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## **CROWD PARTICIPATION IN URBAN DECISION MAKING AND PLANNING: AN EXTENSIVE URBAN CROWDSOURCING LITERATURE REVIEW**

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**Summary:** Urban crowdsourcing has been gaining attention from research communities due to its presumed capability of enabling citizens to be city *prosumers* of data, opinions, and ideas about their city (Lea & Blackstock, 2014). Recently, several urban crowdsourcing investigations and various experiments have been conducted with a view to engaging citizens in order to produce information about their cities and their communities. This article reports on a research based on a systematic analysis of the literature on “urban crowdsourcing” conducted by the authors. Following the general guidelines of the systematic literature review method (Moher et al., 2009), we analysed the current literature available online, searching for combinations of keywords on ISI listed proceedings as well as on databases of leading world publishers. We also used Google scholar to evaluate the popularity of articles, taking account of their citations. The process of identifying and reviewing the literature was conducted in two phases, from September 2017 to February 2018. From our research emerges the potential benefits of crowdsourcing, especially for urban decision making and planning. However, a few of concerns related to crowdsourcing processes have been raised: difficulties in involving people; risks for privacy; quality and accuracy of information gathered.

**Keywords:** urban crowdsourcing, urban livability, citizen participation, city prosumers

## Introduction

Does “the wisdom of the crowd” really exist, or is one more likely to meet the madness of the crowd?

Charles Mackay, who in 1841 published the famous *Extraordinary popular delusion and the Madness of Crowd* (Mackay, 1995 edition) that is considered to be one of the first books to deal with mass psychology, was indubitably persuaded that, in many circumstances, the crowd is characterized by irrational behavior. Such was the case with *tulipomania*, an event that occurred in the Dutch Republic during the 17th century, to which Mackay refers. Around the end of the 16<sup>th</sup> century, tulips were introduced to the Netherlands from the Ottoman empire (Roding & Theunissen, 1993). By the 1630s, some tulip bulbs were reaching extraordinarily high prices:

Nobles, citizens, farmers, mechanics, seamen, footmen, maidservants, even chimney sweeps and old clothes women, dabbled in tulips. People of all grades converted their property into cash, and invested in flowers (Mackay, 1995 edition, p.94).

In 1635, tulips were even being bought with promissory notes (McClure & Thomas, 2017), but this state of affairs couldn't last long, and their price dramatically collapsed in February 1637. Tulipomania can be considered as an example, not infrequent, of a speculative bubble caused by the irrational exuberance of crowd.

Nowadays, however, a broad number of researchers don't share Mackay's view, and are persuaded that the many are smarter than the few, or in other words, that many heads can be smarter than one. It has been observed that the idea of collective wisdom is at least as old as Aristotle's *Politics* (Landemore, 2012), and the modern principle of democratic collective decision-making is founded on the assumption of a

collective intelligence and a collective wisdom.

According to Surowiecki, the average of answers to a given question provided by a hundred people will often be at least as good as the answer provided by the smartest members:

*With most things, the average is mediocrity. With decision making, it's often excellence. You can say it's as if we've been programmed to be collectively smart (Surowiecki, 2004, p. 11).*

Recently, the advent of the internet and social networks has created new opportunities to promote citizen participation and involvement in decision-making.

Nowadays, digital technologies can provide a two-way communication between citizens and decision makers that, potentially, empower participatory and collaborative processes.

This article reports on a research conducted by the authors based on a systematic analysis of the literature on “urban crowdsourcing” - a broad topic covering a variety of studies that focus on the development of ICT-based collective and innovative solutions for increased urban livability.

Partner for Livable Communities, a US non-profit organization created at the end of the 1970s with the objective of providing information, leadership, and guidance in order to help communities help themselves, defines livability as:

[...] the sum of the factors that add up to a community's quality of life – including the built and natural environments, economic prosperity, social stability and equity, educational opportunity, and

cultural, entertainment and recreation possibilities.<sup>4</sup>

## 1. Background

Urban crowdsourcing has increasingly been gaining attention from research communities due to its presumed capability of enabling citizens to be city *prosumers* of data, opinions, and ideas about their city (Lea & Blackstock, 2014).

Urban crowdsourcing is the application of the digital crowdsourcing paradigm to social needs and communities' livability.

Digital crowdsourcing is the use of digital technologies to gather and organize contributions from a multitude of non-professional individuals in order to obtain innovative solutions or products. Although, as Hossain & Kauranen (2015a) reported, the term "crowdsourcing" was only coined in 2006 and is associated with digital technologies, the crowdsourcing paradigm it describes has long been used in the past. For example, in 1714, the British Government offered a prize of £20,000 to anyone who was able to devise a reliable way of computing longitude, whilst, in 1884, 800 readers were engaged by the Oxford English Dictionary to assist in its endeavor to catalog words.

According to the crowdsourcing definition, urban crowdsourcing is the use of digital technologies to gather and organize contributions from citizens in order to improve the urban livability. Thanks to the ubiquity of Wi-Fi connectivity and smart communication devices such as smartphones, phablets, tablets, smartwatches, smart bands, and smart key chains, citizens have become active sensors that can collect data, give advice, and get involved in collaborative activities.

Another term used to address the same scope of urban crowdsourcing is *citizensourcing*.

The term citizensourcing was introduced to refer to the application of the crowdsourcing paradigm to social governance and public policy processes (Lukensmeyer & Torres, 2008).

According to Hilgers & Ihl (2010), citizensourcing can be defined as:

[...] the act of taking a task that is traditionally performed by a designated public agent (usually a civil servant) and outsourcing it to an undefined, generally large group of people in the form of an "open call" (Hilgers & Ihl, 2010, p. 72).

Although the literature on citizensourcing and urban crowdsourcing is not as rich as the literature on crowdsourcing (Hossain & Kauranen, 2015), several investigations and various experiments have been conducted recently with a view to engaging citizens in order to gather information about their cities and their communities.

## 2. Methodology

In carrying out our review, we followed recommendations made by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) group (Moher, Liberati, Tetzlaff, Altman, & Prisma Group, 2009), whilst also taking into account the methodology adopted in some recent reviews in the crowdsourcing scope (Zhao & Zhu, 2014; Hossain & Kauranen, 2015a). We collected a large number of significant articles published in ISI Web of Science and non-ISI conference proceedings as well as in the databases of leading world publishers. We also used Google Scholar in order to integrate the results and evaluate the popularity of

<sup>4</sup> <http://livable.org/about-us/what-is-livability>; last accessed on 04.06.2018.

articles, taking account of their citations. Over the last few years, Google Scholar has grown to be a highly scholarly database and has become competitive with other databases such as ISI Web of Science and Scopus (Harzing, 2013; Harzing & Alakangas, 2017). We only considered peer-reviewed articles. The process of identifying and reviewing the literature was conducted in two phases, from September 2017 to March 2018. In the first phase, we searched for relevant articles adopting a simple search criterion. We collected articles that, in their title, abstract, or list of keywords, contained the terms “urban crowdsourcing” or “citizensourcing”. Indeed, searching the full articles would have yielded many irrelevant items, since an article may contain the search terms in their References section. In the second phase, we analyzed the abstracts of the collected articles. From this analysis, we eliminated any items that were inconsistent or that referred to overly generic issues. Finally, we obtained a collection of articles that we analyzed taking into account:

- Empirical or theoretical results
- Reliable experimentation
- Technological architecture
- Applicability

### 3. Findings

From the first phase we collected a total of 428 items. In the second phase, 132 articles were selected for the abstract analysis. From these, only 82 satisfied the inclusion criteria to be subjected to full text analysis. Figure 1 illustrates the selection process.

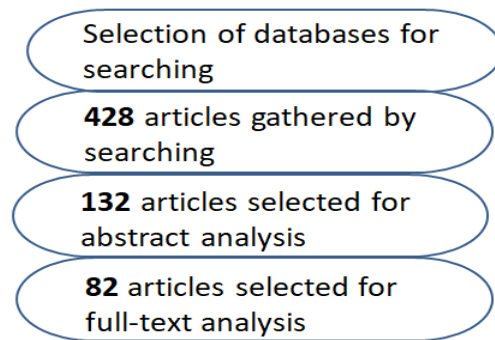


Figure 1. Review flow

Although no limit was set to the survey period, the literature analysis confirmed that the term “citizen sourcing” didn’t appear prior to 2008, whilst the term “urban crowdsourcing” was introduced in 2011 by Zambonelli (2011).

Figure 2 presents the chronological distribution of the analyzed articles.

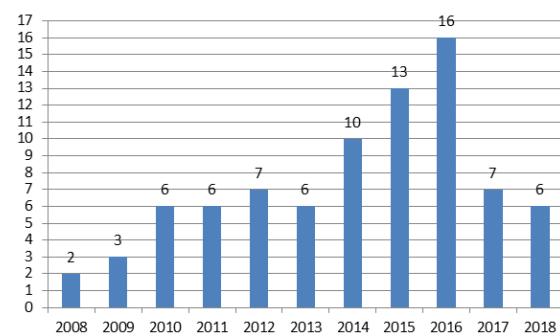


Figure 2. Chronological distribution of the analyzed articles

The selected articles were read in order to identify the various applications of the urban crowdsourcing term, that were grouped depending on whether they were researches, commentaries, or reviews. Figure 3 shows that the majority of articles are commentaries (53%). Indeed, the novelty of the topic favors general analysis and discussion. The high rate of the class “issues/potentiality/challenges” (31%) confirms this aspect.

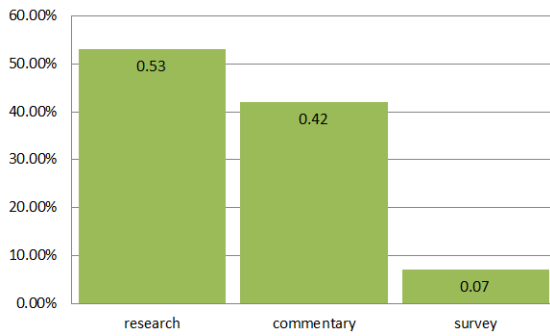


Figure 3. Types of the analyzed articles

We identified the following sectors of application (Figure 4):

- issues/potentialities/challenges
- mobility
- motivation
- participation
- public transport
- urban planning
- urban reporting
- socialization
- urban accessibility
- other

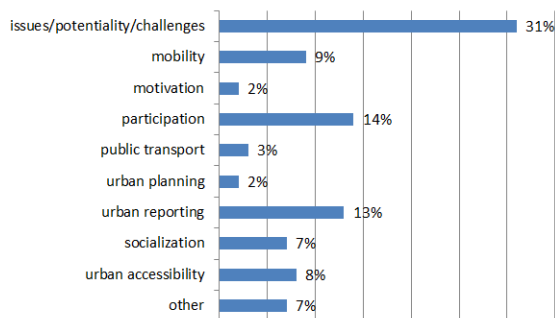


Figure 4. Distribution of sectors of application

#### 4. Principal crowdsourcing applications

From our review, we selected some types of application that appeared relevant for their potentiality.

##### A. Urban crowdsourcing applications

OpenStreetMap (OSM) emerged as the most famous example of urban crowdsourcing available today (Haklay & Weber, 2008). Registered users can input

spatial content in an open access database, building a free editable map of the world. Spatial contents can be nodes, ways, or relations. Nodes refer to Points of Interest, ways refer to roads, whilst relations group objects together.

##### B. Urban planning and public participation

It is a widely shared opinion that crowdsourcing can be effective and useful in urban planning projects (Hilgers & Ihl, 2010). Public participation is deemed a key priority in public planning, and crowdsourcing is considered to be a good way of engaging citizens and facilitating an open dialogue between them and urban planners (Bugs, Granell, Fonts, Huerta, & Painho, 2010; Adams, 2011). It is notable that the Obama administration extensively employed crowdsourcing technologies in order to enhance public participation, especially in the scope of community welfare (Nam, 2012). For example, the implementation of crowdsourcing IT has been proposed for gathering and analyzing data on events, issues, and attendance in order to reveal city conditions through multi-dimensional analysis (Motta, You, Sacco, & Ma, 2014).

Nevertheless, the use of crowdsourcing in public planning appears controversial, since some researchers are persuaded that crowdsourcing is more effective than conventional means of citizen engagement (Seltzer & Mahmoudi, 2012), whilst there are others who consider crowdsourcing to be only complementary to traditional participation procedures, and argue that it cannot replace them (Stern, Gudes, & Svoray, 2009).

##### C. City maintenance and personalized maps

Many experiments and applications have been realized aimed at gathering minute information from citizens that can help in the rescheduling of maintenance activities according to real priorities, as well as for the creation of personalized maps, for

example for users with special or specific needs. These applications allow citizens to notify accessibility barriers and facilities, whilst algorithms have been implemented to filter data and assess its validity (Prandi, Salomoni, Roccetti, Nisi, & Nunes, 2016; Mobasheri, Deister, & Dieterich, 2017; Melis *et al.*, 2018).

#### *D. Emergency monitoring*

Crowdsourcing can provide accurate and timely information about natural disasters (Gao, Barbier, & Goolsby, 2011), whilst crowdsourcing platforms are valuable when collecting geographical information via open data, tools, and services (Crampton, 2009).

#### *E. Urban mobility and public transport*

Several applications have been proposed for supporting urban mobility (Cairo, Salcedo, & Gutierrez-Garcia, 2015). Many of these should properly be classified as crowd sensing rather than crowdsourcing, since they consider data from traffic sensors, public transport vehicles, and parking machines (Gustarini, Marchanoff, Fanourakis, Tsiourti, & Wac, 2014; Shin, 2016), although they share the idea that adaptive vehicle navigator systems could receive data and advise drivers to take alternative routes (Capra, Chatel, Pathak, & Cardoso, 2013; Palazzi & Bujari, 2016).

#### *F. Urban socialization*

The use of crowdsourcing for urban socialization emerges as a topical sector of investigation. This encompasses the use of crowdsourcing to collect data that can be useful for understanding the behavior of urban communities (Rahman, Rahmani, & Kanter, 2014; Palmer & Weber, 2014). Some experimental applications have been realized for promoting communities' engagement in order to collect opinions and attitudes. For example, asking users to identify which demographic group they feel they belong to can allow them to create new

groups and facilitate socialization processes (Santini *et al.*, 2016).

## **Conclusion**

What emerges from our research is the high potentiality of urban crowdsourcing applications to increase the quality of life, security, and the participation of citizens. It has to be noted that all the articles analyzed underline the risks to privacy and the subsequent necessity of realizing applications that reassure citizens in this regard. Finally, the use of crowdsourcing for urban socialization suggests the implementation of applications aimed at guiding appropriation processes in the urban context. Crowdsourcing can be integrated into the various processes of appropriation in the urban context (urban spaces, decision-making procedures, cultural dimensions, etc.), as a component of the negotiation action. Crowdsourcing could contribute to guiding the behavior of the various communities populating urban areas through participatory and guided processes of appropriation.

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