THE SOCIAL SHAPING OF CLOUD COMPUTING: AN ETHNOGRAPHY OF INFRASTRUCTURE IN EAST ST. LOUIS, ILLINOIS

BY

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DISSERTATION

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Abstract

This study investigates the infrastructural tensions that shaped a cloud computing software implementation within 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. Previous studies have focused on the impact of computerization on social workers and welfare organizations. This research instead uses a "social shaping of technology" perspective to analyze the ways in which broader social, institutional, and technical factors shape information infrastructure and its consequences. This eleven-month ethnographic study provides an account of the everyday technology experiences of social workers, managers, and directors in a community-based organization as they used cloud computing services at work.

Three major findings emerged from the study: (1) The tensions between external stakeholder demands and internal organizational needs influenced decisions about how the cloud computing software was configured and implemented; (2) the lack of interoperability between state-mandated and for-profit cloud computing systems, at times, exacerbated these tensions; and (3) the agency of a diverse and resilient group of human services professionals played a significant role in shaping the cloud computing software implementation. In presenting this sociotechnical analysis of information infrastructure, informed by critical perspectives at the intersection of race, gender, class, and technology, this research makes a contribution to the field of library and information science by describing how networked information systems can fail to meet the needs of community-based organizations that provide state-funded public assistance programs. I argue that in order to develop successful information infrastructures in human

services organizations, cloud computing software platforms need to be flexible enough to both provide accountability to funders and meet the needs of community-based organizations.

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Introduction

> We have the emergence of this massive shift of computing….We call it "cloud computing." There are other terms for it. But to me, this is the story of our lifetime. It is the story that will define our careers and what we do, because this is going to go on for a long time.
>
> –Schmidt (2008).

In 2008, former Google CEO Eric Schmidt used the term *cloud computing* in a speech at IBM. Since that day, major newspapers have published scores of articles about the "shift of computing" described by Schmidt and its impact on people, businesses, and governments. For example, in 2009, the *Wall Street Journal* reported that companies across the technology industry were "jockeying to associate themselves with clouds." The same article reported that Merrill Lynch estimated revenues from cloud computing would reach $160 billion in 2011 (Fowler & Worthen, 2009). The *New York Times* painted a futuristic picture of cloud computing that illustrated how grandchildren would one day laugh at their grandparents as they talked about "life before cloud computing" (Meece, 2012). A year later, the *Wall Street Journal* described cloud computing as a part of a "New Industrial Revolution," detailing the ways in which it "threatens to shatter long-standing business models, upend global trade patterns and revive American industry" (Koten, 2013). These are just some of the many examples of the mainstream media's infatuation with cloud computing since Schmidt's speech in 2008.

The hype surrounding cloud computing can be characterized as technological determinism, which has been described as the seemingly inherent power of technology to change society. Technological determinism is 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 idea is connected to widespread beliefs about the nature of economic progress, concepts deeply embedded within the fabric of American society. This way of thinking about technology has incredible force in society. The history of U.S. capitalism, including recent shifts toward "informationalized capitalism" (Schiller, 2007) that have accelerated social inequality, has been deeply intertwined with this exaggerated rhetoric, often motivated by powerful marketing machines that propel its allure (e.g., see Marchand, 1998).

My study interrogates the technological deterministic thinking about cloud computing. Cloud computing can be understood as the use of remote servers and software applications to store, retrieve, and edit files on the Internet. The research uses a "social shaping of technology" perspective as part of its theoretical framework to investigate the broader social, political, and economic forces that shape cloud computing software and its consequences during implementation. Fleck (1994) defined implementation as "the process through which technical, organizational and financial resources are configured together to provide an efficiently operating system" (p. 640). The purpose of this study is to provide a deeper understanding of the human actors, including businesses and governments, and the nonhuman actors, such as networked information systems, that can influence how cloud computing software is configured within a social welfare organization. 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.

More concretely, this study examines the technological deterministic views of cloud computing among workers, managers, and directors at a community-based organization, which I am calling the Metro East Settlement House (MESH), in East St. Louis, Illinois. See Appendix A for more information about the organization's structure, including a list of its fifteen different

community-based programs, and key personnel mentioned in this study. 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. Community-based organizations have been defined as "human service organizations that provide services to residents of the community" (Illinois Department of Human Services, 2014b). Human services organizations are focused on assisting children, youth, adults, and seniors in low-income communities to meet their basic needs and other life challenges.

In contrast to Eubanks's (2011) study, for example, of the everyday technology experiences of female recipients of public assistance programs, my study is focused on the everyday technology experiences of human services providers. I chose to focus my research on providers and their experiences with cloud computing because I was given the extraordinary opportunity to work with MESH as volunteer project manager. As I detail in Chapter 3, the University of Illinois at Urbana-Champaign has had a long-term relationship with residents and community-based organizations in East St. Louis, Illinois. Through this ongoing community–university partnership, I was provided with the opportunity to support MESH as a volunteer in implementing a cloud computing software platform for their organization while using the fieldwork experience as the basis for this research.

Social informatics scholars have studied the introduction of computers in human services organizations since the 1970s. For example, in Kling's (1978) study of automated information systems in an urban welfare organization, he found that federal agencies and other funders benefited the most from computerization, but often at the expense of workers, managers, and welfare recipients. My research seeks to pursue this line of inquiry further by presenting a more recent ethnographic study of cloud computing in a community-based organization in East St.

Louis. However, there is a gap in the literature on the broader social, institutional, and technical forces shaping technology, and more specifically cloud computing, in human services organizations, particularly in U.S. industrial suburbs such as East St. Louis. Before I explain how my research question addresses this gap, I first define cloud computing as a basis for understanding my research problem, design, and methodological approach.

What Is Cloud Computing?

> "I have no idea what anyone is talking about," said Oracle Corp. Chief Executive Larry Ellison, when talking about cloud computing at a financial analyst conference in September. "It's really just complete gibberish. What is it?" He added: "When is this idiocy going to stop?"
>
> –Fowler and Worthen (2009)

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). Today, cloud computing is often described in terms of three types of services, which are shown in Table 1. Mosco (2014) explained, "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 powerful system is creating enormous privacy, security, labor, and environmental challenges—fundamental concerns in today's global networked society.

Table 1. Three Types of Cloud Computing Services

Source: Reprinted from National Institute of Standards and Technology (2011, pp. 2–3).

Service	**Description**
Software as a Service (SaaS)	The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.
Platform as a Service (PaaS)	The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.
Infrastructure as a Service (IaaS)	The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications, and possibly limited control of select networking components (e.g., host firewalls).

In short, cloud computing services give multiple users the ability to create, edit, store, and retrieve files on the Internet via remote servers. Google is perhaps the best-known example of a cloud computing company, with its popular applications such as Gmail, YouTube, and Google Drive (formerly Google Docs). Users can access these services regardless of device or location. Similar services can be offered as subscriptions, for which users pay monthly or yearly fees to store and retrieve files in the cloud. Understanding cloud computing is more important than ever because its infrastructural aspects are primarily responsible for the new "era of Big Data" (boyd & Crawford, 2011). Big data, along with cloud computing, has also been difficult to define. Mosco (2014) described big data as "the movement to analyze the increasingly vast amounts of information stored in multiple locations, but mainly online and primarily in the cloud" (p. 177). This era of distributed computing is motivated by "a deep government and industrial drive toward gathering and extracting maximal value from data, be it information that will lead to more targeted advertising, product design, traffic planning or criminal policing" (boyd & Crawford, 2011, p. 13). As a result, a new digital divide is emerging between those with and those without the tools, skills, and knowledge to make use, and sense, of such large quantities of digital information.

In addition to concerns about those with and without the ability to access and use cloud computing and big data, other questions arise that address longstanding debates within the field of STS. More concretely, what are the relationships between technology, designers, and users in the development of technology artifacts, and how do these connections ameliorate or perpetuate existing social inequalities? Woolgar's (1991) study of usability trials in the development of computers might provide a useful starting point. The author used the metaphor "machine as text" to investigate exactly how designers "configure" users through their reading of designers'

machines, peripherals, and technical documentation. Woolgar argued that a user's capacity to engage with computers is largely "structured and defined in relation to the machine" (p. 89). While the research is useful for engaging with the design and use of cloud computing, it has been criticized for its one-way orientation toward technology development (Mackay, Carne, Beynon-Davies, & Tudhope, 2000). Woolgar's ethnography of computing serves as a theoretical foundation for my study. I also consider cloud computing software as a "configurational technology," which requires substantial user input and learning based on both local knowledge and broader institutional contexts (Fleck, 1994). Therefore, I argue that cloud computing further complicates the technology–designer–user paradigm in STS by introducing additional ad hoc design choices during the implementation process. Why does this matter in the era of big data?

This study is urgent because I argue that poverty, technology, and social justice are becoming entangled in an era of big data. Community-based organizations that provide human services programs have begun to embrace software as a service (SaaS) applications to reduce paperwork, establish quality assurance, and become more attractive to new funders at a time of severe cuts to state and federal funding. In the process, several questions arise. For example, how do for-profit information systems interact with government-mandated information systems? How can cloud computing be used to promote the missions of community-based organizations? What are the sociotechnical and legal challenges facing community-based organizations as they seek to share public data on private cloud computing systems? These are just a few of the many questions that emerged during my fieldwork.

ETO Implementation at MESH

The object of study for my research is called ETO Impact™ (henceforth, ETO). It is a SaaS "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 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). The ETO software is an example of a configurational technology that can adapted to meet the needs of community-based organizations that provide human services programs. 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. During my fieldwork, I discovered that 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 why directors and IT staff wanted the ETO software. I later discovered that not everyone at MESH shared the directors' and IT staff members' excitement for yet another networked information system. These differing views of technology within the organization revealed interesting sociotechnical dynamics between workers, managers, directors, and funders, particularly as we configured and implemented the ETO cloud computing software.

It is also important to point out that my fieldwork focused primarily on only one aspect of cloud computing because ETO is an example of a SaaS application (see Table 1). However, I call my study an *ethnography of cloud computing* to explain how the configuration of ETO as a SaaS platform revealed a broader "web" (Kling & Scacchi, 1982, p. 7) of sociotechnical arrangements. In this study, I preferred the concept of infrastructure to describe these relational aspects of the cloud computing software, including broader social, political, and economic contexts. I also use the term *infrastructure* to explain my methodological approach to studying ETO as a type of cloud computing software. This approach allowed me to study how ETO worked in relationship to other cloud computing systems that were already in use at MESH. At the same time, I tried to focus on the broader social, institutional, and technical forces shaping the cloud computing software implementation at MESH.

Research Question

My study addresses a gap in the literature on the social shaping of cloud computing in human services by responding to the following research question: *How do political, economic,*

historical, and cultural contexts shape cloud computing and its consequences within a community-based organization in East St. Louis, Illinois? To answer this, I conducted an eleven-month ethnographic study of networked information systems at MESH. Key perspectives from social informatics (SI) and science and technology studies (STS), and informed by critical theoretical perspectives at the intersection of race, gender, class, and technology studies, have guided my fieldwork and analyses.

In the ethnographic account that follows, I detail three major findings that emerged during this study: (1) The tensions between external stakeholder demands and internal organizational needs significantly influenced how the cloud computing software was configured and implemented; (2) the lack of interoperability between state-mandated and for-profit cloud computing systems, at times, exacerbated these tensions; and (3) the agency of a diverse and resilient group of human services professionals played a significant role in shaping the cloud computing software. In presenting this infrastructural analysis, I describe the social, institutional, and technical forces shaping cloud computing systems in community-based organizations in U.S. industrial suburbs where high poverty rates exist.

Significance of the Study

This research makes a contribution to the field of library and information science by describing how networked information systems can fail to meet the needs of community-based organizations that provide state-funded public assistance programs. I argue that in order to develop successful information infrastructures in human services organizations, cloud computing software platforms need to be flexible enough to both provide accountability to funders and meet the needs of community-based organizations. I also believe this work makes a contribution by showing the "invisible work" (Star, 1999, p. 385) of human services professionals who are

required to enter data into state IT systems. In this study, I found an incredible amount of inefficiency in this process. I believe my dissertation helps to surface the challenges faced by organizations, particularly as they balance the expectations of funders with their own internal information needs.

My study also contributes new knowledge to the field of infrastructure studies by describing the consequences of what I call a *gateway failure*, or the absence of a gateway between subsystems. As a result, human services professionals at MESH were asked to enter the same data into two different networked information systems, thus decreasing efficiency and increasing the potential for data entry errors. I hope my research will help to further expand the space for infrastructure studies research within the field of library and information science by focusing on the cloud computing needs of community-based organizations in an era of big data. I also argue that the research is relevant in its approach to examining the social shaping of cloud computing software in a U.S. industrial suburb, which I believe is an important site to study how broader social, political, and economic forces uniquely shape information infrastructure in community-based organizations that administer state-funded public assistance programs.

My study ultimately seeks to provoke discussion among academics, practitioners, and policymakers about how to address issues of poverty, technology, and social justice in the information age—three issues I illuminate in my research. 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 prove to be useful to software developers, public policymakers, and community-based organizations interested in using cloud computing to help move people out of poverty.

Ethnography of Cloud Computing

The community-based organization described here is called the Metro East Settlement House, or 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. The ethnography of cloud computing that follows is 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 ETO 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 ETO software and its consequences.

This study is an example of an ethnography of infrastructure (Star, 1999). I used ethnographic methods to uncover the invisible, relational aspects of ETO as a large-scale computing project. I chose to use ethnography because I believe it was the best way to study how the cloud computing system works, as well as to examine the broader structural aspects that shape information infrastructure in a community-based organization. My ethnography was guided by theories from social informatics, STS, political economy of information, as well as critical theoretical perspectives at the intersection of race, gender, class, and technology studies.

Beyond the cloud, this research is about a larger struggle for those communities, like East St. Louis, that have been abandoned in transition from an industrial to an information society. In

this research, I argue that the implementation of cloud computing software, as a configurational technology (Fleck, 1994), provides an opportunity to study how social welfare organizations in low-income communities continue to struggle with the sociotechnical expectations of public and private funders. Ultimately, this is a story about the tensions between those who thirst for big data and those who live and work with the realities of poverty facing children and their families in the United States today. As the gap between the rich and the poor continues to widen in our society, I argue that information scholars have a social responsibility to help find solutions to problems that are often exacerbated by technological deterministic views about cloud computing systems. This study attempts to contribute new knowledge in an effort to address this persistent societal problem.

In Chapter 1, I introduce the concept of infrastructure as a theoretical framework for my study of cloud computing. I highlight the relationist (Sandvig, 2013) approach to infrastructure studies, which is concerned with the social, political, and economic forces, such as hidden costs (Jewett & Kling, 1991), that arise during the implementation of large-scale computing projects. I also maintain that studies within the "social shaping of technology" literature provide key conceptual tools for thinking about the configuration of cloud computing software as an infrastructural development. I call attention to critiques of the social constructivist perspective, particularly those works that have highlighted the political forces embedded within technology artifacts (Winner, 1986). Building on these critical perspectives, I return to studies of infrastructure focused on social justice concerns, particularly issues at the intersection of race, class, gender, and technology. The purpose is to provide a theoretical basis for understanding the agency of human services professionals at MESH as they shaped the cloud computing software.

The goal of the chapter is to establish the idea of cloud computing as an infrastructure, which is the theoretical perspective grounding my ethnographic approach.

In Chapter 2, I introduce my *ethnography of cloud computing* as the method used to study cloud computerization as part of an infrastructural development at MESH. I describe how my research approach was primarily influenced by Star's (1999) ethnography of infrastructure, which offers methodological tools for investigating the "invisible work" underlying large-scale information infrastructure development. I also introduce my ethnographic approach to infrastructure, which is informed by studies that have attempted to incorporate political economic analyses.

In Chapter 3, I introduce the political, economic, and historical conditions shaping East St. Louis as a U.S. industrial suburb, and how these played a role in shaping the cloud computing software as an information infrastructure. The chapter describes my entrance into the field, as is common in most ethnographies. The purpose is to provide additional background and context for understanding the place where my informants and I met infrastructure during the ETO project.

In Chapter 4, I describe the infrastructural tensions (Jackson, Edwards, Bowker, & Knobel, 2007) between external stakeholder demands and internal organizational needs during the ETO software implementation, which I argue ultimately led to the project's failure. By failure I mean, very specifically, that the project ran out of money and had to be put on hold until a later date when more money was available to get the project back up and running. I describe how pressures from state and private funders pushed MESH to adopt ETO to better track outcomes and to report to funders on the program's impact. I describe how external stakeholder demands were a key factor that shaped the ETO software implementation and its consequences at MESH.

In Chapter 5, I argue that the lack of interoperability between state management information systems and ETO, at times, exacerbated tensions between external demands and internal needs at MESH, which I detailed in the previous chapter. The concept of "gateways" (Egyedi, 2000) is used as a theoretical framework to help explain how ETO developed within the Teen REACH program at MESH. I show how different subsystems (i.e., paper forms, spreadsheets, state management information systems [MIS], and ETO) embodied separate political, operational, and technical domains, which did not always promote compatibility between them. More concretely, I maintain that the ETO project experienced what I call a *gateway failure*, or the absence of a gateway between subsystems. As a result, human services professionals in the Teen REACH program were asked to enter the same data into two different information systems, thus decreasing efficiency and increasing potential data entry errors.

Chapter 6 begins with a vignette to show how infrastructural tensions became visible during our software implementation meetings with human services professionals in the Providing a Sure Start (PASS) and Teen REACH programs. I describe how information systems failed the parent educators in the PASS program, particularly in accounting for their invisible work with low-income children and parents in East St. Louis. The second half of the chapter moves to focus on the ways in which the agency of social workers, managers, and directors at MESH played a significant role in shaping the cloud computing software.

In Chapter 7, I argue that if state policymakers require data to understand the needs of community-based organizations that provide state-funded 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. I draw upon Busch's (2011) framework for creating fair, equitable, and effective standards in the development of networked information systems. I do this by elaborating on the sociotechnical struggles between external stakeholder demands and internal organizational needs at MESH as human services professionals navigated a complex infrastructural terrain involving both human and nonhuman actors (Latour, 2005). I conclude with four recommendations for state policymakers, software developers, and community-based organizations interested in using cloud computing software to help move people out of poverty. The purpose is to both highlight the existing sociotechnical and legal challenges facing community-based organizations and to provide alternative paths forward in developing more flexible and configurable infrastructures.

CHAPTER ONE

Infrastructure as a Theoretical Framework

> Understanding the nature of infrastructural work involves unfolding the political, ethical, and social choices that have been made throughout its development.
>
> –Bowker, Baker, Millerand, and Ribes (2010, p. 99)

Introduction

This chapter introduces the concept of infrastructure as a way to think about cloud computing. I do this by reviewing research within social informatics (SI) and science and technology studies (STS) to construct the theoretical framework for my *ethnography of cloud computing*, which I introduce in the next chapter. I begin by reviewing the development of the relationist (Sandvig, 2013, pp. 86–108) approach to infrastructure studies. This perspective is concerned with the social, political, and economic forces, such as hidden costs (Jewett & Kling, 1991), that arise during the implementation of large-scale computing projects. I then explain how key contributions within the "social shaping of technology" literature (Mackay & Gillespie, 1992; MacKenzie & Wajcman, 1999; Williams and Edge, 1996) provide conceptual tools for thinking about the configuration of cloud computing software as an infrastructural process. Next, I review critiques of the social constructivist perspective, particularly those works that have called attention to the political forces embedded within technology artifacts (Winner, 1986). Building on these critical perspectives, I return to studies of infrastructure focused on social justice concerns, particularly issues at the intersection of race, class, gender, and technology. The goal of this chapter is to establish the idea of cloud computing as an infrastructure, which is the theoretical perspective grounding my ethnographic approach. The purpose is to develop a way of understanding not only how cloud computing works, but also for whom it works, and how the

ETO software might have developed another way given a different set of political, economic, historical, and cultural contexts.

Computerization as an Infrastructural Development

In this section, I describe how the idea of computing as infrastructure developed across the fields of SI and 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. 94). A "series of disasters" appeared to follow and characterize early computing projects (Sandvig, 2013, p. 94). Star and Bowker (2006) explained 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.

Early studies of computerization in organizational settings laid the foundation for what would later become the field of SI in the United States during the mid-1990s. Kling (2003) first used the term *social informatics* to describe the ways in which information technology (IT) shapes "organizational and social relations," as well as "the ways in which social forces influence the use and design of IT" (p. 2656). SI researchers have studied the impacts of computerization on work for over forty years; they just had not yet called it social informatics. For example, Kling (1978) looked at the impact of automation on urban welfare organizations. He found that "the agencies which utilized automated information systems were driven by the incentives provided by funders rather than by its aid in improving the efficacy of agency

operations" (p. 491). SI research has shown that the implementation of computers within organizations often has "unintended effects" (Sawyer & Tapia, 2002, p. 97).

Social informatics scholars laid the foundation for future research, which worked to advance the notion of computing as an information infrastructure (Bowker & Star, 1998; Bowker et al., 2010; Hanseth, Montiero, & 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. As the authors described:

> (i)…The infrastructure for supporting the focal computing resource and the organizational procedures by which it is organized and sustained are critical elements. (ii) Each computer-based service is provided through a set of structured computing resources and organized infrastructure. If this organization of essential resources is large and complex, computer-based systems are a form of social organization. Like any organization or institution, it is not necessarily neutral. (iii) There is no "human factor" which is specially separable from the delivery of computer-based information services. Much of the development and many of the routine operations of computer-based technologies hinge on many human judgments and actions carried out within complex, organized social settings. (p. 8)

This description makes three important points, which are key aspects of the relationist's conceptualization of infrastructure. First, the "webs model" (Kling & Scacchi, 1982, p. 7) provides a way to study the complex organizational contexts that shape computing projects, which, as Kling and Scacchi described, are inseparable from the technical aspects of computerization. Second, Kling and Scacchi recognized that computers, as relational systems,

are not neutral. Rather, politics, economics, and culture are deeply interwoven with technical forces that influence the design of computing. Third, Kling and Scacchi's infrastructural view of computing opens the door to study the related social, institutional, and technical processes that are often hidden from view during IT implementation. These three aspects encouraged critical thinking about infrastructure as a relational process that, as a result, can benefit some groups and not others. This point was also highlighted in Murphy and Pardeck's (1991) study of the computerization of human services, in which the authors mentioned that funders often benefit the most from computerization, but often at the expense of social workers, managers, and welfare recipients—a point also emphasized in Kling's (1978) study of computerization in urban welfare organizations.

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). Along with Kling and Scacchi's findings, the authors found that the human and organizational factors shaping computerization may have hidden costs when revealed (p. 263). The Kling and Scacchi and Jewett and Kling studies describe computerization 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). In 1996, while Susan Leigh Star was a professor at the Graduate School of Library and Information at the University of Illinois at Urbana-Champaign, she published a foundational paper in the *Journal of Information Systems* with Karen Ruhleder based

on their submission to the 1994 Computer Supported Cooperative Work (CSCW) conference proceedings. In the paper, Star and Ruhleder (1996) made a major contribution to the development of infrastructure studies by outlining what they believed were essential characteristics of infrastructure. They argued that infrastructure must be understood as having eight dimensions, as detailed in Table 2.

Table 2. The Eight Dimensions of Infrastructure

Source: Reprinted from Star and Ruhleder (1996, p. 113).

Dimension	Definition
Embeddedness.	Infrastructure is "sunk" into, inside of, other structures, social arrangements and technologies;
Transparency.	Infrastructure is transparent to use, in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly supports those tasks;
Reach or scope.	This may be either spatial or temporal—infrastructure has reach beyond a single event or one-site practice;
Learned as part of membership.	The taken-for-grantedness of artifacts and organizational arrangements is a sine qua non of membership in a community of practice (Lave and Wenger 1991; Star, in press). Strangers and outsiders encounter infrastructure as a target object to be learned about. New participants acquire a naturalized familiarity with its objects as they become members;
Links with conventions of practice.	Infrastructure both shapes and is shaped by the conventions of a community of practice, e.g. the ways that cycles of day-night work are affected by and affect electrical power rates and needs. Generations of typists have learned the QWERTY keyboard; its limitations are inherited by the computer keyboard and thence by the design of today's computer furniture (Becker 1982);
Embodiment of standards.	Modified by scope and often by conflicting conventions, infrastructure takes on transparency by plugging into other infrastructures and tools in a standardized fashion;
Built on an installed base	Infrastructure does not grow de novo: it wrestles with the "inertia of the installed base" and inherits strengths and limitations from that base. Optical fibers run along old railroad lines; new systems are designed for backward-compatibility; and failing to account for these constraints may be fatal or distorting to new development processes (Monteiro et al., 1994);
Becomes visible upon breakdown.	The normally invisible quality of working infrastructure becomes visible when it breaks; the server is down, the bridge washes out, there is a power blackout. Even when there are back-up mechanisms or procedures, their existence further highlights the now-visible infrastructure.

Star and Ruhleder (1996) explained that infrastructure is formed by the configuration of these eight dimensions. This perspective is relational because it is dependent on what the authors described as "organized practices." For example, the authors explain that within a given cultural context, "the cook considers the water system a piece of working infrastructure integral to making dinner" (p. 113). In the context of computing, organized practices might include the ways in which a software developer considers "gadgets, servers, cards, and plugs" (MacKenzie, 2003, pp. 367–368) as pieces of infrastructure that support software development projects. 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 tensions between various actors in the social shaping of cloud computing software in a community-based organization that provides government- and private-funded social welfare programs. 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

In this section, I introduce the social shaping of technology as 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. STS developed over the twentieth century to provide scholars and practitioners with theories and methods for investigating technology change in a variety of settings. Bijker and Pinch (2012) explained that before the 1980s, the "social studies of technology was not a legitimate field of inquiry. The

major journal within the STS field, *Social Studies of Science*, did not publish work on how technological artifacts were developed and changed" (p. xiv). STS is largely concerned with technological development as a complex arrangement of sociotechnical factors. Social shaping of technology studies have included: the evolution of large technical systems, such as electrical infrastructure; the invention of personal computing; the social shaping of ballistics; the domestication of technology, such as ovens; reproductive technology; and the development of race and the Internet as social constructs (e.g., see Mackenzie & Wajcman, 1999). Scholars working in this tradition often use sociological, anthropological, and historical methods to explain how a diversity of human and nonhuman actors interact to shape and stabilize technology artifacts in a range of social settings.

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 been criticized because of its apparent lack of boundaries and shared questions within the field:

> What constitutes social shaping research? What are the differences within SST [social shaping of technology]? What is the relationship between SST and other areas of social analysis of technology? [Because of the confusion surrounding SST's identity and claims,] "SST" is often taken to be synonymous with one particular approach—for example the social construction of technology—or more generally with the sociological study of technology. (Williams & Edge, 1996, p. 866)

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, often in unintended directions, which is an 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.

Bijker and Pinch (2012) described three perspectives within STS that share an emphasis on *social constructivism*, or the process in which technologies are socially constructed within a complex ecology of actors. In the next section, I review key works of scholarship that provide ways of thinking about how everyday technologies might have evolved differently under different social, political, and economic circumstances. I discuss large technical systems (LTS), actor-network theory (ANT), and the social construction of technology (SCOT) before turning to critiques of social constructivism. My intention in reviewing this literature is to use it as a platform from which to develop a broader conceptualization of cloud computing as an infrastructure.

Large Technical Systems (LTS)

In Hughes's (1983) classic work on the history of electrification, he argued that infrastructural developments are best understood by investigating the social, political, and economic contexts in which large technical systems (LTS) become enmeshed in society. In this way, Hughes's "systems" approach opened up possibilities for considering "the impact of society, or culture, on the shape of technology," which "had been virtually ignored" in previous studies of technology (p. x). His work contributed to the idea of infrastructure as a cultural artifact. In Bijker et al. (2012), Hughes wrote, "Technological systems contain messy, complex, problem-solving components. They are both socially constructed and society shaping.… Because they are socially constructed and adapted in order to function in systems, natural resources, such as coal mines, also qualify as system artifacts" (p. 45). And, as Sandvig (2013) explained, Hughes's work called attention to the "political and social choices in arenas that had previously seemed only technical and mundane" (p. 98). LTS as a theoretical framework can assist researchers in considering how the Internet as an infrastructure (Sandvig, 2013, pp. 98–99) evolves—and perhaps even devolves—over time.

Hughes emphasized the role of economics in shaping technology. He introduced the term *reverse salient* to describe the phenomenon whereby a component of an expanding system "does not march along harmoniously with other components. As the systems evolves toward a goal, some components fall behind or out of line" (p. 79). His work provided a way of understanding individual technological artifacts as part of a whole system. The LTS perspective, therefore, can contribute ways of thinking about computing projects as cultural artifacts, which are shaped by broader social, political, and economic forces. Other STS scholars have elaborated on Hughes's

systems approach by introducing new ways to study a diverse ecology of actors, both human and nonhuman, in the development of sociotechnical infrastructure.

Actor-Network Theory (ANT)

Latour, Callon, and Law, among others, developed actor-network theory (ANT) as an attempt to provide scientific rigor to social studies of science and technology. ANT conceptualized technology as an embodiment of diverse material forms, which Law (1992) described as a "heterogeneous network."

> The actor-network answer is that it is the end product of a lot of hard work in which heterogeneous bits and pieces—test tubes, reagents, organisms, skilled hands, scanning electron microscopes, radiation monitors, other scientists, articles, computer terminals, and all the rest—that would like to make off on their own are juxtaposed into a patterned network which overcomes their resistance. In short, it is a material matter but also a matter of organising and ordering those materials. (p. 379)

Bijker and Pinch (2012) distinguished ANT from the social construction of technology (SCOT) by characterizing ANT as the study of technology that considers both human actors and nonhuman actors, or "actants," in a series of associations that motivate technological change. "The fundamental distinction between human actors and the rest of the world is transcended with the concept of actant, by which both human and nonhuman entities can have agency" (Bijker & Pinch, 2012, p. xx). Law's (1991) anthology of ANT perspectives sheds light on how scientific and technological developments could be explained. In it, Callon (1991) argued that in order to understand technological change, one must, for example, reconceptualize the role of engineers. "All groups, actors and intermediaries describe a network: they identify and define other groups, actors, and intermediaries, together with the relationships that bring these together." And, he explained, "For this reason I speak of *actor-networks*: for an actor is also a network" (p. 142).

More recently, Sandvig (2013) argued that "infrastructure" is "the new network." He explained that infrastructure research represents a vibrant approach to Internet studies much "in the same way that equally diffuse and inconsistently applied concepts like 'network' have in the past" (p. 6). ANT's view of networks provided me with an important framework for analyzing, for example, how paper forms, spreadsheets, and management information systems, as well as state policymakers, software developers, and community-based organizations, played a role in shaping the cloud computing software as a sociotechnical system.

Social Construction of Technology (SCOT)

Kline and Pinch (1999) explained that social construction of technology (SCOT) is different from other social constructivist approaches in that it is centrally concerned with the idea of "relevant social groups," or those groups of actors involved in the shaping of technology artifacts that work to stabilize or bring "closure" to technological developments. SCOT scholars are interested in the design and development of technological artifacts, "which are seen as embodying social artifacts" (Mackay & Gillespie, 1992, p. 686). MacKenzie and Wajcman (1999) recognized the theoretical strength of SCOT's use of *interpretive flexibility*, which "refers to the way in which different groups of people involved with a technology…can have very different understandings of that technology, including different understandings of its physical characteristics" (p. 21). The SCOT approach is useful to infrastructure studies because of its interest in understanding how things work. "Bijker and Pinch's focus is not just on the symbolic meaning of technologies (which in cases like motorcars or aircraft is subject to obvious social variation) but includes also variation in criteria for judging whether a technology 'works'" (MacKenzie & Wajcman, 1999, p. 21). In addition, Winner (1993) has argued that SCOT can be quite practical for studying the "dynamics of technological change" by looking "very closely at

the artifacts and varieties of technical knowledge in question and the social actors whose activities affect their development" (p. 364). However, the SCOT approach has been contrasted with sociological perspectives that focus on the role of politics or economics—or race, gender, and class—in the construction of technology. As Bijker and Pinch (2012) made clear, "to be sure, conventional sociology and SCOTS do not always make the best bedfellows" (p. xx).

Critiques of Social Constructivism

In this section, I introduce critical responses to the social constructivist frameworks previously discussed (LTS, ANT, and SCOT) that interrogate the apolitical aspects of technological developments. Mackay and Gillespie (1992) described this second broad approach within the social shaping of technology literature as being concerned with how the "wider, 'socio-economic' forces (for example, the decision to invest in particular lines of research and development) affect the nature of technological problems and solutions" (p. 687). Winner (1993) argued that social constructivists such as Bijker et al. (2012) failed to address four important considerations: consequences, irrelevant social groups, structure and culture, and what it all means. He asked: "Who says what are relevant social groups and social interests? What about groups that have no voice but that, nevertheless, will be affected by the results of technological change? What of groups that have been suppressed or deliberately excluded?" (1993, p. 369). Staudenmaier's (1989) concept of impact constituency provides another way to think about Winner's concept of irrelevant social groups. *Impact constituency* refers to the "people and institutions that lose because of the design of a new technology" (p. 156). This group could be, for example, workers who lose their jobs and factories that shutter as a result of computerization. Staudenmaier's second group includes "those who share in the costs of a technology without receiving its benefits." He uses the example from Detroit where "tax revenues support freeway

networks at the expense of nonautomotive transit systems," which in turn can lead to the destruction of homes and "walking patterns in neighborhoods in which people live" (p. 156).

More recently, scholars have responded to Winner's (1993) concerns about social constructivism's failings in several STS studies. For example, Klein and Kleinman (2002) argued that social constructivists can benefit from incorporating more "broadly structural concepts" to provide a method for examining how political economy shapes the "design, development, and transformation of technology" (p. 29). The authors argued for a reconceptualization of social constructivism that seeks to investigate both "social structure and technological change" (p. 48). In another study, Pavone and Arias (2011) looked at how the political economy in Spain shaped the development of genetic testing technologies. The authors described the ways in which "the main legislative and institutional changes" (p. 237) affected the implementation phase in the development of reproductive technologies. This literature builds on earlier science and technology studies that looked at how the power and capacity of groups and institutions influenced the development of ICTs. For example, Sætnan (1991) studied the failed ICT implementation of a production planning system within a hospital in Norway using actor-network-theory and labor process theory. These three studies point to the ways in which the tension between structure and culture can provide an important point of departure for studying how technology develops, for whom, and at what cost to different groups in society.

My work is also located within this critical strand of scholarship that investigates the ways in which the politics of technology can either "preserve or alter" (Williams & Edge, 1996, p. 867) existing inequalities at the intersection of race, class, and gender. My research also considers work that has attempted to combine ethnography with political economic analyses. These studies, described in more detail in the following section, provided me with ways of

looking at how the social, political, and economic forces in a low-income industrial suburb such as East St. Louis shape information infrastructure and its consequences.

Social Justice and Infrastructure Studies

In this final section, I further develop my theoretical framework to include a focus on social justice concerns. In analyzing the social, political, and economic forces shaping cloud computing in East St. Louis, I have used theoretical frameworks from infrastructure studies to guide my thinking about large-scale computing projects. More specifically, I have been influenced by Star's (1999) call to "study boring things" (p. 377), not as a mundane approach to cloud computing but rather as a critical theoretical and methodological approach to information studies. Influenced by her teacher Anslem Strauss, Star believed that studying understudied areas, such as infrastructure, "opened up a more ecological understanding of workplaces, materiality, and interaction, and underpinned a social justice agenda by valorizing previously neglected people and things" (p. 379). In their 1999 article on computer-supported cooperative work systems, Star and Strauss explained, "In recent years, there has been such a large-scale shift in how careers, corporations and the public sector interrelate.… These shifts, viewed broadly, form the conditions for a new arena where the relationship between visible and invisible work is challenged" (p. 11). More recently, Star (2007) used the term *orphans of infrastructure* to refer to those "individual groups and forms of social and professional practice that fit uneasily or not at all within the emerging infrastructural paradigm." Edwards, Jackson, Bowker, and Knobel (2007) underscored the urgency of this research approach when they wrote, "Being 'orphaned' by infrastructure is therefore to be on the receiving end of a significant exercise of exclusionary power, which post-hoc accommodations may never overcome" (p. 25). The authors point to

examples of old buildings that have been retro-fitted with ramps and elevators, but fall short of accommodating people with disabilities (p. 25).

The political economy of information (Mosco & Wasko, 1988; Schiller, 2007; Schiller, 1981, 1996) and feminist theories of technology (Cowan, 1983; Eubanks, 2011; Wajcman, 1991) have contributed key perspectives for analyzing the social shaping of computerization in East St. Louis. I will now briefly review a few key works in political economy of information before returning to studies that have considered the agency of individuals and groups in shaping information infrastructure and its outcomes.

Political Economy of Information

Critical political economy scholars are concerned with the ways in which "power is used to shape the production, distribution, and use of information as a commodity" in capitalist society (Mosco, 1996, p. 3). I use the term *critical political economy* here to differentiate the scholars discussed in my study from mainstream economists. As Golding and Murdock (2000) explained, critical political economy differs in four ways:

> First, it is holistic; second, it is historical; third, it is centrally concerned with the balance between capitalist enterprise and public intervention; and finally—and perhaps most importantly of all—it goes beyond technical issues of efficiency to engage with basic moral questions of justice, equity and the public good. (p. 73)

Critical political economic analyses expose the social and institutional aspects of information systems to draw attention to systems of social control, such as the concentration of media ownership, which often serve to reinforce existing power structures within a system of global capitalism. The political economy of information also provides a framework for considering the "distinction between information as a resource and information as a commodity" (Schiller, 2007, pp. 7–8) within theories of the information society. As Dan Schiller (2007) explained:

> A resource is something of actual or potential use. That is all. The soil, the sea, the spectrum are resources. But all resources are not commodities. Only under particular conditions can they be transformed into commodities. A resource is anything of use, anytime, anywhere, to anyone; but a commodity bears the stamp of society and of history in its very core. (p. 8)

Schiller argued that those concerned with the increasing corporatization of information should follow "the information commodity," which "has become the prime site of contemporary expansion—such as it is—within and for the world market system" (p. 16). In this way, the author explained technological and social change not as a revolution, but rather as part of a transition to what he calls "informationalized capitalism" (p. xiv), in which "communications and information have come to infuse the more encompassing process of capitalist development" (p. xiv). Herbert Schiller (1981) described how ICTs "have made it possible to generate, process, assemble, store and disseminate enormous quantities of information.… In the drive toward privatization of information, the principle that 'information is a commodity' plays a prominent role" (p. 48). A critical political economist might focus on how Internet marketing firms use web-based technologies to commoditize personal information in an effort to advance a networked information economy.

Magnet's (2011) study of biometrics in public assistance programs called attention to the political economy of biometric technology that was claimed to be used to reduce fraud. Magnet found that most biometric efforts had less to do with reducing fraud and more to do with the biometric industry's expansion from scanning criminals to scanning welfare recipients. Her work raised awareness about the use of biometrics in public assistance programs as an extension of the belief about welfare recipients as criminals. In her study, Magnet cites Eubanks's (2006) research on the use of computers "in the surveillance of welfare receipt," saying that "welfare

compels recipients to reveal every part of their personal lives, similar to the prison industrial complex" (p. 84). The study of computing as an infrastructure can provide ways to investigate technology as a form of power in society. This conception shares many of the beliefs about the social shaping of technology previously discussed, but also focuses on the development of infrastructure as a social justice concern.

Race, Class, Gender, and Infrastructure

Feminist theories of technology (e.g., see Cowan, 1983; Eubanks, 2011; Wajcman, 1991) further expose how power shapes infrastructure by emphasizing the "significance of everyday life technologies" (Wajcman, 2010, p. 144). Wajcman, for example, has called attention to the ways in which gender and technology are mutually shaping. In her critique of social constructivism, she argued that "women's systematic absence from the sites of observable conflict over the direction of technological developments is therefore as indicative of the mobilisation of gender interests as is the presence of other actors." She argued that feminist studies of technology have "clearly demonstrated that the marginalisation of women from the technological community has a profound influence on the design, technical content and use of artefacts" (p. 146). I have been particularly influenced by feminist scholars, such as Eubanks (2007, 2011), who have argued for a reconceptualization of commonly held sociotechnical beliefs, such as the digital divide.

In her study of technology, poverty, and social justice at the YWCA in upstate New York, Eubanks (2011) used ethnographic methods to investigate the values, beliefs, and behaviors of women as they challenged normative assumptions about the digital divide, which U.S. policymakers have referred to as the gap between the information haves and have nots (NTIA, 1995, 1998, 1999, 2000). Eubanks found that the women of the YWCA developed

alternative articulations of the digital divide in response to common misconceptions among academics, practitioners, policymakers, and activists. As Eubanks (2011) explained, "Seeing high-tech equity only as broadly shared access to existing technological products ignores other social values, neglects decision-making processes, sees citizens only as consumers, and ignores the operation of institutions and social structures" (p. 26). She argued that U.S. digital divide policy has largely focused on attempts to "'fit' marginalized people into the information society" (p. 35). If academics, practitioners, and policymakers want to achieve a more just society, Eubanks argued, then a significant shift is needed away from distribution as a policy response and toward a deeper understanding of the ways in which oppression impacts social, and thus digital, inequality in the information age.

Scholars have argued that race, class, and gender must be seen as "interlocking categories of experience that affect all aspects of human life; they simultaneously structure the experiences of all people in society" (Anderson & Collins, 1995, p. xi). These socially constructed classifications "become significant when they operate to explicitly *disadvantage* the victims; because the *privileging* of whiteness or maleness is implicit, it is generally not perceived at all" (Crenshaw, 2000, p. 218). Anderson and Collins (1995) cautioned against seeing race, class, and gender as part of an "additive model" that studies their effects on the human experience independently. The additive model views women and people of color as victims, and it fails to analyze the social structures "that shape the experiences of all groups." The authors suggest the "matrix of domination" (Collins, 2000) as a preferred approach that provides a way to study the "multiple, interlocking levels of domination that stem from the societal configurations of race, class, and gender relations" (p. xi). Black feminist scholarship has grown to generate interest among women and men. Themes from Black feminist scholarship have introduced me, as a

White male information scholar, to multiple ways of knowing about how information systems can fail to acknowledge "invisible work" (Star, 1999) in human services.

In particular, I describe how networked information systems failed to account for the everyday experiences of "parent educators" in the Providing a Sure Start program at MESH. My observations and analyses of this sociotechnical failure are rooted in infrastructure studies and informed by technofeminism and Black feminist studies. These perspectives opened up opportunities in my study to observe how the intersections of race, class, and gender surfaced several unique challenges and opportunities for human services professionals at MESH as they described their everyday experiences with technology at work. Infrastructure studies also furnished an intellectual space in which the agency of "impact constituencies" (Staudenmaier, 1989) could be discussed. However, rather than adopting a deficit-based perspective, I argue that an asset-based approach (Rhinesmith, 2012) to high-tech equity can uncover the ecology of actors not often mentioned in social constructivist studies, particularly those individuals in low-income communities left in the wake of the "information revolution" (Wilson, 2004). An asset-based perspective provides a way to study and highlight the agency of so-called nonusers of technology (Brock, Kvasny, & Hales, 2010; Dailey et al., 2010; Eubanks, 2011; Pinkett, 2003; Schuler, 1996). Community assets can emerge as an important point of departure for investigating not only how people adopt technology, but also in understanding how people's everyday experiences with technology—both directly and/or indirectly, for example, as negative externalities—can provide a rich beginning for investigating computerization as an infrastructural process.

STS scholars have called attention to the ways in which "irrelevant" social groups (Winner, 1993) or nonusers of technology (Wyatt, 2003) matter in appropriating technology

(Eglash, 2004). As Sandvig (2012) explained, "Skilled designers are usually the ones who get to design and modify technology with permission, so most appropriation work involves users or otherwise non-traditional technology designers" (p. 192). Therefore, power and privilege have played a direct role in the historical development of technological innovations. Eglash (2004) explained that the primary importance of stories of technological appropriations "is in terms of their potential contribution to sociopolitical resistance and social reconfiguration" (p. x). However, as Sandvig (2012) cautioned, "if not handled delicately," celebrations of technological appropriation "can sound fatally patronizing, but handled well [they give] students of technology and social justice a chance for celebration and optimism in a circumstance where these are rarely found" (p. 192). Sandvig's study played a significant role in guiding my ethnographic research.

In his richly described study of indigenous Internet infrastructure, Sandvig (2012) carefully detailed the ways that user-driven innovation and appropriation supported the infrastructural developments. Sandvig's ethnography of infrastructure (Star, 1999) followed the unfolding of the Tribal Digital Village (TDV) solar wireless Internet distribution network, a partnership between the University of California–San Diego and the tribal governments of southern California. Sandvig (2012) described TDV as a success and reported that 100 percent of residents on the Santa Ysabel Indian Reservation said they used it daily (p. 184). The study is significant because although the technology implementation was wrought with failures and complexities, "the tribe themselves were transformed from users to producers: they now self-provide telecommunications services via TDV. In the process they have pioneered new configurations and assemblies of equipment and protocol stacks that are innovative among their peers, and copied" (p. 190). Sandvig's (2012) ethnography of infrastructure was foundational to

my study of cloud computerization in East St. Louis because it focuses on the critical role of indigenous knowledge (Eglash, 2004) in shaping how a particular technology works.

In this section, I have tried to show how critical theoretical perspectives informed my approach to infrastructure as a theoretical framework for my research. This approach puts social justice at the center in the design and implementation of computing projects and represents a critical underlying framework that has guided my ethnography of cloud computing, which is described in the next chapter.

Conclusion

In this chapter, I introduced the concept of *infrastructure* to describe my theoretical approach for my study of cloud computing. I reviewed key works from SI and STS to begin constructing the theoretical framework for my ethnography of cloud computing, which I introduce in the next chapter. I then highlighted critical theoretical perspectives from political economy of information studies and feminist theories of technology to show how the social shaping of cloud computing in human services should be understood as a site of struggle between competing interests. The goal was to establish the idea of cloud computing as an infrastructure, which is the theoretical perspective grounding my ethnographic approach. In the next chapter, I turn from a view of infrastructure as theory to its application as method within the field of information studies.

CHAPTER TWO

Ethnography of Infrastructure as a Method

> Finding the invisible work in information systems require[s] looking for these processes in the traces left behind by coders, designers, and users of systems.
>
> –Star (1999, p. 385)

Introduction

"Where or in what place do infrastructures and individuals meet?" This question was central to Mackenzie's (2003) study of software design in rural Australia. The research was Mackenzie's attempt to respond to Bowker and Star's (1999) call to study "how it is that individuals and communities meet infrastructure" (p. 33). Bowker and Star argued that information infrastructures disappear when they become stable and usable, thus making it more difficult to understand how they developed. Therefore, they argued, methodological attention is needed in the social sciences to understand how "political and semantic conflicts" shape infrastructural developments (p. 33). Mackenzie focused his observations on the "meeting between individuals, communities and infrastructure in the context of software that manages telecommunications infrastructure" (p. 366). He found that the concept of collective imagining, borrowing from Appadurai (1996), is useful in helping individuals and groups to make "connections between disparate materials such as telephone lines and computers" (Mackenzie, 2003, p. 367) in the development of software projects. Mackenzie argued that the ethnography of infrastructure is a significant methodological approach, when viewed in this way, because it can provide tools to investigate how imagined "detours, torsions, and convoluted trajectories" shape technology developments (p. 383). This chapter and my research as a whole seek to join this methodological conversation. I provide additional background and context for understanding

where the individuals introduced in this and subsequent chapters met infrastructure and how these meetings shaped the cloud computing software.

I introduce the idea of infrastructure as a method to observe how social, institutional, and technical forces shaped cloud computerization within a community-based organization in East St. Louis. My approach is primarily influenced by Star's (1999) ethnography of infrastructure, which offers methodological tools for investigating the invisible work underlying large-scale information infrastructure development. As I described in Chapter 1, my research method is focused on observing and analyzing the relational aspects, or webs (Kling & Scacchi, 1982), that shape information technology projects, particularly during the implementation phase. This is because implementation requires significant decisions to be made about how software is configured to meet the needs of multiple stakeholders. I also introduce my ethnographic approach to infrastructure, which is informed by studies that have attempted to incorporate political economic analyses.

I begin by describing the value of ethnography of infrastructure as a method. Then I discuss the details of my research design and my analytical approach, which are both informed by ethnographic work within sociology and cultural anthropology. I describe my approach to investigating how human services professionals met infrastructure, which was informed by Bowker and Star's (1999) and Mackenzie's (2003) research. As Bowker and Star (1999) explained, an understanding of infrastructure includes the following points:

- A historical process of development of many tools, arranged for a wide variety of uses, and made to work in concert
- A practical match among routines of work practice, technology, and wider scale organizational and technical resources
- A rich set of negotiated compromises ranging from epistemology to data entry that is both available and transparent to communities of users

- A negotiated order in which all of the above, recursively, can function together" (p. 34)

I argue that in order to understand how the cloud computing software developed in my study, it is critical to understand the history of East St. Louis as an industrial suburb. I emphasize this important political economic context as part of my sociohistorical analysis of infrastructure, which I introduce in the next chapter. The role of place is essential to this approach. As I previously mentioned, the concept of place was also foundational to Mackenzie's (2003) research question. In his study, he explained that the "notion of *locality* plays a vital role in situating scientific knowledges, practices, and things" (p. 366). The goal in adopting this methodological orientation is to understand how place becomes "an active outcome of social life" (Mackenzie, 2003, p. 367).

Wolcott (1999) emphasized the role of place more broadly in ethnographic research. "Place, in the sense of venturing someplace else, was important to the early ethnographers because it virtually assured studying among those different from oneself" (p. 33). Although ethnographies have evolved over the century from studies of distant cultures, including the Trobriand people in New Guinea (Malinowski, 1922) and cockfighting in Bali (Geertz, 1973a), toward more recent Internet studies of massive multiplayer online games (Taylor, 2006) and the social lives of networked teens (boyd, 2014), *place*—physical and/or virtual—continues to play a central role in understanding the underlying infrastructures that both shape and are shaped by people's talk and actions in particular locations. How to study the invisible forces that shape culture and technology together becomes an exciting point of departure for ethnographers of infrastructure.

The Value of Ethnography of Infrastructure

Ethnography of infrastructure (Star, 1999) was a valuable method for pursuing my research question because of its strength in connecting macro-level processes to local consequences. I begin by discussing how it might be viewed within the context of traditional ethnographic studies. Then I use the concept of configurational technology (Fleck, 1994) as a way to describe the ETO software. In particular, I discuss how this perspective facilitated a way of looking at cloud computing software as an infrastructural process. I conclude by focusing on the value of ethnography of infrastructure in studying relationships between technology, designers, and users, and how this affected my research.

Traditionally, ethnography was considered to be the outcome or product of field research conducted by anthropologists. More recently, researchers in many disciplines have used the phrase "doing ethnography" as shorthand for "describing how they intend to gather data, without necessarily suggesting or implying, and certainly without promising, that the outcome of their efforts will be framed as ethnography" (Wolcott, 1999, p. 41). Ethnography, as both process and product, has been a popular approach within the field of STS for many years. For example, Latour and Woolgar's (1979, 1986) study of knowledge production in laboratory science embraced ethnography. As the authors explained, the goal of the anthropological observer is to systematically order and report observations, which is "one of the basic principles of scientific enquiry" (1986, p. 43). In gaining entry to a new cultural environment, such as a scientific laboratory, Latour and Woolgar explained that the observer's role is to "steer a middle path between the two extreme roles of total newcomer (an unattainable ideal) and that of complete participant (who in going native is unable usefully to communicate to his community of fellow observers)" (p. 44). In using participant observation for my study, through my job as a volunteer

project manager, I knew that my role was to provide an account that would be of interest not only to social welfare workers, managers, and directors at MESH, but also to those who are not familiar with the infrastructures that support these services. In addition, my ethnography of infrastructure was valuable because it led me to develop a way of looking (Wolcott, 1999) at what some might consider to be the "boring things" (Star, 1999, p. 377) that helped me understand and articulate not only how cloud computing works, but also the underlying relational aspects that directed its development and 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, 1973b) 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 ETO software.

Studying Configurational Technology

My ethnography, as a product, seeks to tell a story about the social shaping of technology and its consequences in East St. Louis, as an industrial suburb. Herein, I write about cloud computing as a configurational technology. Fleck (1994) explained that configurational

technology requires substantial user input based on both local knowledge and broader institutional contexts. My ethnographic account focuses on cloud computerization as an infrastructural process that relied on a number of sociotechnical factors. As Bowker and Star (1999) explained, "Information infrastructure is a tricky thing to analyze.… The easier they are to use, the harder they are to see" (p. 33). However, in my research, because the ETO software was never fully implemented during my fieldwork, its relational aspects of infrastructure were more visible than they might have been had they become fully "sunk into or inside of other structures, social arrangements, and technologies" (Star, 1999, p. 381). This leads to my central point of the value of ethnography of infrastructure. The ethnography of cloud computing presents an exciting opportunity to study infrastructure because the software had not been fully developed. Therefore, researching the implementation phase of cloud computing software allowed me to observe how specific choices in this process represent *values* that can become embedded, and in some cases even reproduced, into the cloud computing software as part of its infrastructure.

Although the cloud computing software that I studied had many options built into it, like most configurational technology, it also had built-in constraints. More concretely, I asked myself repeatedly throughout the study: What is the relationship between technology, designers, and users in the development of ETO, and how do these connections ameliorate or perpetuate existing social inequalities?

Woolgar's (1991) study of usability trials in the development of computers provided my ethnography of infrastructure with a useful starting point. The author used the metaphor "machine as text" to investigate exactly how designers "configure" users through their reading of designers' machines, peripherals, and technical documentation. Woolgar argued that a user's

capacity to engage with computers is largely "structured and defined in relation to the machine" (p. 89). While the research is useful for engaging with the design and use of cloud computing, it has been criticized for its one-way orientation toward technology development (Mackay et al., 2000). Woolgar's ethnography of computing serves as a key theoretical and methodological foundation for this chapter. Therefore, I argue that cloud computing further complicates the technology–designer–user paradigm in STS by introducing additional ad hoc design choices during the implementation process.

My ethnography of cloud computing was sensitive to the configurational aspects of the system, while focusing on the broader social, political, and economic forces that shaped the cloud computing software at MESH. My approach to the ethnography of infrastructure as a method was focused not on representing the symbolic aspects of cloud computing, but rather on describing how it worked (Sandvig, 2013). By using ethnography in this way, I was able to focus my fieldwork efforts on observing and engaging in conversations about the "hidden costs" (Jewett & Kling, 1991), such as additional skills, time, funding, and organizational capacity, needed to successfully implement the ETO software.

The Politics of Ethnography

I now turn to briefly consider the politics of ethnography as a method. My intention is to describe how an epistemological shift in anthropology opened up possibilities for incorporating more critical perspectives, such as political economy and feminism, into ethnographic inquiry. I begin by detailing the shift in thinking about ethnography from an authoritarian regime to an emancipatory approach. I then introduce two studies, in particular, that have influenced my approach to ethnography; these studies sought to incorporate political economic analyses within

ethnographic projects. I conclude by describing how feminist studies of technology and participatory action research have also shaped my methodological approach to the ethnography of infrastructure.

Gitlin, Siegel, and Boru (1989) argued, "Ethnography has never been a neutral undertaking" (p. 239). The authors explained that rather than worrying about debates over reliability and validity, ethnographers should "strive to put the political moment back in the methodological debate by considering the potential of ethnography to foster emancipatory change" (p. 238). Marcus and Fischer (1986) described the "crisis of representation" in the field of anthropology beginning in the 1960s. Modern ethnographers identified that mid- to late nineteenth century conceptions of human populations as "savage," "primitive," or "exotic" were problematic (Marcus & Fisher, 1986, pp. 17–18). This group of scholars argued that concepts such as "power, resistance, institutional practices, and innovation" (Clifford & Marcus, 1986, p. 2) should become the new foundational concerns of ethnographic endeavors. As Clifford and Marcus (1986) argued,

> Ethnography is actively situated *between* powerful systems of meaning. It poses its questions at the boundaries of civilizations, cultures, classes, races, and genders. Ethnography decodes and recodes, telling the grounds of collective order and diversity, inclusion and exclusion. It describes processes of innovation and structuration, and is itself part of these processes. (p. 2)

This radical turn in ethnography opened up possibilities for considering critical political economy and feminist theories in ethnographic studies of technology. There are two studies, in particular, that used both social shaping of technology and political economic perspectives; these played an important role in my research.

Ethnography of ICTs and Political Economy

The first study that influenced how I looked at cloud computerization in East St. Louis is Miller and Slater's (2000) ethnography of the Internet in Trinidad. The authors used ethnography as a research strategy to study and explain how the "Internet Service Providers, the government and the principal Telecomms company" came together to shape the Internet in Trinidad. In their study, Miller and Slater found that many of their informants believed the global economic context played a significant role in helping Trinidad "to diversify its economy away from dependence on petrochemicals" (p. 120). Political and commercial interests together developed Trinidad's Internet infrastructure to advance a liberal economy, and Miller and Slater described how many informants were caught up in the national rhetoric. As they explained, people believed "the future of Trinidad depended upon seizing a moment in which Trinidad has finally realized its competitive advantage in its capacity to provide high-value technological services to the world" (p. 121). Their chapter on the political economy of the Internet in Trinidad is important for comprehending the rest of the book, which is focused largely on the culture of Internet use. The authors argued that Internet use is inseparable from the political economy of the Internet in Trinidad. Ultimately, Miller and Slater argued that an ethnography of the Internet can provide "a detailed focus on what Trinidadians find in the Internet, what they make of it, how they can relate its possibilities to themselves and their futures" and that this would "tell us a great deal about both the Internet and about Trinidad" (p. 1). This perspective guided how I documented and analyzed what human services workers and managers discovered in a nonprofit case management software package and what it might tell us about both the software and about East St. Louis.

The second important study that informed my ethnography is Hakken and Andrews's (1993) ethnography of technology and labor in Sheffield, England. In their book, the authors discovered how the global information economy shaped workers' everyday experiences with technology. For example, one informant posed "questions about technology in general, and new information technology in particular, inside this political economic framework rather than separate from it, a position at which he has arrived after some negative experience with technology" (p. 134). Hakken and Andrews set out to investigate both the factors shaped by technology and the factors shaping technology and found that "changes in the world political economy strongly influenced the course of computerization in Sheffield" (p. 137). The authors argued that ethnography could reveal how social and institutional processes shape ICTs within a local social setting. My research also looked at the ways in which the political economies of East St. Louis and the state of Illinois became visible in the cloud computing experiences of human services professionals at MESH. The Miller and Slater and Hakken and Andrews ethnographies provided me with significant guidance both epistemologically as well as methodologically.

Fieldwork

My ethnographic study was designed to help answer my research question: How do political, economic, historical, and cultural contexts shape cloud computing implementation and its consequences within a human services organization in East St. Louis, Illinois? In this section, I provide an overview of my research methodology, including my approaches to participant observation, interviews, and archival documents, as well as writing fieldnotes. I begin this section by describing how I gained access to the field.

Getting In

In order to begin an ethnographic study, the ethnographer needs a "social trail" from herself to her first informant (Agar, 1980, p. 27). Fortunately, researchers and students from the Graduate School of Library and Information Science (GSLIS) have worked on a number of community informatics projects with individuals and community-based organizations in East St. Louis since 1999. Community informatics has been described as "the application of information and communications technology (ICT) to enable and empower community processes" (Guerstein, 2000, p. 11). This work in East St. Louis built on previous community–university partnerships beginning in the 1980s (Reardon, 1998, 2000). Many of the GSLIS projects have focused on building public computing centers in churches and community centers. This history played a significant role in allowing me to gain entrance into the field.

In February 2013, I called the host organization for my ethnographic study, MESH, to ask them whether there was anything I could do to be helpful while focusing on this work for my research. At that point, I had absolutely no idea that I would embark on a study of information infrastructure. And, I feel quite fortunate that I called on that day at that particular time. They responded by telling me that they had been paying for a SaaS platform that would help them track the performance of their organization and document community needs and impact. However, they did not have anyone within their organization who could help them to configure and implement the ETO cloud computing software.

Social Solutions, the company that owns ETO, described the cloud computing product as a "nonprofit software solution" to help agencies and nonprofit organizations successfully track clients and document program impact for funders and other donors. As their website explains:

> In addition to meeting the daily case management needs of direct service staff, ETO Impact is the leading performance management software solution for the

> human services sector. ETO Impact empowers users with the tools they need to translate data into knowledge about program performance, actively monitor progress toward outcomes, and continuously improve service delivery. (Social Solutions, 2013)

The website also explained that ETO can help nonprofit organizations perform the following tasks: "track and analyze participant demographic data; manage referrals; assess participant needs and progress; maintain comprehensive history of participant information; monitor participant attendance" and more (Social Solutions, 2013). Social Solutions gained notoriety after partnering with the Harlem Children's Zone (http://www.hcz.org) project in 2006. Within two years, Social Solutions was listed as one of the top 5,000 fastest growing private companies in the United States. In a 2011 press release, Social Solutions was described as

> the leading provider of performance management software for human services, connecting efforts to outcomes, people to social services, and service providers and communities to funders. The company's Efforts to Outcomes (ETO™) software goes beyond case management, and enables public, private, and nonprofit organizations, such as Harlem Children's Zone®, Catholic Charities, Annie E. Casey Foundation, HUD, and cities such as Boston and Hartford to collaborate, save time, and improve service quality and effectiveness, and most importantly, demonstrate impact. (Business Wire, 2011)

Social Solutions has grown to be a significant player in the field of performance management systems. The company's focus on designing software solutions to support "data-driven decision making" has been a successful approach, particularly as big data "has been touted as the solution to achieving efficient and highly effective government and human services" (Bordone, 2013, p. 38).

After the directors at MESH invited me to work with them on the ETO project, I asked them if I could work as a volunteer project manager while also studying the implementation for my research. We agreed that engaging in this work together would be a mutually beneficial opportunity: I could provide them with an account of the implementation process and lessons learned, and I could have access to an organization where I could study the software implementation. It was an exciting opportunity to engage in fieldwork and to develop new skills in ethnography while expanding my research experience, which previously focused on qualitative case study methodology (Rhinesmith, 2012). I looked forward to developing a new approach using ethnography to investigate the social, political, and economic forces shaping cloud computing, as an infrastructure, and its consequences in East St. Louis.

Participant Observation

I conducted my participant observation (Emerson & Pollner, 2001) at least three days every week at the research site in East St. Louis between June 2013 and April 2014. During this time, I hoped to discover patterns in the ways human services professionals talked about and engaged in the ETO implementation process. 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.

My fieldwork built on my previous volunteer experiences with MESH. The organization has worked with the University of Illinois at Urbana-Champaign (UIUC), particularly with the East St. Louis Action Research Project at UIUC (now Action Research Illinois), since the late 1980s. MESH has also collaborated with the UIUC Graduate School of Library and Information

Science (GSLIS) on a number of community informatics projects since the late 1990s. These projects primarily involved the design and use of public computing centers in and around East St. Louis (e.g., see Rhinesmith et al., 2011; Wolske et al., 2013). I was first introduced to MESH in 2011 as a paid research assistant in GSLIS. I began working more intimately with the organization when I volunteered as a youth media instructor during the late winter and early spring months in 2012. This work was part of a separate research project that never fully developed because of limited time and resources. However, these experiences gave me an important opportunity to obtain access to the research site and to gain additional understandings of the organization and East St. Louis that were significantly helpful in guiding my work both as volunteer project manager and researcher. In this way, my fieldwork experiences were part of what Van Maanen (1988) described as

> a long social process of coming to terms with a culture. It is a process that begins before one enters the field and continues long after one leaves it. The working out of understandings may be symbolized by fieldnotes, but the intellectual activities that support such understandings are unlikely to be found in the daily records. (pp. 117–118)

I have tried to be reflexive and transparent about the research process in my approach to ethnographic fieldwork. I also tried to adhere to Emerson, Fretz, and Shaw's (2001) approach to participant observation and fieldnotes, particularly in developing theoretical notes in contrast to observational notes. Emerson, Fretz, and Shaw (citing Schatzman & Strauss, 1973) explained, "Theoretical notes represent self-conscious, controlled attempts to derive meaning from any one of several observational notes." In this way, the ethnographer "interprets, infers, hypothesizes, conjectures; he develops new concepts, links these to older ones, or relates any observation to any other in this presently private effort to create social science" (p. 361). This approach

involves constant memoing and reflection on fieldnotes throughout the data collection process, something I describe in the later analysis section.

Writing Fieldnotes

Traditionally, little has been known about how ethnographers write fieldnotes (Emerson et al., 1995, p. viii; Sanjeck, 1990, p. xi). Anthropologists and sociologists have attempted to remedy this problem by calling attention to the writing that comes before ethnographies. Hammersley and Atkinson (1995) explained that fieldnotes are considered "the traditional means in ethnography for recording observational data. In accordance with the ethnographer's commitment to discovery, fieldnotes consist of relatively concrete descriptions of social processes and their contexts" (p. 175). My process for writing fieldnotes involved taking notes in my green notebook whenever I had time and it was not distracting to those whom I was observing. I also kept my audio recorder on hand to record ETO meetings and conversations with staff, managers, and directors at MESH as often as possible. I carried both of these items with my laptop in my bike messenger bag. I collected several hours of audio recordings, which were augmented by my written observations of the culture of computing and work. While I tried to write down as much as possible in my notebook, I also focused on "*what* to write down, *how* to write it down, and *when* to write it down" (Hammersley & Atkinson, 1995, p. 176). I tried to make note of the social interactions that could, at the time or hopefully later, provide multiple ways of seeing the broader social, political, and economic contexts with which my research was ultimately concerned.

While I was in East St. Louis conducting my fieldwork, I stayed at a Catholic Worker House (see Photo 1), which is located in the eastern part of the city and owned by the Catholic Urban Programs. As their website explains, Catholic Urban Programs is "a federation of five

faith-based agencies [that] advances the dignity of the human person through compassionate response to human needs, advocacy for justice, and the empowerment of individuals and families to reach their full potential" (Catholic Urban Programs, 2014). As I had read in other fieldwork accounts (Clifford & Marcus, 1986; Sanjeck, 1990), I too spent my evenings after long days of work in the field back in my "tent," or in my case it was my room at the Catholic Worker House. I often wrote as much as I could remember for as long as I could write about the day's events before getting too tired and needing to take breaks for dinner or bed.

Photo 1. Catholic Worker House in East St. Louis, Illinois

I used a software application called Journler (http://journler.com) to transfer my fieldnotes from my notebook to my computer. In Journler, I had two folders: one entitled "Fieldnotes," where I entered my fieldnotes by date, and another entitled "Research Journal," where I entered contextual information about the project on a more general level. Often these

contextual notes helped to inform what I observed and what I wrote in future fieldnotes. The fieldnotes folder contained electronic transcriptions of my many jottings from my observations on site at MESH. Whenever possible, I also tried to indicate differences between my jottings and my analytic ideas by using brackets around these analytical notes (e.g., see Lofland, Snow, Anderson, & Lofland, 2006). I also used my field notebook to make jottings during my interviews with staff, managers, and director at MESH.

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 (see Appendix B) 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.

On fewer occasions, I asked my informants to set aside time for an interview. This was mostly because, as Hammersley and Atkinson (1995) explained, "However skillful a researcher is in negotiating a role that allows observation of events, some information will not be available at first hand" (p. 125). In these situations, I asked my informants questions about issues and things that occurred off-site (e.g., state welfare and technology policy). In this ethnographic

study of infrastructure, my goal was to gain an understanding of the broader forces shaping the cloud computing software that were often beyond those directly involved at MESH. In trying to discern these broader political, economic, and historical aspects, I often had to ask my informants what they believed were motivating factors in this regard. Regardless of the level of formality, I tried to follow what Denzin (1989) described as an "interview conversation," in which questions are introduced in order to engage informants in the interview process:

> The interview should be approached as a conversation. It is a conversation between two or more persons where the main focus derives from the questions that make up the interview schedule. It is talk managed around a specific set of questions. It is a conversation that should not end until the interviewer has received satisfactory answers to the research questions. (p. 109)

Following this approach, all of my interviews took place on site at the organization during normal work hours. On occasion, my analyses were drawn from remote conversations with staff and managers at MESH using Skype or telephone. In all cases, I recorded audio from my interviews and used a notebook to make notes during my conversations. I also tried to go back to my informants during the span of my fieldwork in order to follow up on previous conversations and to ask clarifying questions. However, the bulk of my interviews were conducted in concert with the participant observation. I asked everyone involved in my research to sign a consent form (see Appendix C).

Software Manuals and Policy 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 software as a service

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. This is something that I discuss throughout the ethnography.

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 (DHS) website (http://www.dhs.state.il.us/page.aspx) and also through the Illinois Framework for Healthcare 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 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. The Illinois Framework website contained critical documentation that provided additional context that helped me understand why MESH directors were motivated to purchase the cloud computing software. As I describe in my later account, I first learned about the Illinois Framework during my interviews with directors at MESH. I had no idea that state technology policy had such a significant role in shaping decisions not only about using the ETO software, but also in guiding its configuration and implementation. These documents also helped to expand my ethnographic study of cloud computing as an infrastructure by considering the role

of political economic analyses in the studying of information and communication technology, as previous studies had led me to consider.

Data Analysis

I situate my approach to data analysis in contrast to other qualitative approaches, such as grounded theory (e.g., see Charmaz, 2001; Glaser & Strauss, 1967; Strauss & Corbin, 1997). The purpose of this section is to provide a richer understanding of the choices I made as a social analyst and how I allowed my theoretical framework to guide my analytical approach. I begin by briefly explaining how I organized my data when I was not in the field.

Data Organization

I created a spreadsheet entitled "Data Archives" to organize and make sense of my data in a holistic manner. During this process, I created categories for my data archive, which are shown in Table 3.

Table 3. Data Classification System

Category	**Subcategory**
AudioNotes	Individual audio recordings (i.e., memos) organized by date
Cloud Computing News Articles	Categories include government, industry (general), Google v. Microsoft, Microsoft, Apple, Amazon, Amazon v. IBM, Cisco v. IBM
ETO	ETO images ETO press Social Solutions website
Fieldnotes	Specific Journler entries
Interviews	Employees
Meetings	Meeting audio recordings Meeting notes (i.e., text documents) Meeting video recordings
Notepad Scans	(Scans of my notepads from work in the field)
Organizational Brochures	Leaflets
Program Documents	Teen REACH Providing a Sure Start
State and Federal Archival Documents	Department of Children and Family Services Department of Human Services Illinois State Board of Education The Illinois Framework

The classification system helped me to keep track of my data and keep it organized. It also allowed me to later consider the depth and breadth of resources that informed my fieldwork and analysis. In addition, I wrote memos throughout the process as a tool to understand which concepts and themes reemerged over time. The classification system informed this important part of my analytical process, which is detailed below.

Journler was also an essential tool not only for writing and collecting my fieldnotes, but also for tracking and organizing other data and documentation related to the project. One of the key features of Journler is its ability to import audio, video, and other text documents into the actual fieldnote entries. This was particularly useful because I used the software tool AudioNote (http://luminantsoftware.com/iphone/audionote.html) to record my research journal entries, described previously. These additional software tools helped me to both track and organize the data collected in my data archives document.

Analysis

As I conducted my fieldwork, I continuously wrote memos based on my fieldnotes. I used these memos to help me reflect and elaborate on the issues that I discovered. My analysis followed the description provided by Emerson et al. (1995):

> Rather than simply tracing out what the data tell, the fieldworker renders the data meaningful. Analysis is less a matter of something emerging from the data, or simply finding what is there; it is more fundamentally a process of creating what is there by constantly thinking about the import of previously recorded events and meanings. (p. 168)

Therefore, as an ethnographer, I have been involved in analysis and interpretation throughout the data collection process. I tried to rely on multiple perspectives to help me develop a deeper understanding of the behaviors of the "culture-sharing group" (Creswell, 2013, p. 198) within the

organization. I also used "triangulation" (Stake, 1995, p. 114) to establish patterns and to help me validate my findings, as well as to increase my own and others' confidence in my interpretation. Finally, as I collected and wrote about my findings, I let my theoretical frameworks guide my analysis and final reporting. As Lofland et al. (2006) explained, "Just as qualitative fieldwork typically entails researcher immersion in a setting, so analysis of the accumulated data requires the researcher to immerse her- or himself in the data" (p. 196). This is the approach that I took with my analysis.

How I Analyzed the Data

I followed Emerson, Fretz, and Shaw's (1995) approach to processing fieldnotes. As I mentioned, my analysis was different from the grounded theory approach. 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 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 of this

process 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.

Conclusion

Ultimately, my goal in adopting an ethnography of infrastructure approach to studying cloud computing was to investigate both the unfolding infrastructural developments and the invisible work embedded in the public and private cloud computing systems. I believe that this approach is significant because it is deeply concerned with uncovering the ways in which coders, designers, and users of systems become entangled in a web (Kling & Scacchi, 1982) of mutually shaping (Wajcman, 2010) forces that are ultimately concerned with hiding from view the powerful influences that embed values in cloud computing systems. In addition, my hope in adopting an ethnography of infrastructure approach was to contribute new methodological possibilities in the study of cloud computing as an infrastructure.

CHAPTER THREE

Remnants of a Dying Industrial Age*

> In the central city or residential suburb, government is designed by its inhabitants to provide some measure of quality of life—safety, health, infrastructure, or development.… In industrial suburbs government was designed as a business tool.
>
> –Theising (2003, p. 7)

Introduction

In this chapter, I describe my entrance into the field, as is common in most ethnographies. The account herein centers around three observations about East St. Louis that are critical to my study of how social, political, and economic forces shape cloud technology at MESH. First, East St. Louis is a U.S. industrial suburb, created by and for industry during the mid- to late nineteenth century. East St. Louis today has been left behind as our global society has moved from an industrial to an information-based economic system. Second, MESH is a community-based organization that provides a range of social and community support programs to low-income residents. As a community-based organization, MESH has its own mission and vision about the services that it delivers to the community. The fact was important to my study because it guided how I observed and analyzed the sociotechnical tensions in the computerization of human services. Third, MESH's relationship with the state of Illinois as a human services provider is an important part of the story about how the ETO software, as an infrastructural development, evolved and devolved within a short time period. I learned that this relationship between MESH and the state of Illinois was critical for understanding how nonhuman actors, or actants, can shape cloud computing software. In describing these three interconnected factors, I

* Title is named after Rabinow's (1977) chapter, titled "Remnants of a Dying Colonialism."

provide additional background and context for understanding the place where my informants and I, together, experienced how information infrastructure can develop.

I begin the chapter by introducing East St. Louis to provide a picture of the place where my informants and I met infrastructure. I argue that in order to understand how cloud computing developed at the Metro East Settlement House, it's necessary to understand the history of East St. Louis as a U.S. industrial suburb. I call attention to the region's political, economic, and cultural history with technology as context before introducing MESH's role in East St. Louis during its "abandonment" phase (Theising, 2003, p. 11). I review theories of technology and the state as a context for introducing the various management information systems at MESH, as a state human services provider. The goal of this chapter is to both describe my experience entering the field while attempting to provide a rich illustration of the ecology of information infrastructure at MESH.

East St. Louis as an Industrial Suburb

East St. Louis, Illinois, is located outside of St. Louis, Missouri, in an area known as the American Bottoms, a flood plain along the Mississippi River that was once home to large indigenous populations before European settlement. The Cahokia people populated the region between A.D. 700 to 1400. The Cahokia Mounds are the archaeological remains of their city, and they are an UNESCO World Heritage Site (UNESCO World Heritage Center, 2014). These giant flat-topped assemblages were erected as the spiritual centers of this once rich agricultural region. Significant crop yields supported a strong local economy, allowing other Mississippians to travel across what we know today as North America and trade with other native cultures. The Cahokia Mounds are still visible upon entering the area. However, a much different landscape

dominates the skyline in the Metro East region of Illinois. East St. Louis is located in the Metro East region, which includes many of the eastern suburbs of St. Louis, Missouri.

It's difficult not to notice the shells of industrial factories that remain in East St. Louis, particularly as an outsider entering the metropolitan suburb for the first time. Like the crumbling ruins of ancient Rome, dilapidated brick buildings with large, shattered smokestacks pepper the skyline across parts of the city today. Overgrown shrubs, vines, and tree branches crawl up and through the windowless, roofless factory casings that once belonged to one of the most prosperous technological engines of U.S. industrial capitalism. These giant machines of production once prevailed over East St. Louis and the metropolitan area, including Granite City (named after the Granite City Steel Company), as well as the former cities of Mansanto (later Sauget), Alcoa (later Alorton), and National City (later Fairmont City, originally named after the St. Louis National Stockyards Company) (Theising, 2003, pp. 95–121). Today, few of these industrial campuses continue to exist. Only the "brownfields," which have been defined as properties with hazardous substances, pollutants, or contaminants (U.S. Environmental Protection Agency, 2014), remain in these largely forgotten metropolitan suburbs.

My description illustrates one of many images of East St. Louis. Other popular stereotypes include depictions of violent crime, drug use, prostitution, and social despair. Local newspapers, radio shows, and television reports serve up a persistent barrage of negative stories about the residents of East St. Louis. How did East St. Louis, and people's perceptions of the city, develop in this way? In order to find answers, it's necessary to begin by understanding East St. Louis's history as a U.S. industrial suburb.

Star and Bowker (2010) explained that sociohistorical analysis is critical to the study of infrastructure. "Something that was once an object of development and design becomes sunk into

infrastructure over time. Therefore a historical, archaeological approach to the development of an infrastructure like the Internet needs complementary sociological, regulatory and technical studies" (p. 232). This approach was useful in studying the political, economic, historical, and cultural processes that shaped the opportunities and constraints of cloud computing technologies at MESH. Sociohistorical analysis, as an investigative method, also opened a door to consider the evolution/devolution of technology within the context of East St. Louis as an industrial suburb.

East St. Louis, Illinois, is one of many formerly thriving U.S. industrial suburbs, such as Gary, Indiana, and Camden, New Jersey, which emerged during the 1800s. The historical research on U.S. industrial suburbs was relatively meager prior to the 1940s (Lewis, 2004, p. 3). Much of the literature has discussed the rise of the middle-class suburb after World War II. "Scholars have dissected the process by which the middle class sought an idyllic rural/urban world where they could escape the central city's congestion, noise, and working class, while having access to both central city-jobs and an urban lifestyle" (p. 3). Although my research is focused on the post-WWII era, the literature that focuses on the political economy of industrial suburbanization prior to the 1940s provided my study with a foundation for understanding why industries first sought to escape the central city.

In their study of the development of North American industrial suburbs, Walker and Lewis (2004) challenged conventional thinking about the spread of industry during the mid-1800s to the mid-1900s. Previous studies described the seemingly natural progression of capital toward the "peripheral regions," thus "freeing corporate-owned factories to seek cheap land and labour far from the city" (p. 6). Walker and Lewis challenged these normative economic assumptions by calling attention to the role of politics and planning in the rise of industrial

suburbanization. “Location at the suburban fringe and outlying districts has offered the hope of combining the manifest benefits of access to the city and its agglomeration economies with a degree of freedom from the working class, city politics, and contending business interests” (p. 11). The authors detailed the threats facing urban industry from increasing “labour militancy and political upheaval associated with reform movements” of the Progressive Era. As a result, political and commercial interests came together to create new places for industry by “installing professional city managers, planning boards, and public works departments…all of whom were nominally independent but worked closely with business” (p. 12). Nash (1989) used the term *corporate hegemony* to explain this phenomenon in her research.

In her study of a General Electric Company plant in the Berkshires of Massachusetts, Nash (1989) developed the term *corporate hegemony,* based on Gramsci’s (1973) work, to describe the idea that the “survival of industry is accepted as a responsibility of labor and community leaders as well as management in order to maintain a competitive position in a world market” (Nash, 1989, pp. 12–13) and that corporate “control rests on persuasion as well as force, gaining consensus through concessions” (p. 11). Nash detailed the ways in which corporate hegemony influenced family and community values, serving as “models for relations in production” (p. 13). For example, she described how competition and technical expertise was inculcated in the behavior of men, women, and children in almost every aspect of work, school, and play. Corporate hegemony played a powerful role in sustaining Pittsfield through a century that witnessed two world wars, major labor unrest, rising unemployment, and increasing rates of alcoholism and divorce.

Theising (2003) and Hamer (2011) contribute key insights about East St. Louis, as an industrial suburb, in their scholarship on the rise and fall of the Metro East region of Illinois

beginning in the 1800s. Theising explained that industrial suburbs like East St. Louis experienced three phases: "creation, operation, and abandonment" (p. 9). In the first phase, industry moved to the periphery of urban centers and established the infrastructure needed to remain connected to the benefits of the city. In the second phase, Theising explained that industry matured "into a profitable enterprise," securing its corporate hegemony in the region. In phase three, industry declined or moved away. As a result, government became "dysfunctional," losing its purpose to exist. "When an industrial suburb reaches phase three," Theising wrote, "an 'East. St. Louis' is found" (p. 9). Theising used archival material to carefully detail how machine politics helped to maintain corporate hegemony in the region before the abandonment phase started in the 1950s, when "industry leaders began to merge, pack up, and move elsewhere" (Hamer, 2011, p. 181).

Over the past fifty years, the region has experienced economic devastation due to "abandonment," a concept developed by Theising (2003) to describe the final phase of industrial suburb evolution "determined by the closure, downsizing, or transformation of the business that controls it" (p. 11). The impacts of heavy industry on the environment and residents in the region have been severe. For example, in East St. Louis, "contaminants include arsenic, lead, carbon monoxide, nitrogen dioxide, and other compounds known to cause cancer" (Hamer, 2011, p. 168). In 1994, the U.S. Environmental Protection Agency reported that local residents complained about dust at the old American Zinc Plant site in Fairmont City, five miles northeast of East St. Louis. After their site investigation, the EPA found "high levels of lead, arsenic, cadmium and zinc in soil samples" (Environmental Protection Agency, 2012, p. 2).

These political, economic, and historical conditions have created an area in which high rates of unemployment, drug use, violent crime, and social despair have become commonplace,

particularly in East St. Louis. In 2014, 100 percent of the children in the local school district in East St. Louis were eligible for the free and reduced-price meal program, which is often considered a common measure of poverty (Illinois State Board of Education, 2014). Basic infrastructures, such as roads, bridges, sewage, and electricity, are often in serious disrepair or entirely nonexistent. Hamer (2011) provides a richly described portrait of contemporary life in East St. Louis. Hamer's scholarship also provides evidence to show why I argue that Theising's "phase three" (i.e., abandoned) industrial suburbs, such as East St. Louis, demand sustained focus and attention from information scholars, practitioners, policymakers, and activists. This sociohistorical context offers key insights for understanding how information infrastructure unfolds and who benefits from these developments. Even with these enormous challenges, East St. Louisans are gloriously resilient, writes Hamer (2011) in her excellent study of work, families, and everyday life in East St. Louis. The suburb was home to many well-known people, including Miles Davis, Ike and Tina Turner, and U.S. Senator Dick Durbin. It's also home to a number of Olympic athletes, including Jackie Joyner Kersey. In fact, the sign one sees entering East St. Louis from Missouri says, "East St. Louis: The City of Champions."

Entering the Field

On my arrival at the Metro East Settlement House, I was struck by its significant size; it is a large brick building in that is surrounded primarily by smaller houses, many of which are missing doors, windows and roofs. The building looks like a high school or elementary school upon first notice, with its broad grey stairs leading up to its red front doorway. Black wrought iron security bars cover the tall windows on the basement level and the first floor. Large air conditioners hang out of the building's tall windows. The busy sounds of cars driving on the

highway can be heard off in the distance. A large white van with the name "Metro East Settlement House" written on its side is parked on the street outside MESH's main administration building. The location served as the "laboratory" where I helped to configure and observe the ETO cloud computing software.

Settlement House

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). These centers were often staffed by volunteers who moved to low-income areas to work and live with those who relied on the settlement house's range of community services. "The premises themselves served as everything from employment bureau to day-care center, public bath to night school, gymnasium to union hall, and soup kitchen and salon" (Lasch-Quinn, 1993, p. 2). In East St. Louis, the poor individuals and families who relied on the settlement house came to the United States largely from Bohemia and Slovenia in Eastern Europe. They worked for the factories that were created by the meatpacking, steel, and other industries that dominated the metropolitan St. Louis area during this time. However, not everyone was welcome inside. "The majority of settlement houses either excluded blacks, conducted segregated activities, closed down completely, or followed their former white neighbors out of black neighborhoods" (Lasch-Quinn, 1993, p. 3). Hounmenou (2012) explained that the failure of the settlement house movement to support African Americans as they migrated in search of work in the industrial north could be attributed to two issues: "the difficulty for houses to raise or get funds for specific services needed by Black migrants and the opposition of White neighbors and settlement house clients to any

assistance to Blacks" (p. 650). Other scholars have argued that settlement workers "merely shared their racism of the day" (Lasch-Quinn, 1993, p. 3).

In response to the settlement house movement's failure to welcome African Americans, a Black settlement house movement emerged across the country (e.g., see Hounmenou, 2012; Karger, 1986; Lasch-Quinn, 1993). African American female activists played a leading role in advancing the Black settlement house movement during the 1920s and 1930s. As Lasch-Quinn (1993) described, Black and White women joined together to work toward social justice, interracial organizing, and civil rights:

> The interdenominational and egalitarian emphasis of this settlement work among blacks brought together women of diverse backgrounds to make important decisions and contributions and discuss and affect policy. This civic apprenticeship yielded the confidence, leadership skills, awareness, and sense of efficacy that led to courageous demands for social justice and equal treatment within their own organizations, and eventually, for some, in society itself. (p. 112)

Inside the settlement houses, African Americans could gain access to social and educational opportunities in safe spaces where they "could also reflect on their experiences of oppression among themselves." And, as Hounmenou (2012) explained, "Black settlement houses not only allowed strengthening the group identity, but they also provided spaces for the development of group oppositional consciousness" (p. 651). As the White population moved out of East St. Louis due to civil unrest during the late 1960s and early 1970s, the Metro East Settlement House focused its attention on providing government-funded social welfare services to the predominantly African American individuals and families in need.

In 2012, MESH served close to 30,000 residents in the Metro East region of Illinois. 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. As Hamer (2011) remarked, "The lack of racial diversity is discernable. What was once a majority white population is now almost 100 percent African American" (p. 36).

In 2013, MESH received the majority of its funding from government grants, individual donors, and the United Way. The Settlement House is also a member of The United Methodist Church. The mission of MESH is to help individuals and families move out of poverty. The main administration building is where I observed and participated in key decisions that were made about how the cloud computing software should be configured and implemented, while considering the consequences of this process for all who had a stake in the project.

Community-Based Organization

During my early days of fieldwork in 2013, I learned that MESH provides community-based services to residents in the Metro East region. However, as Jerold Myers, the vice president of youth programs at MESH, remarked one day during an ETO meeting, "If you can find a definition from the state, please let me know!" He was referring to the use of the term *community-based services* by the state of Illinois, which classifies MESH as a "community-based organization." Jerold Myers is a stout middle-aged African American man with a long history of involvement with state and federal human services programs. As he explained to me, in his low, raspy voice, "You probably don't know this about me Colin, but I got my start with HUD [the Department of Housing and Urban Development] back in the 1980s. Back then the state realized they had a lot to learn from HUD and their systems." A few months after we spoke, I discovered that the Illinois Department of Human Services (2014b) defined community-based organizations in the following way: "Human service organizations that provide services to

residents of the community." In this study, I use the terms *social welfare, community-based services,* and *human services* somewhat synonymously. The services I refer to throughout my ethnography of cloud computing can be described as those services provided by a nonprofit organization to poor, oppressed, and homeless people within a specific geographic location.

Community-based services are truly a lifeline for many families in low-income communities that have been left behind in transition from an industrial to an information society. MESH provides the following list of community-based services: early childhood and prevention services; education and youth development; comprehensive youth services; individual and family support programs; and services to older adults (see Table 4). MESH employs 195 people for the fifteen programs that they operate. Nine of these fifteen programs require the use of either state or federal management information systems (see Appendix A for an organizational chart of MESH).

Table 4. Metro East Settlement House (MESH) Community-Based Human Services Programs

Early Childhood & Prevention Services	**Education & Youth Development**	**Comprehensive Youth Services**	**Individual & Family Support Programs**	**Services to Older Adults**
Child Care Services	AmeriCorps	Comprehensive Community-Based Youth Service System	Comprehensive Emergency Services	Adult Day Care Services
Pre-Kindergarten	Teen REACH	Community Youth Services Program	Teen REACH Community Center	Homemaker Program
Providing a Sure Start (PASS)		Homeless Youth Program	Job Training and Placement Program	Retired Senior & Volunteer Program (RSVP)
Healthy Families of Illinois				

Community Infrastructure

In Latour and Woolgar's (1979, 1986) studies of scientific knowledge production at the Salk Laboratory in California, the authors introduced a fictional character whom they called "the observer." This imagined social scientist used literary inscription "as a principle for organizing his initial observations" about life in the Salk Laboratory and its activities (1986, p. 45). As the observer entered the laboratory for the first time, the authors described how the observer noted the different areas of the building and how the physical space itself impacted the lab's activities. The observer used literary inscription to make sense of these activities in relation to how scientific knowledge was produced in the lab.

In their ethnography, Latour and Woolgar (1986) included a map of the laboratory, which describes a list of the "main flows" in and out of the building. For example, flows included "energy" into the chemistry area, "animals" into the physiology area, and "chemicals, mail, and telephone" into the office space. The main flows out of the building included the word "ARTICLES," in capital letters. In Figure 1, I describe the physical layout of the first floor of MESH and some of the programs located there. In doing so, I attempt to characterize some of the main flows into and out of the building as a way to introduce the relational aspects of the sociotechnical infrastructure that supported MESH's community-based services during my time as a volunteer project manager working on the ETO project.

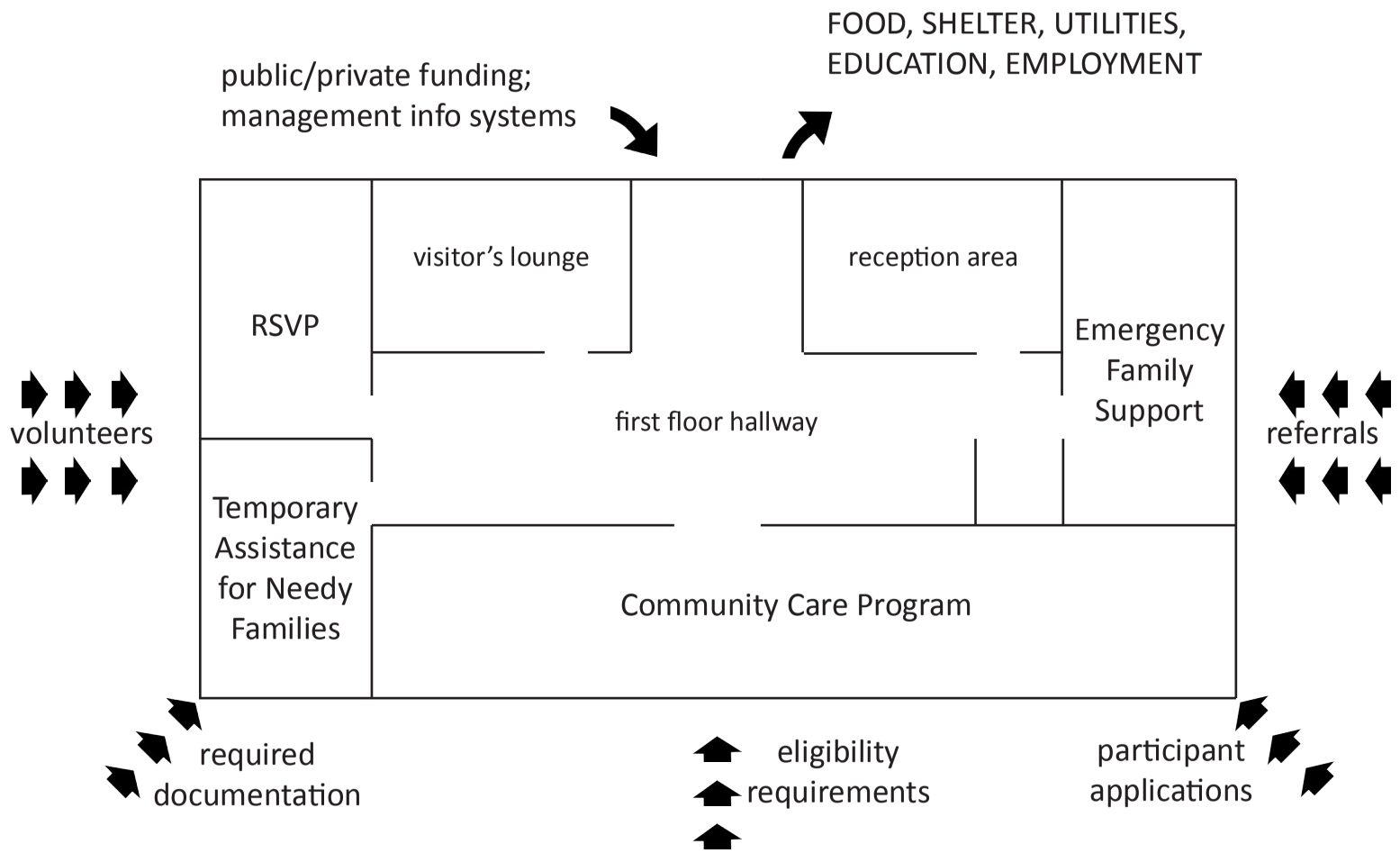

Figure 1. Map of MESH's Administrative Building
This shows the community-based programs and the main flows located on the first floor and described in this chapter. The map reveals the sociotechnical infrastructure underlying the organization and the types of inputs that were considered during the configuration of the ETO cloud computing software.

Upon entering the front door of the building I was often greeted by Cynthia White, the front desk receptionist, who was usually my first point of contact. She was frequently on the phone answering questions from residents who called to inquire about MESH's community-based services. The first floor of the building is home to the offices of several programs at MESH, located in the west, east, and south sides of the building. The west side is home to the Temporary Assistance for Needy Families (TANF) (http://www.dhs.state.il.us/page.aspx?item=30358) program, which includes job training and placement services, and RSVP (http://www.nationalservice.gov/programs/senior-corps/rsvp), a national volunteer program for adults over age 55. The east side of the building includes the main offices for the Comprehensive Emergency Services, which receives significant financial support from the United Way.

The entire back half of the building, on the south side, is home to the Community Care Program (http://www.state.il.us/aging/1athome/ccp.htm) offices, which primarily provide services to older adults. There are about ten people on the floor who are staff and managers, including the director of emergency services. The second floor of the building has offices for the executive staff, including the directors of administration, marketing and development, and youth services.

In the early days of my fieldwork, I spent a significant portion of my time trying to comprehend the infrastructure that supports these community-based services. I tried to understand the relational aspects involving MESH, the state-funding agencies, federally funded programs, private funding (e.g., United Way), program structures, staffing, and IT services. To understand the sociotechnical infrastructure that supports MESH as a community-based organization, and to determine how the ETO software should be configured to connect with this

infrastructure, I reviewed a number of documents. I looked at program logic models, organizational brochures, state and federal government websites, and the IT manuals for the state and federally funded management information systems. This web of connections helped me to not only understand the invisible work supporting MESH's infrastructure, but also to understand the directors' vision for the ETO cloud computing software.

Jerold Myers, the vice president of youth programs at MESH, explained that while MESH's classification as a community-based organization was important for their ability to receive state funds, it had been difficult for him in the past to find any definition about how the state classified community-based organizations. I quickly learned during the ETO software implementation that MESH's designation as a state human services provider (i.e., a community-based organization) was a significant factor in making decisions about how to configure the cloud computing software.

State Human Services Provider

In its first decade of major decline during the 1960s, East St. Louis experienced increasing White flight and an economic downward spiral as factories closed and industries moved outward from the metro region in search of cheaper labor and lower production costs. During this time, social service agencies moved out of East St. Louis because of the growing escalation of racial tension and violence in the community. Derek Phillips, the executive director of MESH, described this period to me during one of our meetings in October 2013. As he explained,

> You know, the YMCA, the Boy Scouts, the Girl Scouts, everybody moved up to Belleville and Fairview Heights, because there was such tensions. I mean we had people staying there twenty-four hours a day, just to keep [MESH] open. You know people's lives were threatened. It was really bad. But then in the 1978, '79,

> ‘80, there was a whole creation of, I’m not going to say War on Poverty, because that was a little earlier, but there was a creation of new state-funded programs. And they wanted an agency with an address in East St. Louis. And we just happened to be at the right place at the right time. And that’s how we ended up getting so many state and federal programs.

The concept that MESH is a state human services provider is key to understanding the organization’s relationship with both technology and its funders.

In the early months of planning for the ETO implementation, I learned that the majority of MESH’s community-based programs were actually state and federally funded. During this time, I quickly discovered the significance of this relationship, particularly in relation to the ecology of information infrastructure. As I explained, MESH is required to use nine different management information systems to report data to various state and federal agencies that fund these programs. MESH’s work with the state is fundamental to understanding how the ETO software developed as an infrastructure. To put it more directly, every aspect of MESH’s community-based human services programs is dependent on either a state or a federal IT system. This fact also provides context for understanding larger changes within society that have been characterized as *informatization.* The political economy of information provides a framework for understanding MESH’s location as a community-based human services provider, particularly between: (1) the state and citizens who rely on public assistance, and (2) the state and private companies, like Social Solutions, that seek to integrate their cloud computing software platforms with state management information systems. In the next section, I argue that informatization is an important concept for understanding the relationship between governments and businesses in the evolution of cloud computing systems.

The Informatization of Community-Based Services

Informatization has been described as the use of information and communication technology (ICT) to further "socioeconomic development as a nation becomes more and more an information society" (Rogers, 2000, p. 71). Informatization is both a theory of technology and a defining characteristic of "the information society," which scholars have argued is a contested concept, particularly "when its adherents diagnose it in quite different ways" (Webster, 2002, p. 29). Service-related industries (e.g., finance, insurance, and real estate) increasingly relied on ICTs during the second half of the twentieth century. The information society is often described as a radical break from the past. However, as Schiller (2007) argued, this "new" era of information is best understood as a continuity of social and institutional relationships that have commoditized information "as a resource that is produced for the market by wage labor" within a global networked economy (p. 21). I use this latter perspective to both provide the context for investigating cloud computing in a human services organization and as "a way to analyze the interactions between a technology and its broader contexts" (Hakken & Andrews, 1993, p. 2).

Complicating assumptions of the inherent economic value of information (e.g., see Bell, 1973; Beniger, 1986; Castells, 2000), Schiller (2007) posed an intriguing question: "What if, however, we suppose that information is not inherently valuable? What if only a profound social reorganization can permit information to become valuable?" (pp. 7–8). Schiller's work called on information scholars to reconsider the historical moments and actors that have influenced major changes in social structure. In doing so, Schiller questioned the relationship between technology and society by calling attention to the continuity of political economy, which has reconfigured information within a system of global capitalism.

These historical developments serve as the background and context for my study, not only for understanding how East St. Louis struggled in transition from an industrial to an information society, but also because they help to explain the social, political, and economic context in which the ETO for-profit software evolved, and ultimately devolved, over time at MESH. I argue that the concept of informatization offers a way to consider how these broader forces continue to shape smaller community-based organizations and their experiences with IT. This focus on the political economic aspects of information infrastructure also helps to contextualize the rationalization of human services through the introduction of networked information systems.

The Computerization of Human Services

The relationship between informatization and community-based human services can be deeply felt at MESH. The use of networked information systems to quantify and report outcomes to public and private funders has created challenges for community-based organizations, such as MESH, who need face-to-face time with those on public assistance in order to understand broader community needs. “Obviously, some aspects of social intervention do not lend themselves well to computerization, and these activities are gradually eliminated or conducted in the traditional fashion” (Murphy & Pardeck, 1991, p. 33). This issue is consistent with the informatization of services taking place at MESH.

One reason for this development is that as state and federal governments continue to slash funding for human services, increasing demands are placed upon policymakers—and state human services providers—to justify public spending for social welfare programs. This has been ongoing for many years. Informatization manifests itself in the emergence of for-profit solutions,

such as ETO Impact, through which nonprofit community-based organizations like MESH are increasingly expected to provide evidence of their impact to funders. The problem, however, is that public and private funders, and the companies that develop for-profit cloud computing systems, often benefit the most from informatization, or computerization, but often at the expense of workers, managers, and welfare recipients (e.g., see Kling, 1978). Murphy and Pardeck (1991) also argued that many social workers often "reject the notion that practice can be quantified" (p. 34) through the use of sophisticated performance management systems.

Other concerns about the computerization of human services involve its dehumanizing effects. "Specifically…the human element may be pushed to the periphery of the intervention process, as technical requirements are given precedence over less technological considerations" (Murphy & Pardeck, 1991, p. 107). Eubanks (2011) detailed the ways in which low-income women at the YWCA in upstate New York described the use of IT in terms of "oppression, exploitation, and privilege" (p. 42). The women articulated that the digital divide should be understood as a "product of social structure and institutionalized inequality" (p. 42).

> But what about the woman who encounters the back of a computer terminal or a digitized voice on the phone instead of a caseworker when trying to access public benefits? Or the woman working on contingent, low-paying, part-time jobs in data entry and call centers? Or the woman half a world away who assembles the circuit boards, monitors, and keyboards that bring the information revolution to the United States? Or the woman whose family dissembles these same devices to recover precious metals several years later with no protective gear, environmental controls, or labor laws? (Eubanks, 2011, p. 28)

Eubanks argued that the everyday technology experiences of women at the YWCA provide a more accurate picture of the relationship between poor people and technology within a system of global capitalism. Concepts like informatization and reconceptualizations of the digital divide

provide opportunities not only to understand how social inequality shapes access, but also how well-intentioned efforts to tackle the digital divide can end up causing more harm to residents in low-income communities (e.g., see Gangadharan, 2013). The purpose of including this fact is not to extend a deficit-based perspective in looking at low-income people's experiences in East St. Louis. Rather, it should be a motivation for discovering alternative ways of thinking about infrastructure as a resource to promote digital inclusion and social justice.

MESH's relationship to the state is significant because it can also provide clues for answering to the following question: Why was the ETO software never fully developed as an information infrastructure at MESH? The story contained in the following chapters seeks to present a more nuanced account than simply saying the project succeeded or failed. Infrastructure, as both a theoretical and a methodological framework, provides a way to understand the complex ecology that motivated the software's sociotechnical development. Informatization, as a concept, provides theoretical guidance for investigating how cloud computerization interacts with community-based organizations that provide social support to parents and children living in poverty.

Conclusion

In this chapter, I introduced my field site by explaining the significance of East St. Louis as an industrial suburb. I argued that sociohistorical analysis is useful for studying not only how industrial technology evolved and devolved over time, but also for understanding how information infrastructure developed during my field research. Ultimately, I tried to show how technology development is unique in industrial suburbs because of their political economic history. In addition, I used the term *informatization* as a framework for considering this

sociohistorical perspective. My goal was to introduce East St. Louis and its history and evolution as important background and context for understanding the ethnographic account that follows.

CHAPTER FOUR

Public and Private Forces

> Infrastructures in their moments of formation can be sites of intense conflict, through which the identity and status of relevant stakeholders, the distribution of benefits and losses, and the general rules of the game are all being worked out simultaneously.
>
> –Jackson et al. (2007)

Introduction

In this chapter, I describe how the infrastructural tensions (Jackson et al., 2007) between external stakeholder demands and internal organizational needs were exposed during the ETO software implementation. I show how state and private funders motivated MESH to adopt ETO in order to centralize data management, better track outcomes, and report on program impact to funders. These external stakeholder demands, in particular, were a major force in shaping the ETO software and its consequences. As a result, I explain how the development of cloud computing at MESH became embedded with the values and politics of state and private funders. As Winner (1986) explained, "The adoption of a given technical system unavoidably brings with it conditions for human relationships that have a distinctive political cast—for example, centralized or decentralized, egalitarian or inegalitarian, repressive or liberating" (p. 29). State surveillance of human services professionals using information technology in social welfare organizations is one example of the political dimensions that can become embedded in management information systems. More explicit examples are introduced in this chapter to show how state and private funders shaped the cloud computing software and its consequences at MESH. I begin with a vignette to show how infrastructural tensions became manifest during the

implementation process.

External Demands versus Internal Needs

It's a bright, sunny August morning in East St. Louis, Illinois. A light breeze blows leaves across the road, and my car dashboard indicates that the outside temperature is 73 degrees. I drive west for fifteen minutes on St. Clair Avenue on my way to the Metro East Settlement House. There are few cars on the four-lane road. Up to my right, I notice much heavier traffic on Route 64 headed west into St. Louis. Billboards hover above me as I pass underneath the highways that crisscross over East St. Louis. I notice a giant McDonald's sign with large golden arches and another T-Mobile display advertising wireless service.

I don't want to be late. Our ETO project team is meeting this morning. Last week, Curtis Fanton, the associate director at MESH (see Appendix A for organizational chart), learned that Shaun Wilson, MESH's (former) IT director, submitted his resignation after seven years at the agency to join a software company in St. Louis. Today, our team will meet to determine how best to move forward with the ETO project. I decide to drive onto Route 64 for one exit, which allows me to avoid getting stuck at one of the many railroad crossings in East St. Louis.

I pull into the dusty parking lot across from the settlement house and park next to a fading red pickup truck. I shut my car door and walk up the grey concrete stairs to the front entrance at MESH, wondering where I'll be seated today. Yesterday a new employee moved into "my office," which another staff member once described to me as "the office for new people. It's the one I had when I first started." After entering the building, I head down the second floor hallway and into the main conference room. The large round clock hanging on the wall says it's

9:00 a.m. I enter the room and get seated in one of the high-backed pleather chairs at the large oak table.

Black wrought iron security bars cover the windows that lead to the roof. The air conditioner hums in the background, cooling off the room, while the early August heat rises outdoors. Curtis is already seated at the table next to Jasper, who will replace Shaun as my main partner on the ETO project. At the onset of our meeting, I ask Curtis a pivotal question about the project: "For the program outcomes that we'll use to configure ETO, do we start by looking at the stated goals defined by the state or federal government…?" Curtis looks at me through his narrow-framed glasses and quickly interjects, "Yes." He continues:

> The outcomes for all of our programs are already built. Some of them are mandated by the state. In addition to that, we have our own outcomes that we put in place. Like for TANF [Temporary Assistance for Needy Families] job placement, one of the outcomes is twenty-one individuals should be placed into employment up to a period of ninety days, with ninety-day retention that pays a rate of ten dollars an hour or higher. That's the outcome. The indicator is: we will hold x amount of hours of job readiness training; we will do x amount of hours of employer recruitment and etc. All of that is already in place.

Curtis went on to explain that some of the employees at MESH don't know the impact they and their programs have on the community. He told us that Theresa Phelps, the TANF program manager, works with many people in the community to help them gain employment. Even if they don't get jobs, Curtis explained, Theresa is directly impacting their lives because these individuals often gain new job skills that they didn't have before working with Theresa. "And, if we track that person at some point they are going to get a job, you know if they are looking. So she's impacting a lot more than she's reporting in DHS."

This vignette summarizes one of the main tensions in the infrastructural development of

the ETO software. External stakeholder demands from state and private funders, and internal organizational needs at MESH, including the desire to capture data beyond state requirements, represented a significant tension during the infrastructural development of the ETO software. Jackson et al. (2007) explained that the development of infrastructure almost always involves winners and losers. Much is at stake in the development of infrastructure. Working, stabilized, and thus invisible infrastructure can provide social, economic, and political benefits to different groups in society. The same can be said with information infrastructure.

The vignette illustrates one of the many instances in which directors told us, as the project management team, to begin by looking at the state-funded program logic models to make decisions about how to configure ETO. In other words, specific decisions about the software implementation were made based on the reporting requirements of public and private funders. Internal organizational needs were often a secondary factor during the implementation process. The findings presented in this chapter support previous studies, which show how social welfare organizations were often pressured by funders to adopt automated information systems.

How Public and Private Funders Shape Technology

Social welfare agencies in the United States have experienced intense stresses during the past five years. This is due in large part to the global financial crisis that followed the housing market collapse in 2007 and the big bank bailouts of 2008. These economic stresses severely impacted historic settlement houses, such as the Hull House in Chicago, which recently closed after 123 years. I observed how the global economic crisis played out during my fieldwork at MESH. The financial pressures at MESH included chronic yearly cuts to government funding for public assistance programs, including additional burdens wrought by the “sequester” of 2013

(The White House, 2014).

These global economic developments have created enormous strains on community-based organizations, such as MESH, which have seen increasing demands for services while receiving fewer resources to help individuals and families living in poverty. At the same time, settlement houses and other community-based organizations that administer public assistance programs have been expected to adopt sophisticated new computing platforms, like ETO, with less capacity—while trying to help poor, oppressed, and homeless people survive another day.

The attack on public sector spending continues, as the privatization of public information increases each year. As Schiller (1981) explained, "In the drive toward privatization of information, the principle that 'information is a commodity' plays a prominent role. Major efforts to banish the idea that information is a social good have been focused on the national government" (p. 48). These pressures were visible here last year, when the Illinois State Senate introduced a proposal to privatize the Department of Commerce and Economic Opportunity (DCEO) in 2013 (Illinois Public Radio, 2013). The DCEO is not the Department of Human Services. However, I argue that it calls into question how the privatization of government services might impact the ways in which public information is collected, stored, processed, and distributed using for-profit networked information systems. This question is particularly salient because Amazon and Google have been competing to convince the White House and U.S. government agencies to move the public's information into the private sphere (e.g., see Bailey, 2009; Francis, 2011; Hart, 2008; Sakole, 2013). The purpose of this chapter is to highlight the ways in which these broader political economic developments have been be felt by organizations, such as MESH, that have been pressured to adopt subscription software platforms, contributing to the expansion of what Mosco (1988) has called the "pay-per society":

> The essence of what is happening is this: new technology makes it possible to *measure* and *monitor* more of our electronic communication and information activities. Business and government see this potential as a major instrument to increase profit and control. The result is a pay-per society. (p. 5)

I now turn to an account that describes how the executive leadership at MESH talked about their motivations for purchasing the pay-per cloud computing system. I focus on the ways in which directors articulated tensions between external stakeholder demands and internal organizational needs in the development of ETO.

Budgeting for Results

Derek Phillips is the executive director of the Metro East Settlement House. He's worked for the organization since the late 1970s, when racial tension in, and White flight from, East St. Louis was on the rise. In 1950, the population was 82,295. In 2012, the population in the city was 27,006. Derek is a tall, White man from the south. He uses a firm handshake to greet me on this early October morning in 2013. We meet to talk about ETO in his office in the MESH Child Care Center.

We sit at two of the four chairs at his small round conference table. During a pause in our conversation, I notice a picture hanging on the wall behind Derek. It's a poster of the photograph titled "Selma-to-Montgomery March for Voting Rights in 1965" by James Karales. Stacks of manila folders with papers inside are piled neatly on his desk. There is also a computer monitor with speakers on his desk, and Derek's office appears to have one of the organization's main computer servers stored in the corner of the room next to where the two of us are seated. Derek is a kind and gentle, but firm, man. He gesticulates when he speaks, and when we talk specifically about ETO, he starts to bounce one leg under the table.

In our meeting, I asked Derek if cuts to state and federal funding influenced his decision to purchase the software as a service platform. “Now, that’s a pretty interesting question! [His eyes light up.] Because if this had been a year or two ago, and I knew that we were going to have these cuts, I’m not sure I would have invested [laughing] in … [laughing]. You know, sadly to say!” After meeting with Derek, I began to think more deeply about the timing of the ETO purchase and how it coincided with other developments, such as changes to state and federal policy during the past few years.

I got into my car and headed back across town to MESH for my meeting with Curtis later that day. During our conversation, I asked him “when did directors first start experiencing increased pressure to adopt a centralized reporting platform, like ETO?” Curtis responded, “I would say about two years ago; two or three years ago. At least within the last two years I know. It may have even been before that.” The day before my meetings with Derek and Curtis, I spoke with Patricia Ableton, the director of marketing and development at MESH. Patricia explained that funding cuts in the past five years forced the organization to rethink how it uses technology. “What happened was when the state and federal government started slashing programs and some of the programs got slashed more than half, we had to do a reality check and say, ‘OK. We cannot run an effective program with this type of budget. There’s no way.’” She went on to explain that some of the programs at MESH had been cut three to four times, and some have been cut every year in the past five years. “Just trying to raise the additional dollars to keep those programs going is a challenge by itself.”

The next day, I decided to ask Derek the same question: “Was there a specific moment when things changed, in terms of increasing external pressures from state and private funders to adopt a universal data management system?” Derek thought for a minute and responded, “Yes.

Specifically, the state has adopted, you know 'Budgeting by Performance'?" I replied, saying "Right. The results oriented.…" And Derek quickly interjected, "Right, 'Budgeting by Results.' And that's true for every one of our programs." On July 1, 2010, Illinois Governor Pat Quinn introduced a reform measure called "Budgeting for Results" in response to the state's growing financial crisis. That same year, the state had a deficit of $13 billion dollars—the third highest state deficit in the country. The law was described as

> an historic spending reform act requiring the state of Illinois to institute a results-based budgeting process that will end the automatic funding of programs. By requiring the State to live within its means and focus on performance, BFR will transform the way that state officials, legislators—and the public—prioritize, think about and implement the State's budget. (Illinois Office of Management and Budget, 2014)

The legislation requires a statewide reporting system to compare "actual results with the budgeted results, providing transparency and accountability throughout the process" (States News Service, 2010). The passage of this bill coincided with the timelines shared by the directors at MESH with regard to when they noticed that funders began to pressure them to adopt a centralized data management system.

Power (1997) used the phrase "audit society" to characterize the increasing use of accountability procedures across public and private sectors during the last half of the twentieth century, particularly in the United States and the United Kingdom. Power argued that rather than being concerned with what the auditing practices "really are," it's more important to understand how the "idea of auditing has assumed such a central role in both public and private sector policy" (p. 7). He explained that profound changes in public administration during the 1990s came from practices in the private sector.

> It emphasizes cost control, financial transparency, the autonomization of organizational sub-units, the decentralization of management authority, the creation of market and quasi-market mechanisms separating purchasing and providing functions and their linkage via contracts, and the enhancement of accountability to customers for the quality of service via the creation of performance indicators. (p. 43)

Power argued that neoliberal ideological commitments, including the need for fiscal restraint, motivated the audit society. He described this new public administrative approach as a characteristic of a broader societal change, which now demands accountability in all sectors of society. Technological advances in the information realm, including management information systems and performance management systems, are often described as having enhanced capability and possibility to drive transformations (Power, 1997, p. 7). I argue that this idea embodies a technological deterministic perspective that propels the audit society, which was a major focus of my investigation of ETO.

Jerold Myers, the vice president of youth programs, explained to Jasper and me, "Budgeting for results has people involved from many different agencies." We met with Jerold to discuss our challenges with not being able to export data out of state management information systems and into ETO. We told him that this lack of interoperability was making our work with ETO very challenging. During our meeting, Jerold explained, "The state is trying to determine a rate of return." Patricia, Derek, and Curtis mentioned two other pressures from state and private funders. The first was from a software development project called "The Illinois Framework," and the second came from the United Way, who had urged MESH to adopt a centralized data management system.

Illinois Framework for Healthcare and Human Services

In my October 2013 meeting with Curtis, I asked him to describe how the state and federal funding cuts impacted MESH's decision to purchase ETO.

> [He pauses for a few seconds and lets out a breath.] Actually, actually very little. What has impacted it, what impacted our decision a few, prior to December 2012, was the Illinois Framework: The system that Illinois is coming up with that was supposed to be customized for all grantees. And, that's been in development for the last four years and it hasn't rolled out yet. So, because of that we've decided to go with our own—with ETO. See on the state of Illinois level, there's various departments. But all of the departments have different tracking systems, different data management systems. There's 200 of them. Yeah, there's quite a few. And, knowing that they were trying to put together one system that could be customized for all Illinois departments and all Illinois providers. And, that's the Illinois Framework. It was supposed to roll out in 2013. It's been in development since maybe '10, 2010. And, knowing the challenges that Illinois has with funding and with Illinois Framework, we decided that it was time for us to just move on with ETO. In the event that Illinois Framework is ever developed and implemented, if it's a good smart direction for us, we'll just go with that.

The Illinois Framework for Healthcare and Human Services launched in 2010 as an effort "to adopt a more efficient and comprehensive approach to service delivery." As the website explains, "The Framework's goal is 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). The timeline on the website shows that they plan to complete the software implementation in 2017. The Illinois Framework should be applauded for its efforts to gather input from community-based organizations, including directors at MESH, to help inform the software development. However, questions still remain about whether community-based organizations

will be able to configure the software to meet local needs.

Curtis's account is significant for two reasons. First, it shows how the state influenced MESH's decision to purchase the ETO software. It could be argued that the state failed MESH by not providing them with an adequate reporting system to meet their needs. The directors at MESH saw ETO as an alternative that could give them the centralized reporting capabilities, while waiting for the state to complete its Illinois Framework program. The narrative above also reveals the complex arrangement of sociotechnical and political economic factors involved in negotiations between state funders and community-based service providers. As Eubanks (2011) argued, technology should be viewed as an "assembly of practices for organizing the world that encode some norms, values, and ways of life at the expense of others" (p. 25). This is important because the struggle over computing systems between the state, private funders, and community-based organizations should be considered within a broad set of perspectives that includes political beliefs and economic incentives. Just as individual choices are key to understanding the social shaping of cloud computing and big data, it is equally important to follow the public and private institutions that benefit from information technology applications, particularly in low-income communities.

The United Way

For many years, private funders have been interested in seeing their grantees use performance-management systems to create efficiencies and document program outcomes. However, these technology expectations have real consequences for smaller nonprofits, such as MESH and other settlement houses, that are expected to spend significant sums of money on third-party cloud computing software platforms, particularly when the funds could be spent providing direct services to clients in need. At the same time, much larger and higher profile

social service agencies, such as the Harlem Children's Zone, have implemented similar cloud computing systems to document their tremendous successes. These developments adversely impact smaller community-based organizations, like MESH, which are expected to fall in line with these popular social welfare models. As Curtis explained, "Every year in our site visit process with the United Way we're always encouraged to look at our method of data capture and reporting, because we have several different systems." Curtis went on to talk about the United Way's desire to have all their grantees use "one universal system for data management, data reporting, and data capture that looks at outcomes, indicators, evaluation assessments, etc." Curtis explained, "When we're in front of funders trying to get proposals approved, a lot of their comments are focused on a centralized system for data management and outcome reporting."

In Kling's (1978) study of urban management information systems (UMIS) in welfare agencies, he found that the United Way and other private funders "forced the neighborhood agencies which they supported to report the services they rendered" through the automated welfare client-recording system (p. 491). In my conversations with directors at MESH, they shared similar stories about technology from their meetings with existing and potential funders. Funding cuts and data management centralization were two real factors that shaped cloud computing at MESH. Derek emphasized during our meeting in October that our ETO project team should pay attention to state and federal outcomes as we configure the cloud computing software. Once these have been configured, then MESH should focus on using ETO to capture efforts that are not currently being captured, as Curtis has been advocating. Derek explained:

> I guess I see ETO as a developmental process. So I think we start off and get it up and running from the easy perspective of taking some basic logic models and saying "Hey, here's our inputs. Here's our outputs. Here's our activities. Here's our short range outcomes. Here's our vision." You know, and then go with that.

Derek described this process of technology integration as part of a culture of learning (Morino, 2011) that was needed to help transform the organizational culture at MESH. This fact is important because it also helps to shed a light on the complex relationship between directors and their expectations of managers and staff at MESH. The organization is certainly not a homogenous group of individuals. During my fieldwork, I discovered differences in opinion among staff members, managers, and directors about the ETO software. Derek recommended that our ETO project team focus our efforts on the existing program goals determined by the state. Eventually, as Derek said, the organization will be able to prioritize data capture beyond both public and private funding requirements. But for now, he told me, our team should remain focused on moving the programs away from paper and into the cloud.

Program Logic Models

One physical manifestation of the infrastructural tensions mentioned appeared in the use (and absence, in some cases) of program logic models to configure the ETO software. A logic model is a type of program evaluation tool that is often used to help "define and clarify what should be measured and when" (Frechtling, 2007, p. 1). Logic models are useful as a form of communication between the program evaluator and the organization in which the program to be evaluated exists. They can also be used as tools to communicate program expectations with participants, including staff, managers, and directors. Logic models can help organizations to visualize and articulate the structure of a particular program. Logic models come in several forms. Frechtling (2007) explained that logic models often have the following four components: inputs, activities, outputs, and outcomes (see Table 5).

Table 5. The Basic Components of a Logic Model

Source: Reprinted from Frechtling (2007, p. 21).

Component	Description
Inputs	The resources that are brought to a project. Typically, resources are defined in terms of funding sources or in-kind contributions.
Activities	The actions that are undertaken by the project to bring about desired ends. Some examples of activities are establishing community councils, providing professional development, or initiating new information campaign.
Outputs	The immediate results of an action; they are services, events, and products that document implementation of an activity. Outputs are typically expressed numerically.
Outcomes	Changes that occur showing movement toward achieving ultimate goals and objectives. Outcomes are desired accomplishments or changes.

These four components come together to form a theory of change. Logic models can be effective ways for community-based organizations to communicate with funders about how the organization will evaluate grant-funded programs. Logic models can also provide the evaluative framework for developing performance-based management systems, such as ETO.

Figures 2 and 3 concretely illustrate how the state-mandated indicators from the DHS Teen REACH program (Illinois Department of Human Services, 2014d) informed the development, and subsequent use, of the logic model that shaped the ETO software's configuration. Figure 2 is the logic model created by the Illinois Department of Human Services (2014d). Figure 3 shows the logic model created by program staff in the Teen REACH program at MESH, which is based on the DHS logic model in Figure 2. As these two logic models reveal, both are focused around the Teen REACH program's six core service areas: improve educational performance; life skills education; parental involvement; recreation, sports, cultural, and artistic

activities; positive adult mentors; service learning activities (Illinois Department of Human Services, 2013c). These core service areas also helped Arthur, Curtis, Jasper, and me, as the project implementation team, to make specific decisions about how to configure the ETO software to meet the needs of both funders and the organization

Logic Model
Teen REACH (TR)

Goal: The goal of the Teen REACH program is *to expand the range of choices and opportunities that enable, empower and encourage youth to achieve positive growth and development, improve expectations and capacities for future success, and avoid and/or reduce risk-taking behavior*.
Eligibility: At-risk children and youth ages 6 to 17 with minimum 85% of youth 11-17.

Inputs	Activities	Strategies	Intermediate Outcomes	Outcomes
• Funding • 50% FTE – TR Coordinator • eCornerstone & data entry • Technical Assistance and Monitoring • Staff training • Quarterly Performance Measure Evaluation • Community Resource Assessment • Criminal Background and CANTS checks on personnel; volunteers etc. • Local Agency Evaluation (self-developed annual surveys to youth and parents – to assess objectives and developmental assets) • Program Standards • Agency Specific Program Policies and Procedures • Signed linkage agreements with each school in which youth are enrolled • Teen REACH policy and procedures manual.	• Tutoring, homework time/help • Career and College exploration • Alcohol and substance use/abuse awareness programming • Sexual activity and pregnancy prevention programming • Anger management programming • Conflict resolution skill development • Decision-making and problem solving skill development • Provide opportunities for parent involvement • Include Parents in the development of program activities designed to meet the needs of their child • Child and adolescent development classes for parents • Communication skill development for parents • Provide opportunities for positive family activities • Programming that offers physical activities and skill development • Nutritional education and healthy lifestyle choices • Activities that teach sportsmanship • Cultural enrichment activities • Provide positive adult role models • Mentoring opportunities • Service-Learning opportunities • Activities that stress Youth Voice • Civic engagement activities • Job readiness skills • Snacks/meals for program youth	• Operate a year round (12 months) out-of-school time program. • Operate the program during the highest crime hours of 3:00 to 6:00 pm • Provide a safe environment with caring adults • Target at-risk youth 11 to 17 years of age. • Conduct activities in all 6 Core Service Areas: 1) Improve Educational Performance 2) Life Skills Education 3) Parental Involvement 4) Recreation, Sports, Cultural and Artistic activities 5) Positive Adult Mentors 6) Service Learning Activities	• Increase school attendance • Increased physical activity • Increased healthy nutritional habits • Increase interactions with a caring adult • Increase year to year academic promotion rate • Increase resiliency to high risk behaviors (as measured by completing life skills activities)	• Youth will be safe from violence • Youth will be safe from high risk behaviors. • Youth will be safe from delinquent /criminal activity • Youth will be graduated from high school.

Figure 2. DHS Teen REACH Logic Model Source: Reprinted from Illinois Department of Human Services (2014c).

Metro East Settlement House
Teen-REACH Logic Model 2013-2014

Goals: To expand the range of opportunities and choices that enable, empower, and encourage youth to achieve positive growth and development, improve expectations and capacities for future success, and avoid and/or reduce risk-taking behavior

Community Need	Target Population	Input	Activities/ Strategies	Intermediate Outcome	Outcome
More than 65% of the families in the East St. Louis community are living at or below the poverty level. Research indicates that poverty is one of the major factors that directly contribute to a broad range of social problems including child abuse and neglect, drug and alcohol abuse, and mental illness. High rates of poverty have also been linked to low developmental levels among children, poor health care among the elderly persons, increased levels of depression and mental illness, and even to a direct increase in the truancy and school dropout rates among youth. Today there are thousands of individuals and families in the greater East St. Louis community who are living in poverty and who are struggling ever day to simply meet the basic needs of their families. Research by the Annie E. Casey Foundation has demonstrated that children succeed in strong families and families succeed in strong, organized neighborhoods.	Youth ages 7 – 17 currently enrolled in grade or high school Single parent households to assist while parent works or pursue higher education. Low income youth	Funding eCornerstone Participant Demographics Parent Educational Level Household Income Siblings/Family Size School Progress Reports Disciplinary Reports Criminal background checks, fingerprinting, physicals, and Tuberculosis tests of all onsite personnel Continuous staff development training	***Academic Assistance Programs*** – includes time to complete homework, tutoring in basic skills, and enrichment programs that encourage creativity ***Recreation, Sports, Cultural, and Artistic Activities*** – includes providing activities and arranging safe outlets for youth to try new skills and develop new interests, to build new friendships, and gain developmentally relevant experiences ***Mentoring*** – providing opportunities for youth to develop and maintain positive, sustained relationships with caring adults through mentoring and other programs that emphasize one on one interactions ***Life Skills Education*** – encompasses training and education that promotes the developments of healthy lifestyles, and encourages abstinence from risk-taking behaviors in areas such as alcohol and substance use, criminal activity, violence, and sexual activity ***Parental Involvement*** – includes opportunities for parents and/or guardians to meet with staff to discuss their children's activities, and to participate in events that strengthen parent/child bonds and community involvement ***Service Learning*** – utilizes a method of teaching and learning that connects classroom lessons with meaningful service to the community. Participants build academic skills while strengthening communities through service. Service learning combines service tasks with structured, youth driven opportunities that link the task to self-reflection, self-discovery, and the acquisition and comprehension of values, skills, and knowledge content with service tasks	Higher graduation rates Improved academic performance Increased school attendance Decreased risk-taking behavior Lower suspension rates in school Lower drop-out rates in school Lower teen pregnancy rates Increased community involvement Higher post-secondary school goals Youth will reduce violent behavior or serious conduct behavior	Youth will demonstrate improved school attendance Youth will show signs of improved school performance You will reduce violent or serious conduct behavior Improve the likelihood for future success Provide positive choices Reduce at-risk behaviors Develop career goals.

Figure 3. MESH's Teen REACH Logic Model

During my conversation with Patricia Ableton in October 2013, she provided additional context for understanding the MESH Logic Model for Teen REACH versus the DHS Logic Model. I began by asking her what role the state logic model played in influencing the Teen REACH program at MESH, in order to gain a better understanding of how to interpret both logic models in configuring ETO.

> Right. We don't use it, even though there's a logic model and a program model for Teen REACH, but it's broad. Every Teen REACH program makes their own manual and logic model, as long as it complies with the state regulations that we have to report on—because every community is different. And they're dealing with different issues. So the logic model or the program manual that we develop for the Metro East, the East St. Louis area would not fit for, say, Decatur, Illinois.

This point illustrates the unique role that MESH plays as a community-based organization in responding to local needs. The challenge for Jasper and me, during the ETO project, was to determine how to preserve the unique attributes of each program (e.g., see "activities" listed in Figures 2 and 3), while establishing a common set of standards (e.g., see "outcomes" listed in Figures 2 and 3) upon which ETO could be used to measure the success of each program.

Arthur Frederichs, the Social Solutions project manager, configured the Attendance TouchPoint during the Quick Start Implementation. This TouchPoint was an essential component of the software that allowed Teen REACH staff to record youth participation in each of the core service areas of the Teen REACH program. In addition, Jasper and I created the Academic Progress TouchPoint, which allowed program staff to record student grades based on how the eCornerstone software was configured. In other words, Jasper and I relied on the Teen REACH program staff to help us understand how eCornerstone worked so we could use that information to configure ETO.

Infrastructural Tensions in the Audit Society

The two logic models (Figures 2 and 3) show the dynamic interaction between the expectations of state-funders and the (re)articulation of state-funded programs by community-based organizations. The point I want to make here is that chronic funding cuts to state-funded programs like Teen REACH force community-based organizations like MESH to find new ways to sustain government-designed programs after funding sources have been cut or eliminated all together. As Jackson et al. (2007) argued, "public investment models have come under some attack, and there is increasing pressure to constrain spending and/or partner with industry in ways argued to promote efficiency and innovation." In this process, community-based organizations, like MESH, are at times forced to rearticulate the goals of state-funded programs to align more closely with the stated missions of their own organizations. Logic models, therefore, become an interesting point of study to investigate how tensions between the goals of the state and community-based organizations can become embedded in the development of information systems in the audit society.

Schoech (1999) explained that human services organizations, such as MESH, often face a wide range of social, political, and economic pressures that can influence how computer applications are shaped within organizations. Economic influences are powerful and can often motivate infrastructural tensions, as organizations find themselves caught between the needs of funders and the needs of those in the community who rely on their services. This tension plays out in the development of infrastructural tools to measure organizational performance.

> The reliance by human services agencies on multiple, changing, and external funding complicates information collection. One problem is that all funding sources rarely agree on what information agencies should report. The various funding sources of an agency may represent many different constituencies, which

> together place conflicting demands on the agency. Meeting client needs efficiently and ensuring client satisfaction do not always result in funding source satisfaction and agency survival. (Schoech, 1999, p. 213)

Program logic models served as an important source of archival documentation for analyzing the infrastructural aspects of the cloud computing software. They also became a contested site during the ETO project because of the factors I described.

I also observed that some program directors at MESH had difficulty designing logic models. Some were not able to produce logic models. Out of the fifteen programs at MESH, I only received nine logic models. I was not able to determine the reasons why before my fieldwork ended. It might have been because of time and capacity constraints, but it also could have been for the reasons I tried to describe above. In my conversations with directors at MESH toward the end of my study, I explained that I believed it was challenging for some employees at MESH to develop logic models because there were, at times, different expectations about outcomes (i.e., between state-funded programs and MESH). As I described above, the DHS Teen REACH program tracks youth until age seventeen. MESH, on the other hand, was interested in tracking outcomes on these same youth into adulthood. Different expectations for the same program can create challenges in developing logic models that articulate the needs of both the state and community-based organizations.

CHAPTER FIVE

From Paper to the Cloud

> I think we're also moving to a world where we measure much more precisely. But we as individuals will quite often find this oppressive.
>
> –Inskeep (2013)

Introduction

In this chapter, I argue that the lack of interoperability between state management information systems (MIS) and the ETO cloud computing software, at times, exacerbated tensions between external demands and internal needs at MESH, which I detailed in the previous chapter. The concept of "gateways" (Egyedi, 2000) is used as a theoretical framework to help explain how ETO developed within the Teen REACH program at MESH. I show how different subsystems (i.e., paper forms, spreadsheets, state MIS, and ETO) embodied separate political, operational, and technical domains, which did not always promote compatibility between them. More concretely, I maintain that the ETO project experienced what I call a *gateway failure*, or the absence of a gateway between subsystems. As a result, human services professionals in the Teen REACH program were asked to enter the same data into two different information systems, thus decreasing efficiency and increasing potential data entry errors. I begin with a vignette to introduce the ETO project's gateway dimensions and the sociotechnical struggles that followed.

"I Don't Want to Duplicate Efforts"

Arthur Frederichs is a project manager at Social Solutions. He visited MESH during three days in late June 2013 to lead the Quick Start Implementation, which was part of MESH's contract with Social Solutions. The Quick Start package included three days of software

requirement meetings and an initial software configuration to get MESH up and running in ETO. The agreement also included individualized customer support following the on-site implementation. During this brief and intense period, Arthur met with the employees of five programs at MESH to determine their software requirements. These five programs were decided upon in advance of the Quick Start Implementation. On the second day, Arthur and I met with Curtis Fanton, the associate director at MESH; Patricia Ableton, the director of marketing and development; and Rhonda Smith, the Teen REACH program manager. During the meeting at MESH, Arthur mentioned, "We can export data out from eCornerstone [the state's MIS] and put them into ETO. The big question that I want to see is what these data look like coming in [to ETO]. I don't want to duplicate efforts." Arthur assumed that interoperability existed between eCornerstone and ETO. He even mentioned the possibility of scheduling automated batch uploads from eCornerstone into ETO. Two months later we discovered a much different reality.

The issue of compatibility between information systems took center stage on a hot mid-August day in 2013, during one of our ETO project meetings with Rhonda Smith at the Teen REACH Center in East St. Louis. Jasper Nichols is my main informant at MESH. He is also my colleague on the ETO software implementation project. Jasper is a tall Caucasian man in his late 50s. His John Lennon glasses sit squarely on his pink nose. He is tall, thin, and talks with a raspy voice from years of smoking hand-rolled cigarettes. Jasper and I began working together at MESH in June 2013, after we learned that Shaun Wilson, MESH's director of information technology (IT), had accepted a job offer at an IT company. Jasper had been working full time with the AmeriCorps program in East St. Louis. He was placed at MESH four years ago and has continued to work with the organization ever since. The AmeriCorps program's mission is to serve disadvantaged youth and "to work with parents, teachers, and after school providers to

improve educational outcomes, reduce childhood obesity, and to increase technological competence in children" (Corporation for National and Community Service, 2013). The program assists up to 600 children each year in East St. Louis. The goal of our meeting with Rhonda at the Teen REACH Center today, two months after the Quick Start Implementation, was to determine whether it was even possible to export data out of eCornerstone and into the ETO cloud computing system.

The directors at MESH are interested in using ETO for the Teen REACH program to report to funders about outcomes beyond state requirements. For example, Patricia Ableton explained that the Illinois Department of Human Services only requires MESH to track youth in the Teen REACH program until they are eighteen years old. MESH, on the other hand, is interested in using ETO to gather longitudinal data to understand how youth progress into adulthood. The directors at MESH believe these data will help them to show the impact of their programs to both public and private funders. The first step is to determine whether data from eCornerstone can be shared with ETO.

After entering the Teen REACH Center (TRC), I walk toward the administrative offices and hear Jasper already down the hall talking to Alice Willis, the Teen REACH program coordinator who works at TRC with Rhonda. I notice the large glass window between the main event space and the computer lab. A green octopus is painted on the window (see Photo 2). "Miss Alice made that," Rhonda explains, as we walk together toward Alice's office to begin discussing the ETO project. Rhonda has worked at TRC for five years. Previously, she worked in an administrative capacity for several different local schools in the Metro East region. She is experienced in working with computers, which was particularly helpful during the ETO

implementation. I later learned that Rhonda was one of the few staff members at Teen REACH with the advanced computing skills needed to use the cloud computing software.

Photo 2. Teen REACH Mission Control, the Computer Lab at the Teen REACH Center

After settling into the computer lab, Rhonda explains to Jasper and me that she only enters the demographic information from the paper intake forms into eCornerstone. She has never been asked to export the raw data out of eCornerstone. By the end of our meeting with Rhonda, Jasper and I were not able to determine if it was possible to get this information out of eCornerstone. Rhonda suggested that we speak with her supervisor, whom she believed had the administrative privileges needed to access these data. Jasper and I later learned that Arthur's fear of duplicating efforts would become a reality.

The Importance of Gateways in Infrastructural Development

The vignette above illustrates the need for what Egyedi (2000) has referred to as "gateways" in the development of infrastructure. In her study of early containers used to transport goods across sea, rail, and road beginning in the 1970s, Egyedi found that the standardized container was a gateway technology that revolutionized the transportation industry. "It is a means to organise the flow of goods more effectively. Although it is a technical artefact, the container is above all an organisational innovation. As an *efficiency-enhancing* gateway it plays a pivotal role in the transportation system" (pp. 3–4). Standardization is key to establishing compatibility among disparate subsystems. Egyedi categorized three types of gateways based on the scope of interconnection involved (see Table 6).

Table 6. Relationship between the Level of Standardization and the Scope of the Gateway Solution

Source: Reprinted from Egyedi (2000, p. 4).

Level of Standardization	Scope of Gateway Solution
High (modeled)	Meta-generic
Medium (standardized)	Generic
Low ("improvised")	Dedicated

Edwards et al. (2007) summarized the three types of gateways in the following description:

> Gateways may be dedicated (improvised, or devised specifically for a particular system); generic (standardized sockets opening one system to interconnection with others); or meta-generic ("modeled," i.e. specifying a framework or protocol for the creation of specific generic standards, without specifying those standards directly) (p. 15).

Egyedi explained, “the degree of standardization to which a gateway is submitted determines the scope of the gateway solution.” (p. 4). Therefore, for the purposes of my study, dedicated gateways are useful for understanding the low level of standardization that occurred in the development of ETO in the Teen REACH program.

Gateways can also be used to explain the development of information and communication technology, including the sociotechnical arrangements upon which they are often dependent. For example, Edwards et al. (2007) further elaborated on the gateway concept by describing plug adapters, such as three-pin to two-pin AC power adapters, as everyday gateway examples. They also introduced the idea of document format converters as gateways in the information technology realm. Software applications that convert video files from QuickTime (.MOV) to Windows Media Video (.WMV) are gateways. These solutions are significant because, as the authors argued, they “represent a key principle in infrastructure development: plugs and sockets that allow new systems to be joined to an existing framework easily and with minimal constraint.” Edwards et al. (2007) argued that rather than viewing gateways as technologies, they should be viewed as “combining a technical solution with a social choice, i.e. a standard, both of which must be integrated into an existing users’ communities of practice” (p. 16). Our attempts to both discover and develop gateways during the ETO project exposed much larger issues as Jasper and I attempted to transfer data from a state MIS into a private, for-profit cloud computing system.

The Teen REACH Program

I now turn to introduce the Teen REACH program and its relationship to MESH in order to further contextualize the influence of the state in the development of cloud computing

software. The Illinois Department of Human Services (DHS) established the Teen REACH program in 1998 to provide services and activities across the state "during non-school hours to youth ages 6–17, when youth are most likely to get into trouble" (Illinois Department of Human Services, 2014d). The program serves approximately 30,000 urban, suburban, and rural youth each year in "schools, park districts, faith-based organizations, YMCAs, and community agencies" (Center for Prevention Research and Development, 2004). Teen REACH works to provide children with responsibility, education, achievement, caring, and hope (REACH).

> The specific activities involved in the Teen REACH program are aimed at improving the likelihood for future success, helping to provide positive choices, helping to reduce at-risk behaviors, and helping to develop career goals. The Teen REACH Program has six core components. The six core components include Education and Academic Improvement, Life Skills Education, Recreation and Sports, Cultural Arts, Mentoring, and Parental Involvement. The staff develops and implements a monthly curriculum and activity schedule. Academic Improvement allows time to do homework, while providing tutoring in basic skills and enrichment programs to encourage creativity. (Metro East Settlement House, 2013)

Statewide funding for the Teen REACH program increased every year from 1998 to 2001. It then leveled out between 2001 and 2004, receiving over $19 million annually during this time (Harvard Family Research Project, 2014). Since 2004, Teen REACH providers across the state have experienced funding cuts every year. In fiscal year 2011, funding fell to $13,881,200, while the number of Teen REACH grantees statewide increased (Illinois Department of Human Services, 2014d).

Teen REACH at MESH

Teen REACH is one of fifteen programs managed by the Metro East Settlement House in East St. Louis, as I described earlier. Most of these programs are required by the state or federal government to use separate management information systems. For example, Teen REACH staff members are required to use eCornerstone (Illinois Department of Human Services, 2014a) to track youth attendance and grades, two key indicators mandated by DHS. If you refer back to Table 4, you can see where the Teen REACH program is located within the matrix of community-based programs offered by MESH. Patricia Ableton, the director of marketing and development at MESH, talked about her past experience managing the Teen REACH program for eight years at four different locations in the Metro East region of Illinois. "What we try to do is we try to give the kids a well-rounded afternoon or day where they can be exposed to new things that maybe in their regular life they would not have the opportunity." Before she became the director of marketing and development, Patricia's office was located in the TRC.

TRC is located just over the bridge from St. Louis, not far from the Route 55/70 exit. A homeless population of predominantly African American men often congregates just outside TRC's doors. Many of the youth participants in the Teen REACH program come from the elementary and middle schools up the street. Jasper and I worked at TRC with Rhonda and Alice between August and October 2013 to configure and implement ETO software. In order to understand how ETO developed as an information infrastructure in the Teen REACH program at MESH, it's important to begin by explaining what I observed about the use of existing information and communication technologies, including paper.

"It Reminds Me of the Paper Application"

In this section, I describe the role of paper at MESH as an anchor for essential social processes, before turning to a discussion of how standards and gateways influenced the development of ETO in Teen REACH. The use of paper at MESH represents a key point of social engagement between Teen REACH staff, parents, and children who enroll in the program. This is significant because "parental involvement" is one of the six stated goals of the Teen REACH program (Illinois Department of Human Services, 2014d). Parental involvement is also the most difficult aspect of the program. In addition, paper also served as a way to keep track of parents' contact information. As Rhonda explained:

> We always have the [paper] applications around. We have to update it every three months because their phones change every month. Like if they have the mini phones, the government phones. You know, they switch them. We need those numbers in case your kid fractured a finger. We need your numbers. I mean, "we need to talk to you!" Trying to talk to the parents is not an easy task. Trying to get the parents to come here to talk to us is very difficult. It's been one of our biggest challenges for what three or four years.

The difficulty connecting with parents also appeared as a recognized issue in a pilot evaluation of the Teen REACH program (Harvard Family Research Project, 2014). While Rhonda and her staff heavily rely on paper (i.e., intake forms) for parents' and primary caregivers' contact information, it also serves as the primary mode of communication for parents to learn about their kids in Teen REACH. The paper intake forms include survey questions that Teen REACH workers ask parents to complete with their kids. The survey asks youth to respond to questions about their perceived challenges in a number of areas.

During the Quick Start Implementation back in June 2013, Arthur created what Social Solutions calls a "TouchPoint," or a module in ETO, where information from these paper forms

and other analog and digital formats at MESH can be entered into the software. A TouchPoint can be used to collect data about any point of service in which direct-service workers interface with clients. Attendance, Referrals, and Surveys are three examples of TouchPoints described in further detail in Chapter 6.

After logging into ETO at my computer station in the lab, I give Rhonda a tour of the Participant Contract TouchPoint.

> *Ethnographer*: Here is the Teen REACH Contract created in ETO Impact. Does this look familiar?
>
> *Rhonda*: It reminds me of the paper application.
>
> *Ethnographer*: With the survey, and all of these questions, do you do a follow up at any point? Do you ask these same questions again?
>
> *Rhonda*: Yearly, because we have to update the application every year. And, those questions are on the application. And we do ask the parents to make sure that all of the fields are filled out. Other than the questions, such as "Do you receive public assistance or food stamps?" They don't fill that one out. Basically what we do is work with both of them when they fill out the application. The parent and the kid are in there together.
>
> *Ethnographer*: So you sit with them as they fill out the paper application?
>
> *Rhonda*: Yes, yes. Because you know a kid would say, "I don't have a challenge with any of these things." And the parent would be like, "Oh yes you do. Yes you do." Because kids will say, "No, no, no. I have *no* challenges." And the parent's sitting there saying, and you look at the paper and there's quite a few challenges. But a lot of times the kidsis there when they fill out the application.

The dialogue above highlights the use of paper intake forms as a key point of social interaction between Teen REACH staff, parents, and youth in the program. Paper also provides staff

members with an opportunity to get to know, and stay in touch with, parents of youth in the program.

The concept of paper as the anchor for essential social processes in Teen REACH is significant for this study, particularly because I am interested in understanding not only how the ETO software was shaped, but also what the consequences of this cloud computerization process were for MESH as a community-based organization. In other words, one might ask: How are social processes or human services impacted by the introduction of cloud computerization? Murphy and Pardeck (1991) explained that when computers are introduced into welfare agencies, "the human element may be pushed to the periphery of the intervention process, as technical requirements are given precedence over less technological considerations" (p. 106). Computerization does provide social welfare organizations with a number of benefits, including the reduction of paperwork, increased quality control, and the ability to use data for assessments and program evaluations (Kling, 1991). However, in the push to satisfy funders, organizations like MESH also have to consider the harmful impacts of technology on both workers and the clients they serve.

In addition to the potential negative aspects of cloud computerization, more concrete technical issues arose during implementation. For example, Jasper and I had to make a decision about how to configure ETO to collect demographic data that had been entered separately into paper, spreadsheets, and state management information systems. We discovered that standards were necessary to help us make decisions. However, as I describe in the next section, standardization also exposed certain power dynamics and their consequences in the configuration of cloud computing software at MESH.

Standards, Gateways, and Power

Jasper and I had to make decisions about how to best configure ETO to meet the needs of the Illinois Department of Human Services, private funders such as the United Way, and MESH itself and its own organizational needs. This is one of the three main themes of this research. Decisions involving the configuration of ETO to include, or not include, certain types of demographic information became an important site of struggle where competing interests between external stakeholder demands and internal organizational needs took center stage. In this section, I describe how the configuration of ETO provided an opportunity to study the power of standards and their impact on the cloud computing software implementation.

Standards

Jasper and I discovered that in order to transfer demographic information from paper to the cloud for the Teen REACH program, we first needed to develop a standard demographic across all of MESH's community-based programs. I quickly discovered the weight of this task. Fortunately, Arthur had already helped us make some of these decisions about "standard" and "custom" demographics during the Quick Start Implementation back in June 2013. However, additional demographic questions remained as Jasper and I configured ETO for the Teen REACH program.

Jasper and I tackled the technical aspects of standardization by downloading the Participant Demographic spreadsheet template from ETO. The software is very helpful, in this case, because it can generate an .XLS file, which can be used to enter demographic information from the Teen REACH paper intake forms into a spreadsheet. This spreadsheet can then be uploaded into ETO via the software's "batch upload" function. In order for this batch upload process to work, the spreadsheet columns need to match the demographic fields in ETO. Jasper

and I spent hours at TRC comparing the demographic information on the Teen REACH paper intake form with the demographic fields configured by Arthur during the ETO Quick Start Implementation (see standard and custom demographics in Table 7). To make things more complicated, eCornerstone, the state's management information system, had its own requirements that we had to consider during the implementation process. Fortunately, the demographic categories on the paper intake forms and in eCornerstone had already been determined by MESH and the DHS, respectively. Decisions about *which* demographic categories would become the standard in ETO, however, presented a daunting challenge.

Table 7. Demographic Fields in Paper, eCornerstone, and ETO

Intake Method	Demographics
MESH (Paper) Intake	Name; Date of Birth; Address; City; Zip; Home Phone; School ID#; Parent/Guardian; Primary Language; Employed (Y) or (N); Services: (TANF, WIC, DCFS, Free/Reduced Lunch, None); Place of Employment; Phone; School Name; Teacher; Phone; Grade; Emergency Contact; Phone; Relationship
eCornerstone (State Database) Intake	Date of Birth* (mm/dd/yyyy); Gender*; SSN; Mother's Maiden Name; Participant's Marital Status; Race; Ethnic Status; Residential Status; Migrant; Level of Education; Education Status; Individualized Education Plan (IEP); Individual Learning Plan (ILP) for GEAR UP; GEAR UP Agreement; Household Size; Household Income; Participant Income; Proof of Income; Employment Status; Occupation Code; Date of Death (mm/dd/yyyy); Language Preference (primary); Language Preference (other)
ETO Impact (Private Cloud) Standard Demographics	First Name*; Middle Initial; Last Name*; Suffix; Race*; DOB*; Zip Code*; Gender*; Address 1; Address 2; Email; Home Phone; Cell Phone; Work Phone; Pager; Emergency Contact (not living in same house); Emergency Contact Phone; Case Number; Marital Status; SSN
ETO Impact (Private Cloud) Custom Demographics	Assigned Staff ID; Referral Entity; Funding Entity; Education Level; Current Living Situation; Ownership of Housing; Estimated Total Household Income; Veteran Status; Military Status; Type of Assistance Requested; Client Information; Medical Condition; Notes/Comments; Program Name; Program Start Date; Program End Date; Dismissal Reason
* Indicates required demographic.	

Busch (2011) explained that standards are powerful. While they often "appear to be neutral, benign, merely technical, obscure, and removed from daily life," Busch argued that standards are an extremely important source of social, political, and economic power (p. 28). This is due in part to their "*ability to set the rules that others must follow, or to set the range of categories from which they may choose*" (p. 28). Standards can be applied to both objects and people. The intensity of the term increases particularly as the phrase "gold standard" has "crept into common usage as a synonym for 'the best'" (p. 22). As Busch explained, standards are powerful because they structure our expectations. This is because "standards, like the world of nature, are seemingly 'supposed' to be the way they are" (p. 32). In addition, Bowker and Star (1999) argued that standards have "significant inertia that can be very difficult and expensive to change" (p. 14). For these reasons and more, I found it unsettling to make a decision about what constituted a standard demographic in ETO.

As I explained, MESH operates fifteen different community-based programs, from child care to services for older adults. Nine of these programs require separate state or federal management information systems. Therefore, Jasper and I had to make a decision between asking workers to collect demographic information in a standardized way and making sure workers gathered enough demographic information from participants so MESH could use and compare these data across all fifteen programs. Jasper and I looked to directors and program managers at MESH for guidance about which demographics were both required by DHS and most useful to MESH.

Photo 3. Configuring ETO in the Teen REACH Computer Lab

Arthur, Curtis, Jasper, and I, and program staff in the five programs at MESH, decided to go with the standard and custom demographics in ETO (see Table 7) for all of MESH's programs. The result is a standardized list for all programs to satisfy state and private funders, while giving managers in each of the programs the freedom to develop their own customized demographics, as needed. As Jasper and I worked in the computer lab at the TRC to configure the ETO software (see Photo 3), we discovered an important gateway that allowed us to transfer standardized information, including demographics, across disparate subsystems.

Gateways

During the ETO implementation at Teen REACH, the Participant Demographic spreadsheets provided Jasper and I with a gateway to transfer information from paper to the cloud. ETO required these spreadsheets to be used to gather bulk information about

demographics and other data. Therefore, spreadsheets served as a dedicated gateway much in the same way that Egyedi (2001) elaborated on the AC/DC rotary converter that linked electricity networks. "These gateways link an exclusive and specified number of subsystems.… Here, the scope of system interconnection is limited" (p. 44). Spreadsheets were dedicated gateways that linked paper and ETO as subsystems. The degree of standardization was improvised as Rhonda, Jasper, Alice, and I spent roughly four hours each on one day at TRC entering the demographic information for 400 Teen REACH participants into four separate spreadsheets. We sat and worked together in the Teen REACH computer lab transferring data from paper into spreadsheets, each at a separate computer. It was tedious. We talked to each other as we entered the data, to provide both technical and emotional support along the way. The next day, we entered each of the completed spreadsheets into ETO as four separate batch uploads.

In this case, ETO was quite useful in contributing to its infrastructural development because the software provided a gateway (i.e., Participant Demographic spreadsheets) from paper to the cloud. This made it possible to transfer information from the Teen REACH paper intake forms into spreadsheets that could then be uploaded into ETO. The difficulty remained in trying to gain access to data held captive in eCornerstone. I now turn to describe the ways in which broader political, operational, and technical issues emerged in trying to establish a gateway between public and private networked information systems at MESH.

State Information Infrastructure

eCornerstone is the Illinois Department of Human Services' (DHS) state-mandated reporting platform for service providers (see Figure 4). The management information system (MIS) was first introduced in 1997 as "Cornerstone," with the goal of integrating "community-

based maternal and child health services provided to Illinois Department of Human Services' customers and to report their health outcomes" (Illinois Department of Human Services, 2014a). MESH is required to use eCornerstone for four of their DHS-funded programs. Rhonda is the main person in the Teen REACH program who uses eCornerstone regularly. She is also the primary contact between the DHS and the Teen REACH program at MESH. The following description of eCornerstone is provided on the DHS website:

> eCornerstone enables agencies to use and manage data for collaboration with local partners, and will provide information for RFPs, program evaluation, and program planning. Not only can eCornerstone agencies accumulate vital information in an efficient manner, but a reduction in paperwork results in staff better utilizing their time. In addition, eCornerstone helps avoid duplication of enrollments and work efforts while offering convenience, as it is easily accessible from on-site or off-site computers. Finally, the eCornerstone system adapts readily to change. Input will always be sought from program staff and users on ways the system can be further enhanced to benefit users. Because of its web-based nature, system modifications are easy to implement and cause minimal interruption for users. (Illinois Department of Human Services, 2014a)

The fear of duplicating efforts in the development of cloud computing software has been a major theme of this chapter, as I mentioned in my vignette at the beginning. As such, the following statement from above warrants further review: "eCornerstone helps avoid duplication of enrollments and work efforts." This statement is certainly true situated in the context above. However, it takes on a different meaning when considering issues of compatibility in the configuration of ETO.

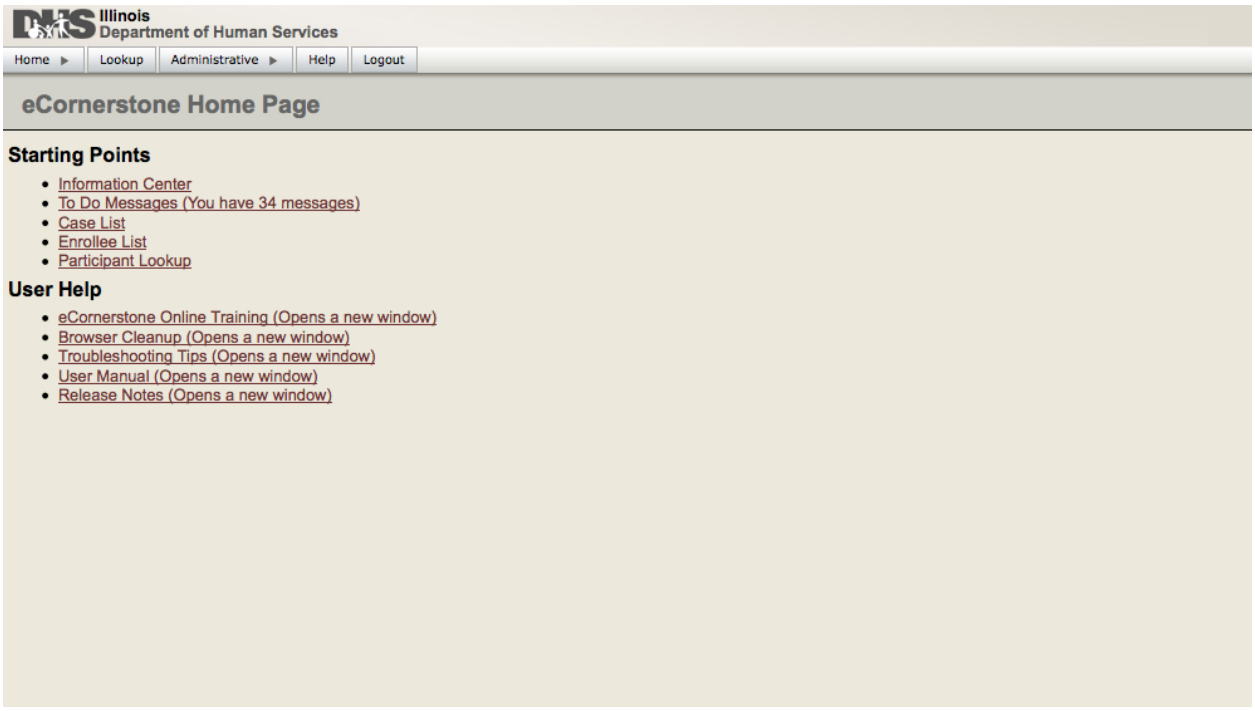

Figure 4. Home Page Screen from the "eCornerstone: User Manual" (Illinois Department of Human Services, 2013)

"POT" Domains

Egyedi's (2000) discussion of political, operational, and technical (POT) domains provides a framework for understanding the infrastructural tensions that emerged while working to find a gateway between eCornerstone and ETO to share information. Egyedi argued that in order to consider how the standardized container developed in the transportation industry, it was important to take into account the political and operational issues as well as previously considered technical issues. These three different "domains" (p. 236), Egyedi argued, provide a more complete foundation upon which to investigate the tensions involved in the ISO container's development.

The political domain includes issues such as regulation and other economic, environmental, and transportation policies. In order for standardization to occur, "Container

standards must overcome incompatibilities between different transport policies and other political and regulatory differences" (Egyedi, 2000, p. 236). In addition, the ISO container required interconnection between different modes of transportation. Therefore, compatibility issues in the operational domain had to be addressed. These included the various interests and priorities of different customers, which resulted in different container requirements. Egyedi explained that in addition to the political and operational issues, there was also a technical component in creating physical compatibility between the subsystems of transportation, including sea, rail, and road (see Figure 5).

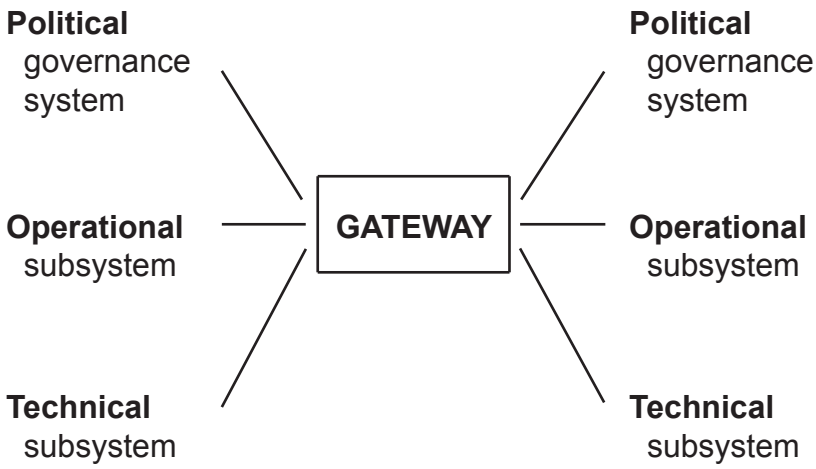

Figure 5. Technological Gateways and Compatibility between the POT Domains in Large Technical Systems

Source: Figure re-created from Egyedi (2000, p. 236).

Gateway Failure

If spreadsheets provided a gateway from paper to the cloud, then eCornerstone became what I call a *gateway failure*. I define this concept as the absence of a gateway between subsystems. In the case of Teen REACH, the failure occurred between eCornerstone and ETO.

This could also be described as the lack of compatibility between political, operational, and technical domains, which the remainder of this chapter analyzes in further detail.

During the Quick Start Implementation, Arthur and Curtis both assumed that it would be possible to export data out of eCornerstone and into ETO. They even talked about the possibility of scheduling weekly exports out of eCornerstone and into ETO through automation. This information transfer process, they proclaimed, would allow MESH to use state-required data to create more sophisticated reports for funders and MESH than was possible with eCornerstone. As Curtis mentioned during our team meeting in early August 2013, "The way we envision this is everything that's captured on a state mandated portal will be captured in ETO.… ETO will take this a lot of steps further than the state portals are taking it." However, as Arthur pointed out during Quick Start, "the devil is in the details." Jasper and I later discovered the real truth behind this statement.

Unfortunately, eCornerstone became a major roadblock. After a month-long process of trying to determine whether we could export data out of eCornerstone, we discovered that it wasn't possible. Instead, double data entry (i.e., into both eCornerstone and ETO) would become the reality, at least for Teen REACH. In our meetings with Rhonda, we learned that eCornerstone does not allow community service providers to gain access to raw data in the form of spreadsheets. Jasper later confirmed this fact after his encounter with Curtis. "It sounds to me that at some point [Curtis] became pretty convinced that we were going to have to have double data entry. He sounded like he was certainly prepared to do so." This realization was a huge setback for Jasper and me because we realized that not only would we have to figure out another way to get data out of eCornerstone and into ETO, but we would also have to ask staff to duplicate efforts in the meantime.

In a later call with Arthur, he said the directors at MESH would have to ask employees to duplicate efforts if they wanted to use ETO. If dual entry became the reality, Arthur explained, then MESH would need strong leadership to help shift expectations. He added, "That does not mean block out other things that you are doing. But depending on what you are doing, there is a lot of existing paperwork in the system. It just means, quit using paper." He admitted there would be situations in which using ETO in the field would not be possible, particularly during teacher evaluations and site visits with clients.

The gateway failure between eCornerstone, as a state and federally funded technology, and ETO, as a private cloud system, created a number of sociotechnical challenges for MESH. This lack of compatibility not only prevented us from transcending eCornerstone, but we also had to recreate much of it. In this way, eCornerstone played a significant role as an actant, or nonhuman actor (Latour, 2005), in the development of ETO. Jasper and I created three TouchPoints: Attendance, Grades, and Progress Notes, based on these same computing functions in eCornerstone (Illinois Department of Human Services, 2013). However, unlike actor-network theory (ANT), the structural factors (i.e., pressure from state, federal, and private funders) played a more significant role than the actor network associated with ETO's development. As the directors at MESH instructed, our primary task was to move data out of the state MIS and into the cloud computing software. In this process of recreating eCornerstone in ETO, I became deeply concerned that Jasper and I were reproducing an already oppressive technological system at MESH.

CHAPTER SIX

Surfacing Invisible Work*

> The rigid architectures of new technologies for welfare administration do not allow for contextual information—the lived experience, struggles, purposes, and motives of women doing the best they can do to survive and raise their children with dignity.
>
> –Eubanks (2011, p. 83)

> What we do isn't seen. I want my staff to get credit for the work they do.
>
> –Francis Jones, PASS program director (June 26, 2013)

Introduction

In this chapter, I use Star's (1999) concept of "invisible work" as a way to understand how state-mandated information systems failed to recognize the work of the parent educators in the Providing a Sure Start (PASS) program who conducted in-home visits with low-income children and their parents in East St. Louis. The PASS program provides parent training, child development, and life skills classes alongside comprehensive case management. In the second half of the chapter, I introduce the ways in which the agency of a diverse and resilient group of African American women, including social workers, managers, and directors at MESH, played a significant role in configuring the ETO software. In emphasizing their everyday experiences with IT at MESH, and recognizing the intersections of race, gender, and class, I attempt to show how management information systems can sometimes be considered "nonworking systems" (Star, 1999, p. 386). The women at MESH explained that the ETO software should address these

* The title is in reference to Star (1999).

structural inadequacies. In sharing these observations, my goal is not to fetishize their "local knowledge," nor do I wish to treat African American women as a singular demographic or biological category. Rather, my goal is to share my observations of the agency of a heterogeneous group of human services professionals by emphasizing how their contributions shaped the cloud computing software.

I begin with a vignette to show how the invisible work of parent educators revealed itself during one of our ETO software meetings with staff, managers, and directors in the PASS program. The ethnographic account highlights the ways in which IT can have political dimensions (Winner, 1986) that benefit some groups at the expense of others. I call attention to how IT failed to account for the everyday experiences of African American women at MESH, which ultimately led to a more informed and representative information system that responded to the technological shortcomings.

"What We Do Isn't Seen"

On a hot day in late June 2013, Curtis Fanton, the associate director at MESH, and I pulled into the parking lot of the MESH Child Care Center for our Quick Start Implementation meeting with social workers and managers in the PASS program. Arthur Frederichs, the project manager from Social Solutions, and Shaun Wilson, the then IT director at MESH, had already arrived for our ETO software meeting. The purpose of our meeting today was to talk with the PASS employees to determine their software requirements for ETO.

Curtis and I opened the door to the Child Care Center and walked inside the building. I could see the front hallway open up into a large auditorium. This was the gym for the child care program. Derek Phillips, MESH's executive director, has an office in the building, which is also

home to the PASS and Head Start (http://ilheadstart.org) programs. On our way toward the conference room for our meeting with PASS, Curtis and I met Arthur and Shaun. We walked together down the main hallway past several administrative offices, including the office of the director of early childhood education.

The four of us entered the main conference room as eight African American female social workers and managers from the PASS program joined us for the meeting. A large poster of Paul Revere holding a metal teapot could be seen on one of the blue walls. On the opposite side of the room there was a window that looked out into the gym, where the kids in the daycare program played. It was a large meeting, twelve of us in total.

The room fell quiet as Arthur opened up his laptop. Francis Jones, the (now retired) program director for PASS, looked at Arthur with a smile and said, "They are just being shy today. They'll speak up." Francis was referring to the seven other women, parent educators and managers in the PASS program, who were seated around the table. They were her staff.

Arthur started the meeting by introducing himself. He then asked everyone else in the room to do the same. After all twelve meeting attendees spoke, Arthur asked the women in the PASS program to answer the following question: "What does success look like in your program? When you have someone who is successful, how do you know?"

> *Francis Jones (program manager)*: We're looking at children birth to three.
>
> *Cynthia Tanner (parent educator)*: The child is going to look happy, and the parents will look eager to learn.
>
> *Janet Hayes (parent educator):* Parents are self-sufficient; utilities are paid; child is enrolled in school; child can say their ABCs; children can say their names; there will be a father in place.

Arthur typed away on his laptop, taking notes as the social workers and managers in the PASS program continued to talk about what success looked like in working with low-income children and their parents in East St. Louis.

Arthur then asked the staff to describe the types of demographic information that are collected during the intake process. Beverly Archer, the program coordinator for PASS, explained to Arthur that they use Visit Tracker (https://www.visittrackerweb.com) to gather demographic information. Visit Tracker is another type of SaaS platform, which is similar in many ways to ETO. Beverly explained that they use Visit Tracker to keep track of participants, primarily children and their guardians, and to enter data from the Parents as Teachers (PAT) curriculum. PAT is a nonprofit organization that "develops curricula that support a parent's role in promoting school readiness and healthy development of children" (Parents as Teachers, 2014). PASS requires staff to use the PAT educational materials when they do in-home visits to children and their parents.

After a lengthy discussion about workflows and forms, Arthur explained, "I'm going to try to get something functioning [in ETO] in the next few days." He said that it would be up to Shaun and me to build out the rest of the software. I turned to look at Shaun, seated to my left, who had a stressed look on his face. All eyes fell upon us, as Shaun let out a big sigh. Shaun and I quickly realized the amount of work ahead of us following the Quick Start Implementation.

Arthur's next question was the most controversial. He asked the eight social workers and managers in the room to describe what metrics they use to track the success of parents and their children in the PASS program. Everyone looked to Francis, and a silence fell on the room.

Francis lowered her head slightly. Her eyes, just below her glasses frames, focused like a laser on Arthur, and with a concerned tone in her voice, she replied:

> It's difficult to measure success, because every parent is different.… We don't want to get test-oriented with our parents.… A child may get up in the morning, and their parent may make them breakfast.

Francis went on to explain how activities such as these should be considered as measures of success. Unfortunately, the PAT curriculum, and the Visit Tracker software that records summaries of PAT reports, does not count these types of successes as part of its design. Francis told Arthur that, in fact, half of the work that her staff does on a daily basis is not considered a success because of the way that the PAT program and the Visit Tracker software are designed. As a result, Francis explained, the parent educators, as well as the PASS program on the whole, may get a negative score at the end of the year. There are many things that Francis's staff members do to provide support and assistance to families that go unrecognized and uncounted every year by the Visit Tracker software.

Arthur responded by telling Francis that her point was very important. Then, he began to move on to his next question. After a bit of back and forth between Arthur and the PASS staff, I jumped into the conversation and asked Arthur: "Shouldn't we try to take down categories of the types of assistance that PASS staff provide, that aren't being recorded, so we can create categories in the ETO software?" He replied, "Yes, if it's not too difficult, we should at least ask the question." He then turned to the group and asked Francis's staff to describe the types of activities they do on a regular basis that don't currently get recognized in PAT and Visit Tracker.

Transportation as Invisible Work

Francis responded to Arthur first by explaining that transportation is a huge part of the work for which the women in the PASS program are responsible. Francis explained, "I like to talk in extremes so people will understand." She then proceeded to tell Arthur that if a parent educator arrives at the client's home and she finds the client has been shot, then the parent

educator has to take on additional responsibilities than are required by the PAT program—and those additional tasks are not recorded in the Visit Tracker software. The PAT curriculum is particularly focused on educational activities and assessments that parent educators are supposed to use with parents and their children inside the home. Francis was referring to certain activities that parent educators were often forced to do outside the home. For example, if the parent educator finds herself in this particular situation, then she will have to call an ambulance. After the ambulance arrives, she will then have to travel with the client to the hospital, all while trying to ask questions mandated by the PAT program. Francis explained that situations like these happen often and require parent educators to engage in tasks that are outside the scope of the PAT curriculum. This work is significant, yet not recorded by computers.

Another significant use of transportation, as a form of invisible work, occurs when a parent educator needs to take a client to a doctor's visit or to other local agencies, with her own car, to help her clients receive social support. Hamer (2011) shared an important illustration, which provides context for understanding the reasons why East St. Louisans have a "love–hate relationship with the automobile":

> When you start considering East St. Louis as an inner-ring suburb, rather than simply a small-urban collection of inner-city pathologies, the car problems of its citizens stop looking like the petty nuisances of poverty. Those nuisances magnify into Shakesperean agonies, torturing East St. Louisans twenty-four/seven in their daily personal interactions, in their professional options, and in their sense of self-worth and full participation in the opportunities and benefits of national life. (p. 58)

Because there is an overwhelming lack of employment opportunities in East St. Louis and the Metro East region, residents are often forced to travel long distances, over the Mississippi River and into St. Louis, to find work. Hamer added, "an institutionally underfunded and inefficient

public transportation system just reinforces this bitter state of affairs" (p. 59), which can make it difficult for parents in the PASS program to get to their appointments and access other local services.

Janet Hayes added that many of her colleagues are often expected to act as interpreters, speaking in Spanish to local service providers, to help connect a family to emergency assistance for issues such as "no food, no utility, eviction notice." The Visit Tracker software does not measure this category of work. Other parent educators at the table nodded their heads in agreement. Curtis, with a look of stunned realization on his face, jumped into the conversation and added, "Wow. That's a huge part of what we do." And, the women around the table responded, "Yes."

Francis told Arthur that transportation issues had a major impact on the work of parent educators. As a result, she reported "50 percent of PAT visits were counted a negative." Francis paused for a second, then looked firmly at Arthur and said, "What we do isn't seen. I want my staff to get credit for the work they do." A tense silence filled the room once again.

Curtis nodded in agreement with Francis and her staff. He then looked down at his watch and announced that Arthur, Shaun, and I had to move on to our next ETO program meeting. Curtis thanked all of the women in the PASS program for their time. Curtis, Arthur, Shaun, and I packed up our things and headed out of the building and back into the parking lot. It was noon. The sun beat down during the hot summer day, with a forecasted high of 93 degrees and a 100-degree heat index. Curtis and I got back into his car and drove back to MESH for our next Quick Start Implementation meeting.

Classifying Work in Infrastructure Development

Bowker and Star (1999) explained that information technology innovations have consequences for workers, particularly with regard to the type of work practices that are counted as legitimate. In their study of the development of the Nursing Interventions Classification (NIC), Bowker and Star focused on the category of "humor" as a work process in the nursing profession. The category was defined as: "Facilitating the patient to perceive, appreciate, and express what is funny, amusing, or ludicrous in order to establish relationships, relieve tension, release anger, facilitate learning, or cope with painful feelings." The category included fifteen subelements, including the following three that are first on the list: "Determine the types of humor appreciated by the patient," "Determine the patient's typical response to humor (e.g., laughter or smiles)," and "Determine the time of day that patient is most receptive" (p. 236). The authors argued that humor, something previously considered a personality trait, became a formal nursing intervention that could be accounted for through its classification.

In the same study, Bowker and Star described how the Iowa group, "who are mainly teachers of nursing administration and research, made essentially three arguments for the creation of a nursing classification" (p. 235):

1. Without a standard language to describe nursing interventions, there would be no way of producing a scientific body of knowledge about nursing.
2. It was a key strategy for defending the professional autonomy of nursing.
3. It was important to be able to talk about nursing in a language that computers could understand, else nursing work would not be represented at all in the future. It would risk being even further marginalized than it is at present. (p. 237)

The first and second points are relevant to both nursing and human services, as both are fields of scientific study and professional practice. The third point is perhaps most relevant to my study of cloud computing and human services professionals.

In the case of transportation as a form of invisible work, Francis tried to explain to Arthur that Visit Tracker, as information infrastructure, failed to recognize the types of work that are expected of parent educators that fall outside of the PAT curriculum. This example of hidden work might be described as a work classification system in the way that Bowker and Star (1999) describe the NIC. While I did not have access to the PAT curriculum during my study, I did gain access to the PAT logic model (http://www.parentsasteachers.org/images/stories/documents/LogicModel_Web.pdf). The logic model provides a list of general categories of activities that are expected of parent educators, which fall into the following three categories: "Parent-Child Interaction, Development-Centered Parenting, and Family Well-Being." In the development-centered partnering category, the topics include: attachment, discipline, health, nutrition, safety, sleep, transitions/routines, and healthy births. From Francis's description of the types of environmental factors that impact parent educators' fieldwork, one could only assume that focusing on these developmental topics while traveling in an ambulance or taking a client to a doctor would be challenging.

The vignette above also demonstrates how information systems at MESH failed to recognize the work of parent educators in the PASS program. This is primarily because the Visit Tracker software did not provide an adequate digital space for workers to provide "metrics" on the everyday realities they faced, particularly as they conducted in-home visits with low-income children and their parents. The vignette exposes a broader sociotechnical infrastructure at MESH, which includes transportation, gunshot wounds, hospitals, translation services, and a lack of

employment opportunities. Hamer's (2011) study of transportation provides a vivid example of this infrastructural perspective in her story about Curvis Shore, a thirty-eight-year-old man, after his car broke down in East St. Louis:

> Repairing the troubled vehicle was easier said than done. For a definitive diagnosis, Curvis would have to remove the parts and have them tested.… And the car also needed tires, annual taxes and tags, insurance, gasoline, and certification in the state emissions-standards test. Fixing a starter or ignition switch had not yet crowned his priority list. Still, the car problem was a severe inconvenience, sometimes keeping him from getting to work on time or running his mother's errands or paying his bills or conducting his love life. (p. 60)

Infrastructure "becomes visible upon breakdown" (Star & Ruhleder, 1996, p. 113). This relational perspective on transportation provides context for the invisible work of a heterogeneous and resilient group of African American women and their everyday experiences with technology at MESH. Francis's plea to ensure that her staff receives credit for their work is intimately connected to the sociotechnical infrastructure of East St. Louis as an "abandoned" (Theising, 2003, p. 11) U.S. industrial suburb. In other words, an infrastructural analysis of this particular nonworking system not only includes the PAT curriculum and the Visit Tracker software, but also ambulance rides and translation services, or the activities not recorded by information technology at MESH.

Information technology failed to address the needs of African American female social workers and managers at MESH and their work with low-income children and parents in East St. Louis. In placing emphasis on the failures of management information systems, in particular, I attempt to move the conversation toward a focus on how technological artifacts do not always benefit everyone equally. I am not interested in blaming IT. Rather, I seek to call attention to the "social and economic system in which it is embedded" (Winner, 1986, p. 20). This is why I

argue that an infrastructural analysis, such as the one presented above, provides a more holistic account of the unique local tensions that shape the development of large-scale information systems.

The June 2013 PASS meeting surfaced some of the invisible work of Francis's staff. In the months ahead, following the Quick Start Implementation, Jasper and I had additional meetings with the parent educators and managers in the PASS program to make sure that ETO was configured to coincide with both the requirements of the PAT curriculum and their own needs based on their experiences conducting in-home visits. We tried to address the shortcomings of the Visit Tracker system by asking parent educators for their advice about how to develop more representative information infrastructure that could be used to measure the everyday realities of their professional lives. The advantage of the ETO software, as a configurational technology (Fleck, 1994), is now turned to as an approach toward addressing some of the technical failures of the existing networked information systems at MESH.

Human Agency and Infrastructure Development

The remainder of this chapter moves from highlighting the ways in which information infrastructure, as a nonworking system, failed to address the professional needs of the social workers and managers at MESH and toward a discussion of how many of these same women, as agents of technological change, played a significant role in making decisions about the ETO software implementation that helped to surface invisible work in the PASS and Teen REACH programs. These women shared their unique perspectives, based on their everyday experiences with technology at work, about how the ETO software implementation could improve the lives of children and families, as well as their own work situations. I describe how specific examples

of TouchPoints, or software modules (e.g., see Figure 6), that were configured within the ETO software were based on the types of activities that previous networked information systems did not address.

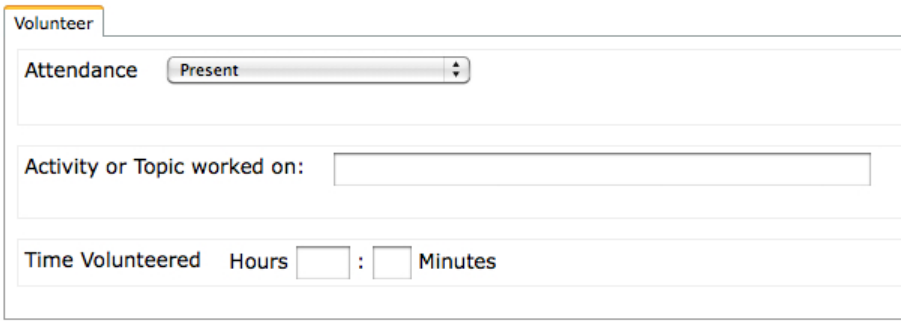

Figure 6. Track Volunteer Time TouchPoint in ETO

I argue that the creation of the TouchPoints, the specific software modules in ETO, helped to make everyday work practices at MESH visible, much the way that the NIC helped to classify, and thus legitimize, the nursing profession in Bowker and Star's (1999) research. In doing so, I show how the agency of this heterogeneous group of employees at MESH played a significant role in configuring the ETO software and strengthening the position of human services professionals at MESH. The purpose is to describe the infrastructural development of what might be characterized as a more fair and representative information system.

Internal Organizational Needs

In my meetings with directors at MESH, they described the ways in which the ETO software would benefit the organization. They explained that many of their clients are no longer eligible to receive state and federal services because of changes to state and federal welfare policy during the past five years. At the same time, MESH has experienced increasing demand for services while cuts to funding continued. Derek Phillips, MESH's executive director, as well

as Curtis Fanton and Patricia Ableton, each shared their perspectives on how the ETO software would help the organization to better track program outcomes and respond to emerging standards from state and federal agencies. The directors also mentioned that while it's necessary to configure the software based on the state-mandated reporting requirements, they also recognized the potential of using ETO to influence public policy by showing state legislators in Springfield exactly how MESH serves individual and family needs—beyond state requirements—across the Metro East region of Illinois.

After several meetings led by social workers, managers, and directors in the various programs at MESH, Curtis, Jasper, and I determined, based on their recommendations, that three data sets in particular would be critical for capturing the invisible work at MESH. I now turn to describing three TouchPoints—Referrals, Surveys, and Volunteers—as a way to show how the agency of human services professionals at MESH played an important role in both configuring the ETO software and legitimizing their everyday work practices.

Referrals

Patricia and her colleagues in the Teen REACH program, along with staff in the PASS program, expressed interest in using ETO to manage referrals within and outside the organization. Patricia told Curtis, Jasper, and me that referrals are a key part of MESH's community-based services. As she explained, "That is why the collaboration of partnerships with different social service agencies, or just other organizations is extremely important." Arthur created the Record Referral TouchPoint following our Quick Start meetings back in June 2013. During one of our meetings with Teen REACH back in September 2013, Jasper and I talked with Rhonda about how she could use the Referral TouchPoint to refer participants to other programs and also how she could receive referrals from other departments at MESH.

Human services professionals in the PASS and Teen REACH programs agreed that the Record Referral TouchPoint would be a useful tool for recording the invisible work that was not being recorded by any state-mandated information systems, including eCornerstone. The organization should now be able to track information about participants in different programs through the TouchPoint—information that is not required by state or private funders. This information should also provide important data that can be used to show state legislators and private funders how MESH responds to the needs of individuals and families living in poverty.

Surveys

Rhonda and Alice also told Jasper and me, during our meetings at the Teen REACH Center, that it would be helpful to have surveys created in ETO. Rhonda told us that surveys are required for their Continuation Plan, which is an internal document at MESH used as part of their grant application process for state funding. Rhonda explained that the plan includes budgets, parent meetings, advisory council meetings, and other pertinent information related to the Teen REACH program. Rhonda and Alice asked us to create surveys that they could use with youth in the program. Rhonda sent us two existing paper surveys (see Appendixes D and E) that they wanted to see in ETO. I created the surveys in ETO by adding text boxes and drop-down lists, with yes and no options for responses. After showing Rhonda the surveys, she mentioned that the digital versions would be useful because staff could use these data for their continuation reports. In addition, she explained that the surveys should help Teen REACH staff to collect and analyze data about youth experiences in the program, both for the DHS and for other existing and potential funders.

MESH employees played an important role in the development of the Teen REACH surveys in ETO. Results from the surveys will hopefully support their programmatic information

needs and document impact on youth over time. This information should also help staff, managers, and directors compare and contrast participant data collected through other TouchPoints, helping them to make decisions about program structure and allocation of time and resources. In addition, these data can help Teen REACH staff produce yearly reports based on pre- and post-surveys from youth in the program. Results from one year can be compared to other years and provide a method for determining where and how to make programmatic changes.

Volunteers

During our Quick Start Implementation meeting with the Teen REACH employees in June 2013, Patricia Ableton explained to Arthur that they did not have a way to track volunteer hours. "We want to track family assistance. Parent volunteer hours. We are also mandated to do a certain number of volunteer hours." She explained that volunteers are also a huge part of the organization. However, most of the volunteer time is tracked using paper. After the meeting, Arthur created a Track Volunteer Time TouchPoint in ETO (see Figure 6). It is fairly simple compared to some of the more elaborate TouchPoints in ETO. From the Dashboard, which is the user interface in ETO, the user can choose the TouchPoint. The software then asks the user to select the name of a volunteer.

Arthur created a drop-down menu to include the following five options: present, present but tardy, present but unacceptable effort, absent, and absent but excused. Staff across all fifteen programs at MESH should be able to use this TouchPoint, based on the recommendation provided by Patricia and her staff during the Quick Start Implementation meetings. The Track Volunteer Time TouchPoint is one of three examples that show how ETO was configured to track information beyond what was required by the state. The TouchPoint should also help to

provide MESH and its funders with a more accurate picture of the role that volunteers play in helping the organization to provide services to the community, particularly in light of the persistent cuts to state and federal funding.

The Referrals and Surveys TouchPoints created an opportunity for staff at MESH to record invisible work and store data in a centralized location in ETO. The Volunteer TouchPoint, on the other hand, raised an interesting question about how to classify work that indirectly benefits clients who receive community-based services at MESH. In Bowker and Star's (1999) study of the NIC, the authors discussed the challenges of classifying direct, indirect, and administrative care.

> Direct care is separated from care that only indirectly benefits patients. Indirect care includes, for instance, coordinating treatment schedules, discharge planning, and patient supervision. One step further removed from the bedside is administrative care, activities for creating a work environment supporting either direct or indirect care. (p. 245)

Bowker and Star explained that the process of defining administrative tasks as care, in their study, was controversial. The authors found that the majority of those whom they interviewed believed that administrative care belonged outside the category of nursing interventions. The point here is that the differences in opinion led to a gray area in the development of the NIC. Bowker and Star argued that the example points to a challenge in the "visibility-discretion" tradeoff for classification designers and users (p. 247).

The Volunteer TouchPoint in this context, therefore, could be considered an example of administrative work at MESH, or what I would call activities for creating a work environment supporting either direct or indirect services to residents who receive community-based services at MESH. Therefore, while the Volunteer TouchPoint does not necessarily apply to the direct-

service work of parent educators or Teen REACH staff, it should help MESH employees to document those activities related to the administration and management of volunteers, which directors at MESH mentioned were such a large part of the support provided to residents who rely on MESH's community-based services.

The Devolution of ETO

I close this chapter with a brief description of how the ETO project came to a halt. I draw upon Fleck's (1994) concept of "configurational technology" as a way to understand some of the organizational challenges that MESH faced in implementing a large-scale cloud computing software application at a time of severe cuts to state and federal funding. I try to show how ETO presented both opportunities and administrative challenges to MESH because they lacked the funding and capacity required to serve both external stakeholder and internal organizational needs. I provide this narrative as a basis for my recommendations in the next chapter.

Fleck (1994) explained that configurational technology requires substantial user input and learning based on both local knowledge and broader institutional contexts. The author also noted that, "Not surprisingly, in general the greater the configurational nature of the technology (i.e. the more it is composed of selections of components to meet local requirements) the greater the chances of failure" (p. 647). In this chapter, I explained how information technology at MESH failed parent educators and managers in the PASS program. This was because the Visit Tracker software failed to account for the invisible work of parent educators who conducted in-home visits with low-income children and parents in East St. Louis. Transportation surfaced as part of the invisible work of parent educators, and the need for a more flexible infrastructure to allow Francis's staff to document their work in the PASS program was addressed. The directors at

MESH saw ETO as having the potential to remedy the failures of Visit Tracker. However, replacing Visit Tracker with ETO proved to be much more complex because of the sociotechnical relations between the Parents as Teachers program and the Visit Tracker cloud computing software.

The ETO software has the potential to remedy many of the infrastructural tensions between external stakeholder demands and internal organizational needs. However, the project ultimately failed. It's important for this discussion to be clear about what I mean by failure. I mean very specifically that the organization ran out of money and could not afford to pay the monthly SaaS fees. As a result, MESH had to put the ETO project on hold until additional grants were obtained. This does not mean that the work that was put into the project was unsuccessful. To the contrary, our project management team learned a great deal about how to create a more just and fair information system to assist social workers and managers in being able to surface the invisible work at MESH.

While the ETO project might be considered a failure in relation to Fleck's definition as a configurational technology, the software also had the potential to address the failures of the technical aspects of state-mandated information systems. I would argue that what I am calling *nonconfigurational technology*, such as Visit Tracker and eCornerstone, lacks the flexibility required by information infrastructure over time, as the work required of human services professionals changes. In the attempt to establish standards, state and private information systems failed MESH in several ways, as I've tried to explain in this study. However, I want to argue that these sociotechnical failures also introduce several important lessons about how public policymakers, software developers, and community-based organizations can work together to ensure flexibility in the future development of interoperable statewide IT systems.

Conclusion

In the first part of this chapter, I described how information infrastructure failed to recognize the work of parent educators in the PASS program. I described how Bowker and Star's (1999) study of the Nursing Interventions Classifications provided a framework for investigating how work is legitimized through the use of classification systems. I used this approach to look at the types of invisible work that were revealed during our software requirement meeting with staff and managers in the PASS program. I then turned to describe how the agency of human services professionals at MESH played a significant role in making decisions about how the ETO software was configured and implemented. I argued that the configuration of the Referrals, Surveys, and Volunteers TouchPoints provided an opportunity to study how workers not only helped to make their own work visible, but also the work of support staff, such as volunteers, who play a vital role in delivering community-based services to residents in East St. Louis. In the next chapter, I turn from my ethnographic accounts in the past three chapters to a discussion of the implications of my findings. I introduce recommendations for software developers, public policymakers, and community-based organizations interested in using cloud computing software applications to help move people out of poverty. The purpose is to present a framework and action plan for addressing the challenges I observed facing community-based organizations in implementing networked information systems as the demand for accountability in state welfare programs increases on a yearly basis.

CHAPTER SEVEN

"What It All Means"*

> Ultimately, one has to decide what one is dealing with and why it matters.
>
> –Winner (1993, p. 373)

Introduction

In this chapter, I argue that if state policymakers require data to understand the needs of community-based organizations that provide state-funded 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

* The title of this chapter is in reference to Winner's (1993) response to social constructivism.

standards that are "fair, equitable, and effective" (pp. 300–308) as a framework for developing more response 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.

I conclude this chapter with four recommendations for state policymakers, software developers, and community-based organizations interested in using cloud computing software to help move people out of poverty. The guidelines provided by Busch offer key lessons for discussions about how to create more fair and equitable IT systems for both community-based organizations and the individuals and families they serve. These recommendations are particularly intended for state government officials interested in developing IT systems for community-based organizations that will support, rather than simply monitor, workers in their efforts to provide financial and social assistance to low-income residents. The ultimate goal of this chapter is to promote a deeper understanding of the information infrastructure challenges facing community-based organizations at a time of severe cuts to funding for public assistance programs and to provide concrete suggestions for developing more humane cloud computing systems.

Standardization and Flexibility

Before I begin my discussion of the infrastructural challenges facing MESH and offer concrete recommendations to address these challenges, I first need to review two concepts that I believe are helpful for understanding the sociotechnical struggles facing MESH and their efforts to create a more humane information infrastructure. These two concepts are "standardization" and "flexibility." I begin by reviewing research within infrastructure studies that provides an important framework for analyzing the tensions between external organizational demands and internal organizational needs at MESH.

As I described in this study, 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. In my research, I have been concerned with the consequences of those state IT systems (i.e., eCornerstone) that lack flexibility. In the case of MESH, the challenge in creating standards in ETO was most visible while trying to negotiate the sociotechnical demands of state agencies and the United Way, on the one hand (e.g., program structure and information reporting requirements), and MESH’s internal organizational needs, on the other (e.g., configuring software to record invisible work, influence policymakers, and attract new funding sources).

At the same time, Jasper and I learned during the ETO implementation that each of MESH’s fifteen community-based programs has its own information gathering needs (e.g., demographic information) and nine of these programs were required to use a different state or federal management information system for data collection and reporting. The infrastructural tensions that became visible during the ETO implementation, particularly with the Teen REACH and PASS programs, became an opportunity for me to develop a deeper understanding of the need to balance standardization and flexibility in the development of information infrastructure at MESH. In the remainder of this chapter, I take up the issue of how to address this challenge in designing cloud computing software applications for community-based organizations.

Designing Fair, Equitable, and Effective Standards

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.
10. Review standards, tests, and indicators frequently.
11. Use law experimentally. (pp. 300–308)

In this chapter, I describe how many 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.

Responding to Infrastructural Tensions

In this section, I briefly review the tensions between standardization (state IT systems) and flexibility (ETO) in the configuration of cloud computing software at MESH before turning to a discussion of how Busch's (2011) guidelines can be applied to the development of future state IT systems. I summarize the conflicting dimensions that existed between external stakeholder demands and internal organizational needs. The former consists of state, federal, and private funders who each have their own expectations about how the ETO software should be used to help them know how their money is being spent. Funders played a significant role in influencing MESH's decision to purchase ETO Impact software. However, these funders did not provide the financial support needed by MESH to maintain the software, train workers, and produce reports for funders. It is important to note that Arthur Frederichs, the project manager at Social Solutions, recommended that if an organization wants to use ETO, then it will need a full-time staff person to manage software and create reports. These staffing costs, as well as the cost of the monthly software service fees, are a significant burden for community-based organizations like MESH, particularly at a time when state budgets for human services are being cut every year.

The internal stakeholder demands have been characterized as expectations—beyond state and private funders—about how the ETO software could be used. MESH was motivated to use ETO to surface the invisible work of its employees, conduct community needs assessments, influence public policy, and gain new sources of funding. This is where we can see MESH as an actor in the social shaping of cloud computing. In Table 8, I attempt to characterize the various sociotechnical aspects that came into conflict during the ETO implementation. I will now turn to summarize my findings from the previous chapters and discuss how the concepts of flexibility

and interoperability can be useful in designing more fair, equitable, and effective information infrastructures for community-based organizations that administer state-funded public assistance programs.

Table 8. External and Internal Infrastructural Dimensions

	External Stakeholder Dimensions	**Infrastructural ← Tensions →**	**Internal Organizational Dimensions**
Social	• State and federal government agencies • United Way • Illinois Framework	• External pressures on MESH to adopt IT • Lack of funding for IT support at MESH • Existing IT systems failed to surface invisible work	• Understanding community needs • Surfacing invisible work • Influencing public policy • Generating new funding sources
Technical	• eCornerstone (one of nine government-mandated information systems at MESH) • Parents as Teachers • Visit Tracker	• Lack of interoperability • Standardization (external) versus flexibility (internal) • Increasing need for "configurational technology" (Fleck, 1994)	• Paper • Spreadsheets • Microsoft Word documents • ETO Impact

External Stakeholder Demands

I introduced the public and private forces that influenced decisions about how the ETO software should be configured. Here, I characterize these actors as part of the 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, I will now attempt to parse them by their interconnected social and technical aspects.

Social. During my fieldwork at MESH, I found that social, political, and economic forces played a significant role in shaping cloud computing at MESH. I put them into categories of public and private. The public forces were primarily defined by state legislation and technology policy. In an effort to respond to the state's fiscal crisis, the governor of Illinois passed legislation in 2010 called Budgeting for Results, which I described as a merit-based system for allocating public funds for public assistance programs. Around the same time, the Illinois Framework was announced as a multiyear IT project focused on creating a single cloud computing system for all of the state's health and human services agencies. There are over 200 different state agencies, and the Illinois Framework seeks to integrate all of them with a single IT system. It is not yet clear, however, how the community-based organizations that administer state public assistance programs will benefit from this statewide IT project. The private forces that motivated ETO's development were largely directed from the United Way. 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.

Technical. The technical elements included the state-mandated management information systems (e.g., eCornerstone) and the other programmatic information systems (e.g., Parents as Teachers and Visit Tracker). The Visit Tracker cloud computing software recorded data from the PAT curriculum. There were technical difficulties associated with moving from the Visit Tracker

software to the ETO software. During our meetings with the workers, 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, which we later found out was true, 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 a consistent manner. Unfortunately, this key issue was not resolved before the ETO project was put on hold.

In addition, the lack of interoperability between the state management information systems that MESH was required to use and the ETO SaaS platform created additional staffing and administrative challenges for MESH. ETO has great flexibility in terms of how it can be configured, which I believe could provide MESH with many benefits in both surfacing invisible work of employees and documenting impact in the community. However, this lack of interoperability resulted in an increased workload that required staff to duplicate efforts, as I tried to show in the case of Rhonda's experiences in the Teen REACH program.

Internal Organizational Needs

As I previously described, the social and technical aspects of cloud computing are interconnected. These aspects focus on ETO's potential as a configurational technology to gather data about community and organizational needs that could be used to surface invisible work, influence public policymakers, and attract new sources of funding. These technical aspects included paper, spreadsheets, Microsoft Word documents, and the ETO cloud computing software. I would argue that the internal technical aspects are more flexible and configurable because of their local orientation. This could be viewed in contrast to the external, which is 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 information boundaries between paper, spreadsheets, Microsoft Word documents, and the ETO software represent some of the technical aspects of the internal organizational dimensions. As I previously mentioned, the internal sociotechnical infrastructure is more flexible and configurable because of its local orientation. This could be viewed in contrast to the external dimensions, which are more fixed and rigid, based on the human and nonhuman actors that came into conflict with the organization's vision for ETO. There are also legal issues related to the technical aspects of the ETO software, which I would include as key relational aspects of the internal organizational dimensions. 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.

Recommendations

I conclude this chapter 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 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 TouchPoint-like modules that could be configured 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.

> In the context of standards setting and enforcement, this means that it is presumed that local knowledge (and customs, traditions, norms, mores, etc.) takes precedence over that to be placed in force over some larger geographic area unless there is a compelling reason why this should not be the case. (p. 301)

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.

As I tried to show, 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 chapter, I discussed the implications of my findings and focused on particular aspects of right and wrong (Winner, 1993) involved in the implementation of cloud computing applications in community-based organizations. I drew upon Busch's (2011) guidelines for building standards that are "fair, equitable, and effective" (pp. 300–308) as a framework for developing flexible, interoperable networked information systems for community-based organizations to better respond to local needs. I reviewed the tensions between external stakeholder demands and internal organizational needs, which ultimately influenced the direction of the ETO cloud computing software at MESH during its implementation phase. I discussed the need for the inclusion of flexibility and interoperability in the development of future state-mandated information systems, while recognizing that there is no perfect solution to the IT challenges facing state agencies and community-based organizations.

After detailing both the social and technical aspects, while recognizing their inseparable nature, I put forward four recommendations for state policymakers, software developers, and community-based organizations interested in using cloud computing as a configurational technology to respond to external demands and promote internal organizational needs. I hope

these recommendations may be useful to community-based organizations interested in using cloud computing software to help people move out of poverty.

Conclusion

> Another step toward creating a humane technology relates to fostering epistemological pluralism. The aim is to reduce the likelihood that other than computer-based knowledge will be treated as worthless.
>
> –Murphy and Pardeck (1991, p. 151)

> In short, there is a lot of work to do, and we all have a role to play in creating a more just world.
>
> –Eubanks (2011, p. 151)

In the Introduction, I began by questioning the technological deterministic thinking about cloud computing, which I explained was propelled in large part by former Google CEO Eric Schmidt's comments and further driven by the mainstream media. I used the concept of technological determinism as an entrance through which to tell a more nuanced and complex story about the uneven distribution of information technology's benefits at a time of increasing social inequality. By focusing on East St. Louis, as a U.S. industrial suburb, I showed how place matters in understanding the potential of cloud computing to support community information needs. The purpose was to examine the relational aspects of computerization in community-based organizations in order to provide an alternative, and perhaps more down to earth, perspective to counter the technological deterministic accounts.

This research makes a contribution to the field of library and information science by describing how networked information systems can fail to meet the needs of community-based organizations that provide state-funded public assistance programs. I argued that in order to develop successful information infrastructures in human services organizations, cloud computing

software platforms need to be flexible enough to both provide accountability to funders and meet the needs of community-based organizations. I also believe this work makes a contribution by showing the invisible work that is spent by human services professionals who are asked to enter data into state IT systems. There is an incredible amount of inefficiency in what I found, and I believe the dissertation can help to surface the challenges faced by organizations as they balance the expectations of funders with their own internal reporting needs.

I also believe that my ethnography of cloud computing makes a contribution methodologically because it provided ways to investigate actual connections between macro-level social, political, and economic conditions and micro-level IT processes within a community-based organization. This approach also allowed me to examine relationships between physical infrastructure, such as transportation, and information infrastructure. This relational perspective led me beyond the local context to consider additional variables that influenced the ETO implementation.

My study also contributes new knowledge to the field of infrastructure studies by describing the consequences of what I referred to as a *gateway failure,* or the absence of a gateway between subsystems during the implementation of ETO. As a result, human services professionals in the Teen REACH program were asked to enter the same data into two different information systems, thus decreasing efficiency and increasing potential data entry errors. In presenting this analysis, I hope to further expand the space for infrastructure studies research within the field of library and information science. This research is particularly relevant in its approach to examining the social shaping of cloud computing software in a U.S. industrial suburb, which I believe is an important site to study how broader social, political, and economic

forces uniquely shape information infrastructure in community-based organizations that administer state-funded public assistance programs.

In this closing section, I elaborate on why East St. Louis was an important place to study cloud computing. I focus on the important role that a diverse and resilient group of human services professionals played in providing alternative views of networked information systems. I refer to Murphy and Pardeck's (1991) discussion of epistemological pluralism as way to argue for a more inclusive approach in the development of cloud computing platforms, particularly within community-based organizations. In doing so, I focus on the reasons why multiple ways of knowing about technology, beyond the assumptions of businesses and governments, have the potential to create more fair, just, sustainable, and accountable cloud computing systems that support community-defined development goals.

Cloud Computing in an Abandoned City

One of the main problems with technological deterministic views about IT is that it can create "policies and institutions that deepen inequality rather than alleviate it" (Eubanks, 2011, p. xvi). Throughout this research, I have argued that East St. Louis is a special place, with its own unique history, challenges, and opportunities for the many resilient people who live and work in this industrial suburb. It is also the place where my colleagues and I uncovered a much more expansive, and hidden, infrastructure that extended beyond computers and the Internet. My study of information infrastructure exposed the previously concealed edges between and across paper, spreadsheets, state-mandated information systems, and the ETO cloud computing software. In the process, a broader infrastructure was revealed that introduced the idea that external stakeholder demands and internal organizational needs created tensions that played a role in

shaping the ETO software. I showed how the study was unique in this case because MESH is a community-based organization that uses state-mandated information systems to provide human services programs.

East St. Louis, as the place where my colleagues and I met infrastructure, played an important role in influencing decisions about how the ETO software developed. In Chapter 5, I introduced the public and private forces, including state and federal government agencies, the United Way, the Illinois Framework, and Budgeting for Results, as some of the factors that shaped cloud computing at MESH. In Chapter 6, I tried to show how transportation in East St. Louis was directly tied to a broader infrastructure at MESH. I argued that information technology failed parent educators in the PASS program who conducted in-home visits with low-income children and their parents. In this case, poverty, geography, and computerization intersected to create what Star (1999) called a "nonworking system" (p. 386) for the parent educators and managers in the PASS program. These infrastructural perspectives together tell a different story about cloud computing than what a utopian view of cloud computing provides.

Ultimately, I argued that the *place* where MESH met cloud computing, as an infrastructure, mattered during the ETO software implementation. This is significant because it also provides additional context for understanding why the project failed. I have repeatedly emphasized that this failure was not because the work completed on the project was unsuccessful. Rather, the organization ran out of money and could not afford to pay the monthly SaaS fees. As a result, the project was put on hold until MESH can receive additional funding to get the project back up and running. By focusing my analysis on East St. Louis as an industrial suburb, I allowed the place where MESH met infrastructure to play a prominent role, which I argued was critical for understanding how the technology developed.

I also emphasized the fact that community-based organizations in Illinois, such as MESH, experience additional challenges in implementing cloud computing because every year state and federal funding for human services gets cut. At the same time, state and federal agencies, as well as private funders, expect these same organizations to adopt sophisticated technology systems with less financial support. In other words, technological deterministic views about cloud computing in East St. Louis do not compute, and won't until more economic opportunities are provided to those who live and work in this low-income region.

Responding to Potential Criticisms of this Research

I now turn to address four potential criticisms, or what I refer to as "misunderstandings," of my recommendations included in the previous chapter. The purpose is to clarify my position on what I have presented in this study and to help the reader better understand my main arguments about why community-based organizations need more flexible, interoperable cloud computing systems to meet the needs of funders, the organizations themselves, and the communities they serve. Those in favor of standardization over increased flexibility, in the design of information infrastructure, could perhaps level the statements below. The criticisms are phrased intentionally to highlight any potential misunderstandings of my arguments. The following statements in bold represent the potential criticisms, which are then followed by my responses.

Misunderstanding 1: ETO is a good idea just as long as sensitive people configure it.

I began this research with a skeptical view of cloud computing software in human services. I was (and remain) deeply concerned about the technological deterministic perspectives that I observed both during my fieldwork and within the commercial media. What I found in East

St. Louis was that cloud computing software platforms in human services *can* be a good idea as long as flexible, interoperable systems—that address the concerns of community-based organizations—are developed to surface invisible work, help organizations respond to community needs, and reduce harms from IT within the community. I included recommendations in Chapter 7 as an attempt to provide concrete steps toward developing more responsive cloud computing applications within community-based organizations that administer state-funded public assistance programs, rather than arguing that state-funded community-based organizations should adopt for-profit, private cloud computing software platforms.

Misunderstanding 2: ETO is a good idea because it will make human services organizations quantify more of their work with low-income people.

By recommending an ETO-like system for state-funded community-based organizations, I am not suggesting that human services organizations quantify *more* of what they do. Rather, as I suggested in my discussion of Power (1997), our society is traveling down a path towards standardization and quantification that may be difficult to reverse. Therefore, if organizations are increasingly expected to quantify their work with individuals and families in low-income communities, then organizations should have access to more just, equitable, and humane IT systems that provide benefits to organizations and not just to funders.

There is no doubt that income inequality is being exacerbated by certain technological developments, as I reviewed in my discussion about the impacts of big data on social inequality (e.g., see boyd & Crawford, 2011). However, there is power in social movements to effect social change. The more power that human services agencies and the communities they serve have over the IT systems that impact their everyday lives, the more likely it may be that the majority in our society can direct positive social change.

Misunderstanding 3: ETO is a good idea because it will help human services organizations get more money from the state and then use this money to quantify more of everything.

Human services organizations absolutely need more money to support their work with individuals and families in low-income communities, and they also need more money if funders expect them to adopt ETO-like systems. However, cloud computing software applications should only be implemented if they are providing benefits to both funders and the communities they serve. The mission of MESH is to help move people out of poverty. As directors at MESH told me, people need jobs. Lack of employment is one of the major reasons why people are living in poverty in East St. Louis. States should focus on finding ways to create jobs, not on forcing community-based organizations to quantify more of everything.

Misunderstanding 4: ETO is a good idea as long as people have a realistic view of cloud computing.

Cloud computing can be a good idea for the reasons I've described above. However, when IT systems fail to account for the work of community-based organizations that are expected to use these systems, then the use of cloud computing software systems need to be addressed. In this research, I called attention to the areas in which I found cloud computing needed to be addressed, and I highlighted areas in which human services professionals at MESH made a positive difference in creating more just, equitable, and effective cloud computing software applications. I hope these perspectives help to provide a more realistic view of the needs of community-based organizations in their work helping children and adults to move out of poverty.

Ultimately, I want to make it clear that I believe there is no perfect solution to the problem of designing cloud computing software systems that meet the needs of both funders and

community-based organizations. However, I do want to argue that state IT systems should facilitate the provision of accurate data to help move more people out of poverty and to provide public accountability, particularly when there are issues identified by community-based organizations and residents that need to be addressed (e.g., privacy, surveillance). East St. Louisans understand the value of broadband technology, yet these vital resources are much lower on their list of priorities for the reasons I outlined in this study. As Jerold Myers, the vice president of youth programs best explained, "people in the community keep telling me, 'We need jobs. We need to make more money.'" Until there is substantial economic investment in the Metro East region, East St. Louisans will continue to face a lack of employment opportunities and persistent struggles caused by trying to live a life in poverty. One way to increase employment opportunities is for businesses and governments to adopt better ways of knowing that value local knowledge.

Valuing Epistemological Pluralism

Murphy and Pardeck (1991) explained that one of the undesirable consequences of computerization is "the monopolization of knowledge" (p. 150). The fear of computers in human services, they argued, is that computer-generated knowledge will become privileged over other types of knowledge, such as multiple, local ways of knowing. Murphy and Pardeck argued that in order to combat these developments, an "awareness must be promoted that restricting the growth of knowledge is both inefficient and ineffective" (p. 151) and can ultimately become a form of social control. The authors used the phrase "epistemological pluralism" as a way to combat the centralization of knowledge that comes as a result of the computerization of human services. In Chapter 6, I argued that a heterogeneous and resilient group of human services

professionals played a significant role in shaping technology at MESH. I showed how the inclusion of multiple perspectives offers the potential of combating the "centralization" of knowledge in the development of networked information systems. This inclusive approach is urgent because, as Mosco (2014) argued, cloud computing promotes a "very specific *culture of knowing* that valorizes certain types of knowledge and ways of knowing that have significant implications across social life" (p. 176). By focusing on the insights of the social workers, program managers, and directors in the PASS and Teen REACH programs, I tried to show how African American women, in particular, at MESH provided ways of knowing that informed the infrastructural development of cloud computing software. However, in doing so, I tried to be careful not to fetishize their "local knowledge," nor did I wish to treat African American women as a singular demographic or biological category. Rather, my goal was to share my observations and analyses of the agency of a heterogeneous group of women at MESH by emphasizing their contributions in shaping the cloud computing software.

Eubanks (2011) emphasized the significance of epistemological pluralism in her discussion and application of Visvanathan's (2005) concept of cognitive justice. As Eubanks explained, "Cognitive justice in the information age demands that multiple knowledges be recognized as arising from specific social locations and be integrated into decision making" (p. 152). In Eubanks's work with low-income women at the YWCA in upstate New York, she developed what she called "popular technology workshops." The workshops were built upon action-based frameworks drawn from participatory action research, popular education, and participatory design (pp. 106–107). The women of the YWCA developed dozens of popular technology workshops over a two-year period between 2001 and 2003. The workshops focused on the everyday technology experiences of a vibrant, diverse, and resourceful group of women

(p. 151) as a gateway toward analyzing the social structures that often shape these technology experiences. At the same time, Eubanks argued:

> The rhetoric of participation can be cynically deployed to enroll oppressed people into the process of their own domination, burdening them with extra responsibilities while failing to shift power relations or patterns of material inequity. (p. 148)

Eubanks explained that ultimately what is needed is a "high-tech equity agenda" that can help everyone understand and transform "the real world of information technology that we all share" (p. 152).

In this research, I shared my observations and analyses of a heterogeneous group of people living and working in a U.S. industrial suburb who use cloud computing at work. My goal was to complicate the technological deterministic views about cloud computing, which have been espoused by elites, and to offer a more human portrait of the extreme sociotechnical challenges facing low-income communities in their efforts to adopt cloud computing software. I offered four recommendations toward a more inclusive approach that promotes epistemological pluralism. My hope is that the stories and 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.

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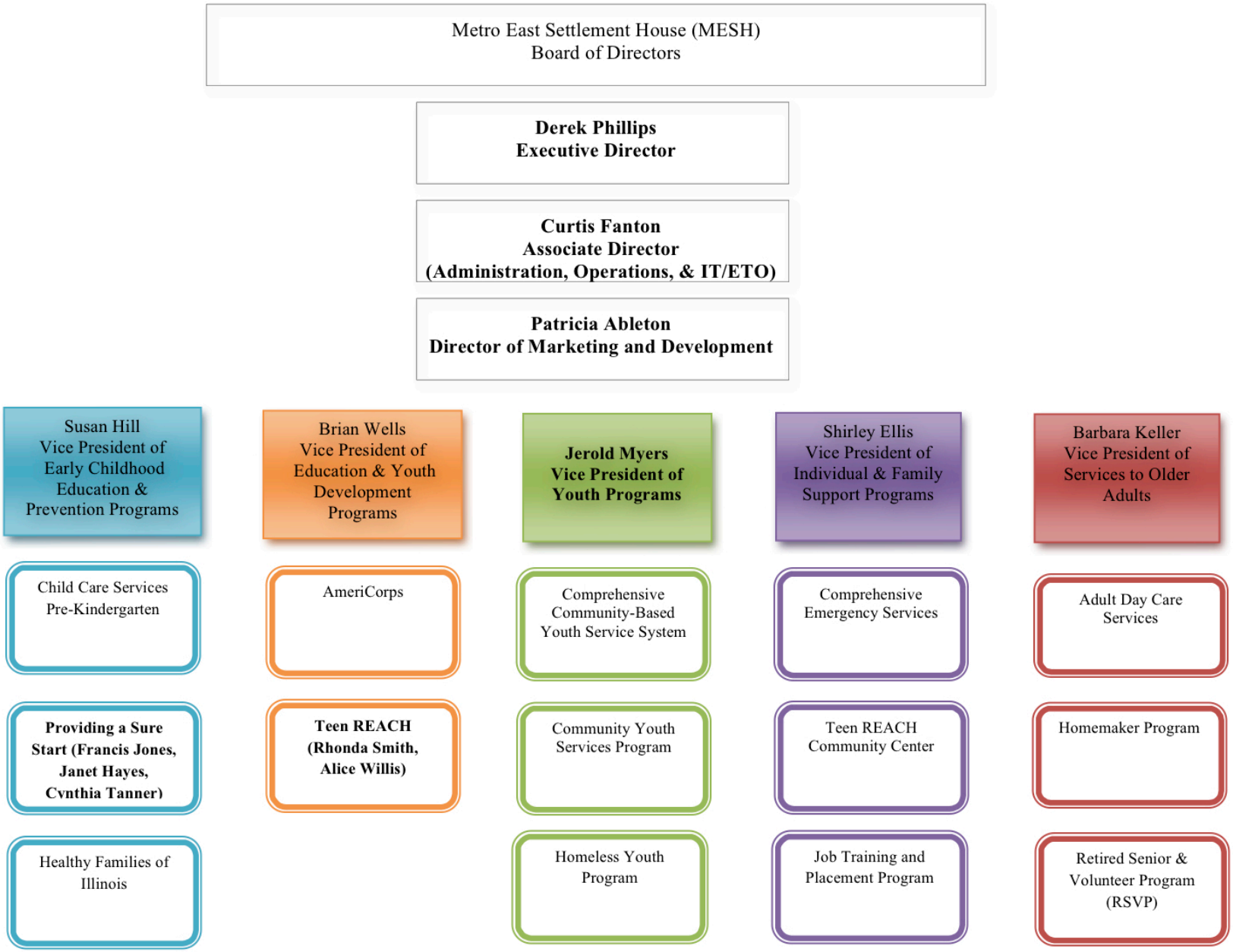
Appendix A: MESH Organizational Chart



Appendix B: Interview Protocol

The Informatization of Community-Based Services in East St. Louis, Illinois

Interview Protocol

Interviewee:

Project/Application:
Interviewer:
Place:
Date:
Time:

#1. Introduce the interviewer.

#2. Introduce the research.

This study is run by University of Illinois at Urbana-Champaign.

The research investigates how the [Metro East Settlement House (MESH)] configured and implemented the ETO™ case management software. In this process, we are interested in understanding how the structural, historical, and cultural contexts influenced this process, as well as what the consequences have been for [MESH] after having implemented the ETO software. The goal of this study is to develop a deeper understanding of the social contexts that shaped the implementation phase.

#3. Introduce the interview.

This interview is a semistructured and will be about 45–60 minutes.

#4. Request permission to use the recorder.

We would like to audio record this interview. Your answers are strictly confidential. The recorded material will be used only for the research and your identity will not be disclosed in any way. Would you permit us to record the interview?

Interview Questions for Directors, Managers, and Staff

No.	Main Questions	Follow-up Questions
1	In your opinion, how successful is the ETO software in helping your organization to provide community-based services?	a. Can you describe the most important things emerging in your mind? b. What are the main goals and objectives for the software? c. How have the goals evolved?
2	Can you briefly describe the history of case management software at the [Metro East Settlement House]?	a. What has been the most rewarding experience during this time? b. What has been the most challenging?
3	Please describe the ETO planning process at [Metro East Settlement House].	a. How were the staff, managers, and directors involved in developing the software? b. How did you get involved in developing the software? c. Were community members or others involved in configuring and/or implementing the software?
4	How do you finance the design and implementation of the ETO software?	
5	How did your organization decide to purchase the ETO software?	a. Were there other options? If so, what influenced your final decision?
6	How did your organization decide to configure the ETO software?	a. What influenced your decisions during this phase? b. Did people have different ideas about how the software should be configured?
7	How has the ETO software changed the way your organization provides community-based services?	a. In what ways has the ETO software changed the nature of work for your employees?
8	How does your organization evaluate performance of the ETO software?	a. In what ways have community members benefited from the ETO software? b. In what ways have community members not benefited from the ETO software?
9	In your opinion, what are the factors that made your organization's ETO software implementation a success? What barriers exist to impede greater success?	a. Can you describe how you have collaborated with other individuals or organizations during the ETO software implementation? What impact did this process have on the implementation?
10	If you could reconfigure the ETO software, what would you do differently?	
11	Is there anyone else we should talk with about the ETO software implementation?	

12	Is there anything else that you would like to say about the ETO software implementation?	a. If there are documents and any other materials important to the ETO implementation, can our research team have a copy of them?

#1. Demographic question

Now I'd like to ask some questions about you.

1. How long have you been working in human services?
2. How many years have you worked at [MESH]?
3. How long have you worked in your current position?
4. What was your previous position?

#2. Closing

(Interviewer thanks the interviewee, requests him/her to let us know when he/she has any further information later, and give a business card.)

Appendix C: Consent Form

INFORMED CONSENT FORM

The Informatization of Community-Based Services in East St. Louis, Illinois
University of Illinois at Urbana-Champaign
Graduate School of Library and Information Science
Champaign, IL 61820

- For questions about the *RESEARCH*, contact Dr. Linda C. Smith, 217-333-7742, or email lcsmith@illinois.edu
- For questions about your *RIGHTS AS A RESEARCH SUBJECT*, contact the office for the Institutional Review Board, Suite 203, 528 East Green Street, University of Illinois at Urbana-Champaign, Champaign, IL 61820. Participants may call the IRB office collect, if they identify themselves as research participants, at 217-333-2670 or contact by email: irb@illinois.edu

Purpose: This research project will examine the everyday experiences of workers, managers, and directors at the [Metro East Settlement House (MESH)] in East St. Louis, Illinois as they configure and implement a human services software platform. In this process, we are interested in understanding the political, economic, historical, and cultural contexts that influence this process, as well as what the consequences might be for [MESH] after having implemented the software platform. The goal of this study is to develop a deeper understanding of the structural, historical, and cultural contexts that shape the software configuration and implementation process.

Your cooperation in this study is completely voluntary. If you prefer not to participate or if you choose to withdraw from the study at any time, you may do so without penalty. The information you are asked to provide is for the purpose of research only.

Procedures: The research will employ two types of methods: (1) observations of workers, managers, and directors at [MESH] during normal work hours, and (2) face-to-face interviews with employees from the organization.

> **Observations**: The observations on site at [MESH] will take place between June 15, 2013, and August 15, 2014. During this time, the investigator, Colin Rhinesmith will take notes on how directors, managers, and staff configure and implement the software. Particular attention will be paid to how the organization's programs (for example, content, materials, etc.) and the contexts that impact these programs (for example, changes in state and federal funding) contribute to the configuration and implementation process. Notes will be taken during regular work hours throughout the study duration. You will also be given the option to participate or not participate in the observations at the end of this form.
>
> **Interviews**: We are conducting interviews with staff, managers, and directors that have been involved in the configuration and implementation of the software. We will be requesting permission to interview you about your participation in this process. You may refuse to

answer any question and may leave the interview at any time. If you choose to stay for the whole interview, it will require approximately 45–60 minutes of your time. This interview will be recorded using digital audio recording equipment and fieldnotes, unless you object to being recorded. You will also be given the option to request copies of the recordings and transcripts. A copy of this form will be given to you.

Risks and Benefits: There are no risks in this study beyond those that might be experienced in everyday life. Because the research will investigate the everyday experiences of workers, managers, and directors at a nonprofit organization as they implement a case management software platform, there may be employability risks associated with participating in this study. For example, if a manager or director discovers during the study that a worker or manager is not performing to a satisfactory level, there may be employability risks associated for the worker or manager participating in the study. However, this information about the worker's poor performance could be discovered via other means (i.e., not through our research) and present an employability risk to them anyway. In this case, the risk might stem from the poor performance, not our study.

The expected benefits of the research to the subjects and/or society include their participation in the first study in East St. Louis, IL, that has examined the political, economic, historical, and cultural contexts shaping information and communication technology implementation. The subjects are expected to benefit from their contribution toward helping to develop a deeper understanding of how a community-based organization in East St. Louis implements information and communication technology to advance the organization's mission. The subjects may also find the study interesting. As there is no more than minimal risk, the benefits of participation outweigh the risks.

Confidentiality: To protect your privacy and that of your colleagues, all transcribing of audio will be done within the University of Illinois at Urbana-Champaign (UIUC). The audio recordings will be transcribed between June 15, 2013, and August 15, 2014, and will be destroyed by the end of this period. The data will be stored in a secure UIUC Box Cloud Service account protected by a password for the duration of the study (at most five years). Presentations, reports, and publications will focus attention on general findings about multi-organizational partnerships and not on individuals or their actions in a way that could result in identification of individuals. We protect your privacy by using a confidential ID in place of your real name. However, if you are interested in having your real name included as a participant in this study your identity would be made public and not protected. You can also choose whether or not you want your name made public at the end of this letter.

Dissemination of Results: The results of this study will be disseminated in Colin Rhinesmith's research at the Graduate School of Library and Information Science at the University of Illinois at Urbana-Champaign. The results may also be disseminated in other publications and conference presentations authored by Colin Rhinesmith. However, the main purpose of the research is to satisfy Colin Rhinesmith's research requirement at the University of Illinois at Urbana-Champaign.

Statement from the Agency Professional

I understand the nature of the study and voluntarily agree to participate in the research. I also agree to be recorded through the use of a digital audio recorder and fieldnotes. I can refuse to be audio recorded. In addition, I understand that I can stop the observations and/or interviews at any time. I have had enough time to ask questions and have them answered. I have been given a

copy of this form whether I agree to participate or not.

Please check one box between yes or no below:

"**I agree** to being observed on site during normal work hours for this research." (❒ Yes No ❒)

"**I agree** to allow my interviews to be audio recorded in this research." (❒ Yes No ❒)

"**I agree** to allow my name used/associated with my responses in publications, presentations, etc." (❒ Yes No ❒)

SIGNATURE OF PROFESSIONAL _____

PRINTED NAME OF PROFESSIONAL _____

AGENCY/POSITION OF PROFESSIONAL _____

DATE _____

Appendix D: Teen REACH Survey 1

THE GREATER METRO EAST TEEN-REACH

PARTICIPANT SURVEY

BASIC INFO

AGE .....

GRADE .....

ABOUT HOW MANY DAYS A WEEK DO YOU COME TO THE CENTER?

1 2 3 4 5

HOMEWORK HELP

DO YOU HAVE TROUBLE COMPLETING YOUR HOMEWORK ASSIGNMENTS? WHY?

_____

_____

DO YOU FEEL THAT YOU NEED MORE HELP WHEN WORKING ON YOUR HOMEWORK ASSIGNMENTS?

YES NO MAYBE

TEEN-REACH STAFF – CIRCLE THE BEST ANSWER

1. THE STAFF CARE ABOUT ME AND LOOK FORWARD TO SEEING ME EVERY DAY

   YES NO MAYBE

2. IF I NEED HELP OR SOMEONE TO TALK TO, I CAN TALK TO THE STAFF

   YES NO MAYBE

3. THE STAFF TALK TO ME AND PLAY WITH ME WHEN I COME TO THE CENTER

   YES NO MAYBE

ANYTHING ELSE???

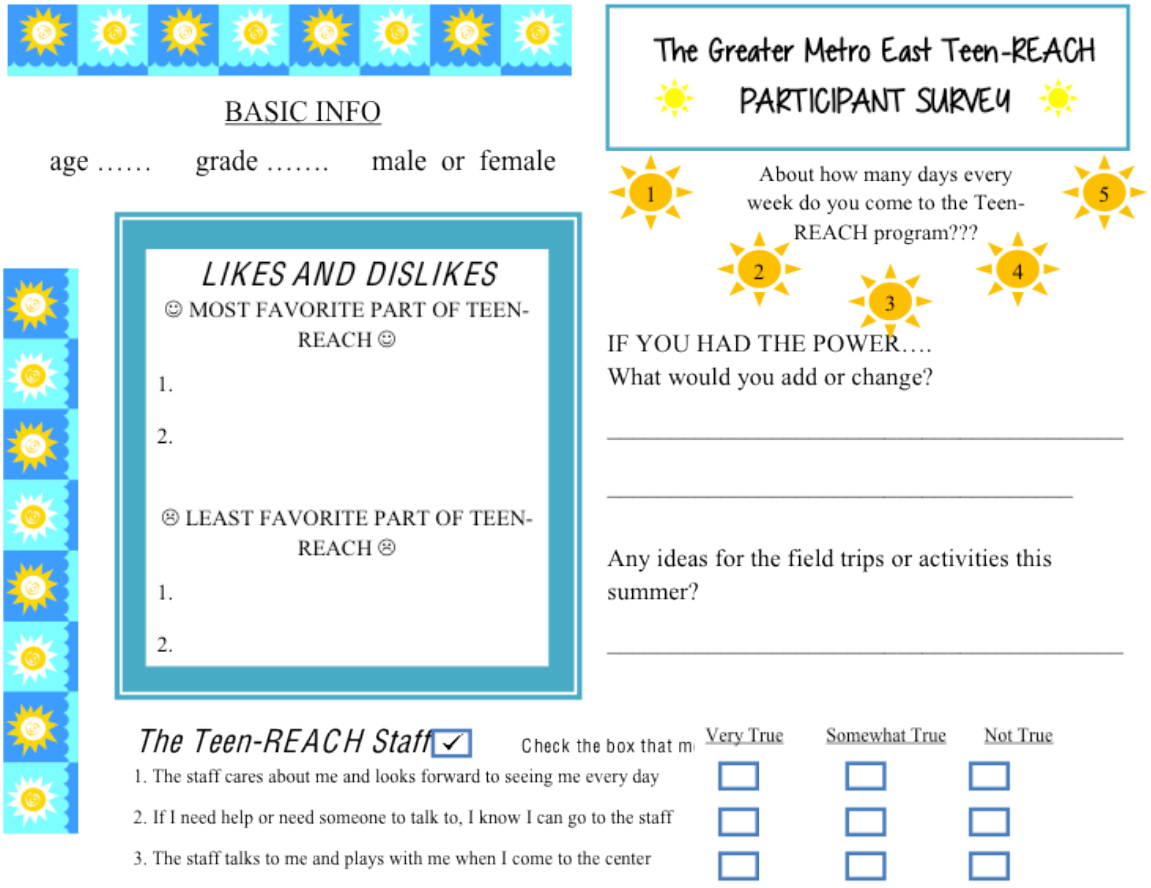
_____

_____

_____

_____

Appendix E: Teen REACH Survey 2



The Greater Metro East Teen-REACH
PARTICIPANT SURVEY

BASIC INFO

age …… grade ……. male or female

LIKES AND DISLIKES

☺ MOST FAVORITE PART OF TEEN-REACH ☺

1.

2.

☹ LEAST FAVORITE PART OF TEEN-REACH ☹

1.

2.

About how many days every week do you come to the Teen-REACH program???

1 2 3 4 5

IF YOU HAD THE POWER….
What would you add or change?

_____

_____

Any ideas for the field trips or activities this summer?

_____

The Teen-REACH Staff ☑ Check the box that m

	Very True	Somewhat True	Not True
1. The staff cares about me and looks forward to seeing me every day	☐	☐	☐
2. If I need help or need someone to talk to, I know I can go to the staff	☐	☐	☐
3. The staff talks to me and plays with me when I come to the center	☐	☐	☐