Performance Information Artifacts:
Boundary Objects to Facilitate Performance Dialogue

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ABSTRACT

The field of performance management is premised on the centrality of measurement and performance information use in everyday decision making and practice. Information is managed through the use of information systems, but research shows that implementing these technological systems is not enough. This research responds to recent calls for a better understanding of performance information use and the role of dialogue among stakeholders in promoting learning and system change. Through case analysis and qualitative modeling, it proposes the concept of performance information artifacts and the need for effective boundary spanners to promote effective learning and knowledge sharing in performance dialogue.

KEYWORDS

Boundary Objects, Dialogue, Performance Information, Performance Information Use

INTRODUCTION

In the summer of 2005, after a routine review of case practice that involved a set of child fatalities, the New York State Commissioner for the Administration for Children Services (ACS) identified several areas in child protection operations, policy, and practice that needed to be changed or strengthened to improve service delivery. Another high-profile child fatality that occurred in January 2006 created additional political and public pressure that resulted in ACS releasing an improvement plan that included a series of initiatives to strengthen case practice, reassess and improve policy and procedures, and infuse resources directly to the front line. It also called ACS to develop ChildStat, an information management system within the family of PerformanceStat systems (Behn, 2003). PerformanceStat is a good characterization of performance strategies in the public sector that use relatively real-time data, information and communication technologies, performance measures, and mechanisms to bring together different actors to make decisions, manage, or learn about a government program (DeHaven-Smith & Jenne II, 2006). Using information and communication technologies to manage and process performance information is becoming a common strategy in performance management (Rochet et al., 2009; Schooley & Horan, 2007; Yang & Maxwell, 2011; Yetano et al., 2021).

A key component of many PerformanceStat systems consists of the use of dialogue to promote learning in performance management (Bebbington et al., 2007; de Bruijn & van Helden, 2006; Laihonen & Mäntylä, 2017; Lewis & Triantafillou, 2012; Moynihan, 2005). Unfortunately, as observed in the ChildStat case, the impact of dialogue is not deterministic or easy to predict, leading sometimes to coordinated action, and sometimes to crystallize conflict. Research in performance dialogue has found that dialogue can lead to pseudo-participation (Aleksandrov et al., 2018), and that problems may emerge when performance dialogue is not linked to decision making (Laihonen & Mäntylä, 2017). Researchers like Lewis and Triantafillou (2012) even suggest to be cautious given that performance dialogue and other learning approaches to performance management may lead to government overload. In addition, although current performance dialogue systems have been implemented with some success, blocked communication has been identified as a main problem of performance dialogue (DeHaven-Smith & Jenne II, 2006). In this way, this paper is guided by the following research question: what are main learning processes and information involved in performance dialogue? And how this information and learning processes may explain communication difficulties in performance dialogue?

Both questions have been identified as important research directions in performance management given that answers will contribute to (1) understanding the effects of different information types and representations on performance information use (Brown & Dillard, 2015b; Kroll, 2015), and (2) understanding how to better design dialogue systems that lead to program improvement and learning (Aleksandrov et al., 2018; de Bruijn & van Helden, 2006). The paper also contributes to a better understanding on how to use information systems for performance management beyond implementation, which has been identified as an important research direction (Brown & Dillard, 2015b; Yetano et al., 2021).

To understand performance dialogue, an interdisciplinary approach is necessary (Pandey, 2016). A great deal of performance studies have found shortcomings related to performance information and performance information use, which is plagued by multiple interpretations and meanings (Kroll, 2015, 2016; Talbot, 2005). To contribute to this literature, we approach the problem of performance information use as knowledge sharing across boundaries. Moreover, we suggest that performance information can be understood as boundary objects (Black et al., 2004; Carlile, 2002; Star & Griesemer, 1989), which are defined as physical and non-physical configurations of metrics, data, visualizations, and other performance-related information that are used in performance management. Our analysis suggest that interactive dialogue can have a failing or success mode as a result of blocked communication, which can be explained –at least in part—by the types and formats of performance information as a boundary object. We propose a conceptual model of knowledge boundaries that capture knowledge sharing using performance information in different contexts, and show that performance information characteristics are key determinants of the success and failure modes of performance dialogues.

The rest of the paper is organized in five more sections. The next section includes a review of the literature on performance information use and key concepts of knowledge sharing at the boundaries. We then present in the third section the research methods used in this work. We continue with a description of the Childstat case, with a focus on instances of interactive dialogue, as well as performance information used. The last two sections of the paper include the proposed model and the conclusions of our analysis.

Performance Information Use In Performance Dialogue

Our research builds on a process view of information use in performance management (Beyer & Trice, 1982; Laihonen & Mäntylä, 2017; Nutley et al., 2007), borrowing from the sociology of technology literature to extend the concept of performance information artifact by connecting it to the concept of boundary object, which further contributes to the characterization of performance information use.

Performance Information Use and Dialogue

Performance information is generated and used in many different contexts of practice, including routine and non-routine feedback. Routine feedback are the inputs, outputs, quality and outcome measures generally associated with performance measurement and quantitative data; and non-routine feedback includes "any kind of data that provide feedback about the work of public administration but are not collected and reported through systematic management routine" (Kroll, 2013, p. 266).

Performance information is socially constructed and different actors will interpret performance information differently based on their organizational roles and practices (Askim, 2007; Moynihan, 2008; Saliterer & Korac, 2014). For example, Top-level managers oversight the organization and derive broad strategic plans (Kroll & Vogel, 2014). Middle level managers are responsible for executing organizational plans in conformance with the company's policies and objectives; communicating information and policies from top management to front-line management and assist them in performance improvement (Floyd & Wooldridge, 1997); front-line managers supervise and guide front-line workers to optimize specific operational processes (Rigopoulou et al., 2012). In addition, manager individual factors have been found to affect performance information use differently depending on their organizational roles (i.e. Mayor vs. CFO) (Saliterer & Korac, 2014). The diversity of positions and responsibilities affects performance information use, and increases the complexity of information sharing. In their role of communicating policy or guiding front-line workers, middle level and front-line managers play the role of boundary spanners, individuals that work at organizational or professional boundaries, and are expected to be competent in different domains as well as socially competent in those same domains (Levina & Vaast, 2005).

The use of learning forums and dialogue approaches promote engaging different stakeholders and facilitating conversations among different perspectives to increase learning (Bebbington et al., 2007; Moynihan, 2005). Promoting such dialogue and learning, nonetheless, is not a simple task and may encounter different challenges, such as blocked communication led by diverse perspectives and interpretations of performance information (DeHaven-Smith & Jenne II, 2006), boundary spanner rotation, incompatible tasks, lack of motivation to have a dialogue, etc. (Rajala et al., 2018, 2020).

Moreover, current research suggests that the introduction of dialogue by mainstream institutions may lead to pseudo-participation or monologic versions of learning forums (Aleksandrov et al., 2018). Although some basic principles for effective dialogue have been already identified, i.e. changes in the organizational culture that values diversity of ideologies, avoids reductionism and pays attention to power dynamics, there are still challenges that need to be addressed (Bebbington et al., 2007; Brown, 2009; Laihonen & Mäntylä, 2017). Better information systems are needed to support more inclusive ways of presenting performance information to create more inclusive ways of understanding wider impacts of organizational activities (Brown & Dillard, 2015b), and improve governance that facilitates stakeholder engagement and questioning values, assumptions and problem definitions (Brown & Dillard, 2015a). Main challenges for dialogue in hybrid organizations include language barriers, conflicting mindsets, inability to aggregate data, boundary spanner rotation, incompatible tasks, lack of motivation to have a dialogue, and clashes in organizational culture (Rajala et al., 2018, 2020).

Performance Information Artifacts As Boundary Objects

Performance dialogues constitute a form of knowledge sharing across boundaries (Bebbington et al., 2007; Moynihan, 2008). Knowledge boundaries come into being as interactions among expert groups that bring to light knowledge that is localized, embedded, and invested in practice (Carlile, 2002; Quick & Feldman, 2011). The focus on knowledge is consistent with performance dialogue approaches, which relies on structural learning, structured processes and recognizing a diversity of perspectives (Bebbington et al., 2007; Laihonen & Mäntylä, 2017; Moynihan, 2008). Learning forums constitute important organizational aids that support performance information use across boundaries (Rajala et al., 2020). Although the concept of boundaries in performance management has been applied mostly to organizational boundaries, involving a diversity of stakeholders in the performance

dialogue results in professional and occupational boundaries that introduce similar challenges and create the possibility for blocked communication.

Drawing from a socio-technical systems perspective (Pinch & Bijker, 1984), we define performance information artifacts as the collection of socially recognizable material and cultural properties of performance measurement and management systems. Performance information artifacts include configurations of metrics, visualizations, and other performance-related material representations of information that are used in the creation and recreation of performance practices. A re-conceptualization of performance information as artifact is important because it accommodates the complexity inherent in not only measuring activities, but in subsequently representing the same activities in numerical forms and other more inclusive representations such as visuals (Brown & Dillard, 2015b).

Research in sociology identifies the role of specific objects that work at the boundaries to facilitate knowledge sharing (Star & Griesemer, 1989). A boundary object is a representation, in this case, a performance information artifact that helps people to collaborate more effectively (Black et al., 2004; Quick & Feldman, 2011). Boundary objects are adaptable representations that allows people with different backgrounds to make different interpretations about them, but to keep a common identity (Carlile, 2002; Star & Griesemer, 1989).

Three characteristics make boundary objects more effective for sharing knowledge across boundaries (Carlile, 2002): a) boundary objects must be "representative" of the language and syntax of the different communities, b) "concrete" enough to depict effectively the consequences of interdependencies among the communities' work, and c) "transformable" to help participants to re-create and transform their own practices in light of the interdependencies. In this way, performance information artifacts that are not inclusive of a diversity of perspectives or that are ineffective in showing interdependencies of work among different actors in the system might not be effective aids to facilitate dialogue, and only facilitate presenting different positions of actors, and may lead to blocked communication instead of increased understanding of the different perspectives to the problem.
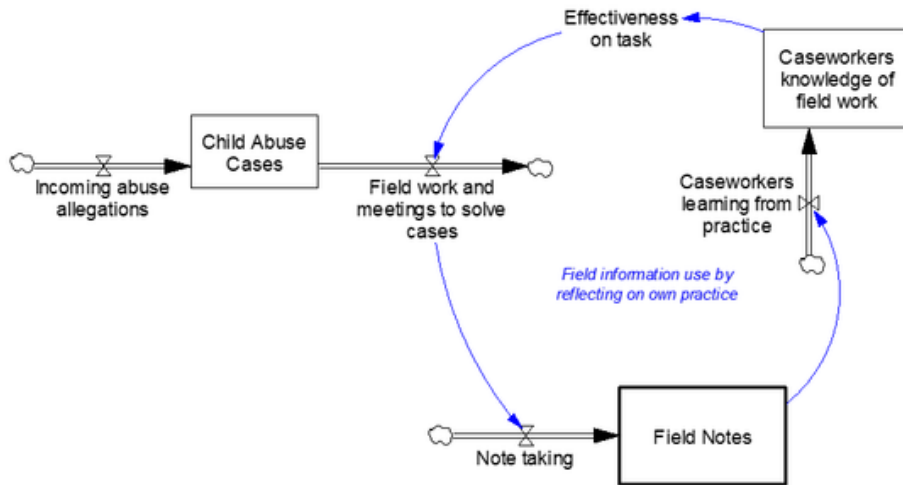
Boundary objects play an important role in facilitating knowledge sharing between different groups, particularly those separated by hierarchy, function, or location (Rajala et al., 2019; Rigopoulou et al., 2012). Levina & Vaast (2005) found that boundary objects deemed useful for boundary spanners and possessing ideal characteristics were largely unused or used in superficial ways, drawing a distinction between designated boundary objects (objects as conceived by the designer of the system) and boundary objects-in-use (as they are in fact used by actors within the system). This characterization suggests emergent qualities of the use of boundary objects.

Methods

In this paper we follow a case study approach (Eisenhardt, 1989; Yin, 2003). Data for this case comes from the analysis of an in-depth case study of the ChildStat program developed at the New York City (NYC) Administration for Children Services (ACS). ChildStat constitutes an example of PerformanceStat system, which implementation involved both an information system and the use of dialogue.

During November 2008 to May 2009, data was collected on multiple aspects of ChildStat using individual and group semi-structured interviews, non-participant observations, and documentation and objects related to the case. A total of forty-seven group and individual interviews, with 126 participants, were conducted and eight meetings observed. Interviews lasted approximately 45 minutes to one hour. A purposeful sample of individuals were selected to incorporate different roles and responsibilities with respect to ChildStat and child protective work. Interviewees included executives, borough management, child-protective managers, supervisors, and caseworkers within the Divisions of Child Protection (DCP), Policy and Planning (DPP), Quality Assurance (DQA), and Management Information Systems (MIS). A convenience sample of various ChildStat meetings were observed and a variety of materials were collected describing the ChildStat initiative including newspaper articles,

Figure 1. *Caseworker knowledge accumulation loop – knowing in practice*

internal newsletter articles, policy memos and training manuals. Formal organizational documents were obtained during interviews and at ChildStat meetings and through Internet searches.

We use the concepts and diagrams of system dynamics (Sterman, 2000) to build a conceptual model on the basis of the case data, more specifically, we use stock-and-flow diagrams as qualitative modeling tools. System dynamics is a modeling and simulation technique that uses endogenous hypotheses to explain dynamic problems (Richardson, 2011). The method relies on thinking about systems through the lenses of accumulations, activities and feedback processes (Black et al., 2004). Accumulations represent the main states of the system, such as the number of open child abuse cases in the ChildStat system (see Figure 1). These accumulations are usually built or depleted as a result of activities in the system, such as making a report of a potential child abuse or field work to solve the case. Feedback processes are circular causal connections among elements within the system that represent hypotheses of endogenous processes within any system. Figure 1 shows a system dynamics representation with three accumulations (*Child abuse cases, Field notes* and *Caseworkers knowledge of field work*), four activities (*Incoming abuse allegations, Field work and meetings to solve cases, Note taking,* and *Field workers learning from practice*) and one feedback process that suggests that field notes constitute an object that facilitates learning and in turn increases fieldworkers *Effectiveness on task* when working on solving cases, and promoting further learning.

We chose system dynamics tools because they have been used effectively to build theory in the social sciences (Davis et al., 2007; Ghaffarzadegan & Andersen, 2012). Moreover, system dynamics has been effectively used to represent learning processes and dialogue across professional and organizational boundaries (Black et al., 2004; Duhamel et al., 2012). The theory construction process consisted of an iterative process of identifying themes in the interview transcripts and making

hypothesis about their relationships. The process was guided by the research questions in the paper, data in the interviews and theories found in the literature.

The Case of ChildStat

In 2006, the Administration for Children's Services (ACS) implemented ChildStat. The goal was to improve outcomes for children and save children's lives, with an emphasis on safety assessments and actions taken during the first 30 days of an investigation.

ChildStat Performance Information Artifacts

The ChildStat process starts with creating performance information artifacts from the information management system. We found four categories of performance information artifacts used in a variety of meetings: (1) ChildStat PowerPoints, (2) ChildStat booklets, (3) ChildStat case reviews, and (4) ChildStat case summary analyses. The information of the first two artifacts focus exclusively on performance indicators, and the next two concentrate on information about an individual case investigation. The ChildStat PowerPoints and ChildStat booklets are prepared by analysts in DPP. The analyst receives approximately 15-20 automated reports from the Information Technology (IT) division weekly and then uses a spreadsheet to create graphs and visuals. Both the PowerPoint and booklets contain the same information, in the same graphical presentation format, but are disseminated through different media.
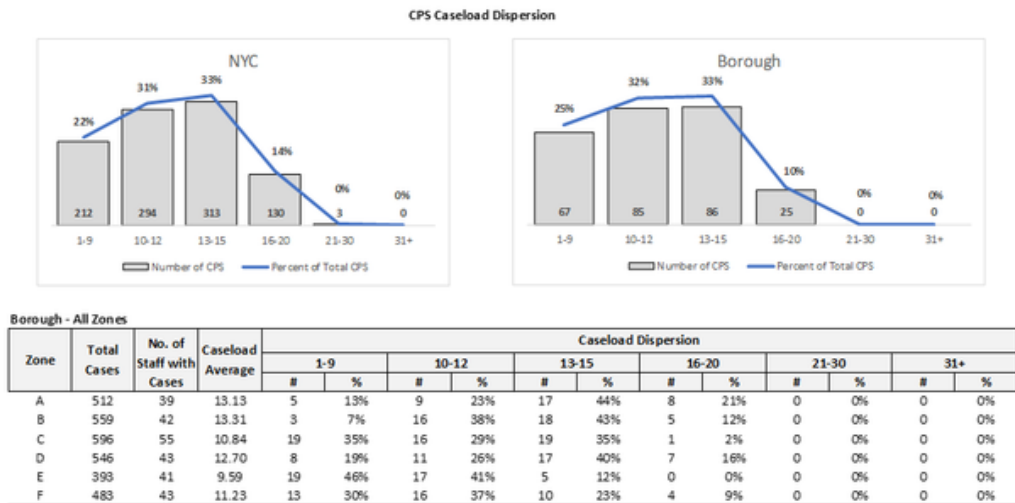
The ChildStat case review is a summarized report of one case investigation created by an analyst on the basis of the electronic case record and other available databases (i.e. child protection databases, preventive services, foster care, and adoption databases, income support, etc.). The review details the step-by-step actions that the caseworker and supervisor documented about the case. Basic contextual information about the borough, caseworker and supervisor tenure, and demographic information about the child and the family are provided. The ChildStat case summary analysis, also prepared by an analyst on the basis of electronic records, is a list of bulleted, one- to two-sentence explanations, of what was done on the case, what the strengths and weaknesses of the case were, whether the caseworker captured the 'bigger picture' of what was happening with this child and family, and suggestions for things that could have been done differently.

The artifacts created for the ChildStat process do not reflect the full range of information artifacts that aid performance dialogue within the organization. ACS executives (within the central office), borough management, zone managers, supervisors, and caseworkers reported four additional categories of information resources used in performance dialogues: specialized reports, computerized information system reports, information providers, and informal and formal communications. While this list of information resources is not exhaustive, it reflects the types most mentioned by participants.

Important reports mentioned by participants include Child Safety Alerts and routine and ad hoc reports that come out of ACS divisions or from the boroughs, as a result of effective dialogue. Child Safety Alerts are written policy and guidance documents from the Commissioner's office, addressing both practice and policy guidelines such as 'how to handle allegations involving children under one year of age.' Approximately 30 alerts were issued between 2006 and 2011. Routine or ad hoc reports generally provide information on the overall quality of case work practice, personnel information, information on training, information about court appearances, or placement reports. An example of a routine specialized report is the 'Monthly Flash' reports, which compile a set of ACS performance indicators across all ACS divisions, not just child protection.

Figure 2 shows a performance information artifact. It takes a singular performance metric – 'case load' – and presents it through many different visualizations. Each visualization provides a slightly different perspective on the performance metric case load – depicting it over time as a trend, as different averages based on zone, borough, or system-wide. The interpretation of meaning of case load is likely to vary.

Figure 2. *Example of case load performance information artifact*

Zone	Total Cases	No. of Staff with Cases	Caseload Average	Caseload Dispersion											
				1-9		10-12		13-15		16-20		21-30		31+	
				#	%	#	%	#	%	#	%	#	%	#	%
A	512	39	13.13	5	13%	9	23%	17	44%	8	21%	0	0%	0	0%
B	559	42	13.31	3	7%	16	38%	18	43%	5	12%	0	0%	0	0%
C	596	55	10.84	19	35%	16	29%	19	35%	1	2%	0	0%	0	0%
D	546	43	12.70	8	19%	11	26%	17	40%	7	16%	0	0%	0	0%
E	393	41	9.59	19	46%	17	41%	5	12%	0	0%	0	0%	0	0%
F	483	43	11.23	13	30%	16	37%	10	23%	4	9%	0	0%	0	0%

ChildStat Learning Forums, Dialogues, and Artifacts Use

A great deal of activity goes on within ACS divisions and the boroughs before and after a weekly main ChildStat meeting occurs. We found ChildStat featured four types of learning forums (DeHaven-Smith & Jenne II, 2006; Lewis & Triantafillou, 2012; Moynihan, 2008), where knowledge boundaries emerged. Table 1 summarizes the distinct features of the four forums: 1) ChildStat preparation sessions (executive & borough level), 2) ChildStat main meetings, 3) ChildStat de-brief meetings, and 4) one-on-one or small group supervisory meetings. In these settings, different expert groups, at different levels of the hierarchy, are engaged in dialogue supported by performance artifacts.

Both the executive-level staff and the borough-level staff hold ChildStat preparation meetings independently of one another and involving different stakeholders (see Table 1). Executive preparation sessions mainly focus on ChildStat PowerPoints and ChildStat booklets, but other information sources are directly brought to bear on the conversations. At the executive preparation session, discussions revolved around several topics such as how to present a change in the way that an indicator is calculated and represented, what new indicators are possible, or what are some new strategies for the larger ChildStat process (i.e., in one session, the discussion focused briefly on the idea of creating 'lessons learned' from weekly ChildStat meetings).

One borough preparation included discussions on ACS executive expectations for ChildStat process, and the ChildStat indicators and case review. The group went through each of the indicators in the booklets, trying to make sense out of them, and thinking about questions that could emerge on the main meeting. However, borough preparation sessions mainly focus on the ChildStat case reviews, case summary analyses, and very detailed information about what the caseworker did and

Table 1. *Four ChildStat Learning Forums and their Characteristis*

	ChildStat preparation sessions	ChildStat main meetings	ChildStat de-brief meetings	One-on-one or small group supervisory meetings
Nature of meeting	Internal	Public	Internal	Internal
Size of group & Length of meeting	● 7 -15 ● Multiple sessions over the course of 1 week	● 40 – 50 ● 3 hours every week	● 20 -25 ● 1 hour every week	● 2 – 7 ● Weekly or bi-weekly for 1 hour
Who participates	Executive Prep ● DCP deputies & staff ● QA deputies & staff ● Legal staff ● Commissioner staff Borough Prep ● Borough Commissioner ● Borough Managers ● Borough Supervisors ● Borough Caseworkers	● Commissioner ● All 11 ACS Deputies ● Borough Commissioners ● Borough Managers ● Borough Supervisors ● External visitors (e.g., service providers, union representatives)	● DCP Deputies & staff ● QA Deputies & staff ● Borough Commissioners ● Borough Managers ● Borough Supervisors	● Chain of supervision meetings ● Deputies to managers ● Managers to supervisors ● Supervisors to caseworkers
Nature of the dialogue	Executive Prep ● No formal agenda ● Free-form discussion ● No formal lead Borough Prep ● No formal agenda ● Structured question and answer session ● Free-form discussion	● Formal agenda ● Structured question and answer period led by Commissioner	● No formal agenda ● Free-form discussion session ● Prompts to start dialogue come from DCP or QA Deputies and staff	● No formal agenda ● Structured discussion led by senior person ● Free-form discussion session
Performance information artifacts used	Executive Prep ● ChildStat booklets ● ChildStat case review ● Flash reports (general performance reports) Borough Prep ● ChildStat booklets ● ChildStat case review ● ChildStat case summary analysis ● Other original prepared materials	● ChildStat booklet ● ChildStat case review	● No performance artifacts used	● Direct reports from case management systems (ACRS and Connections)

did not do, the conditions of the community, and other very situated information is brought to bear during the conversation.

ChildStat main meetings are held every Thursday morning. The deputy commissioner of DCP leads the main meeting, along with the assistant deputy commissioner of operations for DCP. The borough is represented by the borough commissioner, deputies, managers and sometimes supervisors.

Observers from outside ACS are often in attendance, including representatives from community organizations, provider organizations, union representatives, or representatives from other agencies. Caseworkers do not attend. ChildStat main meetings have a formal agenda, starting with questions and answers from the commissioner (e.g., general description on issues at ACS, follow-up information from last ChildStat meeting, etc.) and an update from the borough commissioner (e.g., any problems or accomplishments in the borough, changes since the last time they were at ChildStat, etc). The meeting is then broken up into two identical one-hour-and-fifteen minutes segments, including two zones in the borough. Each segment starts with a 15-minute presentation and discussion of the performance data, a 20-minute presentation of the case investigation, and a 25-minute discussion of the case. The ChildStat main meeting is one context where information use processes occur simultaneously and evolve between contexts. For example, one borough management participant recalled how she was asked during a ChildStat meeting about how she specifically made decisions regarding assigning cases that came into the borough.

A debrief session occurs immediately after every ChildStat meeting. An informal discussion about what happened at the meeting and other issues, concerns, and questions that were brought up, but not fully discussed during the ChildStat meeting, are opened up again for discussion. ACS executives attend ChildStat preparation sessions, ChildStat main meetings, and debrief sessions every week. On the other hand, boroughs are called to ChildStat main meetings on a rotating basis. A borough may be called approximately every six weeks and a particular zone may be called once every three months. We also observed that executives prefer to work with performance artifacts that include graphs and numeric indicators, and borough-level actors focus on text-based case data.

Supervision meetings are generally done on a one-on-one or small group basis. During this one-on-one supervisory meeting, supervisors translate and help front-line caseworkers get the main message from the ChildStat data and the ChildStat main meetings. Actors in the process sometimes find it difficult to connect between case data and performance indicators data.

Modeling Learning Forums and Knowledge Boundaries: An Organizational View

Childstat meetings involve different kinds of actors engaging in dialogue and sharing knowledge to improve performance. The same dialogue process can lead to blocked communication or to effective guidance represented in Child Safety Alerts. Case data suggests that both the objects used and the capabilities of key actors in the system who work as boundary spanners are factors explaining these outcomes.
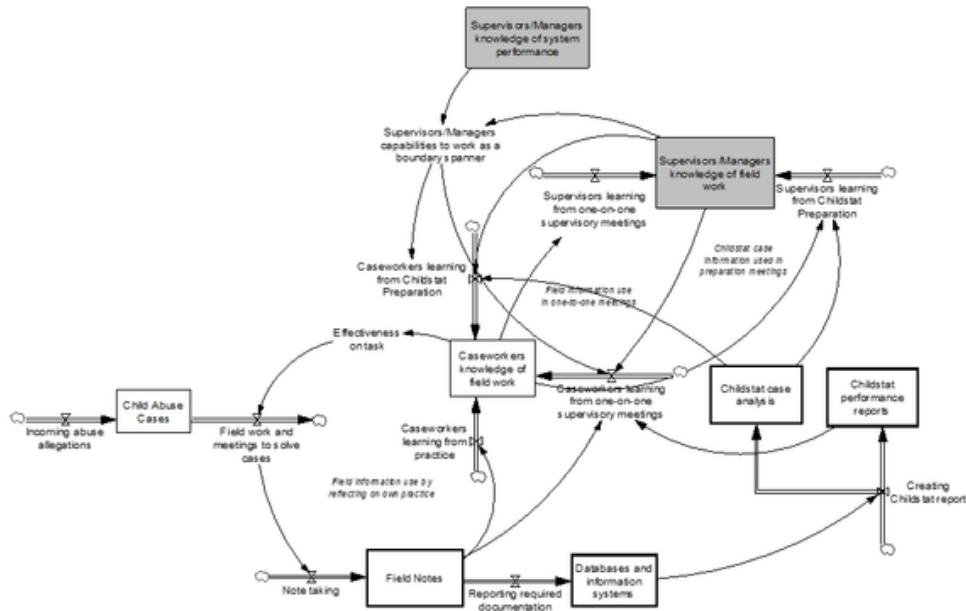
Knowledge Sharing and Information Artifacts At The Operational Level

Figure 1, introduced in the methods section, shows the basic operation of the child abuse investigation system. Caseworkers research in the field to discuss and solve the cases, capturing it in their field notes. We are intentionally simplifying this multi-stage process into a single stage process. Another key simplification is that we are grouping all caseworkers into a single group, which includes caseworkers in all boroughs. The initial process introduced in the picture reflects case workers learning from their own practice (Moynihan, 2005).

However, *field notes* are not the only objects used by caseworkers to improve performance. Caseworkers report some of their notes in the case management system and other *database systems*, which also represent important accumulations in the system (see lower right corner in Figure 3). Information kept in these systems is then used to create other artifacts like the *Childstat case analysis* and the *Childstat performance reports*.

Objects represented as key accumulations in Figure 3 may be used by caseworkers during meetings that they have with their supervisors and managers (a single group for simplicity represented in the top of the figure). Case data suggest that supervisors and managers in the Childstat system perform the tasks of *boundary spanners* (Levina & Vaast, 2005; Rajala et al., 2020), acting as translators of their understanding of system performance into practical considerations that can help caseworkers

Figure 3. *Performance artifacts and knowledge sharing at (or across) supervisor/managers – caseworkers' knowledge boundaries*

to improve their field practice (shadow boxes represent the necessary *knowledge* from boundary spanners to improve performance).

This dialogue takes place at one-on-one meetings and ChildStat preparation meetings. Caseworkers bring to the meeting their knowledge about practice and supervisors/managers bring to the meeting their knowledge of both, field work and system performance. Bringing performance reports to these meetings produces one of the possible dialogue failure modes or blocked communications. Caseworkers cannot claim any kind of ownership over performance reports, making it difficult for supervisors and caseworkers to use it effectively to guide practice. One caseworker describes such difficulty:

One supervisor's comments illustrate the difficulty faced by many when trying to connect performance data with case work:

On the other hand, supervisors that keep what was learned about the metric during ChildStat main meetings and debrief sessions, and can translate this to help the caseworker to be closer to the goal. One manager describes the influence of different boundary objects and their roles as boundary spanners:

Childstat preparation meetings constitute another moment to share knowledge about practice in the field. As one manager suggested,

"I don't get to use [the ChildStat booklet information] a lot because my level of involvement doesn't require me to have much of the information about this. To tell you the truth, I'm more about my supervisor supporting what I have to do. Rather than, you have 10 [cases], and you are gonna get another one and that will be 11. To me, that would distress me more than him/her saying, how about we work on this and move that."

"…this job entails so much and we are dealing with human behavior, there is no tool yet to actually map out every single thing that a supervisor does on every single case at every given time. But they tell you, and you say to them, 'You are talking about statistics, and yet, you want quality case work.' So, what do you want?"

"Yes, I think these statistics mean something to us, but our role is different. When I bring it to my workers [I tell them], 'you got the lowest number of cases, but you don't have the highest number of this [compliance rate], your compliance rate should be wonderful.' I think that brings it to them, because [it makes them think] why would I have just 5 cases, which [should] be good, but [their] compliance rate on safety assessments is like 70 percent, what is going on? I think some of the [caseworkers] will look at me and say, 'yeah she's right'"

Knowledge Sharing and Artifacts At Childstat Learning Forums

Figure 4 describes knowledge sharing across boundaries during the Childstat main learning forums. The figure shows three performance artifacts (*Childstat case analysis*, *Childstat performance reports* and *Child safety alerts*), as well as a new artifact that we believe may increase the effectiveness of knowledge sharing during the learning forums (*Causal model of Childstat system*). Increased knowledge sharing will lead to improving boundary spanning capabilities of supervisors/managers, and increasing the effectiveness of executives to issue *Child safety alerts*.

In the lower right side of the figure, we have represented the way in which executives develop their own knowledge about system performance. Executives' knowledge is built from a series of performance status reports that mainly use aggregated data about the system for example 'case load average by borough'. As a result, executives may change regulatory and legal requirements on what to report and how, also adjusting the reports to improve their learning and modifying the ways to report on performance. These two activities constitute important feedback loops that have an impact on the overall executive learning process.

The central part of the figure represents knowledge sharing during Childstat weekly meetings, which have frequent episodes of blocked communication. As one of the managers suggested:
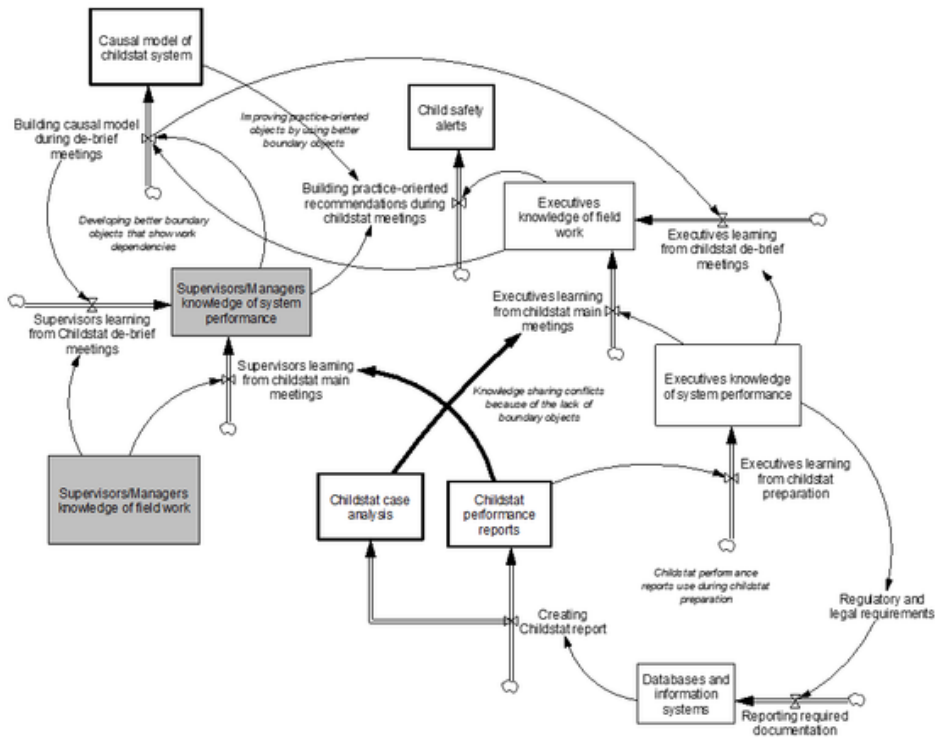
A second opportunity to share knowledge between supervisors/managers and executives are the Childstat debrief meetings. Dialogue in these meetings has yielded in the past guidance for practice in the form of Child Safety Alerts, which constitute useful guidelines to fieldwork practice. However, given that there are no objects used during these dialogues, the results vary and are hard to predict, making it hard to build an effective connection between performance information and policy or action (Askim, 2007; Brown & Dillard, 2015b; Laihonen & Mäntylä, 2017; Moynihan, 2005).

CONCLUSION

The ChildStat strategy was intentionally designed to bring together executives, managers, and supervisors to talk about performance (DeHaven-Smith & Jenne II, 2006; Moynihan, 2008). Although this type of strategies has proven to be effective, research calls for better ways of facilitating dialogue among stakeholders with diverse perspectives (Aleksandrov et al., 2018; Bebbington et al., 2007; Brown & Dillard, 2015a, 2015b). The case itself illustrates some of these difficulties translating performance measurements, such as case load into field practices, or connecting textual representations, such as case notes to performance measures. ChildStat executives and field workers not always can use performance information to learn about causal explanations to support policy and decision making (Askim, 2007; Laihonen & Mäntylä, 2017) or to understand the wider-system impacts of their practice (Bebbington et al., 2007; Brown & Dillard, 2015b).

"[W]hen it is our borough's ChildStat case… We review the case to bring out all the information that wasn't on paper; what was done on the case; how we are going to present the case. We learn from that process alone."

Figure 4. *Performance artifacts and knowledge sharing in at Childstat learning forums.*

The case analysis contributes to the literature by demonstrating that performance dialogue is a dynamic and continuous process that occurs in many contexts, and involving different sets of actors. Moreover, dialogue occurs around performance information represented in what we call performance information artifacts. Different information artifacts are created, used and re-interpreted by stakeholders in their learning processes: charts and numbers are most important at the executive level, and textual descriptions and context-rich representations are most used at the operational level in this case. These artifacts are effective in dialogue occurring within each hierarchical level, but it seems to be effectively translated only when supervisors play the role of effective boundary spanners, connecting aggregate performance measures to field practice (Levina & Vaast, 2005; Rajala et al., 2020). The only widely agreed exception is the Child Safety Alerts, which case participants value as effective practice and policy guidelines.

We suggest that thinking of performance information artifacts as boundary objects explains some aspects of the problem of blocked communication. Executive knowledge and field knowledge are constructed through using different performance artifacts, either charts and numbers or text descriptions. The use of performance artifacts across boundaries, whether it was during performance-related meetings, routine organizational meetings or between executives and field workers, rendered both types of knowledge inseparable from the objects used in the learning process. At the same time,

"Presenting the information is not difficult because we have a format that we follow. However, it's reaching a consensus where we tend to disagree. It seems as though the individuals there, at the table [executives], approach casework practice from a more theoretical perspective. Where we [on the front-line] are on the practical side, so when [executives] ask a question and we tell them how it is, they have a problem accepting that."

performance information artifacts created in this way mostly represent one perspective and make difficult to show the relationships and dependencies among different perspectives to the problem (Black et al., 2004; Carlile, 2002). Performance artifacts used in the Childstat weekly meetings, which are poor in showing these connections, and the lack of use of any artifact during the debrief meetings do not contribute to improvements in system performance.

We argue that, in order to increase certainty about the outcomes of the meetings, ChildStat debrief sessions can be used to produce shared representations of causal models of the system, or at least simplified conceptual connections between field notes and aggregated performance measures. To be effective, these representations need to show the connections between actions in the system and changes in performance measures (Brown & Dillard, 2015a). In a sense, these causal models represent the underlying theory of the Childstat system, and having a causal model or program theory has proven their effectiveness in other performance management environments (Bianchi & Williams, 2015). These shared representations may be used also as ways of representing competing theories about performance. Having a clearer vision of the potential explanations of performance is likely to increase the skills of supervisors/managers as boundary spanners, improving their skills to modify local practices and improve overall system performance. In fact, causal models have the potential of constituting themselves as effective middle-level performance artifacts, concrete enough to share beliefs about the problem, representative enough to include all competing points of view, and transformable enough to facilitate the transformation of practices. The use of performance artifacts may be guided by the following principles:

(1) Performance artifacts need to use a diversity of types and formats to facilitate the understanding of the state of the system by different actors and stakeholders.
(2) The use of performance artifacts that show dependencies and causal connections between performance measurements and concrete practices and actions increase the probability of success in performance dialogue.
(3) Causal models representing the underlying competing theories of a PerformanceStat system have the potential to be effective performance artifacts to improve performance
(4) Mid-level and front-line managers play a key role in the translation of system goals and action (boundary spanners).
(5) The effectiveness of boundary spanners is a function of the balance between knowledge about the system at the aggregate level and its connections to the field practice.

The next steps in our research involves testing the proposition of using causal models and simulations to facilitate performance dialogue, testing its effectiveness in developing shared knowledge and understanding about performance.

REFERENCES

Aleksandrov, E., Bourmistrov, A., & Grossi, G. (2018). Participatory budgeting as a form of dialogic accounting in Russia. *Accounting, Auditing & Accountability Journal*, *31*(4), 1098–1123. doi:10.1108/AAAJ-02-2016-2435

Askim, J. (2007). How do politicians use performance information? An analysis of the Norwegian local government experience. *International Review of Administrative Sciences*, *73*(3), 453–472. doi:10.1177/0020852307081152

Bebbington, J., Brown, J., Frame, B., & Thomson, I. (2007). Theorizing engagement: The potential of a critical dialogic approach. *Accounting, Auditing & Accountability Journal*, *20*(3), 356–381. doi:10.1108/09513570710748544

Behn, R. D. (2003). Why Measure Performance? Different Purposes Require Different Measures. *Public Administration Review*, *63*(5), 586–606. doi:10.1111/1540-6210.00322

Beyer, J. M., & Trice, H. M. (1982). The Utilization Process: A Conceptual Framework and Synthesis of Empirical Findings. *Administrative Science Quarterly, 27*(4), 591–622. 10.2307/2392533

Bianchi, C., & Williams, D. W. (2015). Applying System Dynamics Modeling To Foster a Cause-and-Effect Perspective in Dealing with Behavioral Distortions Associated with a City's Performance Measurement Programs. *Public Performance & Management Review*, *38*(3), 395–425. doi:10.1080/15309576.2015.1006471

Black, L. J., Carlile, P. R., & Repenning, N. P. (2004). A dynamic theory of expertise and occupational boundaries in new technology implementation: Building on Barley's study of CT scanning. *Administrative Science Quarterly*, *49*(4), 572–607.

Brown, J. (2009). Democracy, sustainability and dialogic accounting technologies: Taking pluralism seriously. *Critical Perspectives on Accounting*, *20*(3), 313–342. doi:10.1016/j.cpa.2008.08.002

Brown, J., & Dillard, J. (2015a). Dialogic Accountings for Stakeholders: On Opening Up and Closing Down Participatory Governance. *Journal of Management Studies*, *52*(7), 961–985. doi:10.1111/joms.12153

Brown, J., & Dillard, J. (2015b). Opening Accounting to Critical Scrutiny: Towards Dialogic Accounting for Policy Analysis and Democracy. *Journal of Comparative Policy Analysis*, *17*(3), 247–268. doi:10.1080/1387 6988.2014.989684

Carlile, P. (2002). A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development. *Organization Science*, *13*(4), 442–455. doi:10.1287/orsc.13.4.442.2953

Davis, J. P., Eisenhardt, K., & Bingham, C. B. (2007). Developing Theory Through Simulation Methods. *Academy of Management Review*, *32*(2), 480–499. doi:10.5465/amr.2007.24351453

de Bruijn, H., & van Helden, G. J. (2006). A Plea for Dialogue Driven Performance-Based Management Systems: Evidence from the Dutch Public Sector. *Financial Accountability & Management*, *22*(4), 405–423. doi:10.1111/j.1468-0408.2006.00432.x

DeHaven-Smith, L., & Jenne, K. C. II. (2006). Management by Inquiry: A Discursive Accountability System for Large Organizations. *Public Administration Review*, *66*(1), 64–76. doi:10.1111/j.1540-6210.2006.00556.x

Duhamel, F., Gutiérrez-Martínez, I., Picazo-Vela, S., & Luna-Reyes, L. F. (2012). The Key Role of Interfaces in IT Outsourcing Relationships. *International Journal of Information Technologies and Systems Approach*, *5*(1), 37–56. doi:10.4018/jitsa.2012010103

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, *14*(4), 532–550. doi:10.5465/amr.1989.4308385

Floyd, S. W., & Wooldridge, B. (1997). Middle Management's Strategic Influence and Organizational Performance. *Journal of Management Studies*, *34*(3), 465–485. doi:10.1111/1467-6486.00059

Ghaffarzadegan, N., & Andersen, D. F. (2012). Modeling Behavioral Complexities of Warning Issuance for Domestic Security: A Simulation Approach to Develop Public Management Theories. *International Public Management Journal*, *15*(3), 337–363. doi:10.1080/10967494.2012.725566

Kroll, A. (2013). The Other Type of Performance Information: Nonroutine Feedback, Its Relevance and Use. *Public Administration Review*, *73*(2), 265–276. doi:10.1111/j.1540-6210.2012.02648.x

Kroll, A. (2015). Drivers of Performance Information Use: Systematic Literature Review and Directions for Future Research. *Public Performance & Management Review*, *38*(3), 459–486. doi:10.1080/15309576.2015.1006469

Kroll, A. (2016). Exploring the Link Between Performance Information Use and Organizational Performance: A Contingency Approach. *Public Performance & Management Review*, *39*(1), 7–32. doi:10.1080/15309576.2016.1071159

Kroll, A., & Vogel, D. (2014). The PSM-Leadership Fit: A Model of Performance Information Use. *Public Administration*, *92*(4), 974–991. doi:10.1111/padm.12014

Laihonen, H., & Mäntylä, S. (2017). Principles of performance dialogue in public administration. *International Journal of Public Sector Management*, *30*(5), 414–428. doi:10.1108/IJPSM-09-2016-0149

Levina, N., & Vaast, E. (2005). The Emergence of Boundary Spanning Competence in Practice: Implications for Implementation and Use of Information Systems. *MIS Quarterly, 29*(2), 335–363. 10.2307/25148682

Lewis, J. M., & Triantafillou, P. (2012). From performance measurement to learning: A new source of government overload? *International Review of Administrative Sciences*, *78*(4), 597–614. doi:10.1177/0020852312455993

Moynihan, D. P. (2005). Goal-Based Learning and the Future of Performance Management. *Public Administration Review*, *65*(2), 203–216. doi:10.1111/j.1540-6210.2005.00445.x

Moynihan, D. P. (2008). *The dynamics of performance management: Constructing information and reform*. Georgetown University Press.

Nutley, S. M., Walter, I., & Davies, H. T. O. (2007). *Using evidence: How research can inform public services*. Policy Press. doi:10.2307/j.ctt9qgwt1

Pandey, S. K. (2016). Performance Information Use: Making Progress But a Long Way to Go. *Public Performance & Management Review*, *39*(1), 1–6. doi:10.1080/15309576.2016.1071158

Pinch, T. J., & Bijker, W. E. (1984). The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other. *Social Studies of Science*, *14*(3), 399–441. doi:10.1177/030631284014003004

Quick, K. S., & Feldman, M. S. (2011, June 1). *Boundaries and Inclusive Public Management. Public Management Research Association Conference*, Syracuse, NY.

Rajala, T., Laihonen, H., & Haapala, P. (2018). Why is dialogue on performance challenging in the public sector? *Measuring Business Excellence*, *22*(2), 117–129. doi:10.1108/MBE-06-2017-0032

Rajala, T., Laihonen, H., & Vakkuri, J. (2020). Exploring challenges of boundary-crossing performance dialogues in hybrids. *The Journal of Management and Governance*, *24*(3), 799–820. Advance online publication. doi:10.1007/s10997-019-09485-x

Richardson, G. P. (2011). Reflections on the foundations of system dynamics. *System Dynamics Review*, *27*(3), 219–243. doi:10.1002/sdr.462

Rigopoulou, I., Theodosiou, M., Katsikea, E., & Perdikis, N. (2012). Information control, role perceptions, and work outcomes of boundary-spanning frontline managers. *Journal of Business Research*, *65*(5), 626–633. doi:10.1016/j.jbusres.2011.03.001

Rochet, C., Habib, J., & Soldo, E. (2009). The use of an information system as a legitimate subversive agent. *Information Polity: The International Journal of Government & Democracy in the Information Age*, *14*(3), 155–171. doi:10.3233/IP-2009-0156

Saliterer, I., & Korac, S. (2014). The discretionary use of performance information by different local government actors – analysing and comparing the predictive power of three factor sets. *International Review of Administrative Sciences*, *80*(3), 637–658. doi:10.1177/0020852313518170

Schooley, B. L., & Horan, T. A. (2007). Towards end-to-end government performance management: Case study of interorganizational information integration in emergency medical services (EMS). *Government Information Quarterly*, *24*(4), 755–784. doi:10.1016/j.giq.2007.04.001

Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, "Translations" and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology. *Social Studies of Science*, *19*(3), 387–420. doi:10.1177/030631289019003001

Sterman, J. D. (2000). *Business Dynamics: Systems Thinking and Modelling for a Complex World*. Irwin/McGraw-Hill.

Talbot, C. (2005). Performance Management. In E. Ferlie, L. E. Lynn, & C. Pollitt (Eds.), *The Oxford handbook of public management*. Oxford University Press.

Yang, T.-M., & Maxwell, T. A. (2011). Information-sharing in public organizations: A literature review of interpersonal, intra-organizational and inter-organizational success factors. *Government Information Quarterly*, *28*(2), 164–175. doi:10.1016/j.giq.2010.06.008

Yetano, A., Matsuo, T., & Oura, K. (2021). Diagnostic and Interactive Use of PMM by Japanese Local Governments: Does the Context Affect the Fitness of Use? *Public Performance & Management Review*, *44*(1), 28–57. doi:10.1080/15309576.2020.1817108

Yin, R. K. (2003). *Case Study Research. Design and Methods*. Sage Publications.

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