for the expression of political views, problems and needs, which may ideally symbolize modern *agorae* (Boero, Ferro, Osella, Charalabidis, & Loukis, 2012). These developments put pressure on government organizations to

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[20] This contribution exemplifies the interdependence of institutional and social aspects in any process of public sector reform by means of a figurative 'ladder' made up of several rungs, along the lines marked by Arnstein (1969) and, more recently, Forrester Research (2007).

innovate in their dealings with citizens, introducing new competition for 'nodality' (Escher, Margetts, Petricek, & Cox, 2006) in social and informational networks and offering the potential for 'co-production' and even 'co-creation' of government services (Kannan & Chang, 2013). In fact, tendencies towards the 'Government 2.0' (Baumgarten & Chui, 2009; Chun, Shulman, Sandoval, & Hovy, 2010; Huijboom, van den Broek, Frissen, & Punie, 2010), emerging concept which depicts a situation where canonical governmental boundaries are blurred, leave room for the opportunity to harness "prosumption" (Tapscott & Williams, 2006), i.e., a new model of innovation where formerly passive consumers participate in an active and ongoing way.

In this field, emerging Web 2.0 technologies have dissolved the many technical barriers to widespread and sustained citizen involvement: network effects peculiar to such environments (Christakis & Fowler, 2009) make the process of engaging the citizenry in policy making easier and less costly than ever before, providing unprecedented tools to support knowledge creation and community building (Tapscott, Williams, & Herman, 2008).

Since Web 2.0 applications are already being used in government not only for soft issues (e.g., public relations, public service announcements) but also for core internal tasks such as intelligence services, reviewing patents, support decision making (Osimo, 2008), it is desirable a convergence towards a systematic exploitation of the emerging social media by governmental organizations in the processes of public policies formulation, aiming to enhance a frictionless e-Participation: by doing this, governments make a step towards citizens rather than expecting the citizenry to move their content production activity onto the 'official' spaces created for e-Participation (Charalabidis, Gionis, Ferro, & Loukis, 2010). Resorting to social media, policy makers accommodate heterogeneous clusters of participants and cover all the three stages of citizens' engagement depicted in Macintosh's (2004) framework:

1. E-enabling, which is about supporting those who would not typically enter the Internet (i.e., accessibility) and taking advantage of the large amount of information available (i.e., understandability).

2. E-engaging, that is geared towards consulting a wider audience to enable deeper contributions and support deliberative debate on policy issues through top-down consultation.

3. E-empowering, which is aimed to support active participation and to facilitate the percolation of bottom-up ideas towards the political agenda.

To conclude this introductory section of the fifth chapter, it is essential to remind that dramatic changes taking place all over the world give rise to new social problems and also make the existing 'traditional' ones even more acute and complex. This situation necessitates the adoption of more citizen-centric and participative forms of public policy

making characterized by a stronger interaction between government agencies and citizens, which will allow the former to exploit the knowledge and the creative ideas of the latter concerning the pressing social problems, and also to increase transparency and trust. For the above purposes, over the last years there has been a growing adoption of social media platforms by government bodies (Bertot, Jaeger, Munson, & Glaisyer, 2010; Snead, 2013): public administrations have adopted different Web 2.0 tools, such as blogs, microblogging, wikis, social networking, multimedia sharing, mashup applications, tagging, and virtual worlds, among others. After some years of experimentation, testing, and assessment, the diffusion of social media in government is now intended to innovate how public bureaucracies operate internally and how they interact with the public outside government's organizational boundaries (Criado, Sandoval-Almazan, & Gil-Garcia, 2013). Confident in an unparalleled transformational potential of social media, some forward-looking agencies are progressively moving from simpler forms of exploitation of these strong bidirectional communication channels to more complex and sophisticated ones (Ferro, Loukis, Charalabidis, & Osella, 2013b). The promise is that – in spite of some barriers (Lampe, LaRose, Steinfield, & DeMaagd, 2011) – advanced usage of such digital engagement technologies will support a policy making process that integrates policy development and implementation into a seamless and flexible practice of continuous engagement, improvement and innovation.

5.2 PADGETS Concept and Rationale

While many of the exemplar cases of crowdsourcing highlighted in the scholarly research have been for-profit companies or ventures managed by for-profit companies, crowdsourcing has been gaining traction as a public participation tool for governance and planning, as well as a method for building common resources or processing large batches of data to streamline government functions (Brabham, 2013c).

Taking stock of these evidences, which is corroborated by a wealth of successful cases of which the Icelandic constitution may represent the prototypical 'top of the class', the investigation pertaining to crowdsourcing in the public realm leverages the three-years' experience into the PADGETS project consortium. This context has undoubtedly represented a privileged opportunity for coalescing world-class theoretical studies and intensive fieldwork activities – according to the action research paradigm – in order to systematize how crowdsourcing can be fruitfully incorporated into the policy lifecycle giving life to participatory mechanisms.

To contextualize the project into the cohort of archetypes defined in section 4.3, PADGETS falls in the category 'Geek Hangouts' that finds its position in quadrant 6 of Figure 5.

PADGETS (its full title being "Policy Gadgets Mashing Underlying Group Knowledge in Web 2.0 Media") is a three-year STREP project that has been co-founded by EU in the context of the 'ICT for Governance and Policy Modelling' call of the seventh European Framework Program of research (FP7).

The project consortium has involved 11 partners from 6 EU Member States comprising research entities (University of the Aegean as coordinator, Fraunhofer Gesellschaft zur Förderung der angewandten Forschung, National Technical University of Athens, Politecnico di Torino, University of Regensburg), IT enterprises (Athens Technology Center, Google, Tech4i2, Whitehall Reply) and public administrations (Centre for eGovernance Development for South East Europe, Observatory for the Greek Information Society, Piedmont Region).

The objective of PADGETS has been to implement a prototype service for policy makers that utilizes social media technologies and techniques to boost public engagement, enable cross-platform publishing, content tracking and provide decision support. Through the PADGETS platform, policy makers are capable of disseminating their policy messages through multiple social media simultaneously, using a single integrated interface. They are able to reach large user groups in these platforms and collect their feedback, by keeping track of and analyzing users' reactions to the policy message. The main idea underlying this challenging research endeavor is to bring together social computing with System Dynamics simulation in order to help governments to render policy making processes more participative through crowdsourcing campaign and, at the same time, to provide advanced and more effective types of support to public sector decision making processes.

The following sections of the fifth chapter describe my personal contribution provided in the consortium accompanied by a selection of personal reflections which have been collected in a series of top-tier academic publications.

In terms of timing, the project kicked-off at the beginning of 2010 and successfully concluded in July 2013 after a six-month extension decided by the European Commission. Personally, I have been present in the project since its inception and my involvement in the project has ended with its termination[21]. This means that during the project lifecycle I have had the chance to experiment various research topics and methods depending on the project progress. To define my contribution with reference to key stages of the project lifecycle, my research duties may be summarized as follows:

1. Conceptualization of a crowdsourcing model for participatory policy making over social media.
2. Design of a Decision Support System (DSS) to make order in the wave of social media interactions and crowdsourced ideas.

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[21] In this timeframe I took part to almost all review meetings, plenary meetings and technical meetings.

3. Planning and monitoring of crowdsourcing pilot campaigns.
4. Practical and theoretical evaluation of achieved results.

Each of afore-mentioned thematic areas within my competence is handled in a section of the fifth chapter. In particular, results concerning the conceptualization of the crowdsourcing model foreseen for participatory policy making over social media are presented in the following of the present section. The design of the DSS aimed at supporting policy makers in the maze of social media interactions and crowdsourced ideas is detailed in section 5.3. Fieldwork evidences gleaned during the planning and monitoring of crowdsourcing pilot campaigns are collected in section 5.4. Finally, the systematic evaluation of achieved results is decoupled into two strands: an evaluation that I have collected from the words of key informants involved in the trials is reported in section 5.5 while a theoretical evaluation is formulated in section 5.6.

Digging now into the first thematic area within my competence, there is no doubt that in the governmental opening up, social and technological drivers generated by Web 2.0 applications and social media platforms have brought with them new organizational forms, through the capacity of the Internet and its users to "organize without organizations" (Shirky, 2008). Resulting 'quasi-organizations', from Facebook groups and multi-authored blogs to discussion sites and peer-produced goods (like Wikipedia), are all extremely difficult to categorize according to conventional organizational theory. As a result, even though a widespread 'deformalization' of organizations could generate a governmental response along Digital Era Governance lines, government officials and policy makers are often unsettled or confused by the need to respond to these 'informal' organizational developments (Dunleavy & Margetts, 2010).

My specific research within the first thematic area of interest aims at constituting a valid response to the vagueness that still surrounds such topics, providing governmental actors with ICT tools to orchestrate full-fledged, large-scale participatory campaigns over multiple social media platforms (Ferro, Loukis, Charalabidis, & Osella, 2013b).

The overarching idea that has fuelled my research in this area is to make it possible for public administrations to set up a cost effective participatory processes by moving the political discussion from official websites to social networks where citizens are already debating, taking advantage of enhanced policy intelligence services based on fresh and relevant data (Ferro, Osella, Charalabidis, Loukis, & Boero, 2011). The conceptualization and the implementation of such participative system represent a first attempt to provide policy makers with a set of tools able to foster a modernization of the way governments interact and collaborate with citizens, implying policy shifts in the empowerment of citizens and harnessing the opportunities offered by new technologies.

To transform this ambitious idea into reality, it has been required to come to grips with a groundbreaking concept becoming the keystone of the project proposition. Similarly

to the approach of gadget applications in Web 2.0 – i.e., using data and services from heterogeneous sources to create and quickly deploy applications that provide value added services – it has been introduced the concept of 'Policy Gadget' (or, coining a *portmanteau*, 'Padget') to represent a resource (application or content) created by a policy maker which is typically instantiated in multiple social media platforms. By enabling a thorough interaction with end users in popular locations (such as social networks, blogs, etc.), a Policy Gadget combines the policy message with underlying group knowledge having its *locus* in the social media realm and acts as a pivotal element in conveying society's inputs to policy makers.

Keeping a helicopter view, a Policy Gadget could be likened to a composite structure (Figure 6) made up of four main components (Ferro, Osella, Charalabidis, Loukis, & Boero, 2011):

- A message, that regards a policy in any of its stages and forms, e.g., a draft legal document under formulation, a law in its final stage, an EU directive under implementation, draft policy guideline, a political article or even a campaign video. The policy message is put together adopting a modular structure (using different content types) in order to account for the heterogeneity present among end users in terms of time availability, interest in details and preference for content consumption. Typically the policy message could be structured in three parts: a short and 'catchy' policy statement, a brief policy description and a set of more extensive documentation that may be attached to the message in different guises (e.g., text, multimedia, external links).

- A set of interaction services, that allows users to have recourse to the Policy Gadget (e.g., find it, access its content, share it, comment the policy message). These interfaces may be provided by either the underlying social media platforms in which the Policy Gadget has been launched or by other 'touchpoints' (e.g., native mobile apps, cross-platform mobile website).

- The social context, that is the framework describing social activities and contents related with the Policy Gadget in each individual social media platform where the Policy Gadget is present. As a result, this component allows the Policy Gadget to be a 'context-aware' volume of relevant user activities and user generated contents.

- The decision services, for which the reader is referred to section 5.3.
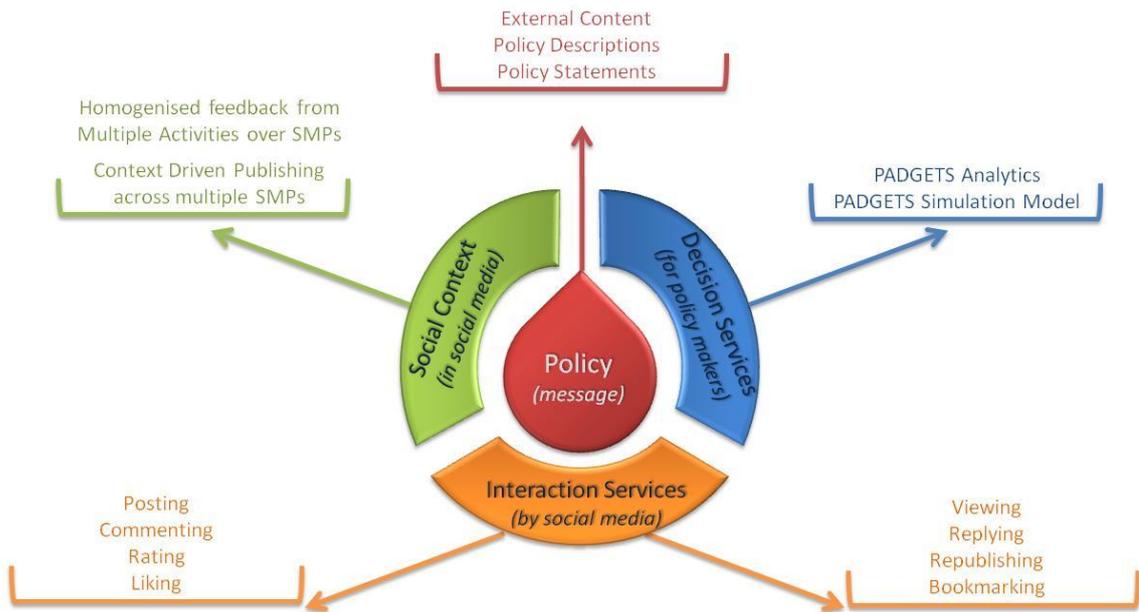
Figure 6 – Main components of the Policy Gadget

If the Policy Gadget represents the 'atom' in the novel participatory model, the campaign takes the semblance of a 'molecule'. As a molecule groups two or more atoms held together by chemical bonds, in the project jargon, a Policy Gadget campaign entails a set of activities covering creation, distribution, interaction, monitoring and termination of more Policy Gadgets oriented towards a specific goal and related to the same theme (Figure 7).
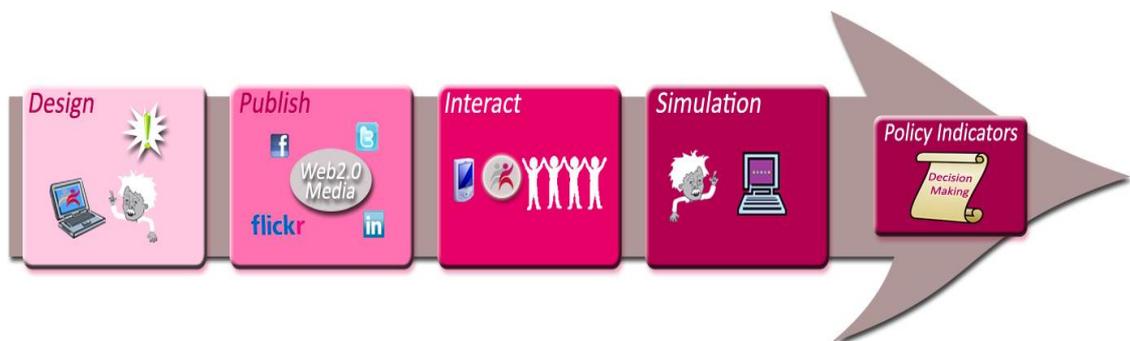
Figure 7 – Workflow of the Policy Gadget campaign

At this juncture, it is relevant to highlight that the concept of 'campaign' represents a distinctive feature of the conceptualization I have proposed for the PADGETS projects. In fact, a glimpse of other commercial products and research artifacts reveals that no one of them currently offers a similar feature meant to track a selected a cohort of posts published in different time periods by means of discrete social media platforms (and diverse accounts), retrieve respective interactions and threads in real-time via APIs, and present results in a harmonized way that reconcile – initially in a database and

subsequently for end user' eyes – the inherent discrepancies among social media platform. To say it with other words, the brand-new cross-platform approach that government agencies may adopt to harness social media for policy making purposes makes it possible to publish and monitor contents (i.e., Policy Gadgets) over an heterogeneous panoply of social media platforms, isolating Policy Gadgets from the 'jungle' of interactions that is generated while running institutional social media accounts, presumably characterized by high-frequency of content publication and burst of interactions and conversations.

This path-breaking approach allows public decision makers to conduct crowdsourcing campaigns in a number of selected social media, with each of them possibly attracting different citizens' groups, so that many and heterogeneous groups affected by a particular policy can be reached and engaged. The streams of interactions generated through these Policy Gadgets (e.g., views, likes, ratings, comments, sharings) are then retrieved by the central system, which constantly crawls APIs exposed by social media. And, above all, these masses of data undergo sophisticated processing (for which the reader is referred to section 5.3) in order to derive valuable information and insights for the policy maker.

The 'disruptive' nature of crowdsourcing campaigns conceived in this way is corroborated by the fact that technological components embodied in the PADGETS suite remain transparent to end users' eyes. In fact, social media users can continue to employ – without any modification – tools with which they are already accustomed to. Avoiding a supplementary cognitive effort is imperative to prevent the reappearance of barriers in public participation, which have already been prodigiously liquefied by the onset of social media. Besides preserving the sacrosanct principle of democratization of public participation, the proposed approach seems to be prone to stimulate a prolific crowdsourcing action: citizens (now wearing the hat of solvers) concentrate their attention on the topics under discussions rather than on coming to grips with new participatory websites, potentially racking their brains to come up with brilliant and unexpected ideas. All that having been said, the architecture of the crowdsourcing campaign is not intended to see all other interfaces apart from the social media native ones as enemies: new complementary channels meant to maximize user experience on mobile devices (e.g., native mobile apps, cross-platform mobile website) guarantee also the presence of another angle from which to look at the digital *agora* and to step in the open-door debate.

In light of its very peculiar nature, the Policy Gadget concept represents an ideal bridge across governments' institutional boundaries allowing establishing a bidirectional communication flow between policy makers and society. The value generated by such a tool unfolds along a number of dimensions, is perspective-dependent and may vary among the different phases of the policy making cycle. Nevertheless, in its essence it

may be conceived as a reduction in the distance occurring between policy making and society's needs, both in terms of time and tools required. In other words, the use of Policy Gadgets allows to better inform the policy decision process by providing a clear and dynamic vision of the disparate stakeholders' opinions and priorities. By giving policy makers a privileged interface for hearing society's voice directly where the crowd choses to express its opinion, a Policy Gadget enables an innovative way to gather, evaluate and decide upon society's input (Ferro, Osella, Charalabidis, Loukis, & Boero, 2011).

Consequently, the vocation of PADGETS platform is to operate as 'information hub' meant to interconnect heterogeneous groups of actors. The plethora of stakeholders potentially involved in Policy Gadget campaigns could be broadly categorized taking into account their belonging to three main classes of macroeconomic actors:

1. Citizens, i.e., simple individuals who are members of social (e.g., school students and teachers, university students and lecturers, commuters of a specific railroad) or administrative (e.g., individuals living in a certain municipality, province, region) communities involved in a Policy Gadget campaign.

2. Organizational actors, i.e., members of social arrangements which pursue collective goals and have a boundary separating them from their environment (e.g., corporations, charities, non-profit groups, cooperatives, political parties, trade unions). These individuals take action on behalf of their organization in order to promote its credo and to support initiatives that are aligned with organizational mission and values.

3. Public servants, i.e., public sector employees working for a government department or agency that is directly involved in a given Policy Gadget campaign; civil servants can provide a valuable contribution that is based on their everyday experience on the field and, besides, on their domain knowledge acquired over time.

Leaving untouched stakeholders identified, a dual interpretation – schematized in Figure 8 – may be adopted to clarify their respective positions in the policy arena: whilst the institutional boundary separates 'inside the government' from 'outside the government', the functional boundary allows to distinguish who draft(s) the policy from the ones who are affected by the policy at stake.
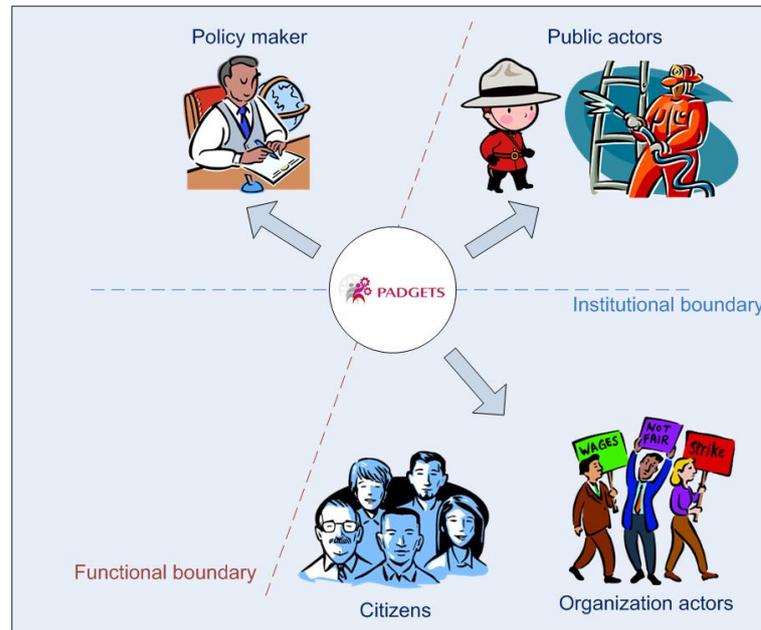
Figure 8 – Actors involved in the Policy Gadget campaign

For the sake of completeness, a further categorization could be applied considering the position assumed towards the Policy Gadget initiatives: stakeholders could appear direct (i.e., entities directly affected by the initiatives or inextricably connected to their effects) or indirect (e.g., people who are connected to direct stakeholder by means of a number of relationships, mere supporters or opponents, opinion leaders, common citizens).

Entering the door of government offices, in my conceptualization the policy maker role could substantially be analyzed under two intertwined perspectives, i.e., a vertical dimension and a horizontal dimension.

The policy maker position along the vertical dimension delineates the hierarchical role played in the governmental organization under examination. Hierarchical positions within governmental bodies may be classified in the following way:

- Strategic roles, which entail long-term decision making and long range planning. Definition of guidelines and policy principles leads to activities characterized by high responsibility.

- Tactical roles, which entail medium-term decision making guided by the pursuit of flexibility and agility. Programming activities involve combining available resources, looking at obstacles and reviewing alternatives in order to guarantee the implementation of strategic plans.

- Operational roles, which encompass short-term decision making, short range planning and day to day administration. Duties connected to these roles pertain to the actual execution of strategic plans centered on down-to-earth reasoning.

The positioning alongside the horizontal dimension reflects the responsibility area occupied by the policy maker within the administrative division that s/he oversees. The complexity underlying an accomplished Policy Gadget adoption calls for a multidisciplinary integration of contributions coming from various areas of expertise. Reasoning at a high level, key responsibility areas may be described as follows:

- ICT domain, related to the technological sphere; interests in this area are related to the feasibility and sustainability of Policy Gadget campaigns with a close focus on matters lying in the information systems field.

- Institutional communication domain, which relies on public relations capacities resident in the public institution; action in this field aims at strengthening citizens' trust in governmental bodies and stimulating active participation of the public in decision making processes.

- Vertical application domain, i.e., the domain that is directly influenced by a Policy Gadget consultation (e.g., healthcare, energy, agriculture, education, transports); stakes in this sphere encompass the successfulness of the initiative – at both qualitative and quantitative levels – for which the crowdsourcing participatory campaign has been prepared.

The two above-mentioned dimensions could be combined in order to obtain a matrix (Figure 9) that recaps the different perspectives from which policy makers observe a Policy Gadget campaign.
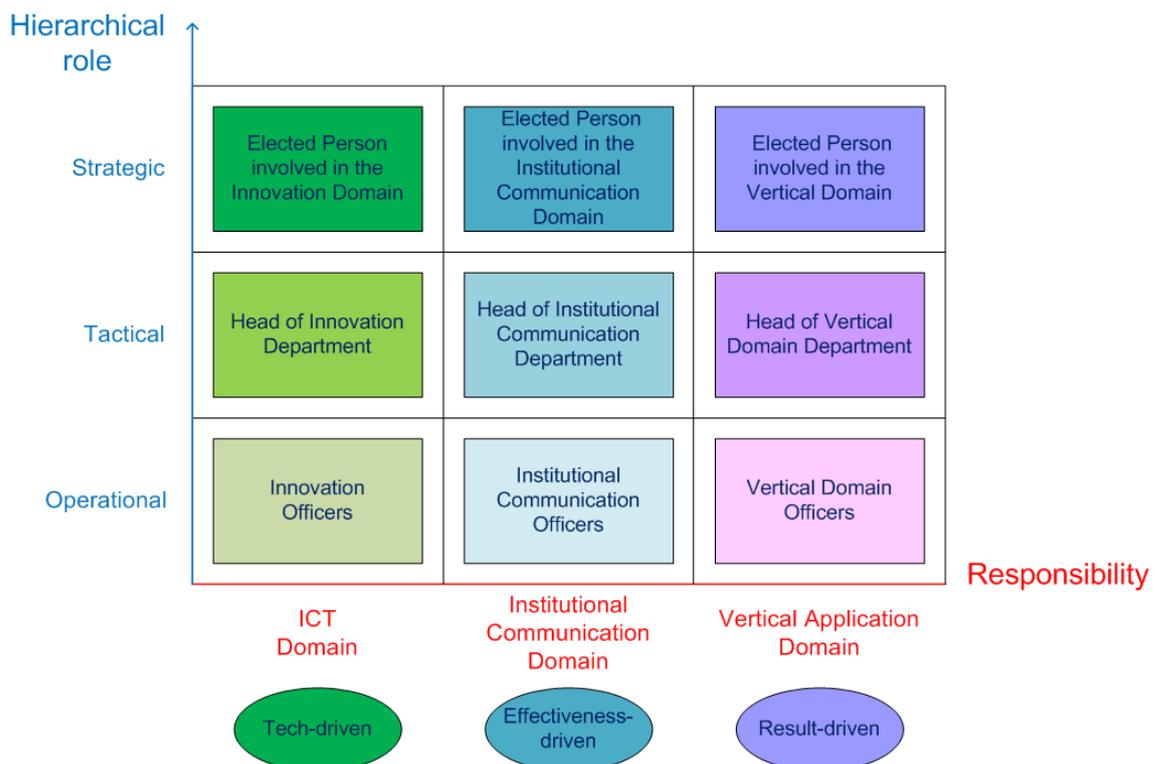
Figure 9 – Policy makers' role in the Policy Gadget scenario

65

Civil servants belonging to afore-mentioned domains and positions, besides covering specific functions in the organizational model (Figure 9), intervene in the platform configuration and usage during the Policy Gadget campaign lifecycle. To reconcile roles at organizational level and roles in the system perspective, I have thoroughly itemized functions of government employees in crowdsourced endeavors (Figure 10):

- Policy owners, i.e., policy officials with the power to influence or determine policies and practices at an international, national, regional, or local level in a well-defined domain; they are responsible for policy shaping, defining principles of public actions and, at the same time, evaluating which aspects are worthy of being discussed in a participative way. They are the employees at the helm of the campaign who oversee its strategic aspects (e.g., campaign timing, topic, contents): given their preeminent role, they are called 'campaign initiators'.

- Campaign managers, who directly operate on the governmental side in order to enhance social interaction and elicit opinions: their duties regard community building, publishing of policy messages, moderation of open discussions and real-time settings (e.g., notify inappropriate people or contents). Being the employee having hands-on interaction with the platform as every-day task, they deserve the name of 'campaign moderators'.

- Governmental enablers, who endorse the culture of Policy Gadgets inside their institution, becoming *de facto* Policy Gadget 'advocates' acting as internal evangelists. In light of their status of IT 'black belts', they operate as technical facilitators and, if required, they can help to demystify common fears and concerns that may arise particularly in not tech-savvy colleagues.

The roles depicted according to the system perspective are reflected in the types of accounts that may be created for platform users.
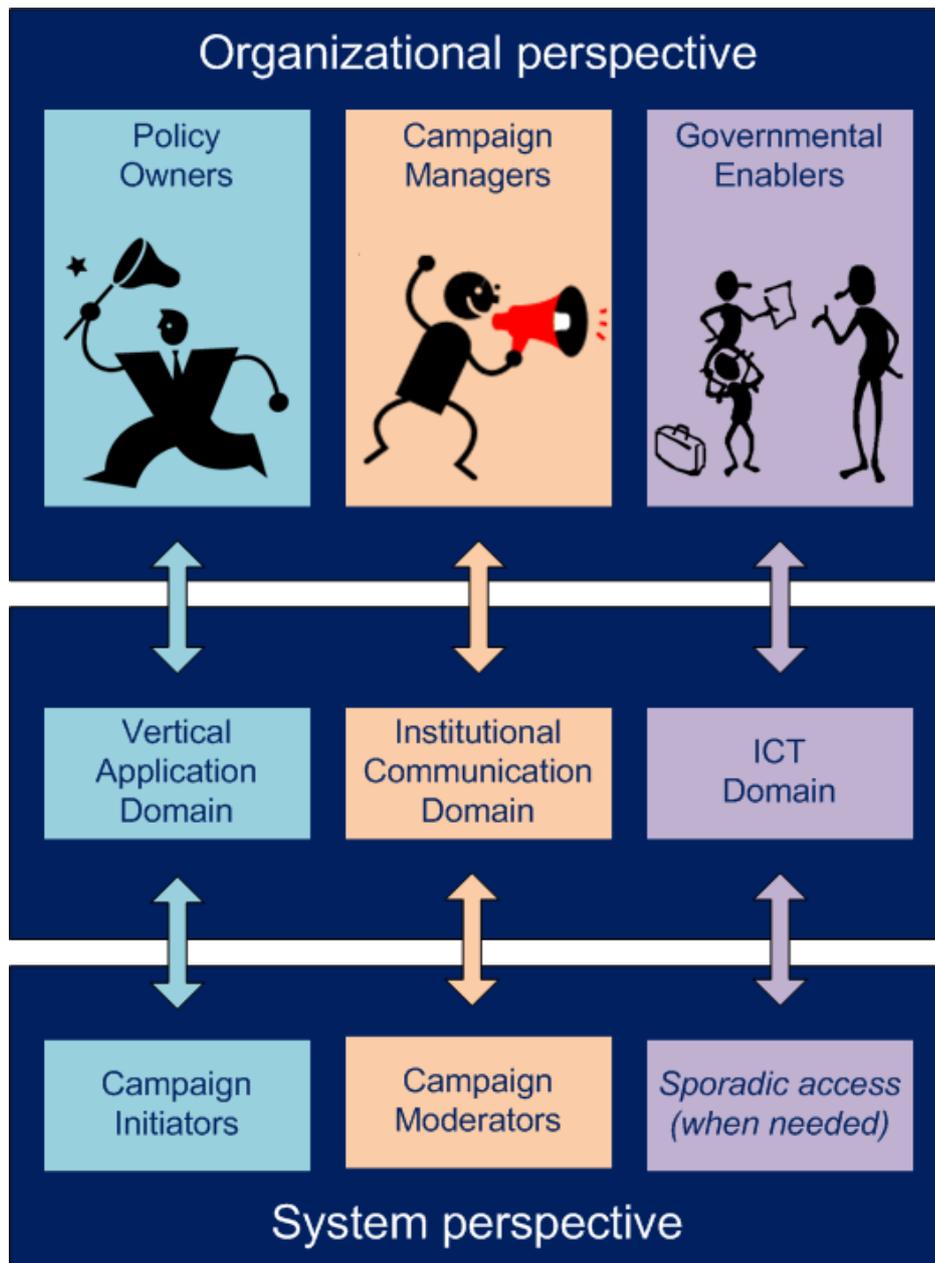
Figure 10 – Matching between organizational perspective and system perspective

To close the loop after the ample digression devoted to stakeholders involved in the crowdsourcing ecosystem, using the lexicon of economists I have summarized the value proposition of the crowdsourcing approach enabled by Policy Gadget in a few words with the catchphrase 'multi-sided, multi-benefit' (Figure 11). In other words, the action of the PADGETS platform generates indirect positive externalities for the different classes of actors engaged in the process (thus multi-sided) as well as different types of benefits for each actor class: convenient and frictionless participation accompanied by more socially-rooted policies for stakeholders; fresh, useful and low cost inputs for policy makers (thus multi-benefit).
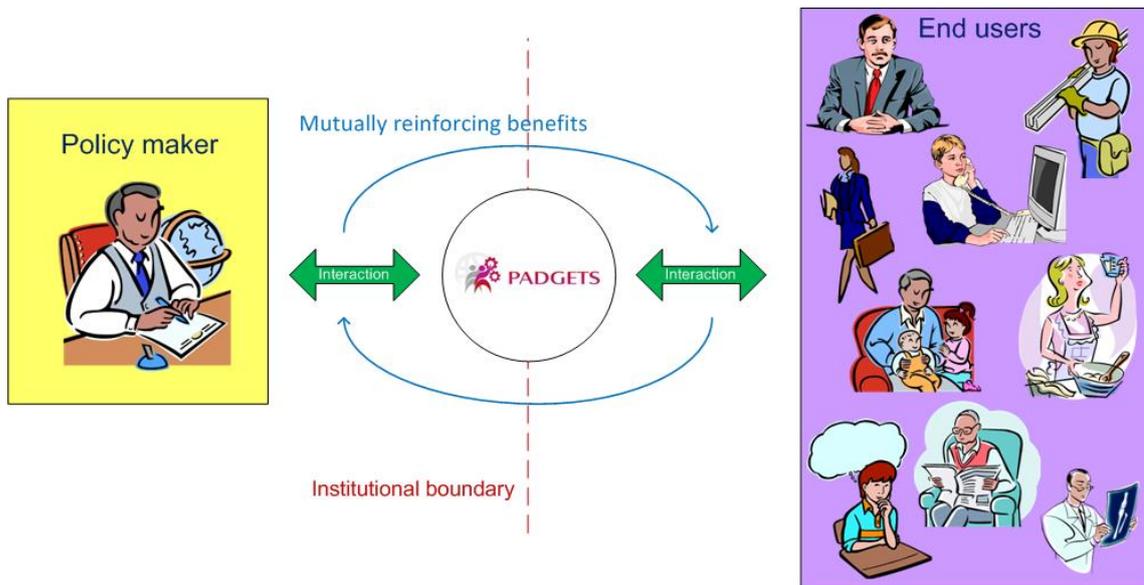
Figure 11 – Two-sided nature of the PADGETS platform

Thanks to the pronounced versatility shown by the platform, a Policy Gadget campaign may be launched during one or more phases of the policy making cycle: agenda setting, policy analysis, policy formulation, policy implementation, and policy monitoring and evaluation (OECD, 2003). The purpose, function and, as a consequence, value proposition of each Policy Gadget campaign may vary according to the stage of the policy cycle in which the campaign is launched, as pointed out by Table 3.

Stage in policy making cycle	Policy Gadgets campaign value proposition
Agenda setting	Elicitation of needs and priorities
Analysis	Collection of opinions
Formulation	Acceptance estimation
Implementation	Assessment of awareness and interest
Evaluation	Evaluation of impact perception

Table 3 – Value proposition of Policy Gadgets campaign in the various stages of policy making cycle

The common thread running through all the various phases is the crowdsourced interaction that provides a clear and dynamic vision of the disparate stakeholders' opinions, ideas and priorities. A simplified version of the policy lifecycle that massively leverages crowdsourcing is visualized in Figure 12.
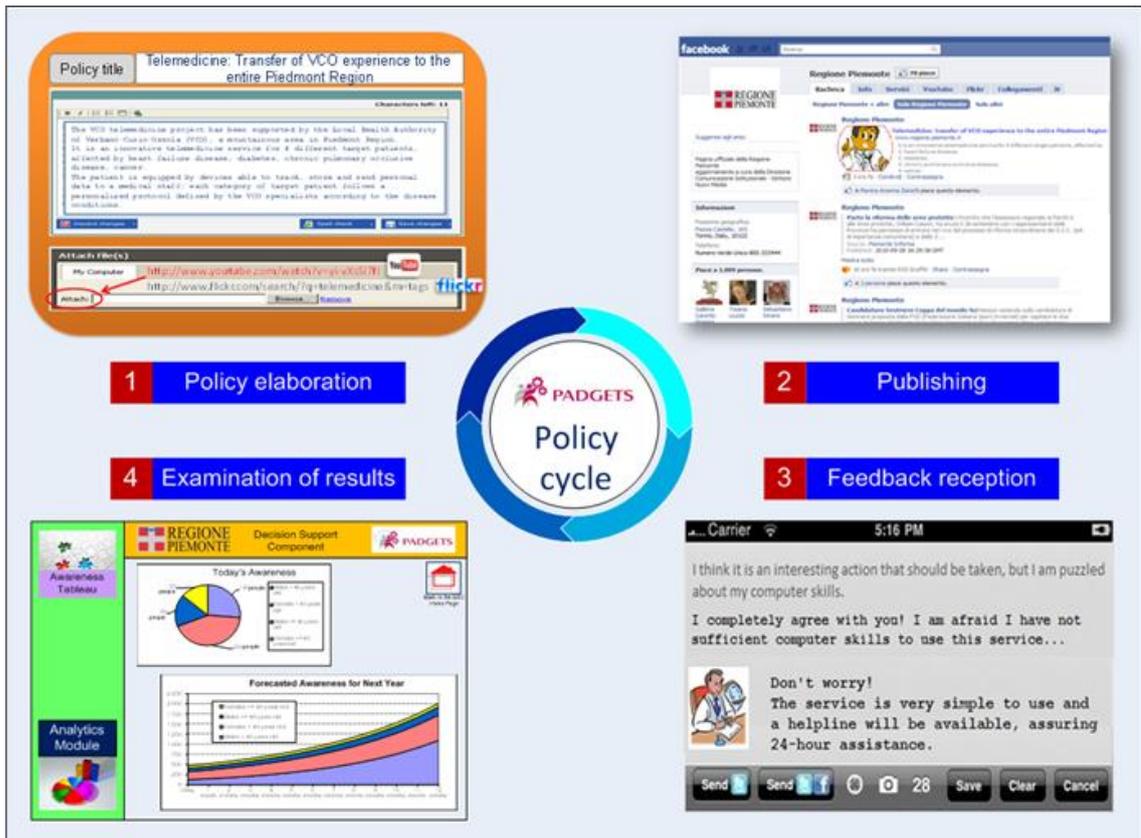
Figure 12 – The crowdsourcing-enabled policy cycle

5.3 Decision Support for Policy Makers

Within the PADGETS consortium, my research activity included not only the conceptualization of the Policy Gadget and its operationalization in crowdsourcing campaigns, but also the design and the (partial) development of a Decision Support System meant to become the daily working tool of forward-looking policy makers.

Entering into the contribution that a similar tool provides to policy makers' every-day activities, it is paramount to bear in mind that the design of public policy in most domains is a "wicked" problem (Rittel & Webber, 1973). As already hinted at in section 5.1, owing to the very nature of these phenomena, several circles of deliberation are necessary to collect stakeholders' voices. In this respect, crowdsourcing has what it takes to transform the way in which collective intelligence percolates across the boundaries of the public sector.

In order to put such mechanisms at policy makers' fingertips and make them effective in scenarios that are more complex and interconnected than those of the past (Courtney,

2001), decision support tools are required for enhancing the quality of the decision process[22].

Some of the classic DSS texts show that the focus of research and application has to a large extent been on individual managers and on organizational decision processes, largely for the private sector. In this domain, in fact, DSSs are mainly targeting improvements in terms of effectiveness and productivity of managers and professionals, boosting the organization's competitive edge, and rationalizing the decision making process within an organizational context (Kamel, 1998). Even though their native *locus* is the private sector, DSSs are gaining recognition in the public sector: many solutions are closely tied to individual fields, such as medicine, while others, in a more general way, are geared towards support in strategic planning and solving problems in management.

The traditional use of ICT tools for decision support, usually encompassing 'closed-door' activity carried out with static external inputs in the form of codified or unstructured data coming from different sources (e.g., statistical offices, other public agencies), is characterized by a number of important limitations in view of the need to analyze complex system behavior in a dynamic perspective. Examples of these drawbacks are the lack of a direct connection with the external reality on which the policy decision has to impact, an inherent delay present in the policy response due to the lead time to collect and process the relevant data necessary for the analysis.

It must be said that in the last decade the number of solutions striving to overcome such limitations has increased (Walker W. E., 2000; Bouras, Katris, & Triantafillou, 2003; Grönlund, 2003; Kersten, 2003; Rinner, Keßler, & Andrulis, 2008). Support systems and cooperation in decision making are, however, still used mainly in narrow professional circles and have not found their way to political decision makers or to the public. The challenge of successful implementation of DSSs with engagement over the whole spectrum of public decision making is still unmet (Benčina, 2007). In particular, in order to enhance the quality and effectiveness of the decision through knowledge harvesting, simulation of future scenarios and structured comparison of alternatives, DSSs depend on the availability and accessibility of timely, relevant and accurate information, which frequently represents the scarce resource.

In the DSS I have designed, such information derives from 'social sources' that guarantee the acquisition of massive, fresh, relevant and machine-readable data in a cost effective way.

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[22] The organizational decision making has its roots in the seminal contributions of renowned mavens such as Simon, Cyert and March; for a comprehensive discussion of these issues see Shim, Warkentin, Courtney, Power, Sharda, and Carlsson (2002).

In order to lay the foundations of the DSS for the PADGETS platform, I started from a set of key underlying assumptions regarding design principles as well as constraints I had to comply with.

1. The design should be centered on the policy maker's perspective, focusing on the manifold needs of daily policy making.

2. The DSS as a whole has to be aligned to project mission and orientation: in particular, the core principle to adhere to is the exploitation of many social media at the same time in a systematic and centrally-managed manner.

3. Considering the economics of the project, reaching internal economies of scope represents for sure a desirable outcome. Thus, the effort has to be geared towards preventing the creation of non-communicating silos and towards avoiding the development 'from scratch' of ad-hoc models for each specific pilot or *locus* of implementation.

4. In conceiving the application logic underpinning data elaboration, the novelty brought by Policy Gadget approach no longer considers individuals as isolated units of analysis but leverages their social connections and the context in which they are immersed as a potentially useful policy tool. By isolating particular behavior of specific groups, the policy maker may take advantage of an additional 'weapon': by targeting more connected or more charismatic individuals s/he is likely to obtain better and faster results than by implementing a generic policy not taking into account the role individuals play in their social network.

5. Some potential threats pertain to the vast fields with which policy makers have to deal, such as the cognitive problem of synthesizing the distributed knowledge collected from stakeholders in many different environments and the intrinsic dynamics of public opinion. In light of such inescapable difficulties, it becomes paramount to keep moderate the cognitive effort required to policy makers while let the 'machines' do most of the cumbersome work.

Keeping in mind afore-said cornerstones, I design the architecture and the application logic of a component that aims at informing the policy maker's decision process (i.e., a decision support tool) by effectively using the knowledge collected through the engagement with a plethora of stakeholders[23] interacting by means of various Web 2.0 social media.

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[23] I prefer the generic term 'stakeholders' to 'citizens' because I think that citizens are only the largest kind of stakeholders interested in interacting with policy makers, and that institutions, which cannot be reduced to their single individuals, can be interested too in the innovative ways of participatory policy making introduced by the project. Hence, actors such as, for instance, producers' and consumers' associations, political parties, trade unions, corporations and charities, could be encompassed under the label 'stakeholders'.

Taking into consideration the rich variety of policy fields, I decided to design a decision support tool capable to be as much as possible 'generic' and 'horizontal', meaning that it should be easily and effectively employed for any kind of public policy. This was done, among other reasons, to enhance the appeal of the DSS in terms of commercialization, i.e., in order to be turned into a marketable product. As a matter of fact, the possibility to reach a wider pool of potential institutional adopters allows to benefit from economies of scope and scale that contribute to lower the unit cost of service provision.

Moreover, considering the issue of synthesizing the widespread information collected through many different Web 2.0 participatory tools selected in the PADGETS project, I started by interacting with local policy makers in order to identify the support they expected from such kind of a tool. Prominent *desiderata* coming from the 'requirement phase' that I oversaw regard the potentiality of collecting through a unique tool various information stemming from dissimilar interaction patterns that are peculiar to different stages along the public policy lifecycle. In particular, policy makers would like to have at their fingertips a decision support tool that (ideally) provides answers to four 'archetypal' questions that I have distilled by recombining their musings. It does not take a long to understand that their scope encircles all phases of public policy lifecycle defined by OECD (2003) (i.e., agenda setting, policy analysis, formulation, implementation, monitoring).

Questions identified are as follows:

1. Are stakeholders aware of the public policy?
2. Are stakeholders inclined to debate the public policy?
3. What do stakeholders think about the specific public policy solution that the policy maker has proposed? To what extent they accept it?
4. Which suggestions are coming from stakeholders?

To say it with other words, the first question investigates whether stakeholders know that the policy under examination exists; the second question regards to what extent they are inclined to reason and debate about the policy theme. The third point, for its part, is centered on stakeholders' judgment about the policy (e.g., acceptance, rejection, neutrality, indifference). Finally, the fourth question hits the nail on the head with a clear reference to crowdsourcing: this question confirms that policy makers yearn for insightful contributions coming from the collective intelligence in an attempt to reap the benefits stemming from bottom-up knowledge percolation.

The identified relevant questions inspired me in the design of a support tool capable of taking advantage of the fruitful synergy among different methodologies and techniques. In order to devise responses to the four questions, the approach I have proposed frames

the multi-platform engagement with the crowd making reference to four interrelated dimensions (Ferro, Osella, Charalabidis, & Loukis, 2013) schematized in Figure 13:

- awareness (i.e., passive reception of the policy message in social media);
- interest (i.e., spreading or commenting the Policy Gadget announcement in social media);
- acceptance (i.e., expression of positive and negative judgments about the policy idea under examination);
- consultation (i.e., submission of relevant ideas pertaining to the policy issue at stake).
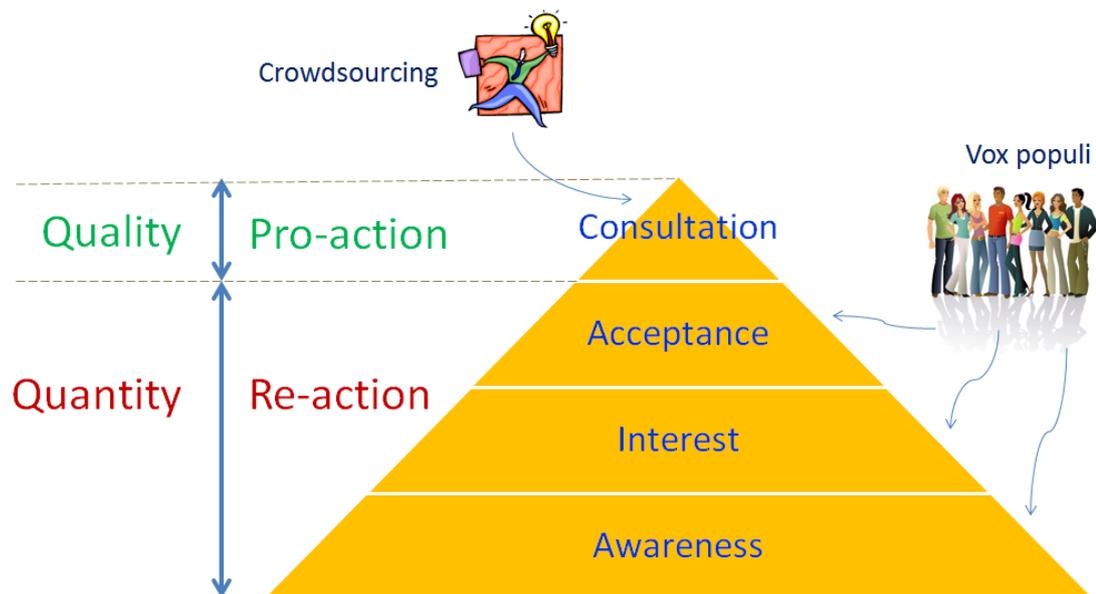
Figure 13 – The PADGETS pyramid at a glance

Looking at the resulting pyramid, the various levels of engagements between policy makers and the crowd are structured to give life to a sort of ladder made up of a number of rungs. The stack configuration reminds that each level depends on the level below in terms of existence similarly to what happens in other hierarchical models present in the literature (e.g., Maslow pyramid, OSI/ISO stack).

The first three layers composing the resulting stack are based on a quantitative approach that attempts to measure the reaction of the citizenry. To use a metaphor, the first three layers are a 'social seismograph' measuring the pulse of the public opinion with respect to the policy at stake. Stepping into the shoes of the policy maker, taking a glimpse of the process of stakeholder engagement is extremely precious also because it constitutes a *conditio sine qua non* for a fruitful exploitation of stakeholders' idea: if no citizens turn up in the Policy Gadgets campaign, brilliant crowdsourced idea will not emerge. With this respect, the eloquent motto coined by Ferro and Molinari (2010) ("no citizens,

no party") hits the mark. Vice versa, the apex of the engagement climax has to do with a qualitative examination of contributions collected during crowdsourcing campaigns as answers to the policy message; in the Policy Gadget scenario, such a policy message plays the role of the 'open call' typical of the crowdsourcing jargon.

The pyramidal stack has been conceived by taking into account concrete needs of public policy makers (i.e., the four questions) and, at the same time, drawing from preeminent theoretical frameworks developed in the disciplines of innovation studies and political science.

According to innovation research conducted by Rogers (2003), the diffusion of an innovation occurs through a sequential five-step process (i.e., awareness, interest, evaluation, trial, and adoption): by analogy, also the propagation of a policy proposal in the public opinion may follow a similar schema and, above all, as an individual might reject an innovation at any time during (or after) the adoption process, in the same way a citizen may oppose a given policy in various phases of her/his decision making process (schematized by me using the triple 'awareness, interest, acceptance').

Furthermore, OECD (2001) identifies three stages of on-line engagement: information (i.e., one-way relation that entails passive access meant to increase stakeholders' awareness), consultation (i.e., two-way relation in which citizens provide feedback and opinions about the policy and related issues) and active engagement (i.e., partnership between the government and the citizenry, with the latter one proposing policy options for deliberative purposes). This approach, which appears also in step with Macintosh's (2004) theory, has been considered as source of inspiration for framing the climax of on-line engagement in the context of participatory campaigns.

In addition, the concept of policy acceptance is well-recognized in political science as it allows to understand the coherence between the proposed public action and the systems of values present in the society, a necessary precondition for a successful implementation of the policy; considering the literary landscape as well as down-to-earth policy initiatives, the concept of acceptance may be seen from a normative point of view or from innovation point of view. For an example of EU funded research project on policy acceptance, see European Commission (2006).

Passing to the description of how the component works, all results shown to policy makers through the DSS are inherently cross-platform in step with the overall design described in section 5.2. Social media platforms integrated in the PADGETS constellation have been selected in light of three prominent criteria:

1. Support to the publication of contents relevant for the policy debate.
2. Possibility to originate threads of textual discussions surrounding the policy topic at stake.
3. Exposure of complete APIs for developers ('write' and 'read').

A detailed examination of the social media platforms having a global footprint had been conducted at the beginning of the project (in 2010). Platforms under the lens were Facebook, LinkedIn, Twitter, Blogger, Digg, Scribd, YouTube, Picasa, Flickr, while Google+ made its debut some months later. This long-list has been filtered in light of above-illustrated criteria, evolving into a short-list that contains only platforms matching all the three criteria: as a result, the prototype released during the project works in connection with Facebook, YouTube, Twitter and Blogger. This cross-platform approach implies the theoretical construction of a 'meta social media' made up of new 'horizontal metrics' each of which has to be put in relation with native metrics peculiar to supported social media platforms. To exemplify this groundbreaking approach, Figure 14 visualizes how the DSS that I have designed combines under a common roof platforms having heterogeneous goals, audiences, functionalities and interaction patterns. By doing this, the DSS 'virtualizes' the native platforms making transparent to policy makers the huge diversity existing among them.

Only in this way, results generated for policy maker can be campaign-specific in lieu of account-specific (i.e., situation that would happen considering each social media platform as a stand-alone silo) or content-specific (i.e., what would occur in absence of the ability to track over time specific contents belonging to the Policy Gadget campaign).
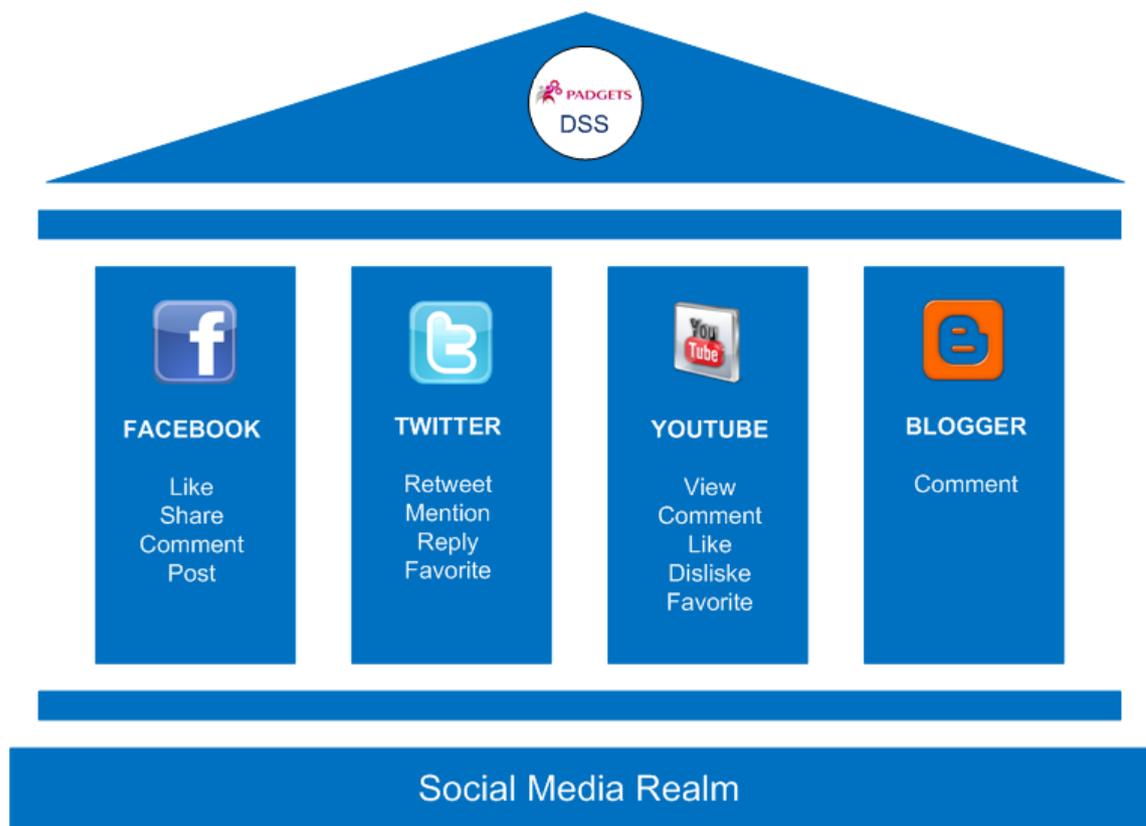
Figure 14 – The cross-platform approach of the DSS

Stepping into the shoes of policy makers, quantitative results representing the preconditions for crowdsourcing (i.e., awareness, interest, acceptance) are presented by means of policy indicators summarized in Table 4. To really provide policy makers with a daily working tool monitoring the progress of the Policy Gadget campaign, all such indicators are computed with a daily granularity.

Policy indicator	Data type	Variable	Numerical properties
Awareness	Integer	Unique users reached by the campaign	Monotonically increasing series
Interest	Floating point	Ratio of unique active users to unique users reached by the campaign	Values ranging from 0 to 1
Acceptance	Floating point	Percentage of users who has expressed in favor of the policy proposal at stake	Values ranging from 0 to 1

Table 4 – Policy indicators in the DSS

Not only all such indicators are computed with a daily granularity, but they are also broken-down into partial values related to socio-demographic clusters. Using gender and age brackets as dimensions for the decomposition, each awareness, interest, and acceptance value is presented in a way that may help the policy maker to detect particular tendencies in certain segments of the audience involved in the crowdsourcing campaign.

Moreover, in the DSS that I have designed, for such policy indicators different values are provided according to an increasing level of sophistication:

- actual distributions (i.e., mere data aggregation that 'simply' groups raw data according to socio-demographic variables);
- resampled distribution (i.e., raw data projection in the real world meant to cope with inherent biases in social media usage);
- projected distribution in the near future (i.e., result of advanced simulation routines that create *in vitro* future policy scenarios in light of the emerging dynamics exhibited by the public opinion).

Combining each policy dimension, and thus its indicator, with the level of sophistication the overall landscape could be depicted (Figure 15).
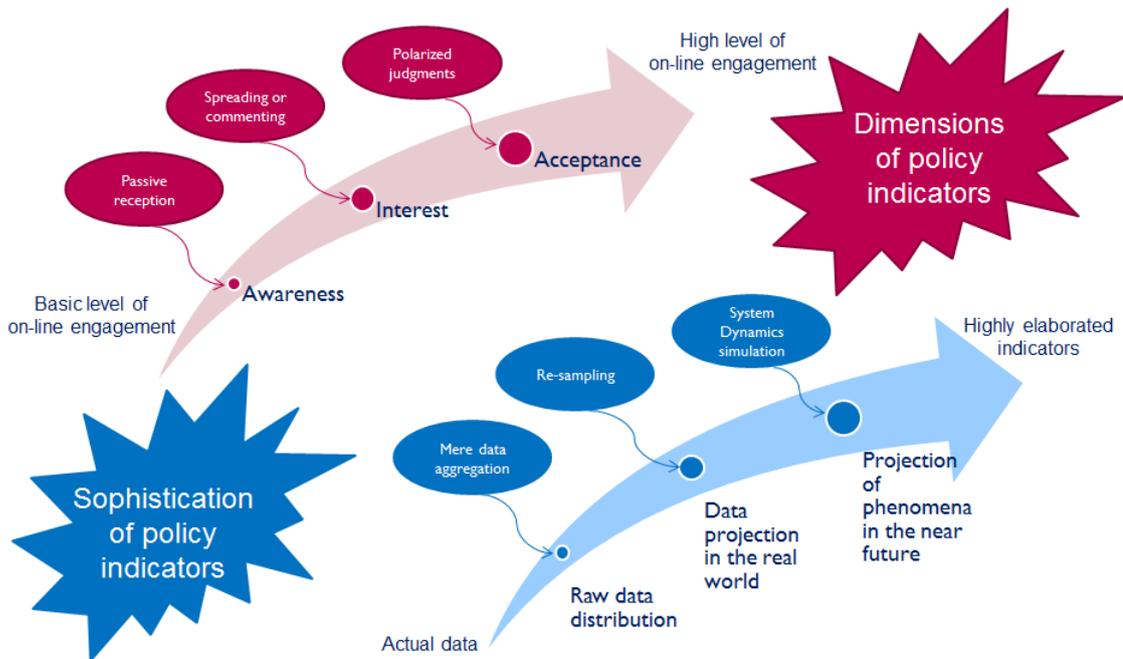
Figure 15 – Policy indicators and their level of sophistication

Such different levels of sophistication for the policy indicators are made available to provide further insights to policy makers going far beyond 'simple' counters.

Actual distributions are inevitably affected by bias that in social media are exceedingly evident. Therefore, in order to increase the real world significance of obtained results, the re-sampling of raw data is computed: moving in this direction represents an attempt to remedy to possible underrepresentation of specific groups of stakeholders in the social media realm. To exemplify, elderly generations are likely to show lower penetration rates in social media: the resampling activity is thus aimed at reducing this bias (and several others) in the estimation of current and future awareness, interest and acceptance rates.

Furthermore, actual distributions provide the current values (to this day) and a backward time series. This output does not satiate the appetite of a forward-looking policy maker who would love to have a clue on what the future has in store for the crowdsourcing campaign. To cope with this 'nice to have' feature, the DSS builds *in vitro* future scenarios of awareness, interest and acceptance by means of complex system simulation.

This highly sophisticated procedure starts from the re-sampling of raw data and operates as schematized in Figure 16.

1. A System Dynamics model is built-up automatically in the background. Three separate sub-models are instantiated, one for acceptance, one for interest and one for acceptance. Taking into account each of them, the complex structure in made up of stocks and flows: each stock (i.e., entity that accumulates or depletes over time) is the level of awareness, interest, or acceptance of a socio-demographic

cluster while each flow (i.e., the rate of change in a stock) represents the influence that one cluster exerts on another one in light of 'ripple effects' shaping human behavior in social media. In terms of topology, the model originates what in graph theory is known as 'complete graph', i.e., a fully-connected network in which each of the nodes is linked to all other ones. In addition, each socio-demographic cluster sees the presence of endogenous dynamics that are disentangled from the viral contagious: this implies that each stock has an endogenous feedback loop, i.e., a flow converging to the same stock from which it has been originated.

2. A calibration procedure is performed through a regression model that computes coefficients and parameters of the model, estimating both mutual interrelations and endogenous growth in view of the evolution registered hitherto. The inputs that feed this procedure are historical time series of awareness, interest and acceptance. Outputs consist of forecasted time series of awareness, interest and acceptance computed for each time bucket (i.e., a day): at this juncture, figures represent a sort of 'most-likely' values.

3. Subsequently, given the stochastic nature of the simulation, the heterogeneity of collected data and the uncertainty affecting some parameters, the simulation runs to explore all the possible outcomes of variations in parameters (including the random seed for stochastic processes). As a result, confidence intervals are computed with a given level of confidence for each forecasted policy indicator: by moving in this direction, it is possible to shift the perspective from deterministic to probabilistic.

4. Once the simulation routines have run 'behind the scene', fresh and customized results are passed to the front-end and presented to the policy maker in a compelling way through a full-fledged Web-based visualization engine.
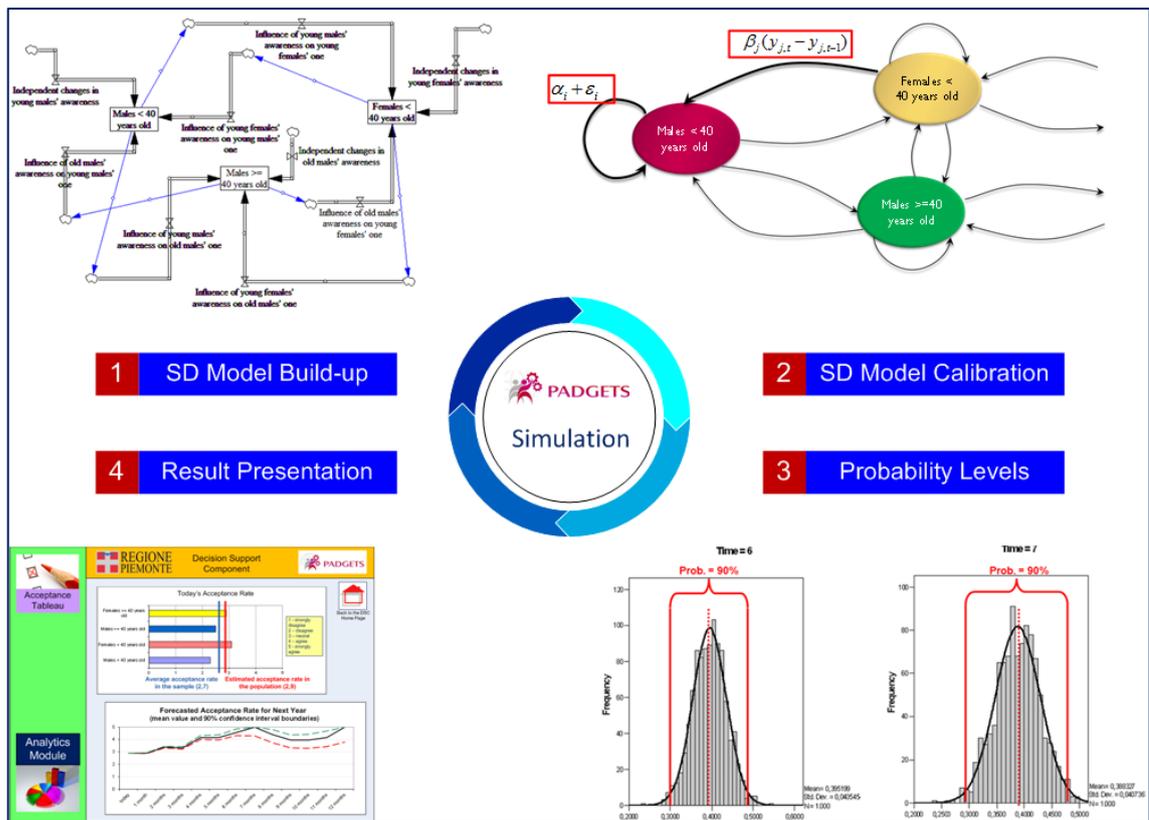
Figure 16 – Procedural point of view on the simulation model

The rationale underlying this System Dynamics model is to simulate how socio-demographic clusters of stakeholders will change their level of awareness, interest and acceptance in the near future in light of intertwined social connections and resulting 'viral' contagious phenomena: treating this system as a complex one reinforces the concept that clusters are not independent, therefore several feedback loops and cascade effects can be at work testifying a blurred overlap of endogenous evolution and external influences.

As the reader has by now understood, this specific System Dynamics simulation model profoundly differ from the 'traditional' ones.

First of all, the presence of a dense graph (in this case, a complete case) renders the design extremely arduous with traditional tools. Since a meaningful visualization of the entire model is practically impossible, Figure 17 attempts to shed light on the dynamics existing between a stock (i.e., a socio-demographic cluster) and its neighbors (i.e., other socio-demographic clusters). The reader is warned that this simplified diagram – sketched out only for the sake of the present manuscript – does not intend to mimic the real model and that the visual schema does not represent a realistic scenario.
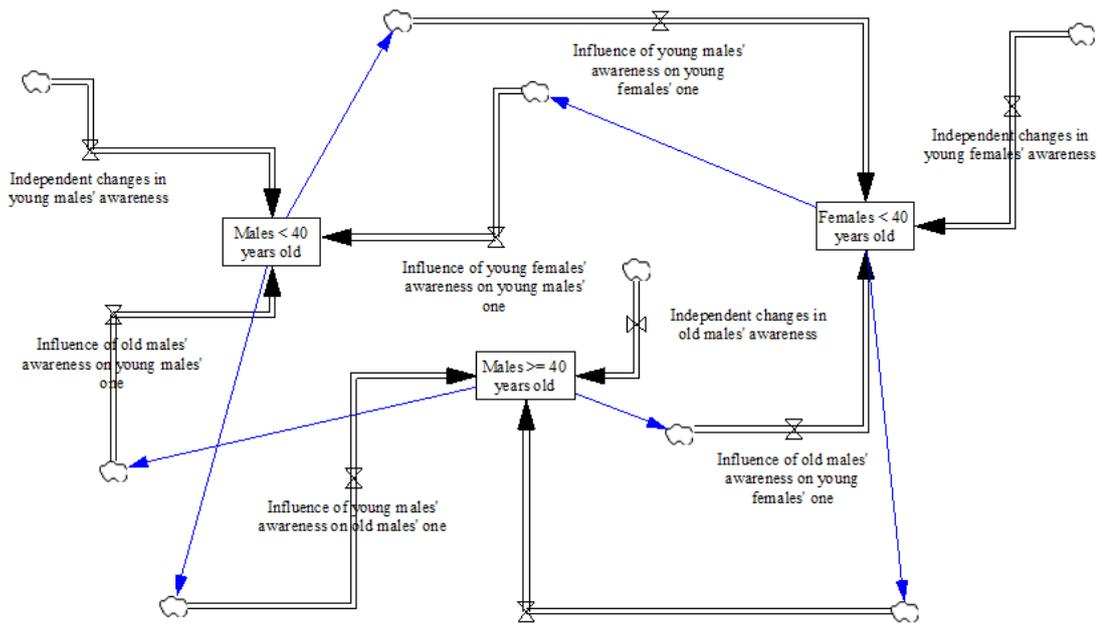
Figure 17 – Simplified representation of the System Dynamics model

Secondly, the reader will not have failed to observe that a series of binding requirements emerge under a technical viewpoint, making it impossible to build the model by means of classic tools (e.g., NetLogo, AnyLogic, Vensim):

- The simulation model cannot be a stand-alone entity but it is imperative to guarantee full interoperability with the DSS and with other components of the PADGEST suite.

- The model should process data inputted via API instead of via GUI (only solution in classic tools).

- The DSS should be able to process information related to different campaigns in a simultaneous manner.

- DSS end users (i.e., policy makers) need to access the functionalities via Web, as planned for all services made available by the PADGETS platform.

As a result, for the actual implementation 'on the field' of the DSS architecture, I have proposed to rely on autonomous and platform-independent software classes with data interfaces for exchanging inputs and outputs with other building blocks belonging to the PADGETS platform. The choice has been to code (the source code has been entirely realized by a colleague of mine) this software entirely in Java (avoiding recourse to external tools for System Dynamics modeling) in order to guarantee platform independence, eventual Web distribution and for relying on well-established Java libraries devoted to required activities of data management and regression.

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From a technological perspective, a similar approach paves the way for a multi-instance execution in the same cloud application environment. In terms of soft (but not less relevant) aspects, significant results are achieved for what concerns the cognitive effort demanded to the policy maker. Removing the need for policy maker to formalize and configure the model (as would have happened in presence of classic System Dynamics tools), a thick layer of complexity is dissolved: algorithms remain hidden to him while the simulation model runs 'behind the scene' and present intuitive visual results to the end user.

For the sake of completeness, it must be added that also opinion mining methods (Pang & Lee, 2008) – outside the scope of the present thesis – have been exploited in the DSS. In this field, the effort is geared towards extracting opinions from unstructured human-authored texts (posts, comments *et similia*) having recourse to techniques such as feature-based sentiment analysis, topic identification and sentiment classification. Semantic analyses in this vein provide an insightful glimpse on 'what people think' capable to conspicuously reinforce the governmental policy intelligence.

A pivotal complementary aspect not to be overlooked is the compliance of the DSS with policy regulation and data protection legislation. In fact, during the entire project, and also beyond its end, there is no transfer of personal data to third-parties: data gathered through crowdsourcing campaigns are stored on servers of one of the consortium partners inside the EU region and are owned by the consortium.

Since the 'North Star' that guided (and still guides) my action is being markedly 'value-driven' rather than 'tech-driven', it may sound wise to conclude the section by coming back to the policy maker's angle in order to pinpoint how the tool previously described is able to 'make sense of data' by smoothing the way for a better informed policy decision.

Such tool has the capability to analyze both unstructured (and sometimes inadvertent) and structured (i.e., crowdsourced answers) society's inputs and, from them, to distill – through a bottom-up dynamics – solutions to pressing (and 'wicked') policy issues and to forecast the possible impact of policies in light of the emerging *vox populi*. Summarizing, from a policy maker's perspective the value proposition of the decision support tool that I designed may be recapitulated as follows:

1. A methodological contribution related to information classification, since the tool provides a well-grounded conceptual framework aimed to classify and aggregate data stemming from social engagement in light of an increasing level of stakeholders' involvement (i.e., awareness, interest, acceptance).

2. A reduction of information complexity, given by a set of peculiar traits (e.g., data aggregation along multiple dimensions, cross-platform data analysis, data projection into the real world, simulation of phenomena in the near future) leading to a well-framed synthesis of heterogeneous society's input.

3. A support to emerging governance models, since the DSS enables new ways for collecting, organizing and delivering information at different authority levels, opening-up on-going governance models and allowing a wider audience to have an impact in the political debate.

5.4 Fieldwork Activities

According to the project timeline, the phase of 'exploration' described above – in which crowdsourcing tools for the public sector (included the brand-new DSS) have been conceptualized and developed – has preceded an 'exploitation' phase when afore-mentioned tools underwent an 'acid test' based on pilots involving actual policy makers operating in a real policy scenario. During this second phase, I have contributed to plan, coordinate and monitor operations concerning the pilot which took place in Piedmont Region. This occasion allowed me to breathe deep the air of action research in the midst of practitioners and to formulate a series of lessons learnt (Osella, 2013).

The topic of the Policy Gadget campaign in Piedmont Region concerned e-Health and, more in details, the extension of remote delivery of healthcare services to regional areas currently not served.

In the last ten years Piedmont Region has spent, on average, the 80.1% of its total budget for providing health services to its citizens and the nominal value for providing those services has increased yearly of 6.1% during the period[24]. Contemporary debt crises at national and European levels require the region to face the challenge to relevantly decrease the expenses on the health system without deteriorating the quality of the services provided to citizens.

Italian national public debt is the 2nd in Europe in terms of public debt over GDP ratio (127% in 2012[25]). This is coupled with another eloquent indicator: in Italy the fiscal pressure (42.8% in 2012[26]), if compared with GDP, remarkably exceeds the EU average value. Such figures testify that in the current scenario there is little room or no room for errors and for wastes of public money, taking into account the fact the imposition of new tax forms may sound as no more sustainable.

The challenge is even more compelling if taking a longer term perspective: the population age is steadily rising and all demographic forecasts at disposal allow reasonably expecting a long-lasting gradual increase in the demand of health services by the regional population. In fact, the age profile ('demographic pyramid') of the population is gradually re-shaping and it is expected to change dramatically in the

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[24] Sources: Italian Ministry of Economy & Finance, Italian Ministry of Health.
[25] Source: Eurostat.
[26] Source: Eurostat.

coming decades. This phenomenon is evident in Europe and Italy it is even more pronounced than in Europe. In Piedmont Region, in particular, the situation is even more exacerbated, as reported in Table 5.

Population Index	EU27[27]	Italy[28]	Piedmont[29]
% over 65 (2002)	16.0%	18.7%	21.3%
% over 65 (2012)	17.8%	20.8%	23.5%
% over 65 (2060)	~29.3%	~31.7%	~32.0%

Table 5 – Projections of the aging population at European, national and regional levels

In such a framework, regional policy makers obviously pay much attention on e-Health initiatives which seem to promise financial savings along improvements in the provision of health services.

To tell the truth, telemedicine is not a 'green field' in Piedmont Region since a trailblazing initiative targeting chronic diseases had been rolled-out 4 years ago in VCO (Verbano Cusio Ossola), a mountainous area in the north of Piedmont Region. Results have been extremely encouraging (this trailblazing initiative rapidly acquired the status of best practice) but it took place on a niche-scale, involving roughly 300 patients in 3 years. At the advent of PADGETS project, Piedmont Region policy makers decided to leverage the brand-new crowdsourcing platform to test the reaction of the citizenry to this proposal: to extend such pioneering initiative having a niche-scale to the entire Piedmont region.

Stepping into the shoes of policy makers, this proposal of best practice transferability is characterized by a huge complexity, given the presence of (at least) two key variables to be dealt with in the problem setting (Figure 18): the first one is related to the geographical scale that is extended, while the second one has to do with context diversity existing between the native area of implementation and the new targeted zones.

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[27] Source: Eurostat.

[28] Source: Eurostat.

[29] Source: Istat.
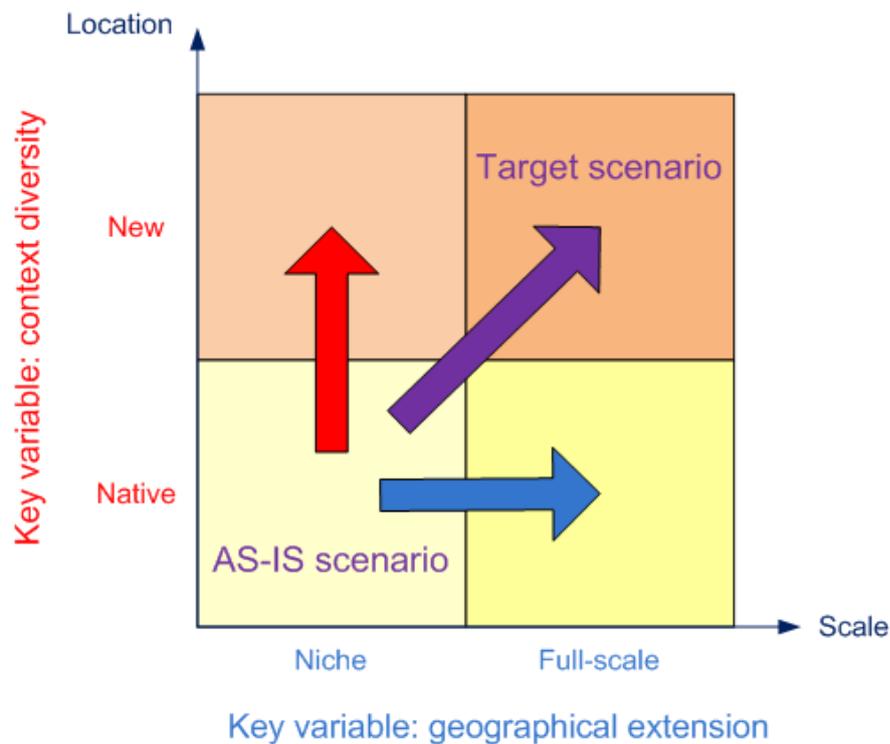
Figure 18 – Key variables of the problem setting

To deep dive into this challenging policy proposal, it is required first of all to assess the readiness on the demand side, i.e., on the patient side. Secondly, there are several hurdles to be cleared at technical and economical levels for the implementation of a similar large-scale telemedicine program. Last but not least, taking into account that health services are provided by 22 local health authorities covering different but often overlapping areas and medical specializations, it is required to come to grips with an appropriate organizational model to orchestrate the transition.

Turning these policy makers' conundrums into guidelines of the crowdsourcing campaign, the PADGETS pilot that took place in Piedmont Region allowed local policy makers to investigate the economic impacts of the extension of e-Health systems to the whole region knowing that they relevantly depend upon citizens' reactions. Furthermore, the pilot represented an opportunity to take stock of the VCO trailblazing experience since the discussion was centered on the exploitation of the experience and the good practices observed in the limited case of VCO. In line with expectations, relevant by-products of the campaign have been the identification of risks, obstacles and key elements for a successful regional development of e-Health services.

According to policy makers' *desiderata*, citizens' response to the planned regional implementation of telemedicine has been tested with reference to two complementary families of telemedicine services that are candidate to bring significant benefits to the entire regional healthcare ecosystem. Whilst the first topic under the spotlight was the virtualization of periodical checkups of patients with chronic diseases (e.g., heart

failure, diabetes, chronic pulmonary occlusive disease, and cancer), the second topic concerned the adoption of policies pertaining to anticipated after-operation discharges of patients, to be constantly monitored by means of appropriate telemedicine tools.

The multi-faceted topic of telemedicine – which represented the *leitmotiv* of the Policy Gadget campaign that took place in Piedmont Region – has been examined from diverse perspectives. In fact, besides the inherent participatory nature of PADGETS endeavor, the synergy with 'Formazione 2.0' project[30] (in which I have been involved as scientific expert) allowed to broad the spectrum of the initiative: activities having to do with information and training have been combined under a common roof with the crowdsourced participation, giving life to the virtuous 'triple helix' visualized in Figure 19.

Information

Training

Participation

Large-scale distribution of multimedia materials regarding cutting-edge medical services in the domains of home-care and self-care.

Provision of educational materials to healthcare professionals in accordance with their recurrent e-Learning programs.

Collection of experiences, opinions and ideas in a bottom-up manner aimed at stimulating the policy action.

Figure 19 – The 'triple helix' of PADGETS and 'Formazione 2.0'

Given the two-sided nature of the policy scenario, target stakeholders reside both on the policy makers' side and on the citizenry's side.

Involved policy makers belong to the three departments of the regional administration:

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[30] The project 'Formazione 2.0' represents the outcome of Piedmont Region successful candidature to the ministerial call concerning the financing of regional programs of health education in the spheres of home-care and self-care. This initiative, whose launch occurred in spring 2012, has shown various complementarities with the topic of the Piedmontese pilot and, as a result, the synergy between the pilot and the 'Formazione 2.0' project has represented a doubtless point of strength.

1. 'Direzione Innovazione, Ricerca ed Università', which is the office managing projects about innovation in public policy and the partner in the PADGETS consortium.
2. 'Direzione Sanità', which manages the provision of healthcare services – on behalf of the national health system – to Piedmontese citizens.
3. 'Comunicazione istituzionale della Giunta regionale – Settore Nuovi Media', which is the central department of institutional communication managing campaigns and the respective interaction with citizens via new media.

Each of afore-mentioned departments brought some officers into the pilot team, rendering it heterogeneous in terms of responsibilities and hierarchical roles. A glimpse of policy makers involved in the resulting pilot team is portrayed in Figure 20 (that is the contextualization of the general schema portrayed in Figure 9).
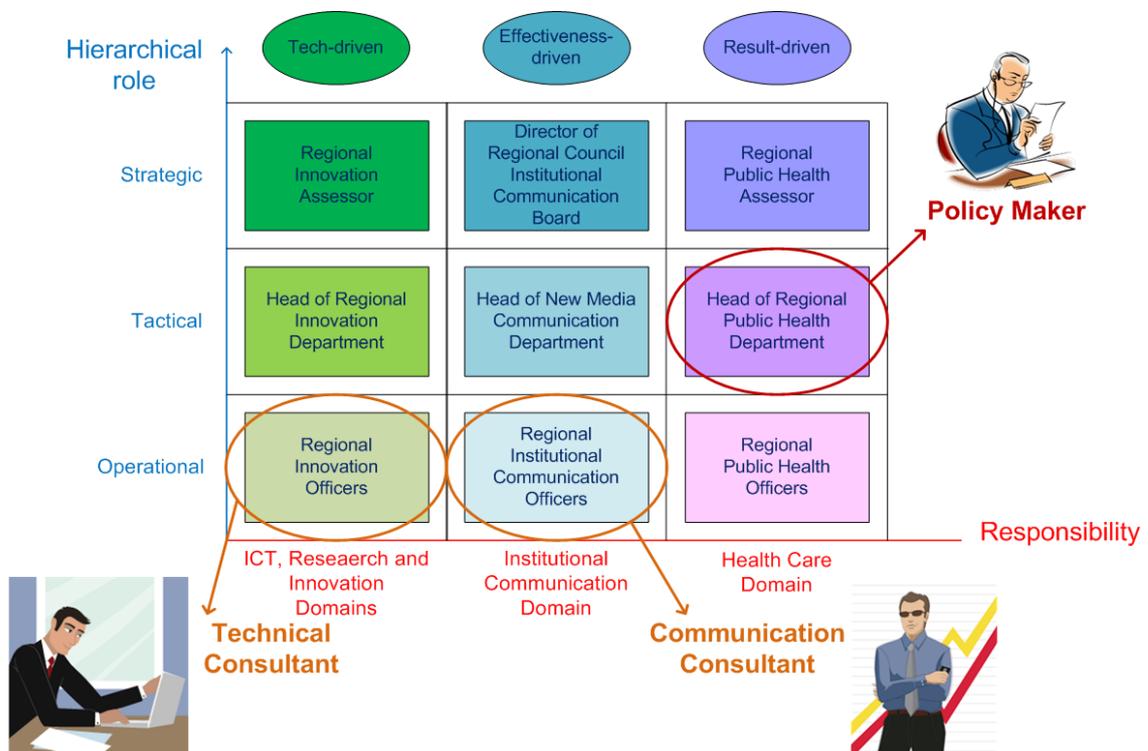
Figure 20 – Policy makers in the pilot team

The pilot team encompassed also members of other organizations. First of all, since the dawn of the project, the Piedmont Region team (PIED) has operated in close cooperation with the project team based in the Polytechnic of Turin (POLITO). This team provided a continuous policy support at a scientific level in different activities ranging from the development of a strategic plan for the management of social media communities to the campaign planning and design. In addition, POLITO team (to which

I belong) has been active in the local and international dissemination of the pilot activities, publishing several scientific papers and being invited to a number of workshops and conferences.

Thanks to the synergy with 'Formazione 2.0' project, the pilot team leveraged the experience of two other organizations belonging to 'Formazione 2.0' consortium. CSI Piemonte was responsible for handling the contacts with healthcare stakeholders, for the definition of the training plan and for the production of multimedia contents. Istituto Superiore Mario Boella, for its part, has been involved in the campaign design, in the execution and monitoring of the campaign as well as in the analysis of the campaign results.

The resulting 'PADGETS constellation' is schematized in Figure 21.
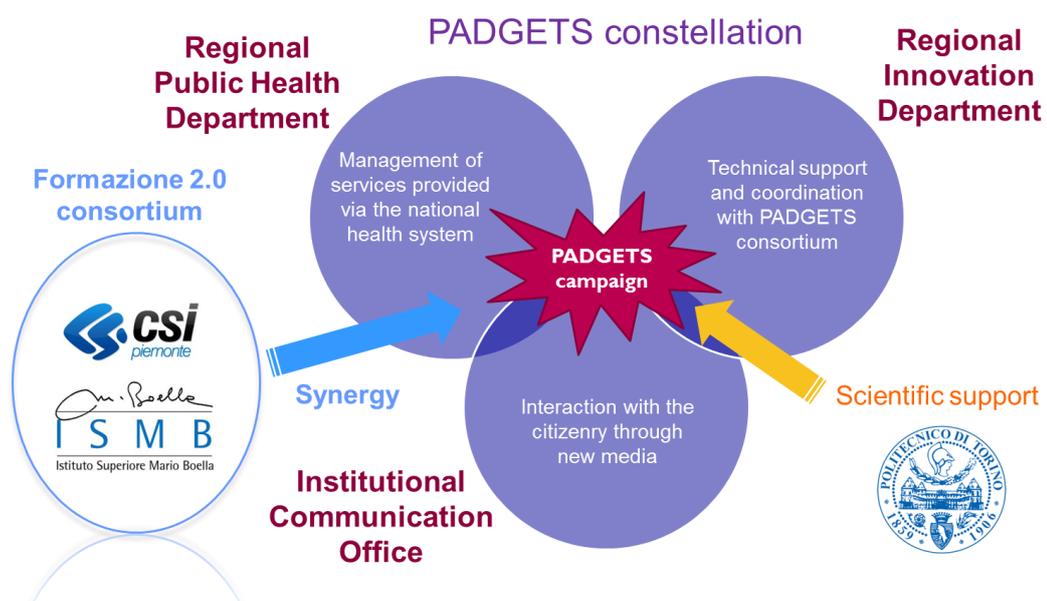
Figure 21 – The 'PADGETS constellation'

Taking a helicopter view on the citizenry's side, the pilot ideally targeted all Piedmontese citizens (about 4.5 millions). However, some specific categories of citizens have been more prone to react and participate in the pilot:

- citizens with chronic diseases (e.g., heart failure, diabetes, chronic pulmonary occlusive disease, and cancer), their families and supporters advocating policies in the healthcare sector (Figure 22);
- all the civil servants, stakeholders (e.g., associations and charities) and public health system employees working on providing public services (e.g., treatments, assistance, etc.) to patients (Figure 23); this list of target stakeholders encompassed also the broad spectrum of health care professionals involved in lifelong learning programs covered by the 'Formazione 2.0' project.
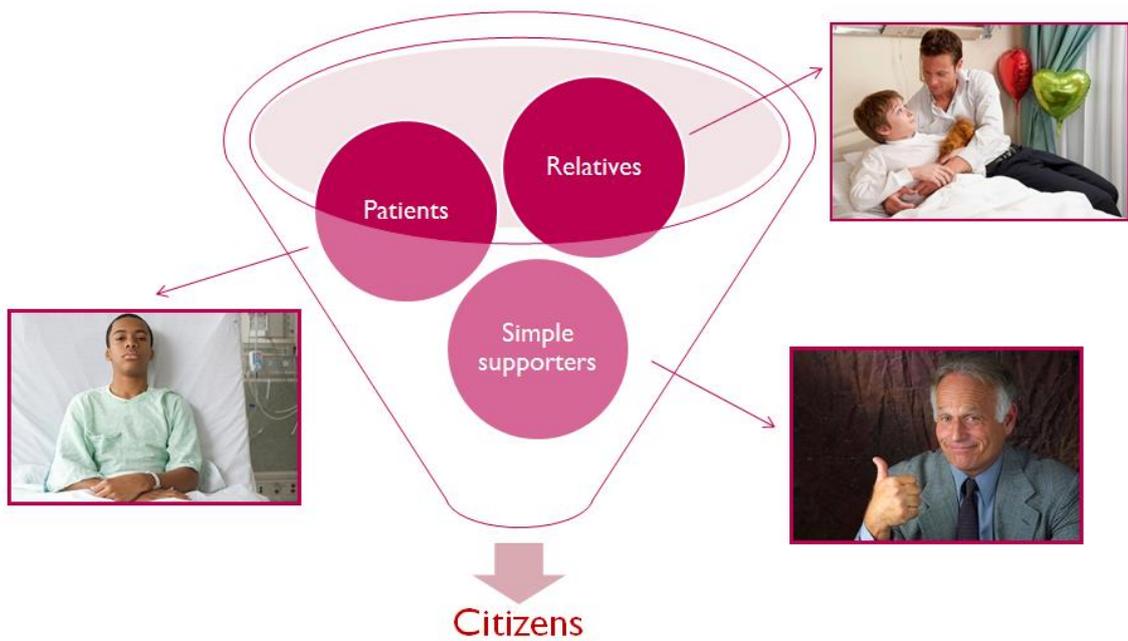
Figure 22 – Citizen as a composite actor in the pilot scenario
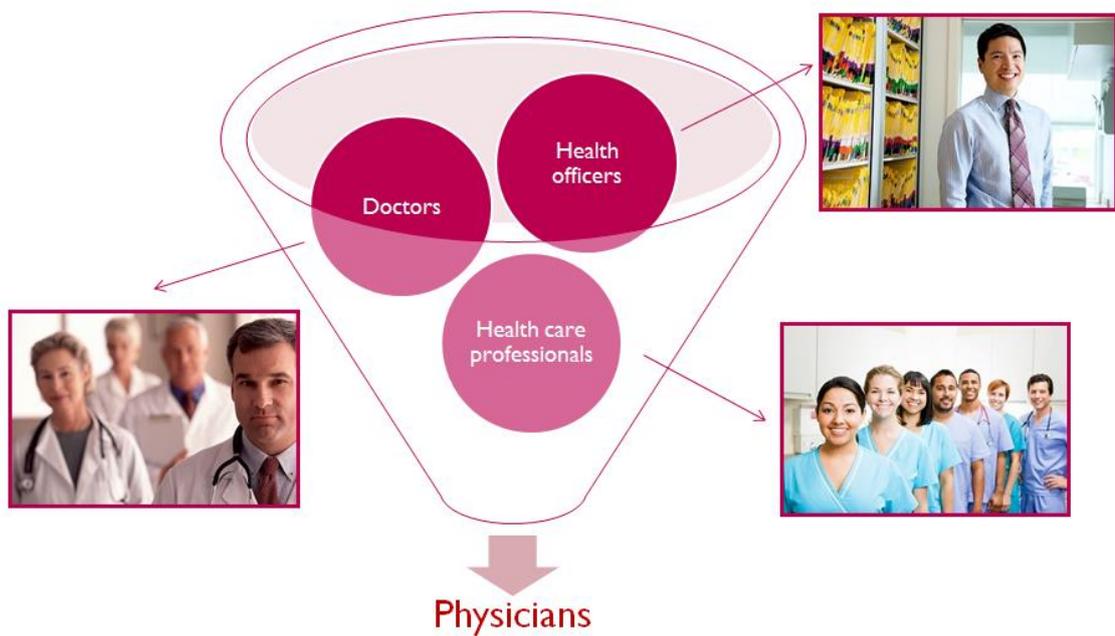
Figure 23 – Physician as a composite actor in the pilot scenario

The launch of an institutional engagement program is a demanding operation based not only on technological stuff, but also on the fragile interaction between society's complex infrastructures and human behavior giving life to a 'socio-technical system' (Sommerville, 2007). This implies that several dissemination means have to be deployed in order to reach a heterogeneous audience as well as to support the campaign

in different steps of the policy formulation lifecycle. Each stage of the policy evolution requires specific tools tailor-made for different aims: making reference to the Piedmontese scenario, the three broad categories of dissemination means (i.e., traditional tools, institutional website, social media platforms) have been situated in a framework that positions them in view of their level of sophistication and, consequently, of the relevance that they assume in the project scenario (Figure 24).
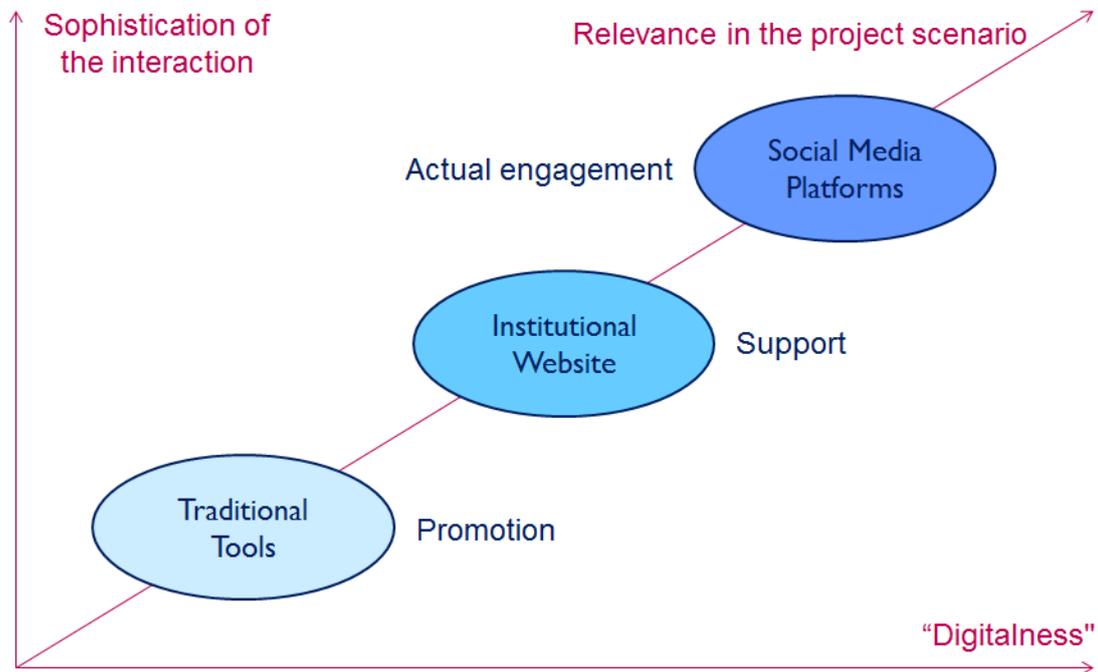
Figure 24 – Map of dissemination means in the pilot scenario

As deducible from the project concept, social media platforms represented the privileged dissemination means since they are the *loci* where actual full-fledged engagement may occurs. In order to boost the coverage and the effectiveness of actions performed through social media platforms it has been paramount to combine their usage with other non-bidirectional tools, such as traditional tools and the institutional website. The formers, which were geared towards promoting campaigns, allowed sensitizing certain cultured environments about PADGETS initiatives (e.g., academic conferences, institutional gatherings, practitioner workshops in the field of policy making). Regarding institutional websites, the pilot team had recourse to the website of both Piedmont Region and CSI Piemonte. Their mission was to support the campaign by providing a concise explanation about PADGETS project's objective and scope and by redirecting users to the social media platforms on which the campaign was taking place. In parallel, a couple of blog posts have been published to increase the awareness about the topics at stake in the participatory initiative.

Coming to social media, Piedmont Region is present and active on many of them. A bird's eye view on existing on-line networks of stakeholders is presented in the Figure 25.

Figure 25 – Existing on-line communities in the Piedmontese scenario

Keeping a helicopter view on the social media constellation managed by Piedmont Region, it is possible to distinguish *ictu oculi* a set of institutional 'vertical' communities from a set of institutional 'horizontal' communities: whilst the formers are devoted to ad-hoc themes related to specific communities of interest, the latters concern general purpose themes being transversal to domains. In terms of organizational models underpinning such communities, institutional 'vertical' communities are managed in a distributed manner involving several regional offices and departments while in 'horizontal' communities the Institutional Communication Department has its finger on the pulse of social engagement activities whose management is centralized and harmonized with off-line communications activities.

That said, the PADGETS pilot had recourse to horizontal communities, due to several reasons:

- General purpose communities boast higher user bases (i.e., fans, followers, viewers *et similia*) than thematic platforms.
- The centralized management performed by the regional Institutional Communication Department guarantees a homogeneous communication style in campaign moderation.

- The synergies already established among horizontal channels testify a 'holistic' approach which, in spite of being not totally exploited, has the power to facilitate the cross-platform conduction of campaign.
- A social media community devoted to healthcare topics was not present in the regional scenario; as a result, there was not a specific *locus* tailor-made for hosting a campaign in the telemedicine field taking advantage of communities of interest already established.

A glimpse on Piedmont Region's 'horizontal' presence in the social media realm is visualized in Figure 26; figures are updated to the launch of the Policy Gadget campaign (i.e., 28th of May 2012).
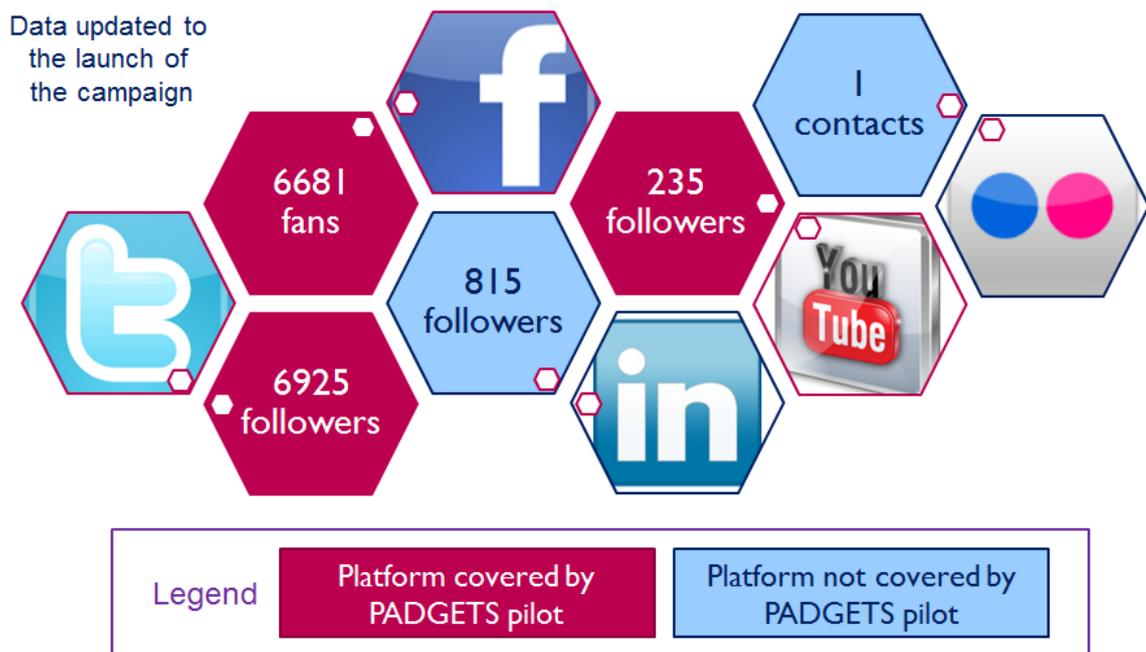
Figure 26 – The social media community landscape in the Piedmontese scenario

As deducible from Figure 26, only a subset of social media platforms present in the regional constellation were covered by the Policy Gadget pilot (see fuchsia hexagons): thus, the presence of Piedmont Region on other social media has been considered as ancillary, i.e., precious for potential virtuous synergies but not vital in order to implement and track active social engagement actions.

After a thorough examination – that I have conducted before the advent of Policy Gadget pilot – on the weaknesses hindering the performances of Piedmont Region in the social media landscape, the pilot team (with my scientific support) defined and put in place a set of strategic action meant to render such platforms a soil more fertile for participatory initiatives both at a quantitative and qualitative level. To sum up, taking

into consideration the multi-faceted dimensions characterizing community building programs, the effort in Piedmont Region has been geared towards a 'two-way' Web 2.0-like style more aligned with paradigmatic social media features (see Figure 27 for a synoptic table).
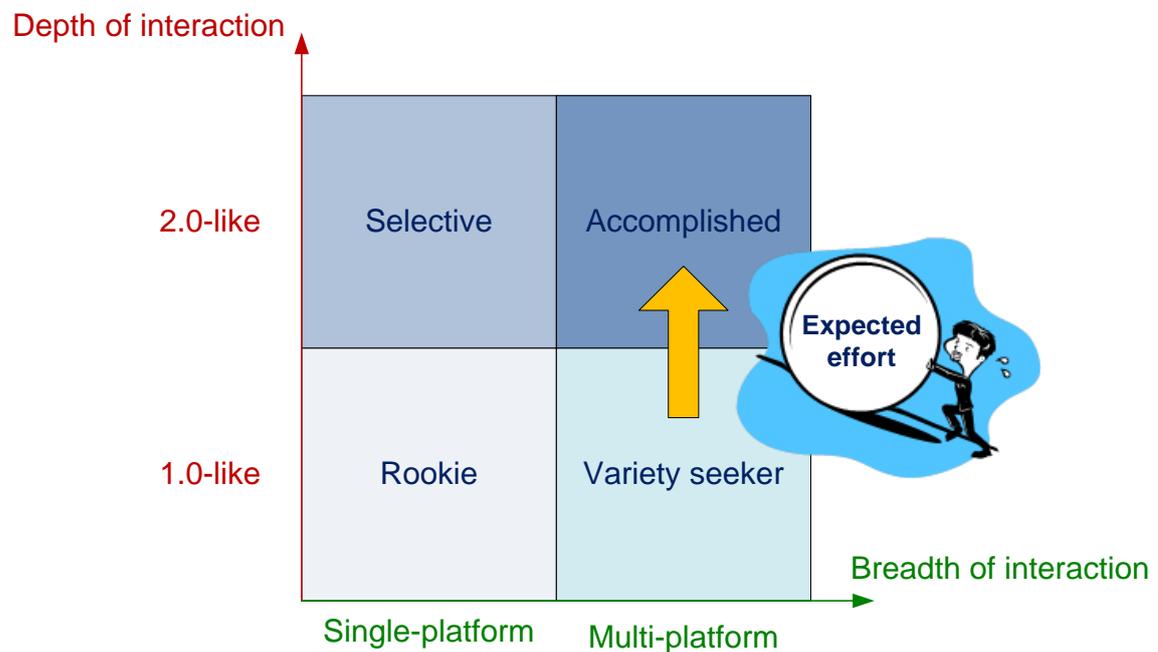
Figure 27 – The community building strategy in the Piedmontese scenario

A latere, it is important to explain that Piedmont Region intervened in the debate resorting also to other institutional accounts managed by peripheral departments/offices or public-owned bodies. Such accounts played a relevant role in the dissemination of policy messages in Twitter and Facebook. Consequently, the resulting 'extended' constellation included also CSI Piemonte, Top-Ix Consortium, CRP (Piedmont Regional Council), Torino Wireless Foundation, Regional Agency for Healthcare Services (via the portal "Io scelgo la salute") and CSP – Innovazione nelle ICT.

In line with policy makers' *desiderata*, two different sub-campaigns have been activated sequentially in order to investigate issues related to diverse yet complementary telemedicine services. The first stint of the campaign, targeting every citizen, concerned the adoption of policies pertaining to anticipated after-operation discharge of patients, to be monitored with appropriate telemedicine tools. The second portion of the campaign, for its part, touched upon the virtualization of periodical checkups of patients with chronic diseases: it goes without saying that this phase mainly targeted patient affected by chronic diseases.

The two sub-campaigns have been scheduled in summer 2012. Each of them lasted two weeks and was made up of five policy messages (Figure 28).

Figure 28 – The pilot campaign at a glance

The complete time schedule of the campaign, including also preparatory activities that I followed, is drafted in the Gantt chart reported in Figure 29.

Year		2011												2012											
Calendar Month		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Project Month		13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
WP 1	Interview with policy makers																								
WP 2	Pilot programming																								
WP 3	Community building																								
WP 4	Selection of multimedia contents																								
WP 5	Detailed planning of the campaign																								
WP 6	Governmental approval																								
M 1	Completion of planning activities																								
WP 7	Translation activities																								
WP 8	Set up of the platform in loco																								
WP 9	HR training in loco																								
WP 10	Campaign execution																								
M 2	Completion of the operative phase																								
WP 11	Internal reporting for policy makers																								
WP 12	Result analysis with policy makers																								
WP 13	Synthesis of lessons learned																								
WP 14	Monitoring and controlling																								
M 3	Completion of piloting activities																								

Figure 29 – Gantt chart of the pilot campaign

In order to support the citizenry in the participatory endeavor, the pilot team decided to produce a list of videos aimed at presenting in succinct and intuitive way the key elements of the policy proposal at stake. Multimedia materials have been realized with the idea of providing the audience with bases to better understand the telemedicine paradigm and to stimulate the crowdsourced endeavor.

Such videos were used in the PADGETS blueprint by benefiting of economies of scope: the collections of thematic materials realized ad-hoc for 'Formazione 2.0' initiative was published in the regional YouTube channel making videos available to the general public without incurring incremental costs for the publication. In fact, the project 'Formazione 2.0' implied the creation and the large-scale distribution for educational purposes of multimedia materials regarding the utilization of cutting-edge medical devices in the domains of home-care and self-care: in view of the *leitmotiv* characterizing the Piedmontese Policy Gadget campaign, such videos become a core ingredient of the pilot strategy thanks to an action of Web syndication. Videos belonging to the YouTube playlist[31] (Figure 30), after the successful completion of the campaign, were selected as official materials in a training program coordinated by Istituto Superiore di Sanità (Italian Superior Health Institute).
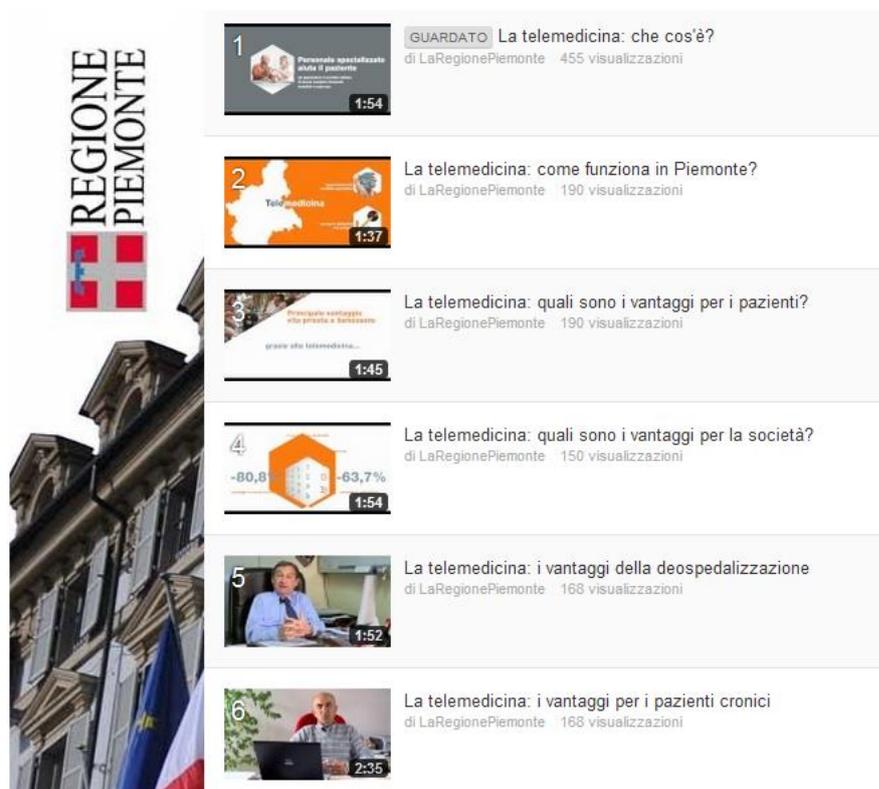
Figure 30 – Video playlist of the Piedmontese campaign

The six videos composing the playlist covered the following topics:
1. What is telemedicine.
2. How telemedicine is implemented in Piedmont Region.
3. How patients may benefit from telemedicine.
4. How the society may benefit from telemedicine.

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[31] http://bit.ly/MedPiemonte

5. Advantages brought by anticipated after-operation discharge of patients.
6. Advantages for patients affected by chronic diseases.

The links to afore-mentioned videos were encapsulated in policy messages, whose structure is visualized in Figure 31. The policy message contains a captivating title that recalls the topic under discussion; such a title is followed by the link to the respective videos and by the link to the survey built via an automated tool offered by the PADGETS platform.
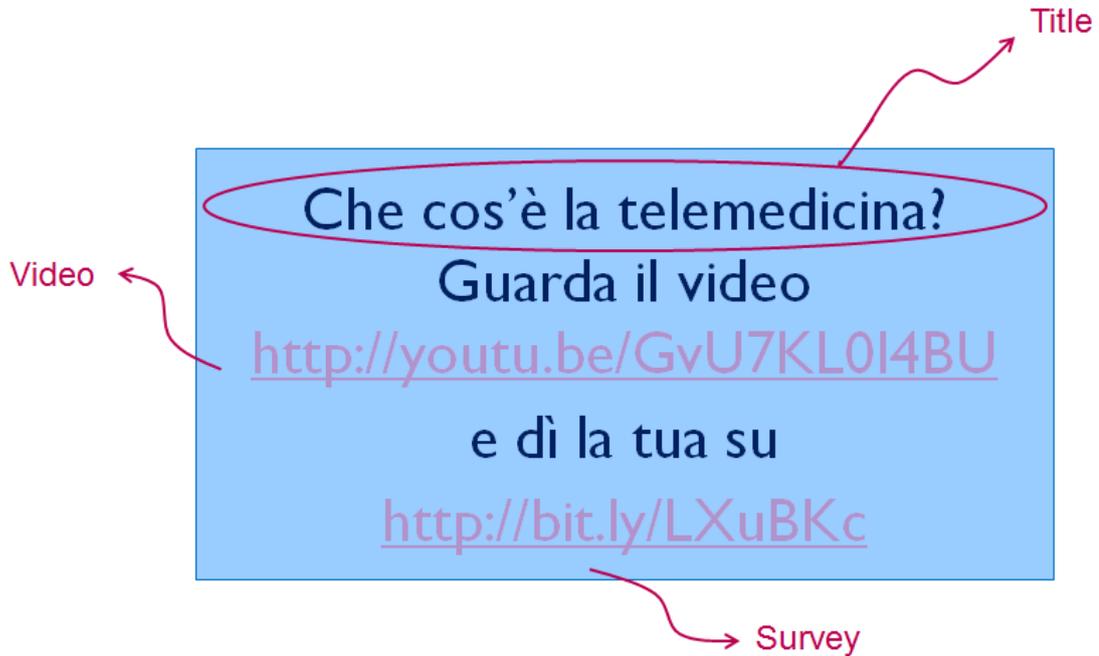
Figure 31 – Policy message template in the pilot scenario

A policy message, once conceived and typed by the policy maker, was posted in multiple social media platform becoming an actual 'Policy Gadget'. In line with the multi-channel approach that is peculiar to the Policy Gadget approach, the policy message visualized in Figure 31 took the shape of a post in the Facebook Fan Page of Piedmont Region and of a tweet published in the Twitter feed of the official account of Piedmont Region (Figure 32); the hashtag characterizing the campaign (#medPiemonte) has been added in an automated way by the platform.

Figure 32 – Policy message published on social media

Coming to results, the prominent figures to be observed through the quantitative lens are the ones stemming from the social engagement occurring over the three main social media platforms (i.e., Facebook, Twitter and YouTube) used in the participatory endeavor under examination; Blogger, for its part, has been excluded since Piedmont Region was lacking in an institutional account on such a platform.

In terms of reach, policy messages have generated over 28,000 impressions. This figure – that has to do with the mere reception of the policy message in the social media realm – is characterized by a cross-platform nature. In Facebook, the figure encompasses the views of posts associated to the campaign which are located on the Fan Page chosen by the policy makers. Regarding YouTube, here the principle does not change: therefore the indicator includes views of the telemedicine-related videos uploaded as part of this campaign. With respect to Twitter, it is important to point out that the number of impressions of a given message ('tweet') cannot be computed resorting neither to native tools nor to third-parties' tools. In this platform, the only viable solution has been to estimate impressions using click-throughs on links as well as YouTube referrals: as a consequence, this value represents a significant underestimation (at least two orders of magnitude) of the actual performance expressed on the specific platform[32].

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[32] The recourse to click-throughs represents a very conservative estimate of the impressions occurred on Twitter, where reach cannot be measured. A more realistic proxy may be the number of followers, whose value fluctuated around 7,000 in the campaign timeframe.

Translating impressions into unique user accounts (so called 'awareness'), the data offered by the DSS show that over 11,000 accounts have been reached (Figure 33). A breakdown of such figures by social media platform allows noticing the lion's share taken by Facebook and the negligible role of Twitter, given by the remarkable under-estimation hinted at in terms of impressions.
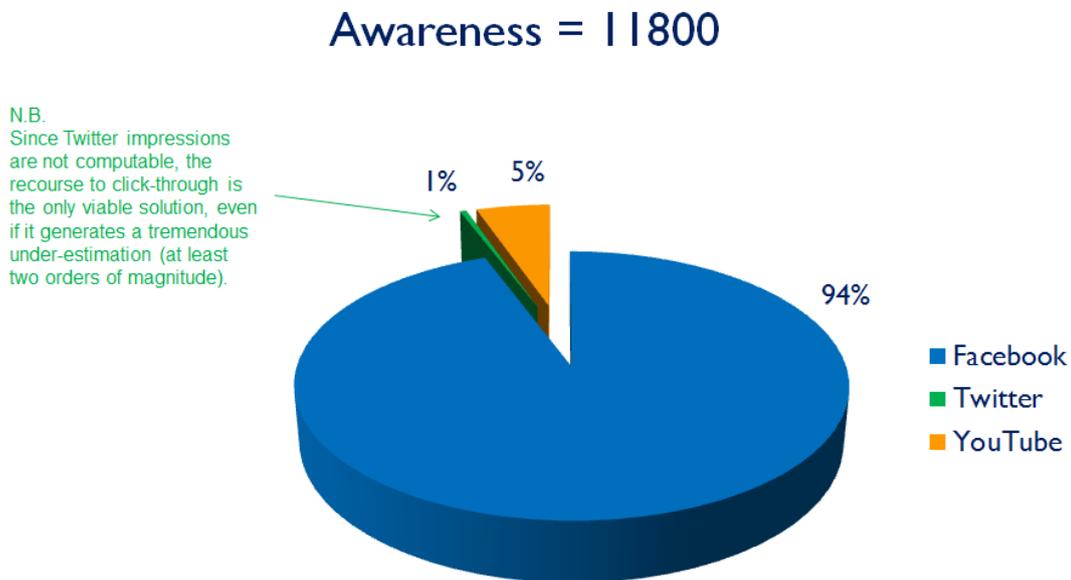
Figure 33 – Estimated awareness in the Piedmontese pilot

Moving from passive interactions to active engagement (so called 'interest'), the DSS reveals the participation of more than 300 (unique) individuals during the campaign lifecycle (Figure 34). The inherent cross-platform nature of this consultation campaign implies the use of different measures from each platform for the calculation of this indicator: unique users who generated a story through comments, likes, and public sharing in Facebook, unique users who performed actions such as like, dislike, comments and sharing in YouTube and, in Twitter, unique users who publish a tweet using the pre-defined hashtag (i.e., #medPiemonte) as well as users who re-tweet or reply to tweets representing policy messages launched by the campaign initiator.

Interest = 321

18%
19%
63%

- Facebook
- Twitter
- YouTube
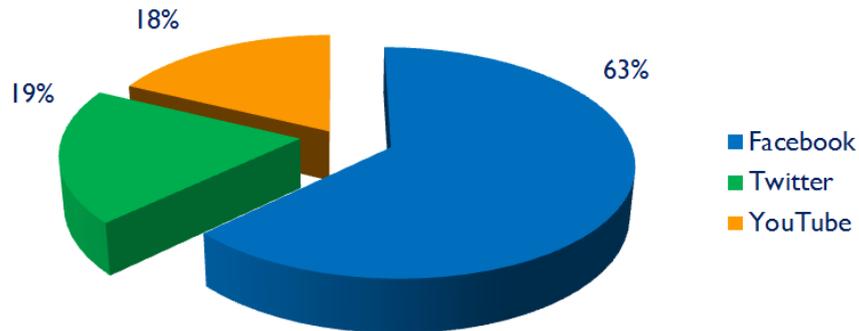
Figure 34 – Estimated interest in the Piedmontese pilot

As a supplement to afore-mentioned figures, it is relevant to stress that performances exhibited by campaign messages published during the pilot have been remarkably superior to the ones of other messages posted in the same period on regional government's accounts apart from the institutional campaign, which may be seen in the guise of a control group. A quintessential example in this vein has to do with Facebook regional channel: taking into account this platform, campaign messages had a reach three times larger than others (on average) while, in terms of active engagement, the campaign generated reactions about twenty times more than usual (Figure 35).

PADGETS messages had a reach 3 times larger than others (on average).

Average audience per message (unique users)

1113

369

1200
1000
800
600
400
200
0

PADGETS campaign | Other messages in the same period

Unique users who have seen posts

Average activity per message (unique users)

20

1

20
15
10
5
0

PADGETS campaign | Other messages in the same period

Unique users who generated a story

PADGETS campaign generated active reactions about 20 times more than usual.

Figure 35 – Relative performance in the Piedmontese pilot: the Facebook case

Going beyond interest and acceptance, climbing up the pyramidal stack of Figure 13 reveals that precious stimuli for policy makers derive from opinions pertaining to the specific aspects of policy topic under examination. During the conduction of the pilot, a brief Web survey has been posed to the audience and linked-to in policy messages (Figure 31).

Regarding the so called 'acceptance' of the policy proposal under discussion, results stemming from survey respondents allow having a 'big picture' of what the citizenry thinks about telemedicine. The underlying policy idea (i.e., extension of the trailblazing telemedicine initiative held in VCO to the whole Piedmont region) has been received very positively by the population, which is portrayed as in favor of the adoption of e-health services: in fact, acceptance equals 94% (Figure 36).
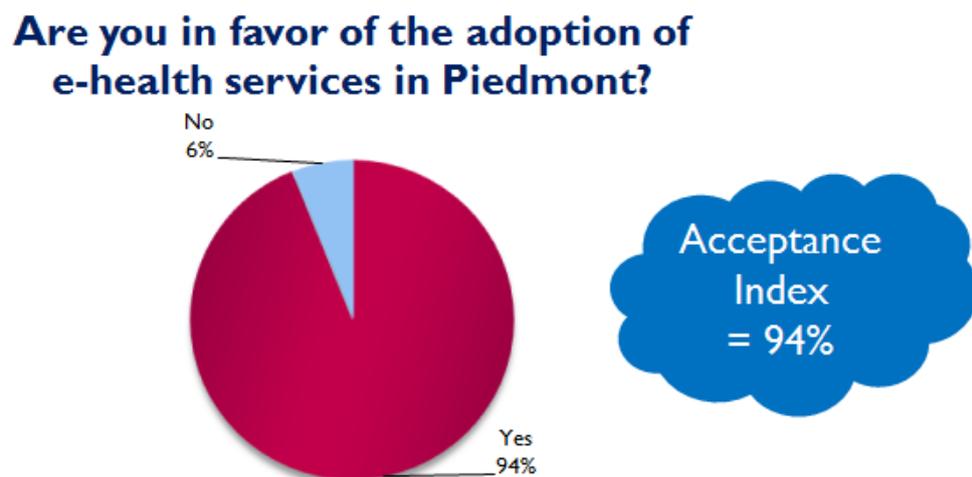
Figure 36 – Acceptance index in the Piedmontese pilot

Such a propensity is coupled with another result that cannot be unnoticed. In case of adoption of e-Health services, 62% of respondents are willing to co-finance the implementation (e.g., Internet connection, devices rental), redefining the 'canonical' economics of public healthcare (Figure 37): end users' contribution may be, indeed, a propellant to spur the uptake of next-generation solutions leveraging distributed care paradigm.

In the case of adoption of e-health services, are you willing to co-finance their implementation (e.g., for internet connection or devices rental)?

No
38%

Yes
62%
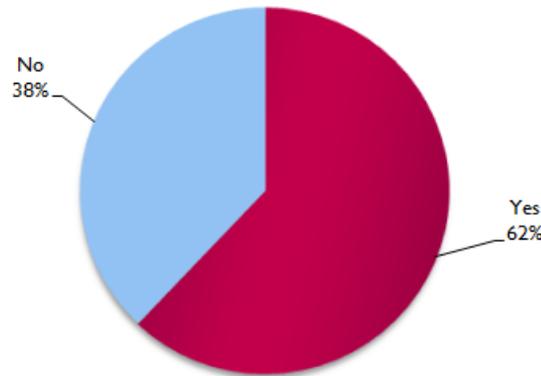
Figure 37 – Opinion question about co-financing

Other questions posed in the Web survey provided precious indications regarding Pros (Figure 38) and Cons (Figure 39) perceived by the citizenry, whose socio-demographic breakdown is portrayed in Figure 40.

Which are the most POSITIVE aspects of using e-health for the anticipated after-operation discharge of patients ?

better and fastest rehabilitation
13%

less space for human errors
8%

less time spent in the hospital
36%

less time spent in commuting, also for relatives
43%
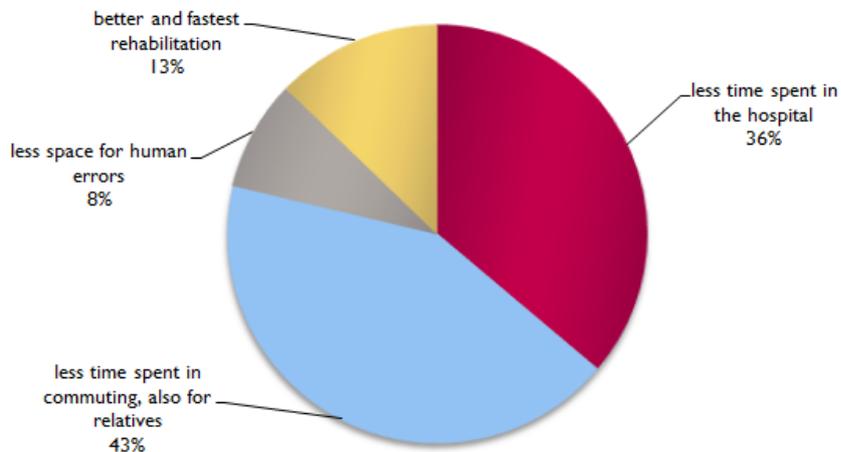
Figure 38 – Opinion question about Pros of telemedicine

Which are the most NEGATIVE aspects of using e-health for the anticipated after-operation discharge of patients ?

technology is not yet fully reliable 4%

the impossibility to share the personal experience with other patients 4%

the loss of human contact with health personnel 36%

diagnosis tools can not completely substitute the eye of an expert 56%
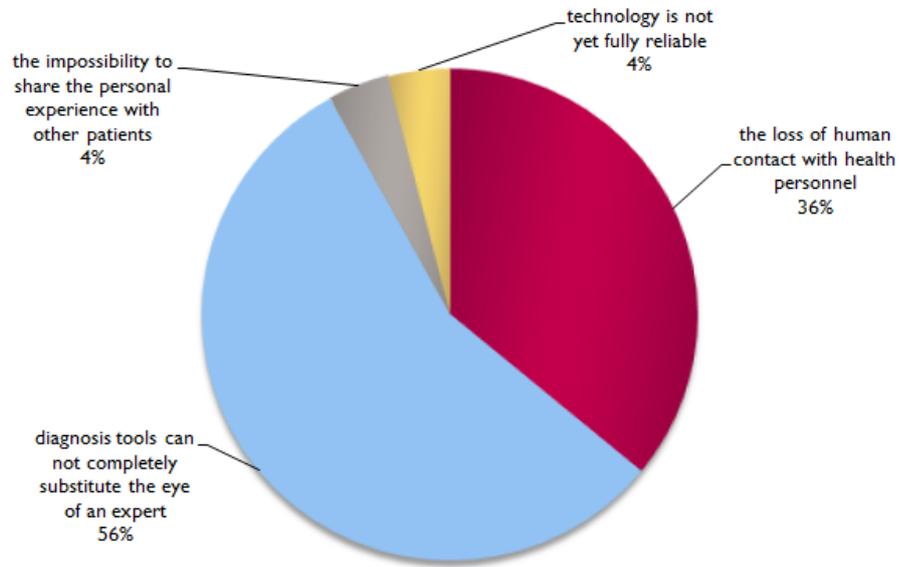
Figure 39 – Opinion question about Cons of telemedicine

Gender

F 33%

M 67%

Age classes

over 55 9%

45-54 15%

25-34 40%

35-44 36%

Do you work in the provision of health services in Piedmont?

Yes 12%

No 88%
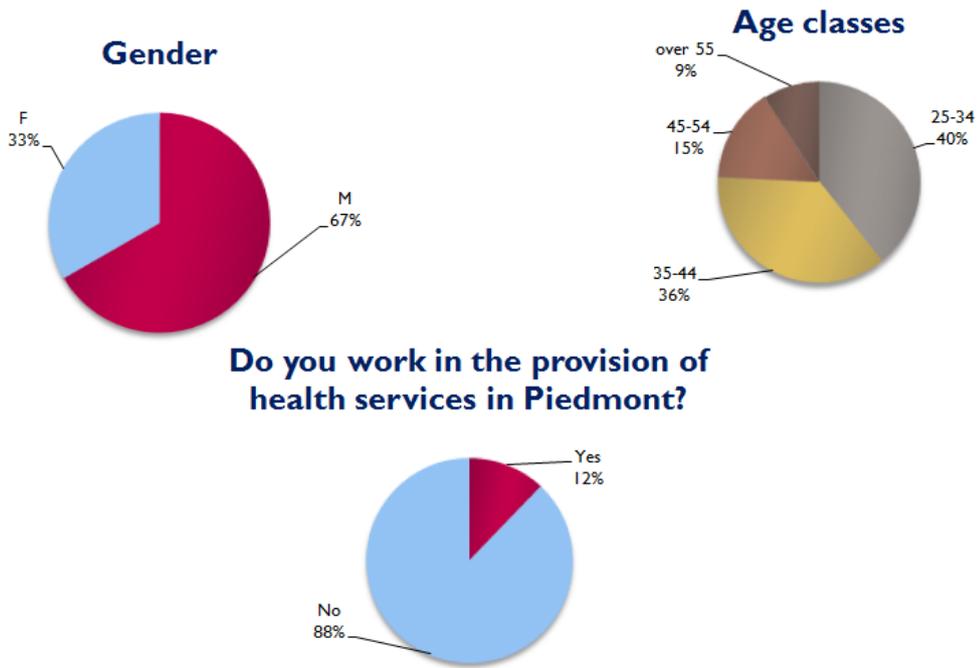
Figure 40 – Socio-demographic breakdown of respondents to the pilot survey

Shifting from the responses gathered via the survey to the insights gleaned from natural language processing, Figure 41 captures the 'zeitgeist' of the Piedmontese campaign by

highlighting how frequently words appeared in Facebook comments published as replies to policy messages, after the stop words peculiar to the Italian language had been filtered out.

Figure 41 – Tag cloud of Facebook comments in the Piedmontese scenario

Reaching the top rung of the pyramidal stack (Figure 13), we enter the 'heart' of the campaign having to do with the consultation soliciting crowdsourced opinion pertaining to the policy proposal.

Looking at ideas that percolated across governmental boundaries, a common thread running through the entire Piedmontese campaign is the significant expectations that citizens have placed on telemedicine. This generally held view has been corroborated by the analysis of comments and posts published by the citizenry on the specified topic. In the teeth of some inescapable obstacles, plenty of opportunities may turn up giving life to positive spillover effects for various stakeholders. This sentiment may be extracted, for instance, from some (translated) tweets collected during the campaign lifecycle (Figure 42).

Telemedicine: a single avoided trip per day to the hospital results in 25 thousand km saved each year. Great experience from Piedmont! #medpiemonte

Owing to the relentless aging and to tight constraints on healthcare budget #telemedicine may become "next big thing" #medPiemonte

Less travel, more leisure time. Telemedicine really changes lives of people! #medpiemonte

The virtuous experience of telemedicine in Piedmont may be a starting point for a more efficient #spendingreview #medPiemonte

#medPiemonte Telemedicine will result in a better care if the infrastructure and the culture enable a full-fledged development

Figure 42 – Selection of tweets from the pilot campaign

Changing social media platform and considering comments published on Facebook (as replies to policy messages) as unit of analysis, an activity of topic identification has been carried out in order to identify key themes at stake during the debate (Figure 43).

OPPORTUNITY

COSTS

Rationaliza-tion of public spending

Uneven technological literacy among patients

Risk of technocratic approach

Time savings and environmental savings

Improvement of healthcare provision

HURDLES

Figure 43 – Results of topic identification analysis

First of all, telemedicine may be seen as the cornerstone for the rationalization of public spending, especially in a period when budget constraints are tighter than ever. Some (translated) messages in this vein are reported in Figure 44.

Rationalization of public spending.

The project has very good prospects and it can certainly represent an efficient way to reduce the cost of public health and prevention services.

An example to follow for regions like mine, Lazio, where – more and more frequently – past and present spending reviews are leading to closure of hospitals.

Taking into account the cutback in social budgets for Y2012, telemedicine is surely the only option to reduce – or at least contain – public expenditure in the healthcare sector without creating detrimental effects on the quality of services provided to citizens.

Figure 44 – Selection of crowdsourced opinions related to the rationalization of public spending

The quest for efficiency in public spending is not the only Pro ascribable to telemedicine according to the audience since substantial benefits arise also on the patient's side: whilst the continuous supervision of the patient's conditions contributes to improve the quality of healthcare provision (Figure 45), a reduction in the number of trips between dwelling places and local hospitals has a remarkable impact in terms of savings (i.e., time devoted to mobility and cost of fuel) and environmental footprint (i.e., containment of CO_2 emissions), as summarized in Figure 46.

Improving of healthcare provision.

Telemedicine can remarkably reduce the queue for particular clinical examinations whose waiting time has now become eternal.

Telemedicine: a new frontier of medical science.

Since chronic diseases do not require personal contact with physicians, in these cases it matters only the monitoring of parameters while the human presence becomes a minor issue.

Figure 45 – Selection of crowdsourced opinions related to the improvements of healthcare provision

Time savings and environmental savings due to less trips.

By improving the quality of life as well as the quality of care provision, telemedicine constitutes a smart use of technology. Tough times for aficionados of long queues at the counters of local health offices!

Since patients no longer have to periodically move, trips to hospitals and medical facilities (which are already over-crowded!!!) are drastically reducing. And it relieves CO2 emissions too.

It would be not a trifling thing to do such operations from home. And I imagine many other applications in multifarious fields. I would say it's absolutely a great thing to improve the quality of life, when most needed.

Figure 46 – Selection of crowdsourced opinions related to societal spillovers

However, despite rosy expectations and fervent impulses coming from technophiles, there are still some major roadblocks clearly perceived by the population. In fact, a number of concerns have been expressed about the uneven technological literacy among patients in light of the relentless aging phenomenon (Figure 47).

Concerns about technology.

It's better a "virtual" Doctor than dying for lack of care ..... However, please help patients who do not master technologies!

Technology scares, especially those who are not born with the PC in the cradle.

The approach to this realm may sound complicated ... You must know how to use technology before starting!

Without broadband connection the inhabitant of a mountainous village cannot reap the benefits of this service and travels continue to be needed. In addition, without proper education and widespread awareness the potential of the service will not be harnessed.

Figure 47 – Selection of crowdsourced opinions related to concerns about technology

Finally, citizens involved in the campaign outlined the risk of applying a technocratic approach that does not take into account the human aspects of the physician-patient relationship (Figure 48).

Fear for the absence of human contact with physicians.

In my opinion, the human relationship is paramount, especially in severe cases or with elderly people.

In any case, data interpretation – especially in more complex situations – requires always a thorough (and human) assessment.

You cannot improvise a system in this vein without adequate training of healthcare personnel and a well-grounded estimation of the time they can devote to telemedicine.

Figure 48 – Selection of crowdsourced opinions related to fear for technocratic approach

5.5 Evaluation from Involved Stakeholders

As anticipated in section 5.2, when the final curtain dropped on the pilot, my research path entailed a practical and theoretical evaluation of achieved results. In this perspective, my first step consisted of fieldwork activities aimed at collecting the evaluation coming from various stakeholders involved in the pilot ecosystem.

Starting from policy makers, in order to collect their voices, a series of interviews has been conducted with officers of Piedmont regional government who were most actively involved in the campaign. Policy makers that I have interviewed are the coordinator of PADGETS project on behalf of the Innovation Department of Piedmont Region, and the executive of the regional Public Health Department and main internal stakeholder of PADGETS project ('policy owner', using the nomenclature of Figure 10). I encountered each of the two informants during a dedicated *vis-à-vis* meeting in autumn 2012. Each interview has been conducted in a semi-structured mode and has been about sixty minutes in length. In accordance with interviewees, informants' voices have not been digitally recorded; at the end of each interview, contents have been summarized giving life to a concise transcription reported below and approved by each of the informant. The semi-structured mode, besides entailing the implementation of a number of predetermined questions defined in concert with the project consortium, left room to the interviewers for probing beyond the answers to their questions and allowed informants to add precious insights stemming from their experience 'on the field'.

Interviewed stakeholder: coordinator of PADGETS project – Innovation Department (Piedmont Region)

Usefulness

What are the benefits that PADGETS brings to the policy process?

We have experienced that the platform surely allowed to save a lot of time and costs: conducting the same activities without the platform would have implied roughly a double cost! Concerning actual policy results, the estimation of awareness, interest and acceptance raised in the population is a step forward. I can say that by using social media analytics – becoming more and more a new 'oil' for 21st century policy making – we were able to measure citizens reactions and thus to reach our main goal. As said before, the platform succeeded in managing the interaction with citizens and this has been fundamental to collect high quality feedback from citizens on the policy at stake. Going beyond 'pure' crowdsourcing, the survey component made it possible to grasp some specific issues concerning the telemedicine policy that are of particular usefulness for a fine-grained revision of the policy proposal. A relevant part of those issues was also on focus in social media textual comments: the slew of comments inspired us, policy makers, in hypothesizing some possible solutions to the emerged criticalities.

Regarding the level of uptake, frequently seen as Achilles' heel in similar experiences, the platform *per se* neither increased the audience nor did it improve the focus on targeted citizens, given its transparency to end users' eyes. About reaching citizens groups not usually participating in political life, the platform and our campaign do not allow us to draw a conclusion about that, but neither can we exclude it. However, the concept of 'campaign' seems to work well enough. Finally, more has to be done under a technical point of view. Since at the launch of our campaign the platform was still in a 'beta' version, some technical hurdles were present but they did not undermine the overall success of the campaign. In fact, some functionalities were not ready to use but present in the interface, making difficult to understand if the functionality was not ready or if it was badly used.

Motivations

What are the reasons that foster PADGETS usage in large-scale applications? What are the hurdles that policy makers have to deal with?

Off the top of my head, I do not think that barriers at work are due to the platform or to the methodology. Barriers are mainly in the involvement of citizens during the policy process: policy makers are frequently scared to lose the control of the process and that the Cons will overcome the Pros. In order to avoid such skepticism, it would be worth to underline how the platform allows to manage and to control citizens' interaction. Secondly, I think that the adoption of PADGETS platform would be much favored by the presentation of some case studies. Perhaps our pilots could partially do the work!

Future prospects

What is your outlook on the future of the platform and concept?

PADGETS surely is a better way to make policy messages and discussions public. It also meets, as far as we can draw conclusions from our experience, citizens' expectations towards a contemporary and open public policy process. That is quite relevant: it takes long to show to policy makers that a new tool is worth, but the fact that citizens react almost enthusiastically makes everything simpler. Furthermore, PADGETS is flexible enough to allow public agencies to adopt it without completely changing the standard processes, and the degree of such adoption can vary as well. Coming to grips with PADGETS is neither simple nor difficult for public agencies: it strictly depends on the agency, and agencies are quite heterogeneous both from the perspective of openness to innovation and of established practices. Consequently, it is not possible to say that PADGETS does not require effort, often is so but sometimes is true the opposite and in those cases, anyway, the required effort is for the good. Surely, the right way to start using PADGETS is by experimenting with it and learning, thus we would not suggest to immediately apply it to huge projects (both in terms of audience and of importance for the agency). As mentioned before, the reaction of society towards the innovation in policy making made possible with PADGETS has been

overwhelming. The PADGETS consortium has to start from that, communicating how the platform is secure and compliant with policy makers' desiderata in terms of decision control.

Interviewed stakeholder: main internal stakeholder of PADGETS project – Public Health Department (Piedmont Region)

Usefulness

What are the benefits that PADGETS brings to the policy process?

Making reference to the campaign that took place last summer in Piedmont, PADGETS has to be considered in my opinion as an extremely interesting experience. Results are certainly encouraging, although numerically inferior to the actual potential of social media. As an experiment, based neither on best practices nor on proven methods, the recourse to PADGETS platform has allowed the regional Public Health Department ('Direzione Sanità') to test the waters of a profoundly new paradigm of policy making. Following this paradigm, the government listens to the *vox populi*, elaborates on it and responds to the citizenry by creating a new bidirectional channel of dialogue that remains always open. So I think that the value proposition of the PADGETS platform may be summarized as follows: to inform the citizenry, to detect persistent puzzlement, to solve nagging conundrums through ad-hoc explanations, and to collect clues that the policy maker may have overlooked. In addition to previous points, there is a further (key) element: the foray in the social media realm has been eased by the chance to harness existing installed bases in order to give life to large digital *agorae* being the ideal *locus* for an open dialogue between citizens and institutions. These new digital and social tools make it possible to reach a wide audience otherwise unattainable that may include also non-experts and not tech-savvies. Talking about the usage of the tool, in my opinion the platform should not be used only in the embryonic stage of the policy: we have to go far beyond! The usefulness of the tool is amplified when it supports the subsequent stages of the policy cycle, i.e., when the salient traits of the public policy are already defined. Here a policy maker like me can present to the public project actions that have already been partially defined, using feedback to adjust the route at tactical level. Looking at the public decision maker, a usage in this vein allows the pursuit of strategic objectives keeping the finger on the pulse of popularity. It goes without saying that PADGETS as 'human seismograph' relieves the risk of error – owing to the watchful eyes of citizens – and dispel the pervasive image of 'introvert' government. It is here that I would like to emphasize the rationale: the citizen makes her/his voice heard and s/he perceives herself/himself as someone taken into account, even when her/his suggestion does not find favor with the officers at the helm of the decision making process. To reach the crux of the matter, the policy maker has at her/his

fingertips a tool aimed at listening but also at providing rapid answers about acceptance or rejection of proposals coming from the citizenry.

Motivations

What are the reasons that foster PADGETS usage in large-scale applications? What are the hurdles that policy makers have to deal with?

Thinking at large-scale applications, I would say that tools of participatory democracy – by providing a real involvement in decision making – are absolutely appropriate to give an active role to the society that is no longer seen as 'passive' entity to be simply investigated through surveys. Looking at my field, a permanent usage of PADGETS – let's think at regional level – would generate a continuous feedback to our Department about the value perception with regard to new technological initiatives that come to light in the healthcare sector. Actually, this would be very precious, given the slice of the regional budget that is devoted to healthcare! Barriers, for their part, are far from being absent and the way to go is still long. Primarily, today's audience is not accustomed to dialogue with public agencies in a bidirectional way: although citizens appreciate the novelty, they are not particularly confident in the acceptance of their demands. And citizens' opinion is often harsh: social media campaigns are perceived as mere instrument of 'political marketing' rather than as concrete opportunity to listen the voice of the citizenry. Working on this aspect is paramount because otherwise it would not be possible to leverage the active role that citizens have while immersed in social media. Looking at the other side (i.e., the government), a first glance reveals that several hurdles are persistent. In fact, many policy makers neglect the involvement of citizens in decision making since they are overwhelmed by daily emergencies exacerbated by the crisis: every day a thousand matters of high priority have to be tackled without too much hesitation. Furthermore, this phenomenon is coupled with limited awareness of the potential of social media tools and with a slow pace of result dissemination. Let me say that policy makers need training and, especially, we need a support staff to help us to overcome inertia and to set the 'right' organizational model.

Future prospects

What is your outlook on the future of the platform and concept?

The innovation brought by PADGETS certainly fits in all areas of public policy. Therefore, I think that – once overcome cultural barriers I hinted at before – the participation has what it takes to become a *modus operandi*. For the near future, my hope is to build up a scenario in which all major strategic initiatives have to be evaluated by a tool *à la* PADGETS: before leaving the floor to experts, a crowdsourced consultation has to be conducted to inform the citizenry about the proposal at stake, to investigate what the public opinion thinks and to provide ad-hoc responses to questions arising during the debate. In such a scenario, the Institutional Communication Department and other regional departments involved from time to time establish intense

collaborations from the dawn of the initiative in order to plan all the various aspects pertaining to the campaign. However, a forward-looking perspective suggests us to go beyond the opening of the policy formulation: we may also open the process of impact assessment. If we step out of the ivory towers of evaluation done exclusively within agency walls (*intra moenia*), we will set up practices meant to integrate internal assessments with indicators that summarize the popularity of initiatives under consideration. I deem that a platform akin to PADGETS may be the ideal vehicle through which the citizenry could be reached in order to request opinions that will subsequently originate indicators of satisfaction. Going back to the short-term perspective, plenty of real policy scenarios may represent a fertile ground for a new experimentation of PADGETS platform. The first idea that comes to my mind is related again to the Piedmontese healthcare sector and, in particular, to the path towards 'healthcare of the future'. In fact, the department to which I belong is on the point of starting a trial of Electronic Health Record (EHR) that is aligned with several roadmaps which are mutually intertwined such as, *inter alia*, the digitization of health records, the management of digital identities, and the provision of health-related services via the Internet. In the face of profound changes that are reshaping mechanisms of healthcare service provisioning, it seems appropriate to keep an eye out for the *vox populi*: this could be done by resorting to a consultation running on social media platforms of Piedmont Region. Taking stock of the experience gained with the pilot on telemedicine, I would like to suggest (as before) the creation of multimedia contents to inform citizens, whose posting will be very useful for kick-starting the debate over social media: a guideline given by means of these multimedia materials will better address the dialogue and will foster citizens to discuss and to propose their own suggestions in a crowdsourced way. The campaign I have in mind will be able to easily disseminate some evidences and to show how the system works, creating awareness both in terms of 'what' and of 'how'. At the organizational level, as corroborated by the pilot recently finished, the use of PADGETS-like solutions requires us to go beyond the 'silos' that often characterize working groups operating in different fields and with different responsibilities within the same public body. Owing to this reason, besides the Public Health Department, it will be surely precious the contribution provided by the Institutional Communication Department. Its officers will be active in the planning phase of the new campaign as well as in the moderation of the debate. For a successful project, we need a great team!

Looking at other side of policy scenario, also social media end users have been involved in an evaluation program after the completion of the campaign. In the recall campaign managed by the pilot team and supervised by me, a subset of citizens who took actively part in the participatory campaign on telemedicine has been contacted in autumn 2012

in order to collect opinion on the novel way of communication brought by Policy Gadget advent in Piedmont Region. In such a group of citizens, the ones who accepted to provide a feedback have been invited to fill in a questionnaire, defined in concert with the project consortium, which has been previously translated in Italian language (Figure 49, Figure 50).

PADGETS - Valutazione Campagna Social Media

Breve questionario di valutazione della Campagna Social Media condotta nell'ambito dei progetti PADGETS - Formazione 2.0

* Required

Come valuti l'utilità di questo nuovo strumento di comunicazione? *

Lo strumento proposto appare appropriato per...

	Totale disaccordo	Disaccordo	Neutrale	Accordo	Totale accordo
interagire con gli enti pubblici in modalità partecipativa	○	○	○	○	○
ricevere informazioni importanti su politiche pubbliche in fase di elaborazione	○	○	○	○	○
conoscere opinioni e suggerimenti formulati da altri cittadini	○	○	○	○	○
esprimere la propria opinione in merito a politiche pubbliche	○	○	○	○	○
influenzare la formulazione delle politiche pubbliche	○	○	○	○	○

Figure 49 – Pilot questionnaire in Italian for citizens (1/2)

Figure 50 – Pilot questionnaire in Italian for citizens (2/2)

Altogether, results obtained from the citizenry are certainly encouraging. For a correct interpretation of the figures, the reader has to consider that – as explained in section 5.2 – technological components (apart from native mobile apps and cross-platform mobile website) embodied in the PADGETS suite remain transparent to end users' eyes, who

continue to employ without any modification tools with which they are already accustomed to. In spite of the 'obscurity' that could cloaks PADGETS platform from citizens' perspective, it is remarkable the great consensus coming from the 42 respondents, in particular with reference to perceived usefulness, willing to participate again in similar crowdsourcing campaign and to recommend PADGETS through word of mouth (Figure 51).
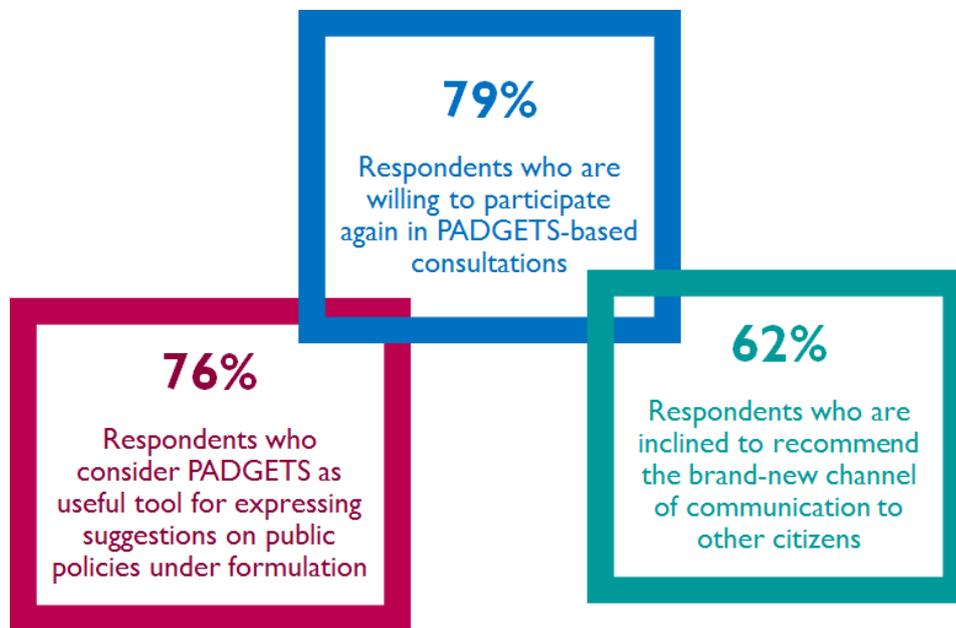
Figure 51 – Prominent results of the questionnaire for citizens

Aggregate results of the questionnaire are summarized in Table 6.

| Legend: |
| 1: totally disagree |
| 2: agree |
| 3: neutral |
| 4: agree |
| 5: totally agree |

| **1) Answer the following questions concerning the usefulness of this new way of communication.** |
| The whole concept and method provides an effective and useful way for… |

	1	2	3	4	5	Total
Communicating with government agencies and participating in the formulation of public policies.	0	0	3	20	19	42
Getting informed on important public policies	0	1	5	13	23	42

under formulation by government agencies.					
Getting informed on other citizens' opinions and suggestions on such public policies under formulation.	0	2	11	18	11	42
Expressing my opinions and suggestions on such public policies under formulation.	1	2	7	12	20	42
Influencing the formulation of public policies by government agencies.	1	5	13	17	6	42

2) Answer the following questions concerning the general attitude towards this new way of communication.						
	1	2	3	4	5	Total
My general impression from the whole concept and method is positive.	2	3	5	15	17	42
It is a better way of participating in the formulation of public policies than the usual discussion *fora* operated by many government agencies in their own websites.	1	2	4	19	16	42

3) Answer the following questions concerning the future intentions about this new way of communication.						
	1	2	3	4	5	Total
I would like to use again this new channel of communicating with government agencies and participating in the formulation of public policies.	1	2	6	22	11	42
I would recommend to other citizens this channel of communicating with government agencies.	1	4	11	17	9	42

Table 6 – Aggregate results of the questionnaire for citizens

5.6   A Multi-Perspective Evaluation Framework

When the final curtain dropped on the pilot, my research path entailed also the development of a multi-dimensional framework for an integrated evaluation of such advanced practices of social media exploitation in public policy making. The evaluation framework I have proposed – in collaboration with some other colleagues – cuts through the technological, political and innovation diffusion perspectives, drawing from theoretical constructs coming from different domains (Ferro, Loukis, Charalabidis, & Osella, 2013a; Ferro, Loukis, Charalabidis, & Osella, 2013c).

From a technological perspective, the evaluation framework assesses to what extent the PADGETS approach is technologically feasible adopting the software platforms and ecosystems paradigm (Tiwana, Konsynski, & Bush, 2010; Gawer, 2010), using as 'platforms' the targeted social media.

The theory of software platforms and ecosystems posits that software development today is increasingly based on pre-existing 'platforms' consisting of 'building blocks' offering basic functionalities, which are combined for developing 'modules' that provide additional features fulfilling specialized needs of specific user groups; an example in this vein is the Apple's iPhone operating system (iOS) serving as a platform for the development of its thousands of apps that provide specialized functionalities. Usually the platform is developed by a major player, while numerous modules are developed by a community that possesses specialized knowledge about users' needs along the 'long tail' (Anderson, 2006). This emerging software development paradigm is highly beneficial, as it reduces significantly the time and cost required for making available specialized functionality.

According to Tiwana, Konsynski, and Bush (2010) the main concept in this software development paradigm is the 'platform', which is defined as an extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they communicate; a 'module' is defined as an add-on software subsystem that connects to the platform to add functionality to it, while an 'ecosystem' is the collection of the platform and the modules that have been developed based on it. Highly relevant for the functioning of this software development paradigm are the 'interfaces' (i.e., stable specifications and design rules that describe how the platform and modules interact and exchange information) and the 'architecture' (i.e., conceptual blueprint that describes how the ecosystem is partitioned into a relatively stable platform and a complementary set of modules that are encouraged to vary, and also the design rules binding on both). The development and evolution of such an ecosystem also necessitates effective 'governance' of it, defined as the allocation of decision making to its various stakeholders

From a political perspective, the evaluation framework gauges to what extent this novel approach to social media contributes to overcome the fundamental difficulty of modern public policy problems, which are becoming increasingly "wicked" (Rittel & Webber, 1973), lacking clear and widely agreed definitions and objectives, and having many stakeholders with different and heterogeneous problem views, values and concerns.

According to the theory of 'wicked' policy problems, which has been initially formulated by Rittel and Weber (1973), public policy problems have changed dramatically after World War II, so a different approach is required for addressing them. Previously, they usually had clear and widely accepted definitions and objectives, so

they could be solved by experts through 'first generation' mathematical methods, which aim to achieve some predefined objectives with the lowest possible resources; this class of public policy problems has been termed as 'tamed'. However, big changes that took place gradually in most societies increased dramatically the complexity of public policy problems. In particular, societies became more heterogeneous and pluralistic in terms of culture, values, concerns and lifestyles, and this made public policy problems 'wicked', i.e., lacking clear and widely agreed definition and objectives, and having many stakeholders with different and heterogeneous problem views, values and concerns.

For these reasons this class of 'wicked' problems cannot be solved by using 'first generation' mathematical methods, since they lack the basic preconditions for this: they do not have clear and widely agreed definitions and objectives that can be adopted as criteria for evaluating possible solutions. So Rittel and Weber (1973) suggest that 'wicked' policy problems require 'second generation' methods, which combine in a first stage consultation among problem stakeholders, in order to formulate a shared definition of the problem, and then in a second stage mathematical analysis by experts. In particular, in the first stage discourse and negotiation take place, aiming to synthesize different views and opinions, and finally formulate a shared definition of the problem and the objectives to be achieved. Having this as a base, it is then possible to proceed in a second stage to a mathematical analysis carried out by experts of the well-defined problem.

Subsequent research on this 'second generation' approach to the solution of public policy problems has revealed that its first stage can be greatly supported by the use of appropriate information systems which allow stakeholders to enter 'topics' (meant as broad discussion areas), 'questions/issues' (particular problems to be addressed within the discussion topic), 'ideas' (possible alternative answers-solutions to questions/issues) and 'arguments' (positive or negative evidence or viewpoints that support or object to ideas).

Concerning the innovative viewpoint, the framework ascertains the presence of the preconditions for a wide adoption and diffusion making reference to the well-established innovation diffusion theory based on the five characteristics proposed by Rogers (2003), i.e., relative advantage, compatibility, complexity, trialability and observability (Table 7), which have been extensively employed for analyzing ICT-related innovations in both the public and the private sector (Wonglimpiyarat & Yuberk, 2005; Raus, Flügge, & Boutellier, 2009).

Characteristic	Definition
Relative Advantage	The degree to which an innovation is perceived as being better than the idea, work practice or object it supersedes.

Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters.
Complexity	The degree to which an innovation is perceived as relatively difficult to understand, implement and use.
Trialability	The degree to which an innovation can be tested and experimented with on a limited scale.
Observability	The degree to which the results of an innovation are visible to others.

Table 7 – The five characteristics of innovations according to Rogers (2003)

The multi-dimensional framework that I have proposed for the theoretical evaluation is shown in Table 8. The focus of such a framework is set on the fundamental innovations and complexities that characterize – at the technological, political and innovation diffusion level – emerging advanced practices of social media in public policy making processes.

Technological feasibility evaluation
To what extent…   • the APIs of the targeted social media provide all the required capabilities for posting policy-related content to them   • the APIs of the targeted social media provide all the required capabilities for retrieving citizens' interactions with this policy-related content (e.g., views, likes, textual comments)   • the main preconditions of the platform-based software development paradigm (such as clear interfaces and governance) are fulfilled   • the whole approach is technologically feasible
Political evaluation
To what extent the proposed approach is useful/beneficial for policy-related campaigns/consultations in terms of…   • time saving   • cost saving   • reaching wider audiences   • identifying the particular problems/issues that exist concerning the particular policy   • identifying possible solutions to these problems/issues

- identifying relevant advantages (positive arguments) and disadvantages (negative arguments)
- in general, collecting high quality feedback/knowledge from the citizens on the particular policy
- facilitating convergence (at least to some extent) between stakeholders on the definition of the problem the policy attempts to address, the main issues, the main solutions/alternatives, and also their advantages and disadvantages
- drawing conclusions concerning the degree of citizens' awareness of the policy
- drawing conclusions concerning the degree of citizens' interest in the policy
- drawing conclusions about the degree of citizens' acceptance of the policy

Innovation diffusion evaluation

To what extent the proposed approach…
- is a better way for consultations with citizens on various public policies than the other existing 'physical' (i.e., 'physical' meetings) or 'electronic' ways for this (relative advantage)
- is compatible with the policy formulation processes of government agencies (compatibility)
- its practical application by government agencies policy makers does not require much effort (complexity)
- can be initially applied in small-scale pilot applications by government agencies, in order to assess its capabilities, advantages and disadvantages, before proceeding to a larger scale application (trialability)
- is an innovation highly visible to other public agencies, policy makers and the society in general, which can create positive impressions and comments (observability)

Table 8 – Multi-dimensional framework for the theoretical evaluation

At technological level, from the analysis of the APIs exposed by social media platforms covered by PADGETS (i.e., Facebook, YouTube, Twitter and Blogger) it has been concluded that all these social media have strategies to support the development of third-party applications using their data, by providing through their APIs a rich functionality for posting and retrieving content, exposing methods that 'go deeply' into their core functionalities. From the above analysis it can be gleaned that the main preconditions of the platform-based software development paradigm are fulfilled to a satisfactory extent, but not completely. All examined social media provide an extensive

and highly useful for these purposes core 'platform' functionality, which is accessible to third-party applications, and can be used for the development of 'modules' providing additional specialized functionalities through APIs, so that the platforms and the modules can work well together as an 'ecosystem'. Also, there are clear 'interfaces' – i.e., specifications and design rules that describe how the platform and modules interact and exchange information based on well-defined APIs – and effective 'governance' mechanisms of the 'ecosystem' (based on the clear allocation of decision making rights to the main stakeholders, i.e., platforms' owners and modules developers). Therefore the proposed complex form of social media use by government agencies for supporting public policy making seems to be technologically feasible to a large extent.

However, some deficiencies have been identified as well. First, the APIs of most of the examined social media are not characterized by stability, and change very frequently in light of the well-known 'perpetual beta' paradigm: this necessitates significant effort in order to continuously adapt third-party applications to keep them operational. Second, there are problems in obtaining important user demographic information related to each 'content' retrieved from them (e.g., author's gender and age of a blog post). Such demographics are important to calculate various indicators (e.g., metrics of awareness, interest, and acceptance in a Policy Gadget campaign) per gender and age group, since aggregate values of them are much less useful to policy makers (as the composition of the user base of such social media platforms with respect to gender, age group, education, etc. is usually not representative of the population).

Looking at the political dimension, interviewees (including public officers involved in other pilot not mentioned in the present thesis) believe that this centralized cross-platform approach to social media use may contribute significantly to the efficiency of policy making in terms of ability to reach more people in a shorter time and at lower costs. One of them offered a clear and synthetic answer on this: "conducting the same activities without the platform would have implied roughly a double cost" (see section 5.5). Interviewees emphasized that social media communication channels are characterized by rapid and viral diffusion patterns. This results in the possibility to reach a widespread audience with limited labor intensity, a characteristic representing an important value driver for policy makers. In addition, they agree that the concurrent and coordinated usage of complementary social media platforms such as Facebook, YouTube and Twitter allowed reaching a much wider range of citizens' groups and also proved to generate significant synergies in terms of overall cross-platform results. Citizen groups that can be reached or involved in a policy-related discussion by using multiple social media are very numerous and variegated in comparison with the existing alternative methods (e.g., organizing 'physical' meetings, electronic consultations in government-operated 'official' websites); however, it has been noted that there are citizens' groups who do not have ICT access and skills owing to the various types of

digital divide still existing, so they cannot be reached and involved in this way (probably, physical meetings remain the most appropriate method for them).

Furthermore, taking into account the analysis of citizens' comments, interviewees highlighted the ability of this approach to clearly single out issues and concerns posed by various stakeholder groups and, at the same time, their expectations concerning the investigated policy solutions. Above all, particular appreciation goes to the ability to crisply identify differences existing among groups: informants agree that gathered comments reveal positive and negative polarization of citizens ("what citizens like and what they dislike") concerning a particular policy – or policy domain in general – and also possible positive or negative impacts of the policy in these dimensions.

However, interviewees found that some further work has to be done in terms of solution identification to various issues and concerns posed, and also with reference to facilitating convergence between differing stakeholders' views. The difficulty perceived by some policy makers in obtaining viable solutions via crowdsourcing has probably to do with the fact that the complexity of the 'wicked' problems inherent in policy actions is quite difficult to address through social media interactions that are often characterized by tight brevity constraints (as in the case of Twitter) or by quick interactions that leave little room to pondering and often contain a significant emotional component (Wang, Carley, Zeng, & Mao, 2007). As per the convergence between stakeholders' views, the limited performance may be ascribed to a number of factors. First, discussion tends to be fragmented between the different used social media thus rendering it more difficult for any given user to have an overall vision. Second, messages tend to be targeted at the government agency rather than aimed at opening up a debate among social media users.

Finally, when looking at the extent to which the approach proposed allows to highlight the levels of people's awareness, interest and acceptance towards a given policy solution, the interviewees believe that the approached proved extremely valuable. The traceability of actions generated over social media combined with the possibility to associate social media usage with more traditional survey-based interactions allowed to produce very reliable estimates.

Delving into the evaluation through the lens of innovation diffusion, all interviewees agreed that such a centralized use of multiple social media in policy making processes of government agencies offers strong relative advantages in comparison with existing alternatives, both 'physical' (e.g., 'physical' meetings for communicating with citizens) and 'electronic' ones (e.g., government e-Participation/e-Consultation portals). A substantial relative advantage arises with respect to previous generation of e-Participation models due to the fact that government makes a first step towards citizens rather than expecting the citizenry to move their content production activity onto the 'official' spaces created for e-Participation. The high levels of reach and engagement achieved with citizens – in the Piedmontese pilots as well as in the other ones – and the

useful insights offered by citizens' textual comments and opinions indicate the significant benefits and relative advantages that the examined centralized cross-platform approach provides.

With respect to compatibility, an interviewee found that this approach seems to fit in with the policy formulation processes of Piedmont regional government since it is "flexible enough to allow public agencies to adopt it without completely changing the standard processes" (see section 5.5). However, not a few of the interviewees (taking into account also other pilots) stressed that a 'typical public servant' might initially not feel 'culturally fit' for and familiar with the language and style of dialogue in most social media, and find it difficult to participate effectively in such dialogues; so some training, followed by some 'familiarization period' would probably be required.

Coming to complexity, I have repeatedly mentioned that the Policy Gadget approach has the distinctive trait of keeping moderate the cognitive effort required to policy makers. The tool hides complex processing algorithms 'behind the scene' and provides decision makers with a set of synthetic, fresh and relevant data through intuitive visual outputs. The easily understandable way of reporting campaign results determines a substantial simplicity in usage that clears the hurdle of complexity, creating a fertile soil for a smooth adoption by every policy maker inclined to embrace open policy making.

Furthermore, the successful completion of the pilot held in Piedmont Region corroborates the *a priori* conviction that this approach might take advantage of a noticeable scalability that allows to move all along the continuum ranging from small-scale to full-scale. All interviewees agreed that this innovation may be experimented in a small-scale without particular obstacles, since there does not exist a 'minimum efficient scale' for running a campaign, so it is characterized by trialability.

Finally, the interviewees mentioned that the high exposure given by social media to public policy campaigns makes this innovation highly visible to other public agencies, policy makers and the society in general. In fact, policy messages make their appearance on public pages accessible by everyone (i.e., Facebook Fan Pages, Twitter Pages, YouTube Channels) and viral 'contagious' phenomena occurring in the social media realm in light of intertwined social connections play their part in garnering a rapid and vast spreading of the policy proposal at stake. These result in high observability of this innovation.

5.7   Lessons Learnt from PADGETS Experience

To close the journey into the world of Policy Gadgets, the present section summarizes lessons learnt during this extremely rewarding research experience. This last stage is highly relevant in scientific terms since the capitalization of lessons learnt from this

one-off initiative will be paramount to shift from a project perspective to a (desirable) process perspective.

Going back to the content structure adopted hitherto, the present sections discusses lessons learnt subdividing them into three strands matching the first three areas of my research in the PADGETS project.

Concerning the conceptualization of a crowdsourcing model for participatory policy making over social media, Policy Gadgets appear as innovative tools for leveraging the group knowledge produced over social media platforms within policy making processes. Although still in its infancy, such instruments represent a promising stepping stone on which to stand for the creation of a new generation of policy making characterized by faster and more frequent interaction between policy makers and society. As a matter of fact Policy Gadgets may promote a cultural shift within government agencies paving the way to a new model in which a change occurs in the role of users, who would participate more proactively in the policy lifecycle (and not only). Above all, they may offer fresh and relevant ideas and opinions to policy makers via crowdsourcing. In addition, thanks also to the refined policy intelligence capabilities resident in the back-end, social media data may be turned into precious assets to anticipate and detect trends in public opinion, yielding augmented responsiveness, representativeness and efficiency to the public policy definition. Moreover, an intense (and smart) use of social media coupled with more in-depth studies of network topologies may also contribute to no longer consider individuals as isolated units of analysis but to leverage their social connections and the context in which they are immersed as a potentially useful policy tools. To exemplify, if a policy maker is interested in promoting a virtuous behavior (e.g., waste recycling), by targeting more active individuals in crowdsourcing or the ones having higher reputation/influence, s/he is likely to obtain better and faster results than by implementing a generic policy not taking into account the role individuals play in their social network.

Finally, a number of open issues are worth mentioning as they may represent useful food for thought for possible future research. An arduous task consists in the creation and testing of an appropriate language and style of communication that government agencies have to adopt in the interaction with society. Moreover, the integration of society's voice into traditional policy making processes still presents some obstacles having to do with striking the right balance between independent and informed decision making and coherence with society's will: crowdsourcing, as defined in this context, is not representative democracy and is not equivalent to national referendum (Aitamurto, 2012).

To sum up, two main novelties introduced by the Policy Gadget approach are worthy of being exploited for future research endeavors in the field. The former is the relaxation of current constraints in terms of size, frequency and quality of participation. All the

different stakeholders are free to participate to any policy process they are interested in, at the time they prefer, with the effort in participation they are willing to spend, and above all using their tools with which they are already accustomed to. From the opposite perspective, policy makers can continuously access reports pertaining to stakeholders' opinion expressed in crowdsourcing mode, being allowed to quickly modify and adapt the policy issues under discussion. The latter novelty concerns the integrated management of multiple social media channels: the presence of a centralized approach decreases the complexity and heterogeneity that comes naturally while managing different social media platforms, each of which exhibits peculiarities in terms of aims, interfaces, functionalities, target audience, content types and degree of content sharing.

In relation with the design of a DSS meant to keep policy makers afloat in the tidal wave of social media interactions and crowdsourced ideas, the intent behind the development of the proposed analytical framework is to provide a first contribution towards the creation of a system that could help policy makers in facing a number of relevant questions often arising through the policy cycle. In my design, this was done by introducing an innovation bringing together social media and System Dynamics simulation. To date, in fact, the use of ICT tools for decision support has traditionally been a closed-door activity usually carried out with static external inputs in the form of codified or unstructured data coming from different sources (e.g., statistical offices). Such approach presents a number of important limitations: evident examples are the lack of a direct connection with the recent external reality on which the policy decision has to impact and the inherent delay present in the policy response due to the lead time necessary to collect and process the relevant data required for the analysis. To illustrate with a metaphor, such process could be compared to driving a car by only looking at the rear view mirror (a partial, indirect and delayed input) rather than through the windscreen. The innovation brought by the DSS opens up the decision support process by integrating it with the stream of activities carried out over social media platforms. This allows establishing a direct link between the decision process and the external world as well as to reason on fresh and relevant information. This, once the necessary organizational processes are in place, should contribute to produce a much more responsive and effective style of decision making in government. Going back to the metaphor, the innovation introduced by the DSS aims at allowing decision makers to drive looking through the windscreen supported by an intelligent navigation system able to anticipate some of the obstacles lying ahead (i.e., the predictive functionalities of the simulation module).

Finally, it is important to discuss also some of the limitations that characterize the DSS presented, as they may represent an interesting starting point for future research. The resampling activity used for the generalization of the results in terms of awareness,

interest and acceptance, for example, contributes to decrease some of the biases inherent in social media usage (e.g., age and gender distribution) but it is far from producing a statistically significant representation of society. In addition, the implementation of a meaningful cross-platform tracking systems still presents a number of challenges having to do with identity management. Along these lines, potential criticalities could derive also in case of scarcity of personal information regarding end users due to heterogeneous policies adopted by social media platforms as well as end users' privacy settings: even though the robustness of the simulation model has been repeatedly tested in 'borderline' use-cases, the absence of a 'minimum set of data' (basically users' age and gender, which represent the key variables on which the clustering procedure is based) may reduce the representativeness of final results and, consequently, could lower the quality of elaborated reports.

Concluding, although far from being error free, it is my firm belief that the framework underpinning the presented DSS constitutes a significant step ahead in helping policy makers in dealing with the challenges arising from the complexity that more and more may be found in modern societies.

To shed light on lessons learnt from the pilot that took place in Piedmont Region in summer 2012 in conjunction with 'Formazione 2.0' project, it is perhaps appropriate to start by remarking that the pilot has surely represented an ambitious initiative characterized by an inherent degree of intricacy. In fact, it required for the first time to combine under a common roof governmental departments and skills that had never interacted before. First of all, the topic under the spotlight (i.e., telemedicine) demanded the active participation of a plurality of actors within the regional government from public health, institutional communication and regional innovation units. Once obtained the institutional commitment of afore-mentioned governmental units, the conceptualization, planning and management of the social media campaign called upon a bewildering array of competencies coming from diverse backgrounds, such as information technology, institutional communication, healthcare sphere, etc. To complicate things further, a remarkable initial uncertainty was ascribable to the introduction of the PADGETS platform in the policy lifecycle, whereas the Piedmontese pilot represented the first test-bed for the brand-new tool on which the consortium was putting the final touches.

Fortunately, this effort has paid off in many ways. Taking a helicopter view of the campaign, promising results have been achieved regarding the level of uptake, the acceptance of the policy message at stake as well as the quality of stimuli and suggestions coming from the citizenry during the consultation.

Taking stock of the *vox populi*, the integration of hopes and fears coming from the citizenry leads policy makers to conceive telemedicine solutions as a new opportunity capable to generate innumerable spillover effects in the socio-economic system;

nevertheless, this model of healthcare delivery has to be considered as complementary and not substitute to traditional practices hinged on *de visu* caregiving.

Results summarized in previous sections should be contextualized in a *milieu* where participatory campaigns were at their first appearance at a regional level. Experience in this field has taught that an audience accustomed to enjoy contents in a passive way (i.e., lurkers) will rarely turn immediately into a flock of active participants (Osella, 2013). In fact, unless shocking events occur (e.g., very charismatic celebs entering the fray, sudden appeal of the policy topic in the citizenry), the reaction of the public assumes a gradual trend in lieu of an abrupt shape. Similarly, the migration of Piedmont Region to a 2.0-like communication style has not been an instantaneous process and a transition has been physiological to get the audience familiar with the novel full-fledged engagement brought by the Policy Gadget approach (Osella, 2013). As widely expected since Piedmontese policy makers were barely dipping their toes into the water of e-Participation, the campaign has not been able to "cross the chasm" (Moore, 1999), i.e., to ideally trigger the transition between visionaries (early adopters) and pragmatists (early majority). However, the very encouraging results obtained with respect to usual performances of Piedmont Region in the social media realm render this experience a stepping stone on which to stand for the development of a new breed of "Policy Making 2.0" (Ferro, Loukis, Charalabidis, & Osella, 2013c) initiatives meant to harness the potential that today is still largely untapped.

Finally, when the final curtain dropped on the pilot, a manager of the regional Public Health Department who was the main internal stakeholder of the project, talking about PADGETS at Social Media Week 2012[33], declared that "the project is of great interest for Piedmont Region since it represents the emblem of the revolution that information and communication technologies are bringing to our daily life". On the whole, the local excitement among public bodies involved in the initiative seems to indicate that the pilot team has been on the right track.

In terms of tension towards the future, my hope is that the 'right track' opened by Policy Gadgets will come to what Tapscott, Williams, and Herman (2008) describe as a continuous circle of policy innovation and adaptation that integrates the knowledge and experience of a broad range of stakeholders in government, business and civil society. In this internetworked policy scenario of the future, decision making will be the product of consultation and collaboration within networks that assemble around relevant political issues. Governments will abandon their monopoly over the policy process in favor of participatory models that invite input – and ownership – at all stages of development, from problem definition, to analysis, to identifying strategic options and making decisions. Posterity will judge!

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[33] http://www.youtube.com/watch?v=WI8yU6wBvB0&t=47m38s

6. Crowdsourcing as Business Model Game-Changer

6.1 The Protocol of Analysis for Selected Cases

As put by Brabham (2008a), the term crowdsourcing is often adopted to describe a new Web-based business model that harnesses the creative solutions of a distributed network of individuals through what amounts to an open call for proposals. Alongside companies operating on traditional global business models – some of whom are struggling feverishly to reinvent themselves – which have dipped their toes into the water of crowdsourced work via one-off initiatives (e.g., Converse, McDonald's, JetBlue, Sony, Chrysler, Goldcorp, Chevrolet[34]), a new breed of firms has come to light in the last decade by massively leveraging crowdsourcing as pivotal pillar of their business logic. Besides this contrast between the 'old guard' – adding crowdsourcing to the business-as-usual leaving untouched the overarching 'evergreen' business models – and the 'new guard' – proposing groundbreaking business models that creatively put crowdsourcing at the core of the company – a myriad of other elements contributes to render particularly heterogeneous the crowdsourcing terrain in the private sector: difficulties in clearly identifying the contours of crowdsourcing (in line with considerations elaborated in previous chapters), capacity of crowdsourcing to rapidly spread its tentacles across many industries, various and tangled topologies of the value ecosystem, diversified mechanisms of solver selection and awarding, slew of motivations that pushes the crowd to answer the open call coupled with a miscellaneous of organizational models for external solvers (as deducible from the multi-dimensional framework), just to name a few of them.

In order to tackle afore-mentioned points of uncertainty in an adequate way, I chose to adopt a structured protocol of analysis that allows to delve into the intricacies of each case under examination making reference to a set of well-defined dimensions (i.e., criteria potentially exploitable for the characterization of archetypal business models).

The set of dimensions has its roots in the eight elements of 'circumstances of human acts' proposed by Thomas Aquinas which have some commonalities with '*loci argumentorum*' and with the well-known 'Five Ws' of information-gathering in journalism.

In drafting the protocol of analysis, each of the rhetorical questions has been associated to a dimension of crowdsourcing relevant for the business model perspective and, if

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[34] Such experiences are succinctly summarized by Brabham (2008a).

deemed appropriate, it has been connected with one or more dimensions that describe modalities to perform external sourcing (cited in section 4.1). The resulting protocol of analysis is schematized in Table 9.

#	Latin	English	Dimension of crowdsourcing	Sources of inspiration
1	QUIS	Who	Actors involved in the value ecosystem (e.g., seekers, solvers, enablers)	Configuration (direct vs. mediated): Feller, Finnegan, and Hayes (2008)
2	QUID	What	Sought result	Focus (intellectual property vs. innovation capability): Feller, Finnegan, and Hayes (2008)
3	QUANDO	When	Event triggering the initiation of the interaction (e.g., open call, open search based on spontaneous submissions)	Initiation of the interaction (open call vs. open search): Diener and Piller (2010)
4	UBI	Where	Problem space (ideally along a continuum raging from 'defined' to 'emergent')	Innovation space (defined vs. emergent): Nambisan and Sawhney (2007b)
5	CUR	Why	Motivation for solvers to participate	Motivation for innovators to participate (extrinsic vs. intrinsic): Boudreau and Lakhani (2009)
6	QUANTUM	How much	Mechanisms of appropriation of the resulting value	Ownership of solutions (owner vs. owner and contributors): Pater (2009)
7	QUOMODO	How	Criteria for solver selection and prize assignment	Solver selection – Degree of openness (everyone can join it vs. selection process): Pisano and Verganti (2008), Pater (2009), Diener and Piller (2010), Sloane (2011a)

				Prize assignment – Governance structure (hierarchical vs. flat): Nambisan and Sawhney (2007b), Pisano and Verganti (2008)
8	QUIBUS AUXILIIS	By what means	Organization of external solvers	Organization of external innovators (collaborative community vs. competitive market): Boudreau & Lakhani (2009)

<p align="center">**Table 9 – Protocol of analysis for case studies**</p>

6.2 Cases under the Spotlight

Following rigorously the case study approach described in section 3.2, above-mentioned protocol of analysis has been applied to a short-list of cases being the fruit of a mixed approach combining empirical sampling with theoretical sampling. The long-list of cases from which to select is the result of an extensive market research put into action taking advantage of several sources: academic publications, white papers, industry analyses, company websites, collaborative repositories and word of mouth. In terms of industry analyses, a starting point has been the comprehensive report published by Massolution (2012).

At the end of the selection process, cases under scrutiny have been as follows:

1. P&G Connect & Develop
2. InnoCentive
3. Kaggle
4. 99Designs
5. Quirky
6. Threadless
7. Amazon Mechanical Turk
8. Clickworker

Applying the protocol of analysis schematized in Table 9 to afore-mentioned cases of interest, a synopsis has been elaborated for each of the cases placing an emphasis on building blocks associated to the rhetorical questions. Case synopses are presented in Table 10, Table 11, Table 12, Table 13, Table 14, Table 15, Table 16 and Table 17.

#	Case synopsis with reference to each specific dimension
1	**Criterion**: QUIS (Who). **Dimension**: Actors involved in the value ecosystem. **Description**: The value ecosystem consists of a seeker (i.e., P&G) and a constellation of solvers (i.e., external innovators).
2	**Criterion**: QUID (What). **Dimension**: Sought result. **Description**: P&G exploits crowdsourcing to seek for outstanding solutions – generally covered by intellectual property – concerning both technical aspects and a wide-ranging spectrum of marketing activities.
3	**Criterion**: QUANDO (When). **Dimension**: Event triggering the initiation of the interaction. **Description**: Usually an open call triggers the crowdsourced endeavor. In fact, 'P&G's Needs' website reports dozens of needs for which P&G is actively seeking solutions and partners, including details of the technical, commercial, or other qualifications that may be required for success. An open call mechanism drives also the 'P&G Co-Creation Channel' representing a crowdsourcing community platform running multiple open innovation contests to co-create with exceptionally talented creative thinkers and creators around the world. Alternatively, spontaneous innovations (e.g., technologies, products, packages) not matching specific needs can be submitted for consideration by P&G by means of 'P&G Innovation Portal'.
4	**Criterion**: UBI (Where). **Dimension**: Problem space. **Description**: In crowdsourcing mechanisms leveraging open calls the problem space tends to be sufficiently emergent due to the many degrees of freedom left to solvers by the few constraints and specifications imposed by P&G. Concerning spontaneous submissions, they entail *a fortiori* an emergent space since they occur by design on a 'green field'. Conversely, in calls taking place in the 'P&G Co-Creation Channel', the problem space is well-delimited by constraints related to the 'legacy' scenario (e.g., existing products, brands, packages, marketing strategies).
5	**Criterion**: CUR (Why). **Dimension**: Motivation for solvers to participate. **Description**: It goes without saying that the majority of solvers are driven by extrinsic motivation usually in the form of monetary remuneration. However, in particular in 'P&G Co-Creation Channel', several women are inclined to take part in contests for dissimilar motivations (e.g., visibility in the community,

#	Case synopsis with reference to each specific dimension
6	enjoyment while working, gender affinity): in this specific channel, the tendency is corroborated by the wealth of non-monetary rewards (e.g., gift baskets and vouchers, special citations from P&G Vice Presidents). **Criterion**: QUANTUM (How much). **Dimension**: Mechanisms of appropriation of the resulting value. **Description**: Usually there is a monetary remuneration for the winning solver aimed at rewarding the selected solutions. This mechanism of appropriation does not imply neither the transfer of the intellectual property to P&G nor the exclusive rights: for instance, licensing is a possible line of agreement.
7	**Criterion**: QUOMODO (How). **Dimension:** Criteria for solver selection and prize assignment. **Description**: Everyone can join the contests provided that s/he has a valid P&G account. The hierarchical structure of governance is reflected in price assignment: selected solutions are chosen by P&G experts having a deep domain-knowledge. As a result, apart from 'P&G Co-Creation Channel', participants are not involved in the evaluation phase.
8	**Criterion**: QUIBUS AUXILIIS (By what means). **Dimension:** Organization of external solvers. **Description**: Solvers' activity is competition-based.

<p align="center">Table 10 – Case synopsis #1 (P&G Connect & Develop)</p>

#	Case synopsis with reference to each specific dimension
1	**Criterion**: QUIS (Who). **Dimension**: Actors involved in the value ecosystem. **Description**: The value ecosystem consists of a number of seekers (i.e., corporations, governmental bodies, non-profit entities), a constellation of solvers (i.e., external innovators) and an intermediary actor (i.e., InnoCentive) orchestrating the resulting two-sided market.
2	**Criterion**: QUID (What). **Dimension**: Sought result. **Description**: InnoCentive aims at leveraging the world's smartest people to come up with ideas and solutions to important business, social, policy, scientific, and technical challenges.
3	**Criterion**: QUANDO (When). **Dimension**: Event triggering the initiation of the interaction. **Description**: A 'challenge' (i.e., well-defined problems whose solutions generate value for the seeking organization) is announced by means of an open call that is scheduled when the seekers has completed all the prescribed procedures required

	to 'go live'.
4	**Criterion**: UBI (Where). **Dimension**: Problem space. **Description**: The breadth of the problem space depends on the specific needs of the seeker. It is not uncommon to see challenges having a technical nature that present clearly defined boundaries set by constraints that cannot be relaxed.
5	**Criterion**: CUR (Why). **Dimension**: Motivation for solvers to participate. **Description**: Solvers are driven by extrinsic motivation related with the opportunity to obtain tangible rewards.
6	**Criterion**: QUANTUM (How much). **Dimension**: Mechanisms of appropriation of the resulting value. **Description**: There is a monetary remuneration – defined *ex-ante* by the seeker – aimed at rewarding the solver who provides the winning solution to a challenge. This mechanism of appropriation does not imply the automatic exclusive transfer of the intellectual property to the seeker: while this frequently happens, in other circumstances by submitting a proposal the solvers grants to the seeker 'only' a royalty-free, perpetual, and non-exclusive license to use any information included in the proposal. Stepping into the shoes of InnoCentive, the intermediary's 'bread and butter' is to manage the two-sided market enabling interactions between two distinct but interdependent groups (i.e., seekers and solvers) and try to get the two sides 'on board' by appropriately charging each side in light of indirect network externalities. In light of these 'golden rules', InnoCentive internalizes the value of innovation by charging seekers who pay a fee to post a challenge on the open innovation marketplace and a commission on the amount awarded.
7	**Criterion**: QUOMODO (How). **Dimension:** Criteria for solver selection and prize assignment. **Description**: Everyone can join contests supervised by InnoCentive (i.e., Premium Challenges, Grand Challenges, Showcase Challenges) provided that s/he has a valid account; *a latere*, closed-door challenges can be put in place by third-parties by means of InnoCentive@Work. The selection of the winning solution is up to the seeker who has to decide which proposal is worth of being paid.
8	**Criterion**: QUIBUS AUXILIIS (By what means). **Dimension:** Organization of external solvers. **Description**: Solvers' activity is competition-based.

Table 11 – Case synopsis #2 (InnoCentive)

#	Case synopsis with reference to each specific dimension
1	**Criterion**: QUIS (Who). **Dimension**: Actors involved in the value ecosystem. **Description**: The value ecosystem consists of a number of seekers (e.g., companies, governments, non-profit entities, researchers), a constellation of solvers (i.e., external data wranglers) and an intermediary actor (i.e., Kaggle) orchestrating the resulting two-sided market.
2	**Criterion**: QUID (What). **Dimension**: Sought result. **Description**: Kaggle aims at providing seekers with smart solutions to their toughest data conundrums by leveraging the expertise of world-class data scientists. Their ability in data crunching, statistics and predictive modeling is made available to leading organizations in order to enable enhanced decision making, insight discovery and process optimization.
3	**Criterion**: QUANDO (When). **Dimension**: Event triggering the initiation of the interaction. **Description**: A competition is announced by means of an open call that is scheduled when the seekers has completed all the prescribed procedures required to 'go live'.
4	**Criterion**: UBI (Where). **Dimension**: Problem space. **Description**: The breadth of the problem space depends on the specific needs of the seeker. Typically, competitions present clearly defined boundaries given by the input datasets on which solvers rack their brains to come up with groundbreaking ideas.
5	**Criterion**: CUR (Why). **Dimension**: Motivation for solvers to participate. **Description**: Solvers are mainly driven by extrinsic motivation linked to the opportunity of obtaining tangible rewards (i.e., cash prizes). This main driver is accompanied by a minor intrinsic component having to do with using Kaggle to meet, learn, network and collaborate with experts from related fields. Such a minor component becomes dominant in 'Playground' public competitions, which are set up to be quirky and idea-driven rather than to solve a specific business or research problem; these unusual competitions are for fun and not for any prize.
6	**Criterion**: QUANTUM (How much). **Dimension**: Mechanisms of appropriation of the resulting value. **Description**: A monetary remuneration – defined *ex-ante* by the seeker – rewards data scientists (often more than one) who provide outstanding solutions matching

	the seeker's needs. In terms of appropriation of intellectual property right, by accepting an award, the winner agrees to grant a worldwide, perpetual, irrevocable and royalty-free license to the seeker to use the winning entry and any model used or consulted by the winner in generating the winning entry in any way the seeker thinks fit; this license is non-exclusive unless otherwise specified. Looking at the facilitator who coordinates the two-sided market, Kaggle earns a fee that depends on the size of the prize pool and the amount of work necessary to run the competition. Furthermore, this income is accompanied by the revenue trickle stemming from 'Kaggle Connect', i.e., a consulting platform that connects companies to the 0.5% elite data scientists belonging to the community.
7	**Criterion**: QUOMODO (How). **Dimension:** Criteria for solver selection and prize assignment. **Description**: The bulk of competitions are open-door (e.g., 'Featured', 'Research', 'Recruiting', 'Kaggle Prospect', 'Playground') and everyone can join them provided that s/he has a valid account. On the contrary, 'Master' competitions are open to only a select tier of elite Kagglers or a subset of these by invitation-only or special eligibility criteria: these competitions are characterized by significant commercial value or sensitive data. The selection of the winning solutions is a structured process. Kaggle competitions are decided by models' performance on a test data set given as input. The final competition standings are determined by solvers' scores on a private leaderboard: the live public leaderboard, which gauges predictive accuracy with respect to a hidden solution file encouraging participants to continue innovating beyond existing best practice, is combined with a private leaderboard calculated at the end. Such a decisive score is obtained from the predictive accuracy measured using a subset of the test set not included in the public leaderboard to ensure that models do not overfit a specific data set.
8	**Criterion**: QUIBUS AUXILIIS (By what means). **Dimension:** Organization of external solvers. **Description**: Solvers' activity is competition-based. Competitors are not only independent scientists: in fact, multiple individuals or entities may team up to submit a single entry.

Table 12 – Case synopsis #3 (Kaggle)

#	Case synopsis with reference to each specific dimension
1	**Criterion**: QUIS (Who). **Dimension**: Actors involved in the value ecosystem. **Description**: The value ecosystem consists of a number of seekers (i.e.,

	corporations, governmental bodies, non-profit entities), a constellation of solvers (i.e., professional creatives) and an intermediary actor (i.e., 99Designs) orchestrating a two-sided market.
2	**Criterion**: QUID (What). **Dimension**: Sought result. **Description**: As a hub for top-talented graphic designers from around the globe, 99Designs provides rapid and frictionless access to designs realized for various applications (e.g., logos, websites, apps, advertising, clothing, product packaging, book covers).
3	**Criterion**: QUANDO (When). **Dimension**: Event triggering the initiation of the interaction. **Description**: A design contest is launched on 99Designs marketplace by means of an open call that is scheduled when the seekers has completed the design brief specifying customer requirements.
4	**Criterion**: UBI (Where). **Dimension**: Problem space. **Description**: The breadth of the problem space depends on the specific needs of the seeker. However, typically competitions present some clearly defined boundaries given by objective guidelines reported by the seeker in the design brief (e.g., visual style, size, language, colors) which are accompanied by 'soft' requirements characterized by a remarkable subjectivity (e.g., target audience, values that the design should communicate, works that designers can take inspiration from).
5	**Criterion**: CUR (Why). **Dimension**: Motivation for solvers to participate. **Description**: Solvers are driven by extrinsic motivation related with the opportunity to obtain tangible rewards.
6	**Criterion**: QUANTUM (How much). **Dimension**: Mechanisms of appropriation of the resulting value. **Description**: A prize money – depending on the 'design package' selected by seeker (e.g., Bronze, Silver, Gold, Platinum) – aims at rewarding the solver who provides the winning design after seven days of contest. This mechanism of appropriation implies that both the designer and the contest holder agree to sign the Design Transfer Agreement as part of the design handover stage. In view of such an agreement, the designer grants to the customer a non-exclusive, royalty free, worldwide, irrevocable, perpetual license to use, reproduce and distribute the transferred design as well as to sell, assign and/or transfer the rights licensed to the customer to any person. The ability of the intermediary (i.e., 99Designs) to

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	appropriately match demand and supply is rewarded by a lump sum fee depending on the 'design package' selected by the seeker. Since the turn-key solution includes the prize for the designer and the coverage of costs incurred by 99Designs, the residual portion of the lump sum originates margins for the intermediary that can appropriate a slice of the resulting value. Laterally, outside the boundaries of crowdsourcing, 99Designs earns a 5% service fee for each 1-to-1 project created.
7	**Criterion**: QUOMODO (How). **Dimension:** Criteria for solver selection and prize assignment. **Description**: Everyone can join Bronze, Silver and Gold contests supervised by 99Designs provided that s/he has a valid account. Premium level contests (Platinum) are characterized by entry barriers for solvers since only 'platinum' designers handpicked for their talent can access the contest. *A latere*, closed-door 1-to-1 projects can be started by seekers who are inclined to interact with a specific designer invited by them: in these circumstances, the solver is selected directly by the seeker without any competitive mechanism. By default, the selection of the winning design is up to the seeker who has to decide which graphical design is worth of being paid. If the seeker experiences difficulties in picking the winner out of the deluge of proposals, s/he can open up the selection: in fact, the contest holder has the opportunity to use a poll tool to invite contacts to vote for their favorite designs in the contest.
8	**Criterion**: QUIBUS AUXILIIS (By what means). **Dimension:** Organization of external solvers. **Description**: Solvers' activity is competition-based.

<div align="center">Table 13 – Case synopsis #4 (99Designs)</div>

#	Case synopsis with reference to each specific dimension
1	**Criterion**: QUIS (Who). **Dimension**: Actors involved in the value ecosystem. **Description**: The value ecosystem consists of a cohort of inventors (i.e., people submitting the initial idea) and influencers (i.e., people who can collaboratively contribute with precious tips and concrete actions of research and design), a constellation of purchasers (it is not rare that they belong to the community of inventors/influencers) and a platform manager (i.e., Quirky) that supervises the process of product development.
2	**Criterion**: QUID (What). **Dimension**: Sought result. **Description**: Quirky exploits crowdsourcing with the aim of making invention

	accessible thanks to the presence of a vibrant community that plays an enabling role in turning ideas into marketable consumer products solving needs that today are not fulfilled.
3	**Criterion**: QUANDO (When). **Dimension**: Event triggering the initiation of the interaction. **Description**: An open search mechanism allows inventor to spontaneously submit their promising ideas. The 'open call' peculiar to the crowdsourcing parlance is done once for all, thus establishing a sort of 'permanent' submission window.
4	**Criterion**: UBI (Where). **Dimension**: Problem space. **Description**: The problem space is emergent owing to the many degrees of freedom left to solvers by the very few constraints imposed by Quirky. The only limitations pertain to the nature of the inventions (only physical consumer products, no business ideas, food, or standalone software) and this fact places the invention process by design on a 'green field'.
5	**Criterion**: CUR (Why). **Dimension**: Motivation for solvers to participate. **Description**: The majority of inventors and influencers are driven by extrinsic motivation usually in the form of monetary remuneration. Nonetheless, the inherent bottom-up dynamics that gives to 'next-door inventor' the opportunity to bring her/his own idea to life – lowering entry barriers and leading to a 'democratization' of product development – leaves room also for diverse motivations going beyond the pursuit of economic gain (e.g., popularity in the community, realization of a personal dream, enjoyment while working).
6	**Criterion**: QUANTUM (How much). **Dimension**: Mechanisms of appropriation of the resulting value. **Description**: 30% of all top-line revenue brought in by Quirky stores as well as 10% of sales performed by retail partners goes back towards the community ('community pot') who crafted the product. Both inventors and influencers appropriate slices of the 'community pot'. If an idea takes off and is picked for development, the inventor receives the largest percentage of the 'community pot' (40%) when the finished product starts flying off shelves. Influencers who provide their contribution during the cycle of product development share the remaining part of 'cake' according to the type of activity they perform: vote for a winner product (5%), research of similar products (5%), consumer and market research (5%), design project (5%), naming of the project (5%), tagline (5%), style project (5%), portfolio analysis (5%), product enhancing with reference to

	concept consolidation and engineering challenges (20%). Each influencer splits the respective slice of the 'cake' with other members of the community who intervene in the same phase sometimes earning some extra prizes. Once the 'community pot' is subtracted to Quirky's top-line, the remaining portion is retained by the company as remuneration for the product development support and for the entrepreneurial risk. At intellectual property level, the perpetual royalty granted to inventors and influencers commensurate with the degree of their contribution represents the return for assigning ownership of all the intellectual property to Quirky (including also, if required, a license on patents covering part of the submitted ideas).
7	**Criterion**: QUOMODO (How). **Dimension:** Criteria for solver selection and prize assignment. **Description**: Everyone can become a member of the community – acting interchangeably as inventor and/or influencer – provided that s/he has a valid account. The selection of winning ideas may be seen in the guise of a giant funnel made up of three stages. In the first one, during the 30 days an idea is active on Quirky website, community members can vote for and comment on it. Ideas overcoming the first step go through an expert review performed every week by a rotating group of staff. Finally, the best 10-15 ideas selected on a weekly basis are examined during a product evaluation session taking place every week at Quirky headquarters: on Thursday the community gathers in a sort of plenary meeting to discuss and choose the best of the best ideas on which to slap the coveted "In manufacturing" stamp.
8	**Criterion**: QUIBUS AUXILIIS (By what means). **Dimension:** Organization of external solvers. **Description**: The coexistence of competition and co-creation is a distinctive trait of Quirky. In fact, whilst inventors are willing to stand out amid the competitors to turn their idea into reality hence reaping the benefits of being initiators, influencers are obliged to follow a collaborative approach due to the fact that their reward is dependent on the market success of the overall endeavor.

Table 14 – Case synopsis #5 (Quirky)

#	Case synopsis with reference to each specific dimension
1	**Criterion**: QUIS (Who). **Dimension**: Actors involved in the value ecosystem. **Description**: The value ecosystem encompasses a cohort of artists, a multitude of purchasers (it is not rare that they belong to the community of artists) and a platform manager (i.e., Threadless) that supervises the process of product

	development.
2	**Criterion**: QUID (What). **Dimension**: Sought result. **Description**: Threadless exploits crowdsourcing with the aim of collecting awesome ideas for apparel design to be turned into real products that people all around the world can wear.
3	**Criterion**: QUANDO (When). **Dimension**: Event triggering the initiation of the interaction. **Description**: An open search mechanism allows artists to spontaneously submit their ideas. In parallel, themed challenges are periodically launched by means a traditional open call that fixes the *leitmotiv* of the campaign as well as the extension of the submission window.
4	**Criterion**: UBI (Where). **Dimension**: Problem space. **Description**: The problem space is completely emergent owing to the many degrees of freedom left to artists by the very few constraints that Threadless imposes. The only limitation pertains to the nature of the design (only designs for the apparel industry) and this fact places the creative process by design on a 'green field'. This lack of constraints is corroborated by the catch phrase chosen by Threadless for its website homepage: "our never-ending, no-themes, no-holds-barred, open-ended design challenge". In presence of themed challenges, the problem space becomes less emergent but, all in all, constraints do not hamper the creativity of designers.
5	**Criterion**: CUR (Why). **Dimension**: Motivation for solvers to participate. **Description**: The majority of artists are driven by extrinsic motivation usually in the form of monetary remuneration. Nevertheless, the inherent bottom-up dynamics that gives to 'next-door fashion designer' the chance to bring her/his own idea to life leaves room also for diverse motivations going beyond the mere chasing of economic reward (e.g., global fame, realization of a personal dream, enjoyment while working, opportunity to collect comments to be harnessed as constructive fuel to make designs even stronger).
6	**Criterion**: QUANTUM (How much). **Dimension**: Mechanisms of appropriation of the resulting value. **Description**: Designers whose creations reach the market receive an upfront cash payment (between \$250 and \$2,000); subsequently to this lump-sum, designers appropriate a slice of the market value stemming from their ideas in the form of royalties commensurate with the number of products sold (the share percentage

	ranges from 3% to 20%). The perpetual royalty granted to designers constitutes the return for assigning ownership of the intellectual property to Threadless. More precisely, the mechanism of intellectual property transfer is not trivial. When a design is submitted, the artist grants Threadless the right and license to upload, modify, reproduce, copy, exhibit, create derivative works of, distribute, and display the design, in any manner, for the purposes of promoting the design itself. Furthermore, the artists must not use the submitted design for any commercial purpose (e.g., sell or license the design) for 90 days after the date of submission to Threadless. Once 90 days have passed, if the design is not chosen for print by Threadless, the artist is free to use the design for any commercial or non-commercial purpose. If this relaxation occurs when the design is rejected, profoundly different is the situation of design acceptance. In the event that the design is selected by Threadless, the artist shall assign the entire right, title, and interest in and to the design to the corporate entity that owns Threadless, and shall waive any moral rights s/he may have in the design. Members of the community who contribute by means of voting, rating and commenting are not rewarded for their activities. Finally, the manager of the product platform (i.e., Threadless) appropriate a significant portion of the resulting value: besides covering costs coming from the product development support as well as from the maintenance of the e-commerce portal and retail shop, Threadless benefits of a margin rewarding the entrepreneurial risk.
7	**Criterion**: QUOMODO (How). **Dimension:** Criteria for solver selection and prize assignment. **Description**: Everyone can become a member of the Threadless community – acting interchangeably as artist or influencer – provided that s/he has a valid account. The selection of winning ideas is a process that massively involves influencers who become the ultimate judges of the submitted ideas. For a period of seven days, community *aficionados* from all over the world score designs. When time is up, Threadless tallies the votes and let designers know the 'verdict'.
8	**Criterion**: QUIBUS AUXILIIS (By what means). **Dimension:** Organization of external solvers. **Description**: Artists operate on a competitive basis due to their desire to turn their ideas into items sold worldwide and thus gain monetary reward. Influencers, for their part, provide their contribution in a collaborative way without any return or participation in a profit pool: their willingness to be decisive for the definition of the product portfolio is often explained by their status of 'early adopters' looking forward to purchase witty and outlandish garments genuinely designed by the community to which they belong.

<p align="center">Table 15 – Case synopsis #6 (Threadless)</p>

#	Case synopsis with reference to each specific dimension
1	**Criterion**: QUIS (Who). **Dimension**: Actors involved in the value ecosystem. **Description**: The value ecosystem encompasses requesters (individuals or businesses), a multitude of workers (called 'providers' in Mechanical Turk's terms of service, or, more colloquially, 'turkers') and a platform manager (i.e., Amazon Mechanical Turk) that orchestrates the crowdsourcing Internet marketplace that follows the economics of a two-sided market.
2	**Criterion**: QUID (What). **Dimension**: Sought result. **Description**: Amazon Mechanical Turk acts as a switchboard connecting a distributed and scalable workforce in order to coagulate fragments of human intelligence to perform tasks that computers are currently unable to do.
3	**Criterion**: QUANDO (When). **Dimension**: Event triggering the initiation of the interaction. **Description**: A Human Intelligence Task (HIT) is made available to workers by means of an open call that is scheduled when the seekers has completed all the prescribed procedures.
4	**Criterion**: UBI (Where). **Dimension**: Problem space. **Description**: The problem space is completely defined since the HIT description is often very well-detailed leaving little to the imagination. This *modus operandi* has gained a foothold in Amazon Mechanical Turk because of the repetitive and rudimentary nature of tasks generally advertised by means of the platform (e.g., data verification, data entry, correction of typos and spelling errors, discovery of missing data, identification of duplicates in a list, product item categorization, sentiment rating in tweets, tone rating of press coverage, generation of keywords for images or websites, basic content moderation, transcription of audio recordings).
5	**Criterion**: CUR (Why). **Dimension**: Motivation for solvers to participate. **Description**: Workers are driven by extrinsic motivation given the opportunity to earn reward amounts: in fact each micro-task is associated to a micro-payment that is transacted after the successful completion of the HIT.
6	**Criterion**: QUANTUM (How much). **Dimension**: Mechanisms of appropriation of the resulting value. **Description**: Workers receive earnings from completing HITs and from bonuses,

	which can derive from any HIT. Incidentally, because users are paid often only a few cents to complete HITs (on average around $1.50 an hour), critics to Amazon cheap-labor micro-tasking have emerged from all corners of the labor, law, and tech communities and some have equated Mechanical Turk to a "digital sweatshop" (Cushing, 2013). Amazon, as intermediary governing the platform, collects a 10% commission on top of the reward amount set for workers; the minimum commission charged is $0.005 per assignment. When a requester grants a bonus, Amazon Mechanical Turk collects 10% of the bonus amount, or a minimum of $0.005 per bonus payment. In case the requester chooses to send HITs exclusively to Photo Moderation or Categorization Masters ('Masters' are elite groups of workers who have demonstrated accuracy on specific types of HITs on the Mechanical Turk marketplace), an additional 20% fee applies.
7	**Criterion**: QUOMODO (How). **Dimension:** Criteria for solver selection and prize assignment. **Description**: Everyone can become an Amazon Mechanical Turk worker provided that s/he has a valid account. Solver selection may become closed-door in presence of HITs designed exclusively to Masters. Workers achieve a Masters distinction by consistently completing HITs of a certain type with a high degree of accuracy across a variety of requesters. Masters must continue to pass statistical monitoring to remain Mechanical Turk Masters. Current Masters have demonstrated accuracy specifically in Data Categorization or Photo Moderation. Prize assignment depends of the feedback provided by the requester at the completion of the micro-task. When a requester accepts the work conducted, the worker receives the payment agreed *ex-ante*. Conversely, when the requester rejects an assignment, the worker who performed it does not get paid, and the requester is not charged the standard Mechanical Turk fee for the HIT.
8	**Criterion**: QUIBUS AUXILIIS (By what means). **Dimension:** Organization of external solvers. **Description**: There is no competition among workers: once they select the assignment they want to perform, no one can challenge their right to be rewarded unless the requester rejects the work. In addition, collaborative production arises on the horizon when composite orders are split into small tasks (i.e., HIT) that are entered into the common system in which users can select and complete them: in such circumstances, the overall results concerning the composite order stems from the assemblage of the outputs made available by single micro-tasks.

<div align="center">Table 16 – Case synopsis #7 (Amazon Mechanical Turk)</div>

#	Case synopsis with reference to each specific dimension
1	**Criterion**: QUIS (Who). **Dimension**: Actors involved in the value ecosystem. **Description**: The value constellation encompasses requesters (usually businesses), a multitude of registered, independent micro-job contractors (called 'clickworkers') and an intermediary (i.e., Clickworker) that orchestrates the crowdsourcing platform.
2	**Criterion**: QUID (What). **Dimension**: Sought result. **Description**: Clickworker taps the distributed knowledge of the crowd to engage the know-how and labor of hundred thousands of 'clickworkers' who assist Clickworker in the fast and efficient processing of projects realized on behalf of customer company.
3	**Criterion**: QUANDO (When). **Dimension**: Event triggering the initiation of the interaction. **Description**: An open call mechanism is adopted to announce tasks which are the decomposition of a customer's project. From that point onwards, each clickworker chooses from the pool of available projects which tasks s/he wants to take on.
4	**Criterion**: UBI (Where). **Dimension**: Problem space. **Description**: The problem space is almost completely defined owing to the two levels of specifications present in the system: whilst a set of detailed requirements is task-specific, other requirements may be expressed at project-level to guarantee modularity – and, as a result, interoperability – among the various outputs generated by the array of tasks. The relatively small degrees of freedom left to the clickworker have their roots in the simple and repetitive types of tasks generally advertised by means of the platform (e.g., SEO text creation, product description and classification, categorization and tagging of video, audio content, and image materials, address enrichment, data verification, basic on-line research).
5	**Criterion**: CUR (Why). **Dimension**: Motivation for solvers to participate. **Description**: Clickworkers are driven by extrinsic motivation given the opportunity to earn reward amounts: in fact each micro-job is associated to a micro-payment that is credited after the successful completion of the task.
6	**Criterion**: QUANTUM (How much). **Dimension**: Mechanisms of appropriation of the resulting value. **Description**: Clickworkers are compensated on a per-task basis according to the

	type of project and job description. The company reports some ballpark figures with respect to the average hourly rate of pay: the company expects that a clickworker' earnings fluctuate around $9.00 per hour. Looking through the optimistic lens, depending on qualifications, speed, practice, and concentration, a user can presumably earn well over $10.00 per hour. The company, as intermediary and 'assembler' governing the platform, collects a margin on each project which is not defined by a catalogue, but varies from project to project depending on the amount of time involved and the quality requirements.
7	**Criterion**: QUOMODO (How). **Dimension:** Criteria for solver selection and prize assignment. **Description**: Everyone can become a member of Clickworker community provided that s/he has a valid account. However a worker cannot select any available task since tasks available may vary from clickworker to clickworker based on qualification assessments, previous works, education, language abilities, and interests: depending on the personal total profile and qualifications, the worker may be offered some projects or may excluded from others. Prize assignment procedure does not imply a thorough inspection of the work by the requester. In fact, the high quality results are secured by special quality management measures such as statistical process control, audits, peer reviews and evaluation. Moreover, when Clickworker deals with large or complex orders, the company and the requester agree in advance on a test order to ensure correct and faultless processing.
8	**Criterion**: QUIBUS AUXILIIS (By what means). **Dimension:** Organization of external solvers. **Description**: There is no competition among workers: once they select an assignment compliant with their status, no one can challenge their right to be rewarded unless internal quality checks report a bad result. In addition, the consolidated *modus operandi* of Clickworker – based on decomposing an order into tasks and subsequently packaging all the chunks – leaves room for collaborative production, albeit not always perceived by the worker: the successful delivery of the whole project requires a meaningful synthesis of individual production activities that, despite being detached, have to be put in relation.

Table 17 – Case synopsis #8 (Clickworker)

6.3 Archetypal Business Models

Results of the cross-case analysis – which has been carried out in view of the multi-dimensional framework – have been designed again in the form of archetypes (i.e., abstractions derived from multiple specific cases) with the intent to show how most of the acknowledged international cases in the limelight can be attributed to a limited number of 'ideal types' that recur in a multitude of forms, as it happens for 'general' crowdsourcing archetypes. The mapping of resulting business models against the classification framework is visualized in Figure 52.
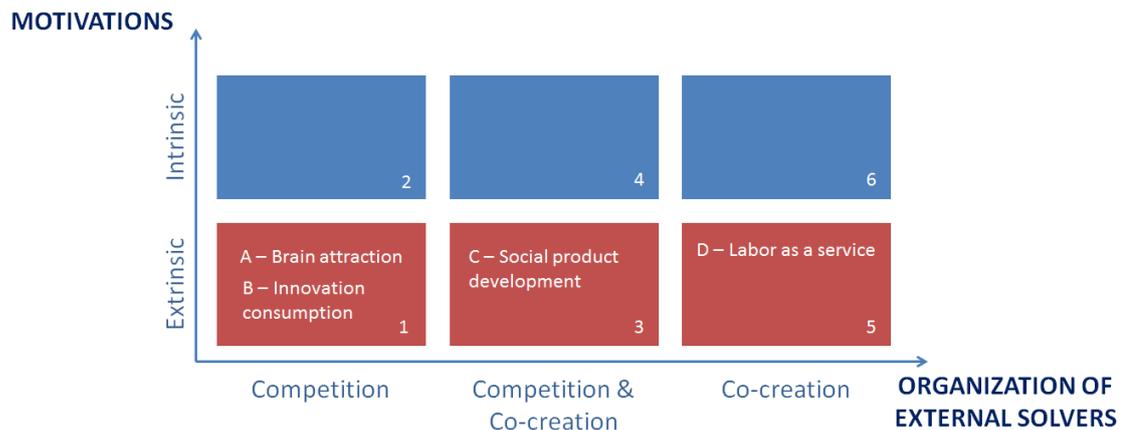

Figure 52 – Mapping of business model archetypes against the classification framework

The description of the archetypes by means of the freshly-coined protocol of analysis, although precise and bespoke, does not allow grasping the 'big picture' of the business logic since it does not unravel the complicated mechanisms that orchestrate the various building blocks in the pursuit of the strategic intent. To overcome this obstacle, in the design phase another tool has been employed in order to visualize archetypal business models at enterprise-level: the "Canvas" (Osterwalder & Pigneur, 2010), i.e., the formalism brought by the Business Model Ontology (Osterwalder, 2004). Even though business models sketched out having recourse to the 'Canvas' are self-explanatory, a few words of comment may help in conveying the gist of each of them.

The archetypal business model A, named 'brain attraction' (Figure 53), portrays a business logic centered on the intermediation of a two-sided market (Rochet & Tirole, 2004) connecting seekers and solvers: the resulting 'knowledge hub' matches organizations having research or creativity problems to be solved without incurring prohibitive search costs, and talented solvers from around the world who are eager to solve such challenges or, generally speaking, competitive contests. The viability of this business model primarily depends on the appropriate balance between the customer bases located on the two sides of the market: following the 'golden rules' of two-sided

markets (Armstrong, 2006; Eisenmann, Parker, & Van Alstyne, 2006), the enabler fixes the price according to the degree of positive externality that each side is able to exert on the other one. As a result, the charged side of the market is − as reasonable − the seekers' one. A company implementing the business model under scrutiny extracts value from the seekers − in exchange to the reduction of search cost and, as a consequence, transaction costs (Bakos, 1998) − by means of upfront fees to list challenges, commissions paid on the awarded amount and, where this option is present, consulting fees charged to top-tier customers for value-added services. Among the variety of case studies, InnoCentive, Kaggle and 99Designs fall into this category.
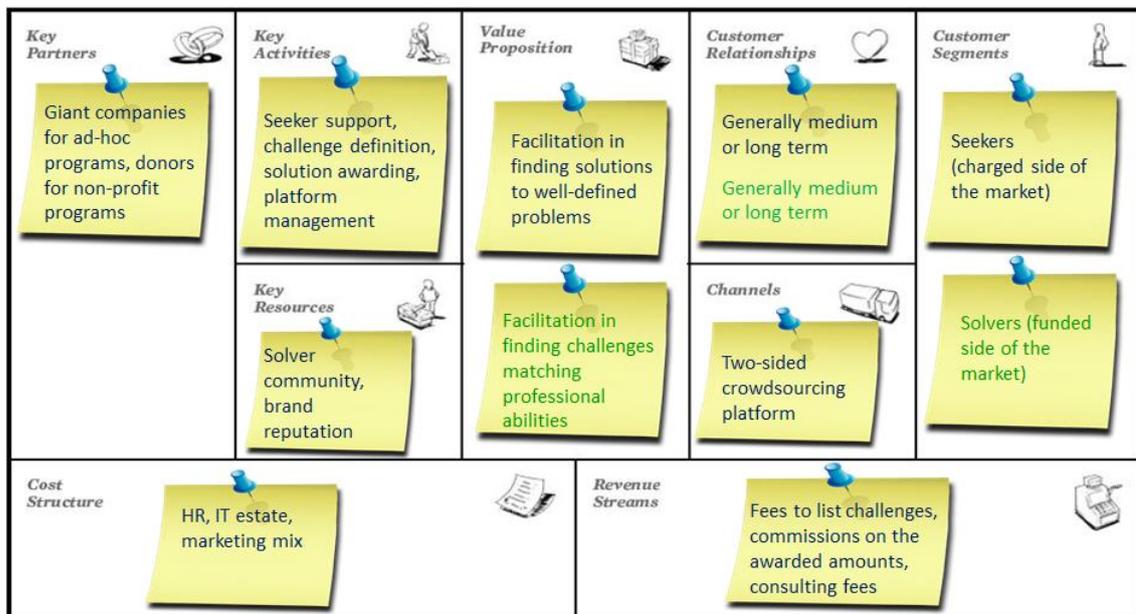

Figure 53 – Archetypal business model A (brain attraction)

The archetypal business model B, dubbed 'innovation consumption' (Figure 54), represents the flagship of a company having a voracious appetite for innovation. The seeker organization connects with a community of expert problem solvers around the world to expose some of its research conundrums and to offers cash prizes for successful solutions developed by external innovators. Dividing ideally the 'Canvas' with a vertical axis of symmetry, it is immediate to note that outside partners are engaged in order to spark corporate innovation processes taking place within the enterprise (in the corporate 'back-end') rather than for the purpose of reselling the innovation sourced externally. Indeed, the epicenter of this business model lies in procurement, since the effectiveness of solutions coming from outside the organizational boundary is reflected in the firm's ability to craft compelling products and services offered to target customers. Looking at the array of case studies, an example par excellence in this vein is P&G Connect & Develop, probably the unique

player that operates at global scale and that exhibits a similar turnover stemming from systematic 'outside-in' innovation.
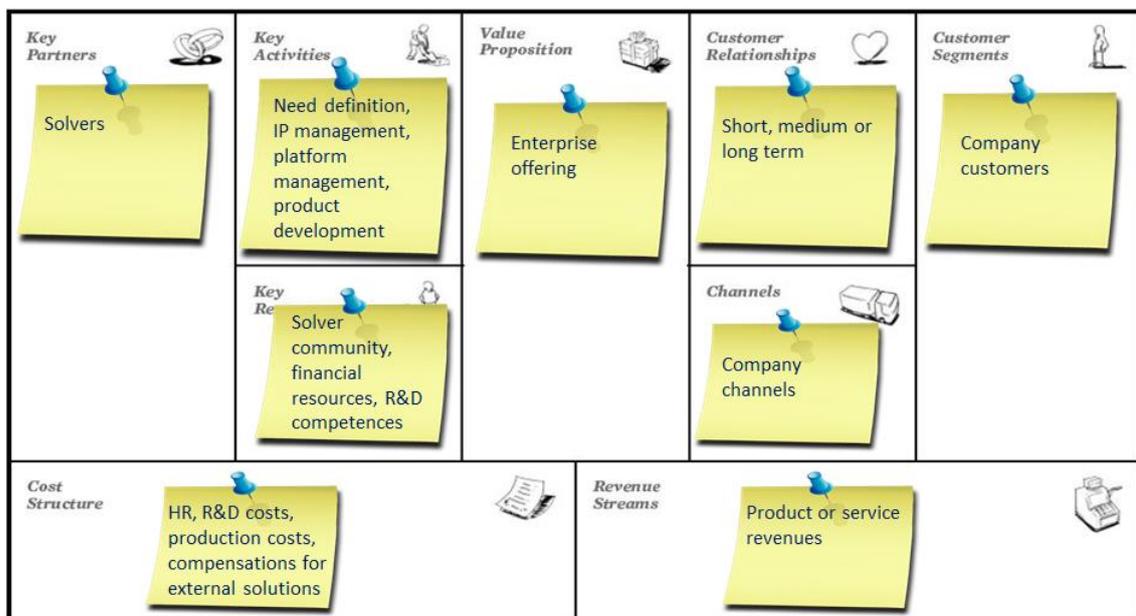

Figure 54 – Archetypal business model B (innovation consumption)

The archetypal business model C, for which I chose the moniker 'social product development' (Figure 55), hinges on the presence of a platform enabling an intense osmosis between a dedicated in-house team and a multitude of external innovators willing to bring products from idea to market. In implementing this business model, the art is to stimulate innovators – both inventors (or artists) and influencers – to rekindle their creativity and to cultivate the sense of belonging to the vibrant community: the notion of 'community' is of paramount importance since members frequently reveal to be the early adopters that purchase brand-new product collectively developed (i.e., the two sides of the resulting market may be occupied by the same individuals). At technical level, the company leverages robust competencies in product scouting, prototyping and product engineering which are pivotal to provide guidance to the restless co-production process. Looking at economics underpinning the business endeavor, the business model has to set minimal but effective barriers to discourage frivolous submissions and, at the same time, to create a 'cash cow' on product sales thanks to well-crafted wholesale and retail strategies that maximize the potential market reach without letting partners (i.e., distributors, external retailers, external wholesalers) erode the value along the supply chain. Case studies representing instances of this archetype are Quirky and Threadless.

Figure 55 – Archetypal business model C (social product development)

The archetypal business model D, known in the present essay with the epithet 'labor as a service' (Figure 56), is another quintessential example of two-sided market. The 'bread and butter' of the company the governs the human intelligence marketplace is to match the needs of requesters with a global, on-demand, scalable and always-on workforce continuously in search for temporary task to be dealt with during spare time or in case of unemployment periods. The enabling actor resorting to this business model centralizes cumbersome operations of coordination (e.g., order decomposition, micro-task assignment, micro-task supervision, quality check) that the requester is happy to completely outsource. Consequently, the 'virtualization' of the labor – already hinted at in the description of the crowdsourcing archetype 'Virtual Factories' – is the centerpiece of the value proposition offered to requesters: this approach oriented to 'servitization' (Baines, Lightfoot, Benedettini, & Kay, 2009) appears very convenient in rendering the cost structure of the customer highly flexible (turning CAPEX into OPEX) and in fostering a quick turnaround of projects also in lack of internal resources and funding. Reasoning in terms of top-line, the major source of revenue for the entity that oversees the human intelligence marketplace is generated by completed orders – either considering them as unique turn-key solutions or simply adding a mark-up to the payment due to the worker on a per-task basis – while fees for added-value services represent the result of successfully cross-selling or up-selling strategies. Amid the palette of case studies investigated in the present thesis, Amazon Mechanical Turk and Clickworker fall under the banner of 'labor as a service'.
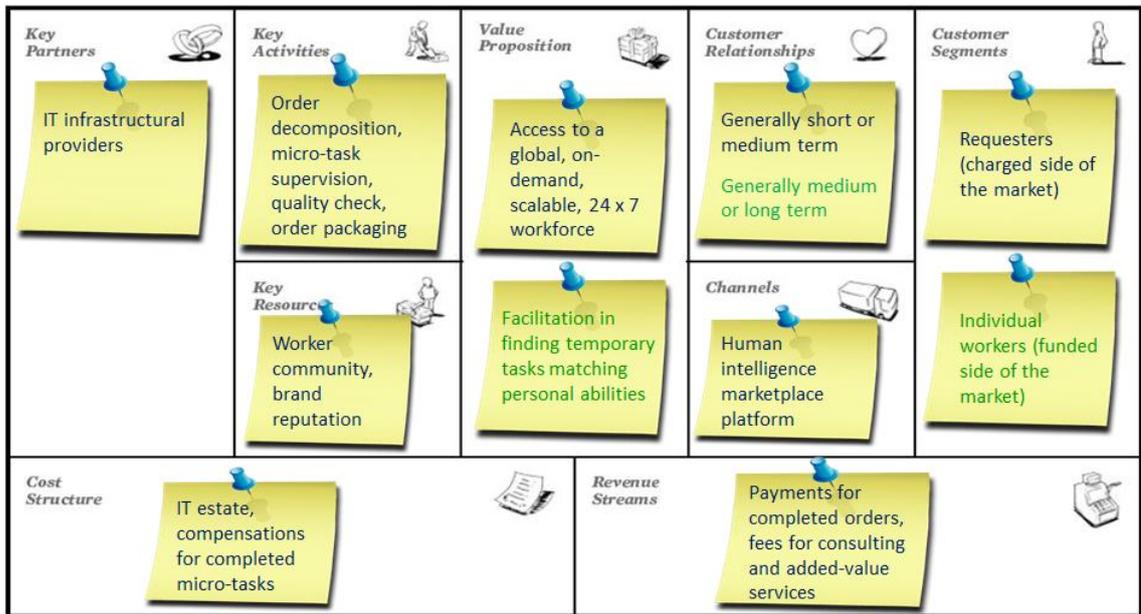
Figure 56 – Archetypal business model D (labor as a service)

7. An Integrated View of Crowdsourcing Models

7.1   A Definition of Extended Governance

A report by Tapscott, Williams, and Herman (2008) highlights that, in the sea of government and public sector activity on the Internet, too many e-Government initiatives are little more than electronic versions of the rack of pamphlets available in every government office. According to such authors, most governments still reflect industrial-age organizational thinking, based on the same command-and-control model as industrial-age enterprises. Bureaucracy and the industrial economy rose hand in hand. The economy needed roads, sewers, electrification, railways and a sophisticated military. As government got bigger, and thereby the revenue of government increased, it became necessary to have more elaborate procedures, structures and controls than were appropriate for an agrarian economy. These helped to ensure some degree of accountability, the reduction of overt patronage and the use of a government job as a payoff for political support. As a result, different departments or agencies were created, run by new layers of professional managers. Hiring practices not controlled by politicians, pay scales, procedures for making appointments, financial systems, audit processes, etc., were put in place. Such agencies grew in size and funding, applying new rules and procedures to ever-increasing layers of staff. All of this was judged to be state of the art at the time and bureaucracy was a very positive term a hundred years ago!

Such bureaucracies have therefore traditionally operated like individual "stovepipes" (Tapscott, Williams, & Herman, 2008) based on the hierarchical chain driven by authority (Kettl, 2000) with information only flowing vertically and rarely between departments. This originates the "silo trap" (Eggers & O'Leary, 2009) affecting those who work in government often stuck in silos and disconnected from others involved in what should be an integrated process.

As put by Tapscott, Williams, and Herman (2008), transforming the deeper structures of government is proving to be an intractable challenge. Deep and resilient traditions combine to frustrate progress, including conflicting time frames and motives, a lack of incentives to innovate and deeply ingrained cultural and institutional legacies.

Established legal and political conceptions of bureaucracy assume that elite groups of experts are in the best position to make dispassionate decisions in the public interest and that these experts have access to the best information. While that may have been broadly true until recently, it is not necessarily true today, as pondered by Brabham (2008a). In theory, ubiquitous information networks can allow organizations to tap the insights of large numbers of people to arrive at decisions and outcomes that are superior

to those presided over by individual experts. Social software such as collaboration tools could, for example, enable public sector organizations to apply the 'wisdom of the crowd' – or more accurately the collective intelligence – to complex social and scientific problems and to vital domains such as health care and education (Tapscott, Williams, & Herman, 2008).

This inarguable evidence calls for a profound change involving every crevice of the government, sometimes intended by thought-leaders as a Schumpeterian 'creative destruction' meant to 'demolish' the Weberian conviction that "the decisive reason for the advance of the bureaucratic organization has always been its purely technical superiority over any other form of organization" given that "bureaucratic administration means fundamentally domination through knowledge": an example in this vein is provided by a widely circulated essay by O'Reilly (2011) who advocates Government 2.0 in the guise of a "government stripped down to its core, rediscovered and reimagined as if for the first time".

In this surge of mainly bottom-up stimuli which are calling a step change in the way the society thinks about government, politics and policy making, one of the pressing challenges is to align this with formal structures and processes at all levels of government (from European to local) but without attempting to take it over (European Commission, 2009).

Trying to strike the right balance between the desire for radical innovation in every nook and cranny of the government and the inescapable need to adhere to existing institutional arrangements, numerous 'mavens' have entered the fray by adding their voice to the long-standing debate on the nature of next-generation government. With this respect, I think that at this juncture it is vital to recognize conditions that are making room for the opening of governmental boundaries and, consequently, for the systematic introduction of crowdsourcing as *modus operandi*, also leveraging practices having their native *locus* outside the public sector boundaries.

As explained by Tapscott, Williams, and Herman (2008), governments no longer have in-house sufficient scope, resources, information or competencies to respond effectively to the policy needs of an interconnected, fast-evolving and unpredictable global environment: policy makers must seek out new partners and participants to help identify problems and create innovative solutions. As a result, these tectonic shifts in technology, demographics, politics and economics are triggering the transition from monolithic government to the next evolution of democratic government. In accordance with this general call for new governmental systems capable of responding flexibly to the challenges of a world of complex systems, Noveck (2009) advocates a new approach for using technology to improve outcomes by soliciting expertise from self-selected peers working together in groups forming open networks.

Looking specifically at policy making, even though many factors may influence the success or failure of public endeavors, one aspect in particular has been identified as fundamental by Cottica (2010). According to him, in fact, most public policies fail due to a deficit of attention. The wide portion of the attention that the public sector may offer is usually allocated to monitoring, supervising and influencing major policy actions. Due to the limited resources available in the public sector – in terms of both time and money (which are not uncorrelated) – residual (and thus scarce) attention is devoted to a number of issues (sometimes minor or local or simply neglected) which are eclipsed in spite of generating significant impacts on the citizenship. The author, in an attempt to hinder this attention shortage that leaves critical aspects of public policy almost unattended, proposes 'Wiki policies' (in analogy with the well-known Web encyclopedia): by means of crowdsourcing, constituencies co-create policies in collaborative 'labs' enabled by today's Web technologies. Arguing that the effectiveness of a public policy is inversely proportional to the degree of control in the hands of authorities, Cottica (2010) formulates the *mantra* of "losing control to gain effectiveness", in step with the foundations of crowdsourcing doctrine.

In this respect, ICTs may allow to create decision processes relying on distributed attention, thus enabling a new form of governance whereby the intelligence and the participation of actors residing outside governmental boundaries are harnessed in the management of public resources (Raguseo & Ferro, 2011). The lowering of communication and coordination costs brought by ICT, coupled with the emergence of behaviors driven by non-financial motivations and reputational incentives, has ignited a process that through sharing and collaboration leads to collective action.

Thanks to advanced ICT tools – for instance Policy Gadgets previously described – the eyes and the brains of people may be turned into useful governmental 'antennas' – in line with the 'citizen as sensor' approach (Seltzer & Mahmoudi, 2012) – which can help to oversee the intricacy of processes and functions that would otherwise be impossible for local administrations to constantly monitor. In addition, creativity and knowledge residing in citizens' brains – if harnessed – may significantly contribute to improve the outputs of the policy making cycle by allowing it to be more demand-driven, to tap into additional skills and competences and to analyze the problems at stake from a multitude of perspective and cultural backgrounds thus reducing the risk of biased or oversimplified problem setting (Ferro, Caroleo, Leo, Osella, & Pautasso, 2013).

This relentless convergence involving, on the one hand, organizations that are gradually opening up their institutional boundaries in order to proactively answer to environmental changes and, on the other hand, citizens who are playing an increasing role in the context of e-Government has lead my reflection to the definition of the 'extended governance'.

Owing to the usage of the locution 'extended governance' – and the same holds for 'governance' (see section 5.1) – for extremely diverse purposes, it appears frequently as a cryptic expression. Therefore, along my research path – piecing together the scattered fragments of the 'next-generation governance' puzzle to form a meaningful picture – I have been inspired to coin a brand-new working definition in an attempt to reasonably capture the prominent aspects to which I have devoted more time and attention. My definition of 'extended governance' is about a governance model that harnesses the potential of collective intelligence by acting as a switchboard connecting a distributed and networked community.

Going beneath the surface, my definition of 'extended governance' can be characterized by looking at four distinctive properties that I have formulated by making reference to ideas coming from renowned mavens who have been engaged in the debate about next-generation governance. This connection is aimed at reconciling the novel connotation of 'extended governance' with the eminent contributions that have gained a widespread popularity within academy and well beyond.

Extended governance leverages network dynamics. First of all, a government implementing extended governance results in an agile and 'tentacular' structure that goes far beyond the traditional public perimeter thanks to an intense osmosis with the society in its various components. A government doing this not only makes its boundaries porous to external ideas and human capital (as it happens looking at the well-known permeable surface of the 'innovation funnel' shown in Figure 4), but also becomes the fulcrum around which a constellation of public, private and/or civil society participants gravitate. Consequently, pluralistic, networked forms of government theorized by Newman (2001), Hartley (2005), Tapscott, Williams, and Herman (2008), and Nambisan (2008) can take shape in the realm of extended governance: being the leading organizational form for greater innovation, agility and citizen participation (Tapscott, Williams, & Herman, 2008), networks become the 'operational arm' of the public body, performing activities once representing the exclusive domain of single public agencies or institutions.

Extended governance turns the government into a platform. Owing to the presence of collective intelligence as lifeblood of the resulting organizational schema, the extended governance leverages innovation, knowledge and stimuli from the market and the civil society. As a result, the model proposed drifts away from the outdated "vending machine government" (Kettl, 2008) to embrace the "bazaar" (Raymond, 1999) metaphor that depicts a collaborative development model that ushers in an unprecedented ecosystem of participation involving a variety of stakeholders: while in the vending machine model the full menu of available services is determined beforehand, in extended governance the "generativity" (Zittrain, 2009) of external innovators who build on top of the platform (O'Reilly, 2011) create an entire new breed

of ideas, services, solutions, policies and proposals that cannot even be conceived in the 'ivory towers' of closed-door government. For this to happen, it is required a radically new approach to the design of programs, not as finished products, perfected in a congressional bill, executive order, or procurement specification, but as ongoing experiments (O'Reilly, 2011) in compliance with 'perpetual beta' approach peculiar to the Web 2.0 realm.

Extended governance opens the government not only for the sake of transparency. Looking at intersection of technology, government and politics, the notion of 'open government' has made a dent in the quest for next-generation governance model. Although the Open Government Initiative of the US federal government[35] – quintessential example in this vein – urged the implementation of three wide-ranging principles (i.e., transparency, participation, and collaboration), it is anything but rare that only the first one is under the spotlight due to frequent desire of the public opinion to render more transparent and accountable (ideally in the guise of 'glass houses') governments whose authority is undermined by a crisis of legitimacy and relevance (Tapscott, Williams, & Herman, 2008). Running a parallel with the 'enterprise 2.0' (McAfee, 2006) in the private sphere, extended governance intends to pave the way for a full-fledged 'government 2.0' (Chun, Shulman, Sandoval, & Hovy, 2010) in which the ground rules for Web 2.0 (O'Reilly, 2007) make it possible the provision of a new constellation of services by and for citizens through the reuse of government data and tools. As the inherent decentralized nature of Web 2.0 stimulates a mass participation in generation, filtering and rating of contents, in the same way extended governance considers 'citizen-sourcing' (Nam, 2012), or 'we-Government' (Linders, 2012), as dominant design in government operations. The adoption of this paradigm in extended governance clearly indicates the shift in public role towards a third-party coordinator (Nambisan, 2008) – an "enabling state" (Wallace, 2013) – while citizens move from users and choosers to makers and shapers (Cornwall & Gaventa, 2000). The benefits from making this change include improved quality of service, reduced investment of public resources, and increased ability to mobilize rare public resources (Lee, Hwang, & Choi, 2012).

Extended governance ushers in new opportunities for grassroots participation. As argued by Shirky (2008), the capacity of the Internet and its users to "organize without organizations" is paving the way to new organizational forms. Social tools are gradually becoming a novel connecting tissue that drastically reduces transaction costs (Coase, 1937; Williamson, 1975) allowing loosely structured groups with limited managerial oversight to operate under the Coasean floor (i.e., threshold under which activities carried out are valuable to someone but too expensive to be taken on in any institutional

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[35] http://www.state.gov/open/

way, because the basic and unsheddable costs of being an institution in the first place make those activities not worth pursuing). While acknowledging this evidence, the extended governance model – instead of pruning activities conducted 'at the periphery' in the name of efficiency – takes advantages of the blooming of distributed and loosely coupled assemblages dealing with tasks for which the direct governmental presence remains uneconomic also after the collapse of transaction costs: new organizational forms acting as governmental 'offshoots' can now operate on a scale previously not exploited and, thus, connect new groups and competencies to the governmental ambit.

7.2 Towards an Outcome-Based Government

The final step has to do with the actual implementation of the extended governance model, which has to be operationalized by means of simple and actionable guidelines.

At this juncture, in fact, taking stock of the lessons learnt from the PADGETS experience, the in-depth examination of real cases and the resulting framework, I have distilled the 'outcome-based government'. The locution has its roots in the belief that governmental actions have to demonstrate a clear link with their results (or outcomes) generated in terms of value for the governments (e.g., efficiency, effectiveness) and, above all, value for society. This pressure seems to be especially exacerbated in a period when public budget constraints are tighter than ever.

In this perspective, the concept of public value can provide an interesting point of view, acting as a backdrop for exploring the various ways in which value may be created (or perhaps enabled) through the systematic exploitation of crowdsourcing.

It has been two decades since the public value framework emerged, articulated by Moore (1995). By and large, public managers who have been exposed to the idea have embraced it enthusiastically (Alford & O'Flynn, 2009) whereas academics have been divided: whilst some are intrigued by it (Stoker, 2003; Talbot, 2011), others are quite hostile to it (Rhodes & Wanna, 2007).

Put it simply, the value delivered to shareholders is the private sector's ultimate measure of a company's success. However, in the public sector, where stakeholders replace shareholders, there is no single or simple 'bottom line' for gauging success. In a broad sense, the focus on public value is the analogue of the desire to maximize shareholder value in the private sector: in fact, according to Kelly, Mulgan, and Muers (2002), all governments should want to maximize 'public value added', i.e., the benefits of government action when weighed against the costs (including the opportunity costs of the resources involved). In light of that vision, the public value concept stimulates public managers to think about what is most valuable in the service that they run and to consider how effective management can make the service the best that it can be (Coats & Passmore, 2008).

It goes without saying that this notion of public value does not connote a monadic structure, but rather a collection of ingredients giving life to a multi-faceted 'value mix' going far beyond traditional public financials. Such 'values' in public value vary considerably according to different authors.

A 2002 report by the UK Cabinet Office's Strategy Unit suggests that public value can be understood in three dimensions (Kelly, Mulgan, & Muers, 2002):

- Services, since public value is created through delivery of high-quality services that create user satisfaction.
- Outcomes, such as security, reduced poverty, public health. The achievement of these goals can overlap with, but is distinct from, services.
- Trust, with reference to the relationship between citizens and the public authority. It is often the most neglected element, but a lack of trust, even where services are well-delivered, reduces public value and can hinder a public service's capacity to create it elsewhere.

Cresswell, Burke, and Pardo (2006), for their part, assert that public value may be subdivided in two components, i.e., the value to the public that results from improving *intra moenia* the government itself, and the 'broader' value that results from delivering specific benefits directly to persons or to groups or to the public at large.

Less schematic is the formulation of Hills and Sullivan (2006), which is hinged on clusters of core values, some of these overlap or blend into one another. On the one hand, there are clusters relating to the process of public service delivery: these include New Public Management values (Hood, 1991) of efficiency, effectiveness and cost effectiveness as well as broader values such as involvement of the public, transparency, equity, authorization and trust. One the other hand, there are clusters of values that relate to the outcome of public services: examples in this vein are quality of life, wellbeing and happiness; social capital, social cohesion and social inclusion; safety and security; equality, tackling deprivation and social exclusion; promoting democracy and civic engagement.

Another ample view is the one expounded by Benington (2011), who embraces a wide scope of areas:

- Economic value, through the generation of other economic activity and employment.
- Social and cultural value, by contributing to social cohesion, social relationships, cultural identity, individual and community well-being.
- Political value, by stimulating democratic dialogue, active public participation and citizen engagement.

A complementary three-tier perspective is the one that comes from Benington and Moore (2011). Their approach pinpoints a notion of public value that consists of three distinct but interrelated processes whose alignment takes a strategic importance: clarifying and specifying strategic goals and public value outcomes; creating the environment necessary to achieve these outcomes; and utilizing the required operational resources, such as staff, skills and technology.

The breadth of the spectrum covered by the moniker 'public value' begs the question of why it might be used instead of other terms such as 'public goods', 'public interest' or 'public benefit', or indeed how it differs from them. As clarified by Alford and O'Flynn (2009), public value includes but is not limited to public goods. Both public value and public goods entail goods which are jointly consumed, and which to a greater or lesser extent are non-excludable and indivisible, but they differ in three important respects. One is that public value entails a wider range of things than those encompassed by public goods. For a start, it includes remedies to market failures of various types besides public goods (e.g., negative externalities, natural monopolies, imperfect information); concomitantly with these solutions to forms of market failure, citizens also value the institutional arrangements which enable markets to operate and societal orderings to function, such as the rule of law, maintenance of order, and mechanisms for the protection of property rights and enforcement of contracts. The second difference is that public goods are, strictly speaking, outputs, i.e., products and services produced by the public organization. By contrast, public value encompasses not only outputs but also outcomes, i.e., impacts upon those who enjoy the value/good in question or upon states of nature important to those people. The third and final difference has to do with the focus put on what has meaning for people, rather than what a public sector decision maker might presume is best for them: more significantly, public value connotes an active sense of adding value, rather than a passive sense of safeguarding interests.

The notion of public value spawned the development of performance measurement/management frameworks, attracting the attention of several enthusiasts. Taking this stance, Kelly, Mulgan, and Muers (2002) discuss public value as an analytic framework for public sector reform where public value becomes "the value created by government through services, laws, regulations and other actions" thereby creating a "rough yardstick against which to gauge the performance of policies and public institutions".

The documented complexity in following this approach derives from the extremely vast scope of inquiry needed to identify and document public value creation. Some attempts have tried hitherto to find an answer to the nagging question: "How can we observe, measure, and document the creation of value for the public?". Cole and Parston (2006) crafted the Accenture Public Service Value Model's methodology for measuring how well an organization achieves outcomes and cost-effectiveness over a period of years

and, adopting a sectorial perspective, Cresswell, Burke, and Pardo (2006) outlined a public value framework for the ROI analysis of government IT estate.

Despite some difficulties in operationalizing the concept through wide-ranging measurement systems, the notion of public value may offer a promising way of measuring government performance and guiding public decisions.

In relation to the present thesis, the notion of public value offers a more evidence-based lens through which policy makers can look at extended governance, shifting their emphasis from activities to results, from outputs to outcomes, and from how a program operates to the good it accomplishes.

Along these lines, crowdsourcing appears as core ingredient in the 'recipe' that governments may choose in the coming future to tap the potential of collective intelligence – asset that today seems certainly underexploited – in order to tackle complex and "wicked" (Rittel & Webber, 1973) public management problems. However, it goes without saying that this notion of crowdsourcing in the realm of outcome-based government does not connote a monadic structure, but rather a collection of practices giving life to a multi-purpose and adaptive toolbox. The resulting definition of outcome-based government portrays a governmental operating at diverse administrative levels which combines – through variegated modalities – the two 'souls' of crowdsourcing-enabled user engagement, i.e., participation (born in the public sector, as it happened with PADGETS) and problem solving (frequently imported *mutatis mutandis* from the private sector). Peculiar traits of the two 'souls' of crowdsourcing-enabled user engagement are reported (with some approximation) in Table 18.

Criterion	Participation	Problem solving
Objective	Opinion gathering	Solution collection
Expected result	Legitimacy	Tackling of grand challenges
Crowdsourcing approach	Wide	Wise
Focus	How	What
Motivation to participate	Intrinsic	Intrinsic and extrinsic
Users' driving force	Collaboration	Collaboration and competition
Prominent metric	Number of individuals involved	Number of top-notch solutions
Signal-to-noise ratio	Low	High

Table 18 – Participation and problem solving as crowdsourcing ideal-types in the outcome-based government

Although these two ideal-types appear *ictu oculi* as very dissimilar, if not in a dichotomy, their complementary role generates the 'cocktail' of collective intelligence for which forward-looking policy maker are longing. In fact, in some circumstances the outcome-based government requires to call on the public in modern *agorae* to collect opinions coming from a vast range of constituencies (so 'wide' crowdsourcing) whose participation is primarily solicited by the sought for legitimacy in policy making. On the other hand, the outcome-based government may want to leverage the collective intelligence residing in the society in order to come up with top-notch solutions (so 'wise' crowdsourcing) for tackling grand challenges. All along the *continuum* stretching from participation to problem solving, the outcome-based government may find new opportunities that generate value: this frequently happens not by 'reinvent the wheel', but by selectively picking smart practices having their native *locus* outside the public sector boundaries.

To conclude, the value orientation applied to extended governance results in a pragmatic change-management tool particularly needed in the public sector. Participation, problem solving and a plethora of other unexpected halfway *modi operandi* create a precious synthesis that may ideally represent the first milestone in the path taken by public bodies which have decided to dip their toes into the challenging but rewarding water of crowdsourcing.

8. Conclusions and Opportunities for Future Research

This thesis represents symbolically the final act of a challenging and highly multidisciplinary study that has immersed me completely for three years at the intersection of innovation management, technology and policy.

The study has its root in the conviction that hitherto there has not been a thorough understanding of the logics used to source, aggregate and capitalize on contributions coming from the crowd; this is a common thread running through the entire spectrum of crowdsourcing, spanning the gamut from the public sector to the private one. Taking stock of this evidence, the thesis aspires to provide a sound basis for clear comprehension and systematic exploitation of crowdsourcing in its multifarious forms. To this end, the research journey has been intended to bridge the prominent gaps found in the various strands of literature examined:

- Paucity of definitional precision.
- Blurred contours of crowdsourcing, which generate frequent overlap with other concepts (open innovation, open source, Web 2.0, just to name a few).
- 'Humanistic' view characterizing mainstream studies (i.e., descriptive and sometimes contemplative method).
- 'Polyphonic' view characterizing mainstream studies (i.e., research perspectives may vary noticeably according to phenomena of interest to each scholarly discipline, without a path of convergence).
- Abundance of anecdotal evidences coming from 'stand-alone' exemplary cases.
- Dearth of systematic approach (i.e., exiguous number of contributions meant to schematize distributed problem solving models in a way suitable to be generalized).

Advancements with respect to the state of the art may be recapitulated looking at findings obtained in response the three research questions that triggered my reflection.

Apropos of the first research question, the empirical observation of real world crowdsourcing examples and the subsequent formalization of archetypal models result in a brand-new framework that provides an unprecedented basis for clear comprehension and systematic exploitation of crowdsourcing. Such a framework categorizes different crowdsourcing archetypes in view of the combination of motivations that pushes the crowd to answer the open call and the organizational model for external solvers. Among the numerous significant elements of novelty brought by this framework, the prominent one is the 'holistic' approach which combines both profit

and non-profit, trying to put private and public sectors under a common roof in order to examine in a whole *corpus* the multi-faceted mechanisms for mobilizing and harnessing competence and expertise which are distributed among the crowd.

In the matter of the second research question, the in-depth examination of participatory mechanisms in policy making and the comprehensive cross-industry study investigating crowd involvement as business model game-changer shed light on mechanisms to unlock the potential of collective intelligence and to transform it into concrete benefits that could be smoothly internalized either by the public or by the private sector. In the public sector, action research – combining in-depth theoretical studies and intensive fieldwork activities – allows systematizing how crowdsourcing can be fruitfully incorporated into the policy lifecycle by leveraging social media with the purpose of providing policy makers with a frictionless mechanism to collect fresh and relevant ideas (and opinions) coming from the citizenry. In the private sphere, case study research provides the foundation to distill archetypal business models already underway which put crowdsourcing at the heart of the company to tap – in the pursuit of profit – the collective and distributed intelligence disseminated in the crowd.

Talking about the third research question, the coalescence of all afore-mentioned bodies of knowledge represents a solid background for the proposition of guidelines outlining a potential next-generation governance model to be operationalized by orchestrating the two 'souls' of crowdsourcing-enabled user engagement, i.e., participation and problem solving. Although still in their infancy, the notions of 'extended governance' and 'outcome-based government' could represent a source of inspiration for policy makers looking for actionable insights to tackle complex and 'wicked' public management problems often characterized by sizeable magnitude, extended footprint and absence of one-size-fits-all solutions. With this respect, feedback coming from attempts – albeit piecemeal and sporadic – to put such models at work will be precious to corroborate or rethink some of the findings presented in this thesis.

In the conclusive remarks it is crucial to discuss also some of the limitations that characterize the presented work, as they may represent an interesting starting point for future research.

In spite of the methodological rigor, external validity may represent the Achilles' heel of every empirical inquiry profoundly related to the context. External validity (or generalizability) is grounded in the intuitive belief that theories must be shown to account for phenomena not only in the setting in which they are studied, but also in other settings (Calder, Phillips, & Tybout, 1982; McGrath & Brinberg, 1983). Concerning the study on the public sector carried out in the PADGETS consortium, for instance, although I conducted an in-depth review of other remarkable exemplars of 'policy making 2.0' during my research journey making reference to cases finally

featured in CROSSOVER report[36], analytical generalization appears tough. This is due to contextual variables (e.g., geographical area, relevance of the topic at stake, sudden appeal of the policy topic in the citizenry due to shocking events, very charismatic celebs entering the fray) playing a very significant role in the success or failure of a given participatory initiative (Osella, 2013).

Moreover, looking specifically at my personal research trajectory, the commitment to the PADGETS project consortium has left a limited effort available for primary research in the private sector. As a consequence, this situation has created to some extent a partial imbalance among the multiple sources of evidence required by the principle of data "triangulation" (Stake, 1995) in case study research.

Besides these issues, the thesis presents stimuli for further studies. Trying to envisage future works based on this research endeavor, in a short-term perspective it will be worthwhile a reality check with respect to the scalability of the approach that I have coined supporting the PADGETS team. To meet this objective, the Policy Gadget approach can be proposed as underpinning framework for a series of large scale-pilots to 'stress test' its scalability. By undertaking this 'litmus test', there will be also the chance for fine-tuning, which seems to be essential for making the leap from project to process and hopefully to transform Policy Gadget in a 'mainstream' crowdsourcing practice.

In a medium-term phase, it will be extremely interesting to conduct a follow-up of the present study that juxtaposes crowdsourcing and design thinking as alternative approaches to search for practical, creative resolution of problems. In fact, there is no doubt that a thorough examination of approaches aimed at tackling 'wicked' problems has to go beyond crowdsourcing in order to test the waters of other strategies that are gaining consensus in these very years as antidote to traditional and outdated forms of decision making. In last decades, "design thinking" (Rowe, 1987) has gained recognition as an alternative approach to problem solving that eschews simple (and simplistic) linear process of decision making, accepts indeterminacy (Buchanan, 1992) and moves nimbly between the abstract and the concrete as well as between analysis and synthesis (Beckman & Barry, 2007) in search for practical, creative resolution of problems or issues.

Finally, such a comparative study paves the way for a long-term, incremental and iterative process aimed at collecting novel repertoires of tools and strategies capable to profoundly influence the way we deal with the most pressing issues of our planet. Probably, that is the ultimate aim of every researcher.

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[36] http://crossover-project.eu/Portals/0/0313F01%20Case%20Studies%20on%20specific%20ICT%20solutions%20for%20Policy%20Modelling.pdf

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