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Digital Participatory Platforms for Co-Production in Urban Development:
A Systematic Review

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ABSTRACT

A renewed interest has appeared in citizen co-production of public services due to financial pressure on governments. While social media are considered an important facilitator, many digital participatory platforms (DPPs) have been developed to facilitate co-production between citizens and governments in the context of urban development. Previous studies have delivered a fragmented overview of DPPs in a few socio-spatial contexts and failed to take stock of the rise of DPPs. This article aims to provide a more comprehensive picture of the availability and functionalities of DPPs. Through a systematic review, 113 active DPPs have been identified, analysed, and classified within a citizen-government relationship typology. Almost a quarter of these DPPs demonstrate a realistic potential for online and offline co-production between governments and citizens. The article critically analyses the characteristics of these DPPs and explores their real-world applications in urban development. The article concludes with directions for further research.

KEYWORDS

Citizen Engagement, Citizen-Government Relationships, Co-Production, Digital Participatory Platforms, Online Platforms, Self-Organization, Social Media, Urban Development

INTRODUCTION

Collaboration and participation of citizens in governments' activities at all levels has received increasing levels of attention in many disciplinary fields such as public administration and government studies, urban planning, public service design, computer science, and information technology (e.g. Bryer & Zavattaro, 2011; Gil de Zúñiga *et al*., 2010; Linders, 2012; Magro, 2012; Munthe-Kaas & Hoffmann, 2016; Sanders & Stappers, 2008; Slotterback, 2011; Verschuere *et al.*, 2012). Much of this attention derives from the potential contribution of new social media, digital platforms and other ICTs to the interactions between (national and local) governments and citizens. Because of wider economic trends, welfare state retrenchment, devolution and new knowledge-sharing patterns, citizens' demands and governments' actions increasingly require two-way engagement and closer collaboration (Kleinhans et al., 2015). A renewed interest has appeared in citizen co-production of public services, especially in view of the financial pressures currently facing governments around

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the world (Linders, 2012; Parrado et al., 2013). Co-production generally refers to the public sector and citizens making better use of each other's assets and resources to achieve better outcomes and improved efficiency (Bovaird & Loeffler, 2012, p. 1121). Co-production is widely regarded as a "solution to the public sector's decreased legitimacy and dwindling resources by accessing more of society's resources" and as a means "to reinvigorate voluntary participation and social cohesion in an increasingly fragmented and individualized society" (Brandsen & Honingh, 2016, p. 427). In line with this stance, mobile applications and platforms created by professional developers through government challenges, prizes, apps competitions, and hackathons - where governments make their data available to produce new ideas and solutions - are widespread and common (see e.g. Challenge.gov; New York City Big Apps; Europe Open Data Challenge, Rotterdam Park Hackathon, San Diego Apps Challenges, Code for America).

While there is an abundance of literature on the use of social media for citizen-government relationships (see e.g. Bryer & Zavattaro, 2011; Magro, 2012; Mergel, 2013), this paper focuses on a more specific type of ICT: digital participatory platforms (DPPs – see Section 2 for definition), that aim to bring together public and private actors (for example Commonplace, coUrbanize, and TransformCity) (Ertiö, 2015; Desouza & Bhagwatwar, 2014). While DPPs have a large potential for facilitating two-way interactions between government and citizens, previous studies highlight that their application to truly foster interaction, mutual collaboration and co-production of ideas, solutions and new services has not been so widespread (Afzalan & Evans-Cowley, 2015; Desouza & Bhagwatwar, 2012; Ertiö, 2015; Williamson & Parolin, 2013; Zavattaro & Sementelli, 2014).

However, previous reviews of such platforms tend to be limited to a few specific socio-spatial contexts like the United States of America or some parts of Europe (Atzmanstorfer & Blaschke, 2013; Desouza & Bhagwatwar, 2012, 2014; Evans Cowley & Kubinski, 2015), thus resulting in a somewhat narrow spatial coverage and limited validity of the conclusions beyond these contexts. As Babelon et al. (2016, p. 2) point out with regard to the related field of Public Participation Geographic Information Systems (PPGIS), and the same is confirmed for DPPs in general by our systematic review, "it now seems instead that research is lagging behind the increased deployment of web-based PPGIS in urban planning and fails to take stock of a flurry of commercially and open-source developed web-based PPGIS applications." The most exhaustive review of (mobile-based) DPPs hitherto was carried out by Ertiö (2015) who included 35 mobile apps from different countries (USA, Australia, Finland, Hong Kong) even though it may be said to be still limited to purposes such as informing the public and one-way communication from government to citizens (almost half the sample of Ertiö) and in terms of spatial and geographical distribution.

Whereas "co-production in the past was constrained by the limited ability of government to effectively coordinate citizen actions and the difficulty of ordinary citizens to self-organize, the advent of the Internet's unique many-to-many interactivity and of ubiquitous communications promises to enable co-production on an unprecedented scale" (Linders, 2012, p. 446). However, Internet-facilitated co-production has not been systematically studied yet (Linders, 2012, p. 447; see also Meijer, 2011). Therefore, this paper has a twofold aim:

1. To provide a more (globally) comprehensive inventory of the availability and development of DPPS for various engagement purposes, their adoption, and actual use by government and citizens, ranging from information sharing to consultation and co-production;
2. To identify those DPPs in the inventory that demonstrate the potential for co-production between governments at various levels and citizens groups, by analysing and discussing their features, the kinds of problems and issues they are used for, and identifying potential case studies for future research on technology-enabled co-production.

For these purposes, we have conducted a systematic review for the identification of DPPs using both academic and practitioner literature, and a Google search in different languages to cover a broader

spectrum of countries around the world. The systematic review first and for all contributes to a much more comprehensive inventory of DPPs, which meet different purposes and goals and reflect varying degrees of intensity in the interaction and collaboration between governments and citizens. As such, this inventory goes beyond and adds to previous reviews of digital platforms for engagement and collaboration. It identifies examples of DPPs for co-production purposes, along with their essential technological features and real-world applications, showing the availability and readiness of technology and paving the way for future research on technology-enabled co-production which should guarantee new knowledge and understanding of how we can use the available technology more effectively.

However, because there are no hard limits between co-production and other forms and intensities of government-citizen interactions, the paper starts with a review of the literature on the different levels of collaboration and engagement between government and citizens that are fostered by DPPs. From this, a typology of citizen-government relationships is therefore developed in section two as the basis for the classification of all identified platforms within one of the levels, grounded in a working definition of DPPs and theoretical foundations of concepts such as co-production. In section three we present the research design that we have applied for the identification and review of DPPS. Section four moves on to discuss the results of the systematic review and to classify the platforms on the basis of the typology as developed in section two. Section five analyses the main elements and functionalities of the platforms that claim to allow for collaboration and co-production identifying their distinguishing features. The final section draws conclusions and provides suggestions for practitioners and for further research.

LEVELS OF THE CITIZEN-GOVERNMENT RELATIONSHIP ENABLED BY DIGITAL PLATFORMS

Digital Participatory Platforms (DPPs) are defined here as a specific type of civic technology explicitly built for participatory, engagement and collaboration purposes that allow for user generated content and include a range of functionalities (e.g. analytics, map-based and geo-located input, importing and exporting of data, ranking of ideas) which transcend and considerably differ from social media such as Social Networking Sites and Microblogging (Facebook, Twitter and Instagram). DPPs thus allow for different levels and intensity of citizen engagement and participation. Many authors have tried to identify the levels of citizens engagement and participation in government activities through the use of digital technologies (De Souza & Bhagwatwar, 2014; Ertiö, 2015; Evans-Cowley & Hollander, 2010; Jones et al., 2015; Khan, 2015; Li & Feeney, 2014; Linders, 2012; McMillan, 2002; Mergel, 2013; Suen, 2006; Williamson & Parolin, 2013). Generally, three levels of engagement with an increasing degree of interaction are identified within the academic literature. They could be summarised as follows:

- **Information sharing:** One-way communication from government to citizens. McMillan (2002) calls this *Monologues* whereas Linders (2012, p. 449) defines this level *Government as a Platform*, in which governments equip citizens with data needed to make informed decisions or design policies/services in a way that maintains freedom of choice, but stimulates a 'socially optimal' option;
- **Interaction:** Two-way communication with dialogue between citizens and government representatives flowing both ways. McMillan (2002) calls this *mutual discourse*;
- **Civic engagement, involvement, collaboration:** On this level, the two-way interactions go beyond basic information exchange to 'materialise' in policy measures, joint service delivery or other interventions. We will refer to this level as co-production, i.e. the public sector and citizens making better use of each other's assets and resources to achieve better outcomes and improved efficiency (Bovaird and Loeffler, 2012, p. 1121).

Co-Production and the Role of Digitally-Mediated Practices

The Internet facilitates 'networked co-production' which emphasises the relationships between government and communities of citizens, i.e. users and non-users of specific services (Meijer, 2011, p. 599-600). DPPs can be particularly useful as content can be created in networks and communities, made available to all members of the community and stored in an accessible format to create an online repository for virtual communities (ibid., p. 601). As such, citizens and professionals can "bring different types of knowledge — the one general knowledge of the core (primary) process of the organization and the production of service, and the other situational or local knowledge" (Brandsen and Honingh, 2016, p. 430).

Within the co-production level where citizens can identify, discuss problems, and propose solutions, concepts and practices such as PPGIS, collaborative mapping, Volunteered Geographic Information (VGI), crowdsourcing, and neo-geography play a fundamental role (Brown & Kytta, 2014; Goodchild, 2007; Silva, 2013; Wilson & Graham, 2013a). PPGIS describes technologies that aim at supporting public participation in a variety of contexts with the aims of inclusion and empowerment of marginalised population to inform environmental and urban planning (Babelon *et al*., 2016; Brown, 2012; Brown & Kytta, 2014; Panek, 2015). Brown (2012) states that collection of spatial data in PPGIS methods is agency driven as opposed to Volunteered Geographic Information (VGI) where citizens and individuals freely contribute their knowledge and information about a specific part of the city (Adams, 2013; Coleman *et al*., 2009; Goodchild, 2007). Such practices fall within the broader conceptualization of 'neo-geography' as defined by Wilson and Graham (2013b, p. 4) who underline that their "use of the word 'neo-geography' marks digitally mediated social practices through explicitly spatialised data/code practices".

A Typology of Citizen-Government Relationship

Adding on to the main levels of citizen-government relationship, some authors (e.g. Desouza and Bhagwatwar, 2014; Ertiö, 2015) identify more levels and sub-levels which further specify the role of, and information flows between, the actors involved in the citizen-government relationship. Ertiö (2015) for example identifies *consultation* as a sub-level of the information sharing level where information flows one-way from citizens to governments, and *criteria power* (ability of citizens to determine a policy or service) and *operational power* (ability of citizens to determine how a policy or service is carried out in practice) as the two sub-levels of civic engagement, involvement and collaboration (the author calls this level *empowerment* instead of co-production). Interestingly, Desouza and Bhagwatwar (2014, p. 37), in their four archetypes of technology-enabled participatory platforms, identify the *citizen-centric and citizen-sourced data* archetype "as an alternative medium for citizens to organize themselves to make a difference in their local communities." Linders (2012) calls this level *Do it Yourself Government* where citizens self-organize to achieve their own purposes.

This, in our opinion, should be the 'top' level of the citizen-government relationship in which citizens self-organize to produce solutions. However, at this level there is little or no interaction between citizens and government and interaction takes place only in cases where choice and implementation of the solution developed by the citizens still requires some government action, as Desouza and Bhagwatwar (2014) and Linders (2012) emphasise in their categorisations.

Table 1 summarizes our typology of citizen-government relationship as drawn from international academic literature.

Despite a growing number of web-based and mobile-based platforms that enable information sharing and interaction between government and citizens, scholars have highlighted that use of DPPs is not yet interactive and is not being able to create two-way communication (Williamson & Parolin, 2013; Ertiö, 2015). To a certain extent, this is due to challenges, risks and other factors that influence government use and citizens adoption of social media and, in particular DPPs (e.g. Bertot et al., 2012; Casey & Li, 2012; Kavanaugh et al., 2012; Khan et al., 2014; Mergel, 2013; Picazo-Vela et al., 2012; Williamson & Parolin, 2013). However, building on and trying to expand previous scholarly work,

Table 1. Levels of citizen-government relationship

Levels	Sub-Levels
Information sharing	Informing: One-way communication ('broadcasting') from government to citizens.
	Consulting: One-way communication from citizens to governments.
Interaction	Two-way communication with dialogue and feedback between citizens and government representatives.
Co-production	The public sector and citizens making better use of each other's assets and resources to achieve better outcomes and improved efficiency.
Self-organization	Public matters: Citizens create solutions independently that are to be recognised, facilitated or adopted by governments and require some government action.
	Private matters: Citizens share information and self-organize for matters of private interest that may develop into public demands requiring some government action.

Source: Own Elaboration

this paper focuses on the availability of DPPs and on the specific features that characterise them, and shows that many interaction and co-production platforms have been already developed and are available and ready to use. Therefore, we have tried to identify a higher number of platforms than has ever been done before to understand development trends in several countries and contexts and to classify the platforms within one of different levels of the citizens-government relationship presented in Table 1. Other classifications are possible and because of this we believe it is essential to provide the full list of identified DPPs (see Appendix, Tables 3-7) as classified within all of our levels of the relationship. This will pave the way for future research on DPPs and especially on those that are classified in the co-production level, regarding their actual use, ability to foster co-production, involvement of citizens and implementation of ideas and solutions, reasons for success or failure. Below, we first discuss the research design that resulted into the list of identified DPPs and then explain how we classified them into the different levels of the citizen-government relationship (see Appendix, Tables 3-7).

RESEARCH DESIGN

For the identification of relevant DPPs we have employed a step-wise review approach with different sources. We started from the communitymatters blog (www.communitymatters.org) where a list of 50 tools for online public engagement was available. We checked all the tools that were listed on the blog to make sure that only those that were still online and accessible were included in our list.

We then searched the literature using the Scopus database to include all articles which discussed and presented DPPs for the engagement of citizens. We performed our search queries on 2nd, 3rd, and 4th November 2016 with the keywords (participatory platforms), (collaborative mapping), and (PPGIS) in the fields "title, abstract and keywords" and limited it to the Social Sciences and Humanities Subject Areas (more relevant for urban studies, planning and geography) while not setting any Date Range limit. We did not use any search operator (e.g. AND, OR, " ") since this would have narrowed our search too much.

The keyword (participatory platforms) returned 552 document results, (collaborative mapping) 842 results, and (PPGIS) 114 results. For the keywords (participatory platforms) and (collaborative mapping), we also performed a manual selection from the search results based on titles. Studies were included if their title referred to one of the following subjects (government, citizen involvement, participation, engagement, planning, cities, PPGIS, crowdsourcing) even if the keywords (participatory platforms) or (collaborative mapping) were not included in the title itself. The documents that were

deemed interesting from the title were downloaded and analysed further. We selected 54 documents for (participatory platforms) and 116 for (collaborative mapping). The keyword (PPGIS) returned 114 document results of which 29 had no full text available. We scanned all the remaining 85 articles to look for platforms mainly in the abstract, introduction, methods and conclusions sections.

Finally, we performed a Google search in different languages to widen the scope and reach of our research outside the anglophone world for a wider analysis of the trends in the development and availability of digital applications and platforms. Other than English, platforms were searched in Italian, Spanish, Portuguese, French and Chinese. We used the national Google search engines for Italy, Spain, Portugal, Brazil, France and the keywords [public participation platform], [collaborative mapping platform], and [citizens engagement platforms] as they translate, not literally, to each language (Table 2). We did search in Spanish in Google.com to cover Latin America and Mexico too. As far as China is concerned, a Chinese PhD student in our department performed the search for us. We used Google Netherlands and Baidu.com to performe the search and keywords [public participation platform], [public opinion platform], [community platform]. The search returned hundreds of thousands of results and we limited our review to the first five result pages for each of the languages which include more relevant and consulted examples.

We were thus able to cover many more countries than in any previous study. The results of this systematic review (summarised in Figure 1) aim to provide a very wide review and inventory of digital collaborative applications and platforms across the world. The list of all platforms identified through our review is available in the Appendix, Tables 3-7.

Following the approach employed by Desouza and Bhagawatwar (2014), the platforms were classified within one of the levels of our typology of citizen government relationship (see Section 2) on the basis of the relationship between the "agents", the knowledge/information flows among the agents, and the platforms' technological features. It is appropriate to focus on these three factors since they define "…aspects related to the collaborative environment of the platforms […] how outputs generated on the platform are used by public agencies and/or citizens, and the type of outcomes from the platform…" (Desouza & Bhagawatwar, 2014, p. 32).

It is important to stress that regarding the informing level we excluded platforms that act as government portals for information conveyance to citizens, since no actual government-citizens collaboration, interaction or two-way communication occurs in these portals (e.g. tax, welfare state, tourist information, public transit, parking information, Web-GIS Portals). As far as the sub-level *private matters* of the self-organization level is concerned, we have included only platforms that are concerned with neighbourhood matters that show potential of becoming related to matters of public interest within one of the levels of citizen engagement.

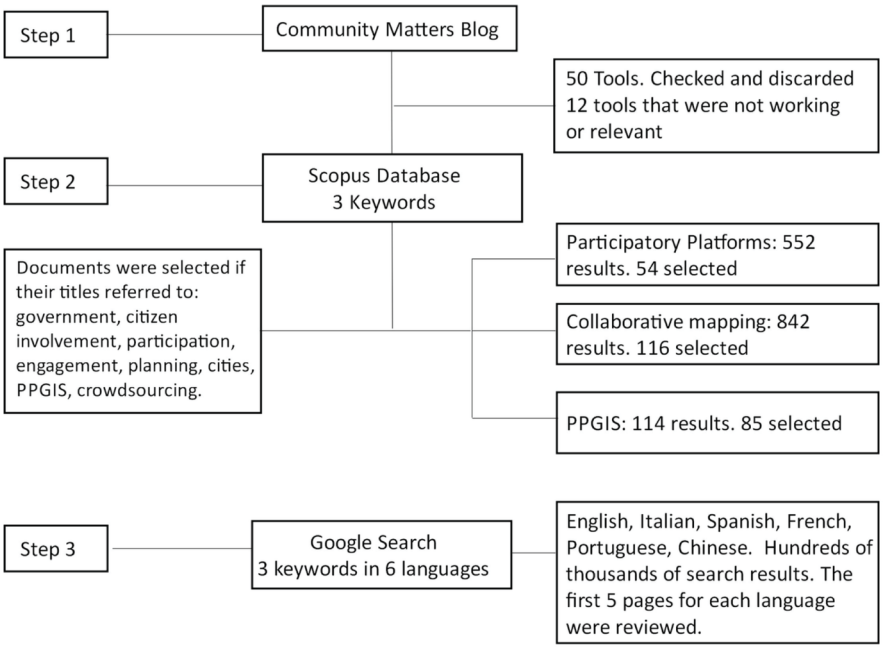
The analysis section focuses on DPPs classified as potentially fit for co-production, to fill the gap within the literature which states that use of DPPs is not yet interactive and is not being able to create two-way communication. In order to achieve this objective, we reveal which co-production platforms have been developed, the spatial context in which they have been applied and the characteristics that

Table 2. Keywords used for internet search in six different languages

EN	Public participation platforms, Collaborative mapping platform, Citizens engagement platforms
IT	Partecipazione pubblica, Strumenti mapping collaborativo, Piattaforme digitali inclusione cittadini
ES	Participacion ciudadana, Herramientas mapeo collaborativo, Plataforma digital inclusion ciudadania
PT	Participacao civica, Projectos mapeamento colaborativo, plataforma cidadania digital
FR	Participation publique, Plateforme cartographique participative, plateforme digitale citoyenne
PRC	公众参与平台, 民心, 社区网

Source: Own Elaboration

Figure 1. Systematic literature review diagram



Source: Own Elaboration

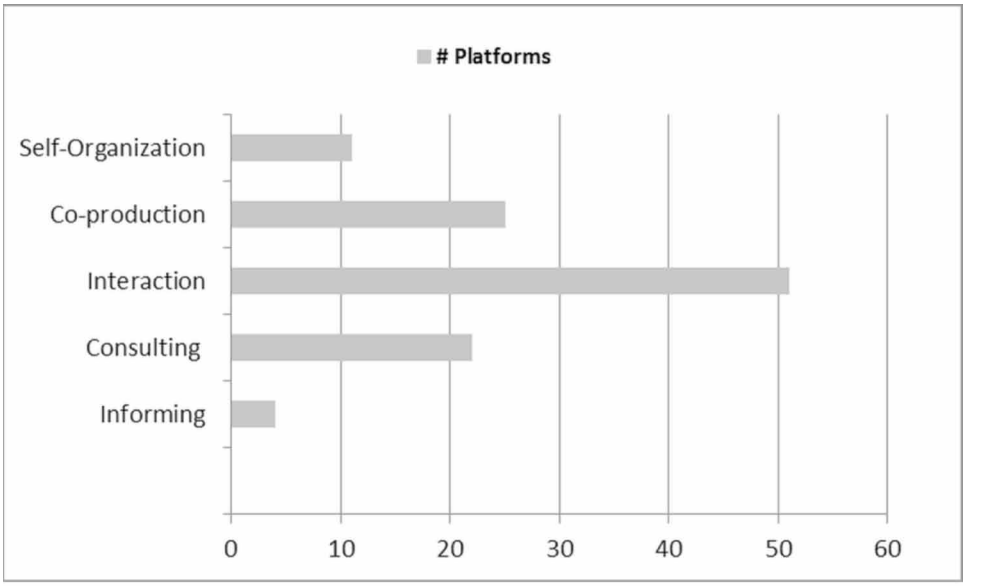
distinguish them from other kinds of DPPs. We focus on three elements: i) technological features which allow to perform certain tasks and reach a high level of engagement; ii) the kinds of problems and applications they have been used for, and therefore tested upon, which allows to identify empirical case studies across the world for future research; and iii) the pricing patterns which may compromise the ability and willingness of government and citizen groups to adopt digital solutions for their co-production efforts. These elements provide fundamental information for adoption and use of such platforms by government agencies and citizens and allow to answer some questions such as: what are users allowed to do with one specific platform? Where and what has it been used for? How much does it cost? Further research on empirical applications and case studies will answer other and more detailed questions such as: how did the platform foster idea generation, resource pooling and discussion between governments and citizens? To what extent have better outcomes and efficiency been achieved, in relation to the objective?

DESCRIPTIVE RESULTS

Based on the research design, we have found a total of 113 digital platforms that classify within the identified levels of the citizens-government relationship (see Appendix and Figure 2). Our review has identified platforms from 21 countries around the world (see Figure 3) with the USA (n = 12), the UK (n = 3), Sweden (n = 3) and The Netherlands (n = 3) showing the higher number of co-productive platforms (25 in total). Other countries that have developed a co-production platform are Australia, Finland, France, Kenya. However, our inventory is by no means fully comprehensive and it is highly likely that many more platforms exist, and further work can expand the current list.

For every platform we provide the name, URL (an extremely important element for future work by other scholars, guaranteeing replicability), a brief description with main purposes, geographic coverage (which refers to the country where the platform was developed or headquarters are located

Figure 2. Number of platforms per level



Source: Own Elaboration

Figure 3. Geographical distributions of digital platforms

Source: Own elaboration, based on the review methodology (see section 3).

and differs considerably from where the platform has been used and applied), pricing, availability of documented case studies (again, fundamental for future work by other scholars), level of the citizens-government relationship, and main technological features (see Appendix, Tables 3-7). This last element, together with real world applications and availability of case studies, is one element upon which we have determined the specific level within which a platform classifies. More specifically, the availability of discussion forums, collaborative mapping tools, geotagging and geolocation tools, reporting functionality, voting and ranking options, submitting and commenting on new ideas, exporting and analytics are all elements that contribute to make a platform more suitable

for co-production purposes. Unlike other studies (e.g. Desouza & Bhagwatwar, 2014), we have not included a column on information and knowledge flows as this is intrinsic to the levels as explained in Table 1, Section 2.

From the lists in the Appendix, as highlighted in Section 3, we have excluded those platforms that act as government portals for information conveyance to citizens within the informing sublevel. This kind of platforms are nowadays extremely widespread; yet, considering the development of technology and the aim of this article they are not relevant here since they do not connote a participatory platform and citizens can only gather and collect information through them. Desouza and Bhagwatwar (2014) present a wide array of such platforms in their model *Citizen-Centric and Government Open Data.* However, we have found four interesting platforms (*Civic Insight, OS City, Open City Chicago,* and *Tell us Toolkit*) that represent exceptions to the more widespread informing platforms and have been included for their general ability to visualize spatial data, query databases, and inform on different elements and on different spatial contexts. They therefore differ from municipal Web-GIS portals or similar services and are worth mentioning.

Consulting platforms (n=22) that require citizens to provide their views, comments and preferences through consultations and surveys exist but usually sustain no options for the government to provide feedback, thus lacking an interactive and co-productive potential. *Interaction platforms* are the most widespread (n=51) and show the greatest geographical diffusion (e.g. China, Brazil, France, Ecuador, New Zealand among other countries). Among these, very much widespread are the so-called *reporting platforms* (e.g. Fix My Street, Fix Ma Ville, Colab, Get it Done) that facilitate interaction between citizens and the local government on a specific practical issue to be solved (citizens report problems and the local government informs them when it has been fixed).

Co-production platforms (n=25) are also quite widespread with many examples from around the world (e.g. Block by Block, Commonplace, coUrbanize, Crowdmap, Maptionnaire, Urban Interactive Studio, TransformCity). Thus, these results expand previous studies (Babelon et al., 2016; Desouza & Bhagwatwar, 2012, 2014; Ertiö, 2015, Evans-Cowley & Kubinski, 2015) and reveal emerging trends towards developing interactive and co-productive platforms that enable online and offline outcomes. In the next section we will focus exclusively on co-productive platforms to understand their technological features, pricing elements, and the kinds of problems and projects that are examined on these platforms that foster a mode of governance where the roles of citizens and governments converge towards co-production.

As regards the *self-organization* platforms (n = 11), we have decided to keep some platforms that fall within the sub-level private matters since they are more representative of the level itself and concerned with neighbourhood matters that show potential of becoming related to matters of public interest (see also Table 1). However, we have excluded many platforms that would classify in this sub-level which do not seem to be related to matters of public interest (e.g. Craigs's List, Marktplaats, Bla Bla Car).

ANALYSIS: FEATURES OF POTENTIAL CO-PRODUCTION PLATFORMS

This section focuses exclusively on the identified DPPs that appear to allow for co-production between (local) governments and a range of stakeholders involving citizens, businesses, and other organizations. Since our definition of co-production emphasizes joint resource contributions by both the public sector and citizens, in order to achieve better outcomes (Bovaird and Loeffler, 2012), we classified DPPs as co-production platforms if they show potential in terms of their characteristics, features and applications to foster joint resource mobilisation and collaboration between (local) governments and stakeholders, including joint solutions, designs, delivery schemes and budget priorities for urban spaces, public facilities, etc. Therefore, redefining how public agencies and urban stakeholders connect, interact, negotiate and make decisions according to a paradigm of co-production in governance is of key importance. However, despite the fact that digital technologies and platforms have pervaded

our daily life, many issues and limitations continue to exist and should be taken into account when using them, such as digital divide (Bertot et al., 2012; Burkhardt et al., 2014; DiMaggio et al., 2004; Norris, 2001; Pizaco-Vela et al., 2012), costs of technology, data storage and ICT infrastructure, training, and in terms of learning the new technology.

The interesting geographical pattern of distribution and diffusion of such platforms (see Figure 3) shows that the USA is the main pioneering country in co-productive platforms. This pattern could perhaps be traced back to the history of community development, planning and engagement that characterises the USA context more than others (Angotti, 2008; Davidoff, 1965). Given the current availability of technology, more citizens groups and cities in different countries can now employ them and undertake efforts for DPP-led co-production.

The following set of co-production platforms (see also Appendix, Tables 3-7) will be discussed in more detail: Bang the Table–Engagement HQ, Block by Block, Carticipe, Citizinvestor, CityLab010, CityPlanner, Commonplace, Community Remarks, coUrbanize, Creative Citizens Sticky World, Crowdbrite, Crowdgauge, Crowdmap, Geojson, Ideascale, Mapping for Change, Map Server, Maptionnaire, MetroQuest, MiniStad, Neighborland, Shareabouts, TransformCity, Urban Interactive Studio, Voor Je Buurt.

As explained in Section 3, these platforms will be analysed with regard to their technological features, the kinds of problems and solutions that are examined and proposed on these platforms, their real-world applications, where available, and pricing patterns. More in-depth future research is needed on co-production DPPs and related case studies to identify the nature, outcomes, engagement processes, and policy implications of co-production platforms.

Technological Features

Digital platforms for co-production purposes sustain a wide variety of features that allow for different user behaviour and collection of ideas, solutions, knowledge, discussion and collaboration between public and private actors. Our systematic review has identified all such features that can be summarised as follows: opinion maps, surveys, discussion forums, budget allocation, simulation design, voting and ranking of ideas, analytics, map-based and geo-located inputs for collaborative mapping such as comments, pins, and other geographical features, crowdfunding, exporting in different formats for further analysis (shape files, csv, kml), importing and media uploading, sharing on other social networking sites such as Facebook and Twitter. The simultaneous availability of many of such features is a fundamental element to classify a platform as fit for co-production. It is interesting to notice that co-production platforms build on many and different features that are available for other platforms by including them in one single platform. The most commonly-found features that represent the more essential ones for co-production are: collaborative mapping, map-based comments and ideas submission, voting and ranking options, media uploads, and analytics. The identification of technological features that characterise and connote co-production DPPs allows to clearly distinguish them from platforms which have other engagement purposes while at the same time highlighting what is needed, and what has already been developed, in terms of technology in order to be able to co-produce actively. This, in turn, provides government agencies, citizens and stakeholders in general with relevant information to choose a platform for co-production and collaboration purposes.

A fundamental feature of the co-production platforms is the spatial map-based visualization of issues, initiatives, and projects at stake that allows citizens to comment upon, design and co-produce new options and alternatives in a geo-located way and with specific reference to the spatial context. The map-based and geo-visualization tools have important implications for engagement practices since they allow participants to be more specific and accurate in both the discussion and solutions of problems, providing them with an intuitive way of representing issues, objects and solutions. This is fundamental in consideration of the real-world contexts and purposes to which they are applied, as discussed in the next subsection. These tools are able to increase the understanding of the issues

at stake, feasibility of solutions, and the spatial relationship between different elements and parts of the spatial context (Marzouki et al., 2017).

This, together with a built-in option for analytics (e.g. number of votes, ideas, participants, spatial analysis), is the main feature that distinguishes co-production platforms from platforms within other levels and for engagement purposes. Important examples of platforms with a user-friendly interface for a map-based feature are *Maptionnaire, Carticipe, Commonplace, Transformcity,* and *Bang the Table*. Special mention is for two DPPs that appear to be particularly interesting. The first one is *Block by Block* whose features allow citizens to create and design parts of their city simulating in a 3D environment what the new solution will look like. This is an outstanding example of how platforms can engage citizens in the effort of designing new solutions for public places. The second example is the *Geojson* platform for collaborative mapping that is based on open source technology and allows users to map, add properties and information, share their maps and ideas with other users, and export them into different formats for further analysis. There are other examples of open source platforms (*Crowdgauge, Crowdmap, Map Server, Shareabouts*) which represent an important opportunity for citizen groups and governments to collaborate without having to bear extra costs for the technology.

Kinds of Problems and Real-World Applications

Co-productive platforms are being applied to find solutions to several kinds of problems within the context of real world applications. However, there is a common denominator among all of the digital co-production platforms' case studies that we have analysed as part of our systematic review: the environment and places we live in and use in our daily life, be them urban, rural, coastal, with a specific use such as a bus station or a public open space such as a square. The focus is on co-producing with citizens, sharing ideas and solutions that can enhance the way such places are used and enjoyed in order to improve their lives and answer their needs.

The real-world applications can be of two distinct types: the first one is more practical, small scale and oriented towards redesigning a specific, spatially-bound object or service, such as a market, a university campus, a bus station, or a park. The second type has more the nature of future-oriented policy making or planning related to the production of a general planning vision for the city wherein citizens co-produce ideas in the fields of pedestrian and cycling mobility, cultural heritage, affordable housing, public transportation needs, and so on. Digital platforms are not limited and designed to fit just one of these two typologies. Many are the examples of platforms that are used for both of them (e.g. *Crowdbrite, Commonplace, Mapping for change, Citizens sticky world*). We will now focus on each of the two types in more detail.

In the first type, we find telling examples from *Bang the Table* with short-term development exercises for open space improvements along the beach through artistic installations, new pathways, boardwalks and benches, improvement of parks and recreation facilities. *Block by Block* is also a clear example. Based on the Minecraft game and in collaboration with UN-Habitat, it allows for reproduction of the environment and space in a 3D virtual world for citizens to plan it and design it. It has been applied to several examples all over the world and especially in distressed areas such as Kosovo, Haiti, Palestine, for instance for the design and upgrade of a transport hub, a new skate park, and a city market. Some of many other interesting examples and potential case studies for future empirical research in this first type are *Citizinvestor*, *Commonplace*, *Co-urbanize*, *Ideascale*, *Urban interactive studio*. Real world applications concern solutions for the location of new bike racks, plaza upgrade, playground renovation, improvement of a university campus, new concepts and ideas for a zoo, redevelopment of a factory building, new sporting village and a community stadium.

The second type of real world applications, which are more oriented towards long-term planning and general policy principles, involves examples of institutional participatory processes. An interesting example is *Carticipe* for the municipal and metropolitan plans of various cities in France such as Lille, Grenoble, and Avignon. This platform was used to co-produce ideas and proposals within the domains of public open spaces, sustainable mobility and bicycle lanes, public services and new retail

and commercial activities. Similarly, *Crowdbrite* was used within the process of developing the Las Vegas Master Plan. Last but not least, the location of new affordable homes and the development of neighbourhood plans (a new practice part of the current English spatial and urban planning system) are examples of real world applications found in *Commonplace*, *Co-urbanize*, *Citizens sticky world*, and *Mapping for change*.

The problems and real-world applications therefore concern several domains of the living environment in urban as well as more rural settings. Public spaces and facilities are the objects of such efforts of co-production through digital platforms with the underlying aim of delivering a new and improved design and a greater usability to meet the needs of the communities.

Pricing Patterns

As for the pricing pattern, there seems to be a connection between the availability of a higher number and more advanced technological features (and therefore co-production potential for users) and the pricing element. In fact, the majority of platforms (16 out of 25) classified within the co-production level have several explicit pricing plans and solutions that vary according to the level of service that is provided. The other nine platforms have no pricing plans, five of which embrace the open source philosophy. No difference is observed between platforms that serve for immediate and short-terms solutions and those which instead support more long-term planning applications. Pricing and financial affordability have implications for the ability and willingness of government and citizen groups to adopt digital solutions for their co-production efforts. If for large and richer cities and communities this might not be an issue, smaller municipalities and poorer communities might indeed perceive it as an obstacle.

Pricing plans can vary from a few dozens of Euros per month to as much as GBP 1,200 per month as in the case of *Creative Citizens Sticky World.* All in all, there seems to be a specific business model behind the platforms for co-production (and to some extent informing and consulting platforms) that is intended to meet a public demand and the need of governments to engage with citizens with state of the art digital tools, so exploiting an expanding market (Sifry, 2014) whose value is estimated to be of around 700 million US dollars' worth of investments (Gordon & Mihailidis, 2016). However, it is not simply a matter of availability of technological features that determines the price. Platforms for *interaction* are generally free to use and so are platforms for *self-organization,* while many of the *informing* and *consulting* platforms included in this article have pricing plans. The reason for this seems unclear and further investigation may be needed from business scholars to determine why this happens.

CONCLUSION

In the current era of almost ubiquitous Internet accessibility, increasing attention and resources are devoted to the role of new information- and communication technologies in establishing meaningful and democratically legitimate citizen engagement. Due to economic trends, welfare state reforms, devolution and new knowledge-sharing patterns, there is a growing interest in two-way engagement and collaboration of governments and citizens (e.g. Ertiö, 2015; Kleinhans et al., 2015; Linders, 2012; Parrado et al., 2013; Williamson & Parolin, 2013). While social media are considered as an important facilitator in this respect, a plethora of digital participatory platforms (DPPs) has been developed to enable collaboration and co-production between citizens and governments. Previous research has revealed the promise of the Internet to "enable co-production on an unprecedented scale" (Linders, 2012, p. 446), but reviews have yielded a fragmented picture of DPPs in only a few specific socio-spatial contexts like the United States of America and some parts of Europe (see e.g. Desouza & Bhagwatwar, 2012, 2014; Atzmanstorfer & Blaschke, 2013; Evans Cowley & Kubinski, 2015). Moreover, Internet-facilitated co-production has not been systematically studied yet (Clark et al., 2013; Linders, 2012; Meijer, 2011).

In this context, this paper aimed to provide a more (globally) comprehensive picture of the availability and functionalities of DPPs and to identify platforms that demonstrate a realistic potential for co-production between government at various levels and citizens groups. Using a three-step systematic review approach, 113 currently active DPPs were identified, analysed and subsequently classified on the basis of a typology of citizen-government relationships, ranging from information sharing to self-organisation (of citizens). This review has shown that almost a quarter of the identified DPPs can be classified as co-production platforms even though development efforts of such platforms are mainly concentrated in the United States while applications concern more countries such as Kosovo, Haiti, Palestine, Nepal, South Africa, Mexico and many more. This is in contrast with previous research that has identified a lower number of collaborative or co-production platforms (Desouza & Bhagwatwar, 2014; Ertiö, 2015, Evans-Cowley & Kubinski, 2015). However, taking into account the development and availability of technology, efforts towards digitally-enabled co-production could be undertaken by many more governments and communities around the world and further investigation should be devoted to understanding how we can make the most out of the available state-of-the-art technology, within the context of community development traditions.

The subset of 25 co-production platforms has been analysed with regard to their technological features, pricing patterns, real world applications and addressed problems and solutions that are examined and proposed on these platforms. Our systematic review has not only contributed new knowledge by the extensive inventory, but also by identifying real world applications and issues which these platforms are used to address. In everyday practice, these platforms are either used for practical solutions for spatially-bound problems, objects or services in citizens' living environments or targeted towards future-oriented vision, planning or policy making of local areas, neighbourhoods, but also cities (master plans and local community plans).

Based on the review and inventory, a few general recommendations for policymakers can be offered. First of all, the review has identified quite a number of up and running co-production platforms. Policymakers, especially in English-speaking countries, should resist the temptation of building their own applications, and rather opt for an already established DPP that has been through numerous test and validation rounds, thus saving substantial time, money and energy in setting up a new platform for digital engagement or collaboration. Second, the range of available functionalities, from easy to more complex, should remind policymakers that not all members of target communities will be sufficiently technologically savvy to use all available functionalities of DPPs. While citizen users will already be a specific part of the general population, technological abilities will differ even within this group. This should be taken into account while applying a DPP to a specific socio-spatial context. Finally, the variety in applications of DPPs should remind policymakers that, while paying attention to the platforms is important, these should not be considered as 'stand-alone' objectives. Rather, DPPs should be perceived as instruments to enable public sector institutions and citizens to make better use of each other's assets and resources, for the sake of better 'offline' outcomes and improved efficiency (see also Bovaird & Loeffler, 2012), but not for the sake of technology itself.

Finally, clear avenues for further research can be provided. First of all, scholars around the world can expand the list of platforms (Appendix, Tables 3-7) and update the description of features, which is enabled by providing crucial platform data (including URLs) to create an up-to-date knowledge base of DPPs. A next step may be to further study actual take-up rates of various DPPs, to uncover reasons for either limited or highly substantial use of DPPs that claim to facilitate co-production. Third, co-production has been associated with strong expectations regarding its potential "to reinvigorate voluntary participation and social cohesion in an increasingly fragmented and individualized society" (Brandsen & Honingh, 2016, p. 427). However, many authors have observed that Internet-facilitated co-production has not yet been systematically studied (Clark *et al.*, 2013; Linders, 2012; Meijer, 2011). Considering the availability of documented case studies for most co-production DPPs, it is our aim to conduct more in-depth research which should identify the nature, process, outcomes (both online and offline) and policy implications of digitally-enabled co-production.

NOTE

An ongoing project and repository of mainly offline participatory and deliberative governance experiences is available on the Participedia platform (www.participedia.net) (Fung, and Warren, 2011).

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REFERENCES

Adams, D. (2013). Volunteered Geographic Information: Potential Implications for Participatory Planning. *Planning Practice and Research*, *28*(4), 464–469. doi:10.1080/02697459.2012.725549

Afzalan, N., & Evans-Cowley, J. (2015). Planning and Social Media: Facebook for Planning at the Neighbourhood Scale. *Planning Practice and Research*, *30*(3), 270–285. doi:10.1080/02697459.2015.1052943

Angotti, T. (2008). *New York for Sale: Community Planning Confronts Global Real Estate*. Cambridge, MA: The MIT Press.

Atzmanstorfer, K., & Blaschke, T. (2013). The Geospatial Web: A Tool to Support the Empowerment of Citizens through E-Participation? In C. Nunes Silva (Ed.), *Citizen E-Participation in Urban Governance: Crowdsourcing and Collaborative Creativity* (pp. 144–171). Hershey, PA: IGI Global; doi:10.4018/978-1-4666-4169-3.ch009

Babelon, I., Ståhle, A., & Balfors, B. (2017). Toward Cyborg PPGIS: Exploring socio-technical requirements for the use of web-based PPGIS in two municipal planning cases, Stockholm region, Sweden. *Journal of Environmental Planning and Management*, *60*(8), 1366–1390. doi:10.1080/09640568.2016.1221798

Bertot, J. C., Jaeger, P. T., & Hansen, D. (2012). The impact of polices on government social media usage: Issues, challenges, and recommendations. *Government Information Quarterly*, *29*(1), 30–40. doi:10.1016/j.giq.2011.04.004

Bovaird, T., & Loeffler, E. (2012). From engagement to co-production: The contribution of users and communities to outcomes and public value. *Voluntas*, *23*(4), 1119–1138. doi:10.1007/s11266-012-9309-6

Brandsen, T., & Honingh, M. (2016). Distinguishing different types of coproduction: A conceptual analysis based on the classical definitions. *Public Administration Review*, *76*(3), 427–435. doi:10.1111/puar.12465

Brown, G., & Kyttä, M. (2012). Public Participation GIS (PPGIS) for Regional and Environmental Planning: Reflections on a Decade of Empirical Research. *URISA Journal*, *24*(2), 7–18.

Brown, G., & Kytta, M. (2014). Key Issues and Research Priorities for Public Participation GIS (PPGIS): A Synthesis Based on Empirical Research. *Applied Geography (Sevenoaks, England)*, *46*, 122–136. doi:10.1016/j.apgeog.2013.11.004

Bryer, T. A., & Zavattaro, S. M. (2011). Social media and public administration. *Administrative Theory & Praxis*, *33*(3), 325–340. doi:10.2753/ATP1084-1806330301

Burkhardt, D., Zilke, J. R., Nazemi, K., Kohlhammer, J., & Kuijper, A. (2014). Fundamental Aspects for E-Government. In P. Sonntagbauer, K. Nazemi, S. Sonntagbauer, G. Prister, & D. Burkhardt (Eds.), *Handbook of research on Avanced ICT integration for Governance and Policy Modeling* (pp. 1–18). Hershey, PA: IGI Global. doi:10.4018/978-1-4666-6236-0.ch001

Casey, C., & Li, J. (2012). Web 2.0 Technologies and Authentic Public Participation: Engaging Citizens in Decision Making Processes. In K. Kloby & M. J. D'Agostino (Eds.), *Citizens 2.0: Public and Governmental Interaction through Web 2.0 Technologies* (pp. 197–223). Hershey, PA: IGI Global. doi:10.4018/978-1-4666-0318-9.ch011

Coleman, D. J., Georgiadou, Y., & Labonte, J. (2009). Volunteered Geographic Information: The Nature and Motivation of Producers. *International Journal of Spatial Data Infrastructures Research*, *4*, 332–358. doi:10.2902/1725-0463.2009.04.art16

Davidoff, P. (1965). Advocacy and Pluralism in Planning. *Journal of the American Planning Association*, *31*(4), 331–338. doi:10.1080/01944366508978187

Desouza, K. C., & Bhagwatwar, A. (2012). Citizen Apps to Solve Complex Urban Problems. *Journal of Urban Technology*, *19*(3), 107–136. doi:10.1080/10630732.2012.673056

Desouza, K. C., & Bhagwatwar, A. (2014). Technology-Enabled Participatory Platforms for Civic Engagement: The Case of U.S. Cities. *Journal of Urban Technology*, *21*(4), 25–50. doi:10.1080/10630732.2014.954898

DiMaggio, P., Hargittai, E., Celeste, C., & Shafer, S. (2004). From unequal access to differentiated use: A literature review and agenda for research on digital inequality. In K. Neckerman (Ed.), *Social Inequality* (pp. 355–400). New York: Russell Sage Foundation.

Ertiö, T. (2015). Participatory Apps for Urban Planning-Space for Improvement. *Planning Practice and Research*, *30*(3), 301–320. doi:10.1080/02697459.2015.1052942

Evans-Cowley, J., & Hollander, J. (2010). The New Generation of Public Participation: Internet-based Participation Tools. *Planning Practice and Research*, *25*(3), 397–408. doi:10.1080/02697459.2010.503432

Evans-Cowley, J. S., & Kubinski, B. (2015). There's an App for That: Mobile Applications That Advance Urban Planning. In C. Nunes Silva (Ed.), *Emerging Issues, Challenges, and Opportunities in Urban E-Planning* (pp. 33–45). Hershey, PA: IGI Global. doi:10.4018/978-1-4666-8150-7.ch002

Fung, A., & Warren, M.E. (2011). The Participedia Project: An Introduction. International Public Management Journal, 14(3), 341-362.

Gil de Zuniga, H., Veenstra, A., Varga, E., & Shah, D. (2010). Digital Democracy: Reimagining Pathways to Political Participation. *Journal of Information Technology & Politics*, *7*(1), 36–51. doi:10.1080/19331680903316742

Gilchrist, A. (2003). Community Development in the UK: Possibilities and Paradoxes. *Community Development Journal: An International Forum*, *38*(1), 16–25. doi:10.1093/cdj/38.1.16

Goodchild, M. F. (2007). Citizens as sensors: The world of volunteered geography. *GeoJournal*, *69*(4), 211–221. doi:10.1007/s10708-007-9111-y

Gordon, E., & Mihailidis, P. (2016). *Civic Media: Technology, Design, Practice*. Cambridge, MA: The MIT Press.

Jones, P., Layard, A., Speed, C., & Lorne, C. (2015). MapLocal: Use of Smartphones for Crowdsourced planning. *Planning Practice and Research*, *30*(3), 322–3236. doi:10.1080/02697459.2015.1052940

Kavanaugh, A. L., Fox, E. A., Sheetz, S. D., Yang, S., Li, L. T., Shoemaker, D. J., & Xie, L. (2012). Social media use by government: From the routine to the critical. *Government Information Quarterly*, *29*(4), 480–491. doi:10.1016/j.giq.2012.06.002

Khan, G. F. (2015). The Government 2.0 utilization model and implementation scenarios. *Information Development*, *31*(2), 135–149. doi:10.1177/0266666913502061

Khan, G. F., Swar, B., & Lee, S. K. (2014). Social media risks and benefits: a public sector perspective. *Social Science Computer Review, 32*(5), 606-627.

Kleinhans, R., Van Ham, M., & Evans-Cowley, J. (2015). Using social media and mobile technologies to foster engagement and self-organization in participatory urban planning and neighbourhood governance. *Planning Practice and Research*, *30*(3), 237–247. doi:10.1080/02697459.2015.1051320

Lee, Y. (2008). Design participation tactics: The challenges and new roles for designers in the co-design process. *CoDesign. International Journal of Co-Creation in Design and the Arts.*, *4*(1), 31–50. doi:10.1080/15710880701875613

Li, M. H., & Feeney, M. K. (2014). Adoption of electronic technologies in local U.S. government: Distinguishing between e-services and communication technologies. *The American Review of Public Administration, 44*(1), 75-91.

Linders, D. (2012). From e-government to we-government: Defining a typology for citizen coproduction in the age of social media. *Government Information Quarterly*, *29*(4), 446–454. doi:10.1016/j.giq.2012.06.003

Magro, M. J. (2012). A review of Social Media use in E-government. *Administrative Sciences*, *2*(2), 148–161. doi:10.3390/admsci2020148

Marzouki, A., Lafrance, F., Daniel, S., & Mellouli, S. (2017). The relevance of geovisualization in Citizen Participation processes. *In Proceedings of the Digital Government Society Conference*, New York, NY. doi:10.1145/3085228.3085240

McMillan, S. J. (2002). A four-part model of cyber-activity. Some cyber-places are more interactive than others. *New Media & Society*, *4*(2), 271–291. doi:10.1177/14614440222226370

Meijer, A. (2011). Networked Coproduction of Public Services in Virtual Communities: From a Government-Centric to a Community Approach to Public Service Support. *Public Administration Review*, *71*(4), 598–607. doi:10.1111/j.1540-6210.2011.02391.x

Mergel, I. (2013). A framework for interpreting social media interactions in the public sector. *Government Information Quarterly*, *30*(4), 327–334. doi:10.1016/j.giq.2013.05.015

Mergel, I., & Bretschneider, S. I. (2013). A Three-Stage Adoption Process for Social Media Use in Government. *Public Administration Review*, *73*(3), 390–400. doi:10.1111/puar.12021

Munthe-Kaas, P., & Hoffmann, B. (2016). *Democratic design experiments in urban planning – navigational practices and compositionist design*. CoDesign. International Journal of Co-Creation in Design and the Arts; doi:10.1080/15710882.2016.1233284

Norris, P. (2001). *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide*. Cambridge, MA: Cambridge University Press; doi:10.1017/CBO9781139164887

Panek, J. (2015). How participatory mapping can drive community empowerment - A case study of Koffiekraal, South Africa. *The South African Geographical Journal*, *97*(1), 18–30. doi:10.1080/03736245.2014.924866

Parrado, S., Van Ryzin, G., Bovaird, T., & Löffler, E. (2013). Correlates of co-production: Evidence from a five-nation survey of citizens. *International Public Management Journal*, *16*(1), 85–112. doi:10.1080/10967494.2013.796260

Picazo-Vela, S., Gutierrez-Martinez, I., & Luna-Reyes, L. F. (2012). Understanding risks, benefits, and strategic alternatives of social media applications in the public sector. *Government Information Quarterly*, *29*(4), 504–511. doi:10.1016/j.giq.2012.07.002

Sanders, E. B. N., & Stappers, J. P. (2008). Co-creation and the new landscapes of design. *CoDesign. International Journal of Co-Creation in Design and the Arts*, *4*(1), 5–18. doi:10.1080/15710880701875068

Sifry, M. (2014). *The Big Disconnect: Why the Internet Hasn't Transformed Government (Yet)*. New York, NY: OR Books.

Silva, C. N. (2013). Open Source Urban Governance: Crowdsourcing, Neogeography, VGI, and Citizen Science. In C. N. Silva (Ed.), *Citizen E-Participation in Urban Governance: Crowdsourcing and Collaborative Creativity*. Hershey, PA: IGI Global. doi:10.4018/978-1-4666-4169-3.ch001

Slotterback, C. S. (2011). Planners' perspectives on using technology in participatory Processes. *Environment and Planning. B, Planning & Design*, *38*(3), 468–485. doi:10.1068/b36138

Suen, I. S. (2006). Assessment of the Level of Interactivity of E-Government Functions. *Journal of E-Government*, *3*(1), 29–51. doi:10.1300/J399v03n01_03

Verschuere, B., Brandsen, T., & Pestoff, V. (2012). Co-production: The state of the art in research and the future agenda. *Voluntas*, *23*(4), 1083–1101. doi:10.1007/s11266-012-9307-8

Voorberg, W., Bekkers, V., & Tummers, L. (2015). A systematic review of co-creation and co-production: Embarking on the social innovation journey. *Public Management Review*, *17*(9), 1333–1357. doi:10.1080/14719037.2014.930505

Williamson, W., & Parolin, B. (2013). Web 2.0 and Social Media Growth in Planning Practice: A Longitudinal Study. *Planning Practice and Research*, *28*(5), 544–562. doi:10.1080/02697459.2013.840996

Wilson, M., & Graham, M. (2013b). Neogeography and volunteered geographic information: A conversation with Michael Goodchild and Andrew Turner. *Environment & Planning A*, *45*(1), 10–18. doi:10.1068/a44483

Wilson, M. W., & Graham, M. (2013a). Situating Neogeography. *Environment & Planning A*, *45*(1), 3–9. doi:10.1068/a44482

Zavattaro, S. M., & Sementelli, A. J. (2014). A critical examination of social media adoption in government: Introducing omnipresence. *Government Information Quarterly*, *31*(2), 257–264. doi:10.1016/j.giq.2013.10.007

APPENDIX

Overview of Digital Participatory Platforms

Table 3. Information sharing: Informing sub-level

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Civic Insight	http://civicinsight.com/	It helps residents to be informed of issues such as code enforcement, building permits.	USA	Yes	Visualization, Analytics	Yes
OS City	http://www.oscity.eu/	Search, visualize, and combine data to gain insight on spatial planning (EU only).	Netherlands	No	Analytics, visualization, aggregation	N/A (presumably)
Open City Chicago	http://opencityapps.org/	A group that creates apps with open data to improve transparency and understanding of our government.	USA	Yes	Open source, Analytics, Visualization, aggregation	No
Tell Us Toolkit	http://www.tellus-toolkit.com/	A tailored package of map-based software tools for spatial analysis, decision support and stakeholder engagement.	UK	Yes (under Portfolio)	Analytics, visualization Decision support	N/A (presumably)

Table 4. Information sharing: Consulting sub-level

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
All Our Ideas	http://allourideas.org/	All Our Ideas is a research project that seeks to develop a new form of social data collection by combining the best features of quantitative and qualitative methods such as interviews, participant observation, and focus groups.	USA	No	Voting tool, analysis tool, adding ideas. Open source	No
Citizen Space	http://www.citizenspace.com/info	A system for creating online consultations, building surveys, complete with contextual information. Designed in collaboration with government specifically for public sector use.	UK	Yes	Online consultations, and surveys, Statistics and analytics.	Yes
Cycle Tracks	https://play.google.com/store/apps/details?id=org.sfcta.cycletracks&hl=en	CycleTracks uses GPS support to track users' bicycle trip routes. It aims to send data about bicycle trips (purpose, route, date and time) to the San Francisco County Transportation Authority's servers for mobility research and policy purposes.	USA	No	GPS tracking, reporting about user behaviour.	No
Cityzen	http://cityzen.io/	Conduct surveys, analyse and visualise data.	USA	No	Analytics, visualization surveys	N/A

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Table 4. Continued

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Emotional Maps	http://www.pocitovemapy.cz/index-en.html	Emotional maps allow users to get involved in the process of collecting information related to their emotional links with their environment.	Czech Republic	No	Comments, opinions, maps, exporting data	N/A (presumably)
Epic Collect	http://www.epicollect.net/	EpiCollect.net provides a web and mobile app for the collecting and submitting ideas, comments, geotagged media	UK	No	Open source, Submit ideas, geotagged media, Analytics	No
Fulcrum	http://www.fulcrumapp.com/	Design custom forms and deploy to mobile devices for fast, efficient, and reliable mobile data collection.	USA	Yes	Collecting data, maps, forms,	Yes (18 to 25$/month)
GEOLive	https://geolive.ca/	GeoLive is a flexible and extendable online participatory mapping tool designed to facilitate organizations' ability to capture, manage and communicate their own spatial data	Canada	No	Maps, comments, geotagged photos,	N/A
iSPEX	http://ispex.nl/en/	iSPEX is an innovative way to measure aerosols. This instrument measures properties of small particles in the sky: aerosols. Aerosols can be measured with the iSPEX add-on together with the iPhone app.	Netherlands	No	Reporting	No
LandscapeMap2	http://www.landscapemap2.org/index.html	Collaborative mapping tools for advancing knowledge about places.	USA	Yes	Mapping, comments,	N/A
Local Data	http://localdata.com/about.html	LocalData is a cloud-based mapping platform that helps cities and communities make data-driven decisions by capturing and visualizing street-level information in real time.	USA	No	Open source Mapping Surveying, data collection, crowdsourcing	No
mySidewalk	http://www2.mysidewalk.com/	Ideation platform for community projects	USA	No	Spatial data collection, visualization, questionnaire	Yes
Partecipa!	http://www.partecipa.gov.it/	National Portal for public consultation. Consulting citizens on issues of national relevance such as quality of air, open data, transparency	Italy	No	Forum, Comments,	No
Participa	http://participa.pt/	Public consultations in Portugal. Citizens can contribute to a debate on a specific issue or project.	Portugal	No	Forum, comments	No
Peak Democracy	http://www.peakdemocracy.co/	Online public comment forum for US government.	USA	Yes	Forum, voting tool, analytics	N/A (presumably)
PlaceSpeak	https://www.placespeak.com/about	PlaceSpeak is a location-based consultation platform that solves the problem of how to engage with people online within specific geographical boundaries -- and prove it.	UK	Yes	Map based, survey	Yes (5.000 a year)
Poll Everywhere	https://www.polleverywhere.com/	It enables to conduct polls and moderate.	USA	Yes	Polls, analytics, moderation	Yes
Popularise	https://popularise.com/	Review projects submit, discuss and support new ideas.	USA	Yes (under cities)	Submit ideas, voting tool, discussion forum	No

continued on following page

Table 4. Continued

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Street Bump	https://itunes.apple.com/us/app/street-bump/id528964742?mt=8	Crowdsourcing application to improve public streets. Street Bump helps residents improve their neighborhood streets. As they drive, the mobile app collects data about the smoothness of the ride	USA	No	Sensing, GPS	No
Ushahidi	https://www.ushahidi.com/features	Developed to map reports of violence in Kenya after the post-election violence in 2008.	Kenya	No	Open source Data collection analytics	Yes (500$/mo)
We Sense	http://wesense.info/en/	The app is able to generate insights on people's perception of urban environments and what effects these surroundings have on them.	Netherlands	No	Media upload, and surveys	No
WideNoise	http://cs.everyaware.eu/event/widenoise	WideNoise is a project of EveryAware. WideNoise. The mobile app allows data to be collected and helps people understand the level of sound pollution around them.	Italy	No	Data collection	No

Table 5. Interaction level

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
AskTheEU	https://www.asktheeu.org/	AskTheEU.org is an online platform for citizens to send access to documents requests directly to EU institutions.	Spain	No	Send request.	No
Basta Platsen	http://dialog.spacescape.se/sollentuna/	Map-based comments for public engagement and discussion. A way to collect people's ideas and opinions.	Sweden	Yes	Map-based comments	No
长江论坛 (bbs.cjn.cn)	http://bbs.cjn.cn/thread-htm-fid-174.html	Established by local newspaper (public media). Encourage residents to comment, report problems (traffic, bus route, bicycle path, health) and make suggestions on local development.	China	No	Discussion Forum, Photo upload	No
BetterStreet	https://betterstreet.org/	Reporting street potholes and other issues.	Belgium	Yes (search by city)	Mobile app, Geo-located reporting, analytics	No
BougeMaVille	https://www.bougemaville.com/	Reporting issues and receiving feedback once the issue has been solved	France	No	Mobile app, Geo-located reporting, analytics	No
Budget Simulator	http://www.budgetsimulator.com/info	Tool for educating about budget priorities and collecting feedback.	UK	Yes	Sliders to allocate resources, statistics and analytics.	Yes
Buiten Beter	http://www.buitenbeter.nl/	Report to the municipality any issue that needs to be resolved such as broken bus shelter, potholes, full trash bins, and so on.	Netherlands	No	Mobile app, Geo-located reporting, analytics	No

continued on following page

Table 5. Continued

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Citizen Budget	http://www.citizenbudget.com/	Citizen Budget online simulator helps solicit residents' feedback on budget consultation.	Canada	Yes (under who's using it)	Comments, survey questions, Analytics	Yes
CitySourced	http://www.citysourced.com/	Quickly identify and report issues effecting communities and quality of life (e.g. potholes, graffiti, broken street lights, public safety).	USA	No	Mobile app, Geo-located reporting, analytics	Yes
Ciudadanos Activos	http://www.ciudadanosactivos.com/	Participación y Control Ciudadano Usando las Nuevas Tecnologías.	Colombia	No	Reporting, Discussion board, Submit idea, Maps,	No
Civic Commons	http://theciviccommons.com/	It serves community leaders, institutions and the growing desire of citizens to be engaged and empowered on key civic decisions. It allows to share ideas and discuss.	USA	Yes	Submit ideas, Discussion board	Yes
Civocracy	https://www.civocracy.org/	Enables effective, constructive discussion and shared decision-making between stakeholders (citizens, businesses, organizations, governments) and encourages active citizen engagement.	Germany	Yes (under top places)	Discussion board, voting tool	Yes
Codigital	http://www.codigital.com/	The most powerful and engaging way for large groups to generate, prioritize and refine ideas. Integrates with Social Networks and Intranets. Demo video.	UK	No	Submit Ideas, Discussion board, Voting tool, Analytics	Yes
Colab	http://www.colab.re/	Mobile app for reporting issues, making suggestions and ideas to local government.	Brazil	No	Mobile app, Geo-located reporting, Voting tool,	No
Deliktum	http://www.deliktum.com	Platform to report problems and crimes on maps.	Ecuador	Yes	Maps, reporting problems and crime, uploading photos.	No
Denuncia BR	http://www.denunciabr.com.br/	Citizens can report and geotag crimes and describe them.	Brazil	No	Geo-located Reporting	No
DialogueApp	http://www.dialogue-app.com/info/	Promotes dialogue to solve policy challenges with citizen input.	UK	Yes	Submit ideas, rate, comment	Yes
Dialoga Brasil	http://www.dialoga.gov.br/	Federal government platform for citizens to contribute with ideas to themes such as health, education, security, culture, and poverty reduction.	Brazil	No	Propose ideas, voting tool,	No
Ethelo Decisions	http://ethelodecisions.com/	Ethelo gathers multiple insights, streamlines collaboration, and identifies highly-supported decisions, all in one intuitive platform.	Canada	Yes	Collect ideas, opinions, analytics	Yes
FixMaVille	http://www.fixmaville.fr/	Reporting issues to councils. As in FixMyStreet	France	No	Mobile app, Geo-located reporting, analytics	No (Yes premium plan)

continued on following page

Table 5. Continued

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
FixMyStreet	http://fixmystreet.org/	Open source report-mapping software that can be deployed anywhere in the world. Most commonly used for reporting street issues to councils, but flexible enough to fit any project that matches geographical points to email addresses.	UK	Yes	Open source Mobile app, Geo-located reporting, analytics	No
民心网 (For the people)	http://www.mxwz.com/	Established by the government for citizens to complain about and comment on different level of governments and departments' performance.	China	No	Discussion forum, submit ideas, complaints, photo upload, Maps.	No
Fort Worth Forum	http://www.fortwortharchitecture.com/forum/	Forum of the city of Fort Worth where citizens discuss new ideas and issues related to new urban development, use of public funds, transportation and so on.	USA	Yes	Discussion forum.	No
Get it done	https://www.sandiego.gov/get-it-done	Reporting services for abandoned vehicles, potholes, street lights, sidewalks. It has probably replaced Street Report.	USA	No	Mobile app, Geo-located reporting	No
Geo Citizen platform	https://play.google.com/store/apps/details?id=com.geocitizen.report	It allows Citizens and Communities to collaboratively report observations, discuss ideas, and monitor issues around their neighborhoods.	Ecuador	Yes	Mobile app, Geo-located reporting	No
Granicus	http://www.granicus.com/	Granicus Citizen Engagement tools allow for more people to contribute ideas for community improvement and provide feedback on current initiatives.	USA	Yes	Comment, discussion forum, submit ideas	Yes
Hey!Tenerife	http://heytenerife.es/es/index.html	Platform for consultation of citizens on different issues proposed by the government. Citizens can also raise issues and start a new proposal/discussion.	Spain	No	Comments, voting tools, discussion forum	No
InCity	http://www.incityapp.fr/	Reporting street potholes and other issues.	France	No	Mobile app, Geo-located reporting	No
Irekia	http://www.irekia.euskadi.eus/	Citizens as well as government can raise and consult on issues.	Spain	No	Open Source, Submit ideas, voting, comments	No
Jaidemaville	http://jaidemaville.com/	Reporting issues.	France	No	Mobile app, Geo-located reporting	No
Leon Emergente	http://emergenteleon.org	León Emergente is an international research and cooperation project aimed at developing an exhaustive digital, dynamic and collaborative Atlas for the city of León, Nicaragua. The aim is to provide access to the different online maps and to engage citizens in the production of these maps in a simple way.	Nicaragua	Yes	Maps, comments	No

continued on following page

Table 5. Continued

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Liquid Feedback	http://liquidfeedback.org/	Governments and parliaments can use LiquidFeedback to poll the opinion of the public, while not being limited to yes/no–questions: Citizens may rephrase the question and provide unforeseen answers.	Germany	No	Open source, Comments, voting	No
Loomio	https://www.loomio.org/marketing	Online tool for collaborative decision-making, built by a team of technologists, activists and social entrepreneurs in New Zealand. Loomio emerged from the need for a scalable way to make inclusive group decisions during the Occupy movement in 2011.	New Zealand	Yes	Open source, Submit ideas, voting, prioritizing,	Yes for premium plans
MapChat	http://mapchat.ca/	MapChat is an open source tool for integrating maps with real-time (as well as asynchronous) discussions between multiple users through chat conversations.	New Zealand	Yes	Open source, Mapping, comments, geotagged media,	No
Mejora tu Ciudad	http://www.mejoratuciudad.org/	Website and mobile application for reporting, interacting, commenting.	Spain	No	Mobile app, Geo-located reporting, comments and ideas, voting	N/A (presumably yes)
Mind Mixer	https://www.mindmixer.com/	It fosters citizens engagement and collaboration. It Allows citizens to submit ideas and vote.	USA	No	Submit ideas, Comments, Voting	Yes
MintScraps	https://www.mintscraps.com/	Online platform that helps restaurants and food service businesses to track and reduce their waste. It connects them with the local waste hauling company to find solutions for recycling, composting and trashing.	USA	No	Analytics, comments, forums.	Yes
mySociety	https://www.mysociety.org/contact/	The tools harness the power of digital technologies to empower citizens, open channels of communication, and help planners make the right decisions. The more famous Fix My Street is part of this effort.	UK	No	Forums, maps, reporting	N/A (presumably yes)
Open311	http://www.open311.org/learn/	Open standard for connecting citizens to government for reporting non-emergency issues.	USA	No	Mobile app, Geo-located reporting	No
OpenDCN	http://www.opendcn.org/index.php/en	The openDCN software environment -- where DCN stands for Deliberative Community Networks – provides on-line dedicated tools to support participation and deliberation. Download	Italy	Yes	Open Source Maps, media upload, comments, Forum.	No
Philly Watchdog	http://www.philadelphiacontroller.org/philly-watchdog	The Nation's first government app allowing citizens to report fraud & waste through smartphone technology.	USA	No	Reporting, media upload	No
PlanYourPlace	http://planyourplace.ca/elgg/	PlanYourPlace is an open source structure of modern web-based solutions to support planning practice that engage community.	Canada	Yes	Open Source Maps, comments, forums	No

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Table 5. Continued

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
PublicStuff	http://www.publicstuff.com/	Communication system for reporting and resolving community concerns.	USA	No	Mobile app, Geo-located reporting, comments, access services	Yes
Sag's Wien	https://www.wien.gv.at/sagswien/	Sending requests to the city of Vienna. At any time, you can report a concern, a danger point or a malfunction via the smartphone to the Vienna City Administration	Austria	No	Mobile app, Geo-located reporting	No
SeeClickFix	http://www.seeclickfix.com/	For reporting and responding to neighbourhood issues.	USA	Yes	Mobile app, Geo-located reporting, Sync, sharing	No
Speak up Austin	http://speakupaustin.org/	The city of Austin's community engagement portal. SpeakUpAustin is making it easier for the public to communicate feedback and receive information.	USA	Yes	Submit ideas, discussion forum, voting tool	No
Textizen	https://www.textizen.com/welcome	Textizen's web platform sends, receives, and analyzes text messages so you can reach the people you serve with the technology already in their pocket, 24/7.	USA	Yes	Text, analytics	N/A (presumably yes)
Tip411	https://tip411site.wordpress.com/	It helps public agencies engage the public through alerts, texts and a mobile app on crime-related information. Tips submitted by citizens can be responded to in real time.	USA	Yes	Submit tips, reporting,	Yes
WeJIT	http://www.mywejit.com/	Collaborative online Forum for decision-making, brainstorming, debating, prioritizing, and more.	USA	No	Submit ideas, voting, comments	No
WhatDoTheyKnow	https://www.whatdotheyknow.com/	You have the **right** to request information from any publicly-funded body, and get answers. WhatDoTheyKnow helps you make a Freedom of Information request. It also publishes all requests online.	UK	No	Send requests to obtain info, comment	No
WriteToThem	https://www.writetothem.com/	Write to your politicians, national or local, for free.	UK	No	Send requests, connect with local politicians	No

Table 6. Co-production level

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Bang the Table – Engagement HQ	http://www.bangthetable.com/	Platform for public engagement needs. Digital mapping, ideation, stories, blogs, discussion forums.	Australia	Yes	Opinion maps, surveys, submit Ideas, Forums, Exporting, Analytics	Yes

continued on following page

Table 6. Continued

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Block by Block	http://blockbyblock.org/	It is based on Minecraft to engage poor communities in urban design and fund the implementation of public space projects all over the world.	Sweden	Yes	Simulation software and urban design	Yes
Carticipe	https://carticipe.net/	Carticipe is participatory platform designed to foster citizens debate and consultation on city-related matters. The tool combines social networks and interactive maps.	France	Yes	Voting, submit ideas, comments, map-based, Analytics	N/A (Presumably yes)
Citizinvestor	http://www.citizinvestor.com/	Crowdfunding and civic engagement platform for local government projects.	USA	Yes	Crowdfunding, voting, submit ideas. Upload media	Yes
CityLab010	https://www.citylab010.nl/	Platform to develop ideas for Rotterdam to make the city a more attractive place to live, work or study.	Netherlands	Yes	Submit Ideas and Plans to the city of Rotterdam.	No
CityPlanner	https://cityplanneronline.com/site/	Map-based platforms and 3-D models that allows citizens to submit their ideas and projects.	Sweden	Yes	Submit ideas, maps, comments, 3-d models	Yes
Commonplace	http://commonplace.is/	A simple and clear map-based tool for capturing people's views.	UK	Yes	Map-based, Analytics, ideas, comments	N/A (presumably yes)
Community Remarks	http://www.communityremarks.com/	Map-based tool for facilitating dialogue and collecting feedback.	USA	Yes	Maps, Photos, Comments, Exporting, Analytics	Yes
coUrbanize	http://www.courbanize.com/	List project information for development proposals and gather online feedback.	USA	Yes	Comment, voting tool, ideas, maps, Analytics	Yes
Creative Citizens Sticky World	http://info.stickyworld.com/	Stickyworld makes it easy to present, explain and discuss your projects with clients, end users, local communities or citizens	UK	Yes	Maps, comments, ideas, discussion forum	Yes
Crowdbrite	http://www.crowdbrite.net/#_blog	It allows citizens and stakeholders engagement for strategic planning, infrastructure, built environment projects.	USA	Yes	Maps, surveys, comments, ideas, visualization, analytics	Yes
Crowdgauge	http://crowdgauge.org/	Allows users to set priorities, rate and support different options and contribute with ideas about actions and policies.	USA	Yes	Open source Budget allocation, maps, rating, comments	No
Crowdmap	https://crowdmap.com/welcome	Crowdmap allows to aggregate and visualise information and data from cell phones, news and web in general on maps. Add comments and report issues.	Kenya	No	Open source Maps, Comments, Importing, reporting, Analytics	No
Geojson	http://geojson.io/#map=2/20.0/0.0	Geojson is a data format for encoding a variety of geographic data. Mapping application for collaborative mapping exercises. Geographic data can be mapped and exported in different formats.	USA	No	Open Source Maps, Comments, Exporting	No

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Table 6. Continued

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Ideascale	https://ideascale.com/gov/	The IdeaScale citizen engagement platform will facilitate data gathering from small to large citizen crowds all in one easy-to-create, easy-to-view, easy-to-manage site.	USA	Yes	Submit ideas, comments, voting, Analytics	Yes
Mapping for Change	http://mappingforchange.org.uk/	Participatory and Collaborative mapping services.	UK	Yes	Maps, comments, ideas, analytics,	Yes
Map Server	http://www.mapserver.org/	MapServer is an open source platform for publishing spatial data and interactive mapping applications to the web.	USA	No	Open Source Mapping,	No
Maptionnaire	https://maptionnaire.com/?lang=en#how	Create a map-based questionnaire of your own. Promote discussion by publishing the results in Maptionnaire. Analyze and report.	Finland	Yes	Maps, comments, submit ideas, exporting	Yes
MetroQuest	http://metroquest.com/	It incorporates scenario planning and visualizations for informing the public and collecting feedback. Allows citizens to submit and vote ideas.	USA	Yes	Submit ideas, Voting, maps	Yes
MinStad	http://minstad.goteborg.se/minstad/index.do	This platforms allows citizens to submit ideas in a 3-D model for the city of Goteborg, Sweden.	Sweden	Yes	Submit ideas, comments, maps, 3-D model	No
Neighborland	https://neighborland.com/	It empowers civic leaders to collaborate with residents in an accessible, participatory, and enjoyable way providing real-world design tools and a powerfully simple platform to engage people on the web.	USA	Yes	Submit ideas, comments, maps, discussion forums.	Yes
Shareabouts – Open Plans Project	http://openplans.org/	Shareabouts is a web-based mapping tool for gathering crowdsourced public input in an engaging social process. People can drop a pin on a map to provide ideas, suggestions, and comments.	USA	Yes (under projects)	Open source Map based, comments, submit Ideas,	No
TransformCity	http://www.transformcity.com/	Collaborative mapping. People can share their ideas and wishes for the area.	Netherlands	Yes	Maps, submit ideas, comments.	Yes
Urban Interactive Studio	http://urbaninteractivestudio.com	Reaches, informs, and involves citizens and stakeholders in public projects and decision making allowing them to comment, share pinions.	USA	Yes	Maps, submit ideas, comments, Analytics.	Yes
Voor Je Buurt (Dutch):	https://www.voorjebuurt.nl/	Dutch crowdsourcing version of the New York platform ChangeByUs	Netherlands	Yes	Share projects, crowdfunding	No

Table 7. Self-organization: Public matters sub-level

Platform	Website	Description	Coverage	Case Studies	Main Tech. Features	Pricing
Airesis	https://www.airesis.eu	A platform to organize groups, engage people and hear their opinion. Tools to share documents, discuss ideas, vote and summarize shared solutions. A mass deliberative system. A tool to enhance collective intelligence.	Italy	No	Open Source Discussion, voting tools.	No
BUURbook	https://buurbook.nl/	Forum that encourages community discussion and action at neighbourhood level.	Netherlands	Yes (under Buurten)	Discussion forum, maps, uploads	No
FragNebenan	https://fragnebenan.com/	Networking and improved interaction among neighbours.	Austria	No	Message board, comments, maps	No
Front Porch Forum	http://frontporchforum.com/	Front Porch Forum's mission is to help neighbours connect and build community. We do that by hosting regional networks of online neighbourhood forums.	USA	No	Discussion Forum	No
MataTag	http://www.mata-tag.com/	Citizens can identify places that need graffiti removal and can volunteer to remove them.	Portugal	No	Upload photos, report graffiti, volunteer	No
Mapas Cultura	http://mapas.cultura.gov.br/	Citizens share information about cultural events that take place in their cities. Information sharing among citizens. No government involved.	Brazil	Yes	Open source Post events	No
NextDoor	https://nextdoor.com/	Private social network and forum for neighbourhoods. Demo video.	USA	No	Forum	No
Open Austin	https://github.com/open-austin/project-ideas/issues	Open Austin project ideas. Part of the open Austin initiative for citizens to discuss ideas and project	USA	No	Forum, submit ideas, comments	No
Recovers	https://recovers.org/	App for self-organizing and organizing disaster relief.	USA	Yes	Comments, volunteering, donations	No
Tem Açúcar?	https://play.google.com/store/apps/details?id=com.temacucar&hl=en	Citizens can share goods, opinions and meet.	Brazil	No	Forum, blog	No
中国桐城 (Tongcheng China)	http://bbs.tongcheng.gov.cn/index.php	Established by the municipality government to encourage citizens to share their experiences and comments and complain on local development issues.	China	No	Discussion Forum, Comments, complaints	No

Source: Own Elaboration

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