Journal of the American Planning Association

ISSN: 0194-4363 (Print) 1939-0130 (Online) Journal homepage: http://www.tandfonline.com/loi/rjpa20

09 F9 11 02 9D 74 E3 5B D8 41 56 C5 63 56 88 C0: Four Reasons Why AICP Needs an Open Data Ethic

Lisa A. Schweitzer & Nader Afzalan

To cite this article: Lisa A. Schweitzer & Nader Afzalan (2017) 09 F9 11 02 9D 74 E3 5B D8 41 56 C5 63 56 88 C0: Four Reasons Why AICP Needs an Open Data Ethic, Journal of the American Planning Association, 83:2, 161-167, DOI: 10.1080/01944363.2017.1290495

To link to this article: http://dx.doi.org/10.1080/01944363.2017.1290495

09 F9 11 02 9D 74 E3 5B D8 41 56 C5 63 56 88 C0

Four Reasons Why AICP Needs an Open Data Ethic

Lisa A. Schweitzer and Nader Afzalan

Problem, research strategy, and findings: Computing and digital technologies have changed how data are created, analyzed, and communicated. The American Institute of Certified Planners (AICP) Code of Ethics has no guidelines for planners working with emerging urban informatics. Here we make a theoretical argument based on the premise of epistemic justice: The idea that how planners collect, manage, disseminate, and use data all bear on justice in democratic decision making about cities. Four reasons exist for planners to prioritize open data in our formal code of ethics. First, emerging Big Data from urban informatics have a steep learning curve that potentially exacerbates the gaps in power and political voice between experts and nonexperts. Second, algorithms have come to govern an increasing portion of human life and cities, and planners should ideally be enabling residents in their ability to scrutinize, understand, and challenge managerial algorithms that have become prevalent in e-government. Third, urban informatics potentially alter the economic and community development of cities and the urban experience. Fourth and finally, ubiquitous data sensing, new consumer tracking capabilities, obscure and readily skipped terms of use agreements, and rapidly changing technologies make cities into potentially coercive data collection environments. **Takeaway for practice**: Substantial barriers exist to open data ethics in an information economy where exclusive access to data can drive profits. Emerging data systems can consolidate power in the hands of experts and large private firms to the exclusion of citizens and small, independent firms. Open data and code vitiates those problems to a limited degree, and AICP could benefit practitioners by adopting an open data ethic.

In this article, we examine how technological changes have altered information about cities and planning, and how those changes create new ethical challenges for planners. Urban informatics, as we use that term throughout, describes a) the data captured as a result of new urban sensing technologies and the b) the subsequent construction of interfaces, information architecture, and interlinked systems that create new data about cities and, more recently, about people in cities.

This article is a plea, of sorts, for planners to develop and include formal principles regarding urban informatics and their use in the profession. The current American Institute of Certified Planners (AICP) Code of Ethics contains two substantive mentions about information management. The first occurs in the section regarding the profession's obligations to the public (1d):

> We shall not deliberately or with reckless indifference fail to provide adequate, timely, clear and accurate information on planning issues.

The second mention of information management concerns longstanding strictures against disclosing confidential information, principles shared broadly across all the professions, from health to education, that use information about individuals and institutions:

> We shall not use to our personal advantage, nor that of a subsequent client or employer, information gained in a professional relationship that the client or employer has requested be held inviolate or that we should

Keywords: planning ethics, urban computing, information technology, epistemic justice, Big Data, informatics

About the authors: Lisa A. Schweitzer (lschweit@usc.edu) is an associate professor at the Price School of Public Policy at the University of Southern California. She specializes in urban studies, particularly analyses of social justice, environment, and transport. She maintains a blog about cities and urban theory at www.lisaschweitzer.com. **Nader Afzalan** (nader_afzalan@redlands.edu) is a visiting assistant professor of urban planning and geodesign at the University of Redlands and the chair of the American Planning Association–Technology Division. His research focuses on the potentials and challenges of using communication technologies and data sources in guiding land use and environmental planning.

Journal of the American Planning Association,
Vol. 83, No. 2, Spring 2017
DOI: 10.1080/01944363.2017.1290495

> recognize as confidential because its disclosure could result in embarrassment or other detriment to the client or employer. Nor shall we disclose such confidential information except when (1) required by process of law, or (2) required to prevent a clear violation of law, or (3) required to prevent a substantial injury to the public. Disclosure pursuant to (2) and (3) shall not be made until after we have verified the facts and issues involved and, when practicable, exhausted efforts to obtain reconsideration of the matter and have sought separate opinions on the issue from other qualified professionals employed by our client or employer.

Planners have debated the role of expertise and information creation in planning over the last 50 years, even as different technologies have changed what information is available, how it is supplied, and its role in cities and human life. Planners have yet to respond in a systematic way to the questions these changes bring for practice. That unwillingness to think about information systems should change; the windows of opportunity that planners have to influence urban informatics are closing due to the speed at which commercial applications have forged ahead (Townsend, 2013).

We believe that the best practices encourage open data, even in the face of the increasing potential for privatization of data collection, management, and analysis in planning. The movement to open data seeks to establish democratic access to information through full public access, open source or code-sharing requirements, proper metadata[1] and citations, and full-disclosure data-sharing reporting. In the United States, much of the open data discussion centers predominantly on governmental agencies. Young (2017) inventoried cities greater than 100,000 in population and finds that that 87 U.S. cities currently have open data policies. His analysis of these cities and their open data policies reveals, however, that open data implementation is uneven across municipal agencies and different departments even in cities, like Portland (OR) and San Francisco (CA), with well-established open data policies and highly skilled practitioners.

There are four reasons why planners should adopt open data as an ethic.

1) Big Data have changed what information is. At the same time, digital technologies have changed what communications can be. Planning thought in recent decades has centered, increasingly, on information and epistemic justice. Epistemic justice argues that how groups and institutions formulate knowledge and information has primary effects on justice. How professions define what a problem is, what factors might influence the problem, and who might be responsible for addressing problems all are functions of information, and all have consequences for justice, however one might define the term (Anderson, 2012; Fricker, 2007). Planners have, for example, sought collaborative methods for knowledge creation, as well as methods for enabling community members to collect data for themselves (Corburn, 2002; Lewis et al., 2010). Planners and researchers in these instances work with community members to collect and analyze data. Residents contribute directly by framing the questions and then collecting the data, for example by wearing pollutant sensors or conducting street amenity inventories.

The current AICP Code holds that planners themselves convey data and have an obligation to do so, but the code also suggests that the obligation exists only when planners are solicited for the information. In a context where much data sharing occurs via digitally mediated communications, the planner's role as a "provider" of information can entail different actions, all of which have consequences for those who want information about their communities (Afzalan & Muller, 2014).

One possibility is to make raw data available for download or live stream in raw formats. Raw data are fine, or even optimal, for people with data management skills. Data users with advanced skills often neither need nor want anybody mucking with the data before they get to it. Millions of data points or hours of unwieldy video data, however, affect openness and accountability in urban informatics. Both require people to have significant processing and coding capacity to use the available data. For all practical purposes—we will use that phrase quite a bit in this article—the gap between experts and nonexperts grows with data size. Supplying only raw data in these instances is the equivalent of having a conversation in another language: Doing so is exclusionary. Information about the data itself requires expertise as well. Raw data from sensors or from social media and online sources can be both poor in quality and misleading, but only those who know what to look for are aware of the problems, let alone how to remedy them so that the data are usable.

The planning profession has long debated what role information and expertise have in defining professionals and their activities, but new urban data take the problem to another level. Most survey files require spreadsheet knowledge, for example, or in some instances, relational data software management capabilities. Emerging Big Data require programming or computational skills to do much of anything useful, and the learning curves are steep. Big Data likely require curation for nonexperts—that is selecting, crafting, winnowing, and presenting information—to get information from the data. Each of those actions

inherent in curating data changes the possibilities for what individuals who see the curated data can do with them (Boyd & Crawford, 2012). Thus, curating data poses some potential ethical conundrums for professions, like planning, committed to providing information broadly and democratically.

Overly curated data presentation, however, such as when individuals are allowed to view only one data record at a time through pull-down menus, does little to enable users to place data in context or allow them to compare different aspects of the data. Web access that allows individuals to look up, for example, the pollutant levels or nearby polluters one record at a time is easy to use, but does not allow people to compare their location with others or any conduct any real analysis.

Rolling out raw data on the one hand, or overly restrictive data querying, even if done to open access, are two extremes that can marginalize users with less technical skill. Determining what a principled compromise might look like has so far been elusive for open data websites.

Arguing that planners should curate Big Data to make it useful to various stakeholders provides little guidance on *how* to do so. We do not have answers here: The problems are new, and the questions surrounding how to curate Big Data strike us as an important area for research in planning and urban studies. A framework of epistemic justice, however, might be a fruitful place to start, granted how planning theory and community-based research have already developed and explored the ethics there. Another potentially complementary set of ideas come from the data–information–knowledge–wisdom (DIKW) hierarchy proposed by Ackoff (1989) and related discussions in information science, epistemology, and ethics among more recent writers (Bates, Lin, & Goodale, 2016; Floridi, 2003; Herold, 2004; Nam, 2014; Rowley, 2007). The details of this framework are a bit beyond the scope of this article, but in summary, the hierarchy attempts to pin down the relationship between data, what those data mean, and how people use data to construct meanings and make decisions. Planners in the 21st century sit in the position of using practical, experiential knowledge of cities—the perceptions, visions, and ideas from those who live in neighborhoods—with Big Data derived from sensors and crowdsourcing. That prospect is exciting, but it also entails a shift in what it might mean for planners to supply information as required in the AICP Code.

2) Urban informatics may extend and potentially entrench governance by algorithm. Big Data and urban informatics change what we might know about the city, but they also change what we might predict about the future. One of the key promises of urban informatics concerns predictive applications. Commercial applications for urban informatics are moving so quickly that evaluating the specific changes risks being spectacularly wrong. Some general things are safe to say nonetheless. The potential upsides of informatics are well known. New data, new information systems, new possibilities for coproducing information with everyday mobile device users can make more efficient use of existing infrastructure or buildings. These applications can facilitate, for example, ride- and homesharing, or forestall congestion around parking or other services. Potential applications also might detect and resolve problems much faster than ever before, such as predicting crash locations and times. New, more comprehensive urban data promise to allow better research and analysis, even if data scientists never manage to achieve the "science of the city" they seem to long for. Many excellent examples of "smart city" solutions already enhance urban services and public works. Madrid's (Spain) use of smart traffic management and lighting is one good example, and others such as smart parking applications are up and running.

Many potential e-government activities differ significantly from the quotidian tasks associated with public works maintenance requests. Some new algorithms portend major changes in how governments will run, how their resources will be deployed, and even how people will interact with public servants. Perhaps the most highly publicized application for Big Data has been predictive policing—using data mining and network analysis to establish when and where future crimes are likely to occur—to allocate police personnel spatially. Predictive policing, which indicates likely crime locations, nicely illustrates an important conflict for planners as they try to work collaboratively with communities harmed by mass incarceration and overpolicing. These problems already make planning a challenge for these communities, and it may only worsen in an environment where algorithms potentially bring more policing rather than less, with little citizen oversight or recourse. There are also privacy and human rights concerns, since using past data or general analysis to set surveillance and policing actions can undermine rights to due process that limit police discretion.

Deliberation about whether these algorithms yield desirable outcomes or contain unacceptable biases, however, can only really happen to the degree that people are aware of how data are collected and the algorithms formulated (Kitchin, 2016). Even if people are aware, those without technical expertise or access to the code may not be able to question, critique, and challenge the algorithms that influence their lives. Policing is only the most high-profile example; predictions of how neighborhoods or

mobility patterns are going to change because of Big Data analysis will affect decisions about investing in neighborhoods. To the degree that algorithms based on urban informatics promise cost reductions for both public and private service providers, algorithms will continue to expand into more decision making and service delivery (Grindrod, 2016). It is unacceptable that the data and code driving governance decisions be unavailable for broad-based scrutiny and auditing when they are used to determine urban service delivery. Planners should be among those advocating for disclosure and open data analytics as they now advocate for the longstanding ethical premise that proposed land use changes be disclosed in a timely fashion.

3) Urban informatics change the urban experience for both individuals and firms sufficiently that planners and local communities have a legitimate stake in how urban informatics become implemented and used. Striking the right tone with discussions on ubiquitous, automated data collection becomes difficult in the aftermath of Edward Snowden's whistleblowing about National Security Administration surveillance and data collection in 2013. Exhibit too much skepticism about data collection, and one can sound like a likely candidate for a tinfoil hat. Too much breathless enthusiasm makes one a naive technophile. Black-and-white thinking about new technology and markets tends to obscure the issues in implementation and governance, and a focus on ethics can help find ways to implement technology and information systems so they prove both useful and morally acceptable.

A first concern is simply that proprietary urban informatics can prompt potentially anticompetitive behavior. This anticompetitive behavior can have major effects on planning for mobility, economic development, community development, and sustainability. Townsend (2013) argues that smart city systems should be publicly owned and governed through open access policies for multiple good reasons, including the ability to avoid local monopolies on data collection and analysis. Local economic and community development has a strong interest in bringing new firms and new labor into places. Privately controlled data and information systems can create barriers to new firms and, importantly, hamstring independent developers that can make the data from urban informatics more useful. Think about it this way: Just as local business elites can use local use controls or environmental regulation to disadvantage new competition, private data collection and systems can also create the same opportunities for business collusion.

This is not a diatribe about sinister capitalism and how government and planners must save the day, but rather a concern about the place-development consequences that result from new urban systems driven by the tech sector with its well-known, well-established patterns of anticompetitive and predatory behavior. Some form of open access to data and cybernetic systems enables free local entry to urban informatics, but businesses themselves may have little reason or ability to ensure that open access. The result can be lower-quality services and potentially stagnant innovation. These effects need not be intentionally anticompetitive or biased to be harmful. Yelp is a good example. Yelp aggregates user-supplied reviews for businesses that future customers can look up to see if they wish to patronize the business. Yelp users, though, have in some instances been highly negative and biased toward minority-owned businesses based on cultural markers rather than just service quality: Nasty comments about missing dogs and cats in reviews of Vietnamese restaurants exemplify this issue. Businesses tend to co-locate spatially, and as a result, Yelp has the potential to further isolate and stigmatize minority-owned businesses depending on how much influence Yelp reviews have on users. Yelp can do the opposite by enabling loyal patrons of those businesses to confront biased reviews. Planners vested in local business development have a stake in which directions these reviews go, and in Yelp corporate policy governing rules about what reviews users see.

Another version of this problem is already evident, with consequences for individuals in cities and the urban experience. Should cities offer free WiFi (wireless Internet) or cede the practice entirely to commercial vendors? The decision to offer free WiFi or not can advantage some types of firms and disadvantage others. Requiring payment for access may be profitable for the service provider, but it is likely costly to the urban businesses that benefit from individuals who use mobile computing to make reservations on the go or linger working while having coffee or a snack.

Cities, moreover, that offer decent-quality, free WiFi services attract people who dwell in public spaces to use the technology for myriad reasons, potentially creating both positive and negative spillovers for businesses. Cities can also lessen barriers to access among their low-income residents. In contrast, cities that allow themselves to become fragmented mosaics of paid-service WiFi services subject residents and users to one annoying patch of signal-grabbing commercial vendors after another. Just about every type of urban informatics or sensor tech has similar potential spatial effects on the quality of urban experience.

In recent years, the effects of new urban data systems have become more apparent with services such as Uber and Lyft, Airbnb, Postmates, or Waze, among many others, that alter the established spatial relationships and urban

experience. Urban informatics may be less visible than streets, design, amenities, and other things for which planners set standards, but they have no less impact.

4) Data collection and sharing from mobile phone apps and sensors alters consent to collect data, which, in turn, muddies the waters about what constitutes fair use of data for urban analyses. The urban landscape is physically changing rapidly due to decisions made by private property owners and new technologies, some of which emerged for distinct purposes coming together in powerful new ways (Viitanen & Kingston, 2014). These changes erode the control individuals have over data collected about themselves.

Location data tracking, for instance, has been around for some time now, and many people are used to it. Even so, 2016 was a banner year for new location data tracking systems and data in what advertisers refer to as "proximity marketing." Unacast (2016), a proximity sensor data firm, reports that the number of location data devices—mainly beacons that communicate with mobile devices to track movements through physical space—nearly doubled worldwide from just over 6 million to just under 12 million in one year. Restaurants and retail establishments are the most avid users of beacons, but other, potential high-payoff locations include airports and stadia, which are retail environments in addition to their primary uses. The purpose is to market proximity by alerting consumers to nearby firms; text alerts might advertise a sale ("It's Happy Hour at CJ's, just around the next corner!") or put select businesses that pay a fee to appear at the top of the list when a smartphone user searches for "places to eat" using a mobile app.

Tracking customer demand through space is easy enough to do if consumers assent to data collection with phone apps and those data collectors come to data-sharing or third-party sale agreements with other firms who then aggregate the data by consumer identification. Parallel breakthroughs in consumer identification technologies and data-sharing agreements, such as Adobe's Cross-Device Cooperative, mean that location tracking and personal data for individuals across devices will be feasible in a matter of time, depending on how U.S. regulatory agencies rule on data sharing.

Location sensing and individual ID tracking technology, if combined with practices that make the data proprietary to businesses that aggregate the data, erode the notion that individuals own and control information about themselves (Dodge & Kitchin, 2007). None of the prior traditions in information ethics helps clarify the future for urban informatics with sensor capture and data sharing. Prior traditions, reflected most strongly perhaps in health informatics, stress several points that sensing data tend to confound, such as privacy and consent in the collection, access, storage, and use of data collected about them during their time engaged with a health services provider. The protocols for data use and privacy tend to be well understood among individuals consuming health services because they have to sign disclosure agreements each time the data are released or used.

Emerging urban informatics do not have similar controls. The mechanisms for consent to release information collected from sidewalk or business video or from sensor technologies are far less transparent. Data are broadly collected, usually with some combination of beacon technology and mobile applications. Companies are required to gain consent from app users: Just about anybody who has used a smartphone app has scrolled through the legalese to agree to the app's terms of use. Virtually nobody reads them, and if somebody should read them, much of the language is hard to understand. Whether this practice truly indicates consent to have one's data collected and shared is debatable.

Several rationales have emerged that attempt to argue that individuals do consent, for all practical purposes, even if they do not really read or understand the terms of use. The first is that beliefs about privacy and information have shifted culturally so that privacy and control over your own information no longer means what it has to prior generations. An industry privacy officer was recently quoted as saying that consumers have become "way more comfortable with location data being used" but that "consumers remain largely unaware of it" (Kaye, 2016). It is hard to accept the validity of the former, granted the latter.

In addition, cultural rationales for what people are used to fail to account for how much technologies change invisibly. Video cameras, when first introduced decades ago, produced unwieldy files difficult to store, process, or analyze. Now, facial recognition algorithms are advanced, video processing is much faster, and storage is much cheaper. The public face of the technology and data collection remained the same, but the backend capabilities as a means to track individuals has changed significantly and will continue to do so.

A third rationale is that firms collecting these data create a sufficient quid pro quo with those who agree to the terms of use that require data collection and sharing. Fitness tracking apps or devices, for example, enable users to track their habits in useful ways in return for reporting that information to the company who then aggregates and uses the information. For individual apps, these ad hoc arrangements make sense and might reasonably proxy for consent.

Urban informatics that use location tracking, however, muddy consent. Smartphone location tracking, ostensibly

optional to the degree that owners may turn off that function, means that to remain outside of data collection, owners/users forgo many of the device's most useful functions such as wayfinding and local searches. Beacons combined with apps, sensors, and innovations in video processing complete a nearly ubiquitous data collection environment where voluntary consent to data collection becomes difficult to achieve.

What does any of this privacy and consent material have to do with planning ethics? First off, planners are engaged with new tech firms in the development of smartphone apps and urban sensor technology so that they are directly involved with the collecting, use, and sharing of these data. Planners work in real estate firms that collect and aggregate data using both smartphones and sensors. Planners also work in consulting firms seeking to develop new data, analysis, and visualization products using urban informatics. Cities, too, also have apps for things such as mobility and parking services that can readily collect data on users that potentially make new revenue sources for agencies.

Ubiquitous data capture in contemporary cities means that entities that collect a) can collect data on members of the public who, for all practical purposes, can hardly consent since avoiding or opting out proves harder than just giving in; b) use those data to further their own private or agency interests; and then c) potentially sit in the position of selling that data, aggregated, either back to representative government agencies or to individual citizens. Capitalism is indeed remarkable for its capability to extract value. The problem is not that people or firms will make money. The problem is whether the urban informatics effectively coerce data collection and exclude people from the benefit of their own data, whether planners and those in allied fields can ethically use those data and what for, and whether communicating about privacy and data sharing might improve so that we could be confident that assent to the terms of use truly equals informed consent. All of these suggest the need for new standards and oversight to guide the ethical development and use of urban informatics systems.

Our Recommendation

We offer here four reasons why planning ethics have to examine and incorporate open data ethics into the AICP Code. First, emerging Big Data from urban informatics have a steep learning curve that potentially exacerbates the gaps in power and political voice between experts and nonexperts. Curating these data so that they are both fully useful and comprehensible to nonspecialists poses a new communicative responsibility for planners.

Second, algorithms have come to govern an increasing portion of human life and cities. These have consequences for distributive justice in cities because they affect the allocation of urban services and development. Planners ideally should be enabling residents in their ability to scrutinize, understand, and challenge managerial algorithms that have become prevalent in e-government.

Third, urban informatics, though invisible, potentially alter the economic and community economic development environment of cities and the urban experience for individuals within cities just as much as urban design does, so that local citizens have a stake in how urban informatics develop.

Fourth and finally, ubiquitous data sensing, new consumer tracking capabilities, obscure and readily skipped terms of use agreements, and rapidly changing technologies make cities into potentially coercive data collection environments. Whether cities and planners can ethically buy, sell, or use data collected and shared from the emerging web of privately owned sensors and mobile applications remains unclear.

Much about urban informatics remains uncertain at this point so that overly prescriptive ethics are probably counterproductive. This is a subject area where those in the APA's Technology Division could provide guidance and leadership as technologies evolve in future years. It is still possible nonetheless to craft an ethos centered on open practices that stress citizen access and inclusion. The AICP Code should explicitly take a position in favor of open data as a planning responsibility, in addition to simply expressing the idea that planners should provide good-quality information. We suggest language for the code:

> Planners shall foster open data using best available practices among public agencies, subcontractors, or private entities using citizen-recording technology to maximize data accessibility for all. We shall ensure the accuracy and quality of the information we share by disclosing and providing data sources, coding, and documentation.

Notes

The numbers in the title of this article serve as a nice illustration for many of the themes we develop in this essay, as they are encryption codes that have come to symbolize an "internet riot" over the control of code exerted among corporate entities. It also shows how information retrieval is hardly objective. Do a search for the numbers using Google to see what you find; it is fair to say the results are spotty and unhelpful. Then do a search for the numbers using Bing: The results are quite different and more useful. The reason is that Google complied with demands from the Motion Picture Association of America and the Advanced Access Content System Licensing Administrator, LLC (AACS LA), not to enable searches regarding the access key. The dispute

between Internet activists and AACS ultimately comes down to control over who is allowed to control software and firmware that read DVD content; encryption foils illegal duplication of content, but it also essentially privileges specific developers and companies and suppresses competition from independent developers.

1. Metadata refer to information attached to data that details information about the size, context, creators, or provenance of that data.

References

Ackoff, R. L. (1989). From data to wisdom, *Journal of Applied Systems Analysis*, *16*(1), 3–9.

Afzalan, N., & Muller, B. (2014). The role of social media in green infrastructure planning: A case study of neighborhood participation in park siting. *Journal of Urban Technology, 21*(3), 67–83.

Anderson, E. (2012). Epistemic justice as a virtue of social institutions. *Social Epistemology*, *26*(2), 163–173. doi:10.1080/02691728.2011.652211

Bates, J., Lin, Y.-W., & Goodale, P. (2016). Data journeys: Capturing the socio-material constitution of data objects and flows. *Big Data & Society*, *3*(2), 2053951716654502. doi:10.1177/2053951716654502

Boyd, D., & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, Communication & Society*, *15*(5), 662–679. doi:10.1080/1369118X.2012.678878

Corburn, J. (2002). Combining community-based research and local knowledge to confront asthma and subsistence-fishing hazards in Greenpoint/Williamsburg, Brooklyn, New York. *Environmental Health Perspectives*, *110*(Suppl. 2):241–248. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241169/

Dodge, M., & Kitchin, R. (2007). "Outlines of a world coming into existence": Pervasive computing and the ethics of forgetting. *Environment and Planning B: Planning and Design*, *34*(3), 431–445. doi:10.1068/b32041t

Floridi. L. (2003). Two approaches to the philosophy of information. *Minds and Machines*, *13*(4), 459–469. doi:10.1023/A:1026241332041

Fricker, M. (2007). *Epistemic injustice: Power and the ethics of knowing*. Oxford, UK: Oxford University Press.

Grindrod, P. (2016). Beyond privacy and exposure: Ethical issues within citizen-facing analytics. *Philosophical Transactions A: Mathematics, Physics, Engineering, Science*, *374*(2083). doi:10.1098/rsta.2016.0132

Herold, K. (2004). The philosophy of information: Introduction. *Library Trends*, *52*(3) 373–376. http://hdl.handle.net/2142/1632

Kaye, K. (2016, December 28). The top three data trends of 2016. *Advertising Age*. Retrieved from http://adage.com/article/digital/top-data-trends-2016/307304/

Kitchin, R. (2016). The ethics of smart cities and urban science. *Philosophical Transactions A: Mathematics, Physics, Engineering, Science*, *374*(2083). doi:10.1098/rsta.2016.0115

Lewis, L. B., Galloway-Gilliam, L., Flynn, G., Nomachi, J., Keener, L. C., & Sloane, D. C. (2011). Transforming the urban food desert from the grassroots up: A model for community change. *Family & Community Health*, *34*(Suppl. 1), S92–S101. doi:10.1097/FCH.0b013e318202a87f

Nam, T. (2014). Challenges and concerns of open government. *Social Science Computer Review*, *33*(5), 556–570. doi:10.1177/0894439314560848

Rowley, J. (2007). The wisdom hierarchy: Representations of the DIKW hierarchy. *Journal of Information Science*, *33*(2), 163–180. doi:10.1177/0165551506070706

Townsend, A. M. (2013). *Smart cities: Big data, civic hackers, and the quest for a new utopia*. New York, NY: W. W. Norton.

Unacast. (2016). *The proximity market in retail*. Retrieved from https://unacast.s3.amazonaws.com/Proximity_Marketing_in_Retail_-_Proxbook_Report.pdf

Viitanen, J., & Kingston, R. (2014). Smart cities and green growth: Outsourcing democratic and environmental resilience to the global technology sector. *Environment and Planning A*, *46*(4), 803–819. doi:10.1068/a46242

Young, M. M. (2017). *The medium is the message: The impact of technological innovation in municipal coproduction systems* (Unpublished doctoral dissertation). University of Southern California, Los Angeles.