

# A Balancing Act: How Organizations Pursue Consistency in Routine Functioning in the Face of Ongoing Change

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**T**his study examines how participants in routines view and balance pressures for consistency in the face of ongoing change. We address this question through a qualitative case-based inquiry into the ostensive aspects of the core operational routine in six waste management organizations. We find that organizational members simultaneously establish and maintain two ostensive patterns—one of targeted consistency and another of flexibility in internal coordination—by leveraging artifacts and connections. Organizations, however, could not establish similar patterns among their customers, who, lacking connections with other routine participants, expected consistency and performed their part less flexibly. These observations lead us to develop a theoretical model that identifies the processes through which simultaneous ostensive patterns of consistency and flexibility are established and sustained among organizational members, as well as the challenges that arise from multiplicity of ostensive patterns among routine participants with different roles and connections. The model advances the dynamic perspective on routines by articulating how artifacts and connections support the balancing of pressures for consistency and for change in routine functioning.

*Key words:* routines; consistency; change; artifacts; connections; mindfulness

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## Introduction

Central organizational theories conceptualize organizations as bundles of routines (Cyert and March 1963, Hannan and Freeman 1989, March and Simon 1958, Nelson and Winter 1982). Defined as repetitive, recognizable patterns of interdependent behaviors among organizational actors (Feldman and Pentland 2003), routines are viewed as pervasively shaping individual and organizational actions. Although scholars agree about the pervasiveness of routines in organizational and individual life, they differ considerably in theorizing how routines function. Early conceptualizations emphasize that organizations have incentives to standardize the activities underlying repetitive tasks (Hannan and Freeman 1989, Nelson and Winter 1982, Winter 1968) and that routines provide the means for performing such tasks consistently. Consistent routine performances are seen as a means of increasing organizational efficiency by reducing deliberation and conflict, and facilitating coordination and task learning (Becker 2004, Stene 1940). These positive effects, however, depend on the stability of operating conditions (Stinchcombe 1990), and research has shown that changing environmental conditions are indeed associated with routine disruption and negative organizational outcomes (Baum and Shipilov 2006, Edmondson et al. 2001).

This “traditional” view has come under criticism for “black-boxing” routines and offering limited understand-

ing of how routines operate in practice (Pentland and Feldman 2008a). An alternative view has been proposed that portrays routines as “generative systems” involving flexible performances that depend on particular circumstances (Feldman and Pentland 2003, 2008, p. 302). This view emphasizes that participants perform routines in variable ways and that change is inherent to the functioning of routines (Feldman 2000, Pentland and Rueter 1994). This view has drawn attention to the tension that arises between organizational efforts to standardize behaviors and achieve efficiencies through consistent routine performances and the dynamic nature of routine functioning.

Cohen and colleagues have recently highlighted this tension, arguing that routines are characterized by the “paradox of the (n)ever-changing world” (Birnholtz et al. 2007, Cohen 2007). Cohen (2007, pp. 781–782) explains the paradox as follows:

From one perspective (that of Heraclitus) “one does not step into the same river twice.” . . . Yet from another perspective that is equally compelling (that of Ecclesiastes), “there is no new thing under the sun.” For an established routine, the natural fluctuation of its surrounding environment guarantees that each performance is different, and yet, being a routine, it is “the same.” Somehow there is a pattern in the action, sufficient to allow us to say the

pattern is recurring, even though there is substantial variety to the action, variety sufficient to allow us to rule out any two occasions being exactly alike.

Cohen (2007) suggests that developing a more systematic understanding of how this paradox is managed in the context of routine functioning is an important goal for research on routines.

In this study we take a step in that direction by examining how routine participants view and balance the pressures for consistency in the face of ongoing change that surrounds routine functioning. To address this question, we undertook a qualitative case-based inquiry into the ostensive aspects (Pentland and Feldman 2005) of the waste collection routines of six waste management organizations. To provide a comprehensive account of participants' experiences with various types of change, we defined change broadly to include exogenous and endogenous change of planned and unplanned nature (Cohen 2007, Edmondson et al. 2001, Feldman 2000, Howard-Grenville 2005). Following Pentland and Feldman (2005, p. 802), who suggest that studies of the ostensive draw on informant accounts that summarize multiple performances across multiple performance conditions, we analyze informant accounts from different hierarchical levels of these organizations to capture multiple views of how organizational members balance the pressures for consistency and for change.

Our findings offer several interesting insights that advance the dynamic view of routines. We find that recognition of the tension between the need to ensure consistency and respond to change leads organizational members to simultaneously establish and maintain two ostensive patterns: one of targeted consistency and another of flexibility in internal coordination. To maintain dual ostensive patterns that combine targeted consistency and enacted flexibility, organizational members leveraged artifacts and connections both in processes that standardize and stabilize behaviors and in processes that facilitate flexible and mindful responses. These processes enabled organizational members to engage in numerous microadaptations and to deliver relatively consistent outcomes to customers. As a result, customers who typically experienced the routine as performed consistently came to expect consistency, and they often synchronized their actions with the expected routine performance by crews. This multiplicity in the ostensive patterns of actors with different roles created additional challenges for organizations.

Based on these observations, we develop a theoretical model that identifies the different processes that support different ostensive patterns for participants with different roles. We articulate how the ostensive pattern of consistency projected externally and the pattern of flexibility maintained internally affect the functioning of routines and why the ostensive patterns of organizational members and of their customers differ. These theoretical

insights extend research of routine functioning by articulating how routine participants balance pressures for consistency and for change. They also highlight how differences in connections among routine participants with different roles affect organizational ability to balance these pressures.

The rest of this paper proceeds as follows. We first provide a brief review of the central theoretical debates in routines research that motivated our research question; we then discuss our setting and methods for data collection and analysis. In the subsequent section, we present our first-order findings about how informants viewed and managed pressures for consistency in the face of ongoing change, as well as their views about the customer performances of the routine. We follow with a theoretical discussion of these findings and conclude with the research implications of our study.

### The Paradox of Routine Functioning

The “(n)ever-changing world” paradox articulated by Cohen and colleagues (Birnholtz et al. 2007, Cohen 2007) underlies a central debate in routines research regarding how routines function and how they affect organizational outcomes. In routines scholarship, the “*never-changing world*” perspective is reflected in work that examines routines as fixed entities designed to generate consistent actions and efficient results (March and Simon 1958, Nelson and Winter 1982). This work emphasizes that patterns of actions stabilize and become increasingly repetitive and automatic (Cohen 2007, Cohen and Bacdayan 1994, Nelson and Winter 1982). Contextual constraints (Cohen et al. 1996), anticipated efficiencies (Karim and Mitchell 2000, Nelson and Winter 1982), and legitimacy (Hannan and Freeman 1989) all contribute to managerial efforts to ensure stability and reap the benefits of the associated consistency (Stinchcombe 1990). Yet stability is difficult to achieve, and as Leidner (1993, p. 8) argues, “Understanding employers' designs for routinization is only the first step in understanding how the routines function in practice.”

By contrast, the “*ever-changing world*” perspective in routines scholarship emphasizes the choice and agency of actors who change and adapt their performances of a routine to respond to changes in the context and/or their own experiences and visions (Feldman 2000, Howard-Grenville 2005, Pentland and Reuter 1994, Salvato 2009). Work from this perspective therefore emphasizes the dynamic characteristics of routines. It conceptualizes routines as consisting of ostensive aspects, which are the general and abstract patterns of the routine, and performative aspects, which are the specific performances undertaken by specific people at specific times and places (Feldman and Pentland 2003). It further distinguishes between the formal design of a routine embodied in artifacts, such as rules, schedules, and

standard operating procedures, and the routine itself, which develops through interactions and connections among actors (Feldman and Rafaeli 2002, Pentland and Feldman 2005). By reconceptualizing routines as involving general patterns and specific performances, this view provides a rich lens for studying the (n)ever-changing world paradox in routine functioning.

Feldman and Pentland (2008, p. 302) further suggest that understanding “how stability and change are achieved” is the principal aim of the dynamic perspective of routines, because routines are systems that have the capacity to produce a wide variety of performances—some stable, some varying—depending on the conditions (Feldman 2000, Feldman and Pentland 2003, Pentland and Feldman 2005, Pentland and Reuter 1994). Research conducted from this perspective has begun to identify factors that affect the interplay between stability and change in routine functioning. For example, connections—defined as “interactions between people that enable them to transfer information” (Feldman and Rafaeli 2002, p. 312)—have been argued to promote the shared understandings that generate context-specific performances (Feldman and Rafaeli 2002); the temporal orientations of actors—toward the past, present, and future—have been shown to influence whether routines gravitate toward stability or variability and change (Howard-Grenville 2005); different magnitudes of change have been found to surface latent conflicts to different degrees and to pose different threats to routine stability (Zbaracki and Bergen 2010); and work structures have been proposed as means for handling recurring changes in a consistent manner (Adler et al. 1999). Taken together, these studies point to the simultaneity of efforts to achieve consistency and the pervasiveness of change in routine functioning. They also suggest the need for closer research attention to the question of how routine participants—in different roles—understand and balance these dual pressures. Our study endeavors to shed light on this question.

## Methods

### Research Setting

Waste collection provides an excellent setting for addressing our research question for several reasons. First, waste collection requires the performance of repetitive actions by multiple interdependent actors on a recurrent basis. Although the task is relatively simple and repetitive, changes are quite common in this setting, ranging from planned modifications such as route reorganizations to perturbations such as truck breakdowns. Second, whereas in many organizational settings clear routines are difficult to pinpoint (Becker et al. 2005, Pentland and Feldman 2005), in waste collection the boundaries of routines across crews and across days of execution are clearly delineated. Crews consist of

a small number of employees whose actions are relatively transparent, thereby enabling us to inquire about specific components and linkages under conditions of both stability and change. Third, the highly standardized operations in waste collection enabled us to observe the same type of routines across organizations, which overcomes the problem with examining comparable routines in different organizations, as noted by routine scholars (Becker et al. 2005, Pentland and Feldman 2005). In sum, waste collection provided an empirical setting where routines are prevalent, clearly delineated, and transparent, and where the changes that affect them are tractable from the informant point of view and comparable across organizations from the researcher point of view.

### Data Collection

*Familiarization Stage.* We began our study with what can be characterized as a familiarization stage, during which we conducted 12 open-ended interviews with a broadly sampled set of industry informants that included presidents of solid waste firms, directors of public and nonprofit solid waste organizations, state government leaders, and faculty experts in the Research Triangle Park area of North Carolina. During the interviews, we inquired about the types of routines used in waste collection (e.g., Cyert and March 1963, Nelson and Winter 1982) and the sources of change in this setting. The interviews ranged from 1 to 2 hours, with an average length of 90 minutes. Field notes were taken during all the interviews and were transcribed within 24 hours. In this stage, informants also directed us to relevant archival data sources, such as the biannual survey of solid waste practices among municipalities (*North Carolina (NC) League of Municipalities* 2001, 2003), annual reports of operating performance for a select group of cities in the state (*NC Local Government Performance Measurement Project* 2003), industry analyst reports, and industry trade publications. We collected and reviewed these sources, including 10 years of trade press coverage in *Waste Age* and *Waste News*.

*Systematization Stage.* Based on observations in the familiarization stage, we developed a multicase research design intended to ensure the development of robust and generalizable theoretical insights. In multicase research design, individual cases serve as experiments across which patterns of relationships can be compared and the robustness of the insights can be assessed (Eisenhardt 1989, Yin 1994). The research design involved six waste collection organizations, all of which were publicly operated sanitation departments within cities in the state of North Carolina, located in the southeastern United States. To increase generalizability, we selected organizations to vary by size and technology—two characteristics that have been argued to affect the use and management of routines (Adler et al. 1999, Nelson and

Winter 1982, Stinchcombe 1990) and were suggested as relevant for understanding routinization in the industry during the familiarization stage.

Using the biannual survey report of solid waste practices of municipalities in North Carolina (*NC League of Municipalities* 2001), we identified three classes of organizational size—large (serving populations of 200,000 residents or larger), medium (serving 50,000–100,000 residents), and small (serving 10,000–25,000 residents); within each class, we selected organizations that varied in process technology—automated versus manual collection.<sup>1</sup> When multiple organizations met our criteria, we approached organizations in their order of geographic proximity to optimize site access. Of the six initially contacted departments, five agreed to participate; the nonresponding one was replaced by the next in order of proximity. Fortuitously, two organizations in our sample were in the process of transitioning from manual to automated technology during the time of our interviewing, enabling us to collect real-time data regarding change effects on routine functioning.

We conducted 28 semistructured interviews in the six organizations at three levels of the organizational hierarchy: director, supervisor, and field employee. This informant pool enabled us to consider multiple ostensive aspects by examining how informants' views of, and roles in, the routine vary by hierarchical level (Feldman 2003, Gavetti 2005). In our setting, directors were responsible for overall design and management of the collection routines, supervisors supervised their day-to-day performance, and field employees performed actual physical collections. Table 1 summarizes the information regarding our sites and informants.

Following extant routines research (Feldman and Pentland 2003, Pentland and Feldman 2005), we asked each informant to describe the waste collection routines in general, as well as to provide examples of specific performances. The interview protocol asked informants to describe (1) what a typical performance of the waste collection routine entails from the perspective of their role; (2) why performances vary and how, asking what changes, why, with whose involvement, and with what consequences in such instances; and (3) if they have developed specific means for dealing with the different types of change identified. To ensure comprehensiveness and comparability of the data collected, we typically concluded the interview by asking informants to provide information about a list of various types of changes identified during the familiarization stage, such as adverse weather, truck breakdowns, and new crew members. All interviews were recorded and transcribed. Field notes taken during the interviews and accompanying site visits were transcribed within a day of each visit. The interviews lasted a little over an hour on average, and the range was between 30 minutes and 4 hours. Each on-site visit also involved field observations, including facility tours, equipment walk-overs, and informal observations of employees engaged in activities such as handling customer calls. These observations were recorded in the field notes.

During the interviewing process, we also gained access to archival materials that informants used to illustrate their points. These materials were diverse in nature, ranging from a 10-year strategic plan and daily operating plans that guided waste collections under typical and adverse conditions to samples of route paths, operational

**Table 1 Summary of Interview Data Collection**

City sanitation department	Organizational size (employees)	Garbage collection process technology (employees/crew)	Number of informants by level	Experience in current position (years)
Metropolis	Large (200–300)	Automated (1–2)	1 Director 2 Midlevel supervisors 2 Field-level crew members	13 3, 1 1, 6
Centre City	Large (200–300)	Manual (2–5)	1 Director 2 Midlevel supervisors 4 Field-level crew members	14 4, md 5, 17, 20, 21
Independence	Medium (50–150)	Automated (1–2)	1 Director 2 Midlevel supervisors 1 Field-level crew member	4 3, 15 13
Suburban	Medium (50–150)	Manual (2–5)	1 Director 1 Midlevel supervisor 2 Field-level crew members	3 3 2, 12
Mercury	Small (20–30)	Automated (1–2)	1 Director 1 Midlevel supervisor 2 Field-level crew members	6 5 4, 7
Middletown	Small (20–30)	Manual (2–5)	1 Director 2 Midlevel supervisors 1 Field-level crew member	8 1, 11 1

Note. md, missing data.

productivity reports, and customer communication materials. Furthermore, as the use of artifacts as a core mechanism enabling the pursuit of consistency and response to change emerged as an important finding in our analysis, we collected additional information about the artifacts used by the focal organizations from their historical and current websites.<sup>2</sup> Similarly, as findings about the role of customers began to emerge, we followed up with the directors of each of the six organizations by phone and e-mail to inquire further about this issue and to request clarifications and additional information. The data collection process during the systematization stage generated approximately 400 pages of text.

### Data Analysis

We conducted our data analysis in the iterative fashion that characterizes the developing of inductive theory, traveling back and forth between the primary and secondary data discussed above, emerging observations, and existing literature (Locke 2001). Using analytical techniques for qualitative content analysis (Miles and Huberman 1994), we analyzed the data collected in the familiarization and systematization stages. The first rounds of the analyses of the two data sets were completed approximately a year apart; however, all available data were revisited in the iterative analytical process described below.

Given our focus on the ostensive patterns of the routines, we performed both “first-order analysis” to capture actors’ understandings in the terms in which they thought about the research problem at hand and “second-order analysis” to move the findings to a theoretical level (Gioia and Chittipeddi 1991). The first-order analysis enabled us to capture actors’ understandings in the terms that are meaningful to them; through the second-order analysis, we developed the theoretical concepts and relationships that underlie the first-order findings (Gioia and Chittipeddi 1991). For clarity, we describe this iterative process in terms of the following four major steps.

*Step 1.* Broad thematic analysis of the data collected in the familiarization stage was performed to develop industry-specific understanding of core routines and their components. These analyses provided information about the type of routines and technologies employed in waste collection, as well as the role of routinization in this setting. The observations from these analyses guided the subsequent steps of our investigation by enabling us to identify the appropriate routine for our study (see Howard-Grenville 2005 for a related discussion), the sampling criteria, and the relevant prompts for a detailed routine-specific interview guide.

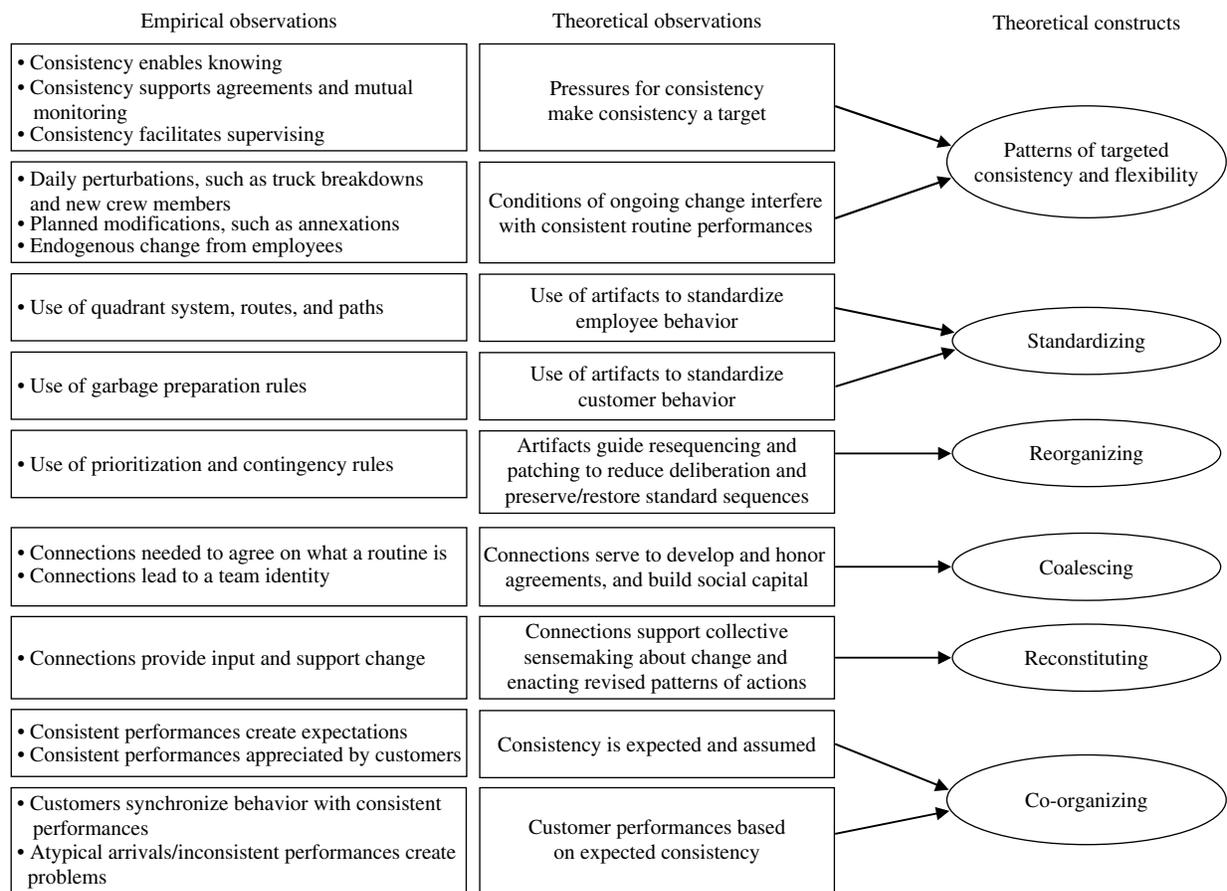
*Step 2.* We began the analysis of the interviews—and the related archival and observational data—collected in the systematization stage by breaking up the data into relevant “text segments” (Greenwood et al. 2002,

p. 66), which were the specific descriptions of routine performances—both characterized as “typical” and as affected by various types of changes. We coded these descriptions using a simple descriptive phrase or term used by informants (Locke 2001, p. 65). Following multiple rereadings of the interviews, we gradually combined codes that varied in specific terms but were similar in essence. To illustrate, a statement by a field employee—“*If you got a new guy on garbage, you just are going to be behind...you are going to have call-ins about 2–3 missed houses. You can’t watch a man all the time. That slows you down, you gotta go back, and it’s just aggravating*”—was coded as “new crew member” (later grouped in the more abstract code “perturbations”), “fall behind” (subsequently grouped in the more abstract codes of “late/atypical timing” and “atypical/inconsistent performance”), “missed houses” (later grouped in “missed collections” and “atypical/inconsistent performance”), and “watching a crew member’s work” (subsequently grouped in “monitoring”). Through this process we also compared and contrasted observations across informants in different roles within each organization. We repeated this process in the next step, where we compared observations across organizations. To increase reliability, these analyses were conducted independently by both researchers, and discrepancies were resolved through discussion and were used for further “querying of the data” in the next round of coding (Strauss 1987, p. 138). The archival sources were used to corroborate informants’ statements about organizational practices and provide additional details, where relevant.<sup>3</sup>

*Step 3.* We then repeated the comparison process described in Step 2 in conducting “between-case” analysis, whereby we compared the observations across the six focal organizations looking for differences in patterns for organizations of different sizes and process technologies. This comparison process generated 360 pages of formal analytical displays, tables, and charts. Contrary to our initial expectations, the between-case analyses revealed few, rather predictable differences across the organizations. For example, informants in organizations using manual process technology reported more within-crew coordination effects, as they used larger crews.

*Step 4.* We next extracted the theoretically explanatory dimensions from the data and first-order findings, traveling back and forth between our data, emerging insights, and existing theory (Eisenhardt 1989, Gioia and Chittipeddi 1991). We integrated these insights into an overall conceptual framework that explains how the ostensive patterns of participants with different roles and with different levels of connectedness interact. Figure 1 presents the structuring of the data from the first-order categories used by the informants to the second-order theoretical observations and constructs that we extracted from them, providing an overall representation of the

Figure 1 Data Structure



observations and relationships reflected in the emergent theoretical framework. As the constructs and relationships that emerged from the data were observed across organizations varying in size and process technology, our theoretical framework is robust to organizational variation along these dimensions.

Consistent with the methods of inductive inquiry, we checked the validity of our emerging insights with key informants by contacting several directors and requesting subsequent clarifications, elaborations, and reactions to our emerging ideas. We also presented the theoretical framework at a number of research conferences and forums, allowing us to incorporate questions and suggestions in both data analysis and theory development. The theoretical framework underwent several major revisions in this process.

### Findings: What Does It Take to Collect Garbage?

In this section, as recommended by Eisenhardt and Graebner (2007), we present together our first- and second-order findings containing our observations and the theoretical insights derived from them.

#### The Solid Waste Collection Routine

The solid waste collection routines in the six organizations we studied were quite similar in overall

design, encompassing four basic steps: (1) employees arrive at the organizational facility (i.e., administrative office and “equipment yard”) in the morning; (2) formal or informal organizing meetings are held among managers—supervisors and/or directors, depending on the organization—and field employees; (3) crews of field employees depart to prespecified route locations (more on that below) and provide waste collection service for the customer households on their routes; and (4) crews return to the organizational facility and report out with the administrative office. Within the third step (provision of waste collection service), crews proceed from the equipment yard to their respective routes in waste collection trucks; once on the route, they drive by each customer residence and empty the waste containers preprepared by the customers.<sup>4</sup> Crews collect waste daily and provide service repeatedly, servicing the same routes weekly or biweekly.<sup>5</sup> While servicing these routes, waste collection crews visit a disposal facility (i.e., a landfill or a transfer station) one to three times a day to empty their trucks, as they “load out” with waste materials. A field employee at Centre City summarized the waste collection routine in his description of “a good day” as follows: “When I wake up in the morning and come to work and have the proper equipment and have the proper men, then I can go out on the route and do my job. And have a good

environment, and get along with everyone, and then come back in and report to my supervisor, then go home.”

While collecting garbage and recyclable materials, field employees interact with one another and their supervisors to varying degrees, including communications about the focal task, unexpected incidents like accidents or truck breakdowns, requests for and provisions of assistance, and observations of relevant customer behaviors, such as a customer putting a waste container out after the truck has passed a residence.

### Pressures for Consistency

The similarities in waste collection routines across the focal organizations reflect, in part, a common, industry-level logic of routinization. According to informants interviewed in the familiarization stage, efficiency in the industry depended on the nature of the process technology employed—automated versus manual—as well as on the *consistency of actual performances of routines*. The industry reports we examined confirmed these accounts as they compared waste collection organizations primarily on efficiency metrics, such as households served per route per crew, cost per ton of collected waste, cost per customer household, and cost per full-time equivalent employee (*NC League of Municipalities* 2001, 2003; *NC Local Government Performance Measurement Project* 2003). The view that overall organizational efficiency depends on consistent performances of the core collection routines was corroborated during the systematization stage, as informants across all hierarchical levels in all focal organizations elaborated on the benefits they derived from consistent performances of their core routines (see Table 2 for illustrative evidence).

Crew members described consistent performances as beneficial for the learning of specific tasks, such as knowing where and how to retrieve and empty containers on a route. Consistent performances enabled them to *know*—without having to think about it (see Table 2)—how specific tasks fit together into the “who, what, when and where” of the routine. According to a crew member at Centre City, “Each laborer knows where the next laborer is going... for instance, if you are going down one street and you work it the same way, then you automatically know that the truck is going to make a right turn, and one laborer may go straight. Everybody just knows where each other is at.”

In addition, consistent performances served as a basis for agreements about how the routine should be performed, enabling crew members to avoid debate and re-negotiations among themselves. A Centre City crew member explained, “I prefer to work it one way. When you are dealing with two other laborers, and they may want to work it a different way, so then you have to get together, and the three of you have to decide what is the best way of doing it.” Once agreements were established, consistent performances helped crew members monitor

each other’s work. With crew members responsible for the same set of houses (i.e., one works the right side of the street, while the other works the left side), each crew member was held accountable for his collection misses and customer complaints.

Managers similarly explained that consistent performances facilitated supervision, enabling them to track the status of crews more easily and to reallocate resources across tasks and crews. According to the director at Metropolis, “Consistency gives you a good feel. A good supervisor can pretty well look at his clock and say truck such-and-such should approximately be here.” A supervisor at Metropolis concurred: “A route supervisor, when he really learns his territory and knows it, he has a time clock in his head, so to speak—that he knows how long it will probably take to run a route.”<sup>6</sup> Consistent performances also helped managers make resource reallocations across service areas efficiently. For example, when garbage crews completed their tasks consistently by a certain time, they could be counted on to provide assistance in other service areas (e.g., yard waste, recycling). Overall, both crew members and managers viewed consistency as beneficial and something that they targeted (see Table 2 for additional evidence).

### Conditions of Ongoing Change

Although consistency was desired, ongoing and varied changes presented numerous obstacles to its accomplishment. Across organizations and hierarchical levels, our informants described a host of everyday challenges. Table 2 provides illustrative evidence regarding the different types of change that interfered with performing the routine consistently. A supervisor at Suburban summarized the long list of conditions that “cause them [crews] to deviate” as follows:

They might have mechanical breakdowns, which might force them to rethink the route. Maybe if they were having some problems with their truck, they may want to do something that’s closer to our repair facility here, you know, in case they have a problem. There might be road construction going on, they might be closing a whole area or section, where they might have to divert and go around... rarely you might get a house fire or something like that. Or after a severe act of nature such as a hurricane or tornado or severe thunderstorm, there might be some lines down, or some trees or limbs, which may cause them to deviate. ...

He also expressed a common lament: “I’d love to say ‘Yes, that next Tuesday, next Friday would be the same,’ but in this business, you just don’t know.” A Metropolis crew member echoed this sentiment: “We would like for it to happen that way [to perform the routine consistently], but most of the time it don’t [laugh], but yeah, you’d like for it to happen that way.” This notion was expressed by many informants as they pointed to changing weather and traffic patterns, employees who get sick

**Table 2 Ostensive Patterns of Consistency and Flexibility for Organizational Employees**

First-order codes and illustrative evidence	Theoretical observations (second-order codes)	Theoretical constructs/ Aggregate theoretical dimensions
<p><b>Consistency enables knowing</b></p> <p>"You always know where you are going. You already have that seed planted...you don't have to think about that part of it." (Centre City field employee)</p> <p>"By doing it the same—we do the same thing routinely—if you're on this truck and on this route, you do know this route. I mean you know where stuff is at, you know what kind of can [garbage container], you know whatever." (Middletown supervisor)</p> <p>Driving the route consistently is "the best for everybody working together, which is the crew" because "they [the crew members on the back of the truck] are familiar with it." (Suburban field employee)</p>		
<p><b>Consistency supports agreements and mutual monitoring</b></p> <p>"A lot of the guys get used to the performance of a person. When you have set your standard, and you get used to this person's standard, you know what they are going to do. You don't have to wonder what they are going to do." (Centre City field employee)</p> <p>"If things are going consistent, and everybody is working together, ain't nobody's job hard at all." (Suburban field employee)</p> <p>"When you run the same way, if you do get a complaint, you are held accountable because you know [which employee] went down which street." (Centre City field employee)</p>	<p>Pressures for consistency make consistency a target</p>	
<p><b>Consistency facilitates supervising</b></p> <p>"Our routes are set up so they run the same way each week...so we'll know where they're at about most of the time... Another thing about our crews is usually about every day, they'll finish about the same time... But what they do when they are finished is they get on the yard waste route and help them. So that makes a difference when they are able to finish, everything's clicking, moving like it should." (Middletown director)</p>		
<p><b>Perturbations</b></p> <p>"Hydraulics and things of that nature, which can really put a damper on your operations...those are high-pressure hydraulic valves and if they blow a hose or leak, they might be down for an hour or two, or maybe a couple of weeks or days." (Suburban supervisor)</p> <p>"An operator will probably know better than we would, as far as what the conditions are out there. Obviously, if there is bad weather it's going to play into the equation on how he services that route, particularly if he has a lot of inclines. Because you are talking about snow and ice...if that's the case, he's going to radio that in [to management]." (Metropolis supervisor)</p> <p>"And if you've got a new driver and you don't know which way they're going, you've got to show them every turn. So it can get really frustrating. It can delay your schedule." (Centre City field employee)</p>		<p>Patterns of targeted consistency and flexibility in coordination</p>
<p><b>Planned modifications</b></p> <p>"We go out and see what all [the annexation] consists of...get a count of how many residents...we have to redeliver cans, reorder cans and get it to them, let them have knowledge as to what day their route will be picked up on, where to place the can...you try to [adjust existing routes to meet the annexation needs]...but we're about to our max, and [an annexation] would really put us in a world of hurt." (Mercury supervisor)</p> <p>"I've got one of the fastest-growing areas, and I always have to reorganize." (Centre City supervisor)</p> <p>"If something changes, it just becomes their job, and they have to adapt to it...you have to go with the flow or go somewhere else [laugh]." (Independence supervisor)</p>	<p>Conditions of ongoing change interfere with consistent routine performances</p>	
<p><b>Endogenous change by employees</b></p> <p>"Basically they have a [prescribed path] system, but you can change that a little bit. In different neighborhoods, if it is better to pull it a different way, I'd always do that" (Middletown field employee)</p> <p>"If I'm running my route the same way every day, completely every day and I'm seeing the same thing, I might change myself up...if I want to change it up one day and work it a different way, I will. If it works out fine for me, I'll do that." (Metropolis field employee)</p> <p>"Once he learns [the route], though, he'll do some changes to it...whatever is easy for him, because lot of times, you know, on paper is a whole lot different than out there actually doing it." (Middletown supervisor)</p>		

or quit, and equipment that breaks down as factors that interfered with consistent performances. Some of them, such as hydraulic-line ruptures and sick employees, are examples of short-term “perturbations” (Cohen 2007), whereas others, such as route reorganizations and equipment upgrades, are examples of larger planned modifications (see Table 2 for examples).

Informants explained that such perturbations and modifications required crews to proceed at a slower pace, figuring out how to complete the task on a new terrain or under difficult weather conditions. These changes prevented them from performing the standard, agreed-upon, and learned sequences. As a result, they deviated from the typical arrival times to customer households (an important issue discussed later) and took longer to complete the overall routine. Managers also noted that such changes required additional time and attention from them, because they needed to reevaluate the task completion process and the resources needed. The supervisor at Metropolis explained, “If you’ve got two men out on vacation and two people call in sick, you don’t have enough people to cover the routes...so [you have] to figure out where do I start...leave the two middle routes sitting, pull [employees] off another route...” Similarly, a Centre City supervisor explained that annexations lead him to “adjust all [of his] routes...as well as go around to some of the other neighboring supervisors that are right near me...we try to distribute it around, shuffle, reorganize it, get everybody’s routes kind of maxed out. Then after they get maxed out, we may have to set up another route.”

Even in the absence of external change in the conditions, routine performances varied. Crew members from several organizations reported that they changed how they performed the routine when they saw opportunities to do it better. As a Mercury field employee told us, “If I could think of a way, a better way of doing it while I’m out there... Say I’m going down this street and I say—well, if I take a left here and I can come around here—you know, you can change it”; similarly, a field employee at Metropolis reported, “Once you learn the area you’re working in, like I say, you can basically change it around and work it a different way. And maybe get through a little earlier.” In sum, employees in all organizations across all hierarchical levels described how ongoing and varied changes affected their performances of the routine.

Taken together, these observations suggest that organizational members developed ostensive patterns that reflected the need for achieving consistency and the variety of changes that interfered with this target. Routine participants also recognized the challenges created by these conflicting pressures and developed the mechanisms for managing them, discussed next.

## Use of Artifacts: Standardizing and Reorganizing

*Standardizing.* Given an industry logic emphasizing efficiency, waste collection organizations used a variety of artifacts to standardize the performance of waste collection tasks. March and Simon (1958, p. 181) define standardization broadly as “reducing [an] infinite number of things...to a moderate number of well-defined varieties.” Routines research has shown that artifacts, such as standard operating procedures and formal rules, formalize the design of the routine in order to standardize the activities performed (D’Adderio 2008, Leidner 1993, Stinchcombe 1990). Standardizing therefore refers to the use of artifacts in routine design to reduce the decision making of participants in the process of their performance. Table 3 provides illustrative evidence about the use of four artifacts in our setting—the quadrant system, routes, paths, and garbage preparation rules—to standardize the performances of the waste collection routine.

The “quadrant system” divides a city into four geographic regions and locates all waste collection crews in the same region on a given day. In combination with a four-day work week for crew members, it is used to standardize routine performances in terms of both space and time, as the same set of routes are performed on the same day of the week. A Mercury field employee explained, “We split the city into four sections... That’s Tuesday, Wednesday, Thursday, Friday. It doesn’t change.” Routes—components of the quadrant system—are another artifact that is used to standardize performances, as each crew is given a map that delineates the area that the crew is responsible for when collecting waste for a particular day of the week; the crew repeats the performance of the routine on a given route on a weekly basis. In the words of a field-level employee at Suburban, “We pull the same way every Tuesday, Wednesday, Thursday, and Friday. That way the crew knows...”

Three of our focal organizations also gave crews prescribed paths along which to collect waste on the route. These prescribed paths were designed using principles of heuristic routing, including maximizing the number of right turns, working the route toward the dump or transfer station, and starting in the hilly areas and working toward flatter ones. Managers used the prescribed paths to increase standardization and efficiency. As the Metropolis director explained, “The driver does not freelance when he gets out there...the whole path for the entire route is designed for each day. Here is where he starts; here is where he stops.” The Centre City director concurred: “You’ve got a beginning point, and you’ve got an end point for each route, and the drivers know them well. The laborers on the back know them well. It is a set route pretty much.” The quadrant system, the routes, and the paths are examples of key artifacts used

**Table 3 Use of Artifacts**

First-order codes and illustrative evidence	Theoretical observations (second-order codes)	Theoretical constructs/Aggregate theoretical dimensions
<p><b>Use of quadrant system</b>                      "Before [the quadrant system], we were just scattered all over town, just like a spider web effect. Now we're geographically centered in areas of town. Therefore the supervisors are more efficient; they don't have to jump all over town to do things. We know where the crews are on any given day." (Independence director)</p> <p>"If you could see the old map [before the quadrant system], which again was color coded, we had different colors in every part of the town every day. We had just trucks everywhere, which again you lose some efficiencies. If a couple routes up in the yellow section needed help, the way it is structured now [quadrant system], you've got everybody up there. So if a guy needs help, everybody is kind of nearby where they can help him. But with the prior system, if two guys up there needed help, whatever, you could have other trucks all over the place, so that would just be a pain to get to them and give 'em a hand." (Suburban director)</p>		
<p><b>Use of routes</b>                      "Like this new guy that I was telling you about that's got a new guy. He's new himself, so he'll get a piece of paper with the route drawn up on it. And he'll go from there... Yeah, the route [map] for the new guy—it is something for him to go by." (Middletown supervisor)</p> <p>"It would be the map, the map that he would start off with, to learn his routes." (Metropolis supervisor)</p>	<p>Use of artifacts to standardize employee behavior</p> <p>Use of artifacts to standardize customer behavior</p>	<p>Standardizing</p>
<p><b>Use of paths</b>                      "We rely very heavily on technology in this department. So the routes are designed with an automated routing system; basically we feed the information into the system, and it actually does a direct path route." (Metropolis director)</p> <p>"Yeah, our routes are set up so that they are run the same way each week. You know, a particular [path] that they follow." (Middletown director)</p>		
<p><b>Use of garbage preparation rules</b>                      "They [the customers] know to have their recyclables and their garbage at 7:00." (Independence field employee)</p> <p>"When we placed the carts out, we put a tag on the carts and we told them [the customers], we repeated what we had already told them [laugh]—when to put this cart out, and how to put it out. And we had little flyers made up." (Centre City director)</p>		
<p><b>Use of prioritization rules</b>                      "If I came upon an accident, I would go around it and come back to pick it up at the end of the day." (Independence field employee)</p> <p>"People and trash, god, if they don't get it picked up [laugh]. So we try to deliver [garbage] service even if we have to take away from something else, even if we have to let go of the yard waste." (Middletown supervisor)</p> <p>"Basically, what we would do then is our main focus is getting all the rotting garbage out of the way. If we have to shut down a yard waste service, that can wait and be caught up later. But it is our garbage that we mainly want to get out of here." (Mercury director)</p>	<p>Artifacts enable discretion while preserving standard sequences</p>	
<p><b>Use of contingency rules</b>                      "[If a truck breakdown occurs], we have spares, and we have had our spare to go down along with the regular truck. What we would do there is use a spare rear-loader, a semiautomated process, and pull crews from another function." (Mercury director)</p> <p>"If it is a quick fix, I bring it in, get it fixed, and take off. But if it ain't, I just get another truck and take off." (Mercury field employee)</p> <p>"Just like if we've got spare people. We've got to have extra people to take up for vacation time, sick leave time. If no one is on vacation, if everybody is here for the week, the whole division is here, we'll run a spare truck to pick up the slack on garbage or heavy areas." (Independence supervisor)</p> <p>"If a truck breaks down, say get an hour or two-hour breakdown, we'll pull other crews in and help get 'em... if we don't have a spare [truck] available." (Independence director)</p>	<p>Artifacts guide patching to reduce deliberation and restore standard sequences quickly</p>	<p>Reorganizing</p>

to support and enhance consistent crew performances of the routine.

In addition, the routes defined the customer households that were served on a given day. A route typically includes 800–900 customer households, who are required to have their waste containers in the right place by a certain time. The focal organizations sought to routinize the activities of customers through a set of service-provision rules. Although these rules varied in specificity across organizations, they generally addressed what constitutes acceptable garbage or recyclable materials for collection (e.g., animal or vegetable foodstuffs, newspapers), how the waste materials and containers were to be prepared (e.g., garbage cart handle facing the residence with bagged trash inside the cart, bottles for recycling rinsed with caps removed), and where the waste containers were to be placed (e.g., garbage carts placed at the curb and at least three feet from obstructions such as utility poles). The rules also specified when the waste container was to be placed outside (e.g., no later than 7 A.M. on the specified day). These rules, or “item preparation guidelines,” were displayed on the websites for all six organizations.

The rules defining how customers should perform their roles exemplify artifact use to standardize customer behavior. This observation is consistent with Leidner’s (1993) studies in fast food and insurance settings and Nicolini’s (2011) study in the field of telemedicine, showing that organizations use a variety of means for standardizing service-recipients’ actions. Leidner (1993, pp. 31–32) notes that “the conditions of stability and predictability necessary for routinization are not entirely independent of an organization’s activities” and that artifacts are commonly used as a means for “channeling customers’ behavior into patterns that are convenient for the organization.” As reported later, we observe similar to Leidner that workers and management shared an interest in controlling customer behavior. The use of artifacts to standardize customer behavior may then facilitate the pursuit of consistency by increasing employee–management cooperation. To summarize, consistent with prior research, we observed that organizations relied on artifacts to standardize the behaviors of both employees and customers.

*Reorganizing Under Conditions of Change.* In addition to the above-mentioned commonly recognized use of artifacts, all of our organizations also used artifacts to generate efficient responses to change (Adler et al. 1999). Specifically, we observed the use of two types of rules that we term “prioritization rules” and “contingency rules.” These rules were used to structure the range of responses to recurring changes, such as truck breakdowns or employee absences. Although not always formalized as standard operating procedures, these rules operated as fairly explicit, collectively understood guidelines. By operating as general guidelines

rather than specifications of exact procedures, these rules both invited mindful consideration of the changing circumstances and enabled the preservation of some degree of automaticity in employees’ responses to events that may otherwise require considerable deliberation.

Prioritization rules guided employee performance of routines under conditions of change toward resequencing and reorganizing the routine so that portions of the typical sequence were preserved while necessary adaptations to accommodate the change were made. For example, at Independence, when waste collections had been missed, a prioritization rule said that employees append the missed sites either to the beginning or to the end of the typical sequence for collecting waste. According to our informants, this approach enabled them to isolate the missed collection work and preserve as much of the standard sequence of the routine as they could. A crew member explained, “I would do it [a missed collection] at the end of the day. This way it won’t change my thinking—you know, I say, okay, I got this section, this section. . . . Now when I’m finished, I made my little note to go in and get the . . . streets that you missed.” Crew members at Suburban similarly discussed the significant time costs incurred from interruptions of the standard sequence and the reorganizing process used to recombine portions of standard sequences, while devising responses to changing conditions.

Another prioritization rule through which the action sequences were reorganized under conditions of change was that garbage was the number one collection priority. Based on this rule, when a garbage collection crew fell behind on a task or was short-staffed, spare resources were reallocated to that task. According to a Mercury supervisor, “I may pull another truck that is on wood waste or something like that and put it on garbage to help them finish . . . ’cause garbage is a whole lot more important than wood waste.” Similarly, at Mercury, when crew members failed to show up for work, supervisors tapped into a reserve pool of spare employees based on this rule; when crew members were out and spare employees were not available, they reached out to the cross-trained staff accordingly. The “garbage is the first priority” rule therefore helped managers reorganize disrupted routines in ways that reduced deliberation about the appropriate course of action while enabling them to exercise discretion about the specific actions needed under the specific circumstances.

Reorganizing also involved contingency rules. At Mercury, for example, all informants described a set of contingency rules that enabled employees to respond quickly in the event of a truck breakdown. These rules were as follows: (a) if the source of the breakdown is a quick fix, wait while the truck is being repaired at the city garage; (b) if the problem is more substantial, get a spare automated truck; and (c) if a spare automated truck is not available, get a spare semiautomated

truck. Contingency rules, therefore, were used to efficiently return to the typical performance sequence by spelling out the processes for changing and/or repairing the affected components. Similar to prioritization rules, contingency rules ensured some degree of automaticity by limiting deliberations among employees about “the best course of action” under conditions of change, enabling them to rapidly get the routine back on track. At the same time, they provided employees with sufficient opportunity for mindfulness in applying the rules to respond to a range of changes and to organize their actions in specific ways that took into account the specific circumstances. Importantly, these rules guided the reorganizing of routines in such ways that portions of standard sequences were preserved as much as possible, and available resources were used to patch up or replace disrupted components.

Taken together, our observations both confirm and extend extant views in routines research on the use of artifacts. Whereas past research has emphasized the use of artifacts to standardize performances (e.g., Leidner 1993), we observe how organizations use artifacts to promote both standard and flexible performances of the routine. Specifically, organizations used some artifacts to limit variation in behavior or performance; they used others to structure variation and enable efficient responses to variable circumstances. We call the first process “standardizing” and the second process “reorganizing.” The two processes supported ostensive patterns that simultaneously targeted consistency and provided the flexibility in coordination necessary to respond to change.

### The Role of Connections: Coalescing and Reconstituting

Whereas the use of artifacts for designing routines has received extensive attention in routines research, the second core mechanism we identified—the role of connections in the coalescing and reconstituting of routines—has received considerably less research attention. Feldman and Rafaeli (2002) developed the core theoretical ideas regarding the role of connections in the development of routines. They argued that by enabling transfer of information among actors, connections contribute to the development of shared understandings regarding how to perform a routine under specific conditions and regarding the appropriateness of particular actions within a broader organizational context; as a result, connections contribute both to the stability and adaptability of organizational routines. How connections affect routine performances, however, has received limited attention in subsequent research. Our analysis suggests that, like artifacts, connections play an important role in generating processes that support the simultaneous pursuit of consistency and flexibility in coordination. Table 4 presents illustrative evidence regarding both processes.

*Routine Coalescing.* Whereas artifacts were used to standardize behaviors by providing general guidelines about how to perform the routine, the connections that formed in the process of performing it enabled the development of common understandings and agreements about its performance in practice. Like the standardizing processes effected through the use of artifacts, the development of within-crew connections reduced variance in the crew’s performance as the routine coalesced through a series of explicit and implicit agreements. According to our informants, the longer a crew had been together, the more crew members’ actions coalesced into a naturally flowing action sequence. A Centre City supervisor described how in his earlier days as a field employee, substantial collective experience was required with the routine before he and his fellow crew members “finally had it that one way, and it was great. Everybody knew where everybody was at and knew where the truck was supposed to be. Just like typical I could go in and tell the supervisor, Dexter’s right there. And he is basically right there.” Consistent performances therefore were possible *only after* connections were formed, because the formation of connections was necessary for agreements to be worked out and honored.

The importance of connections for enabling consistent performances became particularly apparent when a crew member was replaced. A new crew member required a substantial increase in interactions not only *with* the new member but also *among* the rest of the crew, because the crew members had to tell the new arrival what to do, show him how to do it, and watch him closely while still performing their own tasks. According to a Centre City supervisor, interactions are required (a) to help a new crew member “learn the way of things,” which includes the task, the context, and the interactions with others; and (b) to help the crew as a unit to “learn to work as a team,” because the addition of a new person altered how crew members were connected previously.

Furthermore, informant reports indicated that with time spent together performing the routine, the connections among crew members deepened and acquired a more general quality of “getting along” and willingness to work with others as a team. A Metropolis field employee emphasized the team nature of the garbage collection work: “Like I say, with garbage, actually it’s like a team concept. You know, work as a team.” A driver at Mercury echoed this idea and identified “*communication*” and “*getting along*” as essential to consistent on-time performances. As he put it, “If they get along, you know, if the two guys on the back get along, and you get along with them, and there’s communication, and one guy is not lazy, and the other guy works his butt off, you know. . . . So you got to get along, you got to be a team out there, or it doesn’t work. It can really slow you down bad.” The latter point is underscored by a Mercury supervisor who insisted that “[e]verybody gets

**Table 4 Use of Connections**

First-order codes and illustrative evidence	Theoretical observations (second-order codes)	Theoretical constructs/ Aggregate theoretical dimensions
<p><b>Connections needed to agree on what a routine is</b></p> <p>“Well with ours, we pulled the route two or three different ways. And then whatever the guys liked, that’s the way that we would pull. ‘Cause you get a certain section that has more hills, and they’d want to pull those first while they’re fresh in the morning, instead of waiting ‘til late in the afternoon when they’re kind of drained out. August and September, you know when it’s real hot. . . . It’s no set pattern. Our supervisors don’t say, you have to pull it this way or that way. It’s up to the crew and crew leader how the route is pulled or collected.” (Suburban field employee)</p> <p>“If you have a new man on the route who doesn’t know where the can is at a certain house. He’s out looking for a can. . . the other collectors are down at another house. . . they might not want to help him as much, and you have to help him and show him the way. That makes for a long day.” (Suburban field employee)</p> <p>“The new guy you’ve got to constantly keep your eyes on him. Constantly. And then you’ve got a new driver and you don’t know which way they’re going, you’ve got to show them every turn. So it can really get frustrating. It can delay your schedule.” (Centre City supervisor)</p>	<p>Connections serve to make and honor agreements</p> <p>Connections build social capital</p>	<p>Coalescing</p>
<p><b>Connections lead to a team identity</b></p> <p>“And a lot of that is working as a team, learning to work as a team. As anything else, it takes time and consistency to learn the ways of things. . . getting your team organized and working as a team.” (Centre City supervisor)</p> <p>“In recycling, they have what they call the rat pack. It’s three crews that actually work with each other. And that works well. They won’t come in until the last crew is ready to go. . . . The other crews if they have been together long enough, then. . . they know they’ve got that comfort level, got that consistency. . . . Case in point. Just try to move somebody from a crew that they’ve been here for a while.” (Centre City director)</p> <p>“There is no need to put you and I together on a truck if we don’t get along. If we don’t get along, that route will never get completed.” (Independence supervisor)</p>	<p>Connections support collective sensemaking about change</p> <p>Connections support enacting revised action patterns</p>	<p>Reconstituting</p>
<p><b>Connections provide input and support change</b></p> <p>“Internally, we handled [the reorganization] pretty well, because I had the guys involved in it the whole time. . . as far as changing the route and what the new route was going to be. . . . So they were comfortable with the routes all along.” (Middletown director)</p> <p>“When we redid [the routes] a couple of years ago, it was me working with the garbage crews directly—those 6 guys, kind of going through and seeing what would fit for each truck and splitting up the routes. . . . Basically, work directly with the guys that are doing it, and we kind of came up with that together.” (Middletown director)</p> <p>“Basically, at 8 A.M. we have a daily assignment list that the crew supervisor does, and we sit in here—Ed, myself, and the crew supervisor—and we go over this sheet. Any modifications to our routes—such as vehicles or absences—we discuss those, and he’s got them all covered. And then if he says, so-and-so has got a problem with this, and I say well, let’s address this, and we get that employee in.” (Mercury director)</p> <p>“We have a core team of five people, and we’ll sit down and discuss what we need [in order to make the necessary changes].” (Metropolis supervisor)</p>	<p>Connections support collective sensemaking about change</p> <p>Connections support enacting revised action patterns</p>	<p>Reconstituting</p>

along well. We don’t tolerate nothing but that. You can’t, you just can’t. You can’t have one arguing here with this guy here, and get the job done.” Thus, this more general quality of “being a team” and “getting along” was seen as a resource that brought the team to a level of under-

standing that made a difference in the extent to which the crew could perform the routine consistently.

These observations corroborate prior theoretical arguments that connections are important to understanding how routines are performed (Feldman and Rafaeli 2002).

They specify two distinct processes through which connections contribute to the coalescing of routines. First, connections enable agreements about task performances through interactions and information sharing (Feldman and Rafaeli 2002). Second, connections are associated with the development of a more general quality of rapport and being a part of a team, which contributed to sustaining the high levels of coordination required to deliver consistent outcomes under conditions of ongoing change. This observation resonates with research on the effect of employee relational capital on the performance of various tasks (Blatt 2009, Kilduff and Brass 2010, Ibarra et al. 2005). According to this research, a history of interactions leads to the development of personal and emotional relationships that involve facets of trust, norms, and obligations (Nahapiet and Ghoshal 1998). Our informants similarly described how repeated interactions led to the development of social capital that provides both cognitive and social support for routine participants' efforts to pursue consistency and implement changes, as discussed next.

*Reconstituting Routines.* In contrast to the coalescing process, which captures how participants in the routine worked out agreements about the action sequences so that they made sense to the individuals involved, informants' accounts of the use of connections to respond to change point to a broader process of interaction and information exchanges. Connections across crews and hierarchical levels were used to envision action sequences and make them acceptable. We term this process "reconstituting" to highlight that the social capital afforded by shared experiences and repeated interactions facilitated the modification and acceptance of revised routines.

Several informants emphasized the importance of connections within crews and across organizational levels for maintaining service continuity during the implementation of planned changes. A crew member at Centre City highlighted how connections—across teams and organizational levels—supported responsiveness to change:

You have to have a lot of teamwork in your organization. 'Cause you already have a laborer and a driver as a team. But then when you get all these annexations coming, you look at it and you say this is going to overwhelm us. You got to call everybody together, you got to have all the crews—Look, we are going to be one big team. We have to work together. No one person can go out here and get this stuff. It's got to be teamwork.

Similarly, the director at Independence described his organization's transition to the quadrant system as follows: "...We had the assignments ready, and Robert worked with all the drivers and say, you know, well let's think about starting here, what do you think about that? Or starting here, here? They said, nah, that won't

work. And we tried to give most of the guys some areas that they were already familiar with..." Some organizations involved crew members directly in the redesign of the routines by using connections to obtain employee input about the focal routines. As a Metropolis supervisor described,

Usually, I listen to them when we have our employee meetings, and I'll talk to them about certain things that are, you know, hindering them, their performance. So they'll talk about things like—I have a lot of on-street parking in this area. I have a lot of cul-de-sacs, which means that that's going to slow you down. So we may need to make adjustments to the route, so that that route is set up to be a 8.5-, 9-hour, 10-hour route may now be a 11- and 12-hour route for the simple fact that it's all these impediments on it.

Thus, connections across levels were used to develop common understandings of needs and opportunities for change and to make modifications in the routine. This use of connections to reconstitute routines was seen as more efficient and effective than a redesign process that separated the routine design from the social context of its functioning.

Finally, connections—within crews, across hierarchical levels, and among supervisors—were also highlighted in accounts of how organizations understood and responded to perturbations. A Centre City supervisor explained,

Anything can happen. People can get sick... sometimes we may have enough personnel, right, but then things happen—people are sick, they're out for different reasons—and you are short. Then that means everybody got to come... that team concept—you may have to cross-over on this route and help. I may have to go to another supervisor that is close to my area and say—Hey look, I'm in trouble, I need some help. So he may have to send some of his people over.

In sum, these observations suggest that connections enabled not only the coalescing of routines but also their reconstituting for enacting change. Connections enabled participants to collectively make sense regarding needed changes, to support each other in modifying their performances, and to work out routine redesigns. These observations echo Leidner's (1993, p. 20) arguments that workers interpret actions, their own and others', with the "guidance and influence of their employers and their peers." To this we add that the interpretations they construct are embedded in the social fabric of the relationships they develop and alter how they relate to the organization and the routine.

### Summary of Observations about Organizational Pursuit of Consistency in the Face of Ongoing Change

Our observations about how organizational members balanced the pressures to achieve consistent performances in the face of ongoing change revealed that three

key mechanisms facilitated the balancing of these dual pressures. First, in our setting, pressures for consistency arose both from external competitive and institutional pressures and from relatively shared internal perceptions of the benefits of consistency. At the same time, change was also seen as a pervasive challenge to consistent performances. These understandings led to the development of an ostensive pattern that focused on consistency as a target, coupled with an ostensive pattern focused on its effortful accomplishment through flexibility in coordination. These observations are consistent with emerging theoretical views of consistency and change as a duality, rather than a dualism (Farjoun 2010, Pentland and Feldman 2005). When viewed as a duality, two apparently opposing aspects can be seen as mutually constitutive and jointly contributing to effectiveness, whereas when viewed dualistically, these aspects are seen as competing and mutually exclusive tendencies (Farjoun 2010). Consistent with this idea, we observed that the pursuit of consistency motivated the development of ostensive patterns of flexibility; these, in turn, generated the benefits of consistency that contributed to ostensive patterns that maintained it as a target.

Second, the interrelated processes that enabled the simultaneous pursuit of consistency and change centered on two core mechanisms—artifacts and connections. Artifacts and connections were leveraged in two sets of complementary processes. Artifacts were used for (a) standardizing routine actions, as emphasized in much of prior research, and (b) for reorganizing routines under conditions of change so that elements of standard action sequences were preserved while discretion is exercised. Similarly, through connections, routines (a) coalesced into well-understood and agreed-upon patterns of interdependent actions and (b) were reconstituted, as social capital was leveraged to arrive at new agreements about redesigned action sequences. Importantly, according to informants these mechanisms enabled them to provide a large degree of consistency in service delivery, particularly in terms of crew arrival times. Several management-level informants emphasized this fact, as exemplified by the statement of Suburban's director: "We're there every week, pretty much the same time, within that 30-minute window—we're up the street picking up that trash." This consistency, however, had some unintended consequences for customer performances of the routine, as discussed next.

### **The Unintended Consequences of Consistency: Customer Co-Organizing**

As noted earlier, all focal organizations relied on artifacts—formal rules specifying when and where customers should put their garbage out to receive service—to standardize customer behavior. However, informants across all organizations reported that customers did not necessarily follow these rules. Instead, some customers

used the *typical arrival time* of the crew—which, as described earlier, depended on consistency in routine performances—as a basis for performing their roles. A Centre City field employee explained that by driving the same way each time, crews set a pattern that customers got used to, leading them to synchronize their behavior with that of the crew and to perceive "harmony" in their working relationships. Indeed, several focal organizations reported receiving customer praise and compliments for consistent performances; a supervisor at Metropolis even believed that consistent performances generated a stock of customer goodwill from which the organization could periodically draw. Table 5 provides illustrative evidence of the effects of accomplishing consistency on customers.

As the examples in Table 5 illustrate, however, the synchronization of customer behavior with the typical performance of the routine was not something that the focal organizations either intended or desired. The director at Mercury quipped, "You will find that people sort of set their watches by the garbage collection," and the Metropolis director echoed this view: "One of the things that's always been a humor to me, there are people who I think run their whole lives based on when the garbage truck comes." A Suburban driver explained that such synchronization was a source of many problems because customers "know what time we're coming and have their garbage out... if we pull the route backwards, then the people who've been getting picked up at 1:00 are getting picked up at 7:30 in the morning, and they will not have it [their garbage] out." As a result, crew members felt considerable pressure to "drive the same way every Tuesday."

However, as previously discussed, changes in performance conditions led to the need to reorganize routine performances and/or to prolonged collections, both of which resulted in atypical arrival times. Atypical arrival times generated a slew of inquiries and complaints. According to the Mercury director, "If your timing is off by 5 or 10 minutes, the phone rings." As the evidence summarized in Table 5 indicates, both earlier-than-expected and later-than-expected arrivals were reported to create problems. Early arrivals resulted in unprepared customers. According to a supervisor at Centre City, "If you run a route a different way, then they start putting trash out behind you." Late arrivals generated inquiries and complaints, even if the service was actually provided on the day specified by the rules. The director at Suburban remarked, "You'd be surprised how often we'll get the phone call from this old lady who knows her trash gets picked up every Tuesday at 8:30, and she'll call at 11:30 and say, 'Hey, my trash isn't picked up yet.'"

Thus, although all focal organizations used artifacts in the form of detailed formal rules to standardize customer role performances, in practice, customers appear

**Table 5 The Consequences of Consistency on Customer Performances**

First-order codes and illustrative evidence	Theoretical observations (second-order codes)	Theoretical constructs/ Aggregate theoretical dimensions
<p><b>Consistent performances create expectations</b>                      "Lot of your residents get used to you working a route the same way, so they about know the time that you are coming through." (Centre City supervisor)</p> <p><b>Consistent performances appreciated by customers</b>                      "People notice that they are doing a good job [i.e., consistent arrivals]. We get a lot of compliments in here, and they are passed on to the employees." (Mercury director)</p> <p>"[Management] would call [consistent collections] good customer satisfaction." (Metropolis field employee)</p> <p>"We've [cancelled collection service for the entire week] the past two times that we've had inclement weather... [which] shows how much we've progressed as a service provider... 6, 7, 8 years ago [when service was less consistent] the citizens would have been up in arms about that." (Metropolis supervisor)</p>	Consistency becomes expected and assumed	Co-organizing
<p><b>Customers synchronize behavior with consistent performances</b>                      "Our policy is that it is supposed to be out at 7 A.M., but then some of them, you know how it is, you learn the system and you know how your guys are working. So they know that you start the beginning of the route over here—they know that they're on the end of the route, so they may put it out an hour or so later." (Centre City supervisor)</p> <p>"If you arrive on time, the customer knows you are coming, that's great. That's like a working relationship." (Middletown supervisor)</p> <p>"We're like an alarm clock for a lot of people... Even though the ordinance says it has to be out by 7 o'clock, a lot of people have become accustomed to... 'Hey honey, get out the garbage, they're coming,' and everybody rushes to get it out. But if you do it helter skelter... that throws people off, even though they know it's supposed to be out there at 7, they do the fly-by-the-seat-of-their-pants thing. So what happens then, you generate a lot more complaints... you know, they call up and say you missed me." (Suburban supervisor)</p>		
<p><b>Atypical arrivals/inconsistent performances create problems</b>                      "You do have a lot of [customers] that.. if that truck runs its route a little bit different, they want to know why that truck is not to their house at 9:30." (Metropolis field employee)</p> <p>"As a matter of fact, I got two calls yesterday. This same truck that I was telling you had a new guy on it was running about an hour behind schedule, and I had two calls because they were used to him being there at a certain time." (Middletown supervisor)</p> <p>"Then like I said, the public... if you're on that route, and you get to my house at 9:00 and when I don't see you at 9:00, maybe I get impatient and call customer service, 'My garbage is not picked up yet.' Because you are used to that garbage being picked up at 9:00." (Metropolis field employee)</p> <p>"That throws off the whole timing of the route. Because say you've got some elderly person who likes to get up maybe late, or some guy that works at night and didn't put his recycling out on time, he gets up a little late—You are starting on the wrong end of the route for him. You might have 25 complaints before you even get finished." (Centre City field employee)</p>	Customer performances based on expected consistency	

to form ostensive patterns based on the typical collection times that they experienced and came to expect. Following Weick's (1979) discussion of organizing as habit-intermeshing among actors, we refer to the synchronization of customer behaviors with the typical crew performances as "co-organizing." The term co-organizing is appropriate for describing action synchro-

nization either among individuals or among groups of actors, because customer households may perform their role either as individuals or as collectives.

Customer co-organizing appeared highly consequential for our focal organizations. First, co-organizing led to missed collections when the waste was not prepared by the time the truck arrived, resulting in inefficien-

cies because crews needed to go back and recollect waste from “mistimed” sites. Second, atypical arrivals resulted in customer complaints and dissatisfaction, even if the waste was actually collected on the day for service delivery. Customer co-organizing therefore introduced an additional source of pressure for achieving consistency for garbage collection organizations. Consistency was seen as a target not only because of its perceived benefits in learning and coordination but also because of the customer-related costs of failing to achieve it. Third, the anticipated effects of co-organizing led organizations to alter how they would make changes in their routines. For example, Metropolis timed planned changes in their routines to coincide with large changes in the environment. Its director explained, “Typically, we try to make any major changes during an annexation period . . . most people understand if it’s X amount of homes coming on, there’s going to be some adjustments.” This view was corroborated by reports in the trade press, where a top manager compared the route reorganization process to “having a root canal” and a “nightmare” as a result of the customer frustration such changes unleashed (*Waste Age* 1998).

Fourth, customer co-organizing led our focal organizations to invest considerable resources in managing customer participation in the routine under conditions of change. Three of our focal organizations implementing major changes—Centre City and Suburban (changing from manual to automated process technology) and Middletown (changing to the quadrant system)—provided us with ample examples of print- and video-based communications developed to explain how and when customers were to have their waste container ready for collection under the new system. The Centre City director emphasized, “You have to keep [customer confusion] down. I don’t allow anyone to add or change a day of service unless I approve it. That way . . . we let the customer know.” In some cases, the anticipated effects of co-organizing were actually significant enough to alter organizational plans about whether to make changes in the routine at all. For example, a long-time supervisor at Metropolis reported that his organization viewed the customer disruptions caused by reorganizations to be substantial enough that in some cases they would forgo the implementations of improvements in routine design.

In summary, a surprising observation that emerged from our study is that in contrast to crew members and other organizational members, who developed ostensive patterns that accounted for the inevitability of change, the actions of customers indicated rather specific expectations of consistency that were blind to the challenges to its accomplishment. Thus, the ostensive patterns of employees and customers were mismatched because they resulted from different experiences with the performance of the routine. Whereas for crew members consistency was an effortful accomplishment requiring

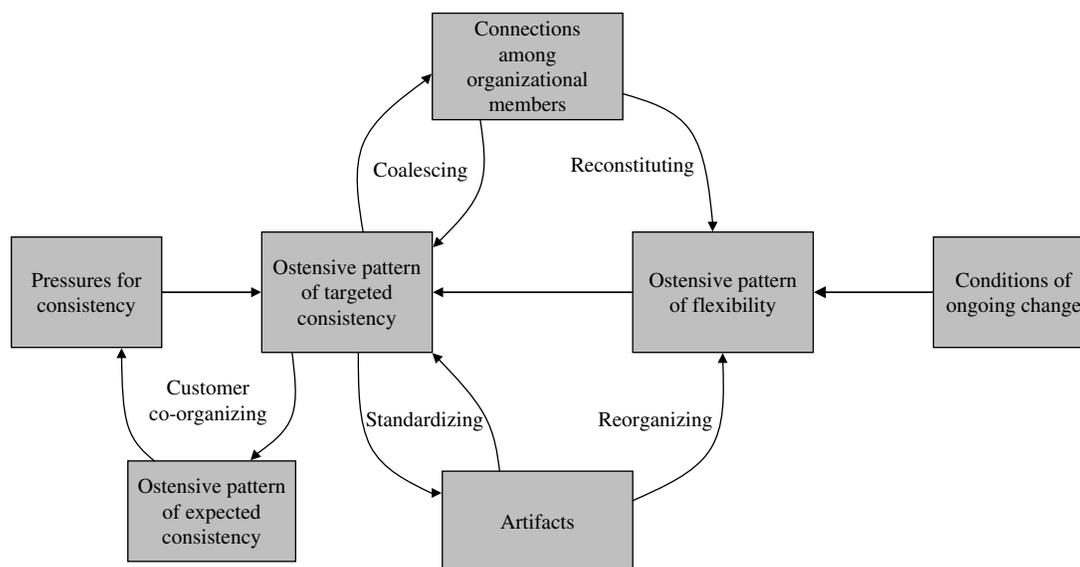
numerous microadaptations, for customers it was an expectation—one that was tightly coupled with a specific timing of service delivery. Although our analyses are not based on direct observations of specific performances by either employees or customers, they are consistent with the observations made by many others that performances create and recreate ostensive patterns (Feldman and Pentland 2005, Howard-Grenville 2005, Narduzzo et al. 2000). Our analyses add to these observations novel insights about how the multiple ostensive patterns of actors with different roles in the routine interact to generate unintended consequences.

## Discussion

Motivated by the central debates in routines theory regarding the effects of consistency and change in routine functioning, and our argument that these debates reflect what Cohen and colleagues have characterized as “the (n)ever-changing world” paradox, in this study we set out to understand the mechanisms through which participants in routines balance the dual pressures for consistency and for change. Our findings revealed some surprising observations and insights that both confirm and extend current understandings in routines research. Figure 2 represents the framework we developed from our observations.

As Figure 2 illustrates, for organizational members ostensive patterns reflect the tension between pressures for consistency and conditions of ongoing change, as well as the related processes that enable them to simultaneously pursue consistency and respond to change. In response to external and internal pressures for consistency, organizational members develop ostensive patterns of targeted consistency, relying on artifacts to standardize action sequences and connections to coalesce these sequences into well-understood and agreed-upon action flows. The same mechanisms that are used to support ostensive patterns of targeted consistency—artifacts and connections—are also central in supporting ostensive patterns of flexibility. Artifacts enable the exercise of discretion under conditions of change by providing a set of structured priorities and alternatives that guide the reorganizing of routines into combinations of modified and preserved sequences. Connections facilitate change by enabling members to leverage common understandings, shared experiences, and interpersonal rapport in reconstituting the routines. These patterns of flexibility, in turn, support ostensive patterns of targeted consistency by localizing and limiting the effects of changes in the case of reorganizing, and by leveraging the established social capital to enable revising of action sequences in reconstituting the routines. This robust system of processes sustains dual ostensive patterns that enable organizational members to simultaneously pursue consistency and enact change.

Figure 2 A Model of Balancing the Pressures for Consistency and for Change



Customers, on the other hand, although also participants in the routine, are not involved in the same processes because they have limited or no connections with organizational members. Instead, many customers simply synchronize their actions with the typical performance of the routine that they experienced, reflecting an ostensive pattern of expected consistency. Customers supplanted the organizational artifacts designed to standardize their behaviors with a co-organizing process that tightly coupled their actions with the typical routine performances of crews. This co-organizing introduced a new source of pressure for consistency for organizational members and exacerbated the challenges they faced in managing the consistency–change paradox.

These findings and insights extend extant routines theory in several areas that have been highlighted as both critical and promising for the advancement of routines research (Cohen 2007, Levinthal and Rerup 2006, Pentland and Feldman 2005): the consistency–change paradox, mindful and less-mindful aspects in routine dynamics, the multiplicity of the ostensive, and the ecology of routines.

### The Consistency–Change Paradox in Routine Functioning

Routines scholars have engaged in a considerable debate about the relative effects and importance of consistency and change in routine functioning. Less attention has been given to how routine participants balance the pressures for both achieving consistency and responding to change (Feldman and Pentland 2008). An important contribution of our study is the development of a process framework that identifies a set of processes through which organizations balance these dual pressures—a central issue not only for routines theory (Cohen 2007,

Feldman and Pentland 2008, Rerup and Feldman 2011) but also for organizational theory more broadly (Adler et al. 1999, Farjoun 2010).

To the degree that the balancing act that organizations engage in has been studied, scholars have tended to focus on the nature of organizational processes and structures that generate consistency and stability amidst changing operating conditions. For example, scholars have shown that organizations establish metaroutines to manage change in a consistent manner and that they separate the performance of standard and atypical tasks through distinct processes and structures (Adler et al. 1999, March and Simon 1958, Nelson and Winter 1982). A different body of research that has studied high-reliability organizations has similarly shown how organizations develop structures to stabilize processes under varying conditions, emphasizing the role of both organizational (Bigley and Roberts 2001) and cognitive structures (Weick and Sutcliffe 2007, Weick et al. 1999). Against this backdrop, a key insight that our study contributes is that, for organizational members, the conflicting pressures for consistency and for change are intertwined in ostensive patterns that encompass targeted consistency and flexibility for its accomplishment. In other words, rather than focusing on controlling or containing one aspect of this duality—thereby adopting a dualistic view that one impedes the other (see Farjoun 2010 for a discussion of duality versus dualism)—organizational members’ ostensive patterns reflected understandings of the consequences of consistency (or lack thereof), of the challenges to its accomplishment, and of the means available to them to pursue it while responding changes.

In terms of the means available to organizational members for managing the dual pressures for consistency and for change, our study reveals the importance

of both formal and informal mechanisms. Although consistent with classical routines theory emphasizing the use of artifacts for standardizing behavior (Cyert and March 1963), our findings also extend this theory by revealing how artifacts guide the dynamic reorganizing of routines to enable responsiveness to change. Specifically, we find that artifacts were used to handle change efficiently by suggesting appropriate courses of action while preserving discretion. Whereas past research has emphasized the standardizing effects of artifacts, we find that they may also provide means for combining mindful and less-mindful aspects of routine performances. This observation is consistent with research on design of artifacts that has argued that “robust design” can tap into preexisting understandings while facilitating the development of new ones (Hargadon and Douglas 2001, p. 488). In a similar vein, our observations suggest that artifacts can be used in the design of the routine to both standardize behaviors and preserve discretion for responding to different change conditions. Research on the effects of design of artifacts on perception, cognition, and action (Rafaeli and Vilnai-Yavetz 2004, Rindova and Petkova 2007) can provide a useful platform for future research to investigate how the artifacts employed in the design of routines affect the balancing of consistency and change demands. Future research examining how different types of artifacts are deployed in the design of routines and how different artifacts may promote consistency versus flexibility, or consistency with respect to some actions and flexibility with regard to others, could provide important insights into understanding the management of the routines paradox.

Furthermore, whereas artifacts are largely introduced by the organization and reflect the management’s view of how the routine *should* function, connections present routine participants with a bottom-up mechanism for actually forming a routine through the coalescing of participant behaviors, as well as for reconstituting it by leveraging social capital to envision and implement change. Whereas past research has theorized the importance of connections (Feldman and Rafaeli 2002), there has been little specification of their effects on the pursuit of consistency and enactment of change. Our study advances research in this area by offering two novel insights. First, we find that for organizational members, connections contribute to the development of social capital that is important in the establishment and honoring of agreements through which routines coalesce, as well as for making sense and implementing revised patterns of actions through which routines are reconstituted.

Second, we find that participants with limited or no connections—in our setting, customers—appear to develop very different ostensive patterns for engaging in the routine. The relative lack of connections appears to result in inflexible expectations of consistency and to facilitate the discarding of organizational artifacts

designed to standardize behaviors. This is an important observation because it departs from prior research that has emphasized the use of artifacts for controlling customer role performances (Leidner 1993). In contrast, we note that the design of routines may affect customer role performances not only directly—through the guiding effects of artifacts, but also indirectly—through the degree and type of connectedness with other routine participants that the design affords.

These observations suggest that future research on routines will benefit from incorporating ideas from social capital theory, which proposes that the connections present in network relationships serve not only as channels for information transfer but also provide actors with various resources more broadly (Bourdieu 1986). In particular, our findings point to the importance of studying how routines affect and are affected by the development of central facets of social capital (Kilduff and Brass 2010, Nahapiet and Ghoshal 1998)—the structural, which identifies the overall pattern of connections among actors (Burt 1992); the cognitive, which focuses on the shared representations and meanings that develop among actors (Cicourel 1973); and the relational, which focuses on the relationships of trust, reciprocity, and obligations that develop among actors based on a history of interactions (Granovetter 1992). Our findings highlight how within the organizational boundary, the structural aspect (i.e., the presence of connections) enables the development of cognitive and relational aspects (i.e., the development of shared understandings of the routine, and the establishment of rapport and team identity, respectively). By contrast, for actors outside the organizational boundary, our findings suggest that repetitive interactions in the absence of structural ties foster the development of unintended and divergent understandings. These insights on the interactions among different forms of social capital can aid in our understanding of how routines evolve and persist within and across organizational boundaries (Howard-Grenville 2005, Kotabe et al. 2003, Nicolini 2011, Pentland and Feldman 2005, Zollo et al. 2002). The insights also point to the need for future research that focuses on role performance at the interfaces of routines—where routine participants with varying degrees of connectedness engage in the routine. Boundary-spanning routines—across organizational work units or in interorganizational relationships—can provide an excellent setting for such studies.

### **Mindful and Less-Mindful Aspects of Routines**

Our findings also offer some interesting insights for understanding the interrelationship between mindful and less-mindful aspects of routines—an issue of growing importance for routines scholars (Argote and Todorova 2007, Becker 2004, Cohen et al. 1996, Salvato and Rerup 2011). Whereas the traditional perspective of routines has been associated with the idea of automaticity,

or mindlessness (i.e., “dead” routines; see Cohen 2007), and the dynamic perspective is aligned with the idea of mindfulness (i.e., “live” routines; see Pentland and Feldman 2008b), recent work has emphasized combining the two. Levinthal and Rerup (2006), in particular, emphasize the mutual constitution of mindful and less-mindful processes in a performative sense; they theorized that some degree of mindless behavior is needed for acting effectively in a mindful way and that some degree of mindfulness facilitates less-mindful behavior. They further stressed the need to examine how the two interrelate in the ostensive.

Our findings speak to this set of issues in two ways. First, we observe that organizational members desire consistency because it enables them to act with less cognitive effort, that is, less-mindfully; this desire is integral to the development of ostensive patterns of targeted consistency. Yet organizational members also recognize that mindfulness is necessary to accomplish consistency, and this mindfulness is integral to the ostensive patterns of flexibility. Moreover, these patterns are mutually constitutive because patterns of consistency generate understandings of the routine that enable employees to respond to change effectively and to develop ostensive patterns of flexibility; in turn, under conditions of change, patterns of flexibility are required for employees to achieve the consistency that they pursue. Paradoxically, the desire for consistency and less-mindful behaviors justifies the efforts required to be mindful and flexible in order to achieve it, and it is by making efforts to be consistent that actors develop capacities to respond flexibly.

The importance of this insight becomes clearer when it is compared with research on organizing for reliability. Whereas this literature emphasizes how mindfulness promotes the envisioning of multiple and varied pathways for achieving reliability (Weick et al. 1999), our informant accounts suggest that mindfulness enables employees to protect well-learned performance sequences, thereby preserving the benefits of less-mindfulness. Thus, although mindfulness is often associated with variable performances (Feldman 2000), our study highlights that actors also engage in mindful processes in order to preserve consistent, well-learned, and agreed-upon patterns of behavior that they associate with cognitive and coordinative efficiencies, i.e., with less-mindfulness.

Second, we observe mutually constitutive dynamics of mindfulness and less-mindfulness across routine participants with different roles. Specifically, we find that organizations’ accomplishing consistency leads to customer co-organizing, which raises interesting questions about the mindful versus less-mindful behaviors of non-core actors with weak or no connections with other routine participants. In our setting, customers appear to rely

on rather minimal cues—the typical crew arrival time—to alter the patterns of their participation in the routine. This observation implies that they engage in the routine in a more-mindful manner than the simple following of the organizational rule would have required. However, our informants report that customers found it very difficult to cope with even simple changes in the routines, such as change in the day of service provision, leading their organizations to further emphasize targeted consistency and to expend considerable resources and efforts in balancing the demands for mindfulness that change imposes on employees versus customers. These paradoxical observations suggest that future routines research would benefit from closer consideration of how different types of actors view and incorporate mindful and less-mindful behaviors in their performances of routines.

### **Multiplicity of the Ostensive Aspects of Routines**

Our surprising findings about the differences in processes through which organizational members and customers engaged in the routine also have important implications for research on the multiplicity of the ostensive aspects of routines. Pentland and Feldman (2005, 2008a) have emphasized the importance of studies that recognize the effects of the multiplicity of the ostensive, because, as the authors argue, multiplicity is easily overlooked, yet its understanding is critical for understanding coordination among actors. Our setting presents a clear example of the consequence of multiplicity of the ostensive for coordination: employees performing the routine in a reverse sequence—“pulling the route backwards”—see it as essentially the same pattern (just backwards), whereas customers experience it as a completely different pattern that interferes with their task performances.

This observation is consistent with prior research that has related the multiplicity of the ostensive to the development of divergent understandings by routine participants with different roles (Bigley and Roberts 2001; Feldman 2000; Feldman and Pentland 2008; Pentland and Feldman 2005, 2008a). Consistent with these ideas, we find that organizational members develop shared and mutual understandings of the routine through connections, whereas participants with limited or no connections appear to develop limited and divergent understandings because they rely on minimal cues. Furthermore, consistent with past research suggesting that prior enactments of a routine shape actor understandings and expectations about how the routine should be performed (Feldman and Pentland 2005, Howard-Grenville 2005), we also observe that “typical” performances generated expectations for consistency. Furthermore, in departure from past research, we observe that customers in our setting exhibit not only generalized expectations about how the routine should be performed (Howard-Grenville 2005) but rather specific and relatively inflexible expectations, which affected their own

performances. Although we recognize that our observations about customer patterns are based on employee accounts that may not portray customer ostensive patterns accurately, they nevertheless reflect the frustrations and challenges that routine participants experience as a result of the multiplicity of the ostensive. Therefore, we suggest that future research should focus on comparing the ostensive aspects of routines across actors with different roles and on identifying the sources of convergence and divergence of their ostensive patterns.

### The Ecology of Routines

Our findings also offer some interesting insights for understanding the functioning of ecologies of routines (Birnholtz et al. 2007). The notion of routine ecology reflects the idea that multiple routines may operate in either a complementary or a competitive fashion. Complementarity between routines exists when the presence of one routine increases the efficacy or survival of another routine; in contrast, routines are in competition when the presence of one routine heightens the risk of failure of another (Galunic and Weeks 2002). Recent research points out the importance of these relationships for routine regeneration. Birnholtz et al. (2007, p. 318) argue that when complementary relationships exist among routines, this “effective ensemble” generates actions that are recognizable in character and supports routine regeneration. By contrast, when routines compete and interfere with one another, the systemic effect is a negative one, with routines detracting from one another and impeding regeneration.

In our study, we observe that the same set of routines can simultaneously have complementary and competitive interactions. At one level, we observe complementarity among routines, as the actions for waste collection by organizational members are dependent on waste preparation actions by customers, and vice versa. At the same time, the process of co-organizing we identify suggests that complementary routines can become competitive as the relationships evolve toward tighter coupling (Coriat and Dosi 1998), and the potential for negative systemic effects arising from conditions of change increases. Whereas Birnholtz et al. (2007) indicate that significant interference between routines can lead to routine failure, we observe organizational efforts to minimize the interference experienced by customers. For instance, managers structured the timing of planned changes such as reorganizations to coincide with annexations or fiscal year changes so that broad environmental factors affect customer routines, and the interference effect of the changes in waste collection routines is minimized. These observations suggest the importance of future research on the dynamics of routine ecologies—specifically, in terms of how bundles of routines co-evolve over time as a function of interacting ostensive patterns among participants with different roles and different connections.

### Boundary Conditions

Before we conclude, we would like to note two boundary conditions for our theoretical ideas. First, waste collection is a context in which both exogenous and endogenous pressures for consistency led to explicit pursuit of consistency, including the formal design of organizational routines. In other contexts, flexibility may be a greater priority. In such contexts, if the view of consistency as a target is less shared among organizational members, then the balancing act between the pursuit of consistency and response to change may involve different processes. Therefore, we encourage future research to consider the pursuit of consistency and change in contexts where variability and change appear to dominate. We note that Farjoun (2010) makes a similar call for greater research attention to how processes of standardization enable change and innovation.

Second, waste collection service is designed as sequential task interdependence (Thompson 1967) in which one set of actors (customers) must provide their input to the process before another set of actors (employees) can act on it. In this way it is different from more directly interactive service settings, such as those studied by Leidner (1993). Our observations suggest that this is a theoretically relevant difference because the design of routines affects the nature of connections among actors in different roles. Therefore, we encourage future research to consider how routine designs around different types of task interdependence, including pooled and reciprocal types (Thompson 1967), affect the processes through which participants balance consistency and change.

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### Endnotes

<sup>1</sup>For the six selected waste collection organizations, analysis of the secondary data revealed substantially lower annual costs of waste collection for organizations using automated process technology (\$91/household) relative to those using manual technology (\$157/household) and modest differences in annual costs by organizational size: small (\$131/household), medium (\$119/household), and large (\$123/household).

<sup>2</sup>Historical sites were accessed through the “Wayback Machine,” hosted by the Internet Archive.

<sup>3</sup>For example, an informant account about the procedure for handling adverse weather was corroborated and detailed in

the strategic plan provided by one of the organizations. Informants' accounts of the use of a "garbage comes first" prioritization rule were corroborated by press releases issued to inform the public of how the organization would handle a specific adverse weather event.

<sup>4</sup>For organizations utilizing the automated process technology, customers must leave their waste container at the curb for service provision, and each route is serviced by one or two field employees using trucks that provide hydraulic assistance for dumping waste containers. For organizations that use manual process technology, the routes are serviced by crews of two to five field employees that rely on their own physical/manual efforts to put the waste into the truck, and customers may leave their waste container behind the house ("backyard service") or bring it to the curb.

<sup>5</sup>For the case organizations, the collection of garbage and recyclable materials is the dominant organizational task, although they also collect other materials for which they have dedicated crews and equipment, such as yard/wood waste (grass clippings, leaves), bulk waste and white goods (sofas, refrigerators), and even a dead animal detail.

<sup>6</sup>Our informants tended to refer to individuals as "he" or "him," reflecting the predominantly male workforce in these organizations.

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