The Social Shaping of Cloud Computing: An Ethnography of Infrastructure in East St. Louis, Illinois

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ABSTRACT
This paper presents findings from an ethnographic study of cloud computing in a human services organization in East St. Louis, Illinois. Previous social informatics studies have focused on the impact of computerization on urban welfare organizations. This research instead uses a “social shaping of technology” perspective to investigate the ways in which broader social, political, and economic forces shape cloud computing and its consequences within a nonprofit organization that administers government-funded social welfare programs. The findings illustrate how the infrastructural tensions between external stakeholder demands and internal organizational needs significantly influenced a cloud computing software implementation project. In presenting this infrastructural analysis, I seek to fill a gap in the literature on the social shaping of cloud computing and its consequences in U.S. industrial suburbs, such as East St. Louis, where high rates of poverty exist.

Keywords
Cloud computing, social informatics, ethnography, infrastructure studies, community-based organizations.

INTRODUCTION
The term cloud computing has caused significant confusion since its introduction. Cloud computing itself refers to “both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services” (Armbrust et al., 2010, p. 50). This is not a new concept. Time-sharing, or the sharing of computing resources among multiple users, emerged during the early 1960s as large mainframe computers began connecting to networked information.

Cusumano (2010) explained that although the idea of cloud computing is antiquated, software services on the web didn’t appear until the 1990s. These services “ranged from email to calendars, groupware, online publishing, simple word processing, and many other common consumer and even business applications” (Cusumano, 2010, p. 28). Mosco (2014) argued, “Cloud computing has been defined in many ways, but most would agree that it is a powerful system for producing, storing, analyzing, and distributing data, information, applications, and services to organizations and individuals” (p. 6). As Mosco carefully detailed, this system is creating enormous privacy, security, labor, and environmental challenges—fundamental concerns in today’s global networked society.

This paper presents findings from an eleven-month ethnographic study of a cloud computing software implementation within the Metro East Settlement House (MESH). This is a pseudonym I created in an attempt to protect the privacy of the organization. In fact, all of the names of people mentioned in this research have been changed to protect their privacy. MESH is a community-based organization in East St. Louis, Illinois. A community-based organization provides nonprofit social welfare services to low-income residents within a specific geographic location. In East St. Louis, 100 percent of the local school children are eligible for the free and reduced-price meal program, which is a common measure of poverty. Findings are presented from my participant-observation with social workers, managers, and directors at MESH as we attempted to integrate state-mandated and for-profit cloud computing software applications.

The goal of this paper is to promote a deeper understanding of the human actors, including businesses and governments, and the nonhuman actors, such as networked information systems, that can shape cloud computing software and its consequences. In taking this approach, I focus on the ways in which the often hidden or “infrastructural” aspects of large-scale computing projects (e.g., see Kling & Scacchi, 1982; Star & Ruhleder, 1996) can benefit some groups, but often at the expense of others. Ultimately, I argue that cloud computing in community-based organizations should be viewed as a site of struggle that can reveal more about how the information society developed, for whom, and at what cost to the public and the surrounding environment. In doing so, I hope my analysis will be useful to software
INFRASTRUCTURE AS A THEORETICAL FRAMEWORK
In this section, I introduce the concept of infrastructure as a way to think about cloud computing. The purpose is to develop a way of understanding not only how cloud computing software works, but also for whom it works, and how the software project might have developed another way given a different set of political, economic, historical, and cultural contexts.

Computerization as an Infrastructural Development
The idea of computing as an infrastructure developed across the fields of social informatics (SI) and science and technology studies (STS). The development of the relationist approach to infrastructure studies is rooted in sociotechnical analyses of computerization beginning in the 1970s. As Sandvig (2013) explained, “In its first decades, computing appeared to be a new kind of engineering drastically unlike other kinds of engineering, like building bridges or buildings” (p. 9). A “series of disasters” appeared to follow and characterize early computing projects (Sandvig, 2013, p. 9). Star and Böwker (2006) argued that failures are critical to infrastructure studies because they help to show that infrastructure development and its maintenance require work, which is frequently overlooked. Failure can also reveal the broader structural forces upon which stable infrastructures are dependent. Social informatics scholars set the foundation for future research, which worked to advance the notion of computing as an information infrastructure (Bowker & Star, 1998; Bowker, Baker, Millerand, & Ribes, 2010; Hanseth, Monteiro, & Hatling, 1996).

Two SI studies, in particular, were foundational to the development of the relationist perspective within infrastructure studies. In the first, Kling and Scacchi (1982) developed the idea of computing as “webs.” As they explained, “web models make explicit the salient connections between a focal technology and its social and political contexts” (p. 3). The concept of infrastructure was foundational to their theorization. Jewett and Kling’s (1991) study of computerization in social science research was another important SI contribution to the relationist’s understanding of infrastructure. They argued, “Infrastructure is a useful concept in analyses of computing support—it denotes all the resources and practices required to help people adequately carry out their work (Kling, 1986; Kling & Scacchi, 1982)” (p. 247). The Kling and Scacchi and Jewett and Kling studies described infrastructure as a dynamic sociotechnical process, which often involves a range of contextual elements that motivate large-scale computing projects.

In the 1990s, STS scholars further concretized infrastructure as “a relation not a set of things” (Sandvig, 2013, p. 10). Star and Ruhleder (1996) made a major contribution to the development of infrastructure studies by outlining what they believed were essential characteristics of infrastructure. Recognizing that conflicts often arise between multiple participants in the development of large-scale computing projects, Star and Ruhleder (1996) argued, “An infrastructure occurs when the tension between the local and global is resolved” (p. 114). For my study, this perspective has grounded my observation of the “infrastructural tensions” (Jackson, Edwards, Bowker, & Knobel, 2007) facing community-based organizations that administer state-funded social welfare programs.

Standardization and Flexibility
Standards are integral to the stabilization of infrastructure. From the electrical grid to the Internet, standardization helps infrastructure become embedded in, and thus invisible in, support of other processes. Bowker and Star (1998) described the importance of standards in this way: “It is not possible to build a modern housing development without them: too much needs to come together—electricity, gas, sewer, timber sizes, screws, nails and so on” (p. 233). The challenge in creating standards, however, can often be found in negotiations between global processes and “local adaptations” (Gasser, 1986).

Hanseth et al. (1996) explained how the terms standardization and flexibility provide important conceptual tools for understanding the development of information infrastructure, or “II.” They described that in computer science, standardization “denotes the social and technical process of developing the underlying artifact related to II—namely, the standards that govern the communicative patterns.” Flexibility, on the other hand, “denotes (a) flexibility in allowing for further changes or (b) flexibility in the pattern of use” (p. 408). Ultimately, they argue that the development of II requires that standards be flexible and open to change over time. Hanseth et al. (1996) suggested the phrase “anticipated and alternating flexibility” (p. 419) to describe the need for II to allow for required and anticipated changes over time.

More recent studies have recognized that information infrastructure “needs to be flexible and open to change as the world and the demands on that infrastructure change” (Pargram & Palme, 2009, p. 198). The architecture of the Internet depends on its flexibility. The social shaping of technology literature provided me with additional conceptual tools for understanding cloud computing software as an infrastructure shaped by social, institutional, and technical forces.

The Social Shaping of Technology
The social shaping of technology is an area within STS that has contributed theoretical frameworks for understanding the often hidden social, political, and economic forces that shape infrastructure and its consequences. The social shaping of technology literature has largely been described...
as a response to “technological determinism” (MacKenzie & Wajcman, 1999; Williams & Edge, 1996), a theory that assumes “technological change is an independent factor, impacting on society from outside of society, so to speak” (MacKenzie & Wajcman, 1999, p. 5). The social shaping perspective is useful for considering how computing as an infrastructure develops, for whom, and at what cost to the public and its surrounding environment. The literature also recognizes that while society shapes technology, technology in turn has societal impacts. The literature has also been criticized because of its apparent lack of boundaries and shared questions within the field (Williams & Edge, 1996).

Scholars working within the field recognize that a broad range of sociotechnical arrangements underlie the development of any technology artifact. As Bijker, Hughes, and Pinch (2012) explained, this perspective “aims at contributing to a greater understanding of the social processes involved in technological development while respecting the seamless web character of technology and society” (p. 4). Thus, the social and technical are mutually constitutive and cannot be analyzed separately—a concept which has been referred to as “co-production” (Jasanoff, 2004). These connections often involve political, economic, historical, and cultural contexts, as well as nonhuman factors, that influence the development of technological artifacts. Social shaping scholars have also argued that technology develops unevenly over time and often in unintended directions, another assumption shared by social informatics scholars. Ultimately, this group of scholars is concerned with understanding how technology artifacts, systems, and heterogeneous networks become embedded (i.e., taken for granted) in everyday life.

ETHNOGRAPHY OF INFRASTRUCTURE AS A METHOD

In this section, I describe the idea of infrastructure as a method, which I used to observe how social, institutional, and technical forces shaped cloud computerization at MESH. My approach was primarily influenced by Star’s (1999) ethnography of infrastructure, which offers methodological tools for investigating the invisible work underlying information infrastructure development. As I explain, my investigation was focused on observing and analyzing the relational aspects, or “webs” (Kling & Scacchi, 1982), that shape cloud computing software projects, particularly during the implementation phase.

Ethnography of Cloud Computing

The study was designed to respond to my primary research question: How do social, political, and economic forces shape cloud computing and its consequences in a community-based organization in East St. Louis, Illinois? To answer this inquiry, I conducted an eleven-month ethnographic study of government-mandated and for-profit cloud computing software services in use at the Metro East Settlement House in East St. Louis.

MESH began as a settlement house in the early 1900s, much in the same tradition as Jane Addams’s Hull-House in Chicago. Settlement houses emerged during the Progressive Era as “both a residence and a community center that aimed to assist migrants and the poor to adjust to the industrial, urban life” (Hounmenou, 2012, p. 650). In 2012, MESH served close to 30,000 residents in the Metro East region of Illinois, which includes many of the eastern suburbs of St. Louis, Missouri. The population of East St. Louis in 2010 was 27,006, and 98 percent were African American (U.S. Census Bureau, 2012). The residents who rely on MESH’s services today are the predominantly African American individuals and families that live in East St. Louis.

MESH provides state- and federally-funded human services to poor, oppressed, and homeless people within a specific geographic location. These community-based services are truly a lifeline for many families in the low-income communities that have been left behind in transition from an industrial to an information society. MESH provides the following list of services: early childhood and prevention services; education and youth development; comprehensive youth services; individual and family support programs; and services to older adults. MESH has 195 employees for the fifteen programs that they operate. Nine of these fifteen programs require the use of either state or federal management information systems.

The findings in this paper are based on my fieldwork as a volunteer project manager with MESH between June 2013 and April 2014. During this time, I traveled to East St. Louis almost once a week to work with MESH staff, managers, and directors to configure and implement the cloud computing software. As a participant-observer, I used this time to observe the talk and actions of employees to understand how broader social, political, and economic forces, such as cuts to state and federal funding, influenced decisions about the cloud computing software. I also interviewed employees and reviewed government and technical documents related to government information systems and technology policy in the state of Illinois. I was particularly interested in understanding how these broader structural developments shaped the software and its consequences.

I believe that ethnography, as a process, using participant observation, interviews, and archival research—or what Wolcott (1999) referred to as “experiencing, enquiring, and examining”—was the best approach to guide my inquiry. Rather than searching for universal law, ethnographers focus on producing descriptive “detailed accounts of the concrete experiences of life within a particular culture and of the beliefs and social rules that are used as resources within it” (Hammersley & Atkinson, 1995, p. 10). STS scholars have described this approach as an extremely valuable method, particularly because “it offers a rich description of how work is done, its social setting and the understandings of different players” (Williams & Edge, 1996, p. 884). Ethnography also allowed me to engage in
writing “thick description” (Geertz, 1973) about the “the design of networks and their import” (Star, 1999). In using this approach, I produced a pile of fieldnotes and memos that I considered to be a data set (Emerson, Fretz, & Shaw, 1995) for analyzing the infrastructural development of the cloud computing software.

**ETO Implementation at MESH**

The object of study for my research is called ETO Impact™ (henceforth, ETO). It is a “performance management system” that is often used “to respond to current demands for getting and showing results, whether in the public, nonprofit, or private sectors” (Julnes, 2009, p. 7). Social Solutions is the company that created this software as a service, or SaaS, platform. They offer a range of software products for small to large organizations. As their website explains, ETO is “the first software created by case managers for case managers” (Social Solutions, 2013). At the end of 2012, MESH purchased ETO to help staff, managers, and directors track the performance of their organization and to utilize sophisticated analytical tools to report outcomes to their existing and potential funders. The ETO software is an example of a configurational technology (Fleck, 1994), which requires substantial user input based on both local knowledge and broader institutional contexts. In many ways, the software is similar to content management systems, such as Drupal or Wordpress, that give users the opportunity to configure the software to respond to specific local requirements.

At the end of 2012, MESH purchased ETO in order to have a centralized data-gathering platform and reporting system, which private funders had been pushing them to purchase. The directors at MESH described the ways in which the United Way and other private organizations had for many years encouraged them to adopt a single reporting platform. MESH was required to use nine different state and federal management information systems to gather data on participants, track outcomes, and create reports for funders. The main problem was that these systems were not connected to one another. Therefore, reporting was extremely difficult and inefficient at MESH because the organization was required to print out several reports from each system and then compile them into a single report for funders. The directors at MESH believed that ETO would be a way to solve this information management dilemma.

In May 2013, during our early ETO project meetings, directors and IT staff at MESH expressed their enthusiasm and hopes for ETO. They talked about how ETO would change their organization and provide positive benefits to staff, managers, directors, and funders alike. These technological deterministic views of the ETO software were particularly intriguing to me as I set out to investigate the social shaping of cloud computing and its consequences in East St. Louis. The directors at MESH also described how they believed ETO would give their organization the opportunity to influence public policy by providing state legislators in Springfield with a more holistic picture of the actual community needs that exist across the Metro East region of Illinois. These were some of the reasons the directors and IT staff wanted the ETO software.

**Participant observation**

I conducted my participation observation (Emerson & Pollner, 2001) at least three days every week at the research site in East St. Louis. During this time, I hoped to discover patterns in the ways human service professionals talked about and engaged in the ETO software implementation. I tried to pay particular attention to the broader structural contexts that shaped how employees at MESH interacted both with each other and with the software. I also paid attention to the ways in which issues related to the digital divide, which is often shaped by persistent poverty (e.g., see Servon, 2002), might influence the behaviors of workers and managers during the ETO implementation stage.

**Interviews**

My approach to interviewing informants was “conversational” (Denzin, 1989, p. 109), as is common in ethnographic fieldwork. As Hammersley and Atkinson (1995) explained, “The aim here is to minimize, as far as possible, the influence of the researcher on what is said, and thus to facilitate an open expression of the informant’s perspective on the world” (p. 129). This perspective also assumes that interviewing is such an integral aspect of participant observation “that it is often subsumed as an aspect of it” (Wolcott, 1999, p. 51). I did have a set of semistructured questions from which my interview questions were derived. However, my interviews were motivated more by conversations with my informants in naturalistic settings, such as the office space or in the car while driving to and from meetings at one of the other locations of MESH. In these cases, our conversations and actions unfolded in relation to the configuration and implementation of the cloud computing software.

**Archival documents**

Archival research, or “examining” (Wolcott, 1999, pp. 58–61), played an important role in influencing how I approached participant observation and interviews during the cloud computing implementation. It also helped me to contextualize the tensions I observed between human and nonhuman actors (Latour, 2005) in the development of the SaaS platform. Two sets of data, in particular, played an important role. The first set included technical manuals related to the software, both as PDFs and online documents. Social Solutions provided a number of very useful resources, including the “Quick Start Implementation Guide,” during our ETO Impact Quick Start process. In addition, the Social Solutions website provides a number of useful online resources for technical support. These documents were very helpful not only in helping us to configure and implement the software, but also in
understanding the values embedded into the software as a configurational technology.

The second set of documents that helped guide my fieldwork included state welfare and technology policy publications available on the Illinois Department of Human Services website (http://www.dhs.state.il.us/page.aspx) and also through the Illinois Framework for Health and Human Services website (http://illinoisframework.org). The DHS website provided useful documentation related to the eCornerstone software, which is the state-mandated management information system used in the Teen REACH program at MESH. These documents helped me understand how the software worked and where exactly it created tensions with the private ETO Impact software.

Data Analysis
I followed Emerson, Fretz, and Shaw’s (1995) approach to processing fieldnotes. Therefore, rather than discovering theory from the data, my approach involved constant analysis, which was both inductive and deductive, “like someone who is simultaneously creating and solving a puzzle, or like a carpenter alternately changing the shape of a door and then the shape of the door frame to obtain a better fit” (p. 144). I argue that this method works well for studying software projects, which are quite fluid and at times challenging based on the diversity of skills required for their use and ever-changing nature of technology. As Star and Ruhleder (1996) explained, “Trying to develop a large-scale information infrastructure in this climate is metaphorically like building a ship that you’re on while designing the navigation system and being in a highly competitive boat race with a constantly shifting finish line” (p. 112).

At the same time, the fieldnotes became a data set that I systematically analyzed line-by-line using “open coding” (Emerson et al., 1995, p. 150). In open coding, the ethnographer strives to identify events “described in the notes that could themselves become the basis of categorization” (p. 152). As the name implies, this process strives to be as thematically open as possible without introducing any preconceived categories. The goal is to connect observations to more general analytic categories and issues related to my research focus (Emerson et al., 1995, p. 154). After open coding my fieldnotes, I used initial memos to “identify, develop, and modify broader analytic themes and arguments” (Emerson et al., 1995, p. 157). I analyzed my interview transcripts using open coding and initial memos. These memos followed the open coding process as a step toward thematic development. I also used my research journal entries to elaborate more generally on both the open coding and the initial memos. This was an opportunity to bring all of the pieces together and to concretize the most important thematic elements that were later included in my final ethnography.

FINDINGS AND ANALYSIS
In this section, I describe how tensions between external stakeholder demands and internal organizational needs influenced decisions about how the cloud computing software was implemented at MESH. I summarize the findings from my ethnography of cloud computing before discussing the implications of my research for state policymakers, software developers, and community-based organizations interested in using cloud computing to help move people out of poverty.

Responding to Infrastructural Tensions
In this section, I summarize the conflicting dimensions that existed between external stakeholder demands and internal organizational needs during the implementation of ETO. The external stakeholders consisted of state, federal, and private funders who each had their own expectations about how the ETO software should be used to help them know how their money was being spent. Funders played a significant role in influencing MESH’s decision to purchase the ETO software. However, these funders did not provide the financial support needed by MESH to maintain the software, train workers, and produce reports for funders.

The internal stakeholder demands included expectations—beyond those of state and private funders—about how the ETO software should be used. MESH was motivated to use ETO to conduct community needs assessments, influence public policy, and gain new sources of funding. This is where MESH was an actor in the social shaping of cloud computing. In Table 1, I attempt to characterize the various social aspects that came into conflict between stakeholders during the software implementation.

External stakeholder demands
During my fieldwork, I found that public and private forces influenced decisions about how the ETO software should be configured. Here, I characterize these actors as part of the

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<tr>
<th>External Stakeholder Dimensions</th>
<th>Infrastructural Tensions</th>
<th>Internal Organizational Dimensions</th>
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<tbody>
<tr>
<td>State and federal government agencies</td>
<td>Lack of funding for IT support at MESH</td>
<td>Influencing public policy</td>
</tr>
<tr>
<td>The United Way</td>
<td>External pressures on MESH to adopt centralized IT</td>
<td>Generating new funding sources</td>
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<tr>
<td>Illinois Framework</td>
<td>Existing IT systems failed to surface invisible work</td>
<td>Understanding community needs</td>
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Table 1. External and Internal Infrastructural Dimensions (Social Aspects)
external stakeholder dimensions, while recognizing that the lines between social and technical aspects of cloud computerization were often blurred. In fact, as social constructivists have argued, technology is assumed to be part of a “seamless web” of social and technical relations (Bijker et al., 2012, p. 4). However, for the purposes of deconstructing the sociotechnical aspects of the external stakeholder dimensions to show more of the complexity and nuances of the ETO implementation, I will now attempt to parse them by their interconnected social and technical aspects.

Social. The private forces that motivated ETO’s development were largely directed from the United Way, a national nonprofit organization focused on “helping children and youth achieve their potential,” “promoting financial stability and independence,” and “improving people’s health” (United Way, 2014). I found that the United Way and other private entities told directors at MESH that they needed to adopt a centralized data reporting system to both sustain and bring in new funding sources at a time of chronic cuts. Curtis Fanton, the associate director at MESH, described the external pressures facing MESH from organizations such as the United Way. As he explained, “The desire of the United Way for United Way agencies is to have one universal system for data management, data reporting, and data capture that looks at outcomes, indicators, evaluation assessments, etc.” I found that Curtis’s statement, and similar statements from other directors at MESH, supported findings from Kling’s (1978) study in which he learned that private funders, like the United Way, forced their grantees to use information systems for data management and reporting purposes.

Technical. The technical elements (see Table 2) of the external stakeholder dimensions included the state-mandated management information systems, such as eCornerstone (https://ecs.dhs.illinois.gov/ecspublic/ecs) and the other programmatic information systems, including Parents as Teachers (http://www.parentsasteachers.org) and Visit Tracker (https://www.visittrackerweb.com). The Visit Tracker cloud computing software platform allowed staff at MESH to collect data from the Parents as Teachers (PAT) curriculum, used by parent educators in their work with low-income families in the Metro East Region of Illinois. However, Visit Tracker is not a state-mandated system.

There were technical difficulties associated with phasing out the Visit Tracker software for the Providing a Sure Start (PASS) program employees at MESH and moving to the ETO system. The PASS program provides families in the Metro East region with parent training, child development, and life skills classes alongside comprehensive case management to parents and their young children. During our meetings with the parent educators, managers, and directors in the PASS program in November and December 2013, we learned that the Visit Tracker software automatically updated when there were changes to the PAT curriculum. Therefore, we made the assumption that the company that operates Visit Tracker was closely connected with the PAT program, particularly since PAT had endorsed Visit Tracker. This made our work more difficult in responding to the PASS employees’ concerns that the ETO software be updated in consistent manner. Unfortunately, this key issue was not resolved before the end of my fieldwork at MESH.

In addition, the lack of interoperability between the state management information systems that MESH was required to use and the single ETO platform created additional staffing and administrative challenges for MESH (see Table 2). ETO has great flexibility in terms of how it can be configured. However, this lack of interoperability resulted in an increased workload that required staff to duplicate efforts. This is because eCornerstone did not provide a way to export data into ETO. Therefore, staff members were asked to enter the same data twice into two different systems.

Table 2. External and Internal Infrastructural Dimensions (Technical Aspects)

<table>
<thead>
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<th>Infrastructural Dimensions</th>
<th>Internal Organizational Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>eCornerstone (government-mandated information system)</td>
<td>Lack of interoperability</td>
<td>ETO for-profit cloud computing software</td>
</tr>
<tr>
<td>Visit Tracker (client management system)</td>
<td>Standardization (external) versus flexibility (internal)</td>
<td>Spreadsheets and Microsoft Word documents</td>
</tr>
<tr>
<td>Parents as Teachers (curriculum)</td>
<td>Increasing need for “configurational technology” (Fleck, 1994)</td>
<td>Paper (applications, surveys, etc.)</td>
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Internal organizational needs

The social and technical aspects of cloud computing at MESH focused on ETO’s potential to gather data about community and organizational needs that could be used to surface “invisible work” (Star, 1999, p. 385) of employees, conduct community needs assessments, influence public policymakers, and attract new sources of funding. These internal organizational dimensions included paper, spreadsheets, Microsoft Word documents, and the ETO cloud computing software. I would argue that the internal technical aspects were more flexible and configurable because of their local orientation. This could be viewed in contrast to the external dimensions, which were more fixed and rigid based on more remote forces, including both human and nonhuman actors that clashed with the
organization’s vision for how it could use the ETO software.

Social. The social aspects on the internal organizational side could be understood as (1) community and (2) organizational needs. As I mentioned, MESH itself, as a community-based organization, was an actor in the social shaping of cloud computing. The role of MESH as an actor was visible when Curtis explained that ETO “will also allow us to reach out to our legislators on what is really needed in the community, versus what we are currently providing.” This statement encapsulates what I mean by the tension between external stakeholder demands and internal organizational needs in the cloud computerization process at MESH. Patricia Ableton, the director of marketing and development at MESH, told me that having the ETO software will help the organization become nationally accredited as a social service agency. As she explained, “If we get this accreditation it could bring in more dollars for the agency,” which would be very useful at a time of severe funding cuts to social services. Kling (1978) referred to this phenomenon as the “administrative attractiveness” of computing, which has helped welfare organizations sustain federal funding and attract new sources of funding.

Technical. The different information systems at MESH, including paper, spreadsheets, Microsoft Word documents, and the ETO software, represented some of the technical aspects of the internal organizational dimensions. As I mentioned, the internal sociotechnical infrastructure is more flexible, configurable, and interoperable because of its local orientation. This could be viewed in contrast to the external information infrastructure (e.g., eCornerstone), which is more fixed and rigid, based on state welfare and technology policy in Illinois.

There were also legal issues related to the technical aspects of the ETO software, which I would include as key relational aspects of the internal organizational infrastructure. In addition to the lack of interoperability between public (state) and private (ETO) cloud computing systems, there are legal issues related to data use and sharing between public and private software platforms. These concerns could be introduced as questions: (1) What are the legal implications of sharing state-mandated demographic data with for-profit cloud computing systems? (2) What are the privacy and security issues related to sharing these data across networks? (3) Do additional consent forms need to be used to make sure that people agree to sharing their personal data for evaluation purposes in for-profit cloud computing software platforms, such as ETO? These questions remained open because the lack of interoperability prevented us from sharing data across public and private systems. However, these legal issues remain a factor in the future as community-based organizations, such as MESH, seek to integrate for-profit cloud computing software platforms into their existing state-mandated information infrastructures.

DISCUSSION

I now turn to discuss the implications of my findings. More concretely, I argue that if state policymakers require data to understand the needs of community-based organizations that provide state-funded social welfare programs, then state IT systems should be configured in such a way to allow community-based organizations to gather the data required to show the actual needs that exist in the community. I also maintain that if public and private funders expect community-based organizations to adopt cloud computing systems to provide accountability, then funders should also supply the financial, technical, and legal assistance to help community-based organizations develop flexible, interoperable, and equitable information infrastructures.

In pursuing this path, I am certainly not arguing that MESH should use such a system to get more money than other social service agencies in Illinois—they’re all working from the same amount of funding. Rather, I explain that an ETO-like system, created by the state for all community-based organizations across the state, can help more organizations like MESH gather data and report findings on actual community needs that can help the state understand those needs more clearly. I believe that a system developed with these goals in mind can provide organizations with the data needed to inform policymakers in the way that directors at MESH described in my study.

In presenting this discussion, I draw upon Busch’s (2011) guidelines for building standards that are “fair, equitable, and effective” (pp. 300–308) as a framework for developing more responsive networked information systems. I use this approach as a foundation upon which to argue for my decision to recommend a more humane state IT system for workers and managers in community-based organizations such as MESH, rather than recommending that organizations give their money to private, for-profit cloud computing companies like Social Solutions. I strongly believe that state-funded IT systems offer a measure of public accountability and an opportunity for civic engagement that does not exist in quite the same way with for-profit cloud computing systems.

Designing Fair, Equitable, and Effective Infrastructure

Flexibility in infrastructure design is essential to the goal of developing more responsive information systems for community-based organizations such as MESH. In addition, ethical guidelines in the development of standards should be considered to promote more fair cloud computing software applications. Busch (2011) argued that ethics are integral to the creation of standards, particularly because standards are everywhere in society and have certain benefits and costs associated with them. For example, “food safety standards are generally used to avoid undesired consequences—death and illness” (p. 247). In order to address some of the ethics involved in the creation of standards, Busch provided a set of guidelines or a “standard for standards,” which he explained “may be helpful in
determining whether standards achieve their ethical objectives” (p. 301):

1. Delegate to subsidiary bodies when possible.
2. Use precaution.
3. Do minimal violence.
4. Make accountable standards.
5. Encourage the voice of publics through participation.
6. Use the most appropriate form of standard.
7. Ask about path dependence.
8. Design appropriate tests.
9. Open new avenues to thinking and acting by making routine things habitual.
11. Use law experimentally. (pp. 300–308)

In my recommendations, I describe how several of these guidelines should be applied as community-based organizations engage with public and private funders in the development of centralized IT systems to document outcomes and provide accountability.

**Recommendations**

I conclude with four recommendations, based on Busch’s (2011) guidelines for “building standards that are fair, equitable, and effective” (pp. 300–308), for software developers, public policymakers, and community-based organizations interested in using cloud computing software to help move people out of poverty. It is important to note that these recommendations are only relevant, and potentially useful, to community-based organizations that administer state-funded programs. Specifically, I make recommendations to improve the configurability of state IT systems to benefit community-based organizations and funders, rather than advocating for private, for-profit systems in human services, while recognizing that there is no perfect solution to designing one-size-fits-all state cloud computing software platforms. However, in making these recommendations, I suggest opportunities to increase flexibility in the design of state IT systems to make it easier for community-based organizations to use and share data as well as to provide a level of public accountability in the process. The purpose of these recommendations is to address the needs of community-based organizations as they seek cloud computing software platforms that will allow them to collect data and provide reports to funders on actual community needs.

**Recommendation 1**

*State policymakers should develop flexible, interoperable software platforms for community-based organizations.* As states develop large-scale information infrastructures to increase interoperability between state agencies, they should also ensure that these same systems increase data access and sharing between community-based organizations and state agencies. The Illinois Framework for Healthcare and Human Services (2013) has a goal “to develop a sustainable foundation of interoperable systems and information sharing across seven state agencies to enable Illinois to provide greater coordination in client services” (Illinois Framework for Healthcare and Human Services, 2013). This massive information infrastructure project has the potential to break down sociotechnical silos between state human services agencies. It could also provide important benefits to community-based organizations by developing configurational software platforms like ETO.

The inclusion of interoperability in these statewide systems, I argue, would make it potentially easier for community-based organizations to do more with the data that they are already required to gather and report on for state agencies. Flexible state IT systems are also less expensive options for these organizations, which have been pressured into purchasing expensive SaaS platforms without receiving the financial support to acquire and maintain the for-profit cloud computing software systems. More concretely, state policymakers and their technical staff should develop ETO-like systems for community-based organizations. This would give organizations the ability to configure software modules based on the needs of the organizations and the communities they serve. In other words, state agencies should design flexible, configurable, and interoperable systems that can meet the information needs of both state agencies and the community-based organizations.

**Recommendation 2**

*State policymakers should engage community-based organizations as key stakeholders in the development of flexible, interoperable platforms.* The Illinois Framework’s stakeholder engagement process is an excellent model that other states should adopt. During the early months of the project, the Illinois Framework project leaders held a series of meetings to which community-based organizations like MESH were invited. This is not only a key aspect of the software development lifecycle, but it should also be considered as a foundational model for other states interested in developing flexible, interoperable software platforms for community-based organizations.

Busch (2011) argued that “participation is critical both for designing standards that are acceptable to all affected parties as well as for providing legitimacy to the standards themselves” (p. 303). These stakeholder meetings also provide opportunities for community-based organizations to surface the invisible work of their employees and to provide feedback about the ways in which state-mandated information systems can create less oppressive work environments for employees (e.g., reducing stress from surveillance) at community-based organizations, thus reducing harm.

**Recommendation 3**

*State policymakers should create legal guidelines for community-based organizations interested in using flexible, interoperable software to repurpose data.* State policymakers should work together with software
developers and community-based organizations to determine the sociotechnical and legal frameworks needed to make it easier for community-based organizations to access and utilize data from state-mandated information systems. In developing more flexible information infrastructures, state policymakers should engage with experts to determine current and potential legal challenges in this process. Busch (2011) explained that in the creation of any standard, it is necessary to delegate to subsidiary bodies whenever possible. If one of the goals of policymakers is to assist the public in reducing their reliance on public assistance, then one goal should be to anticipate how chronic yearly cuts to public funding impact community-based organizations and, in particular, how this impacts data access, use, and reporting needs to attract new sources of funding.

**Recommendation 4**

*State policymakers should increase funding for IT capacity within community-based organizations that are required to use state-mandated IT systems.* As my research has shown, increasing social and technical demands on community-based organizations like MESH, due to ongoing cuts to public funding, have made it increasingly difficult for these same organizations to support the IT demands placed on them by both public and private funders. If funders expect under-resourced community-based organizations to adopt increasingly sophisticated and expensive cloud computing systems in the era of big data, then funders should also expect to increase their own support for IT staff with the skills needed to utilize these systems, train staff, and keep them running.

In my study, I found that a lack of funding was the primary reason that the ETO software project ultimately failed. Public and private funders need to provide community-based organizations with the adequate funds to support the successful implementation of configurable cloud computing systems. MESH needed access to demographic data collected through state-mandated information systems to inform policymakers about community needs and gain new sources of funding during a time of chronic yearly cuts to public funding. However, important questions remain about the ability of community-based organizations to use information collected through state-mandated systems, particularly if the lack of interoperability between these cloud computing systems is not addressed.

**CONCLUSION**

In this paper, I presented findings from an ethnography of cloud computing in a community-based organization in East St. Louis, Illinois. I used an infrastructural approach to examine how the tensions between external stakeholder demands and internal organizational needs exposed broader social, political, and economic forces that ultimately shaped the ETO software at MESH. The purpose was to examine the relational aspects of computerization in a community-based organization in order to provide an alternative, and perhaps more down to earth, perspective to counter technological deterministic accounts of cloud computing.

I shared my observations and analyses of a heterogeneous group of social workers, managers, and directors who used cloud computing software platforms at work. I offered four recommendations toward a more flexible, interoperable, and equitable information infrastructure to help alleviate tensions between various stakeholders in human services computing projects. My hope is that the suggestions included in this research will begin a broader conversation about the challenges and opportunities of cloud computing and its application in support of a more just society.

**REFERENCES**


