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ABSTRACT

We identify and examine the assumption of information determinism that is commonplace in policy arenas: that mere access to the "right information" will precipitate desired actions. Our analysis focuses on implications of information determinism in three cases: California disaster response plans in the 1980s, an Indian development project in the 1990s, and an education project directed at the Global South in the 2000s. Our analyses shows that planning based on information deterministic assumptions tends to overlook the sociomaterial circumstances of information production and circulation, including how social structures and materiality shape information in practice. Further, they imbue what we call "information" with the agency to bring about change. While we do not deny that "information" can be useful, we argue that policy needs to move away from information deterministic thinking and its singular focus on information access to address the needs of marginalized and vulnerable populations.

Information empowers and information frees people at all levels of society, regardless of their gender, their level of education, or their status, to make rational decisions and to improve the quality of their lives.[1]

We examine the problematic assumptions and implications of "information deterministic" policies. By "information determinism," we refer to the notion that "information" by itself, and in the abstract, can bring about social change—believing that access to such "information" will automatically lead to predictable (usually positive) outcomes. In this view, the practices and conditions before and after access are relatively unimportant.

We present three case studies derived from larger research projects that spotlight information determinism: California disaster response plans in the 1980s, an Indian development project in the 1990s, and an education project directed at the Global South in the 2000s. These cases illustrate why policies underpinned by information determinist assumptions are problematic: "Information" rarely brings about the transformations that people believe it will. Moreover, information determinism obscures on two levels. One, it hampers a nuanced understanding by lumping together different kinds of resources, expectations, and ideologies as "information." Two, it deters an examination of how "information" is actually leveraged in practice.

Information determinism imagines a future where certain kinds of policy solutions flow naturally from access to "information." It extends the idea of technological determinism (e.g., Heilbroner 1967; Joerges 1999). Information determinism, however, deserves separate examination because it is much more illusive for two reasons. One, "information" itself is perceived to be immaterial (Blanchette 2011; Duguid 1996). Two, the material basis for giving it form and its circulation can greatly vary.

Information deterministic policies locate the value of "information" in itself, rather than in the socio-material relations within which it circulates (Brown and Duguid 2000; Duguid 1996; Srinivasan 2011; Williams 1973). The materiality of "information," which is essential for its circulation, is often elided. In the process, information determinism obscures the sociopolitical contexts that shape "information" and also the information practices of people living in them. Leveraging earlier debates on technological determinism and sociomateriality (e.g., Gillespie et al. 2014; Gitelman 2013; Orlikowski 2007; Orlikowski and Scott 2008; Østerlund 2008; Leonardi and Barley 2008; Leonardi, Nardi, and Kallinikos 2012; Leonardi 2013), we argue that claims about what information can "do" on its own ignore three fundamental factors that shape information production and circulation: social structure, human agency, and materiality.

We now turn our attention to our cases, investigating the information deterministic underpinnings of each and showing how the information practices envisioned in

policy differed from reality. To illustrate the wide reach of information determinism, we examine cases from three domains of activity—disaster management, development, and education—and over three decades. We trace the elisions in structure, agency, and materiality in each of the cases. In the first case, we analyze how information was imagined in California disaster response plans in the 1980s. We find that the policymakers assumed information flows without paying attention to the work involved in translating a disaster into "information." This also assumed that the public would automatically act in predetermined or at least predictable ways on government-issued "public information." In the second case, we examine how information was linked to the goals of an Indian development project in the 1990s. We discover that the project's conception of information creation, provision, and use was divorced from the realities of existing political structures. In the third case, we examine the preoccupation of the One Laptop per Child (OLPC) project's leadership and developers with the "view source" button on their laptops, which made visible the source code of the program running on the computer. They believed that access to this technical "information" would prompt the disadvantaged children in developing countries to learn programming. We discover that "information" is not a substitute for either pedagogy or students' agency.

The rest of the article proceeds as follows. We first discuss the three cases. Thereafter we discuss how information determinism obscures our understanding of the information practices on the ground. Lastly, we offer our concluding thoughts.

Materiality of information in disaster response planning: The 1989 Loma Prieta, California, earthquake

The 1989 Loma Prieta earthquake was northern California's last major earthquake, measuring 6.9 on the Richter scale with an epicenter approximately 60 miles south of San Francisco. It is estimated to have caused $10 billion in damage and the loss of 63 lives—the costliest natural disaster in U.S. history at that point in time (Page, Stauffer, and Hendley 1999).

As we describe next, earthquake response plans rested on three assumptions about "information": The state would somehow have the information it needed, the government would inform the public about what had happened and what to do next, and the media would automatically transmit this "public information" to the public. In all the planning, "public information" was imagined to possess agency that transforms behavior. While there was much discussion of information

circulation, we found that little consideration was given to how it would be made into a material entity that could be shared. Additionally, we found that contrary to the disaster plans' assumption that information would flow from the government to the people, people learned about the earthquake as they experienced it, from friends and colleagues, and from the media—and so did the state.

At the time of the Loma Prieta earthquake, the disaster response plans included the "Federal Response to a Catastrophic Earthquake" (FEMA 1987) at the national level (which had "limited activation" after the earthquake); the State Emergency Plan and the Multi-hazard Functional Planning Guidance, which was meant for both state and local disaster plans, at the state level; and plans for cities and counties at the local level. The federal response plan had a different approach to the creation of information than the other plans. But we focus here on the local and state plans because postearthquake reports indicated that the immediate response to the earthquake was primarily handled locally (State/Federal Hazard Mitigation Survey Team 1990).

According to California's Multi-hazard Functional Planning Guidance, a network of public information officers (PIOs) at local and regional organizations throughout the state would gather "the information" after a disaster (Office of Emergency Services [OES] 1985, 155). Additionally, "the Jurisdiction Emergency Public Information (EPI) Organization" would "prescribe procedures for … dissemination of accurate instructions and information to the public" (OES 1985, 153). At the city level, the San Francisco Multi-hazard Functional Plan explained Emergency Public Information as "Information disseminated to the public by official sources during an emergency, using broadcast and print media … include[ing]: (1) Lifesaving/Health Preservation Instructions … (2) Emergency Status Information … and (3) Other Useful Information" (City and County of San Francisco 1988, 313–315). The media were characterized as the "means of providing information and instructions to the public, including radio, television, and newspapers" (City and County of San Francisco 1988, 82). In other words, the state and regional government officials would gather "information" about a disaster from local government officials and tell the media what had happened and thereafter the media would relay these details to the public. "Public information" was imagined to spur a particular response, a predictable outcome.

This model of "public information" resembles Shannon and Weaver's 1948 model of information transmission: It casts the public in the role of receiver, the government as the authorized purveyor of the official message, and the media as the willing and transparent transmitters of the government's take of the situation.

"Information" here is treated as something that public information officers could unproblematically pluck out of the world and send to people at the state level. The model assumes that the public would act on "public information" from the government. But notably, it sees neither the public nor the media as active participants in the production of information (except as rumor generators). As we show in the following, this vision for "public information" did not correspond with what actually happened after the Loma Prieta earthquake.

The plans did not take into account that television, radio, and newspaper companies themselves might suffer damage from the earthquake and have difficulty in continuing their operations (Rapaport 1998). The plans were also not realistic about who might be most adversely affected. There were many non-English speakers in the area. Furthermore, non-English speakers were often elderly or with few resources and the most in need of assistance. The effect of the earthquake was particularly severe for the Latino community in Watsonville. While government plans articulated the need for the dissemination of translations of public information in languages such as Spanish (e.g., OES 1985, 162, attachment A-6), this did not happen, leaving some of the most vulnerable communities out of the loop and reliant on the non-English-speaking media and civil society organizations for translations (Tran and Conkin 1989; Conkin and Colm 1989; Ng 1989a; Ng 1989c; Subervi-Vélez et al. 1992). The Spanish-language media provided translations of initial releases of public information and information about where to get help to those who primarily spoke Spanish (Subervi-Vélez et al. 1992). Local newspapers, television, and community groups provided translation of earthquake safety instructions in Lao, Vietnamese, Khmer, and Chinese (Tenderloin Times 1989; Ng 1989b; Wong 1989). In effect, the disaster response public information infrastructure did not accommodate non-English speakers in information gathering at the time of the earthquake or adequately inform them of the shelter and recovery services subsequently made available.

Professional responders had difficulty gaining a broad understanding of the damage after the earthquake in spite of the plans designed to facilitate it (National Research Council 1994). At the local level, public information officers and other professional responders got tied up with immediate needs of earthquake victims—not on producing information to pass on to other officials (Comfort 1999). This effectively made it impossible to enact the government's plan, which was based upon these individuals collecting "information" that would then be circulated. Public information officers at the state level, who were supposed to provide "public information," not having the

reports they expected from officials in affected municipalities, relied on the media to get a sense of what happened. Because the state was using the media, and the media sought out the disaster responders as official sources and cited them frequently (Smith 1992; Subervi-Vélez et al. 1992), the state and media reinforced each other's role as providers on information on the earthquake.

Finally, the plans did not anticipate that the media might follow their own interest and focus on the most damaged and spectacular damage in San Francisco, the broken Bay Bridge, and the freeway collapse in Oakland that killed 43 (Smith 1992; University of California Graduate School of Journalism 1989; State/Federal Hazard Mitigation Survey Team 1990; Rogers et al. 1990). The cities of Santa Cruz and Watsonville were the closest to the earthquake epicenter and had suffered severe damage, but lacked the popular allure of San Francisco in news and were initially ignored by the national news media. Instead of the government determining what information the media transmitted, the government's response was shaped by the media's focus on San Francisco in particular. Officials got initial reports from television, not from the network of public information officers, whose constraints were described earlier (National Research Council 1994; Tierney 1992; Maloney 1989; State/Federal Hazard Mitigation Survey Team 1990). As a result of the focus on San Francisco, officials in several nearby areas who were also hard hit concluded that they were "on their own" after the earthquake (California Seismic Safety Commission 1991).

The information practices laid out in disaster response plans were based on a vision of a highly ordered world where the state would release public information via a compliant and transparent media apparatus to people who were awaiting instruction on how to proceed. The local plans prescribed how details about the disaster were supposed to be shared, but did not clearly articulate how the government was going to gather or create (much less assess or sanction) this "information." In examining the actual practices after the aftermath of the Loma Prieta earthquake, we find that government agencies were not able to themselves gather "information" either for their own decision-making purposes or for the purposes of informing the public. Throughout, we find that the plans barely articulated how "public information" would be constructed into an entity that could be widely shared.

Years later, Hurricane Katrina again found federal officials receiving news about the hurricane from television reports. Reports on the American government's inadequate response to Hurricane Katrina insisted that the federal government did not have access to the right information to make appropriate decisions—placing

blame on information (or the lack of it) rather than on the agencies coordinating response (Townsend 2006). In this way, the value placed on "information" deflected responsibility from public officials. Additionally, with an information-deterministic view, agencies reimagined disaster response as an information problem, to which politicians offered information technologies as the solution. We find in this case that information is imparted agency, while the agency of the officials and institutions involved in disaster response is obscured. In our next case, we show how information determinism can similarly obscure the political worlds within which information circulates.

Social structures and information circulation in the Information Village Research Project, Puducherry, India

Information is also perceived to be critical in the arena of international development. Especially since the late 1990s, access to information and its provision though community-access information and communication technology (ICT) centers have been regarded as important development goals. We examine one such project—the Information Village Research Project (IVRP) funded by Canada's International Development Research Centre (IDRC).

IVRP was widely regarded as a pioneer "ICT for Development" project. It was covered widely in the press (*The Hindu* 2001; in *The New York Times,* Dugger 2000; in the *New Scientist,* Le Page 2002; MSSRF [M.S. Swaminathan Research Foundation] 2004a); discussed in academic, nonprofit, and policy circles (Balaji, Kumaran, and Rajasekarapandy 2002; Kanungo 2002; IIITB 2005; MSSRF 2003; Ofir and Kriel 2004); attracted visitors from across the globe; and won a number of awards, such as the Motorola (Dispatch Solution) Gold Award and the Stockholm Challenge Award in 2001 (MSSRF 2004b; Ofir and Kriel 2004).

IVRP originated in an interdisciplinary dialogue organized in January 1992 by an Indian nonprofit, the M.S. Swaminathan Research Foundation (MSSRF), which supports research on agriculture and sustainable development in India. This "Dialogue on Information Technology" was the second in a series of dialogues called Reaching the Unreached organized by the foundation with support from IDRC and other organizations with a goal of bringing the latest advancements in technology to the rural poor (MSSRF 1993). The participants in the 1992 dialogue included agricultural researchers, scientists, and representatives from nongovernmental organizations (NGOs) and from government departments (agriculture and electronics) from different parts of the

world. MSSRF thus explained its motivations behind IVRP:

> Today knowledge is wealth and countries which are information poor or regions which are information poor, also happen to be economically backward. How can we bring the information age to rural India, that is our first important task here. (MSSRF 1993, 4)

Following the already-mentioned dialogue, a consortium of experts generated a list of items that would need to be collected for a pilot information village project, wherein they cast a vast range of things as "information." The consortium also proposed that the needs of the "information poor" be addressed by the creation of "information shops" where villagers could purchase information much like any other commodity, for a price. The precise contents of the "information package" made available at an information shop were to be "determined by the needs and requirements of the villagers" (MSSRF 1993, 251). Meanwhile, the owner of the shop, "being interested in making profit," would also ensure the quality and relevance of this package (MSSRF 1993, 251). Thus, while the pricing of information products was not explicitly discussed by the consortium, the eventual financial sustainability of shops through the sale of information was implied even at this early stage of the project.

IVRP sought to involve a range of actors, including information producers, information resource centers, and information seekers.

> Information seekers will obtain what they need from among a set of information resource centres using an appropriate communication medium … the resource centre essentially acts as a single-point source for all types of information products. The information resource centres will be fed by a set of information producers. (MSSRF 1993, 251)

The "information producers" for this network would include "farm men and women, remote sensing centers, national information centers, government departments and institutions" (MSSRF 1993, 251).

IVRP believed that "information" would bring about changes in behavior—especially in decision making related to livelihood opportunities—that would in turn improve the economic standing of the "information poor." It treated "information" as having inherent value and something people could have more or less of, as implied by the term "information poor." The IVRP model was thus predicated on the idea of information as a resource. What was not considered was the sociopolitical environment in which people access and make "information" meaningful. Moreover, in adopting an information production–consumption paradigm, IVRP regarded its "information producers" and "information

consumers" as apolitical individuals who produced, consumed, and transmitted information without interpreting or transforming it in any way.

MSSRF eventually obtained funds from IDRC to implement IVRP with a "hub-and-spokes" model: a central hub that was linked to experts, and village-level information shops that accessed the hub to fulfill their information needs. The IVRP hub was established in 1998. At the center of a star-shaped network, the hub communicated with all the information shops with a mix of wired and wireless technologies. What is noteworthy here is that information shops could not directly communicate with one another (MSSRF 1999b, 9; Balaji, Kumaran, and Rajasekarapandy 2002). The hub was to "add value" to information before sending it out to villages. This added value included the translation of content into the local language, Tamil, by personnel at the hub. Hub employees also provided weather reports and compiled a monthly newsletter that included local history, agricultural tips, and a listing of employment and educational opportunities. Some of the content came through contributions from village residents, who thus fulfilled, at least to some extent, their role as "information producers," as envisioned at the time of project design.

Once the hub was set up, information shops were opened in a variety of premises in surrounding villages, including in panchayat (elected village council) buildings, temple premises, and, in one case, a building constructed specifically for the purpose (MSSRF 2004d). Volunteers operated these shops. Information shops housed a personal computer, printer, display board, and equipment for data communication, all provided by MSSRF. Most shops also had a public announcement system that was used to read out important news items and also other priority items such as job advertisements and application deadlines. In fishing villages, the information shops also had an electronic board that displayed weather conditions at sea.

In the initial years of the project, several of the costs of running the hub and information shops were covered by the IDRC grant and by MSSRF. Meanwhile, village residents accessed most services at the information shops free of charge. Prior to setting up the information shops, IVRP had concluded, using village-level participatory rural appraisals and surveys, that even in conditions of poverty, "where information channels fulfill a felt need, the economic viability of the channel can be brought about" (MSSRF 1999b, 14). While the financial sustainability of information shops remained a long-term goal for the project, IVRP's primary focus in its initial years was to make the project socially sustainable. This was why villagers paid no or minimal fees to access services

at the information "shops" in the initial years, though this had started to change by the mid-2000s (IIITB 2005; Srinivasan 2011).

IVRP's focus on providing locally relevant information, and on gauging village information needs, is worth emphasizing here. Initially, the project personnel at the hub used surveys to gauge "information needs." Subsequently, they developed village databases based on survey data. These databases were installed on the computers in information shops. In this way, village residents shaped, at least in part, the contents of these databases. Hence IVRP has been rightly praised for its efforts to contextualize and locate the "right" information. Our point, however, is that IVRP was nevertheless deterministic in its belief that information—in this case, information identified as relevant by experts, IVRP personnel, and village residents—would lead to change in behavior, which in turn would lead to improved socioeconomic conditions of the villagers. In so doing, IVRP overlooked how information practices were enmeshed in the political life of the village.

For example, in IVRP's mapping of "information sources," traditional village council leaders and elected politicians were not included. This proved to be a serious omission since villagers very often negotiated their interactions with the state through the local leadership. MSSRF's desire to keep IVRP away from politics turned out to be problematic here. It prevented MSSRF from considering village council leaders and elected politicians as potential "information sources" it could partner with. Yet in practice, the ability of villagers to avail benefits from government entitlement schemes depended on their networks with them (Srinivasan 2011). In effect, residents without ties to the local leadership were unable to leverage the government information accessed at information shops.

IVRP personnel were also sensitive to the role of caste, class, and gender in the working of information shops. They tried to locate information shops in places that would be accessible to marginalized populations (Dugger 2000; Le Page 2002; Balaji, Kumaran, and Rajasekarapandy 2002). Moreover, they offered information in multiple modes (written and oral) so people with different levels of literacy and education could access it. But political factors were, nevertheless, not seen as constitutive of information.

In spite of all its efforts to be inclusive of gender, class, and caste in its design, IVRP ended up reinforcing existing divides by working with the already powerful factions of the community (in class and caste terms), who had the resources to run information shops (Sreekumar 2007). Here again it underestimated the consequences of taking this path of least resistance because it believed that

"information" was sui generis and thus independent of the political structures.

We see here that the design of IVRP isolated "information" from politics, located value and power in "information" alone, and saw it as an agent of transformative change. In practice, the value of the "information" provided at IVRP centers was shaped by the political life of the village. Since political realities were not factored into the design of IVRP, its potential to catalyze social change was severely restricted. Our next case shows how the idea that access to information is necessarily transformational, and taken to an extreme, may end up shifting the responsibility for transformation onto individuals.

Information and learning in One Laptop per Child project

In January 2005, when the MIT-based One Laptop per Child (OLPC; then the "$100 laptop") was debuted with much fanfare at the World Economic Forum, the project made unrestricted information access a central component of its mission to overhaul education across the Global South with its open-source laptop, called the "XO." While OLPC could easily be criticized for technological determinism because of the project's embrace of the laptop as an agent of social change, it is the faith of its leadership in the value and agency of information that warrants attention here.

We focus in particular on the "view source" button OLPC added to XO to provide information about the inner workings of computers to their child-users. The "view source" button never worked well in practice. In fact, Ames (2014; 2016) never saw it used once in her 7 months of observations across Latin America, which has 85% of OLPC's laptops (Ames 2014; 2016). Yet it became evocative among developers and others tracking the OLPC project.

OLPC's commitment to unrestricted information access echoed that of the free and open-source software (FOSS) movement. The belief here is that unrestricted information access frees and empowers the user to transform that information into personal and social development. However, the subtext, as this case indicates, is that unrestricted access to information will shape the child-user into a particular kind of actor: an empowered and cheeky "hacker" like those populating the halls of MIT and Silicon Valley companies (Ames and Rosner 2014), who would go on to bring about economic and social change across the Global South (Ames 2014, 2016). In effect, such users would be clones of the OLPC leaders themselves. In this way, the rhetoric of free information access was ironically channeled to foreclose the futures of the beneficiaries.

The OLPC laptop with its much-vaunted "view source" button was meant to be a source of (technical) information. Bridging hardware and software, the "view source" button on the XO was a physical key on the keyboard that was designed to show the source code of the program that was running. OLPC developers boasted that it would enable children to learn how to program, just as the "view source" option in Web browsers enabled many OLPC developers to learn HTML and Web development. Once the child-users learned programming, they could change XO's features to better match their needs. With this "if you don't like it, change it" attitude, the OX's developers dispatched concerns of cultural imperialism.

OLPC leadership linked the view source button to "information." It claimed that with this feature, children and their families will "be better able to participate in the information society."[2] Seymour Papert, co-founder of OLPC and its intellectual leader, said in a November 2006 USInfo webchat interview that like a Web browser, the view source button "lets people of any age get to information" (Papert 2006). Similarly, in an interview on National Public Radio's February 2007 program on open source, the host, Christopher Lydon, described the XO laptop as "a hacker's paradise, a real open source playing field." The guest, Walter Bender, co-founder of OLPC and its head of software development, described how the XO laptop allowed for deep exploration by making visible all of the source code—the "information" on the computer's inner workings:

> We want the children to be able to reach inside the machine. We want the teachers to be able to reach inside the machine; and touch it, and transform it, and explore it as deeply as they want to. And a closed system does not allow that. (Lydon 2007)

It is important to note that Bender neglected to mention the high level of technical expertise needed to make sense of this "information." In the same vein, at a 2007 meeting Chris Blizzard, then OLPC's software team lead at Red Hat, said that the "information" the laptop would provide would empower children to "have initiative" in their lives: "Mainly I feel very strongly for the impact it has on education, impact it has on very strong social issues, health, and almost anything," he said. He continued, "Most importantly the impact it has on empowering a population to look at the world around them to have the initiative" (Blizzard 2007).

In this way, OLPC's leadership emphasized information access over pedagogy. They thought that with the "information" provided by the "view source" button, the children would "naturally" want to explore the workings

of the laptop deeply in ways that would enable them to become developers.

We argue that one possible consequence of making education an individualized experience where everybody (in theory) has all the "information" they need to succeed is the shift in the burden of failure from the system—a flawed educational model, a corrupt government, an unjust economic structure—to the individual. Even more troubling, some in the OLPC project have suggested that only some individuals are capable of the free thinking that the "view source" button elicits. With the kind of individual access to computers and other objects-to-think-with that he promotes in his books, Seymour Papert boasts that education can become a "private act" (Papert 1980, 37). In a 2006 interview on OLPC, he reiterated this belief in individualized learning, referencing the "millions" of people (such as those who have adopted the values of programming culture) who learned to use computers because they had access to them:

> In the end, [students] will teach themselves. They'll teach one another. There are many millions, tens of millions of people in the world who bought computers and learned how to use them *without anybody teaching them*. I have confidence in kids' ability to learn. (Papert 2006, emphasis added)

While this do-it-yourself education appeals to the OLPC developers, such individualism is not universal. It is predicated solely on "information access"—access to the "view source" buttons, for example—instead of the sociocultural context that enables learning. OLPC was initially built on the assumption that every child will learn with a laptop, because they will have the "information" they will need (Ames 2015). Through "information" the burden of making learning happen shifts from the school, parent, teacher, learning environment, and pedagogical technique to the child.

Prior to co-founding OLPC, Seymour Papert was, along with fellow co-founders Nicholas Negroponte and Bender, a founding professor at MIT Media Lab. The OLPC project was the culmination of decades of Professor Papert's theorizing about how computers and "information" could transform children's lives—theorizing that continues to inspire many in the technology design world, despite ample evidence that this approach does not work (Ames 2016). Papert's accounts of more than 30 years of experiments with children and computers spotlights the few children who took to the computer like fish to water, while ignoring the children who did not become as engaged with it (Ames 2015). The success of a few star students plays up the importance of "information access," but we may ask, what becomes of the "average" learner?

This selectivity takes on greater import when we realize that open-source programmers, who have contributed substantially to OLPC, are a remarkably homogeneous group—98.5% male (Nafus, Leach, and Krieger 2006). OLPC contributors have said in interviews that they would love for that ratio to change, but the OLPC wiki and mailing lists do not speak of any initiative to attract more girls. Their attitude seems to be that if girls decide to adopt programmers' values, then Godspeed to them. They show no willingness to proactively work to attract them. On the contrary, their focus on merely providing access to the "information"—while ignoring the social structures that enables learning (and, in fact, enabled their own; see Ames and Rosner 2014)—obscures the project's selectivity behind a veneer of informationally enabled egalitarianism.

Information determinism and its elisions

"'Information' is a bad fit. But, like an ill-fitting suit, at least it's big enough to cover everything, even if it's generally ugly" (Vaidhyanathan 2006, 297).

In thus describing information, cultural historian Siva Vaidyanathan underscores an important point that is also evident in our cases: The term "information" is stretched to accommodate various meanings (Brown and Duguid 2000). It can be empirically demonstrated, for instance, that safety guidelines can improve disaster response, that details of cropping practices prove critical for farmers, and that findings on new pedagogical practices can improve an individual's education. What is problematic is that the value of such specific "information" often serves as a gateway to declaring its value in the abstract, allowing information in general to be associated with intrinsic worth and positive outcomes. This in turn leads to information mythologies such as "information is power" without defining what specific information is referenced, how and by whom its power is wielded, and who is affected by it.

Whether or not intentionally produced, this slippage between the specific and abstract senses of "information" allows for conclusions that would not have been possible if there was a single sense in which the term "information" was used. This enables claims that "information wants to be free" as we saw in OLPC, and an overall vision of "information" crossing social, political, and physical distances without the resistance posed by the materiality of printed books, radio transmitters and receivers, or the machines and cables of the Internet backbone. These sorts of beliefs about the value of "information" echo prior claims about technologies ranging from trains and telegraphs to space shuttles and the Internet. James Carey (1988), David Nye (1996), and

Vincent Mosco (2005) connect these claims to the digital and technological "sublime": feelings of awe, spiritual transcendence, and utopian visions for the kind of world that they might make possible or even inevitable. Information mythologies reify information while discursively constructing the inevitability of an "informational future" (Day 2001).

These mythologies make the circulation of information appear natural and inevitable, attributing agency to information itself and obscuring the power of institutions in its circulation (Tsing 2000, 330). The focus on "information flow," furthermore, encourages an understanding of information as something that exists "out there" rather than as something that must be actively produced and interpreted (Nunberg 1996). Our cases show that the attribution of innate value and agency to information has enabled linking of bits, records, and documents seamlessly to broad visions of preparedness, participation, and improved state–citizen relations, while obscuring the sociomaterial politics of their everyday production, circulation, and use.

These mythologies blind, leading actors to at times vastly underestimate the sustained sociotechnical commitment often needed to carry out their visions (Mosco 2005; Nye 1996). Consequently, governments, aid agencies, and others pour money into informational solutions, often with little critical thought (Light 2003). It takes a lens that is not information deterministic to show us what is obscured when actions and policies are predicated on inherent value and agency of information.

Conclusion

In our analysis we examined discrepancies between information deterministic assumptions and information practices. We found that the attribution of value, properties, and agency to information in these claims obscured the role of social structures (the village council leaders and elected politicians left out of information need mappings in the case of IVRP), the capacity and agency of participants (the student users of OLPC), and the materiality of information (California disaster response plans' assumption that information was something that the state could and would just have) in shaping its production, circulation, and use. Moreover, it shifted attention from the actual information practices on the ground in each case.

What are the implications of information determinism? We argue first that it fosters emphasis on information in policy formulation, which benefits providers of information-oriented solutions and deemphasizes solutions that do not reify information. Second, and

more crucially, by imbuing information with value and agency, the onus for action is shifted to those with access to information. Once information is provided, it is no longer the responsibility of the state to ensure certain outcomes—instead, this becomes the individual's responsibility. This shift toward individual responsibility, we find, is closely related to a larger shift in development discourse toward market- and individual-based ideas of social change.

Notes

1. Remarks by K. Y. Amoako, Executive Secretary of the United Nation Economic Commission for Africa, at an information technology coordination meeting in Addis Ababa, Ethiopia, October 1996 (quoted in United Nations 1997).
2. http://wiki.laptop.org/go/OLPC_Principles_and_Basic_information (accessed September 18, 2016).

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