Communication and Peace

Mapping an emerging field

Edited by
Julia Hoffmann and
Virgil Hawkins

Contents

13 Digital technology and peace

Steven Livingston

The ability to gather and manage information on a global scale is growing exponentially. According to one estimate, at the close of the twentieth century, the sum of *all human-produced recorded information* (including all audio, video recordings, and text/books) was about 12 exabytes of data (Enriquez 2003).[1] To put that in perspective, Cisco (2014) predicts that in 2017 the same amount of data will be produced *in a single month*. Data are now extracted from *social, spatial,* and *genetic* relationships at an unprecedented rate and scale (Cukier and Mayer-Schoenberger 2013).

In this chapter, the discussion of peace is situated in the context of a consideration of the availability of information (Bimber 2003; Bennett and Segerberg 2013; Shirky 2008). I argue that information and communication technologies empower communities and non-state actors in efforts to address the social and economic conditions that give rise to endemic violence and instability. We begin with a brief review of insecurity – the absence of peace – in the world. Next we turn to a brief survey of relevant technologies, followed by a review of new collective action theory, or what I will refer to as digitally enabled collective action. I'll also illustrate the concept with a few examples. We will then close with a discussion of the connection between accountability and peace.

Insecurity around the world

Despite taking millions of lives, "stealth conflicts" tend to remain off the radar of conventional media (Hawkins 2008). An oft-cited example is the conflict in the Democratic Republic of Congo (DRC) where estimates point to approximately five million deaths from war, disease and malnutrition since the mid-1990s (Gettleman 2012). These are the wars that traditional media too often miss. "One or two of the twenty or thirty conflicts ongoing throughout the world appear to be 'chosen' as the subject of intense scrutiny and selective indignation, very rarely on the basis of scale or the level of humanitarian emergency" (Hawkins 2008: 187). Conventional media are even less likely to cover mob justice attacks in urban slums or guerrilla attacks on communities found deep in the bush in

Africa or high in the Andean mountains. As long as people experience these depredations without voice and without effective recourse, the violence will continue unabated.

Most modern conflicts are found in the Global South. Furthermore, many conflicts are not between states, but rather among sub-state actors, exclusively, or between sub-state actors and states. Figure 13.1 illustrates the distribution of conflicts in the world in 2012.

The darker shades indicate a greater prevalence of conflict.[2] About a third of all conflicts (*n*=128) observed in this survey were found in Asia and Oceania. Sub-Saharan Africa came next with 90 conflicts. The Middle East and North Africa recorded 69. Europe experienced 58 and the Americas 51 conflicts. At the heart of most of the conflicts in the world were disputes over status claims to legitimate governance. About 80 percent of all conflicts were "domestic," involving disputes over sub-national predominance – attaining *de facto* control over a territory or a population (Heidelberg Institute for International Conflict Research 2012). As insecure as the Global South already is, there is reason to believe that the situation is, in fact, much worse. The inherent methodological limitations for tracking conflict and insecurity lead to this conclusion.

The Heidelberg Institute for International Conflict Research, for example, uses "news archives and other open sources" in assembling its statistical assessments of global conflict (2012: 121). The task of collecting accurate data on a global scale is enormous and imprecise. It is therefore understandable that the Heidelberg Institute must rely on the sources they do. Yet one should keep in mind that newspapers and other reliable news outlets either do not exist, or, if they do exist, are severely constrained and under-resourced. Little of the violence that touches the lives of people living in urban slums or in remote rural communities is known or reported by any news organization. In some places violence is pervasive yet episodic, buried in the daily routines of those living in slums or in remote rural settlements.
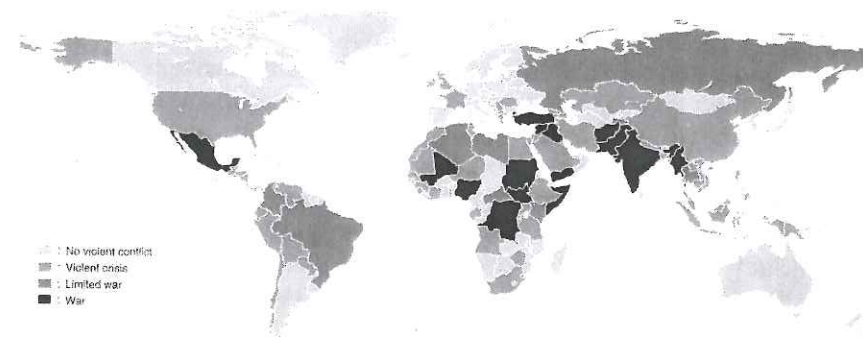

Figure 13.1 Global distribution of conflicts (source: Conflict Barometer 2012, Heidelberg Institute for International Conflict Research).

Around the world populations live in fear of political and criminal violence (which are at times indistinguishable) *and* undisciplined and unaccountable security forces (which are sometimes indistinguishable from the criminal and political sources of violence). What does insecurity look like in areas defined by the absence of war but still lacking in peace? Typically, it involves high crime rates, violent rivalry among competing ethnic groups, and mob justice.

In the absence of effective policing, communities mete out swift and brutal "mob" justice on suspected criminals. According to Kenyan police statistics, 429 people were killed in mob justice attacks in 2011, though the actual number of deaths was surely much higher. Police statistics in Kenya are highly unreliable. Mob justice attacks are situational and episodic. The mobs are spontaneous and swift to resort to violence. Vigilantism, on the other hand, is a more sustained and organized form of security provisioning (Totolo 2009). It involves an informal organization of young men, often of a particular identity group, who provide for the security of the community. Although some of these groups provide a vital community service, they often degenerate into protection rackets and extortion rings. One such self-defense group that strayed into criminality is the Mungiki in Kenya. Dominated by members of the Kikuyu ethnic group, the Mungiki illustrates the precipitous slide self-help security protection efforts experience: from security force to criminal gang. As one investigation noted,

> Initially, the Mungiki were seen as substituting for a lack of public services in the slums. Later it started bullying individuals and businesses, including *matatus* [minibus taxi drivers] and owners of real estate, into making payments for services which it would provide, including connecting electricity, providing pit latrines, and meting out justice. Mungiki and other gangs across the country (e.g., the Taliban, Chinkororo, Kamjeshi, Baghdad Boys, and many others) grew and multiplied within the context of a political culture that both used and tolerated extra-state violence.
>
> (Waki 2008: 27)

In slums and poor neighbourhoods, local residents manage their own security, either through mob justice or vigilantism. In wealthier areas, private security firms fill in for missing state security provisioning. According to one estimate, some 1,500–2,000 security firms employ about 100,000 people in Nigeria. Kenya has about 2,000 such companies, some of which have expanded operations to meet demand throughout East and Central Africa. There are as many as 430,000 active private security officers in South Africa alone (Private Security Industry Regulatory Authority of South Africa 2012). This mish-mash of private groups in Africa varies dramatically in competency and integrity, though almost all lack standards of accountability or regulation. The results of such informal and private security efforts can often be entirely counterproductive.

In some cases the state maintains a monopoly on the use of force. The experience of state use of force, of course, varies widely. But where state security forces are unaccountable, poorly trained and unprofessional, peace is violated in profoundly disturbing ways. In his 2010 annual report, the United Nations Special Rapporteur on Extrajudicial, Summary, or Arbitrary Executions stated: "All too common are intentional murders in which police shoot to kill alleged criminals without resort[ing] to other appropriate measures" (Alston 2010: 8). In some countries the security forces are directly controlled by politicians, and "security officials may conduct politically motivated killings, including of political opposition members or supporters, and election-related killings" (Odinkalu 2010: 43). This claim echoed a 2006 statement by Nigeria's first Presidential Committee on Police Reform:

> Extrajudicial killings, summary executions of suspects and revenge killings are also widely reported. Due to a combination of poor training, inadequate infrastructure, and absence of respect for due process and human rights, the police often resort to torture to extract confession[s] and information from suspects.
>
> (cited in Odinkalu 2010: 43)

In Kenya, during a tense period in June 2007, the Mungiki was accused of killing 15 police officers and 27 civilians, many of them by beheading (Odula 2007). In response, the police claimed to have detained 2,464 "suspected" Mungiki members. However, this may have been only a small part of the police response. In November 2007 the Oscar Foundation Free Legal Aid Clinic Kenya, a human rights organization, reported that between 2002 and 2007 Kenyan police had killed over 8,000 people in crackdowns against the Mungiki, and that another 4,000 people were missing (BBC 2007). Well beyond the reports of violence one finds in newspapers, insecurity – the lack of peace – is deeply endemic to areas outside the governance capacity of an accountable state.

Whether considering community self-help initiatives, private security, or state systems run amok, *the fundamental problem involves a lack of transparency, accountability and restraint.* With few resources and even less oversight, the institutions intended to maintain security become themselves a principal source of insecurity. How might we accentuate accountability functions with various digital technologies?

Our goal here is to consider the possibility that advances in digital technology will provide greater accountability. At the heart of the process are methods to strengthen accountability through a leveraging of various technologies. The expectation here is that digital technology will expose the illegitimate use of force and deter its future use. The first step in making this argument is with a brief introduction to relevant technologies. I will also offer several examples of their use in enhancing transparency and accountability.

Information and communication technology

As of 2014 there were about seven billion mobile phone subscriptions in the world, with billions of other connected devices comprising the "Internet of Things." Over 30 billion connected devices were expected by 2020 (ABI Research 2013; Chaouchi 2010). Although a digital divide remains, especially with regard to the broadband connectivity of rural areas in the Global South, the fastest growth rates in mobile telephony are found in Africa and Asia (Livingston 2011).

In addition to mobile telephony, geographical information system (GIS) platforms, geographical positioning satellites (GPS), and various remote-sensing satellites are vital sources of data. Geospatial data create the capacity for constant spatial awareness – either for handheld devices or for devices embedded in automobiles, ships at sea, and onboard aircraft. Remote sensing data are themselves varied in content and precision, with different sensors capable of capturing different parts of the electromagnetic spectrum with varying degrees of spatial precision. Panchromatic (black-and-white) imagery is now available in less than 0.5 meter resolution, meaning objects on the ground that are about the size of a toaster can be seen from 600+km away in space. Multi-spectral and hyper-spectral imagery, though with less precise spatial resolution (at least when used from space) detects aspects of the chemical composition of substances on the ground. When mounted on aircraft, precise three-dimensional models of the material composition of objects on the ground are possible. For example, the health of photosynthesis is detectable in the non-visible ranges of the electromagnetic spectrum, making it possible to monitor the health of crops and forests from space.

These data are managed by GIS software platforms that add practical value to massive amounts of geospatial data. These are not stand-alone technologies. GIS, GPS and remote sensing are essential constituent elements in an integrated geospatial referencing and communication system. Without GPS and GIS, mobile telephony would be impossible, while mobile telephony facilitates the broad adoption of GIS and GPS platforms – such as Google Maps.

Remote sensing satellite imagery is important for expanding the ability to account for human rights violations. Amnesty International, for example, used high resolution satellite imagery to reveal the scale of destruction arising from civil unrest in the Central African Republic. "The images – some taken since the beginning of November (2013) – include evidence of 485 homes being torched in Bouca as well as internally displaced persons (IDPs) massing near the town of Bossangoa as people flee the ongoing violence" (Amnesty International 2013). In Nigeria, satellite imagery revealed that in February 2013 the Nigerian government destroyed the homes of around 9,000 people as a part of a "redevelopment" initiative tied to a counterinsurgency campaign directed at Boko

Haram, the Muslim militant group operating mostly in the north (Collins 2013).

Also in 2013, Human Rights Watch used satellite imagery to reveal what it called the "massive destruction [and] deaths" resulting from a military raid on the town of Baga in northern Nigeria. The raid was carried out in retaliation for an attack that killed a soldier.

> Baga residents told Human Rights Watch that soldiers ransacked the town after the Boko Haram militant Islamist group attacked a military patrol, killing a soldier. Community leaders said that immediately after the attack they counted 2,000 burned homes and 183 bodies. Satellite images of the town analyzed by Human Rights Watch corroborate these accounts and identify 2,275 destroyed buildings, the vast majority likely residences, with another 125 severely damaged.
>
> (Human Rights Watch 2013)

Digital technologies also help security forces in their efforts to provide individual and collective security. One way this is achieved is through what some call social physics (Pentland 2014). Data are used to map behavioral patterns over time, leading to probability-weighted predictions of future behavior (Pentland 2014). In May 2012 Caesar Acellam, a commander of the Lord's Resistance Army (LRA) and military strategist for the extremist group's leader Joseph Kony, was captured by the Ugandan Army. Capturing LRA commanders is especially difficult because of their habit of hiding in the jungles of the Democratic Republic of the Congo, South Sudan and the Central African Republic. Drawing on hundreds of data points – including terrain information, the location of prior LRA attacks, access to resources and locations of internally displaced persons (IDPs) – DigitalGlobe, a remote sensing satellite and geospatial information company, identified a pattern behind LRA movements. With this information algorithms generated a heat map pinpointing where LRA movements created a pattern. These data produced a weighted prediction of where the LRA was likely to attack next. Acellam was found in one of those areas (Clark 2013).

In other instances broadly distributed mobile telephony enables crowd-sourced monitoring of elections, efforts to respond to natural disasters, or politically motivated violence. Broadly distributed individuals, each carrying a mobile phone, become the eyes and ears of an initiative to achieve a collective goal or good. The cost of their involvement, at an individual level, is negligible, and perhaps even unrecognized.

For example, contested elections have been the source of political instability and crisis the world over (Hyde 2011). Ushahidi GIS platforms are now used to monitor election processes via crowdsourced reports from the field using mobile phones. An example would be the use of mobile phones to report violent incidents following the disputed elections in

Kenya in 2007. The reports were managed on an open source digital mapping platform called Ushahidi, the Swahili word for "witness." Since then, hundreds of Ushahidi deployments have monitored other violent episodes and conditions, as well as elections. Crowdsourcing and Ushahidi have also been used to coordinate the public response to wildfires in Russia and to earthquakes in Haiti, Japan and New Zealand (Jeffery 2011; see also Bailard *et al.* 2012; Asmolov 2014; Meier 2014).

The forensic sciences have also been affected by the digital revolution. Data are extracted from genetic and textual sources. Newer scanning technologies, for example, enable forensic archivists to sort and manage massive amounts of unorganized textual information. This can be illustrated by an example that is also relevant to the larger point of this chapter.

In July 2005 files containing the names, addresses and identification documents of the many thousands of victims of the Guatemalan government's decades-long civil war were found in an abandoned warehouse in Guatemala City. It contained an estimated 80 million individual pages, or about 15 million documents. Benethech, a non-profit technology company based in the Silicon Valley, built specialized scanners and software to digitize the documents. The process of scanning so many documents in a meaningful timeframe also involved the datafication of space within the warehouse itself. First, the physical dimensions of the warehouse were obtained. From this, precise points in three-dimensional space within the warehouse were randomly sampled. In essence, a random selection of spots within the physical dimensions of the warehouse was used to locate documents, painting a picture of what the entire population of documents would eventually reveal. Meanwhile, archivists continued the laborious process of digitizing the entire body of records. By the end of 2013 about 20 percent of the documents (15 million pages) had been digitized (Kinzer 2013). In the absence of scanners and software, assessing the content of the documents would have taken decades.

Meanwhile, Guatemalan forensic anthropologists made use of genetic markers to trace the identities of victims of human rights abuses. DNA extracted from bone fragments or teeth of a victim is matched with the DNA of members of the affected community; that is, the victim's likely relatives. Investigators establish the victim's identity through DNA matching, a process first developed and used on a large scale by forensic anthropologists working to identify the disassociated remains of the 8,000 men and boys murdered by Serbian military in the Srebrenica massacre of July 1995 (Wagner 2008). This process is made less costly and less time consuming by efficiencies made possible by computer software (Brenner undated). In some instances, forensic anthropologists have been able to match genetic evidence collected from massacre sites with archival records assembled by forensic archivists to hold the perpetrators accountable (Suarez 2013; Boyd 2008). In Guatemala, Argentina, Peru, Chile and in the Balkans, former members of death squads and the political leadership that directed them have been prosecuted based on evidence collected by forensic specialists using these advanced technologies (Robbins *et al.* 1995).

Most of the technologies discussed above lead to the datafication of social, spatial or genetic relationships. The data that are extracted from these relationships constitute new sources of transparency. People and groups who shatter the peace and well-being of other people and groups are now less likely to continue to do so without detection.

Concluding thoughts – accountability and peace

Amartya Sen has famously observed that famines do not occur in countries with a free press and fair multi-party elections. "Famines are easy to prevent if there is a serious effort to do so, and a democratic government, facing elections and criticisms from opposition parties and independent newspapers, cannot help but make such an effort" (Sen 1999a: 8; see also Sen 1999b: 180–1). Newspapers and elections are accountability mechanisms. They take their force from the ability to signpost indifference, misconduct and malfeasance. Sen's understanding of development economics is directly related to peace and accountability. Traditionally, the success of economic development has been measured by gross domestic product (GDP), the measurement of all domestically produced goods and services. Sen and his followers believe GDP is a poor proxy for a more complete and humane understanding of what it means to live in a developed country. His "Capabilities Approach" emphasizes a different set of expectations. Sen measures progress in development according to an individual person's well-being. "What is this person able to do or be?" (Nussbaum 2011: 18). What impediments do they face and how can they be freed from them? Capabilities do not reside only within an individual. They are also the freedoms created by the combination of personal abilities and *the social, political and economic environment in which he or she resides*. Political philosopher Martha Nussbaum has contributed to the Capabilities Approach by specifying some of the core attributes of a fully realized life. These include the ability to live a life of normal length; to enjoy good health and adequate nourishment; to maintain bodily integrity, understood as the ability to move about without fear of violent assault; enjoying a life of the mind, one that allows one to imagine and think and reason; enjoying a healthy emotional life; having the freedom to make political choices and expressions; and having property rights on an equal basis with others (Nussbaum 2011: 33–4). These attributes also seem to sketch the contours of a condition deserving of the term *peace*. Peace is more than the absence of war. It is the presence of the life-affirming attributes of the community in which one lives. Some living conditions "deliver to people a life that is worthy of human dignity that they possess, and others do not" (Nussbaum 2011: 20).

With this added element we are proposing that digital technology contributes to the creation and preservation of peace. They do so by enabling groups and organizations to inspect the conduct, past and present, of those who undermine human capabilities. To live a life of normal length, to enjoy good health and adequate nourishment, and to be able to move about without fear of violent assault, require sources of individual and collective security that are themselves accountable. Digital technology contributes to the creation of that condition. This is the principal tie, as I see it, between information and communication technology and peace.

This is not a perfect solution. Knowing about a harmful condition or human rights abuse does not necessary translate into change (Dai 2013).[3] Regulation by revelation has its limits. Some violators of individual and collective security are impervious to external pressure. It is also a deeply ironic solution. It relies on advanced digital technologies – such as remote sensing satellites, GPS and digital mapping – all technologies created for the purposes of more efficient and deadly warfare. The first marketed transistor, the 2N697, developed in 1958 by what would become Intel, was sold to IBM for $150 a piece, a price that far outstripped its pure market value. That price was met by the deep pockets of the Pentagon, which saw its potential for weapons development (Lécuyer 2010). The Internet is also a Defense Department creation. And in the wrong hands greater transparency intended for good can turn into a lack of privacy resulting in political control.

This dialectic of technology is not limited to satellite imagery or mobile phone metadata. Every technology, from biological science (curing disease or creating biological weapons) to radiology (medical imaging and radio-therapies or nuclear weapons) to aeroplanes (civilian airliners reuniting families or bombers) has a dialectical presence. The key is to teach and share the values that will give strength to preferred outcomes. No outcome is predetermined. They are instead contested and fought over by people who work together collectively for things that matter to them – such as peace.

Notes

1 One exabyte = $1,000^6$ bytes = 10^{18} bytes or 1,000,000,000,000,000,000 bytes or 1,000 petabytes or one million terabytes or one billion gigabytes.
2 For a definition of conflict see Heidelberg Institute for International Conflict Research 2012:120.
3 For a broader discussion of transnational human rights activism and information, see Risse *et al.* 1999, and Keck and Sikkink 1998.

References

ABI Research. 2013. "More than 30 Billion Devices will Wirelessly Connect to the Internet of Everything in 2020." May 13. *ABI Research News*. Online, accessed May 22, 2014, available at: www.abiresearch.com/press/more-than-30-billion-devices-will-wirelessly-conne.

Alston, Philip. 2010. "Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions (A/HRC/14/24)." Geneva, Switzerland: United Nations.

Amnesty International. 2013. "New Satellite Images Reveal Shocking Aftermath of Abuses in Central African Republic." *Amnesty International News*, November 8. Online, accessed May 22, 2014, available at: www.amnesty.org/en/news/new-satellite-images-reveal-shocking-aftermath-abuses-central-african-republic-2013-11-08.

Asmolov, Gregory. 2014. "Natural Disasters and Alternative Modes of Governance: The Role of Social Networks and Crowdsourcing Platforms in Russia" in Steven Livingston and Gregor Walter-Drop (eds), *Bits and Atoms: Information and Communication Technology in Areas of Limited Statehood*: 98–114. New York: Oxford University Press.

Bailard, Catie, Rob Baker, Matt Hindman, Steven Livingston and Patrick Meier. 2012. "Mapping the Maps A Meta-Level Analysis of Ushahidi and Crowdmap." CrowdGlobe, July. Online, accessed May 22, 2014, available at: http://irevolution.files.wordpress.com/2013/01/internewswpcrowdglobe_web-1.pdf.

BBC. 2007. "Kenyan Police 'Killed Thousands'." November 25. Online, accessed May 22, 2014, available at: http://news.bbc.co.uk/2/hi/7112183.stm.

Bennett, W. Lance and Alexandra Segerberg. 2013. *The Logic of Connective Action: Digital Media and the Personalization of Contentious Politics*. New York: Cambridge University Press.

Bimber, Bruce A. 2003. *Information and American Democracy: Technology in the Evolution of Political Power*. New York: Cambridge University Press.

Boyd, Clark. 2008. "Guatemala: The Secret Files." *Frontline*. PBS, May 27. Online, accessed May 22, 2014, available at: www.pbs.org/frontlineworld/stories/guatemala704/.

Brenner, Charles H. Undated. "International Commission on Missing Persons." Online, accessed April 16, 2014, available at: www.ic-mp.org/committees/steering-committee-on-forensic-sciences/charles-hbrenner-phd-usa/.

Chaouchi, Hakima. 2010. *The Internet of Things*. London: Wiley-ISTE.

Cisco (2014). "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2013–2018." Online, accessed May 22, 2014, available at: www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.pdf.

Clark, Liat. 2013. "How Geospatial Analytics Is Helping Hunt the LRA and Al-Shabaab." *Wired Magazine*, June 24. Online, accessed May 22, 2014, available at: www.wired.co.uk/news/archive/2013-06/24/geospatial-analytics-hunting-lra.

Collins, Katie. 2013. "Satellite Images Prove Forced Evictions that Left 9,000 Homeless in Nigeria." *Wired Magazine*, August 14. Online, accessed May 22, 2014, available at: www.wired.co.uk/news/archive/2013-08/14/satellites-nigeria-forced-evictions.

Cukier, Kenneth and Viktor Mayer-Schonberger. 2013. *Big Data: A Revolution that will Transform how we Live, Work, and Think*. New York: Houghton Mifflin Harcourt.

Dai, Xinyuan. 2013. "The 'Compliance Gap' and the Efficacy of International Human Rights Institutions" in Thomas Risse, Stephen C. Ropp and Kathryn Sikkink (eds), *The Persistent Power of Human Rights: From Commitment to Compliance*: 85–102. New York: Cambridge University Press.

Enriquez, Juan. 2003. "The Data that Defines Us." *CIO Magazine*. Fall/Winter. Online, accessed December 1, 2013, available at: www.cio.com/archive/092203/enriquez.html.

Gettleman, Jeffrey. 2012. "The World's Worst War." *New York Times*, December 15. Online, accessed May 22, 2014, available at: www.nytimes.com/2012/12/16/sunday-review/congos-never-ending-war.html?_r=0.

Hawkins, Virgil. 2008. *Stealth Conflicts: How the World's Worst Violence Is Ignored.* Hampshire, England: Ashgate.

Heidelberg Institute for International Conflict Research (2012). "Conflict Barometer (21)." Online, accessed May 22, 2014, available at: www.hiik.de/en/konflikt-barometer/pdf/ConflictBarometer_2012.pdf.

Human Rights Watch. 2013. "Nigeria: Massive Destruction, Deaths from Military Raid." *Human Rights Watch News*, May 1. Online, accessed May 22, 2014, available at: www.hrw.org/news/2013/05/01/nigeria-massive-destruction-deaths-military-raid.

Hyde, Susan D. 2011. *The Pseudo-Democrat's Dilemma: Why Election Observation Became an International Norm.* Ithaca: Cornell University Press.

Jeffery, Simon. 2011. "Ushahidi: Crowdmapping Collective that Exposed Kenyan Election Killings." *Guardian*, April 7. Online, accessed May 22, 2014, available at: www.theguardian.com/news/blog/2011/apr/07/ushahidi-crowdmap-kenya-violence-hague.

Keck, Margaret E. and Kathryn Sikkink. 1998. *Activists Beyond Borders: Advocacy Networks in International Politics.* Ithaca: Cornell University Press.

Kinzer, Stephen. 2013. "Glimmers of Hope in Guatemala." *New York Review of Books*, December 5. Online, accessed May 22, 2014, available at: www.nybooks.com/articles/archives/2013/dec/05/glimmers-hope-guatemala/.

Lécuyer, Christophe. 2010. *Makers of the Microchip: A Documentary History of Fairchild Semiconductor.* Cambridge, Mass.: MIT Press.

Livingston, Steven. 2011. *Africa's Evolving Infosystems: A Pathway to Stability and Development.* Washington, DC: National Defense University Press.

Meier, Patrick. 2014. "Crisis Mapping in Areas of Limited Statehood" in Steven Livingston and Gregor Walter-Drop (eds), *Bits and Atoms: Information and Communication Technology in Areas of Limited Statehood.* New York: Oxford University Press.

Nussbaum, Martha C. 2011. *Creating Capabilities: The Human Development Approach.* Cambridge, Mass.: Belknap Press of Harvard University Press.

Odinkalu, Chidi A. 2010. *Criminal Force: Torture, Abuse, and Extrajudicial Killings by the Nigerian Police Force.* New York: Open Society Institute.

Odula, Tom. 2007. "Arrest Reported in Kenya Mungiki Beheading Spree." *Guardian*, August 22.

Pentland, Alex. 2014. *Social Physics: How Good Ideas Spread: The Lessons from a New Science.* New York: Penguin Press.

Private Security Industry Regulatory Authority of South Africa. 2012. "2012 Annual Report (20)." Online, accessed May 22, 2014, available at: www.psira.co.za/psira/dmdocuments/annual_report/Annual_Report_20112012.pdf.

Risse, Thomas, Stephen C. Ropp and Kathryn Sikkink. 1999. *The Power of Human Rights: International Norms and Domestic Change.* New York: Cambridge University Press.

Robbins, Robert J., David Benton and Jay Snoddy. 1995. "Informatics and the Human Genome Project." *IEEE Engineering in Medicine and Biology*, 14 (6): 694–701.

Sen, Amartya K. 1999a. "Democracy as a Universal Value." *Journal of Democracy*, 10 (3): 3–17.

Sen, Amartya K. 1999b. *Development as Freedom.* New York: Anchor Books.

Shirky, Clay. 2008. *Here Comes Everybody: The Power of Organizing without Organizations.* New York: Penguin Press.

Suarez, Pablo. 2013. "The bloody truth: Forensics rebuilding identities." *Buenos Aires Herald*, September 19. Online, accessed May 22, 2014, available at: http://buenosairesherald.com/article/140945/the-bloody-truth-forensics-rebuilding-identities.

Totolo, Edoardo. 2009. "Kenya: vigilantes unleashed." The International Relations and Security Network, June 2. Online, accessed May 22, 2014, available at: www.isn.ethz.ch/Digital-Library/Articles/Detail/?lng=en&id=100755.

Wagner, Sarah E. 2008. *To Know Where He Lies: DNA Technology and the Search for Srebrenica's Missing.* Berkeley: University of California Press.

Waki, Philip N. 2008. "Report of the Commission of Inquiry into Post Election Violence." Nairobi, Kenya: Government Printer.