

# Across Boundaries of Influence and Accountability: The Multiple Scales of Public Sector Information Systems

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## ABSTRACT

The use of ICTs in the public sector has long been touted for its potential to transform the institutions that govern and provide social services. The focus, however, has largely been on systems that are used within particular scales of the public sector, such as at the scale of state or national government, the scale of regional or municipal entity, or at the scale of local service providers. The work presented here takes aim at examining ICT use that crosses these scales of influence and accountability. We report on a year long ethnographic investigation conducted at a variety of social service outlets to understand how a shared information system crosses the boundaries of these very distinct organizations. We put forward that such systems are central to the work done in the public sector and represent a class of collaborative work that has gone understudied.

## Author Keywords

Cooperative Work, Public Sector, Organizational Boundaries, Field Study

## ACM Classification Keywords

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## General Terms

Design, Human Factors, Management

## INTRODUCTION

As the study of cooperative work and computing has matured, it has examined a broad range of different contexts and systems in the ongoing pursuit to understand and support cooperative work in myriad settings (e.g., [3, 6, 22]). Most often, the contexts studied have involved settings with bright-lined boundaries around what the cooperative work is, with whom it is accomplished, and on whose behalf. In many cases, both the effort that goes into using cooperative systems and the reward to be gained from their use co-exist within single settings, such as a single enterprise; however,

well-known examples have documented how the work and benefit often fall to different individuals within these settings [19, 26].

In other words, much of the focus in the literature has been on examples that exist at a single site, within a particular sphere of influence and accountability. As examples, in control room studies, the focus is the control room and the technicians, dispatchers, or engineers who work within this context (e.g., [22]); in studies of domestic technologies, the sphere of influence and accountability is that of the home, and those who reside in, or visit it (e.g., [6]); and in studies of systems deployed in industry or enterprise, the workgroup or business organization defines the sphere of influence and accountability (e.g., [3]). While each of these contexts are different, they all share the quality of having a well-defined, albeit potentially large social boundary in which the cooperative system and the work being supported exist. Even in the case of very large enterprises, which may have a global geography and multiple sites (and certainly may comprise multiple internal organizations and workgroups), the boundary of the enterprise itself can be considered as its own sphere of influence and accountability and has been fruitfully studied as such (e.g., [18, 23, 34]).

One way to frame our understanding of the kinds of studies noted above is to consider them as taking place within a particular *scale*. Scale, as we will use the term throughout this paper, directly addresses the organizational and institutional boundaries of *influence* and *accountability*. This definition differs from other studies that have looked at systems at scale—variously defining scale as a metric for the number of users of a particular system [45], or as the lifespan of a system [37], or via the disperse communities that the system encompasses [32]. Our notion of scale extends these notions by explicitly considering the consequences of hierarchical accountabilities and distinct spheres of influence that arise from complex cooperative systems with large numbers of users (across independent organizations), and long lifespans (as tools for enacting public policy), and whose use encompasses communities that cross local, regional, and national contexts.

Starting with this notion of scale—as distinct organizations that operate within different spheres of influence and who are related through hierarchical accountabilities—we exam-

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ine the impact of a cooperative system deployed to *cross* these boundaries. By doing so, we extend our understanding of complex cooperative systems by bringing to light unique concerns in how domain knowledge, work practice, and power relations are situated across distinct and independent organizations working within a common service ecosystem.

### **The Public Sector as a Scale-crossing Context**

The public sector is one environment where cross organizational use of information and communications technologies (ICTs) is common. Within the public sector we find the conjunction of governmental bodies and nonprofit agencies, each implicating different organizational scales in the conception and deployment of technologies meant to support the implementation of public policy [3]. While scale crossing does exist in other contexts—recent work in cyberinfrastructure shares some of the same challenges where diverse and loosely confederated organizations need to develop complex computing solutions to support their work [37, 45]—the challenge of crossing scales is *central* to work in the public sector.

There are three characteristics that make scale crossing endemic in the public sector: upward accountability, lateral cooperation, and internal work practice. Upward accountabilities come by way of mandated reporting requirements from a variety of government, regulatory, and funding agencies. Lateral cooperation is necessary as nonprofits often form “silos” of single service, implicating multiple agencies in care provision and requiring them to repurpose information systems in order to facilitate coordination. Finally, internal work practice comes to bear as the same information systems used to collect data (for upward accountabilities) and coordinate care (for lateral cooperation) are intended to support day-to-day case management.

To better understand the implications of scale crossing on information systems and the organizations that use them, we present an ethnographic study that focuses on one particular information system used in the provision of human services across the southern U.S. state of Georgia. The scales at which this system is used range from the local service provider, to the regional coalition, and up to state and national government. At the local scale, the system is used by an extremely diverse set of nonprofits as they provide basic human services in the community. At the regional scale, this same system is the focal point for efforts to encourage collaboration between service providers and to implement regional policy goals with respect to caring for the indigent. At the state scale, the system is viewed as a tool to measure outcomes and steer policy. Finally, at the national scale, the system is one of many whose use is mandated as part of how the U.S. Government tracks and allocates funding for basic human services. Thus, this single system is simultaneously employed by a range of distinct and disconnected organizations, each of which bring different goals, perspectives, and interpretations of the technology and its intended uses.

### **THE PUBLIC SECTOR & CROSSING SCALES**

While ICT adoption and use in the public sector is certainly governed by factors such as dynamics of power, organizational politics, and work/benefit disparities, there are addi-

tional constraints, some of which run counter to assumptions made about how ICTs might be applied in the public sector. In particular, the necessity for collaborative systems in the public sector to cross scales creates specific challenges that have yet to be adequately addressed: beginning with the individual who needs services or information, to the nonprofit providing those services and information, to municipalities serving a diverse population, to state and national government agencies who coordinate those services, and finally to the policy makers and administrators who are attempting to address social needs.

### **ICTs in the Public Sector**

A number of researchers have articulated the hopeful prospects of public sector ICTs as a fount of institutional transformation. This work has variously focused on how ICTs might amplify the efforts of nonprofit organizations (e.g., [17, 30]), on the potential impact of ICTs for public engagement with government and democratic process (e.g., [5, 43]), or on ICTs’ ability to provide access to complex data sets that would otherwise be impossible to collect and manage (e.g., [14, 40, 44]). The driving force in much of this work is an expectation that the transformations that accompanied ICT adoption in the private sector can be brought to bear on public institutions: from creating more efficient public bodies, to increasing participation, to providing better information to policy makers.

While not strictly part of the public sector, private nonprofits in the U.S. are often the main point of contact for public services and are an important part of the larger public sector ecosystem. Within this class of organizations, the use of ICTs has been promoted as a way to streamline management practices [30], aid volunteer recruitment [21], and open new opportunities for fundraising [17]. Each of these activities present accountabilities that connect to different scales. Management practices can be internally focused, but may also come from external pressure to increase efficiency in the organization; volunteer relations speak directly to the community the nonprofit exists in; and fundraising activities expose the organization to a range of external accountabilities as funders exert influence via the pocketbook.

Beyond the potentially transformative role of ICTs within nonprofits, they are also being used to collect raw data and as conduits for information to policy makers in state and federal governments. The bureaucracies and policy setting organizations that operate state- and nation-wide programs are increasingly directed to develop their programs in response to real data. Yet this position is fraught with issues that inherently cross scales. As Sarpard points out, the issues are centered around “*who* will control and have access to the information, and *how* can government leaders utilize the data to increase the effectiveness of governing and thus, improve the common good” [emphasis hers] [39]. Embedded in these two questions is a concern about whether that data would be used to more evenly distribute limited resources or to manipulate social and economic divides.

An additional challenge with the drive for more data is the collection of accurate data. Such data collection requires the input of stakeholders across several scales, and must work

within an environment where service provision, not data collection, is the primary focus of the organization [14]. The work of collecting data is often complicated as the nonprofit points of service are constrained by a lack of technical capacity. Furthermore, systems are mandated by bureaucracies and administrators who are far removed from the day-to-day operations of service provision. This in turn leads to a mismatch of expectations between potential gains from data collection and ICT adoption and the disruption to work practice for case managers and service providers [12, 20, 27].

### Crossing Scales

Not all systems that are designed for the public sector will, or need to, cross scales. However, there is a class of ICTs with this characterization that are situated across the boundaries of multiple organizations: specifically, those systems that roll up data from direct service providers for public accountability and policy setting. These kinds of system expose some of the unique challenges that arise in the public sector and how such systems are implicated in the work of many agencies and organizations: systems put into service to collect data are mandated based on the government's need for accurate information but must be used at direct service outlets where limited technical capacity affects use, where the relationship to regulatory infrastructure affects how data collection is perceived and carried out, and where direct service and not data collection is the primary concern.

One of the central differences between how ICTs are employed across scales in the context we report on here, versus within the scientific communities that have been the focus of cyberinfrastructure work, is the relationship between the scales of organizations involved. Ribes and Finholt point out that some of the central challenges in developing cyberinfrastructure are bound up in the long lifespan of the technology [37]. Specifically, organizations participating in the development of cyberinfrastructure need to both develop a long view of how their science will progress over the lifespan of the technology as well as how they will manage their accountabilities up to external funding bodies whose funding renewal model may be based on a much shorter cycle of demonstrated progress.

Similar dynamics are at play within the public sector; however, the impact they have on how organizations adapt their practices for upstream accountabilities is amplified by several factors. First, systems used in the public sector come by way of mandated rather than voluntary programs. Second, the mandated system, as we will describe in more detail below, was not developed through the kind of consensus driven model that seems to prevail in cyberinfrastructure studies [37, 38, 45]. Finally, the spirit of collaboration and openness in the scientific community is unique and not as apparent in the public sector. In contrast, the public sector seems to exhibit a more protective orientation between both peer organizations as well as between supervisory organizations. This more guarded stance is intertwined with rifts that are present across nonprofit service providers including: opposing philosophies on how to provide aid, coping with limited and transient technical expertise, protecting the people they serve and how they are represented to authorities in

shared databases, and ultimately competing with each other for funding and legitimacy vis-à-vis how they are funded and whom they serve [27].

Part of the challenge in addressing ICTs that cross scales—that is to say that cross boundaries of differing spheres of influence and accountability—is that much of the previous work on how organizations adopt and arrange themselves around technology has been focused internally. Orlikowski has built a comprehensive study of how ICTs are involved in structuring work within organizations (e.g., [33, 35, 36]). She notes that the use—“enactment”—of technology within organizations comes “in response to various technological visions, skills, fears, and opportunities, influenced by specific interpretations and particular institutional contexts, and shaped by a diversity of intentions and practices to collaborate, solve problems, preserve status, improve efficiency, support work processes, learn, and improvise” [35]. However, the underlying position takes as given that these factors are contained within a single organization at a single scale. Likewise in Markus' analysis of resistance toward ICT adoption [29]: the analysis comes from looking within an organization and assessing how different groups within the organization position themselves alongside new technologies introduced to affect organizational change.

For work in the public sector, these analyses fall short as the ICTs deployed are done so across scales rather than within scales. One way to understand this is that in both Orlikowski's and Markus' work, the organizations all share the same organizational chart—regardless of how large or convoluted that chart might be. This constitutes, for our purposes here, a single scale. In contrast, the kind of work we are reporting on in the public sector comprises many organizations whose organizational charts remain distinct. As a result, they exhibit different tensions in how accountabilities are managed and how work practices are modified based on assumptions of how different external organizations will use the shared system and interpret the work represented in it. Most importantly, these organizations exhibit very different constraints in how information moves up and down the scales.

Given the unique challenges of deploying systems across the boundaries of these different scales, we wanted to understand the management of diverse expectations placed on such a system. Our study takes on many of the same issues Kling set out to understand over 30 years ago in his investigations of automated information systems [25]. Our focus, however, was to more directly understand how ICTs meshed with service provision, how different scales viewed and promoted the system in use, and to identify how conflicting perspectives were resolved.

### STUDY CONTEXT, METHOD, & ANALYSIS

The analysis presented here derives from a year-long ethnographic engagement conducted at organizations operating at different scales in Atlanta, Georgia (a large U.S. city). The study started with six weeks of ethnographic observation which were largely focused on the work practices at the direct service providers. Initially, we set out to better understand how diverse nonprofit service providers used the

homeless information system (HMIS) in support of their work. After the initial six weeks of observation it became clear that the HMIS was used by organizations beyond the peer group of direct service providers. We realized that a comprehensive investigation of how the HMIS was used needed to include representatives from external organizations that operated at what we would come to understand as different scales.

In broadening the scope of organizations to study, we shifted toward a more interview-driven investigation. The move from observation to interview was grounded in the on-going coding and analysis of field notes, and continued to evolve based on the on-going coding and analysis of interview transcripts. Over the course of the year, we interviewed case managers at direct service providers. We interviewed executive directors, several of whom sat on the mayor's regional commission on the homeless and who were actively engaged in fostering more communication between care providers in the greater metropolitan region. We also interviewed the executive director and head of user training at the HMIS vendor to better understand their role in providing technology to a staggering diversity of service providers. Finally, we interviewed the state's Department of Community Affairs (DCA) administrator whose job it was to coordinate the HMIS across the hundreds of nonprofits providing human services in the state of Georgia.

Our data comprised transcripts from interviews, observational field notes, and documentation covering the HMIS and state and federal requirements for such systems. As noted, analysis was done iteratively and continuously throughout the study and helped develop the interview questions and scaffold our investigation of the organizational issues that we encountered. Our analysis was based firmly on the fundamentals of qualitative research [31, 42], and afforded us insight into the ICT needs at each distinct scale: at very small and locally focused nonprofits, at larger service providers with greater need and capacity for internal coordination, at city and regional scales via the perspectives of agency directors, and at state and national levels via our interaction with the HMIS vendor and DCA administrator.

Ultimately, the study developed our notion of scales as distinct strata of accountability and influence and developed our understanding of how these different scales fit together. In so doing, it helped address a number of questions, including: 1. How did each organization—at its particular scale—use and view the HMIS? 2. How did the HMIS cross boundaries from individual service providers, to regional action, to state and national agendas? 3. What were the disparities between how the HMIS was presumed to be used (or its purported utility) and how direct service providers actually used it?

### **THE ROLE AND LIMITS OF HMIS IN CROSSING SCALES**

By combining the thick description developed from observation data and our qualitative analysis of the interviews, we developed a more comprehensive understanding of how organizations at the different scales used, interpreted, and set expectations for the HMIS. What became clear were the conflicts and tensions built into the HMIS as well as into the use of the HMIS at each of the different scales. Some of the ten-

sions arose due to the normal dynamics of complying with external accountabilities, while others grew out of the differences in how case management might be supported versus how one might capture system reports. In all cases, the scales involved in the social service ecosystem compounded the inherent complexity of the HMIS and the labor done at each of the scales to manage work, expectations, and measures of progress.

### **From Whence HMIS?**

Nationally across the U.S., the widespread adoption of HMIS software did not begin until 2003 as part of policy changes initiated by Housing and Urban Development (HUD)—a department of the U.S. Government whose mission is to support community development and affordable housing. Up to that point, no systematic reporting was being done, meaning there was no way to reliably measure the efficacy of programs or to enforce accountability for how funds were being distributed at service providers across the country. To address this issue, Congress mandated, via HUD, the collection of service data in electronic form [39]. In the state of Georgia, where we conducted our study, a single HMIS has been in use since the HUD mandate went into effect. The use of a single system statewide stands as an exception to the norm, as in most states the selection of an HMIS is made on a locality-by-locality basis, resulting in scores of deployed systems and a very diverse national ecosystem that must all roll data up to HUD.

The HMIS in use in our study was developed locally, growing out of an existing case management-oriented HMIS previously in use in a few of the more densely populated counties. The genesis of this system came in the mid 1990's, when a handful of nonprofit homeless service organizations joined forces in an effort to reduce duplication, streamline care provision, and support inter-organization collaboration through the use of ICTs. The overarching goal at the time was to ensure effective service and treatment for the chronically homeless. Thus, the HMIS was built to support nonprofits in the urban center who were providing care to a core portion of the homeless population. Based on this expected population, a number of early assumptions were built into the HMIS, including the assumption that individuals and not family units were the primary clientele; reports were centered around service transactions, rather than the people who received those service transactions; case management features were optimized for bed and shelter management, rather than services addressing family needs or homeless prevention programs.

After the HUD mandate, this system was repurposed from its role in supporting case management in a few urban counties, to its new role in satisfying the HUD mandate for tracking service provision statewide. As the statewide roll-out occurred, and as the HMIS was put to new use within new organizations, the ecosystem that the HMIS was used in changed. First and foremost, as the developer of HMIS pointed out to us, the slow and steady uptake of the HMIS that was beginning to happen naturally at the scale of the individual nonprofit transformed into a two year backlash against the system as a result of the HUD mandate. At the root of this back-

lash was the reaction some nonprofits had to using a system developed to support certain case management philosophies while eschewing others.

The second thing that changed—or that at least became more prominent to the developer of the HMIS after the HUD mandate—was a shift away from the underlying principle of collaboration between organizations to one of regulation and compliance. The view from the director of the HMIS vendor was that while the system was born out of a desire by a few organizations to collaborate, the HUD requirements—while ostensibly sharing the goal of supporting collaboration around service provision—ended up being orthogonal to many of the core assumptions that informed the case management model in the HMIS. This in turn undermined the spirit of collaboration as nonprofits became more guarded while they came to grips with how to maintain regulatory compliance and ensure ongoing HUD funding.

Further, with statewide adoption of the HMIS came a shift in the core use cases the HMIS needed to support. Individuals were no longer the majority client being entered into the system, as statewide use now included a far more diverse set of nonprofits and services. Service transactions were also no longer the most important component to track, with demographic information becoming far more important. As designed, the HMIS provided reports that were derived from a very specific way of recording service transactions, and it did not produce adequate reporting for family units who received care. Nonprofits, however, were focusing their data entry on the people receiving care and were using a variety of mechanisms to record service transactions. The result was that records were entered in the HMIS to satisfy HUD requirements but not in a way that enabled the appropriate reports to be generated, painting an inaccurate picture for HUD and frustrating the nonprofits as they tried to understand and reconcile the disparities.

### **Local Scale: Direct Service Provision**

Previously, we reported on some of the incongruities between how case managers used ICTs and the style of work that the systems in use were meant to support [27]. In that study, two issues stood out: poor technical performance of the HMIS impinging on case managers' productive contact time with clients, and a lack of collaboration tools complicated the task of constructing care across different organizations. In the work we are presenting here, we draw on these initial findings and expanded the investigation of how the HMIS is situated in the larger ecosystem of human services.

The organizations that we interviewed for this work varied considerably. Some were, and remain, very active participants in steering the development of the HMIS. Notably, three of the nonprofits we interviewed considered themselves founding members of the HMIS from the 1990's. The remaining seven nonprofits had varied relationships with the system. For some it was the sole data management tool in use, while for others the HMIS was used minimally while paper records were preferred for day-to-day operation.

Across all of the nonprofits, the main driving force behind using the HMIS derived from its mandated aspects: the

need to record client data to generate reports to funding bodies—typically government based funders at a combination of municipal, regional, state, and national levels. Yet, as noted above, the transformation of the HMIS from a case-management-focused system to one used for HUD compliance meant that the key reports necessary to demonstrate compliance were often difficult to generate. To cope with this difficulty, the case managers would download the data from the HMIS into an Excel spreadsheet or local Access database to generate reports. This practice, while born out of necessity, raises questions about data integrity and accountability. It also reveals how the report was the priority for the nonprofit, not the data itself, which begins to unpack how different priorities at different scales can result in use of the HMIS that runs counter to expectations held by certain stakeholders.

The workflow and data model within the HMIS was built around capturing service information so that it could be usefully shared across nonprofits. For those first nonprofit service providers that were engaged in collaborative care provision, the detailed accounts in a particular client's service history were useful as they exposed the kinds of services that were effective, provided context for engaging the client on their history, cut down on the retelling that may otherwise drive client and case manager interaction as different organizations are pulled into the mix, and helped case managers identify clients who may be trying to game the welfare system. As explained by the director at the HMIS vendor, the HMIS set out to address just these problems: ease the burden of moving between service providers so that information only needed to be recorded once, provide a cross-organization history of care so that case managers would not suggest or enroll the client in programs that end up working at cross-purposes, and provide a systematic way for nonprofits to coordinate with each other.

With these goals in mind, the HMIS was reasonably well suited to supporting care provision, and in the instances where case managers used the HMIS to support these aspects of their work, it was around the features that enhanced their understanding of where the client had been, what that person may need next, and which programs seemed to be the most effective. That said, many of the case managers did not use the HMIS to support these activities; instead they would enter data into the HMIS because they had to, but the "live" data used to inform their case management was kept elsewhere. In the extreme case, two of the service providers had specific staff members or volunteers whose sole job was to manage data entry into the HMIS—the case managers did not touch the system at all, instead relying on paper records for case management support.

The collaboration tools the HMIS provided were particularly problematic. Two reasons for the failure of the HMIS's support of collaborative work emerged through our interviews. The first was that information about clients was carefully partitioned based on the kind of nonprofit entering the data, the kinds of services being provided, and finally contingent on explicit permission to view shared information from the client. This made it difficult for case managers to access information about a particular client. The second prob-

lem, which ultimately led to the collaboration features being dropped from the HMIS, was that in contrast to the careful guarding of information about clients, information about the service providers—such as the availability of the services offered—was viewable by every other service provider with no access controls to determine who could see what. The result of this global resource sharing model was that when a few service providers started sharing information about the resources they had—whether financial or program based—they had to cope with a surge in referrals for those limited resources. The influx of referrals created more work for some nonprofits, while creating negative perceptions of service as clients were shuffled from waiting room to waiting room.

At the local service provider scale, the motivations for using the HMIS included supporting case managers with accurate information (when such case management practices existed), being able to effectively communicate with other service providers in their cohort, and with being able to meet mandated reporting and compliance standards by funding organizations at the state and federal level. Each of these serve a different scale—the local, the regional, and the state/national. What became apparent to us was that for the majority of the service providers we interacted with, they had to develop ICT practices that supported compliance in lieu of developing practices that supported regional collaboration or case management.

#### **Regional Scale: Metropolitan Planning and Response**

At the regional scale, the use of the HMIS shifted away from working toward more efficient care provision at the single nonprofit. Instead, HMIS use was focused on creating working cohorts of providers to support specific segments of the homeless and extremely poor population. Through our interviews with the executive directors of the service providers, it was revealed that the undertaking to coordinate care was based on both grass roots efforts at a select few of the more active organizations and on support from the mayor's office to make sure different groups were talking to each other.

The facets of the regional scale that stood out in our observations and that were corroborated through interview highlighted how the HMIS sat viscerally between the needs of direct service providers and the more abstracted needs at the state and national scale. Service providers, as pointed out above, need very specific tools that support them at the “point of sale.” On the other side, at the upstream state and national scales, the mandate has been for tools that collect information about the people served and the kinds of services available, leaving the details of how those services are provided to local organizations.

The regional scale, as we found through our investigation, was particularly focused on the need for collaboration across service providers and government agencies. This focus touches on the details of service provision in so far as it identifies which services are complimentary and which service philosophies compatible. It is also driven by data collection as a way to document the collaborations that occur. The motivation for cross-cutting collaboration is partially captured in two multi-year plans created by the city government to expand supportive housing and end homelessness [13,

15]. Both plans take specific aim at particular needs within the community and set fairly coarse benchmarks for meeting such needs. The mayor's office managed these efforts by establishing different commissions and working groups to address targeted benchmarks. The benchmarks, in turn drove the requirement that the HMIS provide collaboration support. They also drove a different set of data collection requirements meant to provide accountability about the makeup and mechanics of collaborative efforts taking shape.

This mixture of requirements places the regional scale between the purely data-driven worlds at state and national agencies and the practical day to day needs of those providing basic human services to the city's urban poor and homeless. At a fairly basic level, these requirements can be difficult to reconcile. For the HMIS vendor, there are a host of competing requirements and preferences from the 200-plus service providers who use the system. Their ideas of collaboration differ wildly and their business practices for managing those relationships are not all amenable to procedures captured by the HMIS. Perhaps more fundamentally challenging to use and adoption is the focus on providing data to support the collaborative activities.

Despite the claims from proponents of the HMIS that the system was focused on supporting collaboration and community action, the on-the-ground perception of the HMIS by case managers was that it was a tool for meeting mandated data collection requirements from the DCA, HUD, and others. As the regional focus on collaboration has developed, the conversation about how to capture accountabilities in collaborative efforts has begun to focus on what kinds of data need to be kept in order to provide empirical evidence that such alliances are happening and how well they are working. As these new data reporting requirements rolled down to the individual service providers, their perception was that they represented yet another set of onerous data collection activities rather than a set of tools to help service providers identify constructive ways of working together.

#### **State & National Scale: Policy & Outcome Based Metrics**

At the state scale, the HMIS is primarily a data aggregator. Our interview with the DCA administrator called attention to the importance of good and accurate data so that accurate funding could be granted for the work being done. In addition to coordinating state funding sources, the DCA also plays a role in distributing some HUD funding—with a large grant going directly to the HMIS vendor to continue to evolve the system.

The need for accurate information about service activities made underreporting a main concern for the DCA. The worry expressed by the administrator was that a significant number of service providers were not using the HMIS to collect service data—or were using it incorrectly—so that reports would not accurately reflect actual service levels. The fear was that if service providers were underreporting, then the state as a whole would not appear to be providing the levels of service it was actually providing. This in turn would put the state's current funding levels at risk, and create a crisis of already constrained resources.

Where the regional and local scales had increasingly greater need for good HMIS support for direct-service providers, the state scale was much more interested in acquiring good data and less concerned with the details of service provision. Again, this situation is understandable, and not inappropriate, as the role of the DCA is to make decisions about what programs to support, and act as an intermediary to state and national government funding agencies to ensure the necessary services are available to citizens in need.

Despite the state's focus on acquiring robust data from service providers, the DCA administrator was also aware of how onerous such data requirements could be to nonprofits across the state. Having just returned from a national conference where HUD began to unveil new data collection requirements, the reaction of the administrator was that achieving compliance with what they have now is already difficult enough. Moreover, she noted that the new data collection requirements were focused on providing outcomes-based evidence of program efficacy before the organizational and cooperative support pieces necessary to manage that kind of information at the local scale were in place.

Another complication hinged around a number of decisions made at the outset of the HMIS design to protect the privacy of individuals entered into the system. Again, this goes back to the assumptions that the HMIS was best built to track service transactions rather than individuals. In the U.S., the Health Insurance Portability and Accountability Act (HIPAA) dictates the standard of privacy, confidentiality, and accountability around health information. This standard is often applied to information collected in other human service areas that may not strictly be governed by the act, as is the case with the HMIS. Certainly some of the service providers who use the HMIS need to follow HIPAA rules, though not all are subject to them. To complicate matters, according to the DCA administrator, and triangulated from our own interviews and observations, a number of additional privacy features were built into the HMIS that do not originate from a coherent set of regulations or published best practices. The issues were first discussed in our earlier findings [27], and we would call attention to them here as artifacts in the HMIS that arose out of an activist agenda to protect a vulnerable population from the threat of government monitoring but that have the unintended consequence of hindering the kinds of information sharing necessary to support collaborative action leveraged through the HMIS.

At the state and national scales, the focus on data acquisition blurs the requirements for the HMIS to support care provision activities. What's more, all of the organizations we worked with, including the HMIS vendor, receive significant funding from state and national agencies which in turn aligns their priorities around supporting and participating in data collection via the HMIS.

## DISCUSSION

Our examination of technological and organizational systems that operate at different scales demonstrates how different expectations and uses arise around a shared HMIS. Critically, such scale crossing is becoming ever more important as the public sector continues to embrace ICTs as a way

to support local providers' provision of human services and provide data to inform public policy.

## Crossing Scales, Boundary Objects, & Classifications

One way forward in thinking about how such large-scale systems cross scales is to consider them as boundary objects [41]. Indeed, the role of ICTs within the public sector could be distilled down to that of boundary object between the citizenry, the government, and the public and private institutions that act on the behalf of both.

To a degree, this is how the HMIS we studied was presumed to work: the features directly used by the direct service providers were meant to be structured to support their day-to-day work by maintaining representations of each client—similar to how health records represent patients [8]. That same information, especially the fields indicating movement between different organizations, was intended to be mutable enough to render an understanding to regional organizations of how the population was being served, and how the service providers involved were working together to make service happen. Finally, information from across the state could then be aggregated to inform state and national agencies about how policy decisions and directions are impacting specific segments of the population.

Another way to conceptualize the information needs at the different scales—and the role of the HMIS as a boundary object that can be used to translate the data between scales—is that the direct service providers need the data as information directly. It informs them about individuals and about the needs and opportunities that will help those individuals. To employ a mathematical metaphor as we move up the scales, the regional level requires the first derivative of the data to understand the dynamics of the population within specific geographic areas. The state and national levels need the second derivative of the data so that they can understand how quickly change is taking place vis-à-vis public policy decisions and implementation. Throughout each of these transformations, the HMIS should create an ability to represent multiple perspectives on the data and facilitates negotiation and evolution both up and down the different scales [28].

These features build upon previously established characteristics of effective boundary objects. Kellogg et al. build on the point that “effective boundary objects need to provide practical, political means for bridging boundaries,” ultimately working toward creating shared knowledge across those boundaries [24]. However, the cost of doing so is high, even when those boundaries are *within* a single scale. As Carlile notes, “the cost for any group dealing with increasing novelty at a boundary is not just the *cost of learning* about what is new. It is also the *costs of adjusting* or *transforming* their ‘current’ ways of doing things to accommodate the knowledge developed by another group to collaborate at a boundary” [emphasis his] [11]. When the boundaries cross several scales with widely different spheres of influence and accountability, and when there is a dearth of direct means to negotiate the bridging of these boundaries, we end up with the kinds of breakdowns presented here: rather than focusing on how the HMIS could support immediate work needs—like aiding case management, finding available ser-

vices, or realizing management efficiencies—the case managers at the direct service providers were chiefly concerned with trying to guess and satisfy the needs of the regional and national scales.

This guessing cuts straight to one of the keys challenges in working across boundaries in that it “is not just that communication is hard, but that to resolve the negative consequences by the individuals from each function they have to be willing to alter their own knowledge, but also be capable of influencing or transforming the knowledge used by the other function” [10]. So for each of the downstream scales (or “functions” in Carlile’s words), there are negative consequences for not altering their knowledge, yet there are few, if any channels to influence or transform knowledge in the upstream scales.

Ultimately, this leads to misalignment between the expectations at the local scale and the expectations at the regional and national scales. In the context we present here, the difference in expectations across scales and the constricted channels for effecting change upstream undermined the capacity of the HMIS as a boundary object, instead fixing it as a tool for the supervisory scales. As Lutters and Ackerman note, the interpretation of boundary objects is excluded from the objects themselves [28], yet in the instances of HMIS use we observed, a significant effort went into preserving one privileged interpretation, foregoing the negotiation of meaning that has been associated with boundary objects used to work in different arrangements [8, 28].

### Revisiting Riverdale

In approaching the expansion of ICTs within public services, we were struck by the relative stasis within the literature on large scale public systems. We mentioned Kling at the beginning of this paper, and it is worth returning to his work from over 30 years ago, as many of the finding and trends he identified persist today [25]: use of HMIS does reduce some of the administrative duplication for clients and case managers as individuals move between service providers; however, the utility of HMIS to case managers is often obscured by their conflicting accountabilities and the uneven use of such systems across the service ecosystem that make integration and efficiency gains difficult to realize and difficult to measure.

Additional dynamics that stand out are the role of data at direct service organizations and at regional institutions. In both our work and in Kling’s, issues around how the data should be trusted, and how it could be productively used to secure greater resources are consistent. One of the themes that surfaced throughout Kling’s piece was the on-the-ground truth that the system was an administrative and management aid yet was presented by the proponents of the system as an aid to supporting grass root collaboration [25]. This tension was apparent in the system we studied as well in so far as management at the nonprofits was always concerned with regulatory compliance and satisfying their accountabilities to funders.

While it might be true that the technical capacity at many of the nonprofits was limited—and varies wildly from place to place, as we have previously reported [27]—the san-

guine view of the capabilities of the system are in direct contrast to the work practices and perceptions of system value-add at the service providers. For many of the organizations we worked with, their interactions with each other and the collaboration they engaged with was sufficiently managed through social channels that have been established over decades of collaboration. For them, the HMIS played purely an accountability role necessary to demonstrate their service provision to external organizations; the HMIS was a tool for conferring legitimacy on the actions of the agencies and their relationship with external organizations [4].

Again the parallels between the contemporary use of these systems and the use reported by Kling three decades ago are apparent. He noted that, “In contrast to [the automated information system’s] marginal utility as an aid for internal management, it has helped some of its agencies increase credibility and gain support from funders” [25]. The credibility gap between organizations who embraced the HMIS and those who did not (or could not due to resource and technical constraints) becomes a new source of tension within the service ecosystem. One of the challenges we observed was that specialized service providers are not well supported by the HMIS in terms of the kinds of information they need to capture to demonstrate their program’s efficacy. This becomes a disincentive to use the system which in turn disadvantages them from the preference conferred upon providers who are deeply vested in HMIS use.

### Lessons Learned

To mitigate the gaps between purported value and actual use, and to provide a broader path to entry and adoption of the HMIS, we might argue that such public systems need to be much more customizable by the local service providers. This might entail a shift from identifying specific collaborative mechanisms which need to be supported toward a system-as-medium approach, as Bentley and Dourish have previously argued [7]. However, this approach is less tractable in a highly regulated environment where the mechanisms of service provision may be set scales apart from where the actual work takes place. Moreover, the ability to customize the system requires a fairly high degree of technical sophistication at the local scale where on-going and unique configurations have the most potential benefit but where such expertise is least likely to be found [16, 27].

There are also echos of the tensions that exist within *inter-individual* collaboration in the subtle, contingent nature of *inter-organization* collaboration. Different stakeholders have unique assumptions about what information is necessary, what form it should take, and how it should be integrated into formal and *ad hoc* processes [1, 2]. One of the challenges that arises out of this tension is the need to balance flexibility to capture dynamic local knowledge at the local scale, and the need for staid and stable categories at the regional and global scale as a normalizing mechanism across a diverse ecosystem.

Finally, there are considerations about how we classify work that occurs at different scales. The conflation of tracking service transactions versus tracking people is one such example and reinforces the inherent costs and dangers of classifica-



tion systems [9], suggesting that such costs and dangers are only amplified when the systems in use move across disparate organizational boundaries. There are other lessons to be considered as well, such as the role of evolving the understanding of services across scales [16]. As the HMIS was modified to manage data for HUD consumption, a rigid taxonomy of service transactions was instituted, yet as service practices evolved through use, the understanding of that taxonomy changed. This amplifies distorted interpretations at local and global scales. Eventually the two become disconnected as there is no way within the HMIS to reconcile the disparities between the data and the metadata. We witnessed this effect in part through how case managers abandoned use of the HMIS to capture their categorization of services (e.g., working case notes) and instead only focused on maintaining information in a manner that would support HUD consumption.

## CONCLUSION

The work presented here pulls back the curtain on how large-scale information systems are used across agency boundaries in the public sector. By examining the use of a single shared system at the local service provider scale, at the regional scale, and at that statewide scale (which is beholden to the nation-wide scale), we begin to unravel how organizations at each level place expectations on the system and integrate it into their work.

Specifically, we found that the state and national scales set the tone for accountabilities in the HMIS all the way down to the local scale. This came as a small surprise as the HMIS was designed from the outset to support local service provision and the accountabilities derived from local action. The upshot of this focus on external and distant accountabilities, rather than local accountabilities to parties within the service provider's sphere of influence, undermined the HMIS' role as a boundary object, causing local service providers to reconfigure their use of the HMIS to support the work of the regional and state scales rather than their own.

As a result, we would argue that systems that cross distinct organizational boundaries, like the HMIS we studied, present a separate class of system that has gone understudied. Factors such as the dynamics of power, organizational politics, and work/benefit disparities are amplified in the public sector because individual organizations become specialized and siloed from each other in work practice, yet must exist and operate within a normalizing regulatory environment. This dichotomy creates new trade-offs between how work is mediated by ICTs as service providers attempt to balance the pressure to adopt ICTs to enhance service provision and the need to use such systems for external accountabilities.

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