

Chapter Title: The failures of participatory mapping: a mediational perspective

Chapter Author(s): Gregory Asmolov

Book Title: Mapping Crisis

Book Subtitle: Participation, Datafication and Humanitarianism in the Age of Digital Mapping

Book Editor(s): Doug Specht

Published by: University of London Press. (2020)

Stable URL: <https://www.jstor.org/stable/j.ctv14rms6g.10>

---

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <https://about.jstor.org/terms>



This book is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (CC BY-NC-ND 4.0). To view a copy of this license, visit <https://creativecommons.org/licenses/by-nc-nd/4.0/>.



JSTOR

*University of London Press* is collaborating with JSTOR to digitize, preserve and extend access to *Mapping Crisis*

## 2. The failures of participatory mapping: a mediational perspective

*Gregory Asmolov*

Since around 2010, we have seen the field of digital mapping flourish. The mapping boom is taking place in three major dimensions: the creation of maps that address a variety of fields and issues, the development of new mapping platforms that simplify participation in mapping and the emergence of mapping and geographic information system (GIS) volunteer communities. The rapid distribution of mapping solutions across a variety of fields, as well as the significant increase in the simplicity and accessibility of map creation, have turned maps into an omnipresent medium and form of communication. A variety of research projects have investigated the various contributions of mapping (see Baruh, 2015; Bott and Young, 2012; Haklay, 2013a; Hunt and Specht, 2019; Liu and Palen, 2010; Young, 2014). Most, however, have considered the functions of these tools in a particular context. Some scholars have also highlighted how participatory mapping challenges institutional actors by offering the crowd new tools for increasing transparency around various social and political problems, in addition to a mechanism for holding the actors responsible for these problems accountable.

The celebration of participatory mapping often underlines the successful case studies and the empowering role of the maps. Due to the simplification in the creation of maps and a number of influential case studies, the idea of 'let's create a map' has become in many cases a universal solution for a variety of issues. However, the creation of an online map cannot ensure the desired outcome. The purpose of this chapter is to go beyond the instrumental focus on participatory mapping, as well as the discussion about how digital maps contribute to the empowerment of users. In order to address these challenges, we propose a focus on the triangle of relations between the tools and purposes of mapping and the communities engaged in it, by examining maps in a context of activity systems (Engeström, 1987).

The first section of the chapter describes the rise of participatory mapping, followed by a review of the literature that addresses its social and political role. Next, we discuss how digital maps can be conceptualised in the context of cultural-historical activity theory (CHAT) and offer a conceptual framework

for the analysis of maps in the context of activity systems. On the basis of this conceptual framework, we go on to consider case studies from the fields of crisis mapping and urban mapping. The analysis section explores the relations between various communities related to digital mapping and identifies gaps in the structure of activity systems around mapping. The analysis discusses the consequences of the simplification of participation in mapping, with more internet users taking part in the process, but not necessarily in the solution of the issues mapped. It highlights that the symbolic representative value of the map in many cases does not necessarily lead to action, despite the claims that maps will increase transparency and accountability. The conclusion asks if information and communications technologies (ICTs) contribute to shifting the balance towards mapping activity, while fewer resources deal with mapping-enabled activity.

### **The rise of participatory mapping**

The emergence of Web 2.0 and the increasing dominance of user-generated content online can be seen in many platforms, genres and formats. Maps 2.0 (Crampton, 2009) is a space for the manifestation of user-generated content. Goodchild (2007, p. 212) describes 'the widespread engagement of large numbers of private citizens, often with little in the way of formal qualifications, in the creation of geographic information' as volunteered geographic information (VGI). VGI is also often linked to a notion of 'neogeography', which refers to 'people using and creating their own maps, on their own terms, by combining elements of an existing toolset' (Turner, 2006, p. 3). According to Goodchild (2009, p. 82), the key feature of neogeography is 'a blurring of the distinctions between producer, communicator and consumer of geographic information'. At the same time, this research highlights the potential cooperation between traditional geographers and neogeographers when 'diverse VGI contributed by citizens via a bottom-up process complements, and in some cases integrates well with, the spatial data infrastructure constructed by authoritative sources via a top-down process' (Elwood et al., 2012, p. 585).

An 'explosion of participation' in collaborative map-building is linked to the development of a variety of technologies that enable participatory mapping (Goodchild, 2007). These enablers can also be addressed as digital affordances of participatory mapping (Livingston, 2016). A first set of affordances is related to georeferencing as the ability to detect location by relying on global positioning system (GPS) technology and the integration of geolocation functions in various devices, platforms and apps. According to Hardy et al. (2012), georeferencing is enabled mainly by the geotagging of various types of data, including text messages and photos. Another set of affordances is related to the capacity of users to collect, produce and share digital data about their

surroundings by relying on networks of participatory sensors, which can also be addressed as participatory sensing (Goldman et al., 2009).

Participatory sensing, in turn, can also be addressed as a private case of a broad group of affordances related to crowdsourcing (Brabham, 2013). The production of digital maps can be approached as an outcome of the digitally mediated mobilisation of user resources (Asmolov, 2014), which includes the sensors, analytical skills, knowledge and social capital of users. Goodchild and Glennon (2010) highlight VGI's reliance on crowdsourcing and present a case where the crowd can potentially solve a problem more effectively than a group of experts, as well as how 'information obtained from a crowd of many observers is likely to be closer to the truth than information obtained from one observer' (p. 233).

Different types of affordances lead to the simplification and increased accessibility of tools for the creation of maps. These include tools that allow the collection of geographical data (e.g. OpenStreetMap – OSM), tools for the development of new maps (e.g. Mapbox) and crowdsourcing mapping applications that allow the collection of data on different topics and generate thematic map 'mash-ups' (e.g. Ushahidi or Crowdmap). In addition, tools that support mapping include mobile applications that enable participation in the process, SMS platforms that allow data collection relying on text messages, and a variety of tools for data sharing, data aggregation, data verification and the engagement of users in online activities.

The proliferation of participatory mapping technologies with a low entry threshold gives rise to different types of mapping projects. Some of these projects, such as OSM, have focused on the development of maps in order to collect new geographic data about specific areas. Others have introduced various types of thematic maps that offer a visualisation of different data sets relying on geolocation and geotags. The latter can be addressed as map-based web mash-ups that 'combine or mash up multiple sources of data, which are displayed in some geographic form' (Liu and Palen, 2010, p. 69). One could also differentiate between dynamic maps that are frequently updated and used as tools for the collection of data from various sources and static maps that are used for the visualisation of a particular data set.

Map-based mash-ups have been used in various fields, including citizen science projects and environmental monitoring (Connors et al., 2012), as well as mapping for the purpose of news coverage. Urban mapping that relies on user-generated information is often used as part of civic applications (Ermoshina, 2014) that offer citizens an opportunity to participate in finding solutions to problems in their neighbourhood. Participatory mapping is also used for public and environmental health surveillance (Kamel Boulos et al., 2011) and for the mapping of humanitarian emergencies and conflicts (Livingston, 2016).

Special attention has been dedicated to the role of participatory mapping in crisis situations. According to Liu and Palen (2010, p. 70), 'crisis map mash-ups are emerging as interesting artifacts in the practical work of reporting on, assisting in, and managing emergencies'. For Meier (2011, p. 1242), crisis mapping has four pillars: 'information collection, visualization, analysis and decision support'. The public can also assist in 'classifying and sorting the large amounts of information' (Simon et al., 2015, p. 614). In this way, mapping platforms help with making data sets actionable in a situation of information overload. Liu and Palen (2010, p. 89) also highlight the benefits of integrating professional and participatory geotechnologies in situations of crisis through relying on 'hybrid forms of informal, participatory systems with professional (or professionalized) systems'.

Ziemke (2012, p. 105) suggests that the mapping of a crisis covers a broad range of situations beyond conflicts and natural disasters:

Slow-onset chronic conditions like poverty, homelessness, gender-based violence, foreclosures and forced eviction were being mapped alongside acute disasters, and disasters can be either natural or man-made ... Maps can also be leveraged to help monitor elections by allowing citizens a space to report intimidation, violence, and fraud at the polling station. Maps also may act as a witness to crimes committed by the state, such as harassment, detention or torture.

There is also a broad range of views on the functions of participatory maps. For instance, Goodchild and Glennon (2010, p. 231) argue that 'geographic data and tools are essential in all aspects of emergency management: preparedness, response, recovery, and mitigation'. Digital maps can support 'situational awareness' (Mark and Semaan, 2008) and supplement traditional information sources (Bruns et al., 2012). Particular attention is dedicated to how crisis mapping supports 'crowdfeeding', which is the facilitation of peer-to-peer mutual aid in emergency situations (Ziemke, 2012). This is particularly notable in cases of limited statehood and failure by the emergency services to provide emergency response (Asmolov, 2013). Additional functions include testing hypotheses, detection of trends and early warning of events, as well as using maps as testimony to shed light on different forms of human rights violations or abuses by repressive regimes (Livingston, 2016; Ziemke, 2012). Participatory maps can also be used for data verification by relying on crowdsourcing practices.

However, mapping does not necessarily have a specific goal. Maps associated with open-data ideology are created on the basis of the assumption that data should be available and usable, while no one can predict in advance how a particular type of data can be used. For instance, the Wikimapia project seeks to respond to a call to 'describe the whole world'. The same goal is shared by OSM activists. Russian GIS expert Maxim Dubinin compares open data to the concept of a 'primordial soup':

We work at the level of the nutrient broth. It's such a mess of elements, some fragments of molecules, some things that potentially can give birth to life. Life cannot appear without this soup. Speaking in a very simplistic way, lightning will strike this soup and life will be born. But without this soup, lightning can strike the clear water forever and nothing will happen. The beautiful part of creating maps as open data is that when we do it we have no idea how it will be used.<sup>1</sup>

Mapping without a specific purpose resembles a notion of 'generativity', as conceptualised by Zittrain (2008, p. 70), who defines it as 'a system's capacity to produce unanticipated change through unfiltered contributions from broad and varied audiences'. Generative mapping suggests that the mapping itself does not have a specific purpose, but that it contributes to developing an environment with better capabilities of attaining a variety of unanticipated goals. For instance, data collection on crisis situations in remote areas cannot be carried out without an updated geographic map of these areas.

While VGI can be considered as a case of crowdsourcing, where the resources of the crowd have been mobilised in order to develop maps, in many cases the crowd has also been transformed into a community of digital mappers. Since the catastrophic earthquake in Haiti in 2010, the crisis mapping movement has gained momentum and included a variety of initiatives (Starbird and Palen, 2013; Ziemke, 2012). The mapping communities share some neocartographic skills and manifest a growing cartographic literacy (Liu and Palen, 2010). The increasing range of opportunities for participation in mapping has led to the creation of a diversity of communities of mappers around ideas and values (e.g. open data), platforms (e.g. micromappers), topics (e.g. crisis mappers or citizen scientists), as well as around professional communities (e.g. the GIS community). In some cases, these communities transform into various forms of organisations that can be considered as intermediaries between institutional actors and the digital crowd. The social and political role of new digitally enabled actors, however, requires further discussion.

## The social and political role of participatory mapping

A number of scholars have celebrated the advantages of participatory mapping. Goodchild (2007) presents VGI as a case of a 'dramatic innovation'. It is also considered to be a manifestation of a 'spatial century' (Gould, 1999) and 'an unprecedented shift in the content, characteristics, and modes of geographic information creation, sharing, dissemination, and use' (Elwood et al., 2012, p. 585). Goodchild and Glennon (2010, p. 238) have also highlighted how the crowdsourcing of geographic information allows faster collection and

1 From an interview conducted in Russian in September 2013. Translated by the author.

verification of information, while 'authoritative information is much slower to appear than VGI'.

Analysis of the role of participatory mapping goes beyond the instrumental value of mapping. It explores how liberalising access to maps and their development changes the power relations between different actors and democratises the medium of mapping (Gartner, 2009, p. 74). For instance, increasing access to satellite imagery has limited the capacity of authoritarian regimes to conceal violations of human rights (Livingston, 2016). There are arguments that celebrate participatory mapping as a practice that can significantly contribute to solving many social or political problems (Fairbanks, 2013) and as 'a tool for social transformation' (Roberts, 2012).

Mapping can also be approached as one of the manifestations of what Manuel Castells (2007) calls 'mass self-communication'. A reality where anyone can participate in geographic mapping, add layers of information to maps or create dedicated thematic maps, as well as using the process as a tool for social mobilisation and agenda setting, has contributed to increasing transparency and accountability. When emergency situations occur in authoritarian political environments, crisis mapping is considered a source of alternative framing (Entman, 1993) of the disaster, which can challenge the authorities' control of the construction and dissemination of information about the crisis.

At the same time, there are scholars who question whether participatory mapping can substantially contribute to empowerment and democratisation. Haklay (2013b) examines the exclusion from participation in the production of maps and suggests a 'hierarchy of hacking' that defines different degrees of capacity to participate in the mapping process. He argues that only bounded groups of experts can fully explore the potential of mapping (Haklay, 2013b, p. 63). These skills tend to be less available to those who are less well represented.

Critical research on Web 2.0 cartographies questions the way reality is represented through maps and approaches maps as symbolic constructions that reflect the power relation between various actors. According to Bittner et al. (2013, p. 946), critical cartography suggests 'explorations that question given social realities and sensitize for patterns of marginalization and exclusion', a consideration of 'the social contexts in which maps are produced and further, the way maps (re)produce social realities'. In addition, the new technologies of mapping allow new affordances for the construction of a reality that can favour traditional institutions (Asmolov, 2014).

Optimism about the democratic potential of participatory mapping can also be approached as a case of solutionism, as conceptualised by Morozov (2013, p. 6): 'Recasting all complex social situations either as neat problems with definite, computable solutions or as transparent and self-evident processes that can be easily optimized – if only the right algorithms are in place!' Some empirical research highlights the challenges related to participatory mapping.

For instance, a report titled *Mapping the Maps* has demonstrated how only a small percentage of the maps created on the basis of the Crowdmap platform were actively used (Bailard et al., 2012). About 93 per cent of the more than 12,000 Crowdmaps analysed in the research sample had fewer than ten reports, while 61 per cent were identical to the default Crowdmap setting.

In some cases, mapping initiatives fail to engage a local community due to technological challenges, social or gender norms, as well as the apathy and political risks that can affect reporting. Monitoring and evaluation of crisis mapping projects, for example in the case of the deployment of Ushahidi following the earthquake in Haiti in 2010 (Heinzelman and Waters, 2010), also raise some questions about the extent to which the platform contributed to the response on the ground (Morrow et al., 2011).

The celebration of participatory mapping often underlines the successful case studies and the empowering role of maps. Due to the simplification of the creation of maps and a number of influential case studies, the idea of 'let's create a map' has become in many cases a universal solution for a variety of issues. However, the creation of an online map cannot ensure the desired outcome. A more nuanced understanding of the social and political impact of participatory mapping requires a conceptual framework that considers digital mapping affordances in the context of situations that have been addressed by mapping.

## Maps and activity: a conceptual framework

Addressing the debate about the role of participatory mapping requires a conceptual framework that allows us, on the one hand, to address the uniqueness of digital maps as participatory objects and, on the other hand, to explore the role of maps in the context of issues that have been addressed by mapping. While the affordances concept explains the technological factors that enable participatory mapping, it does not allow us to explore it in the context of specific situations. At the same time, theories that discuss the social and political impact of participatory mapping are mostly focused on explaining the successful cases where this could play a substantial role. Nonetheless, they do not explain the various scales of impact of participatory mapping and the cases of its failure. In this light, there is a need for a framework that will support a critical analysis of both the successes and failures of participatory mapping in addressing social and political challenges, as well as in addressing both technological and sociopolitical aspects of user participation in the development of digital maps.

In order to address these challenges, the following conceptual framework proposes a focus on the triangle of relations between the tools and purposes of mapping and the communities engaged in it. Traditionally, maps were



considered primarily as something that mediated the relationship between the user of the map and their environment. By offering a representation of an environment that assisted with navigation, maps helped the user to reach a specific destination. Most users, however, were excluded from production of the map. The emergence of ‘prosumers’ (Toffler, 1980) – those who both participate in the generation of maps and also use them – can be associated with the dual position of a map as an object of development and as a mediator of the relationship between users and their environment. This duality is addressed here through the lenses of CHAT and by relying on the notion of activity systems developed by Engeström (1987).

Activity theory grew out of cultural-historical psychology, as developed by Lev Vygotsky (1978). According to Vygotsky, the ‘individual and the social were conceived of as mutually constitutive elements of a single, interacting system’ (cited in Cole, 1985, p. 148). CHAT argues that the activity is a form of relationship between individuals (subjects) whose environment has two properties: it is mediated by tools and oriented towards goals (objects). According to Kaptelinin and Nardi (2006, p. 56), ‘the structure of a tool itself, as well as learning how to use a tool, changes the structure of human interaction with the world’. In this sense, a map is a tool that mediates the relationship between subjects (users) and their environment. It supports navigation and allows a subject to achieve its object.

Vygotsky (1981), however, highlighted how the role of maps is more complicated than just the mediation of external activity. He argued that maps can be considered as psychological tools that mediate mental function. According to Vygotsky (1930), psychological tools ‘are directed toward the mastery of [mental] processes – one’s own or someone else’s – just as technical devices are directed toward the mastery of processes of nature’ and modify the ‘structure of mental functions by determining the structure of the new instrumental act, just as the technical tool modifies the process of natural adaptation by determining the form of labour operations’. In other words, maps have a reverse function by comparison with material tools. While material tools are applied in order to change the object of activity, maps are internally oriented and change the subject. In this light, maps structure, guide and transform activity by offering new forms of relationships between a subject and his/her environment and supporting the attainment of specific goals.

Vygotsky distinguished between psychological tools as physical artefacts and as symbolic systems (Kaptelinin and Nardi, 2006), and showed that physical artefacts continue to fulfil their functions even after their subjects stop using them. This phenomenon was addressed as a process of internalisation, that is the transformation of the material psychological tools into internal cognitive functions. According to Kaptelinin and Nardi (2006, p. 43), ‘internalization of mediated external processes results in mediated internal processes’. However,

despite the differences between material and psychological tools, the analysis of tools – whether material or psychological – was situated within a context of the mediation of activity. Kaptelinin and Nardi (2006, p. 42) conclude that ‘the use of mediators, whether crushing a nutshell with a hammer or orienting oneself in an unfamiliar city using a map, changes the structure of activity’.

CHAT highlights how maps should be examined in the context of human activity as a form of mediated subject–object relation. Nevertheless, while the traditional analysis of maps in activity theory has addressed maps as psychological tools that transform users’ relations with the environment, digital affordances that allow participatory forms of producing maps have created new challenges for their conceptualisation. On the one hand, maps continue to be a mediating tool located between subject and object, supporting orientation towards a goal. On the other hand, maps are an object of participatory production that is mediated through a variety of digital tools. Moreover, maps can be considered as an object of collective activity.

Vygotsky’s followers were concerned with the role of tools in the mediation of activity as part of collective action. Relying on a notion of activity developed by Leontiev (1978), Engeström (1988, p. 30) conceptualised activity as a collective phenomenon and defined it as ‘systems of collaborative human practice’. Engeström proposed that we analyse the role of tools as one of constituting and mediating activity systems. In addition to a relation between subject and object (purpose of activity), which is mediated through tools, the model includes three supplementary elements of activity: the rules within activity systems, the community of those who participate in an activity that has been mediated by an artefact and the division of labour within this community (around attaining the object of the activity system) (see Figure 2.1).

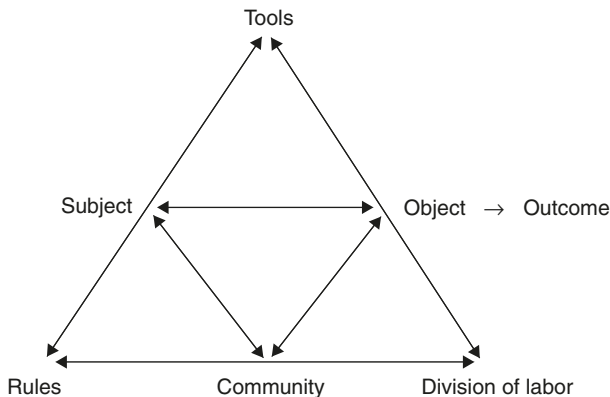


Figure 2.1. The model of a human activity system (Engeström, 1987).

From this perspective, a participatory online map has a dual position. On the one hand, a digital map is a tool that mediates the activity of a community of subjects in relation to a specific object. On the other hand, a digital map as an outcome of participatory development can be considered as an object of activity of a community of users that is mediated by relying on a variety of digital tools. In the first case the object of the systems is the creation of the map, while in the second case the map is used in order to reach a desired outcome.

The major question suggested by applying CHAT is: what is the place of the mapping within the activity system? In the case of 'mapping as activity', the purpose of the activity system is the creation of the map. In the case of 'map-mediated activity', there is an infinite range of potential forms of activity, while the common denominator of these activities is that they are supported by mapping. Activity theory offers a methodological framework for the analysis of digital maps in the context of activity systems. The purpose of analysis, however, is not only to establish the location of a map in the context of an activity system. The main advantage of applying CHAT to the analysis of participatory mapping is the opportunity to explore the interrelation between maps as an object of activity and maps as mediators of activity.

In some cases, the participatory development of maps can be integrated into a larger context of activity around a common object that requires mapping as a form of mediation. In this case, those who create maps and those who use maps belong to the same system. In other cases, the development of maps and the activity supported by mapping can be seen as segregated activity systems, or at least systems with a limited degree of integration. In this case, the question becomes: Do mapping as an activity and mapping-mediated activity belong to one integrated activity system or are they separate systems? And, if the communities of these systems are separate, how is their relationship structured?

To sum up, unlike the critical approach that investigates maps as a form of symbolic representation, a conceptual framework that relies on CHAT allows us to focus beyond the question of how reality is constituted, through a map as an outcome of a particular power relationship. The focus on the link between the participatory development of mapping and the activity that is mediated through maps allows us to consider critically the role of digital maps in the context of social and political processes. The following case studies allow us to apply this framework to an analysis of crisis mapping and urban mapping.

## Case studies

### *Crisis mapping*

According to Starbird (2012, p. 47), 'crisis maps are maps of impacted areas that users collectively create and edit'. She explains that 'volunteers for crisis mapping projects can come from a local community in response to a specific

event, or from a growing pool of individuals who identify as “crisis mappers” and repeatedly participate across events, most often from outside the affected area’. In this sense, crisis mapping initiatives can represent a spontaneous self-organisation of people around a specific crisis, relying on members of a crowd or on projects facilitated by an established community of crisis mappers. In order to address both cases, this section considers a number of cases from Russia, as well as other cases that have been supported by members of the global crisis mapping community.

In 2010 a densely populated area of western Russia experienced a significant wave of wildfires. The disaster caused dozens of casualties. Russian internet users tried to self-organise to respond to the emergency. The crisis-related online activism was motivated particularly by the lack of an appropriate response from traditional institutions responsible for disaster management (Asmolv, 2013). A group of online volunteers created an Ushahidi deployment and named it Help Map. The purpose of the mapping was not only the collection of information about fires, but also the facilitation of aid links between those who needed help and those who were interested in helping.

While state-controlled traditional media broadcasted that the situation was under the full control of the emergency services, Help Map offered an alternative picture, presenting a truer scale of the disaster by relying on reports from citizens. Moreover, it also offered a mapping of resources available to support an emergency response. The major purpose of the mapping was the collection of data about needs and available resources (including transport, firefighting equipment, clothing, evacuation destinations and volunteers willing to participate in firefighting). The emergency services ignored the map and avoided contact with volunteers. However, the map was used by volunteers on the ground and by charity non-governmental organisations (NGOs) that took part in the emergency response.

The purpose of moderators, who created an offline coordination centre, was not only to aggregate data from different sources and verify the data submitted by users, but also to make sure that requests for help were linked to offers of help and to ensure that the information mapped did not remain without a response. If internet users were not able to address a particular need, the moderators tried to find a relevant NGO or charity organisation to help. In other words, the mappers’ activity was not limited to mapping, but also involved doing their best to ensure that the required activity happened in the offline dimension. In this sense, the map was not only a tool for data collection, but also a tool for the allocation of citizen-based resources for the purpose of emergency response. In the case of Help Map, there was no strong distinction between those who created the map and contributed to the mapping and those who used it to respond to the disaster. The mapping itself and the activity enabled by it relied on the same community of internet users.

A few months later, in the winter of 2010–11, Russia was hit by an unprecedented cold front. Many cities were left without heating and thousands of people were struggling to receive basic supplies due to the extreme weather conditions. This crisis was addressed by another deployment of Ushahidi called *Holoda.info* (*holoda* means ‘cold’ in Russian). The structure of the map was similar to that of Help Map. However, this time no offline coordination centre was established. In addition, unlike in the case of the wildfires, this crisis was not met with large-scale citizen mobilisation. Eventually, the map collected many reports about problems in different regions experiencing extreme weather. Nonetheless, the map stopped functioning a few days after deployment since it received very few reports about available resources and was not connected to specific organisations offering a response. While *Holoda.info* contributed to increasing transparency around the scale of the crisis, its role in the facilitation of response was minimal.

In another case of disaster response in Russia, a different type of relationship between the community of mappers and the community of responders was evident. In July 2012 floods destroyed a significant part of the city of Krymsk in southern Russia. As in the case of the wildfires in 2010, the response from the authorities was slow and insufficient. Many volunteers self-organised online and went to the area of the disaster. However, one of the problems they faced on the ground was a lack of updated maps of the disaster area. Lack of a geographic map made the coordination of a response more difficult. To address this gap, a group of OSM volunteers self-organised in Russian OSM forums and created an updated map of the area of the floods. Consequently, volunteers were able to have updated maps that enabled them to facilitate a better response to the emergency. In this case, there was a clear differentiation between the community of mappers and those who used the maps. Moreover, the map created online as a result of the mapping activity was transformed into a physical printed artefact that was used by volunteers. Despite the fact that the mappers and those who used the maps were from different communities, this case presents a good example of integration between a mapping activity and an activity enabled by mapping within unified activity systems and with the object of responding to the disaster. Later, the OSM map was also used as the basis for online thematic maps in order to create a crowdsourcing deployment similar to Help Map in the case of the wildfires.

The global crisis mapping movement offers a different case of relations between those that participate in mapping and those that use the map to address a crisis. The case of the response to Typhoon Yolanda, which struck South East Asia in November 2013, allows us to consider the complexity of the relationship between the different actors that participate in mapping and the responders. The request ‘to carry out a rapid needs and damage assessment

by tagging reports posted to social media' (Meier, 2013a) was submitted by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) to the Digital Humanitarian Network (DHN), which represented an online coalition of organisations of networked volunteers.

The activation included not only the members of online crisis mapping communities, but also an appeal to members of a broad crowd that could participate by using the Micromapping tool (Hildebrandt, 2013). This tool simplified the participation of online users in the analysis and categorisation of visual and textual information about the disaster. MicroMappers<sup>2</sup> is based on the idea of crowdsourcing and microtasking (such as in the case of Amazon Turk), where the simplification of participation is based on tasks that do not require prior knowledge, allowing the range of potential participants to be expanded and making the achievement of the desired outcome easier and faster.

The project was managed by Patrick Meier (who at the time worked at the Qatar Computing Research Institute) and his colleagues from the volunteer disaster-response community Standby Task Force (SBTF). Relying on a number of tools that aggregate disaster-related messages and images, the platform created a data set of hundreds of thousands of tweets and images related to the consequences of the typhoon. Aggregation tools allowed an ongoing process of 'feeding the clickers' with new data for categorisation and geolocation (Meier, 2013b). The analysis relied on a number of mechanisms that allowed the tagging of tweets and images by 'clickers'.

In this case, the microtasking platform and the map were two different tools. The mapping activity was mediated through the microtasking platform, while the visualised outcome was represented through a map. The map was created following a request from its potential users:

In the case of Typhoon Yolanda, we also had a formal partner, the UN Office for the Coordination of Humanitarian Affairs (OCHA), that officially requested digital humanitarian support. In other words, our efforts are directly in response to clearly articulated information needs. In contrast, the response to Haiti was 'supply based' in that we simply pushed out all information that we figured might be of use to humanitarian responders. (Meier, 2013a)

This case presents a strong division between the community of mappers and those who used the map. It allows us to identify three type of actors that are related to the mapping. The first group was an unbounded crowd that took part in mapping by relying on mediation with dedicated tools that simplified participation. The second was a bounded group of online volunteers with a certain degree of expertise that managed the crowd and made sure that the map met the expectations of responders. The third group was humanitarian agencies

2 See <http://micromappers.com>.

that used the maps to increase situational awareness, support the allocation of resources and assist responders on the ground.

In this case, intermediaries like SBTF and DHN made sure that the outcome of participatory mapping was integrated with activities that could benefit from the maps. That linkage was also supported by the fact that the mapping activity was activated by responders. In other words, in the community around the map of Yolanda there was an integration of mapping as an activity and the activity enabled by the mapping. That said, while initially emergency organisations outsourced the mapping to the crowd, in more recent years we can see how international organisations develop internal technological and professional capabilities to analyse big data in crisis situations and therefore have less need for the engagement of external actors.

### *Urban mapping and civic applications*

The mapping of the urban environment for a variety of purposes has become a popular branch of participatory mapping. One of the best-known examples is SeeClickFix, a web tool for the reporting of non-emergency issues in a neighbourhood to local authorities launched in the United States in 2008. The name SeeClickFix highlights the connection between the act of data collection, the act of mapping and the act of resolving an issue that has been mapped. Another tool, CitySourced, 'provides new spatial media tools for civic engagement' and is 'seeking citizen involvement in municipal problem-solving by allowing people to submit reports about different problems (e.g. potholes or garbage) to an interactive online map' (Elwood and Leszczynski, 2013, p. 8). This map offers local government an opportunity to follow a problem and report back on the resolution of the issue.

Urban mapping projects that seek to resolve local issues, however, have also been launched in countries where the local authorities often seek to avoid responsibility and ignore citizen reports. In this light, some urban mapping initiatives are considered as 'civic applications' and provide a means of cyber-empowerment that assists city residents in forcing local authorities to address problems. According to Ermoshina (2014, p. 5), 'civic applications make use of existing legal mechanisms and standards to legitimize and strengthen an individual complaint'. She describes the mechanism of civic application: 'Every problem declared via a civic application has two destinations. The first one is an invisible one – higher administrative units (Inspectorate, City Hall, etc.). The second destination is a public one – the application's server – where the problem becomes visible to other users' (Ermoshina, 2014, p. 6).

One of the most popular Russian participatory mapping civic apps is Rosyama, launched by Russian oppositional activist Alexey Navalny to address the condition of Russian roads. Once a message with the geolocation and image

of a pothole is submitted, this automatically generates a complaint that is sent to the local authorities responsible for the issue, who are then legally obliged to take care of it. In another case, a platform from St Petersburg, Zalivaet.spb (Flooded.spb), offered a map of leaking roofs following spring melting snow in 2010 in order to force the local housing service to address the problem. Eventually, senior officials had to pay attention to the map and invited the founder of the project to collaborate in resolving the problem. Another online urban mapping platform, RosZHKH, was a Russian alternative to SeeClickFix that allowed people to submit reports about local problems such as illegal parking and linked these reports to a tool that generated official complaints to local authorities.

In all the above cases, the participatory mapping not only increased transparency around specific problems, but also allowed people to hold the authorities accountable by offering a specific repertoire of activities to address the problem. The maps can be seen here as ‘problem-solving instruments’ that offer a link between the mapping of the problem and the activity enabled by it. That said, in many cases the mapping projects were not able either to force the authorities to respond or to develop a collaboration mode with local authorities that allowed them to offer a link between participatory mapping and activity in response to the issue raised by the map.

The following case enables us to examine the relationship between mappers and the users of the map in a project called Open Maps of the Perm Region, launched by an ombudsman of the Perm region in Russia with assistance from the World Bank in 2011. The general purpose of the project was defined as supporting local self-governance and civic society, including citizen activism in the region (Margolina, 2012). The maps addressed mostly small cities with some significant social challenges. For instance, in Kizel a Crowdmapping deployment called ‘Recreating Our City: Kizel – Past, Present and Future’ was created.<sup>3</sup> The city had been experiencing significant problems since its main industries were closed. The idea was to map three different geographic layers in the dimension of time. The ‘past’ layer would map how the city had looked in the past (a nostalgic manifestation of memories). The ‘present’ layer would focus on the current problems of the town. The ‘future’ layer would present a map-mediated vision of how the city should look.

However, while planning these projects the initiators discovered that the basic layer of updated geographic data was missing for some areas. Consequently, the project suggested first mapping the towns themselves (literally ‘putting them on the map’) in order to allow for work with

3 See <http://history.kizeladm.ru>.



issue-related layers later. Civic activism was refocused from solving local problems to engaging people in geographical mapping, relying on OSM and based on the website [osm.perm.ru](http://osm.perm.ru). Eventually, the project was successful in adding a great deal of geographical information about remote areas of the Perm region to OSM. The regional Crowdmap deployment in Kizel, however, remained almost empty and inactive a couple of years later. The project was successful in creating a community of VGI mappers, but failed to create a community of users of those maps.

In some cases, the authorities have tried to take control of mapping tools by offering their own urban mapping platforms. In this way, the moderators could filter reports submitted by citizens, as well as making sure that the action supported by the maps had no disruptive effect. For instance, in some cases, reports about streets that were blocked by snow were addressed by removing the snow from photos using Photoshop and posting the edited photo as proof that action had been taken. In other cases, platforms offered a limited repertoire of citizen participation. For instance, the Active Citizen platform, launched by the mayor of Moscow, was criticised for appearing to provide an opportunity to complain, but with no consequent action taken, and creating 'a semblance of openness and participation, while in practice neutralising citizens' activity and exerting control over them' (Asmolov, 2017, p. 463).

The idea that in order to solve the problem you first need to create a layer of geographical information about a particular area that is scarcely represented on the existing map is certainly not exclusive to Russia. One of the most notable projects in this field is the mapping of the slums of Kibera and Mathare in Nairobi. According to Fairbanks (2013), 'on Google Maps they figure as blank expanses, in keeping with their reputation as shadowy, marginal places'. Drawing Kibera on the map relied on the engagement of volunteers to collect data about the area and on the crowdsourcing of information about the location of key places (such as water taps, schools, pharmacies) based on information from local citizens, as well as adding official data. However, according to Kovacic and Lundine (2013, p. 123), while Map Kibera successfully created data and mapped the slums, the outcome of the mapping project was not 'accessible to or consumable by local organizations'.

A new model of mapping was implemented by a social enterprise, Spatial Collective, in the slums of Mathare: 'The goal was that Mathare residents, through mapping and social media tools, relate their stories to an audience outside of the slum and beyond the borders of the nation, but more importantly start the conversations within the community through constant small forums' (Kovacic and Lundine, 2013, p. 124).

The mapping relied on members of youth groups from the slums. One of the leading activists, Isaac Mutisya, explained the role of the map from the

perspective of the local mappers: 'We think of GPS maps as guides. They are the sometimes annoying, always calm, recorded voice in our car that steers us through unfamiliar places. But maps are also public records that can help slum dwellers negotiate with city authorities' (Warner, 2013).

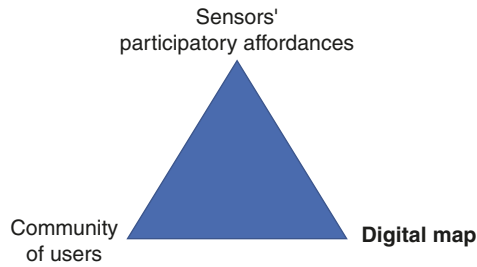
One of the issues for problem mapping in Mathare was illegal dumping grounds. The purpose of mapping was defined as improving 'the existing waste management systems found in the community' (Spatial Collective, 2013). Mapping various segments of the life cycle of waste and locations related to illegal waste allowed local community members to take care of this problem. Other problems addressed by the map have focused on the facilitation of dialogue between local residents and the local authorities, for example on mapping the infrastructure of pipes in order to increase the number of public toilets and crime mapping that relies on community reporting.

The case of Mathare demonstrates how the same community has conducted the mapping and used the outcome of it to enable an activity that can contribute to the solution of problems like waste management. We can also see how a specific organisation, in this case the social entrepreneurship Spatial Collective, supports both the mapping process and how it is used to address the problems of the slums. The purpose of the maps is 'not only to present information (e.g. a water supply shortage), but also to produce concrete action (e.g. to facilitate the delivery of water to remedy the shortage)' (Kovacic and Lundine, 2013, pp. 126–7).

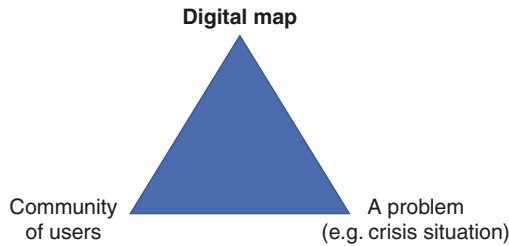
## Analysis

This chapter argues that the role of participatory digital maps needs to be examined in the context of activity potentially related to these maps. The notion of an activity system allows us to identify the dual position of the maps as a mediator and/or as an object. Case studies from the fields of crisis mapping and urban mapping allow us to examine the locations of the maps in the context of activity, as well as the structure of relations between different communities of users related to the maps.

Figure 2.2 presents a case where the map can be considered as an object of activity. This activity is mediated via a variety of digital tools that afford a broad scope of participation in the development of maps. The participatory mapping activity includes the aggregation of data from a variety of sources, data analysis and data verification. In each case considered above we can see various forms of digitally mediated participatory practices that were directed towards the development of digital maps. Maps as objects can be seen both in the case of participatory development of geographic maps (e.g. OSM) and of participatory development of issue-focused maps such as crisis maps or urban maps.



*Figure 2.2. Participatory maps as objects of activity.*



*Figure 2.3. Participatory maps as mediators of activity.*

Figure 2.3 presents a case where the map can be considered as a mediator of activity in relation to specific objects. This can be seen in the cases of crisis mapping, where digital maps were supported in order to enhance emergency response, and in the cases of urban mapping, where the maps were developed in order to address a variety of problems on the city level. The major question, however, is how mapping as an object of activity is related to the outcome of the mapping. Figure 2.4 allows us to focus on an analysis of the relationship between the community taking part in the production of the map and the community using the map, and to explore the mechanisms linking the map's two functions.

In the case of Help Map, the mapping activity and the mapping-enabled activity were integrated in the structure of a mapping platform, suggesting a link between needs and resources. Those who participated in the mapping were the same group of people who participated in the response to what had been mapped. Both activities relied on a community of volunteers who used the Internet, as well as a number of NGOs participating in the emergency response. It is safe to say that the mapping and mapping-enabled

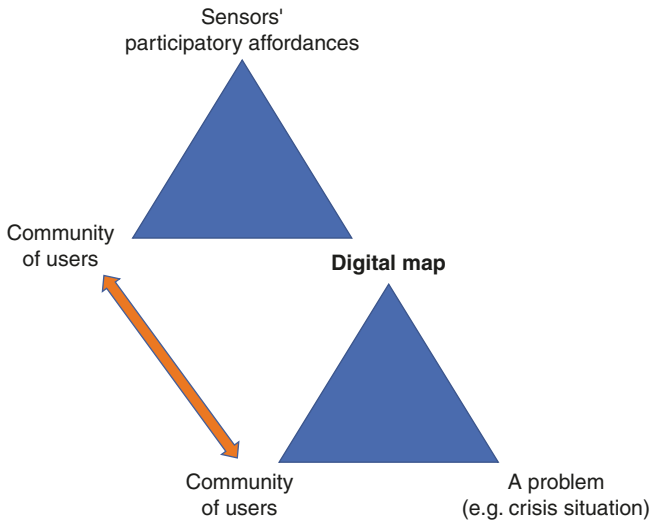


Figure 2.4. *The dual role of participatory maps in the context of activity systems.*

activities were highly integrated in the case of Help Map. The group of map moderators played the role of facilitators in order to ensure that the mapping was linked to the activity required in response. However, in the case of the map that dealt with the extreme weather in Russia, this link was missing and the map remained mostly an object of activity.

In the case of the response to Typhoon Yolanda, the community of users that created the map and those who used the map were substantially different. The map relied on the participatory activities of micromappers; however, the outcome of the mapping was developed for an international responding organisation, in this case OCHA. The link between mapping as an activity and the activity mediated by it was supported by SBTF, an established online community of crisis mappers. The two types of activity were also integrated due to the facilitation by the DHN and due to the fact that the activation of the mapping community took place following a request from those interested in the map to support the rescue operation on the ground.

The cases of urban mapping also allow us to examine different types of relations between mapping as an object of activity and the activity that has been mediated by the mapping. In the case of projects dealing with potholes, leaking roofs and neighbourhood problems, the maps forced institutional actors to address the issues thanks to algorithms that automatically generated

complaints. The moderators of the maps also made sure that the reports were transformed into official complaints and reached their destination. In the case of the Open Maps project in Perm, the emergence of a GIS mapping community was not followed by the emergence of an issue-mapping community or a community of people who could act on the basis of the mapping. The map in Kizel demonstrates how mapping can be disconnected from activity that is supposed to address the issues mapped.

The case of the mapping in Kibera and Mathare also demonstrates how it is linked to various types of activity by the local community. The same community of youth groups from the slums was engaged in mapping and in activity relying on it (such as the collection of rubbish). In some cases, the community around the map included not only internal actors (local residents), but also external actors, including the authorities and aid organisations. The high degree of integration between mapping and mapping-enabled activity was supported by the Spatial Collective NGO.

In some cases, however, the mapping activity is not necessarily designed to address a specific problem. The cases where it is driven by the goal of updating geographic maps (as in the case of OSM) can be considered as 'generative mapping', where the purpose is to support unexpected outcomes and a variety of potential actions. Generative mapping relies on a community of mappers, but usually this is not linked to a community of those who can use the map, since no specific type of mapping-enabled activity is considered as part of the project.

These cases allow us to identify two types of relations between a community of mappers and a community of those who use the maps. In the first case, groups of users belong to the same group. This can be seen in the case of crowdfunding projects, where the members of the crowd both develop and use the maps to address the issues mapped. In the second case, the community of users that participate in mapping and those who use the maps can be seen as two different groups. In most of these cases, the mappers can be considered as members of a digital crowd or online groups of volunteers, while those who use the maps to address the issue of mapping are institutional actors.

In some cases, the institutional actor initiates and supports the mapping in order to support their own activity. In these cases, the maps serve as facilitators of collaboration between the community represented by the mappers and external actors. In such cases, we can see that mapping is more likely to be followed by a mapping-enabled activity and to serve the mutual interests of all sides. In other cases, the maps force institutional actors to respond. The purpose of the map in these cases is to get the issue on the agenda and to attract attention. However, this symbolic representative value of the map in many cases does not necessarily lead to action, despite the claims that maps will increase transparency and accountability.

In all the cases considered, we have seen that a central role in connecting mapping as an activity and the activity mediated by mapping was played by intermediaries. In some cases, the intermediaries are an outcome of spontaneous self-organisation, as in the case of the Help Map coordination centre. In the case of Typhoon Yolanda, intermediaries are presented by online groups of volunteers, including SBTF and DHN. In the case of Kenya, the intermediary is an NGO (Spatial Collective). Some of the urban mapping platforms embed a mechanism that links mapping to action. In the cases of Rosyama and Zalivaet.spb, the automatic generation of complaints, as well as the activities of the founders of the mapping platforms, ensure that the outcome of mapping forces institutional actors to address the issues mapped.

The additional trend that can be seen is that the organisational actors develop internal capabilities of mapping by relying on the analysis of big data and therefore rely less on the engagement of the crowd. This can be seen as a shift from crowdsourcing to insourcing of digital mapping. At the same time, we can see that some institutional actors seek to neutralise the link between mapping and mapping-enabled activity through the development of platforms that allow them to control the outcomes and offer a semblance of participation. The latter can be addressed as a form of vertical crowdsourcing (Asmolov, 2017).

## Conclusion

The focus on participatory mapping in the context of activity systems has allowed us to explore the relationship between those who create the data and those who use it, and in particular to ask to what extent these groups are interrelated. The investigation has focused on the degree of integration between various types of activity as represented in the links between different communities of users. Maps always exist in a context of activity. The balance between activity directed towards the development of a map and activities that rely on mapping differs, however, from map to map.

The analytical differentiation between mapping as activity and activity mediated by mapping allows us also to investigate the relation between these two forms of activity and suggests a model for the structure of this relation. In the first case, the same community conducts both mapping and the activity based on the mapping. In this case, mapping as an activity is a segment that has been integrated into a larger activity system. In the second case, the mapping as an activity and the mapping-enabled activity are two separate systems with independent objects of activity and different communities.

Addressing the question of the structure of the relation between mapping as an activity and the activity enabled by mapping allows the identification of different kinds of 'mapping failures'. The first type of failure is where mapping

as an activity is not followed by an activity mediated by mapping. In this case, the map remains a meaningless object. For instance, in some cases a community of social activists (such as an NGO) will ask a community of mappers to create a map (either a geographic or an issue map), but this map will not in the end be linked to or integrated within any specific activity.

The second type of failure can be seen when a community that needs a map in order to achieve its purposes is not able to mobilise a community of mappers to create the required mediating tool or more generally does not realise the mapping needed. A third type of failure, which can be seen within activity systems mediated through online maps, is around the object of mapping. In these cases, there is a contradiction between, on the one hand, the way the mappers imagine the desired activity enabled by mapping and, on the other hand, the forms of activity desired by the people experiencing the problem on the ground.

One may argue that because it is easier today to participate in mapping than in the activity enabled by it, more internet users are taking part in the process, but not necessarily in the solution of the issues mapped. Consequently, ICTs contribute to shifting the balance towards mapping activity, while fewer resources deal with mapping-enabled activity. While almost anything can be mapped, this does not guarantee that mapping will contribute to a solution to what has been mapped. Conversely, mapping becomes part of a symbolic gap between increasing awareness of a problem and the decreasing amount of resources available to solve this problem. Considering maps in the context of activity systems should help to address this gap, and help the users of digital maps not only to navigate the environment but also to change it.

*This research has been supported by the Leverhulme Trust.*

## References

- Asmolov, G. (2013) 'Natural disasters and alternative modes of governance: the role of social networks and crowdsourcing platforms in Russia', in S. Livingston and G. Walter-Drop (eds.), *Bits and Atoms: Information and Communication Technology in Areas of Limited Statehood* (Oxford: Oxford University Press), pp. 98–114.
- (2014) 'Vertical crowdsourcing in Russia: balancing governance of crowds and state–citizen partnership in emergency situations', *Policy & Internet*, 7 (3): 292–318.
- (2017) 'Vertical crowdsourcing (Russia)', in A. Ledeneva (ed.), *The Global Encyclopedia of Informality: Towards an Understanding of Social and Cultural Complexity*, vol. 2 (London: UCL Press), pp. 463–7.

- Bailard, C., R. Baker, M. Hindman, S. Livingston and P. Meier (2012) *Crowdglobe: Mapping the Maps: A Meta-Level Analysis of Ushahidi and Crowdmap* (Washington, DC: Internews Center for Innovation and Learning).
- Baruh, L. (2015) 'Social media and citizen engagement in crises', *Interactions: Studies in Communication & Culture*, 6 (2): 131–40.
- Bittner, C., G. Glasze and C. Turk (2013) 'Tracing contingencies: analyzing the political in assemblages of Web 2.0 cartographies', *GeoJournal*, 78 (6): 935–48.
- Bott, M. and G. Young (2012) 'The role of crowdsourcing for better governance in international development', *PRAXIS: The Fletcher Journal of Human Security*, 27: 47–70.
- Brabham, D.C. (2013) *Crowdsourcing* (Cambridge, MA: MIT Press).
- Bruns, A., J. Burgess, K. Crawford and F. Shaw (2012) *#qldfloods and @QPSMedia Crisis Communication on Twitter in the 2011 South-East Queensland Floods* (Brisbane: ARC Centre of Excellence for Creative Industries and Innovation).
- Castells, M. (2007) 'Communication, power and counter-power in the network society', *International Journal of Communication*, 1: 238–66.
- Cole, M. (1985) 'The zone of proximal development: where culture and cognition create each other', in J.V. Wertsch (ed.), *Culture, Communication and Cognition* (Cambridge: Cambridge University Press), pp. 146–61.
- Connors, J.P., S. Lei and M. Kelly (2012) 'Citizen science in the age of neogeography: utilizing volunteered geographic information for environmental monitoring', *Annals of the Association of American Geographers*, 102 (6): 1267–89.
- Crampton, J.W. (2009) 'Cartography: Maps 2.0', *Progress in Human Geography*, 33 (1): 91–100.
- Elwood, S., M.F. Goodchild and D.Z. Sui (2012) 'Researching volunteered geographic information: spatial data, geographic research, and new social practice', *Annals of the Association of American Geographers*, 102 (3): 571–90.
- Elwood, S. and A. Leszczynski (2013) 'New spatial media, new knowledge politics', *Transactions of the Institute of British Geographers*, 38 (4): 544–59.
- Engeström, Y. (1987) *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research* (Helsinki: Orienta-Konsultit Oy).



- (1988) 'How to do research on activity?' *Quarterly Newsletter of the Laboratory of Comparative Human Cognition*, 10: 30–1.
- Entman, R. (1993) 'Framing: toward clarification of a fractured paradigm', *Journal of Communication*, 43 (4): 51–8.
- Ermoshina, K. (2014) 'Democracy as pothole repair: civic applications and cyber-empowerment in Russia', *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 8 (3), <https://doi.org/10.5817/CP2014-3-4>.
- Fairbanks, E. (2013) '5 maps that could help solve some of the world's most daunting problems', *Wired*, 14 Nov., <https://www.wired.com/wiredscience/2013/11/spacial-collective-map-kibera> (accessed 19 Feb. 2019).
- Gartner, G. (2009) 'Web mapping 2.0', in M. Dodge, R. Kitchin and C. Perkins (eds.), *Rethinking Maps: New Frontiers in Cartographic Theory* (London: Routledge), pp. 68–82.
- Goldman, J., K. Shilton, J. Burke, D. Estrin, M. Hansen, N. Ramanathan, S. Reddy, V. Samanta, M. Srivastava and R. West (2009) *Participatory Sensing: A Citizen-Powered Approach to Illuminating the Patterns That Shape Our World* (Washington, DC: Woodrow Wilson Center), [https://www.mobilizingcs.org/wp-content/uploads/Participatory\\_Sensing.pdf](https://www.mobilizingcs.org/wp-content/uploads/Participatory_Sensing.pdf) (accessed 19 Feb. 2019).
- Goodchild, M.F. (2007) 'Citizens as sensors: the world of volunteered geography', *GeoJournal*, 69 (4): 211–21.
- (2009) 'NeoGeography and the nature of geographic expertise', *Journal of Location-Based Services*, 3 (2): 82–96.
- Goodchild, M.F. and J.A. Glennon (2010) 'Crowdsourcing geographic information for disaster response: a research frontier', *International Journal of Digital Earth*, 3 (3): 231–41, <https://doi.org/10.1080/17538941003759255>.
- Gould, P. (1999) *Becoming a Geographer* (Syracuse, NY: Syracuse University Press).
- Haklay, M. (2013a) 'Citizen science and volunteered geographic information: overview and typology of participation', in D. Sui, S. Elwood and M. Goodchild (eds.), *Crowdsourcing Geographic Knowledge* (Dordrecht: Springer), pp. 105–22.
- (2013b) 'Neogeography and the delusion of democratisation', *Environment and Planning A*, 45 (1): 55–69.
- Hardy, D., J. Frew and M.F. Goodchild (2012) 'Volunteered geographic information production as a spatial process', *International Journal of*

- Geographical Information Science*, 26 (7): 1191–212, <https://doi.org/10.1080/13658816.2011.629618>.
- Heinzelman, J. and C. Waters (2010) *Crowdsourcing Crisis Information in Disaster-Affected Haiti* (Washington, DC: US Institute of Peace).
- Hildebrandt, A. (2013) ‘Typhoon Haiyan creates testing ground for crisis mappers: tech-savvy population, willingness to try new ideas help country prepare for next disaster’, *CBC News*, 18 Dec., <https://www.cbc.ca/news/world/typhoon-haiyan-creates-testing-ground-for-crisis-mappers-1.2462119> (accessed 19 Feb. 2019).
- Hunt, A. and D. Specht (2019) ‘Crowdsourced mapping in crisis zones: collaboration, organisation and impact’, *Journal of International Humanitarian Action*, 4 (1), <https://doi.org/10.1186/s41018-018-0048-1>.
- Kamel Boulos, M.N., B. Resch, D.N. Crowley, J.G. Breslin, G. Sohn, R. Burtner, W.A. Pike, E. Jezierski and K.-Y. Slayer Chuang (2011) ‘Crowdsourcing, citizen sensing and sensor web technologies for public and environmental health surveillance and crisis management: trends, OGC standards and application examples’, *International Journal of Health Geographics*, 10: 67, <https://doi.org/10.1186/1476-072X-10-67>.
- Kaptelinin, V. and B.A. Nardi (2006) *Acting with Technology: Activity Theory and Interaction Design* (Cambridge, MA: MIT Press).
- Kovacic, P. and J. Lundine (2013) ‘Mapping Kibera: empowering slum residents by ICT’, in S. Livingston and G. Walter-Drop (eds.), *Bits and Atoms: Information and Communication Technology in Areas of Limited Statehood* (Oxford: Oxford University Press), pp. 115–30.
- Leontiev, A.N. (1978) *Activity, Consciousness, and Personality* (Englewood Cliffs, NJ: Prentice Hall).
- Liu, S.B. and L. Palen (2010) ‘The new cartographers: crisis map mashups and the emergence of neogeographic practice’, *Cartography and Geographic Information Science*, 37 (1): 69–90.
- Livingston, S. (2016) *Digital Affordances and Human Rights Advocacy* (SFB-Governance Working Paper Series, No. 69) (Berlin: Collaborative Research Center (SFB)).
- Margolina, T.I. (2012) *Annual Report 2011* (Perm: Human Rights in Perm Region).
- Mark, G. and B. Semaan (2008) ‘Resilience in collaboration’, in *Proceedings of the ACM 2008 Conference on Computer Supported Cooperative Work* (San Diego, CA: ACM), pp. 137–46, <http://portal.acm.org/citation.cfm?doid=1460563.1460585> (accessed 19 Feb. 2019).

- Meier, P. (2011) 'New information technologies and their impact on the humanitarian sector', *International Review of the Red Cross*, 93 (884): 1239–63.
- (2013a) 'Digital humanitarians: from Haiti earthquake to Typhoon Yolanda', *IRevolutions*, 11 Nov., <http://irevolution.net/2013/11/11/humanitarian-technology-haiti-to-yolanda> (accessed 19 Feb. 2019).
- (2013b) 'MicroMappers: microtasking for disaster response', *IRevolutions*, 18 Sept., <http://irevolution.net/2013/09/18/micromappers> (accessed 19 Feb. 2019).
- Morozov, E. (2013) *To Save Everything, Click Here: The Folly of Technological Solutionism* (New York: PublicAffairs).
- Morrow, N., N. Mock, A. Papendieck and N. Kocmich (2011) *Independent Evaluation of the Ushahidi Haiti Project*, <https://www.urban-response.org/resource/6000> (accessed 19 Feb. 2019).
- Roberts, T. (2012) 'Digital mapping as a tool for social transformation', *Laptop Burns*, 25 June, <http://laptopburns.wordpress.com/2012/06/25/digital-mapping-as-a-tool-for-social-transformation> (accessed 19 Feb. 2019).
- Simon, T., A. Goldberg and B. Adini (2015) 'Socializing in emergencies: a review of the use of social media in emergency situations', *International Journal of Information Management*, 35: 609–19.
- Spatial Collective (2013) 'Spatial Collective tackles waste management in Mathare', *Mapping: (No) Big Deal*, 4 August, <http://mappingnobigdeal.com/2013/08/04/spatial-collective-tackles-waste-management-in-mathare> (accessed 19 Feb. 2019).
- Starbird, K. (2012) *Crowdwork, Crisis and Convergence: How the Connected Crowd Organizes Information During Mass Disruption Events*, ATLAS Institute Graduate Theses and Dissertations (Boulder: University of Colorado), [https://scholar.colorado.edu/atlas\\_gradetds/12](https://scholar.colorado.edu/atlas_gradetds/12) (accessed 19 Feb. 2019).
- Starbird, K. and L. Palen (2013) 'Working and sustaining the virtual disaster desk', in *Proceedings of the ACM Conference on Computer Supported Cooperative Work* (San Antonio, TX: ACM), pp. 491–502.
- Toffler, A. (1980) *The Third Wave: The Classic Study of Tomorrow* (New York: Bantam).
- Turner, A.J. (2006) *Introduction to Neogeography* (Sebastopol, CA: O'Reilly Media).

- Vygotsky, L.S. (1930) *The Instrumental Method in Psychology*, <https://www.marxists.org/archive/vygotsky/works/1930/instrumental.htm> (accessed 19 Feb. 2019).
- (1978) *Mind in Society: The Development of Higher Psychological Processes* (Cambridge, MA: Harvard University Press).
- (1981) ‘The instrumental method in psychology’, in J. Wertsch (ed.), *The Concept of Activity in Soviet Psychology* (New York: Sharpe), pp. 134–43.
- Warner, G. (2013) ‘In Kenya, using tech to put an “invisible” slum on the map’, *NPR – Parallels*, 17 July, <https://www.npr.org/blogs/parallels/2013/07/17/202656235/in-kenya-using-tech-to-put-an-invisible-slum-on-the-map> (accessed 19 Feb. 2019).
- Young, C. (2014) ‘HarassMap: using crowdsourced data to map sexual harassment in Egypt’, *Technology Innovation Management Review*, March, <https://timreview.ca/article/770> (accessed 19 Feb. 2019).
- Ziemke, J. (2012) ‘Crisis mapping: the construction of a new interdisciplinary field?’ *Journal of Map and Geography Libraries: Advances in Geospatial Information, Collections and Archives*, 8 (2): 101–17.
- Zittrain, J. (2008) *The Future of the Internet and How to Stop It* (New Haven, CT: Yale University Press).

