

DEVELOPING PUBLIC SECTOR CITIZEN-SOURCING METHODS

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Abstract

The public sector, motivated by the multiple ‘success stories’ of the ‘open innovation’ paradigm, and especially the crowdsourcing, in the private sector, and also by the increasing complexity of social problems and needs, has started moving in this direction as well, and this gives rise to the gradual development of the ‘citizen-sourcing’. However, there has been much less research and practice in the area of public sector citizen-sourcing in comparison with the area of private sector crowd-sourcing, so there is much less knowledge and maturity in the former area than in the latter. This paper makes a contribution towards filling this gap. It provides an overview of the research that has been conducted in this area by the research group of the author in the last decade as part of several European projects, concerning the application in the public sector of the crowdsourcing ideas, and the development of ICT-based methods for this purpose. In particular, we present four such ICT-based methods for public sector citizen-sourcing we have developed, for both ‘active’ and ‘passive’ citizen-sourcing, initially aiming at the general public and latter focusing on the knowledgeable experts. Furthermore, we propose directions for future research in this area.

Keywords: crowd-sourcing, citizen-sourcing, government, policy, innovation.

1 INTRODUCTION

Private sector firms have shifted from the established ‘closed innovation’ paradigm, which is based on internal information, knowledge and ideas, towards the ‘open innovation’ paradigm, which exploits to a large extent also external information, knowledge and ideas, possessed by other firms (e.g. suppliers, customers, business partners, research centers, universities, etc.), as well as by ‘crowds’ of individuals, this latter giving rise to the development of the ‘crowd-sourcing’ (Chesbrough, 2003a, 2003b and 2006; Brabham, 2008, 2012 and 2013; Huizingh, 2011; West et al., 2014). Open innovation is defined as ‘the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively’ (Chesbrough, 2006). Open innovation research and practice initially focused mainly on the exploitation of external information, knowledge and ideas of other organizations, such as suppliers, customers, business partners, research centers, universities, etc. (organizations oriented open innovation). However, later there has been extensive interest in the exploitation of external information, knowledge and ideas possessed by ‘crowds’ of individuals as well (individuals oriented open innovation), taking advantage of the capabilities offered by modern ICT, and especially the Internet, and this led to a rapid development of ‘crowd-sourcing’ (Howe, 2006 and 2008; Brabham, 2008, 2012 and 2013). Crowdsourcing is defined as ‘a new web-based business model that harnesses the creative solutions of a distributed network of individuals, in order to exploit ‘collective wisdom’ and mine fresh ideas from large numbers of individuals’ (Brabham, 2008). There has been extensive research for the identification and development of effective practices for open innovation, and especially crowd-sourcing, in the private sector, the assessment of their effectiveness and also the discovery of the specific contexts each of them is more appropriate for (a brief review of this research is provided in section 2.1).

The public sector, motivated by the multiple ‘success stories’ of this new innovation paradigm, and also by the increasing complexity of the social problems and needs, has also started moving in this direction as well, and this has given rise to the gradual development of the ‘citizen-sourcing’ (Linders, 2012; Nam, 2012; Mergel and Desouza, 2013; Ferro et al., 2013; Prpić et al., 2015b). In particular, government agencies increasingly attempt to use ICT, and in order to exploit the extensive information and knowledge possessed by citizens, and also their creativity and ideas, in order to develop highly efficient and effective new innovative public policies, and also improvements of existing ones, or adaptations of them to new needs and conditions in society (a brief review of this research is provided in section 2.2). However, there has been much less research and practice on public sector citizen-sourcing in comparison with the private sector crowd-sourcing, so there is much less theoretical basis, experience and maturity in the former area than in the latter. It is therefore necessary to develop effective and theoretically sound ICT-based methods for citizen-sourcing, which enable the efficient retrieval of policy relevant information, knowledge and ideas from citizens, and then the advanced processing of them in order to calculate useful policy analytics that can provide substantial support for public policy making.

This paper aims to contribute towards filling this gap. It provides an overview of the research that has been conducted in this area by the research group of the author in the last decade as part of several European projects, concerning the application in the public sector of the crowd-sourcing ideas, and the development of ICT-based methods for this purpose. In particular, we present four such ICT-based methods we have developed, which concern both ‘active’ and ‘passive’ citizen-sourcing, extracting relevant information, knowledge and ideas from the general public and the knowledgeable experts as well, using both web 1.0 and web 2.0 oriented ICT tools:

- i) The first method involves ‘active expert-sourcing’, using a web 1.0 oriented government operated structured e-consultation forum (section 4).
- ii) The second method involves web 2.0 oriented ‘active citizen-sourcing’ using social media accounts of government agencies, in which government has an active and directive role, posing a particular social problem or public policy direction, and soliciting relevant information, knowledge, opinions and ideas from citizens (section 5).
- iii) The third method involves web 2.0 oriented ‘passive citizen-sourcing’ using social media as well, but going beyond the accounts of government agencies, and exploiting political content developed by citizens in various external social media not belonging to/controlled by the government (e.g. external political blogs, fora, news websites, and also external Facebook, Twitter, etc. accounts) (section 6).
- iv) The fourth method involves ‘passive expert-sourcing’, aims to exploit policy relevant information, knowledge and ideas published by experts in external social media (section 7).

For all the above four methods of ICT-based citizen-sourcing by government agencies we describe the techniques used for the collection of external policy relevant content, and then for its processing in order to calculate from it useful ‘policy analytics’, which provide support for the development highly efficient and effective new innovative public policies, and also improvements or adaptations of existing ones; also we provide an overview of the conclusions of their first evaluations.

This paper is structured in eight sections. The following section 2 reviews relevant previous literature concerning private sector crowd-sourcing and public sector citizen-sourcing. Then in sections 3 is described the common methodology adopted for the development of the abovementioned four ICT-based citizen-sourcing methods, which are then presented in sections 4, 5, 6 and 7. Finally section 8 summarizes conclusions and provides future research directions.

2 LITERATURE REVIEW

2.1 Private Sector Crowd-sourcing

Extensive research has been conducted for the identification and development of efficient and effective practices of open innovation in the private sector, the assessment of their effectiveness and also the understanding of the specific contexts each of them is more appropriate for (Laursen and Salter, 2006; Pisano and Verganti, 2008; Huizingh, 2011; Inauen and Schenker-Wicki, 2011; Bellantuono et al., 2013; Mina et al., 2014; Felin and Zenger, 2014; Arvanitis et al., 2015). In the following we review some indicative studies, which are representative of the kind of research that has been conducted in this area. Pisano and Verganti (2008), based on extensive previous qualitative research and consulting, identify four main types of open innovation practices, which differ in two dimensions: openness (= to what extent can any interested actor – organization or individual - participate) and degree of hierarchy (= to what extent there is a dominant actor who defines the problem and selects the best solution(s)). The first of them is the ‘innovation mall’ (open – hierarchical), in which the owner firm can post a problem and any actor can propose solutions, from which the firm finally selects the best one(s). The second is the ‘innovation community’ (open – nonhierarchical), which is a network where any actor can propose problems and/or offer solutions. The third is the ‘elite circle’ (closed - hierarchical), in which a selected group of experts chosen by the owner firm, in order to address a specific problem defined by the latter, which finally selects the best of the proposed solutions. The fourth is the ‘consortium’ (closed - flat), which is a group of organizations that jointly select problems and choose solutions. Furthermore, for each of these four main types of open innovation practices its main advantages and challenges are identified, as well as the kinds of problems it is appropriate for, and the required firm’s capabilities for its effective application. Bellantuono et al. (2013), based on extensive review of relevant literature, conclude that a big variety of open innovation practices have been developed in the private sector, which can be described in terms of the following nine variables: access mode (= the extent of pre-qualification of external knowledge sources), degree of formality (= the extent to which the communication between the knowledge source and the recipient firm is based on predefined procedures and protocols), incentives (= the drivers that motivate the knowledge source provide its knowledge to the recipient firm), interaction mode (= the way the recipient firm and the knowledge source interact), information flow (= whether it is ‘mono-directional’ or ‘bi-directional’), locus of control (= the actor(s) making the main decisions), coordination mode (= the way the interdependences between knowledge recipient and source are managed), output (= the existence of limitations concerning the access on the results) and coordination form (= the kind of relationships between knowledge source and recipient). Furthermore, the same study identified five context characteristics that determine the suitability of each of these multiple open innovation practices: knowledge owned by the recipient to address the innovation problem, knowledge owned by the recipient to define the innovation problem and evaluate solutions, interest and easiness of the knowledge source to participate in the innovation project, recipient’s collaborative architecture and criticality of the knowledge supply. Finally, associations between the above context and open innovation practice variables are proposed (for specific values of the context variables are recommended appropriate values of the open innovation practice variables). Felin and Zenger (2014) identify six main types of innovation practices, differing mainly in (a) the communication channels they use for knowledge sharing, (b) the types of incentives, and (c) the types of property rights practices: four types of open innovation practices (partnerships/alliances, markets/contracts, contests/platforms and user/ community innovation), and also two types of closed innovation practices (authority-based hierarchy and consensus-based hierarchy). Also, they determine for what kind of innovation problems each of them is appropriate for; they find that the main characteristics of an innovation problem that determine which is the optimal type of innovation practice for addressing it are the degree of ‘problem complexity’, and also the degree of ‘hiddenness’ of the required knowledge. They conclude that as innovation problems become more complex, firms should adopt practices that facilitate extensive external knowledge sharing; on the contrary as innovation problems become simpler, the firm adopts practices that motivate more autonomous trial and error search of solutions within the firm based on internal knowledge. Furthermore, for innovation

problems that require hidden knowledge (i.e. whose source is not known to the firm), firms should adopt practices that broadcast problems widely, so that relevant knowledge can be ‘self-revealed’.

Another relevant research stream investigates empirically the effects of various open innovation practices, or specific characteristics of them, on firms’ innovation performance. For instance, Laursen and Salter (2006) define two measures of openness of firm’s innovation processes, the breadth of search (defined as the number of external knowledge sources searched by the firm), and the depth of search (defined as the extent to which the firm draws knowledge deeply from these external sources), and investigate empirically their effects on firm’s innovation performance. Based on data from 2707 UK manufacturing firms they estimate several innovation models, leading to the conclusion that both breadth and depth of search have a curvilinear (inverted U-shape) relationship with innovation performance: initially they both have positive impacts, but increasing them beyond their ‘optimal levels’ reduces innovation performance (revealing negative ‘over-search’ effects). Inauen and Schenker-Wicki (2011) investigate empirically the effect of different open innovation practices on innovation performance, using data collected from 141 stock-listed companies from Germany, Switzerland and Austria. They conclude that innovation collaborations with customers, suppliers and universities have positive impact on innovation performance. Arvanitis et al. (2015) investigate empirically the impact of two external knowledge acquisition practices, ‘buy’ (through a contract of knowledge transfer, or external R&D) and ‘cooperate’ (meant as active - formal or informal – cooperation with other firms and research institutions), on firm’s innovation performance, based on data from 1419 Swiss firms and 2547 Dutch firms. Their results suggest that both ‘buy’ and ‘cooperate’ practices have positive effects on firms’ innovation activities; also, results from the Dutch sample provide some indication that there are positive economies of scope in doing external and cooperative R&D simultaneously.

Also, considerable research has been conducted for the identification and development of efficient and effective practices of crowdsourcing (focusing on individuals oriented open innovation); reviews of this research are provided by Hetmank (2013), Tarrell et al. (2013), Rechenberger et al. (2015) and Hossain and Kauranen (2015). According to Afuah and Tucci (2012) under certain circumstances crowdsourcing the solution of a problem a firm faces can be a very strong and effective alternative, much better than solving the problem internally or contract it to a designated supplier (‘classical’ outsourcing); these circumstances concern characteristics of the problem, the knowledge required for the solution, the crowd, and the solutions to be evaluated. In the following we focus on some indicative studies, which are representative of the kind of research that has been conducted in the area of crowdsourcing. Rouse (2010), based on a review of relevant literature, distinguishes between two types of crowdsourcing with respect to participants’ motivation: (i) individualistic (aiming to provide benefits to specific persons and firms), ii) community oriented (aiming to benefit a community of some kind, through ideas and proposals), and iii) mixed (combinations of the above). Furthermore, she proceeds with identifying seven more detailed types of participant motivations: learning, direct compensation, self-marketing, social status, instrumental motivation (= motivation to solve a personal or firm problem, or to address a personal/firm need), altruism (= motivation to help the community without personal benefit) and token compensation (= earning a small monetary prize or gift). The same publication concludes that many of the benefits of crowdsourcing described in the literature are similar to those of the ‘mainstream’ outsourcing: cost savings, contracts and payments that are outcome based (rather than paid “per hour”), and access to capabilities not held in-house; however, an additional benefit of crowdsourcing, which is not provided by outsourcing, is the capacity to exploit knowledge and skills of individuals who might not otherwise contribute. Geiger et al (2011), based on many previous case studies, identify two main classes of crowdsourcing practices: integrative crowdsourcing (aiming to collect from the crowd a large amount of knowledge on a topic, which is integrated in a large knowledge base) and selective crowdsourcing (in which the organizing firms aims to select the best one(s) among a set of options, ideas, proposals or designs that the crowd has provided. Then they are further elaborated into five types of crowdsourcing practices: integrative crowdsourcing without remuneration, integrative crowdsourcing with success-based remuneration, integrative crowdsourcing with fixed remuneration, selective crowdsourcing without crowd assessment and selective crowdsourcing with crowd assessment. Brabham (2012), based on the analysis of several case studies, identifies and elaborates four types of crowdsourcing practices: i) knowledge discovery and

management (= an organization tasks crowd with finding and reporting information and knowledge on a particular topic), ii) broadcast search (= an organization tries to find somebody who has experience with solving a rather narrow and rare empirical problem), iii) peer-vetted creative production (= an organization tasks crowd with creating and selecting creative ideas), and iv) distributed human intelligence tasking (= an organization tasks crowd with analyzing large amounts of information).

More recently, Prpić et al (2015a) develop a typology of crowdsourcing methods, which includes four basic types: a) crowd voting, in which organizations pose an issue to a crowd and aggregate the subjective responses derived from crowd participants to make a decision; b) micro-task crowdsourcing, in which organizations engage a crowd to undertake work that is often unachievable through standard procedures due to its size or complexity; c) idea crowdsourcing, in which organizations seek creativity from a crowd, aiming to leverage its diversity to generate unique solutions to problems/issues; d) solution crowdsourcing, in which - as opposed to idea crowdsourcing - organizations pose a well-defined and idiosyncratic problem to a crowd, potentially the organization's innovative and creative consumer base, asking for actual solutions. The same study also defines the conditions under which each of the above crowdsourcing types is more appropriate, which concern (i) the type of contributions required from members of the crowd (objective or subjective content); and (ii) how these contributions will collectively help find a solution to their problem the organization faces (by aggregating or filtering contributions). Finally, it is argued that organizations should place great emphasis on building their 'crowd capital', defined as organizational resources (e.g. knowledge, labor, funds) that can be acquired through crowdsourcing. Also, a three-step process model for generating crowd capital is proposed: the first step focuses on how the crowd is to be constructed; the second step concerns the capabilities firms need to develop in order to acquire and assimilate resources from the crowd; finally the third step concerns the optimal management and harnessing of the crowds.

However, there is a lack of similar research, with respect to quantity, breadth and depth, for the public sector citizen-sourcing, as explained in more detail in the following section 2.2, probably because it is a more recent phenomenon than the private sector crowd-sourcing.

2.2 Public Sector Citizen-Sourcing

Limited research has been conducted concerning the application of crowd-sourcing ideas in the public sector, the development of efficient and effective methods and practices for this purpose, and the evaluation of them from various perspectives (Lukensmeyer and Torres, 2008; Hilgers and Ihl, 2010; Linders, 2012; Nam, 2012; Seltzer and Mahmoudi, 2012; Mergel and Desouza, 2013; Ferro et al., 2013; Prpić et al., 2015b). In the following we focus on some indicative studies, which are representative of the kind of research that has been conducted in this area. Lukensmeyer and Torres (2008) argue that citizen-sourcing may become a new source of policy advice, enabling policy-makers to bring together divergent ideas that would not come from traditional sources of policy advice; furthermore, it may change the government's perspective on the public from an understanding of citizens as "users and choosers" of government programs and services to "makers and shapers" of policies and decisions. Hilgers and Ihl (2010) developed a high level framework for the application of citizen-sourcing by government agencies, which includes the following three dimensions: i) citizen ideation and innovation: this first dimension focuses on the exploitation of the general potential of knowledge and creativity of the citizens, in order to enhance the quality of government decisions and policies, through various methods, such as consultations and ideas and innovations contests; ii) collaborative administration: this second dimension explicitly addresses the integration of citizens for enhancing existing public administrative processes; in this direction experiences from private sector firms' user innovation and user-generated-content are leveraged in order to create new innovative tasks and processes for public agencies; iii) collaborative democracy: this dimension includes new ways of external collaboration, and also systematic integration of external actors into traditional administrative tasks and processes, in order to improve and expand public participation within the policy process, including the incorporation of public values into decisions, improving the quality of decisions, building trust in institutions and educating citizens. Nam (2012) developed a framework for

the description and analysis of government agencies citizen-sourcing initiatives, which includes four main types of them: a) contest (=competition-driven citizen-sourcing, with material (usually monetary) incentives (e.g. cash, prizes) or/and career opportunities; b) wiki (= collaborative website that can be edited directly using a web browser by anyone with access to it, with non-monetary reasons motivating participation, such as amateurism (commitment to hobbies) and altruism (voluntary contribution to society)); c) social networking (= forum for discussion and interaction, which motivates participation primarily through the desire and expectation of forming new relationships and strengthening existing ones); d) social voting (= it allows citizens to post their own ideas, make comments on others' ideas, and rate them; they provide a unique motivator for engagement: citizens can make their voices be heard by other citizens and by the government). Mergel and Desouza (2013) investigate the case of USA Challenge.gov platform, which enables federal agencies to host contests on problems and challenges they face, create awareness for them and bring citizens together in a competitive scenario to solve them; this platform allows citizens to provide solutions, and also review and evaluate solutions provided by other, vote on solutions, and even get involved in the implementation of solutions and subsequent evaluation of new policies or other types of public sector innovations. This study provides interesting insights into the implementation process of crowdsourcing solutions for public management problems, as well as lessons learned concerning the design of open innovation processes in the public sector, and also the role that public managers play in the implementation process of such initiatives. Prpić et al. (2015b) examine the suitability of three widely used types of private sector ICT-mediated crowdsourcing practices (virtual labor markets, tournament crowdsourcing, open collaboration) for citizen-sourcing in different stages of the public policy cycle (agenda setting, problem definition, policy design, policy implementation, policy enforcement, policy evaluation), reaching encouraging conclusions.

However, extensive further research is required in the area of public sector citizen-sourcing, in order to develop in this area a knowledge base, and based on it high levels of effectiveness and maturity, comparable to those of the private sector crowd-sourcing area. Our research makes a contribution in this direction.

3 DEVELOPMENT METHODOLOGY

In sections 4, 5, 6 and 7 are presented four ICT-based citizen-sourcing methods, which have been developed by the research group of the author in the decade, as part of several European projects. They support both 'active' and 'passive' citizen-sourcing, aiming at the efficient retrieval of policy relevant information, knowledge and ideas from citizens, both from the general public and also from knowledgeable experts, using initially web 1.0 oriented tools, and latter web 2.0 oriented tools taking advantage of social media. All four methods have been developed through a common methodology, which includes the following steps:

- a) Development of the basic idea of the method by the project consortium, and based on it submission of relevant research proposal
- b) Detailed analysis of requirements of potential users of them (participating as partners in the corresponding European project)
- c) Elaboration and detailed development of the method
- d) Development of the corresponding ICT platform
- e) Pilot applications and evaluation of them (using both qualitative techniques, such as interviews and focus group discussion with pilot participants, and quantitative techniques, based on questionnaire surveys)
- f) Final formulation of the method and the corresponding ICT platform

4 ACTIVE WEB 1.0 EXPERT - SOURCING

The first method involves ‘active expert-sourcing’ using web 1.0 oriented government operated structured e-consultation fora: this term denotes a structured electronic web space hosting policy related consultations on topics defined by government, in which participants can enter specific types of semantically-annotated postings, and associate them to previous postings according to some predefined rules, all based on a “discussion ontology. This structure aims to result in more effective electronic consultations, with more mentally-processed, focused, and, therefore, higher-quality contributions of the participants. Such contributions are also associated with the contributions of other participants in a structured way, enabling a better communication and interaction among them, in comparison with the unstructured discussions taking place in the usual unstructured forum tools. This method has been developed as part of the LEX-IS project (‘Enabling Participation of the Youth in the Public Debate of Legislation among Parliaments, Citizens and Businesses in the European Union’) (www.lex-is.eu), which has been partially funded by the ‘eParticipation’ Preparatory Action of the European Commission.

Our main model of structured e-consultation forum has been based on the IBIS framework (Conklin and Begeman, 1989; Conklin, 2003), so it allows each participant to enter five types of postings: issues, alternatives, pro arguments, contra argument and comments. Also, a number of possible associations between them have been defined in accordance with IBIS: for each issue participants are allowed to enter alternatives or comments, for each alternative they can enter pro arguments, contra argument or comments, for each argument (pro or contra) other arguments (pro or contra) and for each comment other comments. Furthermore, we also defined and evaluated a second simpler model of structured e-consultation, which allows the participants to enter a smaller number of types of postings. It follows the Q-A (Questions-Answers) structure, which has been successfully used in informative pages of many websites, so it allows each participant to enter three types of postings: questions, answers and comments. Also, a number of possible associations between them were defined: for each question participants were allowed to enter answers or comments, and for each comment to enter other comments. This second structured e-consultation model is simpler than the first, as it allows three types of postings instead of five allowed by the first model, and also a much smaller number of possible associations among them; it provides a less rich and expressive e-consultation language than the first IBIS-based model, however it is simpler and easier.

Two pilot applications of this method were organized concerning structured e-consultations on legislation under formation in the Greek and Austrian Parliaments. The Greek pilot e-consultation was about a bill concerning the ‘Contracts of Voluntary Co-habitation’, which regulates the matter of the formal voluntary co-habitation of two persons of different gender without being married, which is a highly controversial topic for the Greek society. The Austrian pilot e-consultation was about a ministerial draft bill titled “Child and Youth Welfare Law”. In the following Figure 1 we can see part of the Greek e-consultation.

From the evaluation of these two pilot applications it has been concluded that this structured e-consultation (especially the more complex model based on the IBIS framework) is too difficult and demanding for less sophisticated users (e.g. in terms of education and general maturity); so it might not be appropriate for e-consultations with the general public, and would more suitable for e-consultations with experts. This is mainly due to the big mental effort it requires, on one hand for thinking in the highly structured way that such tools impose, annotating correctly the postings and in general using efficiently the ‘discussion language’, and on the other for understanding the structured postings of the other participants and the connections among them. For this reason less sophisticated users tend to reduce the structure of the discussion, by using too often the more broad and low profile types of postings (such as the ‘comment’), instead of the more specific and high profile ones (such as the issue, the alternative and the pro and contra argument); also they tend to enter many simplistic postings (repeating more or less previous postings, or containing just “I agree” or “I disagree”) and make many mistakes in postings’ annotation. A direct consequence of these is a lower suboptimal exploitation of the expressiveness and potential of the structured e-forum tools for structuring discussions, resulting in less structured e-consultations, which tend to resemble more the unstructured e-forum discussions. On the contrary more sophisticated users seem to be more capable of utilizing

correctly and efficiently the ‘discussion language’ provided even by a complex e-consultation model, though they recognize as well that this requires a considerable mental effort. We saw that such sophisticated users are capable of utilizing efficiently all the ‘expressiveness’ of such a language (even a rather rich and complex, such as the one of the IBIS-based e-consultation model), making effective use of all the types of postings provided, not only the broader and lower profile ones, but also the more specific and higher profile types.

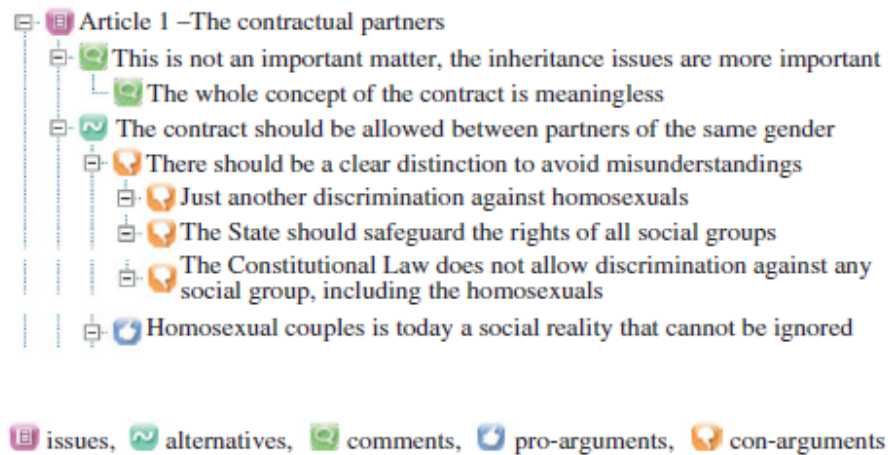


Figure 1. Active web 1.0 expert-sourcing using a structured e-consultation forum

However, with respect to usefulness, it seems that the structured e-consultation is better than the normal unstructured one for conducting important discussions for both more and less sophisticated users. More sophisticated users seem to perceive a higher usefulness of the e-structured forum tool than the less sophisticated users, since the former can much better use complex discussion languages and exploit to a larger extent the potential of these tools for structuring discussion. However, even for the less sophisticated users, despite the abovementioned difficulties they have, the structured e-consultation seem to offer advantages over the unstructured one. Furthermore, from the comparison between the two examined e-consultation models it can be concluded that the first more structured e-consultation model (based on the IBIS framework) results in more extensive discussions with more postings and depth and higher interaction among the participants than the second simpler and less structured model; this can be attributed to the stronger stimulation and guidance, and also to the richer discussion language provided by the first model in comparison with the second. More information about this method are provided by Loukis and Wimmer (2010 and 2012).

5 ACTIVE WEB 2.0 CITIZEN - SOURCING

The second method involves web 2.0 oriented ‘active citizen-sourcing’ using government agencies’ social media accounts, in which government has a strong and directive role, posing a particular social problem or public policy direction in its social media accounts, and soliciting relevant information, knowledge, opinions and ideas from citizens. The relevant content generated by citizens is automatically retrieved from these government agencies’ social media accounts, and then processed in order to produce useful policy analytics and support drawing conclusions from it. This method has been developed as part of the European research project PADGETS (‘Policy Gadgets Mashing Underlying Group Knowledge in Web 2.0 Media’) (www.padgets.eu), which has been partially funded by the ‘ICT for Governance and Policy Modeling’ research initiative of the European Commission.

In particular, this method is based on the centralized automated publishing of multimedia content (e.g. a short text, a longer description, images, videos, etc.) concerning a social problem of interest or a public policy under formulation to the accounts of a government agency in multiple social media (e.g. Facebook, Twitter, YouTube, Picasa, Blogger), in order to actively stimulate discussions on it.

Throughout these social media consultations we continuously retrieve and monitor various types of citizens' interactions with the content we have posted (e.g. views, likes, ratings, comments, retweets), and finally we process these interactions in order to support drawing conclusions from them. Both content posting and interactions' continuous retrieval are performed in a highly automated manner using the API of these social media from a central ICT platform, in which also processing and results presentation are performed.

For the practical application of this method, a government agency policy maker, through a web-based dashboard or a mobile phone application, can initiate a campaign concerning a specific topic, problem or policy in multiple social media, using the accounts of the government agency in these social media and the corresponding networks. For this purpose he/she creates relevant multimedia content (e.g. short and longer topic description, images, videos, etc.), which are then automatically published in the corresponding social media (e.g. in the Twitter the short topic description, in Blogger the longer one, in YouTube the video, in Picasa the images, etc.) by the abovementioned central ICT platform. The citizens will view this content, and interact with it (in all the ways that each social media platform allows), either through these social media, or through a mobile phone application. Then, these interactions will be automatically retrieved and shown continuously to the policy maker, through the above web-based dashboard or mobile phone application, so that appropriate interventions can be made (i.e. new content can be published) if necessary. Finally, after the end of the campaign, sophisticated processing of all citizens' interactions with the above content will be performed in this central ICT platform, using a variety of techniques (e.g. calculation of web analytics, opinion mining), in order to provide useful analytics that support government decision and policy making. In Figure 2 this active crowdsourcing approach is illustrated.

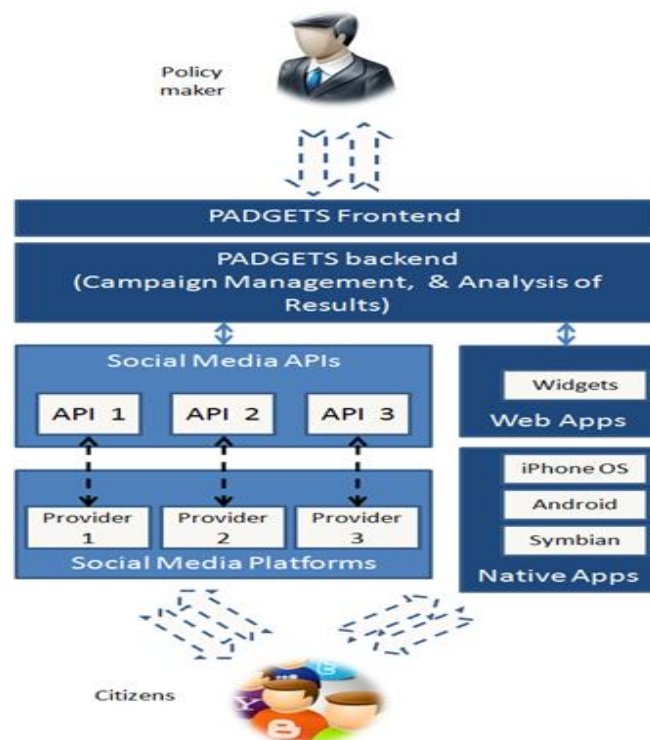


Figure 2. Active web 2.0 citizen-sourcing using multiple government social media accounts

A pilot application of this method was organized for conducting a campaign in multiple social media by Piedmont Regional Government, concerning the implementation of a telemedicine initiative (initially applied in a limited area) at a large scale in the entire Piedmont region. From the evaluation of this pilot application it has been concluded that this method can be useful/beneficial for addressing fundamental challenges that public policy making faces in its attempts to solve the wicked problems of modern societies. In particular, it enables reaching wider and heterogeneous audiences in shorter time

and at lower costs, conveying policy-related information to them, and also identifying a wide range of particular problems/issues they perceive with respect to a policy under discussion. Furthermore, the wealth of comments from different citizens' groups that such a multiple social media usage approach provides enables the identification of citizens' 'positive values' (things that citizens value) and also 'negative values' (things that citizens dislike) with respect to the particular policy or policy domain in general, which are very useful for the comprehensive design and evaluation of public policies. However, this method seems to be less efficient in solutions generation and also in facilitation of convergence among stakeholders' views.

Finally, it has been concluded that this method, viewed as an innovation in policy formulation processes of government agencies has the fundamental preconditions for a wide diffusion and adoption by government agencies: relative advantage, compatibility with existing values and processes, reasonable complexity, trialability and observability. However, its compatibility, and in general the benefits that can be created by it, depends to some extent: i) on the political tradition of the adopting government agency with respect to bi-directional communication with citizens in all phases of policy making, ii) on its familiarity with and experience in using social media for this purpose, and iii) on their positive general attitude towards innovation. Nevertheless, the shift to a 2.0 communication style appears to require a lengthy process among both society and government agencies. More information about this method are provided by Ferro et al. (2013) and Charalabidis et al. (2014a).

6 PASSIVE WEB 2.0 CITIZEN - SOURCING

The third method involves web 2.0 oriented 'passive citizen-sourcing' using social media, however going beyond the accounts of government agencies, and exploiting political content developed by citizens in various external social media not belonging to the government (e.g. political blogs, fora, news websites, and also external Facebook, Twitter, etc. accounts). In this method government has a less active and more passive role, collecting and analyzing content on a specific topic or public policy of interest, which has been freely generated by citizens (without direct stimulation and direction by government) in various external social media sources, and then calculating from it useful policy analytics. This method has been developed as part of the European research project NOMAD ("Policy Formulation and Validation through Non-moderated Crowdsourcing") (www.nomad-project.eu/), partially funded by the "ICT for Governance and Policy Modeling" research initiative of the European Commission.

In particular, this method includes the following four steps:

- i) The first step is to build the 'domain model', which is an ontology-based representation of the objects of the thematic domain we intend to intervene in through a policy (e.g. energy domain, education domain, health domain). The main entities-terms of this are inserted, as well as relations among them, in a tree structure, using a graphical modelling tool.
- ii) Then the second step is to build the 'policy model', which is a representation of the public policy we want to collect relevant content about from the social media; it consists of a number of 'policy statements' associated with one or more nodes of the policy model, and for each of them some positive or negative 'arguments'. A policy model is inserted on a policy model (used as a basis for it) using the above graphical modelling tool.
- iii) Upon the completion of the models, the user provides a list of social media sources (e.g. blogs, news websites, and also Twitter, Facebook, etc. accounts) which are going to be crawled, in order to find relevant content about the topic or public policy of interest (= places on the web that according to our previous knowledge might contain relevant user-generated content, i.e. where citizens are likely to have expressed relevant opinions and suggestions).
- iv) The defined sources (in step iii) are searched against the above domain and policy models (defined in steps i and ii respectively), and the collected content undergoes sophisticated processing using

opinion mining techniques: initially opinions and arguments are extracted, and then sentiment analysis of them is performed). The results are presented to the user in visualized form; a typical results' visualization screen is shown in the following Figure 3.

In this typical results' visualization screen in the upper left part is shown an estimation of the volume of discussion and the cumulative sentiment for all the elements of the domain or policy model (according to the selections made just above it), the former being visualized through the height of the corresponding rectangle, and the latter through its color (with the green color denoting positive sentiment, and the orange denoting negative sentiment). For the above model, or for a selected element of it, below (in the lower left part of the screen) is shown the distribution of the volume of discussion over time and also across age groups. In the upper right part is shown a word cloud depicting the most frequent terms-topics discussed online (colored according to the corresponding sentiment), while in the lower left part we can see a list of text excerpts from the sources with relevant content (concerning the selected model or element of it). Also an 'audience comparative view' can be provided, which shows differences among selected different age, gender or education groups, or differences over time, in the discussed topics (concerning volumes of discussion and sentiment, terms-topics frequencies).

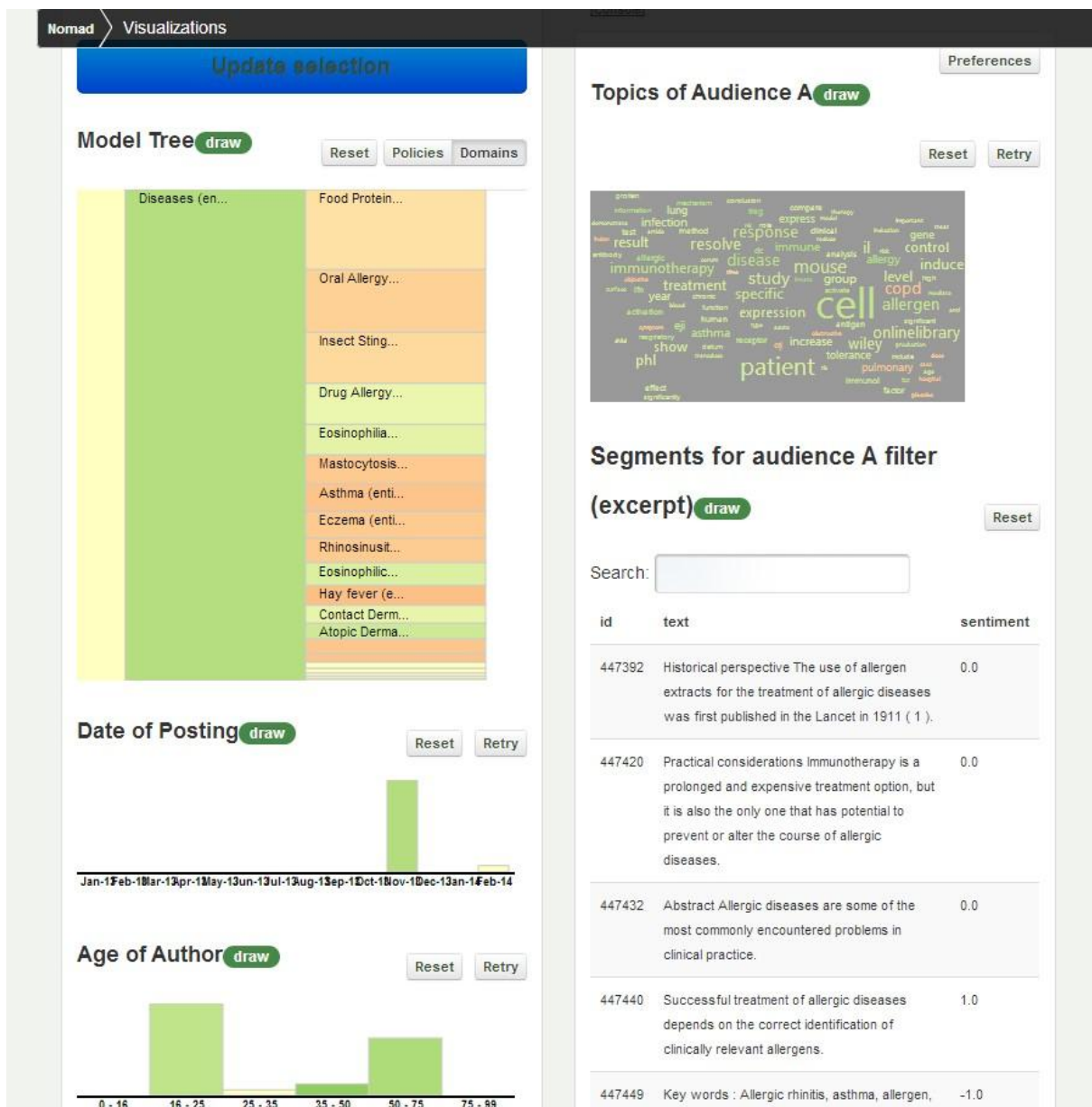


Figure 3. Passive web 2.0 citizen-sourcing - typical results' visualization screen

Three pilot applications of the above method were conducted. The first one was conducted by the Greek Parliament, and concerned the regulatory and legal framework on energy management (the “Greek Strategy for Energy Planning”). The second pilot application was conducted by the Austrian Parliament, and aimed to monitor the ongoing public debate on a ‘freedom of information act’, i.e. a coherent legal basis for “open government information in Austria” and the open government data policies at large. The third pilot application was oriented towards a more scientific policy topic: it was conducted in collaboration with the European Academy of Allergy and Clinical Immunology (EAACI) in order to assist it in discovering the public stance against “allergy diseases and immunotherapy”, and based on this knowledge to design policies for raising awareness in this area, and also to formulate relevant policy proposals.

From the evaluation of these pilot applications it has been concluded that this method of passive citizen-sourcing can provide considerable support for public policy making, enabling the low cost and fast assessment of citizens’ feelings/attitudes concerning a prospective or existing policy, and also the identification of emerging new relevant issues/topics in the society. However, this method poses some risks, associated with the misuse of it for promoting individual interests (by reporting selectively only some of its results which are in desired directions, and hiding some others), and also with the possible intrusion into citizens’ private sphere (so it is necessary to avoid content sources in which contributors perceive their postings and discussions as private). It has been concluded that the quantity and the representativeness of the ‘crowd’ who created the collected content, on which the results have been based, was satisfactory, but there was some skepticism about the quality and reliability of this content (e.g. due to possible bias of its creators and manipulation). Therefore critical success factor of this method is the selection of an extensive and representative set of high reliability and quality social medial sources to be monitored. However, despite the above drawbacks the overall assessment seems to be positive: this method can provide considerable support for the design of public policies.

Furthermore, this evaluation provides evidence that this method of passive citizen-sourcing, viewed as an innovation, has most of the preconditions proposed by the theory of innovation diffusion of Rogers (2003) for a wide adoption and diffusion. In particular, it has been concluded that it offers strong relative advantage over the existing alternatives for the same purpose, and has high levels of trialability (i.e. can be tried and experimented on a limited scale basis); also, it has a good level of compatibility with the policy formulation processes, and with the needs, the mentalities and the values of the people designing and applying public policies. However, this method does not seem to be easy to use, as it requires building complex models of the specific domain and also the particular policy we are interested in. More information about this method are provided by Loukis et al. (2015) and Androutsopoulou et al. (2015).

7 PASSIVE WEB 2.0 EXPERT - SOURCING

The fourth method involves web 2.0 oriented ‘passive expert-sourcing’, aiming at collecting experts’ policy relevant information, knowledge and ideas. It exploits policy relevant content developed in various external social media, beyond government social media accounts (e.g. political blogs, fora, news websites, and also external Facebook, Twitter, etc. accounts), but uses reputation scores of the content authors, in order to determine the order of content presentation in response to users’ queries; therefore, experts’ content is given priority and higher visibility. There has been extensive political sciences research, which has revealed the importance of both democracy (i.e. political consultation with all stakeholder groups) and technocracy (i.e. specialized knowledge of experts) for the development of effective public policies for addressing the complex problems of modern societies (Brown, 2009). So the main objective of this method is to enable a better interconnection of the two important bases of modern public policy making, the democratic processes and the technocratic expertise, by supporting the transfer of knowledge from the latter to the former. This method is currently under development as part of the European research project ‘EU-Community’ (project.eucommunity.eu/), which has been partially funded by the ‘ICT for Governance and Policy Modelling’ research initiative of the EU.

The main characteristics of it are:

- It focuses on the European Union policy community, and not on the general public, and aims to leverage the former by increasing its ‘interaction density’ and also quality, which fosters the development of shared values and beliefs concerning desirable policy objectives and instruments, and finally to increase the efficiency and effectiveness of this community.
- It provides support not only to the European Union decision makers on policy formulation and implementation issues, but also to the other groups of the European Union policy community as well, such as the various types of influencers and policy analysts, in order to exchange information, knowledge and expertise, and also opinions, positions and proposals, and improve their capacity to participate in and contribute to the European Union policy processes.
- It adopts a ‘selective’ approach, focusing on the most knowledgeable and credible people on each topic we are interested in, by using advanced reputation management methods, and also focusing on the most relevant documents (such as web pages, blog posts, social media content, online comments, word/pdf documents, collected from various external sources) on each topic we are interested in, using documents’ curation/relevance assessment methods.

An overview of this method is shown below in Figure 4.

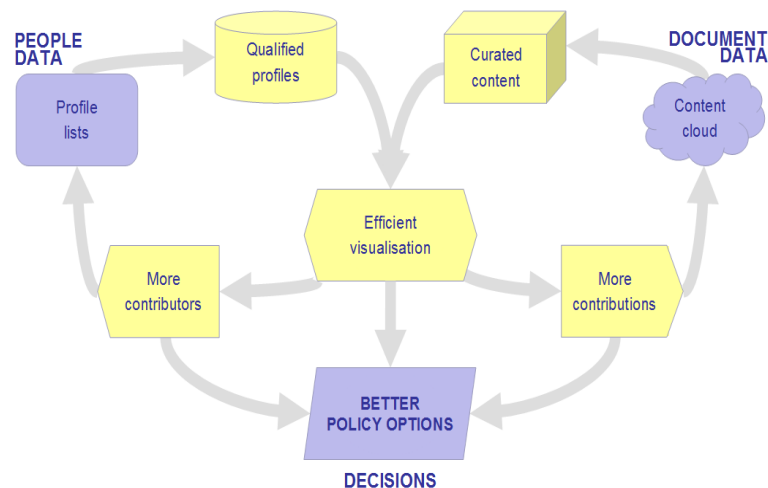


Figure 4. *Passive web 2.0 expert-sourcing – an overview*

We remark that it consists of three main processes: the first two of them crawl at regular time intervals the most relevant external sources of EU policies knowledgeable and credible people, and also of relevant documents of various types, update the corresponding databases, and also assess their reputation/credibility of the former and the relevance of the latter. These databases are used by the third process, which processes users’ queries (e.g. concerning the most reputable/credible people or the most relevant documents on a specific topic) and presents the results, making use of visualization/visual analytics techniques. More information about this method are provided by Charalabidis et al. (2014b).

8 CONCLUSIONS

The public sector starts applying the crowdsourcing ideas initially developed in the private sector, in order to exploit the extensive information and knowledge possessed by citizens, and also their creativity and ideas, for the development of highly efficient and effective new innovative public policies. However, there has been much less research and practice concerning public sector citizen-sourcing in comparison with the private sector crowd-sourcing, and there is much less knowledge and maturity in the former area than in the latter. This paper contributes to filling this gap. In the previous sections an overview has been provided of the research that has been conducted in this area by the

research group of the author in the last decade as part of several European projects towards the development of ICT-based methods for citizen-sourcing. In particular, we have presented four such methods, which cover both ‘active’ and ‘passive’ citizen-sourcing, extracting relevant information and knowledge from the general public and the knowledgeable experts as well, using both web 1.0 and web 2.0 oriented tools.

However, further research is required in order to gain a better understanding of the contexts, social problems, public policies and types of solicited external information and knowledge each of them is more appropriate for, and also how they can be combined. A notable similarity between them is that none of them includes competitive contexts and some kind of rewards, which are central elements of private sector crowd-sourcing. Therefore, further research is required in order to examine to what extent we can incorporate in these methods competition and rewards (monetary or non-monetary), analogous to the ones of private sector crowdsourcing. Another similarity is that all these four methods support only the first component of firm’s ‘absorptive capacity’ (Cohen and Levinthal, 1990; Lane et al., 2006), the identification and acquisition of useful external knowledge, and neglect the other components, which concern the dissemination, assimilation and exploitation of this external knowledge, despite the strong arguments provided by the absorptive capacity research that in order to improve the innovation performance of organizations it is necessary to increase their capacity in all the above-mentioned components. So it would be highly beneficial if ICT-based citizen-sourcing methods should support not only the acquisition of relevant external information and knowledge from citizens, but also its dissemination and assimilation within the competent government agency, and then its application and exploitation for public policy making development. So further research is required in this direction.

Also, further research is required in order to develop a wide range of ICT-based open innovation methods and practices in government, for exploiting external knowledge resources of citizens, and possibly of other actors as well, such as other government agencies, universities, research centers, and even private sector firms (e.g. suppliers of equipment), and also determine the kinds of innovation problems each of them is more appropriate for (e.g. such as the research presented of Bellantuono et al. (2013) and Felin and Zenger (2014)). Finally, it would be interesting to conduct research concerning the application in the public sector the ‘crowd capital’ building ideas proposed by Prpić et al. (2015a) for the acquisition of various external resources (e.g. knowledge, labor, funds).

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