Crowdsourcing and policing: Opportunities for research and practice

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Abstract
Crowdsourcing, i.e. digitally enabled processes to solicit contributions from large groups of external actors, is considered a promising approach to improve collaboration between citizens and organisations in both the private and public sector. In the present paper, we explain what crowdsourcing means and how it works. We then review the state of the art in this emerging field of research and examine the manifold opportunities, key challenges and main risks of its application in policing contexts.

Keywords:
Crowdsourcing, social media, internet, collaboration, policing

Introduction
Technological progress and accelerating changes in the population structure of modern societies present major security challenges for public authorities. These can only be mastered using complex security networks (Dupont, 2004). In such networks, security actors such as the police are closely connected and working with private security actors and citizens. This insight is well established in the literature and builds on, among other things, the pioneering work of Elinor Ostrom. More notably for the purposes of our paper, she investigated why the crime rate in a community actually increased, when the police came off the beat and into patrol cars (Ostrom and Baugh, 1973). She used the term ‘co-production’ as a way of explaining why the police needs the community as much as the community needs the police. In essence, public order and security crucially depend on participatory collaboration between state-sanctioned actors, such as the police, and actors of the wider public. Popular examples underlining the importance of collaboration in the field of security include the
concepts of ‘community policing’, which integrates police and local communities, schools, clubs, immigration authorities, etc. to ensure public safety (Tilley, 2008), and ‘police private partnerships’, in which the police join forces with private security actors to ensure the safety of neighbourhoods, factories, industrial areas, etc. (Youngs, 2004). In summary, public order and security are premised on the insight that close collaboration between different security actors is essential.

This puts the spotlight on innovative strategies, methods or technologies that enhance collaboration in the domain of policing. It is in this context that crowdsourcing, i.e. digital platforms and processes to solicit contributions from large groups of external actors, seems particularly promising as both an approach and a technology to significantly improve collaboration between public and private security actors, and to mobilise and re-engage the civil society in order to enhance public order and security. Crowdsourcing can leverage the potential of new forms of digitally enabled collaboration between police authorities and civil society. In what follows, we will briefly review the state of the art of crowdsourcing and pay particular attention to the opportunities and main challenges of its application in policing contexts.

**Crowdsourcing Definition**

Crowdsourcing is a multidimensional concept encompassing a wide range of empirical phenomena related to very different tasks and actors, and it has been subject to many misunderstandings (Hopkins, 2011). Hence, it cannot be satisfactorily defined in a few words. The following widely used definition of crowdsourcing was given by Estellés-Arolas and Gonzálezm-Ladrón-de-Guevara (2012: 197) in a paper, which explicitly aimed at defining crowdsourcing:

‘Crowdsourcing is a type of participative online activity in which an individual, an institution, a non-profit organisation, or company proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task. The undertaking of the task, of variable complexity and modularity, and in which the crowd should participate, bringing their work, money, knowledge and/or experience, always entails mutual benefit. The user will receive the satisfaction of a given type of need, be it economic, social recognition, self-esteem, or the development of individual skills, while the crowdsourcer will obtain and utilise to their advantage what the user has brought to the venture, whose form will depend on the type of activity undertaken.’

Crowdsourcing consists thus of a voluntary, collaborative relationship between a crowdsourcer — usually an organisation or an institution, e.g. the police — and a crowd — a large group of people that are considered together — using the internet to provide solutions to problems for the mutual benefit of the crowdsourcer and the crowd (Brabham, 2013). At
a basic level, community- and contest-based crowdsourcing can be distinguished. Community-based crowdsourcing is a continuous collaborative effort by a broad group of actors typically united by a common purpose and a shared identity. Prominent examples of this type of crowdsourcing include the online open-content collaborative encyclopedia Wikipedia and the open-source operating system Linux. In academic circles the distinction between community-based crowdsourcing and other, similar forms of online participatory work and user-generated content activities has been and still is the subject of much controversy (Hopkins, 2011). Contest-based crowdsourcing, in contrast, is competitive and less continuous in nature, as members of the crowd compete against each other in an attempt to win an often one-shot contest and capture the associated reward, which can be a monetary (e.g. prize money) or non-monetary (e.g. reputation). Market-leading intermediaries of such contest-based crowdsourcing comprise NineSigma and InnoCentive. In this paper, we focus primarily on contest-based crowdsourcing with many ideas being applicable to community-based crowdsourcing as well.

**Crowdsourcing Process**

Crowdsourcing usually unfolds in a sequential process (Wexler, 2011), which is illustrated in Figure 1. First, the crowdsourcer — in a policing context: the police — becomes aware that an internally unsolved often technical problem could potentially be solved by transferring it to a loosely defined crowd. Then the crowdsourcer broadcasts an ‘open call’ in the internet, often supported by a specialised intermediary, inviting the crowd to participate in solving the problem and providing a set rules or expectations for the participants. In order to motivate the crowd to participate, the crowdsourcer can offer monetary benefits such as a cash prize or career-enhancing attention. Such incentives might not be necessary when participants are expected to be motivated by altruism and their belief in the cause. Next, the crowdsourcer collects and evaluates the input received from the crowd. To identify the most valuable solution proposals, the crowdsourcer might again rely on the crowd by asking the crowd to assess the solutions submitted, thereby allowing them to learn from their peers. The most highly ranked solutions are usually turned over to internal experts and decision-makers who select the most valuable solution proposal and decide on whether to implement it. Finally, the crowdsourcer has to decide on whether to end or restart the crowdsourcing process, in an attempt to find a better solution for the problem or to solve another problem.

On the basis of this general process, many different applications of crowdsourcing are feasible. Crowdsourcing has already been successfully used by numerous companies to attract ideas and solutions to technical problems and gauge feedback from customers, ranging from new software (Boudreau and Jeppesen, 2015), IT-products (Bayus, 2013) or solutions to technical problems (Jeppesen and Lakhani, 2010; Lüttgens et al., 2014), to baby food (Poetz and Schreier, 2012) and designs for clothes and car parts (Langner and Seidel, 2015). We also
know that crowdsourcing has been successfully used in the public sector to facilitate open governance and improve transparency, participation and collaboration of citizens in political processes (McDermott, 2010). For instance, movements such as ‘Open Data’ (e.g. data.gov) or ‘Crowdsence’ (e.g. Project Galaxy Zoo) attract large numbers of participants and result in unprecedented data inputs and project outcomes (Franzoni and Sauermann, 2014; Hilgers and Ihl, 2010).

Interestingly, the contemporary literature on crowdsourcing usually depicts the crowd as an inexpensive, original, effective and efficient problem solver, and hence crowdsourcing as generally beneficial, in particular for the crowdsourcer, but also for the crowd. This notion contrasts with the classical, but somewhat antiquated sociological conception of crowds as irrational and threatening phenomena, and therefore as a social problem (Wexler, 2011). In spite of the obvious and undeniable opportunities of crowd-based problem solving, we must, however, not ignore its disruptive power dynamics. Instead we should question the postulated win-win framing and account for ‘those who are disintermediated or have their labor replaced by the crowd’, that is, for ‘those who bear the costs’ (Wexler, 2011: 14) of crowdsourcing.

**Crowdsourcing Applications**

In an attempt to structure the multitude of existing crowdsourcing applications, Brabham (2013) developed a typology that distinguishes the following four problem-based crowdsourcing approaches covering the range of problem-solving activities suitable for crowdsourcing:
— **Knowledge discovery and management**: The crowdsourcer tasks the crowd with finding and collecting information into a common location and format, e.g. reporting conditions and use of public parks and hiking trails.

— **Distributed human intelligence tasking**: The crowdsourcer tasks the crowd with analysing large amounts of information, e.g. language translation for documents and websites or mapping of stars.

— **Broadcast search**: The crowdsourcer tasks the crowd with solving technical problems, e.g. finding better algorithms for timing traffic signals.

— **Peer-vetted creative production**: The crowdsourcer tasks the crowd with creating and selecting creative ideas, e.g. developing designs for public structures or art projects.

The four categories illustrate the different crowdsourcing mechanisms and goals, but are still quite abstract. A more pragmatic typology is presented by Hossain and Kauranen (2015). Based on an extensive literature review, they distinguish the following seven general crowdsourcing applications:

— **Idea generation**: Crowdsourcer calls crowd to submit new ideas, to generate ideas collectively, and to select the best ideas.

— **Public participation**: Political or public decision-makers use an online platform to engage a wide range of citizens in public planning projects, to harness their knowledge and to facilitate an open dialogue between citizens and policymakers.

— **Microtasking**: Crowdsourcer calls crowd to complete small, labour-intensive tasks for monetary or non-monetary rewards, e.g. Amazon’s Mechanical Turk.

— **Open source software**: Crowd collectively develops computer software, e.g. Mozilla Firefox or OpenOffice the source code of which is public and that can be used free of cost.

— **Citizen science**: A form of collaborative research in which the participation of the crowd is used to solve real-world problems, e.g. by voluntarily collecting and processing data for scientific enquiry.

— **Citizen journalism**: Journalistic websites, such as e.g. Newsvine, calls crowd to submit, rate, recommend and comment on news stories and articles.

— **Wikies**: Websites, which allow anyone to contribute to their contents, thereby facilitating online work in collaborative environments, e.g. Wikipedia.

In practice, however, most crowdsourcing initiatives involve several of the abovementioned applications and cannot be assigned unambiguously to one area. In the following, we will examine which of these crowdsourcing applications could be useful in policing contexts.
Crowdsourcing in Policing Contexts

In the context of policing, crowdsourcing is still in its infancy. However, given the increased diffusion and interdependence of digital technologies like social media, internet, GPS, smart phones, cameras, and sensors, crowdsourcing offers completely new opportunities for security actors to cooperate with each other and with the wider public. Such new forms of collaboration between citizens, police, local authorities, and private security service providers hold considerable promise to improve public safety and order, in particular because it is a resource-efficient, bottom-up approach which builds on technical devices (e.g. smart phones) and corresponding behaviours (e.g. photography, social networking) that are widely used by citizens, regardless of their socioeconomic, cultural and ethnic background.

Based on Hossain and Kauranen’s (2015) abovementioned typology, the most obvious applications of crowdsourcing in policing contexts correspond primarily to the areas ‘public participation’ and ‘idea generation’. Accordingly, crowdsourcing technologies could be used, for example, in crime prevention programs, whose success critically depends on effective collaboration between the police, other public agencies and the broader civil society. Ideation contests, for instance, could be a promising avenue to generate and select new crime prevention strategies and tools, and to exploit the creativity and knowledge of key stakeholders from e.g. social services, schools, job creation, housing, law enforcement, and, of course, citizens. Other crowdsourcing applications combining ‘public participation’ with ‘idea generation’ could be aimed at engaging a wide range of citizens in security-related legislative processes such as, for example, the ‘Policing Act Wiki’ in New Zealand, which empowered citizens to engage in an open dialogue with the parliamentarians responsible for drafting a new police law by presenting the ‘old’ police law in wiki format (Hilgers and Ihl, 2010). This new format allowed the public to incorporate their demands and proposals by modifying, rewriting and complementing the ‘old’ police law, thereby helping lawmakers to improve the quality and efficiency of their regulatory practice. The wiki-version of the new police law was officially approved by the New Zealand parliament in 2008.

Further potential applications of crowdsourcing in a policing context are related to technical problem solving and security analytics. Problem solving contests could contribute to solve key internal technological challenges public authorities and police forces are faced with, for example, automated video tagging, face recognition or predictive policing algorithms (Greengard, 2012). Data mining, that is, the automated categorisation and grouping of data and identification of associations and remarkable patterns, could enable the collection, preparation, analysis and interpretation of large-scale security related datasets (e.g. photos, CCTV data, crime statistics, socioeconomic statistics, security barometers) in a manner that is conducive to the development of innovative analytical tools to support public authorities in ensuring public order and security.
The most promising applications of crowdsourcing in policing, however, include the ability to involve large numbers of citizens more directly in criminal investigations and other public order preserving activities, such as searches for missing persons or manhunts. Historical examples of such forms of crowdsourcing were, for instance, ‘Wanted dead or alive’ campaigns in the Wild West, or, more recently, reality crime TV shows like ‘Crimewatch UK’, ‘America’s Most Wanted’, or Germany’s ‘Aktenzeichen XY … ungelöst’. The success of these paper- or TV-based crowdsourcing formats, despite their obvious limitations, provides further indication of the potential of crowdsourcing in the digital world of the 21st century, when online manhunts using police webpages and in particular social media sites, such as Facebook and Twitter, can reach hundreds of thousands or even millions of citizens in a few hours. Such interactions, however, do not fully exploit the strengths of crowdsourcing, as social media are merely used to supplement current channels of communication such as public service announcements, and serve mainly as a means of collecting and disseminating information rather than engaging in public discourse (Nhan et al., 2017).

Online collaboration between the police and citizens becomes particularly effective when public participation is combined with microtasking, that is, when police tasks are distributed over the internet to a large group of people, thereby enabling the police to collect large quantities of crime-relevant data and to use a large number of decentralised actors to help analyse these data without tying up police resources. Typical examples of this form of crowdsourcing is public monitoring of CCTV systems over the internet, which has significantly improved the surveillance capabilities in the United Kingdom (Schafer, 2013; Trottier 2014a, 2014b), and the posting of photos of persons alleged to have participated in the 2011 Stanley Cup riots in Vancouver by the police through a Facebook page, where visitors were invited to report anyone they recognised (Schneider and Trottier, 2011).

A case in point is the terror attack on the Boston Marathon in 2013 killing three people and injuring more than 170 (Rash, 2013). Here, in addition to the usual calls for information that might contribute to identifying possible suspects, the police asked citizens to submit photos and videos from the attack and the crime scene, which triggered large volumes of data streaming in that had to be analysed by police officers to find clues as to the identities of the attackers. However, these official police investigations were accompanied by parallel investigations conducted by online communities who pooled information and resources in order to assist the police in the analysis of the vast amount of data. At the same time, websites like Reddit (‘the frontpage of the internet’) also posted photos and video clips circulating through the news and social media and invited their members to analyse the visual data for clues, e.g. annotating persons with large backpacks who seemed suspicious. Finally, the official police investigations led first to the identification and location of two suspects, and 4 days later to one suspect killed and the other captured. In contrast, the unofficial investigations performed by the ‘cyber-vigilantes’ only resulted in false accusations, thereby illustrating the risks of crowdsourcing activities in the context of policing (Brabham, 2013; Nhan et al., 2017).
The limits and risks of crowdsourcing in policing contexts arise from the fact that the distributed actors in the crowd lack professional training, and that their efforts and activities are often redundant or subject to error. In spite of being well intentioned, crowdsourcing activities using internet technologies can give way to rampant speculation and further discriminatory practices. Innocent actions can be mislabelled as suspicious activities and, even more worrisome, innocent individuals can be misidentified as legitimate suspects. In combination with potentially dangerous forms of cyber-vigilantism such as doxing, which exploit the victims’ privacy in an incontrollable manner with no chance for self-defence, crowdsourcing in the context of policing therefore can have potentially disastrous effects (Nhan et al., 2017; Schafer, 2013).

Nevertheless, the speed and scale of the unofficial investigations and the huge amount of relevant real-time information, photographs and videos collected in the aftermath of the Boston Marathon terrorist attack also demonstrated the opportunities of crowdsourcing for generating useful hints and involving communities in investigational and other law enforcement activities. Hence, bringing together the activities of the police and citizens in an official crowdsourcing platform, preferably owned by the police, which serves as a place for citizens to upload their photos and videos as well as to analyse them looking for useful clues, is paramount. Under such conditions, the police should be able to control or at least direct the data analysis activities by charging the participating public with appropriate duties (e.g. ‘tag all male persons with blue backpacks’), eliminating bogus leads and misidentifications of individuals as suspects, dispelling rumors, etc. and allowing the law enforcement authorities to exploit the advantages of crowdsourcing while minimising its potential for harm.

**Crowdsourcing Challenges**

The previous chapter has not only illustrated the considerable potential of crowdsourcing in a policing context, but also its limited diffusion to date. It is against this backdrop that police practitioners and policing scholars alike might wish to dedicate greater attention and resources to the following three main crowdsourcing challenges, which can be broadly subsumed under the headings ‘human behaviour’, ‘organisation’, and ‘technology’ (see Figure 2).

— **Human behaviour:** Mainly due to psychological reasons, there can be substantial resistance to the introduction of crowdsourcing. Such behaviour is particularly prevalent if either individuals or organisations strongly resist change. This can be manifested in reactions like the Not-Invented-Here syndrome, which is the attitude-induced rejection of inputs from an external source (Antons and Piller, 2015). There is some evidence that such behavioural traits can be found in police organisations (Crank, 1997).
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Figure 2 — Crowdsourcing Challenges

— **Organisation:** Crowdsourcing may require new intra- and inter-organisational strategies, structures and processes, which in turn may present barriers to the introduction of crowdsourcing in policing contexts. For example, crowdsourcing may necessitate new job responsibilities or workflows. We know from the organisational literature, however, that organisations often respond reluctantly to such changes (Hannan and Freeman, 1977). While organisational benefits from crowdsourcing may be tangible, crowdsourcing might require organisational upfront investment that can be difficult to attract.

— **Technology:** Crowdsourcing may present a variety of technological challenges. This includes unprecedented quantities of data, data flows, data analysis, data security and privacy concerns (Piezunka and Dahlander, 2015). On the one hand, social media like Twitter and Facebook offer notable opportunities for police and other security actors to, for example, identify suspects or receive crime warnings. On the other hand, crowdsourcing might result in information overflow and increased stress for police and other security staff.

In order to successfully meet these challenges, police organisations will have to develop new crowdsourcing competencies, create new crowdsourcing partnerships, and design new crowdsourcing platforms. Again, we will briefly review each in turn.

— **Crowdsourcing competencies:** Crowdsourcing requires new competencies from security actors to be effective. Of particular importance for crowdsourcing are competencies...
related to the identification, integration and utilisation of new knowledge (West and Bogers, 2014). At the beginning of a crowdsourcing process, actors must be able to identify and frame a problem (Afuah and Tucci, 2012). They also have to specify the target audience for the selected crowdsourcing model (Lüttgens et al., 2014) and develop specific incentives for this target audience to encourage their participation (Frey et al., 2011). Once participants have submitted inputs, these inputs need to be analysed (Dahlander and Piezunka, 2014). Furthermore, inputs from social and other media require particular competencies from security actors and administrators of crowdsourcing communities. This may require new staff and further education.

— **Crowdsourcing partnerships**: Research on collaborative innovation clearly shows the advantages of a diverse partner network (Salge et al., 2013). For example, for the development of products and services, customers, suppliers, competitors, and universities play important roles. As mentioned above, collaboration and partnerships already play an important role for some police and security staff, but still remain to be fully leveraged. Collaboration with specific partners may be intensified based on the nature of the security problem at hand. Citizens may be able to support the police in the identification of suspects, while app-developers may support police work with specific algorithms. The challenge for any organisation using crowdsourcing remains to identify the appropriate mix of partners to increase security in its specific security context.

— **Crowdsourcing platforms**: Crowdsourcing platforms need to be designed such that partners have the appropriate incentives to contribute (Frey et al., 2011). This not only includes extrinsic incentives such as monetary incentives (e.g. prize money), but also intrinsic incentives such as recognition, reputation, fun, or intellectual challenges to solve problems (Füller, 2006). Research shows that contest-based crowdsourcing competitions are primarily fueled by monetary incentives, whereas community-based crowdsourcing tends to be more reliant on participants’ intrinsic motivation (Afuah and Tucci, 2012). In the context of security, this underlines the importance of identifying and designing the right incentives for citizens and other security actors to participate in crowdsourcing activities and to keep them engaged over time (Schaefer et al., 2017).

The complexity of the abovementioned challenges and opportunities of crowdsourcing in the context of policing calls for rigorous academic research as well as practical experience. Indeed, the considerable challenges can only be overcome successfully, if police practitioners and policing scholars join forces. In doing so, they should not only seek to shed light on the upside potential of crowdsourcing technologies as a means to re-think police work in the digital age and re-engage civil society for increased public safety and order, but also seek to explore the associated organisational, human and technical challenges. We, however, are confident that crowdsourcing might contribute to a new and mutually beneficial mode of collaboration between citizens, the police, and other players in the field of security.
References


