Promoting open innovation in the public sector through social media monitoring

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ABSTRACT

Motivated by the multiple 'success stories' of the open innovation paradigm in the private sector, and also by the increasing complexity of social problems and needs, the public sector has started moving in this direction, attempting to exploit the extensive knowledge of citizens for the development of innovations in public policies and services. As the direct transfer of open innovation methods from the private sector to the public sector is not possible, it is necessary to develop effective 'citizen-sourcing' methods, which address the specific needs of the public sector, and then analyze and evaluate them from various political and management sciences' perspectives. This paper makes a two-fold contribution in this direction: i) It evaluates a novel method of monitoring relevant social media (e.g. political blogs, news websites, and also Facebook, Twitter, etc. accounts) by government agencies, by retrieving and making advanced processing of their content, and extracting from it external knowledge about specific domains of government activity or public policies of interest, in order to promote and support open innovation; ii) For this purpose it develops a multi-perspective evaluation framework, based on sound theoretical foundations from the political and management sciences, which can be of wide applicability; it includes three evaluation perspectives: a political perspective (based on the 'wicked' social problems theory from the political sciences), a crowd-sourcing perspective (based on previous management sciences research on crowd-sourcing) and a diffusion perspective (based on Roger's diffusion of innovation theory from management sciences). The above evaluation provides interesting insights into this novel method of promoting and supporting open innovation in the public sector through social media monitoring, revealing its capabilities and strengths, and at the same time its problems and weaknesses as well, and also ways/interventions for addressing the latter.

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1. Introduction

Motivated by the multiple 'success stories' of the open innovation paradigm in the private sector, and also by the increasing complexity of social problems and needs, the public sector has started moving in this direction, attempting to exploit the extensive knowledge of citizens ('citizen-sourcing'), in order to develop innovations in public policies and services: new public policies and services, or improvements of existing ones (Ferro, Loukis, Charalabidis, & Osella, 2013; Linders, 2012; Nam, 2012; Mergel & Desouza, 2013; Prpić, Taeihagh, & Melton, 2015). The exponentially growing use of the Internet, and especially the social media, by citizens for publishing public policy related content, and exchanging relevant political opinions, creates big opportunities in this direction, exploiting the wealth of knowledge hidden in them in order to support and promote open innovation in the public sector.

Open innovation was initially developed and applied in the private sector, as firms started shifting from the established 'closed innovation' paradigm, which is based on their internal knowledge resources, towards the 'open innovation' paradigm (Chesbrough, 2003a, 2003b, 2006; Huizingh, 2011; West, Salter, Vanhaverbekec, & Chesbrough, 2014), which exploits to a significant degree external knowledge resources as well, possessed by other organizations (e.g. suppliers, customers, business partners, research centers, universities, etc.), and also by 'crowds' of individuals (the latter dimension of open innovation being referred to as 'crowd-sourcing'). Open innovation is defined by its pioneer Henry Chesbrough 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). Extensive research has been conducted for the identification and development of open innovation methods and practices in the private sector, the assessment of their effectiveness and also the discovery of the specific contexts for which each of them is more appropriate (see Section 2.1), which has led to higher levels of maturity in this area. Recently there has been growing interest, among both researchers and practitioners, in the crowds of individuals' oriented dimension of open

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innovation, crowd-sourcing, 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) (see Section 2.2).

Government agencies made some first steps towards the application of these ideas in their particular context, initially by adopting 'active citizen-sourcing' approaches, in which they played an active and directive role: they posed a specific social problem or public policy (existing or under development) in a government website or social media account, and asked citizens to provide their knowledge and opinions about it. Subsequently some government agencies started experimenting with a new 'passive citizen-sourcing' approach, in which they have a less active role: they monitor passively relevant 'external' (= not owned and controlled by government) social media (e.g. political blogs, news websites, and also Twitter, Facebook, etc. accounts), retrieving from them and analyzing content on a specific topic or public policy (existing or under development), which has been freely generated by citizens, without any government direction or stimulation, in order to extract from it relevant knowledge and opinions of citizens (Bekkers, Edwards, & de Kool, 2013; Charalabidis, Loukis, Androutsopoulou, Karkaletsis, & Triantafillou, 2014; Loukis & Charalabidis, 2015). Social media monitoring (SMM) has been initially adopted by private sector firms in order to collect external knowledge and opinions from various social media about their products and services, and also the ones of their competitors, which are then exploited for the development of product and service innovations, and for the design of communication strategies (Croll & Power, 2009; Kasper & Kett, 2011; Sen, 2011; Zhang & Vos, 2014) (see Section 2.3). Recently government agencies started experimenting with SMM as well, but there is still limited knowledge concerning the use of it in government for promoting and supporting open innovation, its potential, its strengths and weaknesses. Also, there is a lack of effective methods for performing SMM in the government context, which would allow an intensive and systematic exploitation of the extensive policy related content generated by citizens in numerous social media freely, without any direction or stimulation by government, in order to extract knowledge useful for innovation (e.g. on problems and needs perceived by various groups of the society, advantages and disadvantages of existing public policies and services, or proposals for new policies and services, etc.). It should be emphasized that this externally and freely generated content is quite valuable for the development of innovations, as it is much more extensive, rich and politically diverse than the content generated in government websites and social media under government direction or stimulation (exploited by the 'active citizen-sourcing' approaches). As the direct transfer of SMM methods from the private sector to the public sector is not possible, it is necessary to develop effective SMM methods in the public sector for promoting and supporting open innovation, and then analyze and evaluate them from various perspectives, based on sound theoretical foundations from the political and management sciences.

In particular, this paper makes a two-fold contribution in this direction:

I) It evaluates a novel method of monitoring relevant social media (e.g. political blogs, news websites, and also Facebook, Twitter, etc. accounts) by government agencies, by retrieving and making advanced processing of their content, and extracting from it external knowledge about specific domains of government activity or public policies (existing or under formulation) of interest, in order to promote and support open innovation; this evaluation has been based on three pilot applications of this method, followed by relevant focus group discussions with involved individuals, from which our evaluation data have been collected (as described in the 'Research Method' Section 4, while the results from the analysis of these data are presented in Section 6). It should be noted that the development and the detailed description of this method are beyond the scope of

this paper, which focuses on its evaluation, however for the sake of completeness of the paper in Section 5 there is an outline of the method, while more details are provided in Charalabidis et al. (2014) and Loukis and Charalabidis (2015).

II) For this purpose it develops a multi-perspective framework for evaluating the use of SMM in government for promoting and supporting open innovation, which can be of wide applicability, using sound theoretical foundations from the political and management sciences. It includes three evaluation perspectives: a political evaluation perspective (based on the 'wicked' social problems theory from the political sciences – see Section 2.4), a crowd-sourcing evaluation perspective (based on previous management sciences research on crowd-sourcing – see Section 2.2) and a diffusion potential evaluation perspective (based on Roger's diffusion of innovation theory from management sciences – see Section 2.5).

The research presented in this paper has been conducted as part of the European research project NOMAD ("Policy Formulation and Validation through Non-moderated Crowdsourcing" – for more details see www.nomad-project.eu/), partially funded by the "ICT for Governance and Policy Modeling" research initiative of the European Commission. The paper is structured in seven sections. In the following Section 2 the background of our study is presented. The proposed multi-perspective evaluation framework is presented in Section 3, followed by the research method in Section 4. The abovementioned novel method of SMM in government for promoting and supporting open innovation is outlined in Section 5. Then the results are presented and discussed in Section 6. Finally, in Section 7 the conclusions are summarized and future research directions are proposed.

2. Background

In this section we outline the background of our study concerning its main topics, open innovation (in 2.1), and the particular dimension of it we focus on, crowd-sourcing (in 2.2), and also SMM (in 2.3); then we provide some background on two of the theoretical foundations of our evaluation methodology: the wicked social problems theory (in 2.4) and the diffusion of innovation theory (in 2.5) (while our third theoretical foundation concerning crowd-sourcing is discussed in 2.2).

2.1. Open Innovation

As mentioned in the Introduction, extensive research has been conducted for the identification and the development of open innovation methods and practices in the private sector, for their analysis and evaluation, and also for discovering the contexts and types of problems for which each of them is more appropriate (Arvanitis, Lokshin, Mohnen, & Woerter, 2015; Bellantuono, Pontrandolfo, & Scozzi, 2013; Felin & Zenger, 2014; Huizingh, 2011; Laursen & Salter, 2006; Mina, Bascavusoglu-Moreau, & Hughes, 2014; Pisano & Verganti, 2008). A typical study in this direction is the one of Felin and Zenger (2014) that identifies six main types of innovation practices used in the private sector: 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 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 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'. Moreover, there is another relevant research stream, which investigates empirically the effects of various open innovation practices on firms' innovation performance (Arvanitis et al., 2015; Inauen & Schenker-Wicki, 2011; Laursen & Salter, 2006). A typical study of this stream is the one of Inauen and Schenker-Wicki (2011) who investigate empirically the effect of six open innovation practices (co-development of new knowledge or innovation in co-operation with customers, suppliers, competitors, cross-sector companies, consulting firms and universities) on innovation performance, using data collected from 141 stock-listed companies from Germany, Switzerland and Austria. They conclude that innovation co-operation with customers, suppliers and universities have positive impact on innovation performance.

However, there is a lack of similar research on open innovation in the public sector (a) identifying/developing a wide range of open innovation practices, b) evaluating them and c) determining the kinds of problems each of them is more appropriate for); so the existing knowledge base for the application and development of open innovation in government is limited in comparison with the private sector. Therefore, extensive further research should be conducted in the near future in order to fill this gap in the abovementioned three directions a) to c), and finally achieve higher levels of maturity and effectiveness in the open innovation practices of the government agencies. This paper makes a contribution in the first two of these research directions (a and b), by evaluating a novel method of SMM in government for promoting and supporting open innovation from three critical political and management sciences' perspectives, by developing a multi-perspective evaluation framework for this purpose, which can be of wide applicability for future research, and also by identifying weaknesses of this SMM method and ways/interventions for improving and further developing it.

2.2. Crowd-sourcing

Initially open innovation research focused mainly on the exploitation of external knowledge of other organizations, such as suppliers, customers, business partners, research centers, universities, etc. (organizations oriented open innovation), however later it started dealing with the exploitation of external knowledge possessed by 'crowds' of individuals as well (individuals oriented open innovation), usually referred to as 'crowd-sourcing' (Brabham, 2008, 2012, 2013; Howe, 2006, 2008). Considerable research has been conducted for the identification and development of effective methods and practices of crowd-sourcing and crowd motivation to participate in it; reviews of this literature are provided by Hetmank (2013), Majchrzak and Malhotra (2013), Pedersen et al. (2013), Rouse (2010), Rechenberger, Jung, Schmidt, and Rosenkranz (2015) and Tarrell et al. (2013). Initially this research focused on analyzing successful crowd-sourcing cases, but later it started moving to a higher level, and generalizing (based on knowledge gained from multiple case studies) in order to identify patterns and trends in this area, and also to develop effective crowd-sourcing practices (Brabham, 2012; Geiger, Seedorf, Schulze, Nickerson, & Schader, 2011; Hetmank, 2013; Rouse, 2010). A typical study in this direction is the one of Brabham (2012), who based on the analysis of several crowd-sourcing case studies identifies and elaborates four types of crowd-sourcing 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).

Another stream of crowd-sourcing research emphasizes the inherent risks and challenges of it, arguing that the outcomes of crowd-sourcing, mainly with respect to the quality and usefulness of

the collected knowledge, might be uncertain; also some important critical success factors are identified, such as the existence of sufficient, diverse and knowledgeable active crowd, as well as some risk factors that might have negative impact, such as digital divide related problems and the consequent participation inequalities (i.e. under-representation of some groups, and over-representation of some others), and possible bias and manipulation of the crowd (Agafonovas & Alonderiene, 2013; Bott & Young, 2012; Geiger et al., 2011; Jain, 2010; Sharma, 2010).

However, much less research has been conducted on crowd-sourcing in the public sector, focusing mainly on 'active citizen-sourcing' (Ferro et al., 2013; Linders, 2012; Mergel & Desouza, 2013; Nam, 2012; Prpić et al., 2015). A typical study is the one of Nam (2012) who analyzed emerging practices of USA government agencies for sourcing professional knowledge and innovative ideas from citizens, and identified four main types of such practices (with respect to the ways used for knowledge and ideas collection): Contest, Collaborative Wiki, Social Networking and Social Voting. Our research contributes to the enrichment of our knowledge on public sector crowd-sourcing (citizen-sourcing), focusing on the evaluation and further development of a novel and quite different approach to citizen-sourcing: on the use of 'passive citizen-sourcing', through SMM by government agencies (see following Section 2.3), in order to promote and support open innovation in public policies and services (development of new public policies and services, or improvements of existing ones).

2.3. Social Media Monitoring

Social Media Monitoring (SMM) is defined as 'the continuous systematic observation and analysis of social media networks and social communities' (Fensel, Leiter, & Stavrakantonakis, 2012). As mentioned in the Introduction, SMM has been initially used by private sector firms, in order to collect external knowledge and opinions about their products and services, and also the ones of their competitors, from various social media, which are used for the development of product and service innovations (both new products and services, and also improvements of existing ones), and for the design of communication strategies (e.g. for addressing negative postings and questions) (Croll & Power, 2009; Fensel et al., 2012; Kasper & Kett, 2011; Mayeh, Scheepers, & Valos, 2012; Sen, 2011; Stavrakantonakis, Gagiu, Kasper, Toma, & Thalhammer, 2012; Zhang & Vos, 2014). However, there is a lack of frameworks for the multi-dimensional evaluation of SMM platforms, practices and approaches, which would allow assessing various aspects of them, identifying their strengths as well as their weaknesses. There is only one framework for evaluating SMM software tools proposed by Stavrakantonakis et al. (2012), which however assesses only the functionality they provide, ignoring all other aspects. It comprises a set of evaluation criteria for assessing the functionality of SMM tools from three perspectives: the concepts they implement (data capture and analysis, workflow, reaction to posts, and identification of influencers), the technologies used (listening grid adjustment, near real-time processing, integration with third party applications, sentiment analysis, historical data) and the user interface (dashboard, results' export) they provide.

Quite limited is the previous literature concerning the use of SMM by government agencies. Only Bekkers et al. (2013) investigate the SMM practices of four Dutch public organizations. They examine the goals of SMM, the way of operating it and its effects; with respect to the second they discriminate between four types of monitored citizens' electronic discussion media based on two criteria: the level of perceived privacy (low or high), and the type of issues discussed (personal or societal). However, there is a lack of multi-dimensional frameworks for evaluating the use of SMM by government agencies from various political and management perspectives, which would be quite important for the development of knowledge in this area. Our research contributes to filling this research gap, as it develops a framework for the multi-dimensional evaluation of the use of SMM in government for promoting

and supporting open innovation from three highly important perspectives (explained in Section 3).

2.4. Wicked Social Problems Theory

Previous research has highlighted the increasing complexity and 'wickedness' of the problems of modern societies, which have to be addressed through appropriate public policies (Buchanan, 1995; Coyne, 2005; Head, 2008; Kunz & Rittel, 1972, 1979; Rittel & Weber, 1973). In particular, in a highly influential paper Rittel and Weber (1973) theorize that social problems became after the end of the Second World War increasingly 'wicked', lacking clear and widely agreed definition and objectives. As our societies have become more heterogeneous and pluralistic in terms of culture, values, concerns and lifestyles, in most social problems there are stakeholder groups with quite different and heterogeneous problem views, perceived issues, concerns and expectations, and this leads to a lack of clear and widely agreed problem definition and objectives.

This increases significantly the difficulty and complexity of the development of public policies for such social problems, as the competent government agencies have to collect and process a large amount of external information concerning the different issues perceived by different problem stakeholder groups, as well as the different solutions they propose and arguments in favor and against them, and in general their different concerns, expectations and attitudes; then it is necessary to have consultations and negotiations with them in order to achieve some degree of synthesis and consensus. Previous research in this area has revealed that these can be greatly supported through the use of appropriate information systems, referred to as 'issue-based information systems' (Conklin, 2003; Conklin & Begeman, 1989; Kunz & Rittel, 1979), which allow problem stakeholders to enter their perceptions concerning the main elements of such a problem: 'questions/issues' (particular sub-problems to be addressed), 'ideas/proposals' (possible alternative answers-solutions to questions/issues) and 'arguments' (positive or negative - evidence or viewpoints that support or object to ideas).

Therefore the evaluation of the use of SMM by government agencies for promoting and supporting open policy innovation should include as its main perspective the assessment of how useful SMM is for collecting knowledge on the questions/issues, solutions/ideas and positive/negative arguments perceived by various problem stakeholder groups with respect to a particular domain of government activity or an existing or under development policy of interest.

2.5. Diffusion of Innovation Theory

The use of SMM by government agencies for promoting and supporting open policy innovation is itself a big innovation in the policy development practices and processes of government agencies, so it is important to examine it from this perspective as well, and assess to what extent it has the fundamental preconditions for a wide diffusion. Extensive research has been conducted concerning diffusion of innovations, in order to identify factors that favor it (MacVaugh & Schiavone, 2010). One of the most widely recognized theories of innovation diffusion is the one proposed by Rogers (2003), which has been extensively employed for analyzing ICT-related innovations in both the public and the private sector (Al-Jabri & Sohail, 2012; Loukis, Spinellis, & Katsigiannis, 2011; Raus, Flügge, & Boutellier, 2009). According to this theory, there are five critical characteristics of an innovation that determine the degree of its adoption:

i) Relative Advantage, defined as the degree to which an innovation is perceived as better than the idea, work practice or object it supersedes;

ii) Compatibility, defined as the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters;

iii) Complexity, defined as the degree to which an innovation is perceived as difficult to understand, implement and use;

iv) Trialability, defined as the degree to which an innovation may be experimented with on a limited scale basis;

v) Observability, defined as the degree to which the results of an innovation are visible by the external environment.

Therefore, it is important to assess to what extent the use of SMM by government agencies for promoting and supporting open innovation, viewed as an innovation itself, has the above characteristics required for high levels of adoption and diffusion.

3. A Multi-perspective Evaluation Framework

Based on the background presented in the previous section a multi-perspective framework has been developed for evaluating methods and practices of SMM use in government for promoting and supporting open innovation, which is shown in Table 2 (evaluation perspectives, and for each of them its particular questions), while previously in Table 1 we can see the literature support for each perspective. As explained in more detail in the following paragraphs, the fundamental political perspective of such as evaluation framework should be the assessment of how useful SMM is for collecting external knowledge of citizens concerning the main elements of the increasingly complex and 'wicked' problems of modern societies, which are (according to the 'wicked' social problems theory outlined in Section 2.4) the issues, proposed solutions of them and relevant positive and negative arguments perceived by different stakeholder groups. However, since SMM in government aims at crowd-sourcing public problems and policies related knowledge, it is necessary to assess to what extent the inherent critical success factors of crowd-sourcing (identified by previous research in this area and mentioned in Section 2.2) are fulfilled. Finally, since the use of SMM by government agencies for promoting and supporting open innovation constitutes itself a big innovation in their policy formulation practices and processes, it is necessary to examine SMM from this perspective as well, assessing to what extent it has the fundamental preconditions for a wide diffusion (according to the diffusion of innovation theory outlined in Section 2.5).

In particular, the main external knowledge elements, which are required to be collected from the citizens, in order to promote and support open innovation in the public sector (such as development of new public policies, or improvements of existing ones), are: i) At a first level the existing interest/discussion in the society concerning relevant topics/thematic domains and policies, and the existing attitudes/sentiments for them; ii) At a second level, taking into account the findings of political sciences research on the increasing complexity and 'wickedness' of social problems, and also their main elements (discussed in 2.4), of critical importance is knowledge on relevant issues, proposed solutions and positive/negative arguments, as perceived by different problem stakeholder groups (Conklin, 2003; Conklin & Begeman, 1989; Kunz & Rittel, 1972, 1979); iii) Finally, at a third level, taking into account the importance of the 'dynamic capabilities' for both private and public sector organizations (e.g. see Teece (2007)), and also the dynamism of modern social problems and needs, quite important is also knowledge about the time wise changes of the above. For the above reasons, the

Table 1
Literature support of the three evaluation perspectives.

Evaluation Perspective	Literature support
Political	Conklin (2003), Conklin and Begeman (1989), Kunz and Rittel (1979),
Crowd-sourcing	Agafonovas and Alonderiene (2013), Bott and Young (2012), Geiger et al. (2011), Jain (2010), Sharma (2010)
Diffusion	Rogers (2003)

Table 2
A Multi-perspective framework for the evaluation of SMM use in government for promoting and supporting open innovation.

Political Perspective
To what extent the particular method of SMM in government is useful/beneficial - for assessing for a particular domain or an existing or under development policy • the level of interest/discussion in the society? • the attitudes/sentiments of the society (positive – neutral - negative)? • the time wise changes of the above (level of interest/discussion and attitudes/sentiments)? • whether there is uniformity/homogeneity of the above among different groups? - for identifying • relevant issues posed by citizens or needs of them? • proposals for solving relevant problems or improving policies? • arguments (positive or negative ones)? - and in particular for the early identification of • new emerging relevant issues or needs in the society? • new emerging proposals in the society for solving relevant problems or improving policies?

Crowd-sourcing Perspective
To what extent you agree with the following: • the results provided (levels of interest, sentiments, issues, proposals, arguments, etc.) are representative (or at least indicative) of the ones prevailing in the society as a whole (and do not represent only some groups of citizens)? • the above are non-biased and non-manipulated? • are of high quality? • they can contribute positively to the development or improvement of public policies in the particular domain.

Diffusion Perspective
To what extent you agree that the particular method of SMM in government, viewed as an innovation • is better than other existing traditional or electronic methods used for similar purposes in the public policy development processes? • is compatible with the public policy development processes, as they are applied in European Union countries, and can be integrated in these processes? • is compatible with the needs, the mentalities and the values of the people designing and applying public policies? • can be initially applied in a small scale in public policy making before proceeding to a large scale application of it? • is in general easy to use? • its application does not require extensive effort? • its visualizations are easy to understand?

first perspective of our evaluation framework is the political one, having as theoretical foundation mainly the wicked social problems theory (see 2.4), and secondarily the dynamic capabilities theory (Teece, 2007). In particular, it assesses to what extent a particular method of SMM in government is useful/beneficial for assessing for a particular domain or an existing or under development policy: the level of interest/discussion in the society, the attitudes/sentiments of the society (positive – neutral - negative), the time wise changes of the above (level of interest/discussion and attitudes/sentiments), and also whether there is uniformity/homogeneity of the above among different citizens groups; furthermore, for identifying relevant issues or needs posed by citizens, proposals for solving relevant problems or improving policies, and relevant positive and negative arguments; and also for the early identification of new emerging relevant issues or needs in the society, and new emerging proposals for solving relevant problems or improving policies (enhancing the dynamic capabilities of government agencies with respect to their 'sensing' component (according to Teece (2007)).

Furthermore, the support provided by this form of 'passive citizen-sourcing' through SMM for the development of open innovation in government agencies relies critically on the degree of fulfillment of the inherent critical success factors of crowd-sourcing, which have been mentioned previously in Section 2.2 (such as representativeness of the crowd, lack of bias and manipulation). Therefore, the second perspective of our evaluation framework assesses the extent of existence of the main critical success factors of crowd-sourcing identified by previous relevant research (Agafonovas & Alonderiene, 2013; Bott & Young, 2012; Geiger et al., 2011; Jain, 2010; Sharma, 2010), which constitutes the theoretical foundation of this evaluation perspective. In particular, it assesses to what extent the results provided (concerning levels of interest, sentiments, issues, proposals, arguments, etc.) are representative (or at least indicative) of the ones prevailing in the society as a whole (and do not represent only some groups of citizens), and also are non-biased and non-manipulated, are of high quality, and can contribute positively to the development or improvement of public policies in the particular domain.

Finally, the use of SMM by government agencies for promoting and supporting open innovation constitutes itself a big innovation in the policy formulation practices and processes of government agencies, so the third perspective of our evaluation framework concerns its diffusion potential. It assesses to what extent the particular method of SMM use in government for promoting and supporting open innovation has the five characteristics proposed by Rogers diffusion of innovation theory (Rogers, 2003) that lead to high levels of adoption and diffusion (discussed in 2.5). In particular, it assesses to what extent it is better than other existing traditional or electronic methods used for similar purposes in the public policy development processes (relative advantage), is compatible with the public policy development processes, as they are applied in European Union countries, and can be integrated in these processes, and also compatible with the needs, the mentalities and the values of the people designing and applying public policies (compatibility); furthermore, to what extent it can be initially applied in a small scale in public policy making before proceeding to a large scale application of it (trialability); finally, to what extent it is easy to use, its application does not require extensive effort, and the visualizations of its results are easy to understand (complexity). We have not included assessment of the fifth characteristic proposed by Rogers diffusion of innovation theory, the observability, as such methods nature are not meant to be visible by the external environment.

4. Research Method

Three pilot applications of the particular method of SMM use in government for promoting and supporting open innovation (outlined in the following Section 5) have been conducted as part of the NOMAD project (mentioned in the Introduction), and evaluated using the multi-perspective evaluation framework presented in Section 3. Since this SMM method was intended to be used not only by government agencies, but also by other public policy stakeholders (e.g. professional associations) interested in open innovation as well (who would like to make use of external knowledge and opinions of citizens, in combination with their own, in order to formulate policy innovation proposals to be submitted to government), two of these pilots were carried out by government organizations, the Greek and the Austrian Parliament, and the third one by an important policy stakeholder in the health domain, the European Academy of Allergy and Clinical Immunology (EAACI). A detailed scenario has been designed for each pilot, which describes how this SMM method will be used for the collection of external knowledge and opinions by the respective 'owner' organization on a particular topic in order to promote and support open innovation. The particular topics of these pilot applications were selected so that on one hand they reflect current debates and interests of their owners, and on the other hand they cover quite different and diverse domains.

The first pilot application was conducted by the Greek Parliament, and concerned national energy planning, based on the white paper "Greek strategy for energy planning"; the objective of the pilot

application was to assess public opinion and attitude/sentiment against this prospective legislation, and to collect relevant proposals and ideas, in order to develop improvements of the above document. The second pilot application was conducted by the Austrian Parliament, and concerned the 'Freedom of Information Act', i.e. a coherent legal basis for opening government information in Austria and open government data policies at large. The third pilot application was oriented towards a more scientific policy topic, and was conducted in collaboration with the EAACI in order to assist them to formulate new policy proposals on "allergy diseases and immunotherapy" to be submitted to competent government agencies.

In particular, for each pilot the following process was followed:

A. At first, the detailed SMM use scenarios and topics were defined in cooperation with the organizations 'owners' of the pilots, then the domain and policy models required (see following Section 5 for more information) were created by them with the support of the research team, and finally a list of targeted external social media sources (which, according to previous knowledge of the pilot owners, might contain relevant user-generated content) has been specified.

B. After the above preparation, the owners initiated the process of crawling the specified external sources against the corresponding domain and policy models, and processing the collected content.

C. Then the personnel of the owner organization who participated in this pilot examined the results, assisted by members of our research team, and used them in order to draw conclusions concerning the topic of each pilot.

D. Finally, for each pilot an evaluation focus group discussion was organized, which was attended by personnel of the owner organization who were involved in this pilot, and also other additional invited persons who had relevant knowledge and experience. In the pilots of the Greek and Austrian Parliament were invited advisors and assistants of Members of the Parliament, and journalists specialized in the corresponding domain; the total number of participants in these two focus group discussions was 22 for the Greek and 10 for the Austrian one. In the EACCI pilot were invited doctors, experts and journalists specialized in allergy and clinical immunology; the total number of participants in this focus group discussion was 21. During these focus group discussions the proposed SMM method was introduced to the audience, together with the supporting ICT infrastructure, and particular applications with their results were showcased. Then the participants had the opportunity to interact with the ICT platform, performing some predefined tasks, under the observation of organizers' staff, who supported them in completing these tasks, and recorded any comments or difficulties.

In order to collect evaluation data from the participants of these focus group discussions we used a combination of both qualitative and quantitative techniques. Qualitative techniques allow a more in-depth examination of a phenomenon of interest, and therefore lead to the generation of deeper knowledge about it, not limited to a predefined number of variables (as in the quantitative techniques), enabling a better and richer understanding of 'why' and 'how' things happened; the quantitative techniques offer the advantage of enabling the summarization of a large quantity of evidence into a few numbers (e.g. averages), which makes it easier to draw conclusions (Maylor & Blackmon, 2005; Ragin & Amoroso, 2011; Yin, 2013). For these reasons, in order to combine the abovementioned advantages of the qualitative and the quantitative techniques, in each of these focus groups we conducted initially qualitative discussions focused on the questions of the three perspectives of our evaluation framework (Table 1), in order to gain a deeper and richer understanding of why the participants perceive a low or high level of value generated along each of these dimensions. Then we asked them to fill an evaluation questionnaire, which has been

structured based on the questions of the three perspectives of our evaluation framework: these questions were converted to positive statements, and the respondents were asked to provide the degree of their agreement/disagreement with each of them in a five-levels scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree), which condenses/summarizes all the positives and negatives along the particular value dimension. The above qualitative discussions were recorded with the consent of the participants, and then transcribed and coded manually using an open coding approach (Maylor & Blackmon, 2005); the data collected through the questionnaire were processed using Excel.

5. A Method of SMM in Government for Open Innovation

Though the development and the detailed description of the evaluated SMM method are beyond the scope of this paper, for the sake of completeness of the paper in this section we provide an outline of the method, and also a typical screen (in Fig. 1) of the visualized information finally provided to the users by the ICT platform supporting the application of this SMM method; more details are provided in Charalabidis et al. (2014) and Loukis and Charalabidis (2015). The method consists of four steps:

i) The first step is to build the 'domain model', which is a representation of the main entities-terms of domain we intend to intervene in through a policy (e.g. energy domain, education domain, health domain), as well as relations among them, in a tree structure; this is done using a graphical modelling tool.

ii) The second step is based on the above domain model to build the 'policy model', which is a representation of the public policy we want to collect relevant content about in 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 positive or negative 'arguments'; this is done using the same graphical modelling tool.

iii) Upon the completion of the models, the user provides a list of social media sources (e.g. political blogs, news websites, and also Twitter, Facebook, etc. accounts), which are going to be crawled, in order to find relevant content about the domain or public policy of interest.

iv) The above sources defined in step (iii) are searched by the above ICT infrastructure against the domain and policy models (defined in steps (i) and (ii) respectively), and the collected content undergoes sophisticated processing using opinion mining techniques (as described in more detail in Charalabidis et al. (2014)). The results are presented to the user in visualized form; a typical screen is shown in Fig. 1.

As we can see in Fig. 1 that the visualized information provided to the user includes:

- In the upper left part of the screen is shown for each of the elements of the domain or policy model (according to the selections made just above it) an estimation of the volume of discussion and the cumulative sentiment; the former is 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 selected model, or for a selected element of it, in the lower left part of the screen is shown the distribution of the volume of discussion over time and also across age groups,

- while in the upper right part is shown a word cloud depicting the most frequent terms-topics discussed online (colored according to the corresponding sentiment),

- and in the lower left part we can see a list of text excerpts from the sources with relevant content (all concerning the selected model or element of it).
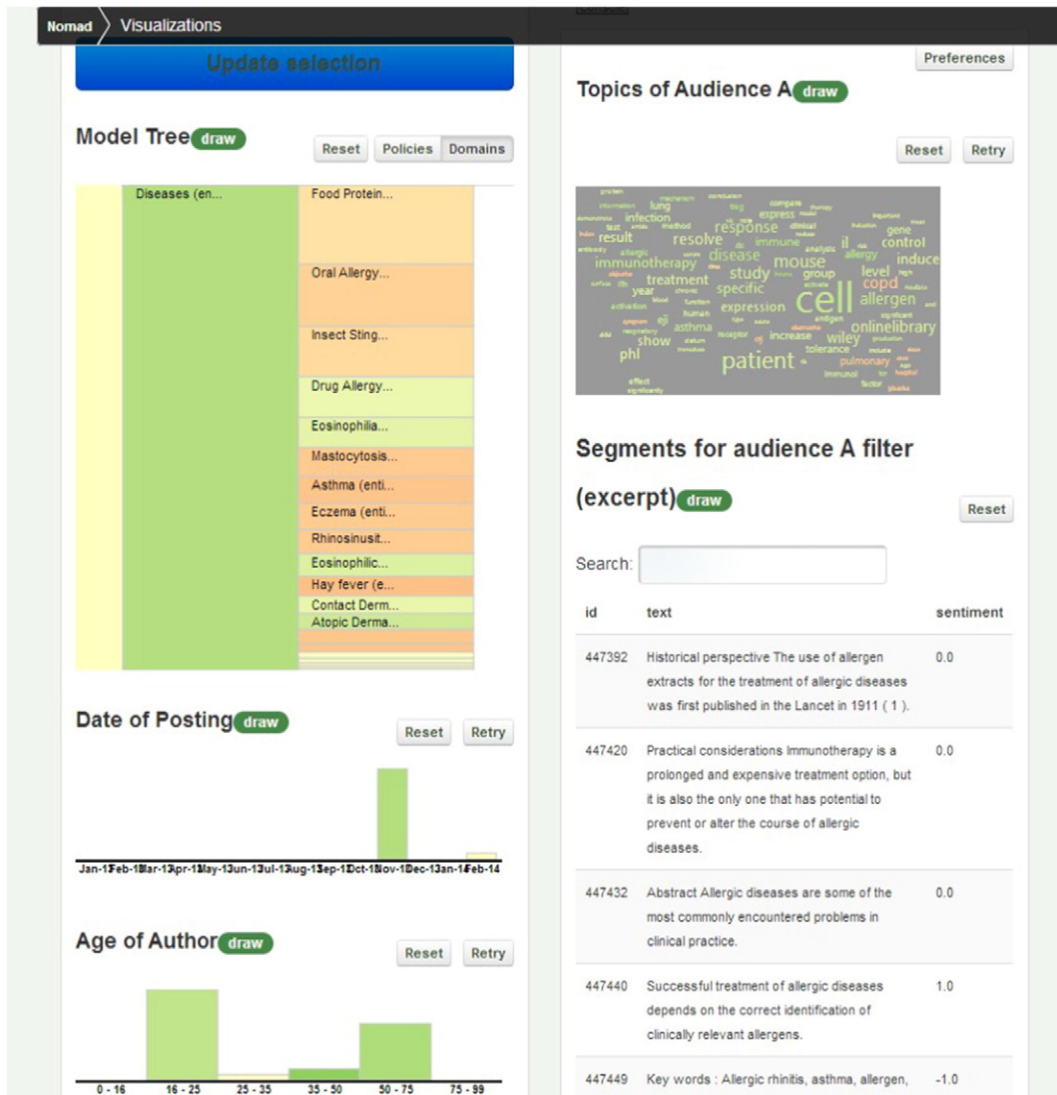
Fig. 1. A typical results' visualization screen.

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 (volumes of discussion and sentiment).

6. Results

In Table 3 we can see the results of the processing of the evaluation data collected through the questionnaire (relative frequencies of the responses 'strongly disagree' (SD), 'disagree'(D), 'neutral'(N), 'agree' (AG) and 'strongly agree' (SAG) respectively.

6.1. Political Perspective

With respect to the political perspective from Table 3 we can see that 96.20% (56.6% + 39.6%) of the respondents strongly agree or agree that this SMM method is useful for assessing the level of interest/discussion in the society about a particular domain of government activity or an existing or under development policy, but this percentage is lower at the level of 73.60% (47.2% + 26.4%) for its usefulness for assessing relevant attitudes/sentiments of the society (whether they are positive, neutral or negative), and even lower 55.80% (47.2% + 11.3%) for its

usefulness for assessing whether there is uniformity/homogeneity of the above among different citizens' groups. Furthermore, our results indicate that this method can provide more detailed knowledge elements as well, which are highly useful for facilitating and promoting open innovation. In particular, 81.2% (60.4% + 20.8%) of the respondents strongly agree or agree that this SMM method is useful for identifying with respect to a particular domain, or an existing or under development policy of interest relevant issues posed by citizens or needs of them, while this percentage is 73.6% (43.4% + 30.2%) concerning the identification of positive and negative arguments, and 62.3% (41.5% + 20.8%) for identifying specific proposals from the society for solving relevant problems or improving relevant policies. Another interesting finding is that this SMM method is useful for 'sensing' changes in the external environment of government agencies, which facilitate and promote relevant open innovation. In particular, 84.9% (60.4% + 20.8%) strongly agree or agree concerning its usefulness for the identification of changes in the level of interest/discussion and in the attitudes/sentiments in the society concerning a particular domain of government activity or an existing or under development policy; a little lower at the level of 73.6% (52.8% + 20.8%) is this percentage concerning the usefulness for the identification of new emerging relevant issues or needs, and even lower 58.5% (39.6% + 18.9%) emerging proposals for solving

Table 3
Average ratings - relative frequencies of 'strongly disagree', 'disagree', 'neutral', 'agree' and 'strongly agree' for all questions.

Political Perspective	SD	D	N	AG	SAG
The particular method of SMM in government is useful/beneficial					
- for assessing for a particular domain or an existing or under development policy					
• the level of interest/discussion in the society	1.9%	1.9%	0%	56.6%	39.6%
• the attitudes/sentiments of the society (positive – neutral - negative)?	1.9%	7.5%	17%	47.2%	26.4%
• the time wise changes of the above (level of interest/discussion and attitudes/ sentiments)?	1.9%	5.7%	7.5%	60.4%	24.5%
• whether there is uniformity/homogeneity of the above among different groups?	3.8%	5.7%	32.1%	47.2%	11.3%
- for identifying					
• relevant issues posed by citizens or needs of them?	1.9%	1.9%	15.1%	60.4%	20.8%
• proposals for solving relevant problems or improving policies?	3.8%	7.5%	26.4%	41.5%	20.8%
• arguments (positive or negative ones)?	0%	7.5%	18.9%	43.4%	30.2%
- and in particular for the early identification of					
• new emerging relevant issues or needs in the society?	1.9%	9.4%	15.1%	52.8%	20.8%
• new emerging proposals in the society for solving relevant problems or improving policies?	3.8%	9.4%	28.3%	39.6%	18.9%

Crowd-sourcing Perspective	SD	D	N	AG	SAG
To what extent you agree with the following:					
• the results provided (levels of interest, sentiments, issues, proposals, arguments, etc.) are representative (or at least indicative) of the ones prevailing in the society as a whole (and do not represent only some groups of citizens)?	7.5%	11.3%	24.5%	43.4%	13.2%
• the above are non-biased and non-manipulated?	7.5%	15.1%	35.8%	24.5%	17.0%
• are of high quality?	3.8%	17%	35.8%	32.1%	11.3%
• they can contribute positively to the development or improvement of public policies in the particular domain?	1.9%	1.9%	13.2%	58.5%	24.5%

Diffusion Perspective	SD	D	N	AG	SAG
To what extent you agree that the particular method of SMM in government, viewed as an innovation					
• is better than other existing traditional or electronic methods used for similar purposes in the public policy development processes?	3.8%	3.8%	35.8%	32.1%	24.5%
• is compatible with the public policy development processes, as they are applied in European Union countries, and can be integrated in these processes?	3.8%	0%	22.6%	58.5%	15.1%
• is compatible with the needs, the mentalities and the values of the people designing and applying public policies?	1.9%	5.7%	39.6%	37.7%	15.1%
• can be initially applied in a small scale in public policy making before proceeding to a large scale application of it?	1.9%	9.4%	13.2%	32.1%	43.4%
• is in general easy to use?	7.5%	17%	20.8%	45.3%	9.4%
• its application does not require extensive effort?	1.9%	28.3%	22.6%	37.7%	9.4%
• its visualizations are easy to understand?	5.7%	3.8%	28.3%	45.3%	17.0%

relevant problems or improving relevant policies. These results indicate that this SMM method can enhance the dynamic capabilities of government agencies with respect to their 'sensing' component (Teece, 2007), mainly in sensing changes in the general interest and attitude, and less in identifying more specific new issues, needs or proposals.

In the focus group discussions there was an overall agreement that this SMM method provided a time and cost efficient channel to assess citizens' interest, attitudes and feelings concerning a particular domain or policy of interest, which is better, quicker and less expensive than the traditional citizens' surveys conducted by government agencies for the above purposes. The knowledge elements extracted from a wide range of social media sources (e.g. political blogs, news websites, and Twitter, Facebook, etc. accounts) are regarded as very useful for open policy innovation. Participants mentioned that based on their experience in the policy making area this SMM method has the potential to become a "powerful tool for producing new policies", which can be used in all stages of public policies' lifecycle. However, they mentioned the risk of misusing such SMM results for promoting individual interests, by focusing selectively on some of the results that support their own positions, and hiding some others in the opposite direction, or possibly misinterpreting them, instead of using these results for collecting external knowledge from the society, in order to formulate better and more effective policies. Furthermore, they also mentioned the risk of monitoring citizens' postings perceived by the latter as private, which would seem as an intrusion into citizens' private sphere; even worse would be the use of the results for identifying citizens having political beliefs and orientations different from the ones of government, and for personal monitoring of them. It was generally concluded that the benefits for society from the use of any web-monitoring tool by government depend critically on how this technology is utilized and how its results are exploited, so it was recommended that government should develop strict regulations concerning how this powerful tool should be used.

It has been stressed that one of the most valuable capabilities of this method is the comparative analysis/view it can provide, i.e. present comparisons in the results between demographically different audiences (e.g. in terms of gender, age and education), or different time intervals. This is very useful for the design of policy innovations, since as mentioned previously in 2.4 most social problems become increasingly 'wicked', having various stakeholder groups with different perceptions of the problem, the main issues and the objectives to be achieved. Also the comparison between two different time periods enables monitoring the evolution of public stance on a policy related topic, and also measuring the impact and effectiveness of various relevant communication and awareness campaigns or interventions. However, the participants of the focus groups discussions suggested that more comparative analysis/view capabilities should be provided, e.g. between geographic areas (since the geographical dimension is very often important for government decision making, especially for public policies that concern or affect specific regions) and content source groups (since usually there are differences between content sources groups of different political orientations).

Finally, some of the participants in the focus group discussions mentioned that this SMM method enables to some extent the identification of emerging new relevant issues/topics, proposal, and in general new tendencies in the society concerning a domain of government activity or public policy, however not to the extent they would expect and require. The word cloud (in the upper right part of the main results' visualization screen – see Fig. 1) does not seem appropriate for the early identification of new issues, proposals and tendencies, as it is dominated by the well-established terms (shown with big character sizes, as they are more frequently mentioned by citizens), while the new ones are hardly visible (only some of them are shown with much smaller character sizes, as they are much less frequently mentioned by citizens); so new issues, proposals and tendencies can be identified mainly by

reading the list of text excerpts from the sources with relevant content (in the lower left part of the main results' visualization screen – see Fig. 1). In order to have improvement in this direction two suggestions have been made: a) to add the capability of temporarily removing out of the word cloud the most frequent terms it includes (shown with big size), so that other less frequently mentioned topics-terms become more visible; b) to process further the above text excerpts using various opinion mining techniques, in order to automatically identify new terms.

6.2. Crowd-sourcing Perspective

With respect to the crowd-souring perspective from Table 3 we can see that 56.5% (43.4% + 13.2%) of the respondents strongly agree or agree that the results produced by this SMM method (levels of interest, sentiments, issues, proposals, arguments, etc.) are representative of the trends and opinions prevailing in the society as a whole, while this percentage is at the lower level of 41.5% (24.5% + 17%) concerning the lack of bias and manipulation, and at 43.4% (32.1% + 11.3%) concerning their quality. However, despite these drawbacks, 83% (58.5% + 24.5%) of the respondents strongly agree or agree that the results provided by this SMM method can contribute to the development or improvement of public policies.

In the focus group discussions there was skepticism about the representativeness of the citizens' groups who produce the content collected from the monitored social media (i.e. whether the results reflect the general public opinion or not), and also about its reliability (i.e. whether it is non-biased, non-manipulated and of good quality). There was wide agreement that the selection of the social media sources to be monitored is of critical importance in this respect: it was emphasized that it is necessary to select a representative set of high reliability and quality social medial sources to be monitored. Also, it was thus it was suggested to monitor not only 'open' content sources (i.e. freely available), but also 'closed' ones as well (i.e. subscription based ones, such as high quality newspapers' and magazines' websites), since it is believed that the latter might contain higher quality content. Furthermore, a suggestion that emerged was to provide the capability to focus on specific groups/communities, by producing results (e.g. the ones shown in the basic results' screen shown in Fig. 1) corresponding to specific groups of sources (i.e. for subsets of the initially defined sources that have specific political orientations, or correspond to particular sectors or professional groups), or even access the individual sources from which a term of the word cloud originates. It was stressed that it is of particular importance in order to be able understand better an opinion, argument or suggestion, or to assess a sentiment, to know the context in which it has been expressed.

Also, some of the participants mentioned that a weakness of this SMM method is that it does not distinguish between the results coming from experts and the ones from the general public; so they suggested that the content retrieved by the monitored sources should be weighted based on the reputation of the source or even the author. Finally, it has been mentioned that there are posts in some sources, which are reproduced (possibly with small changes) on purpose in other sources, and this can lead to mistaken political conclusions as to the extent of social support of opinions, proposals, arguments, etc. expressed in the social media; so they suggested that it would be useful if such 'chains' of reproduction could be detected (e.g. using appropriate text processing and opinion mining methods), since this would on one hand allow the identification of 'digital opinion leaders', and on the other hand enable a more precise assessment of the real social support of the expressed opinions, issues, proposals and arguments.

6.3. Diffusion Perspective

With respect to the diffusion perspective from Table 3 we can see that 56.6% (32.1% + 24.5%) of the respondents strongly agree or disagree that this method of SMM in government offers relative advantage over the existing traditional or electronic methods used for similar purposes in the public policy development processes; this percentage becomes 73.6% concerning its compatibility with these processes, 52.8% (37.7% + 15.1%) concerning its compatibility with the needs, the mentalities and the values of the people designing and applying public policies, and 75.5% (32.1% + 43.4%) concerning its trialability in a small scale before proceeding to a large scale application of it.

In the focus group discussions the potential usefulness of this SMM method for the development of public policies, and also improvements of existing ones, has been confirmed; there was an overall agreement that it offers significant relative advantages over the citizens' surveys, which is the main alternative for the same purpose currently in use by government agencies. It has been mentioned that surveys have two main disadvantages in comparison with SMM: they can neither capture public sentiment nor provide detailed information (e.g. frequently mentioned terms/topics, relevant text excerpts) concerning an existing or under development public policy; however, citizens' surveys can give more representative results (by using balanced and representative citizens' samples).

However, only 54.7% (45.3% + 9.4%) of the respondents strongly agree or agree that this SMM method is easy to use, while 47.1% (37.7% + 9.4%) strongly agree or agree that it does not require extensive effort; however, with respect to the main output of this method, the visualizations it provides (see Section 5), a higher percentage of 62.3% (45.3% + 17.0%) strongly agree or agree that they are easy to understand. These results indicate that the use of this method of SMM in government does not seem easy to the respondents. In the focus group discussions it was mentioned that the main reason for this is the need to build complex models of the specific domain of government activity as well as the particular policy we are interested in, which requires much time and effort. As a possible solution for this was suggested the use of existing domain ontologies or vocabularies as a basis (and probably add or subtract from them entities-terms), therefore the functionality of the supporting ICT platform should be enriched in order to provide such import capabilities. For the results' visualization it was stressed that it is useful for gaining a better understanding of the results, however some improvements are required, such as provision of some additional charts, and improvement of existing ones in order to become more clear and understandable; also it should provide the capability to use some of the results (e.g. terms-topics from the word cloud) in order to improve the initial domain and policy models. Furthermore, it was suggested that the visualization tool should be more flexible and adaptable to user's preferences. Another issue raised was that the users cannot understand how the various types of results (e.g. discussion volumes, sentiments, word clouds) have been produced, and this makes their interpretation difficult; so it would be useful for each chart to provide a basic explanation of how it has been calculated, possibly with links providing more detailed explanations if required by the user (i.e. higher transparency of results).

7. Conclusions

The public sector has started applying the crowd-sourcing ideas, which have been initially developed and applied in the private sector, aiming to exploit the extensive knowledge of citizens for the development of innovations in public policies and services, such as new public policies and services, or improvements of existing ones. However, the existing knowledge base concerning methods and practices for open innovation in government is limited in comparison with the private sector. Therefore extensive research is required for the development of effective open innovation methods and practices for the public sector, which address its specific needs and orientations, and then for the analysis and evaluation of them from various perspectives. This paper contributes to filling this research gap. It evaluates a novel method of monitoring relevant external social media (e.g. political blogs, news websites, and also Facebook, Twitter, etc. accounts) by government

agencies, in order to promote and support open innovation. Furthermore, for this purpose it develops a multi-perspective framework for evaluating the use of SMM in government for promoting and supporting open innovation, based on sound theoretical foundations from both the political and the management sciences.

It has been concluded that this method of using SMM in government can significantly promote and support open innovation in public policy (development of new public policies for addressing complex and 'wicked' social problems, or improvement of existing public policies), as it can provide to government agencies extensive relevant external knowledge highly important for this purpose. In particular, it allows extracting from social media various kinds of media useful external 'high level' knowledge concerning the level of interest/discussion in the society for a particular domain or an existing or under development policy, and the attitudes/sentiments of the society. Furthermore, it allows extracting more detailed external knowledge as well, about relevant issues posed by citizens, and to a lower degree proposals for solving relevant problems or improving policies and relevant arguments (positive or negative), which can significantly facilitate, promote and support open policy innovation. Another interesting finding is that this SMM method is useful for 'sensing' changes in the external environment of government agencies, which can be very useful for the development of policy innovations for addressing these changes; therefore the use of this method can enhance the dynamic capabilities of government agencies with respect to their 'sensing' component (Teece, 2007).

However, some risks have also been identified, associated with the degree of representativeness of the citizens' groups who produce the content collected from the monitored social media, and also its reliability (i.e. whether it is non-biased, non-manipulated and of good quality). However, despite these possible drawbacks, the results of this SMM method seem to be highly useful for the development or improvement of public policies. The selection of the social media sources to be monitored is of critical importance in this respect. Finally, with respect to the diffusion potential of this method, it has been concluded that it possesses to a good extent all the required characteristics for a wide adoption by government agencies, with the only exception of its relatively high complexity. Our results indicate that it is not easy to use and apply, as it requires building complex models of the specific domain and also the particular policy we are interested in; the use of relevant existing ontologies or vocabularies as a basis for them might reduce the required effort and time for this. Also, the benefits for society from the use of such SMM methods by government seem to depend critically on how and for what purposes they are used, as there are significant risks of misusing them (so transparency and regulation in this respect are necessary). Finally, our research has identified ways/interventions for improving and further developing this SMM method, and addressing its weaknesses.

This study has interesting implications for research and practice. With respect to the research, it contributes to the increase of our limited knowledge base concerning open innovation method and practices for the quite specific context of the public sector, focusing on a novel approach of 'passive citizen sourcing' for promoting and supporting open innovation, based on the monitoring of relevant social media by government agencies using an advanced ICT infrastructure. Also, it has developed a framework for the multi-dimensional analysis and evaluation of such methods with respect to their contribution to open innovation in government, from both political and management sciences' perspectives, which can be useful for the extensive future research required on public sector open innovation. Our study shows that the analysis of open innovation in the public sector is more complex than in the private sector: while the latter is based on various management science perspectives, the former should combine both management and political sciences perspectives. With respect to practice, this study has developed practically useful knowledge concerning on one hand the value that such a SMM method can provide to government agencies towards the promotions and support of open innovation, its strengths and advantages, and on the other hand its problems and weaknesses, and also ways/interventions for addressing them, and critical success factors.

The main limitation of this study is that it focuses only on one of the dimensions of open innovation in government: the collection of relevant external knowledge from the citizens; however, it has not investigated the other dimensions of it that concern the exploitation of this external knowledge within government agencies in order to design innovations in their policies and services. According to previous research on the 'absorptive capacity' of organizations (Roberts, Galluch, Dinger, & Grover, 2012) the innovation development process consists of three main stages: external knowledge acquisition, assimilation and application/exploitation; organizations in order to be successful in innovation should develop high capacity in all three of them. Our study (and also most of the studies that have been conducted on public sector citizen-sourcing – see Section 2.2) focuses on the first of them, so further research is required concerning the other two stages, aiming at the development of processes, practices and ICT infrastructure for the assimilation of this external knowledge collected through SMM within the government agency, and then its application/exploitation for the development of innovations in policies and services. 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)). The proposed evaluation framework can be used for the multi-perspective evaluation and understanding of other more complex methods of passive, or even active, citizen-sourcing, or - as mentioned above – of other methods of extracting knowledge resources from other actors, for promoting and supporting open innovation. Finally, further research can be conducted for elaborating the quantitative analysis of the evaluation data collected through the questionnaire (e.g. to add a general evaluation question, and through the calculation of its correlations with all the other variables to draw conclusions concerning the perceived importance of the former for the users).

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