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Generating Novelty Through Interdependent Routines: A Process Model of Routine Work

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We investigate how multiple actors accomplish interdependent routine performances directed at novel intended outcomes and how this affects routine dynamics over time. We report findings from a longitudinal ethnographic study in an automotive company where actors developed a new business model around information-based services. By analyzing episodes involving interdependent routines, we develop a process model of *routine work* and dynamics across routines. We identify three types of routine work (flexing, stretching, and inventing) that generate increasingly novel actions and outcomes. Flexed, stretched, and invented performances create emerging consequences for further actions across routines and surface differences between actors that could lead to breakdowns of routine work. Actors respond to such consequences through iterative and cascading episodes of routine work. We discuss how our findings provide new insights in efforts to create variable routine performances and the consequences of interdependence for routine dynamics.

Keywords: organizational routines; organizational processes; field study; interdependence, routine dynamics
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Introduction

Organizational routines (hereafter, simply *routines*) have long been central to understanding how work is accomplished in organizations (Cyert and March 1963, Feldman 2000, Nelson and Winter 1982, Parmigiani and Howard-Grenville 2011, Stene 1940). Empirical studies have established that routine performances may vary each time a routine is enacted (e.g., Essén 2008, Feldman 2000, Howard-Grenville 2005, Pentland and Rueter 1994). Feldman and Pentland (2003) explained that such variations in performances are effortful accomplishments that interact with ostensive patterns to create both stability and change.

Organizing typically involves multiple routines with interdependent action patterns (Dutta et al. 2003, Parmigiani and Howard-Grenville 2011). Because most studies of routine dynamics took single routines as the unit of analysis (Parmigiani and Howard-Grenville 2011, Pentland and Feldman 2005), only a few studies have investigated how interdependence affects routine dynamics. These studies reported that interdependencies constrain the variability and change of routine performances (e.g., Feldman 2000, Howard-Grenville 2005, Narduzzo et al. 2000). As Feldman (2000, p. 627) noted, "Routines may have a harder time changing if they are coupled with routines performed by people distant from the people making the changes." Furthermore, Zbaracki and Bergen (2010) observed that routines are more likely to break down when large variations are introduced in interdependent actions. Not surprisingly, actors often direct their efforts at creating consistency in performing a routine to avoid divergence that could negatively impact interdependent actions across routines (Turner and Rindova 2012).

Yet, some situations require actors to intentionally strive for novelty in the context of interdependent routines. Striving for novel outcomes is of strategic importance to organizations given competitive pressures and the need for innovation (March 1991). Because the emphasis in studies of dynamics across interdependent routines so far has been on the work involved in stabilizing routine performances, we know relatively little about the work through which actors accomplish novel outcomes through interdependent actions. Striving for novel outcomes may require divergent performances of a routine (D'Adderio 2014, Feldman 2000, Howard-Grenville 2005, Pentland and Feldman 2005, Rerup and Feldman 2011). However, research shows that intentional efforts to introduce changes in routines are at best difficult (Edmondson et al. 2001, Feldman 2003) and that working across dependencies becomes more difficult as novelty increases (Carlile 2002, 2004).

Such observations call for research on the kinds of efforts required for generating novelty through interdependent routines (see also Turner and Fern 2012).

In this research, we address the following questions: How do multiple actors accomplish interdependent actions in routine performances directed at novel outcomes? And how does this affect routine dynamics over time? To investigate these dynamics of interdependence, we adopt a relational approach. Relationality is a core aspect of a practice perspective (Feldman and Orlikowski 2011) and is particularly suited for studying interdependent phenomena in organizations (Bradbury and Lichtenstein 2000). Importantly, relationality goes beyond a focus on interpersonal relations by stressing more fundamentally how interacting phenomena are mutually constitutive (Emirbayer and Mische 1998, Feldman and Orlikowski 2011, Michel 2014, Østerlund and Carlile 2005).

We build on prior work that examined the consequences of interdependence and novelty using a relational approach (Carlile 2002, Østerlund and Carlile 2005). The presence of novelty, relative to past experiences, requires actors to identify and respond to consequences of emerging dependencies besides addressing known interdependencies (Carlile 2002, 2004; Carlile and Rebentisch 2003). Furthermore, the multiplicity of actors involved in interdependent actions yields differences in knowledge and interests among actors that affect how novelty and its consequences are experienced (Carlile 2002). Attending simultaneously to novelty, dependencies, and differences will allow us to better understand how actors generate novelty in interdependent actions.

We investigate these dynamics of interdependence in a longitudinal field study of a development program in an automotive company we call AutoCo. The company aimed to develop an information-based services layer to complement their existing product portfolio, which involved many interdependent development routines spanning multiple departments (e.g., Marketing and Sales, Product Development, Information Technology (IT), and Purchasing). Given the multiplicity of actors involved and the amount of novelty associated with the program, this case provides an excellent setting to investigate dynamics of generating novelty through interdependent routines.

By analyzing episodes involving multiple interdependent routines, we develop a process model of routine work and the dynamics of interdependence. *Routine work* refers to actors' efforts through which they direct routine performances toward their intended outcomes and respond to emerging consequences of earlier routine work. The term *routine work* signals the broader turn to studying *work* in organization and management studies (Philips and Lawrence 2012), which focuses on actors' purposeful efforts directed at their social context. Thus, *routine work* builds on a conceptualization of routines as effortful and emergent accomplishments (e.g., Feldman 2000, Pentland and Rueter 1994).

Our core contribution lies in showing how actors engage iteratively in different types of routine work to generate novel outcomes within a web of interdependent routines. We identify three types of routine work, *flexing, stretching*, and *inventing*, which confront participants with increasing novelty. This novelty creates emerging consequences that in turn require further routine work. We show that across the three types of routine work, increasingly different understandings become implicated in routine performances, which increases the potential for breakdowns of routine work. Responding to the emerging consequences and differences that surface requires iterative and cascading episodes of routine work. This paper thus illustrates the delicate maneuvering between creating divergent routine performances to realize novel intended outcomes on the one hand and realizing interdependent actions by reproducing ostensive patterns to respond to existing interdependencies on the other hand.

In the remainder of this paper, we first review the literature on routine dynamics and then explain our relational approach. We provide details about our methodological approach, the research setting, and how we developed our core theoretical categories. From our longitudinal field study, we have chosen to present two narratives that demonstrate how actors tried to realize novel outcomes through routine work, which in turn created emerging consequences for other interdependent actions, and how routine work helped responding to these emerging consequences. We then discuss how our findings contribute to our understanding of routine dynamics and provide boundary conditions of our study and suggestions for future research.

Theoretical Background

Routine Dynamics

A routine is defined as "a repetitive, recognizable pattern of interdependent actions, involving multiple actors" (Feldman and Pentland 2003, p. 96). Whereas early work on routines emphasized their role as a source of stability in the relationship between individual and organizational behavior (Cyert and March 1963, March and Simon 1958), subsequent research argued that routines evolve over time (Nelson and Winter 1982). This apparent dichotomy was resolved through empirical studies of the microprocesses underlying routines, grounded in practice theories (Feldman and Orlikowski 2011, Parmigiani and Howard-Grenville 2011).

The practice perspective is based on detailed empirical observations of variability in routine performances. The studies by Pentland and Rueter (1994) and Feldman (2000) describe the surprise of uncovering variations in performances of what would typically be conceived as stable routines. Pentland and Rueter (1994) showed great variability in how a software support team handled

customer calls; this routine was instantiated in many different sequences of action. Feldman (2000) studied annual routines in a student housing department (budgeting, hiring, training, moving students into residence halls, and closing residence halls) and found that participants made emergent changes in the performance of the routines and that many changes were retained over time. Later studies corroborated the variability in the sequences of actions that make up routines (Essén 2008, Howard-Grenville 2005, Pentland 2003, Pentland et al. 2011, Turner and Fern 2012, Turner and Rindova 2012) and changes in such sequences of action over time (Pentland et al. 2011, Salvato 2009).

Building on practice theories, Feldman and Pentland (2003) explained these observations of routine variability and change by conceptualizing routine dynamics as a recursive relation between ostensive and performative aspects. The ostensive aspects of routines refer to the general pattern of a routine as it is enacted by participants (Feldman and Pentland 2003, Pentland 2011). This pattern may differ from an espoused or documented version of the routine (D'Adderio 2008, Feldman and Pentland 2008). Ostensive aspects are distributed among participants who may understand such patterns differently and as such are not monolithic (D'Adderio 2014, Feldman and Pentland 2003, Turner and Rindova 2012). Yet some shared understanding among participants facilitates enacting the routine (Dionysiou and Tsoukas 2013, Feldman and Rafaeli 2002) and makes the routine recognizable as a pattern for action (Cohen 2007). Performative aspects refer to the routine as enacted in "specific actions, by specific people, in specific places and times" (Feldman and Pentland 2003, p. 101) and capture the central role of agency in enacting routines (Feldman 2000). Ostensive patterns emerge from the history of routine performances and may be changed when routine performances produce variation that is selectively retained (Pentland et al. 2012, Salvato 2009), but may also be stabilized when variable routine performances reinforce the general routine pattern (Turner and Rindova 2012).

Pentland and Rueter (1994) showed that each routine performance is an effortful accomplishment instead of a mindless operation. Studies have shown that such efforts may be oriented at stability as well as at change in both a responsive and proactive manner. Responsive efforts may be oriented at establishing stability when people repair routines (e.g., Tucker and Edmondson 2003) and create emergent change when they respond to outcomes of prior performances (Feldman 2000). In turn, proactive efforts may be oriented toward stability when people anticipate and adjust performances to ensure the consistency of such performances (Turner and Rindova 2012), and toward change when people imagine novel applications of the routine in the future (Howard-Grenville 2005). We propose the term *routine work* for such efforts of people to create change and stability in routines.

Our focus is on routine work and the interdependence of actions in routine dynamics. Interdependence refers to a situation in which one person's actions constitute the necessary means for other people's actions to be successfully completed (Thompson 1967), thereby generating meaningful outcomes that individuals cannot achieve alone. Such interdependence between actions can be sequential (one-way dependence) or reciprocal (bidirectional dependence). Routines are seen as repeated sequences of action to deal with interdependencies (Cohen and Bacdayan 1994). Interdependence may exist between actions within a routine, but also between actions that stretch across routines (Dutta et al. 2003). Such interdependence between routines is the foundational idea behind the conceptualization of an organization as a nexus (Nelson and Winter 1982), "collection" (Winter 2003), "bundle" (Felin and Foss 2012), or "ecology" of routines (Birnholtz et al. 2007, Galunic and Weeks 2002).

Interdependence has been primarily viewed as a constraint on the variability of routine performances. Narduzzo et al. (2000) argued that when routines are interconnected with other routines, change will be less likely because of the potential impact on those other routines. Feldman (2003) observed an instance where routine change failed because actors considered the proposed change inconsistent with the larger organizational context as exemplified in other performances. Howard-Grenville (2005) theorized that embeddedness in technological, coordination, and cultural structures reduced the probability that variations in routine performances would be retained in subsequent iterations. Exceptional routine performances were overruled by the artifacts and expectations arising from other interdependent structures in which the routine was embedded, thereby stabilizing routine performances. Turner and Rindova (2012) show how the stabilizing effect of interdependence was effortfully enacted. They studied garbage collectors who tried to routinize the interdependent activities of customers, while those customers adapted to the performances of the waste collection routine they experienced. This tight coupling reinforced the garbage collectors to strive for consistency in their performances to avoid customer complaints. Even when the garbage collectors implemented changes to routines, they anticipated the reactions of customers and sought to minimize disturbances to customer routines.

We extend these studies by focusing on proactive routine work that ignites dynamics of interdependence. Whereas Turner and Rindova (2012) observed actors who strived for consistency in the face of interdependence, we seek to understand what happens when actors strive for novelty, thereby responding to their call to investigate routine dynamics "in contexts where variability and change appear to dominate" (Turner and Rindova 2012, p. 44). Striving for novel outcomes typically generates variable routine performances that diverge from ostensive patterns (Pentland and Feldman 2005, Salvato 2009,

Turner and Fern 2012). Given the broadly shared idea that interdependence across routines limits variability and change, theoretical progress can be obtained by investigating efforts oriented at novel outcomes despite interdependence. Thus, this research aims to increase our understanding of routine work involved in deliberately striving for novel outcomes.

A Relational Approach to Routine Dynamics

To investigate the consequences of interdependence for routine dynamics, we use a practice perspective and its relational approach to conceptualizing phenomena (Feldman and Orlikowski 2011, Østerlund and Carlile 2005). A relational approach is useful for studying interdependence, because relationality is concerned with phenomena that are interdependent and mutually constitutive (Bradbury and Lichtenstein 2000). This implies that agency is not the property of atomistic individuals, but constituted in relations with other phenomena (Emirbayer 1997, Emirbayer and Mische 1998).

We draw on work that developed a relational approach to the challenges of innovation across boundaries (Carlile 2002, 2004; Carlile and Rebentisch 2003; Østerlund and Carlile 2005). Carlile (2004) identified that the dimensions novelty, dependence, and difference have to be considered simultaneously to understand the actions of actors in relation to each other and to other elements of the situation.

The first dimension is *novelty*. Novelty should always be determined relative to what an actor has done in the past, because past experiences influence what actors see and do under conditions of novelty (see Carlile 2004). Novelty generates challenges for interdependent actions since what is familiar and novel is likely to vary between actors. This makes novelty specific to a particular situation (involving specific actors in specific times and places) rather than a general condition of uncertainty or ambiguity.

The second dimension, *dependence*, concerns the consequences of actions for other actions (Carlile 2004). Following the practice-based focus on action in routines (Pentland et al. 2012), we specify interdependence as dependencies between actions, because actions have consequences for each other that actors have to identify and then respond to in particular situations (Carlile 2004). The challenge for actors under conditions of novelty is that they have to identify and respond to consequences that emerge at specific dependencies in routine performances (Carlile 2002, 2004).

The last dimension, *difference*, refers to differences in experience, understanding, and interests (Carlile 2004). Actors may have different understandings of the ostensive pattern of a routine (D'Adderio 2014, Feldman and Pentland 2003), which are shaped by how actors are embedded in their organization and their prior experiences with enacting the routine (Essén 2008, Howard-Grenville 2005). This multiplicity of the ostensive pattern means that actors may have different ideas on what constitutes an appropriate performance (Pentland and Feldman 2005, Turner and Rindova 2012). Drawing on philosophical pragmatism (James 1907), Carlile (2004) argued that difference and dependence are conceptually and empirically interrelated: if there are no dependencies between actions, any difference will prove inconsequential. But given specific dependencies, actors need to determine the consequences of their differences.

Connecting novelty, dependence, and difference strengthens the conceptualization of the impact of interdependence on routine dynamics and supports studying the work through which actors generate novelty through interdependent routines. In the absence of novelty, shared understandings about *what* to do in particular circumstances and *why* some actions are appropriate help actors perform interdependent routine actions (Feldman and Rafaeli 2002). But when novelty increases, shared understandings may fall short as differences may arise. For example, Feldman (2000, p. 622) observed that novelty resulting from changes in the hiring routine revealed differences in the ideals of the building directors and central administrators involved. Furthermore, observations of a price-setting routine showed that the novelty associated with major price changes created a lack of common interest that generated variation in routine performances and, in some cases, a breakdown of the routine altogether (Zbaracki and Bergen 2010). Such observations ask for more insight on the consequences of interdependence of routine performances as actors strive for novel outcomes and how this shapes routine dynamics over time.

Methods

Our research aims at theory elaboration (Vaughan 1992), meaning that we build on existing theoretical ideas and aim to refine their concepts, relations, and explanatory limits (Lee et al. 1999; Locke 2001, p. 113). We followed an inductive research design, starting from an interest in interdependencies between actions and the variability of routine performances. Informed by a practice lens (Feldman and Orlikowski 2011) and our relational approach, we collected detailed longitudinal data on the microactions to strive for and address novelty in routine performances by deploying ethnographic methods (Barley and Kunda 2001, Bechky 2006).

Research Setting

We were granted almost unfettered access for our ethnographic fieldwork at AutoCo, an international automotive firm that develops and manufactures vehicles and vehicle hardware. When we began our research, a group of senior managers—the heads of several subdepartments in Marketing and Sales—had just started to develop a new business model around information-based services, which they planned to integrate with the firm's existing

products. Compared to other development programs at AutoCo, this program was radically different since it aimed at developing information-based services rather than hardware products. Thus, AutoCo provided a suitable setting for studying the work involved in realizing novel outcomes through interdependent actions.

Development programs at AutoCo are organized through various interdependent routines that span numerous departments such as Marketing and Sales, Product Development, and Purchasing. The nature of this novel program required collaboration across even more departments than is normally the case in new product development. Given our interest in the dynamics of interdependence between actions across routines, we did not focus on a single routine or on predefined interdependencies only. Instead, we maintained an open perspective on which existing interdependencies became implicated and what novel dependencies would emerge over time.

Data Collection

We collected longitudinal data over 21 months. As a passive participant observer (Agar 2008, Spradley 1980), the first author followed the program in real time. In the first 14 months, she spent between one and five days per week at AutoCo; in the subsequent months, she visited AutoCo at least once a month. We took *actions* as our main empirical focus (Pentland and Feldman 2005, Pentland et al. 2012) and collected detailed observational and interview data on how actions unfolded over time (see details of collected observation and interview data in Tables A1 and A2 in the online supplement (available as supplemental material at http://dx.doi.org/10.1287/orsc.2016.1051)).

Observations. The first author observed 68 meetings in which the program content was developed through, for example, discussing strategy documents and creating presentations for AutoCo's Board of Executive Directors. These meetings formed the most important data source as they enabled us to observe the actions of the managers who worked on the program (i.e., what they did to realize the novel business model around information-based services). During these meetings, managers performed the actions associated with various development routines. After each day at AutoCo, the first author wrote extensive field notes (Emerson et al. 1995). Whenever it had been possible to record a meeting ($N = 62$), she or a research assistant transcribed parts of the conversations.

Interviews. Through formal and informal interviews, we followed up on what happened outside of meetings and how actions impacted other actions later on. The first author conducted 41 formal semistructured interviews, occasionally with a coauthor present, with the marketing and sales managers as well as with members of other departments (at least one member per department). She also informally interviewed the people she observed during meetings ($N = 57$). Since the program manager was present during most program meetings, he became a key informant who was frequently interviewed. All formal and a number of informal interviews were recorded and transcribed verbatim.

In early interviews, we asked the interviewees to explain the steps involved in development work at AutoCo to identify the core routines and gain insight in the actions involved in performing these routines. In all interviews (except for those that took place before the program had started), we asked the interviewees to describe their actions (e.g., what they had been doing to progress the program), which other actors they had engaged with, and how they perceived the actions taken. Finally, we asked them to reflect on how actions diverged from or resembled performances they had engaged in or encountered in the past.

Documents. Throughout the study, we collected an extensive set of documents (e.g., presentations, technical documents, meeting minutes, and intranet pages) containing two types: documents used in the routine performances and documents containing formal descriptions of the development routines at AutoCo. We used these documents to triangulate the interviews and observations and to deepen our understanding of the routines at AutoCo.

Data Analysis

We followed general procedures for building grounded theory (Glaser and Strauss 1967, Locke 2001) and process analysis (Langley 1999) to expand our understanding of the work involved in generating novel outcomes. By constantly comparing the empirical observations to our emergent theorizing and by drawing on existing theory, we developed and refined the theoretical categories (Gioia et al. 2013, Van Maanen 1988). The theoretical categories we developed are italicized in the five analysis steps described below. Table A3 in the online supplement provides an overview of these categories and shows exemplary empirical observations related to the two narratives we structure our findings around.

Step 1. *Identifying Development Routines at AutoCo.* In the first analysis step, we identified the routines that were enacted in the development program. Following Feldman and Pentland (2003), those action patterns that consisted of multiple actions, were performed by multiple actors, and were recurrent and recognizable as patterns were considered routines. For each identified routine, we documented the interdependencies that were typically enacted and were therefore part of the ostensive pattern.

For space concerns, we selected two focal routines that were most central to organizing development programs at AutoCo to present our analysis: the "Toll Gate" and the "Partner Selection" routines. A selection of steps, actions, and interdependencies with other actions are shown in Tables 1 and 2. These tables focus on the parts of the

Table 1 The Definition Phase in AutoCo's Toll Gate Routine

Steps	Examples of how actors enact these steps and interdependencies
1a (in parallel with 1b)	Product Planning defines customer and market requirements for realizing customer value *Actions* include interviewing customers, consulting market research reports, integrating insights in customer requirements *Example interdependencies*: Triggers performance of the Quality Function Deployment routine
1b (in parallel with 1a)	Product Planning collects internal requirements for the program at various departments (e.g., Product Development, After Sales, Purchasing) *Actions* include organizing meetings with other departments to discuss their requirements, investigate the consequences of these requirements for project costs and lead time *Example interdependencies*: Triggers performance of "specifying technical requirements" at product development (in parallel with the definition phase and is continued in the conceptualization phase)
2	Product Planning synthesizes information obtained from 1a and 1b in the Toll Gate Program *Actions* include consulting past Toll Gate Programs, integrating requirements for different departments, describing overall program targets, estimating overall program costs, creating scenarios, organizing business case review sessions with departments, including Finance
3	Product Planning and the program manager present the Toll Gate Program to the board *Actions* include reviewing the Toll Gate Program with other departments, submitting the Toll Gate Program to the board, planning the board presentation meeting *Example interdependencies*: Triggers the performance of the "executing a market scan" step in the Partner Selection routine
4. "Gate 1"	The Board of Executive Directors reviews the Toll Gate Program as part of the "Gate 1 decision" whether to continue the program *Actions* reviewing the Toll Gate Program, deciding whether to continue the program or not, notifying Product Planning and the program manager of the Gate 1 decision
Start of the conceptualization phase, leading up to "Gate 2"	

Table 2 AutoCo's Partner Selection Routine

	Steps	Examples of how actors enact these steps and interdependencies
In parallel to the definition phase in the Toll Gate routine	1	Purchasing manager defines the selection scope based on input from the (concept) Toll Gate Program *Actions* include defining criteria for evaluating partner performance, identifying team members for future partner selection meetings *Example interdependencies*: Interdependent with "specifying technical requirements" by product development
In parallel to the conceptualization phase in the Toll Gate routine	2	Purchasing manager and program manager perform a market scan *Actions* include reviewing past comparable market scans, performing desk research on potential partners, discussing the long list of suppliers with the program manager, deciding on the long list in the team
	3	Purchasing manager requests proposals from potential partners on the long list *Actions* include writing the technical requirements based on the requirements identified by Product Development, purchasing manager sends out request for proposal to potential partners *Example interdependencies*: Interdependent with "specifying technical requirements" by product development
	4	Team evaluates partner proposals *Actions* include planning partner selection meetings, determining partner scores on the criteria, performing a total costs analysis for each partner proposal, creating a short list of preferred partners
	5	Purchasing manager prepares and presents proposal to senior management *Actions* include planning workshops with partners on the short list, creating an overview of partners and their respective scores and total costs, performing and risk analysis for the program, presenting proposal to senior management *Example interdependencies*: Provides input for the Gate 2 decision

routine that feature in the narratives in the finding section. Besides observing routines that were regularly enacted at AutoCo, we also observed novel emerging action patterns (e.g., patterns that became known as the "Tree" routine and the "Joint Specification" routine).

The Toll Gate routine consists of sequences of actions that lead up to the formal approval and market introduction of new products and organizes the involvement of multiple actors from departments such as Marketing and Sales, Product Planning, and Product Development. This routine is structured in three phases: the definition, conceptualization, and engineering phases. During each phase, AutoCo members follow particular action patterns, leading up to decision milestones ("gates"). At such gates, AutoCo's Board of Executive Directors reviews progress and decides whether to continue a development

program or stop it to avoid investing in unpromising programs. The logic of this routine is that particular actions inform and therefore must precede later actions, (e.g., "defining market and customer requirements" in the definition phase must precede "proposing technical solutions" in the conceptualization phase). Actions are therefore sequentially interdependent (Thompson 1967).

Besides structuring actions in phases, the Toll Gate routine also coordinates the actions and responsibilities across different departments. The Toll Gate routine is performed in parallel with other routines in the involved departments. As such this routine is highly interdependent with other routine performances of actors from other departments. Actions in the Toll Gate routine both shape and are shaped by actions in other routines and are therefore reciprocally interdependent (Thompson 1967). As Table 1 shows, Step 1b triggers the involvement of Product Development and Purchasing, who start the action "specifying technical requirements," which, for example, forms the input for the third step in the Partner Selection routine (see Table 2).

The Partner Selection routine, the second routine that features in our narratives, is about identifying and selecting partner organizations. A typical performance of this highly structured routine consists of seven steps starting with the action "defining the selection scope" and concluding with "signing the contractual agreements." The first five steps and the associated action patterns feature in the narratives that we present our findings around and are described in detail in Table 2. Actors from the Purchasing Department are responsible for seeking and selecting partners, but they perform this routine together with actors from the Product Development Department.

The Partner Selection routine is tightly connected to the Toll Gate routine since various actions are performed in parallel and mutually inform each other. For example, after passing Gate 1 in the Toll Gate routine, Product Development starts writing a so-called "Technical Requirements Document," which is used as the input for "sending out requests for proposals to potential partners" in the Partner Selection routine (see Table 2). As such, within the sequential structure of the Toll Gate and Partner Selection routines, actions across these routines are reciprocally interdependent.

Step 2. *Identifying Episodes of Routine Performances in the AutoCo Data.* We created a timeline of the actions taken as part of the development program based upon observations and interviews, thereby creating an event sequence list (Poole et al. 2000). Furthermore, we wrote detailed narratives (Langley 1999) around the actions taken in the routine performances. In these narratives, we described which actors were involved, their intended outcomes, and what actions happened later on. We drew heavily on expressions and quotes of the actors involved from the observation and interview data (Agar 2008, Langley 1999). When analyzing these episodes of routine performances, we noticed that participants considered some routine performances as more divergent than others (Pentland and Feldman 2005) and that different participants evaluated performances differently. These narratives and emerging insights provided the foundation for the subsequent analysis steps.

Step 3. *Conceptualizing Routine Work.* By systematically contrasting the episodes of routine performances identified in Step 2, we developed an understanding of the variety of performances in the AutoCo case and how performances came about. Informed by these comparisons and the literature on routines as effortful and emergent accomplishments (e.g., Feldman 2000, Pentland and Rueter 1994), we developed the theoretical category "routine work." Routine work refers to actors' efforts to direct routine performances toward their intended outcomes and respond to the emerging consequences of earlier routine work.

We distinguished three types of routine work that involve increasing amounts of novelty: *flexing*, *stretching*, and *inventing* work. *Flexing work* means that actors adapt existing interdependent actions in a routine that all participants are familiar with. *Stretching work* refers to actors adapting actions to stretch the application of an existing routine with other participants who are unfamiliar with the routine. Finally, *inventing work* refers to actors building a new emerging action pattern without drawing on a particular existing routine. In this situation, all participants are unfamiliar with the emerging routine pattern. We analyzed the routine performances captured in Step 2 using these three types of routine work.

Step 4. *Relational Analysis of Episodes of Routine Work Over Time.* In this step, we analyzed the episodes using our relational conceptualization of interdependence by attending simultaneously to the dimensions of novelty, dependence, and difference. Episodes of routine work that led to breakdowns were used as empirical windows (Sandberg and Tsoukas 2011) to understand the consequences of routine work. By chronologically ordering related episodes of routine work and the resulting routine performances (as identified in Steps 2 and 3), we attended to the temporal connectedness of episodes over time (Pettigrew 1990). By visualizing the patterns we observed (Langley 1999), we traced what happened after participants had flexed, stretched, or invented performances. We found that the novelty associated with such performances was often consequential for other interdependent routines. By analyzing episodes of routine work over time, we noticed that breakdowns occurred when actors had different experiences of the novelty associated with their *intended outcomes* or the *emerging consequences*. To gain further insight in such *surfacing differences*, we complemented the perspectives of the managers who drove the change with the perspectives of

other people involved in episodes of routine work. By carefully examining our interview and observation data, we spelled out the *intended outcomes* and the *understandings of ostensive patterns* that different people brought to episodes of routine work as the baseline against which actors evaluated the actions taken in flexed, stretched, or invented routine performances.

Findings from the AutoCo Case

We present the analysis of our ethnographic data through two narratives that display chronologically how the consequences of interdependence shaped the unfolding routine dynamics. Given the space constraints of a journal article, we cannot provide an overview of all episodes of routine work in our data. Rather, we provide two representative narratives with episodes of routine work through which actors changed performances to realize their *novel intended outcomes*. Each narrative is followed by an analysis in which we further develop our key theoretical concepts and findings and extend these insights to the broader dynamics observed at AutoCo. In the analysis of Narrative 1, we explore how routine work brought about *emerging consequences* for further routine performances. In the second part of the analysis, we draw on both Narratives 1 and 2 to unpack the dynamics of interdependence by analyzing a sequence of routine work to address breakdowns in routine performances. We illustrate how *surfacing differences* in participants' understandings of ostensive patterns led to those breakdowns. Table A3 in the online supplement shows how the theoretical categories we developed are connected to additional empirical evidence associated with Narratives 1 and 2.

Narrative 1

Developing Information-Based Services Requires Routine Work. In April 2010, a group of managers from the Marketing and Sales Department started discussing ideas for developing a new business model around information-based services. John, the director of business development, initiated and led these discussions. He envisioned a program for collecting and analyzing real-time data from their vehicles to provide new value for their customers (e.g., increased fuel efficiency by providing drivers with real-time performance information and a reduced likelihood of component failures through real-time monitoring of vehicle parts). As an added benefit for AutoCo, these data could be used to realize various cost savings for AutoCo's internal business processes (e.g., by identifying potential vehicle problems early and thereby reducing warranty costs). However, AutoCo had never developed a business model around information-based services before. John concluded that it would be difficult to pass this novel development program through the existing Toll Gate routine, as the Toll Gate routine had no way of representing the envisioned internal cost saving benefits: the first step in the Toll Gate routine, the so-called "definition phase," was focused on customer benefits only. The definition phase consisted of actions to investigate and specify customer needs, such as the quality function deployment method. Therefore, John felt that to define this new program, they would have to take a step back and create a new approach for defining a program around "internal cost savings." After analyzing comparable business models in other industries, he came up with an idea for an approach to organize the program definition in a novel way.

Inventing the Tree Routine for Developing Information-Based Services as the Intended Outcome. That summer, John invited several other senior marketing and sales managers for a day-long meeting to try his Tree approach for defining the cost savings for AutoCo's internal business processes. Two of these other managers were Tom and Harry (the director and the senior manager of product planning), who in their roles as product planners would usually take the lead in the definition phase in the Toll Gate routine when defining a new development program. Like John, Tom and Harry became convinced that for defining internal cost savings, they could not draw upon existing action patterns. The marketing and sales managers agreed to meet on a weekly basis to further the definition of their new program. During these meetings, they began to refer to their actions as "the Tree" and, more technically, as the "Goal–Function–Data–Methods" approach.

This emergent "Tree" routine consisted of the following action pattern. The managers started by "identifying goals" (identifying which cost savings for AutoCo's business processes they could target) and "analyzing which functions" they would have to deliver as part of the program. Subsequently, they discussed which "data had to be collected" from the vehicle to realize their cost-saving goals and through which "[technical] methods they could collect these data." These iterations from "goals," to "functions," to "data," to "methods" became the core action pattern in their weekly meetings. Before each meeting, the program manager distributed printed copies of intermediate versions of the tree map (an Excel sheet), which the managers jointly evaluated. They then continued to map the goals, functions, data, and methods in new "cost saving branches" in a digital version of the tree map using a projector.

Responding to Emerging Consequences by Flexing the Toll Gate Routine. By mid-October dependencies emerged between the Tree routine and AutoCo's existing development routines. The managers felt they neared the moment to ask AutoCo's Board of Executive Directors (hereafter, "the board") to officially approve the program and sign off the resources required for further development. Harry, the senior product planner, had performed the program definition activities for many past development programs and therefore knew that the board would require

a so-called "Toll Gate Program" document as input for their "Gate 1" approval decision (see Step 4 in Table 1). He anticipated that to engage the board, they would have to invoke the Toll Gate routine and, in particular, the actions involved in "preparing a Toll Gate Program." Thus, the performance of the Toll Gate routine became dependent on the performance of the Tree routine.

The marketing and sales managers needed to respond to this emerging consequence of the invented Tree routine for the Toll Gate routine. They needed to connect John's Tree routine to the board's expectations to sign off on the Toll Gate Program, but how? Harry accomplished this by flexing the Toll Gate routine to create a bridge between "preparing a Toll Gate Program" and the action pattern for defining cost saving branches in the Tree routine. Through this flexing work, the managers adapted the existing outline of the Toll Gate Program to accommodate internal cost savings. This flexing work involved changing the structure of the business case in the Toll Gate Program (from a focus on customer value to include internal cost savings) and the kind of evidence used to support the business case (from customer research and market reports to estimated cost calculations validated by consultants). Through this flexed performance of the Toll Gate routine, the managers were able to respond to the dependence that emerged between the Toll Gate and Tree routines. Being able to use these routines in unison, they could engage in interdependent action with the board to ultimately get their approval for the program.

Responding to Further Emerging Consequences by Stretching the Toll Gate Routine. In preparing the presentation to the board, the marketing and sales managers realized they had overlooked *who* would develop the information-based services. In other development programs, AutoCo's Product Development Department was the designated group in charge of developing the program. However, to realize the information-based services (their novel intended outcome), an IT system for collecting and analyzing real-time vehicle data had to be developed, and Product Development (or any other department at AutoCo) lacked the required capabilities for that. As Harry explained, "We don't have the knowledge [for building the information-based services] in-house, not at all." To deal with these issues, the managers realized that they had to source external expertise to be able to further the development program. Yet that insight went against the sequences of action associated with the Toll Gate routine: external partners are normally only selected in the conceptualization phase, after having passed Gate 1 (see Table 2).

The need for external partners to complete the definition phase (the activities leading up to Gate 1) implied a new dependence between the performance of the Tree, the Toll Gate, and the Partner Selection routines. To deal with this dependence, John and the other marketing and sales managers estimated they needed the input of partners as part of their definition activities for the Toll Gate routine performance and started referring to their actions as "Gate 1.5." This label signaled they were already involved in activities that would normally only take place after having passed Gate 1 (see Table 2). Activities normally associated with the Partner Selection routine and the conceptualization phase in the Toll Gate routine were now stretched forward and became dependent with activities in the definition phase. As a result, the marketing and sales managers became engaged in the Partner Selection routine and performed activities that they were normally not involved in and therefore unfamiliar with. Such a change in AutoCo's established development process was highly unusual: it went against the sequential logic of the Toll Gate routine.

Analysis of Narrative 1

Intended Outcomes, Routine Work, and Novelty. The dynamics in routine performances we observed were set in motion by the novel intended outcomes that actors had in mind. The efforts of the marketing and sales managers were directed at developing an innovative business model around information-based services. They tried to realize this intended outcome by engaging in different types of routine work that involved identifying and conceiving new ideas for potential novel actions and trialing such actions.

The examples in Narrative 1 illustrate how the different types of routine work differ in terms of the relative familiarity of the actors involved (ranging from all actors familiar with the routine in flexing work, to some of the actors in stretching work, to none of the actors in inventing work). *Flexing work* involves changing existing patterns by adapting actions to accommodate novel intended outcomes. As Narrative 1 showed, in flexing work, actors only slightly adapted existing actions patterns so that these were still recognizable for the actors involved (e.g., adapting the usual outline of the Toll Gate Program and trialing ways of including "internal cost savings" to engage the board). *Stretching work* involves imagining novel usages of existing action patterns, thereby stretching the range of applications for which a routine is used and the involvement of actors who are unfamiliar with the routine. As described in Table 2, the action patterns associated with the Partner Selection routine are usually performed in parallel with the definition phase (as opposed to the conceptualization phase) in the Toll Gate routine; this implies engaging actors normally not involved in this routine (marketing and sales managers instead of product developers). *Inventing work* involves creating new ways of realizing intended outcomes through entirely novel action patterns that do not resemble any existing patterns. As Narrative 1 showed, John conceived of the initial idea for the nascent Tree routine by analyzing information-based service models in different industries. He then tried it out

in a group of managers that he saw fit for furthering the development of the information-based services. As such, the amount of novelty generated through flexed, stretched, and invented performances increases across the types.

Existing Interdependencies and Emerging Dependencies. The resulting novel actions and outcomes from routine work can affect other routine performances. Existing interdependencies with downstream actions may be affected, but also novel dependencies may emerge, which in turn may affect a range of further interdependent actions in the same routine or across routines. Since in flexing work all participants are familiar with the routine performance, it is easier for participants to anticipate how the flexed performance is interdependent with other actions than in stretching and inventing work, for which it is less clear what actions will follow. The potential for new emerging dependencies therefore increases from flexing to stretching to inventing work.

Actors' past experiences with routine performances are central in anticipating (inter)dependencies between actions. For example, recall that Harry anticipated that the board would require a "Toll Gate Program" document as input for deciding whether to continue the program. His past experiences with the Toll Gate routine made him realize the emerging dependence between the Tree and the Toll Gate routines. Up until that point, performing the Tree routine had not implicated the Toll Gate routine. Dependencies may, however, not always be anticipated; sometimes dependencies are only identified when other people become involved or as people are confronted with the consequences of novel actions and outcomes in downstream actions.

Cascading Episodes of Routine Work to Respond to Emerging Consequences. Narrative 1 showed that the novelty resulting from episodes of routine work was consequential because of the existing interdependencies and emerging dependencies between actions. For example, recall that the novel outcomes associated with the Tree routine became consequential for the Toll Gate routine. Initially, it was unclear for the marketing and sales managers how to respond to the novelty that originated from earlier routine work (i.e., how they could incorporate the novel "cost saving branches" that resulted from the Tree routine in the Toll Gate Program).

To respond to such emerging consequences of earlier routine work for both existing interdependencies and emerging dependencies, additional routine work was needed. The marketing and sales managers flexed their performance of the Toll Gate routine to accommodate their focus on cost savings in the Toll Gate Program. This flexing work generated consequences that again required further routine work (stretching the conceptualization phase forward to start involving external partners). Thus, Narrative 1 shows that routine work both generates consequences and is also a way of responding to the consequences of earlier routine work.

The episodes of routine work in the AutoCo case generated a dynamic between the different types of routine work. By shifting between different types, actors effortfully maneuvered between being oriented toward realizing novel intended outcomes and being oriented toward existing interdependencies. Inventing work is mostly oriented toward realizing novel intended outcomes: the novel action patterns are entirely directed at such novelty. On the other hand, flexing work is more oriented toward existing interdependencies by engaging actors in interdependent actions (e.g., the board). Remaining close to existing interdependencies facilitated engaging other actors in performing novel actions across routines. Recall that Harry engaged the board by delivering an output familiar to them (the Toll Gate Program).

The consequences of introducing the Tree routine spread out even further beyond what we were able to recount in Narrative 1. For example, the marketing and sales managers had to engage in further routine work with people from the After Sales Department to respond to the emerging consequences of the Tree performance for some of After Sales' existing routines (e.g., the "Failure Mode and Effects Analysis" routine that was used to analyze when and how vehicle components fail to manage warranty costs). They flexed the performance of this routine to use the Tree artifact (with its "cost saving branches") as a new outcome of the failure analysis of vehicle components and as a new input for the Tree analysis. Therefore, further routine work was required to address this emerging reciprocal dependence between the Tree and After Sales' routines, which, in turn, also generated further consequences for other routines.

These examples show that the marketing and sales managers responded to the consequences of earlier routine work by engaging in further routine work to accomplish interdependent actions over time and progress their development program. Therefore, routine work is not a one-off event, but rather consists of cascading episodes over time, involving further interdependent routines. In Narrative 2, we will further elaborate on how actors experienced routine work and emerging consequences differently and how this affected routine dynamics. Building on the emerging consequences of the Tree routine described in Narrative 1, Narrative 2 describes how the Purchasing Department and the Partner Selection routine became implicated.

Narrative 2

As outlined in Narrative 1, the marketing and sales managers had realized they needed external partners to develop the new information-based services. Although normally external partners would only become involved during the conceptualization phase in AutoCo's Toll Gate routine, the marketing and sales managers responded to this emerging consequence by creating the unorthodox

notion of a "Gate 1.5," thereby bridging the definition phase, which they still had to complete, and the external sourcing activities, which they had to embark on. Will, the program manager, anticipated that it would be challenging to work with the Purchasing Department to source external expertise at such an early stage: performing the Partner Selection process in parallel to the definition phase in the Toll Gate routine went against the common action pattern.

Responding to Emerging Consequences by Flexing the Partner Selection Routine. Will contacted the Purchasing Department to ask for their support. Hillary, a purchasing manager with significant experience in sourcing hardware components, was assigned to the program. In her long career at AutoCo, she had been involved in various front-end innovation projects. As shown in Table 2, one of the existing interdependencies between the Partner Selection routine and the Toll Gate routine is performed through the activity called "specifying technical requirements." Normally the Purchasing Department would initiate their Partner Selection routine to identify and select suitable partners once the board had signed off on the definition phase in the Toll Gate routine. As Hillary explained, "[normally] when the program definition activities are completed [after passing Gate 1], Product Development starts writing a Technical Requirements Document, and we'll use that to ask for proposals and quotes from various potential suppliers."

Not having completed the definition phase yet, Will asked an experienced product development engineer for an example of a "Technical Requirements Document." Will quickly realized that the sample documents contained more detailed technical requirements than he could possibly deliver at this stage given the novelty of the program. He followed the sample documents as much as possible, but could only provide more general and abstract requirements, which he referred to as "specifying *high-level* technical requirements." Through this flexing work (i.e., writing more high-level technical requirements compared to past performances of the Toll Gate routine and the Partner Selection routine), Will tried to respond to the consequences of their Gate 1.5 for "specifying technical requirements" earlier than usual in the Partner Selection routine. Even though Hillary realized the technical requirements were not at the level of detail she normally worked with, she agreed to send out a request for proposals to 15 potential partners.

Responding to Emerging Consequences Through More Flexing Work. After Hillary received all the proposals from potential partners, she scheduled another meeting with Will. Core activities in the Partner Selection routine are "evaluating partner proposals" and "creating a short list" (see Table 2). During the meeting, Hillary realized that their "high-level technical requirements" had yielded qualitatively different responses from the potential partners. This meant that she could not evaluate and rank the partners in the normal way: "if we want to do it right, we should also include the commercial dimension, but I don't think we can do that." Will felt that since "we have the prices" in the proposals, they had all the commercial data they needed to move forward. For Hillary, "having prices" was insufficient, since it was unclear how each partner had arrived at their prices: "I can't make sense of it; we are comparing apples and oranges." To deal with this interdependence between the "specifying technical requirements" and the "evaluating partner proposals" actions in the Partner Selection routine, Hillary and Will engaged in further flexing work by introducing an intermediate "normalization" step to compare the cost price of the different hardware components quoted by the suppliers. Will argued that they "could try to normalize the cost prices assuming each supplier would have the same configuration and estimate what it would cost." This "normalization" of information in the partner proposals proved useful for furthering the performance of the Partner Selection routine to develop a short list (Step 4 in Table 2).

Surfacing of Differences in Performing the Flexed Partner Selection Routine with Ron. After the success of this subsequent flexing work for hardware partners, Will started the performance of the Partner Selection routine for an IT partner who could deliver a system for collecting and analyzing real-time vehicle data. After Will had developed the high-level technical requirements, he asked Hillary to send them out to his list of potential partners. She told him she could not because IT purchasing fell under Ron's remit. Will was surprised that he had to work with another purchasing manager. His surprise turned to deep frustration when Ron questioned why he had developed such "high-level technical requirements" and why he had only considered three potential IT partners. For Ron, an experienced purchaser of IT commodities (e.g., laptops, software, temporary IT staff), the most important activity was to conduct a large "market scan" and then develop a preference ranking of suppliers. A "long list" of only three potential suppliers could simply "not [be] the result of a solid market scan!" As a commodity purchaser, Ron had very different past experiences compared to Hillary and he insisted that Will should go back and expand his market scan. Hillary knew all the potential hardware suppliers personally, and therefore the market scan step in the Partner Selection routine was of less importance to her compared to Ron. In meeting after meeting, Will and Ron battled over the length of the list of potential IT partners. But since no more companies could be identified who could supply a complete system for collecting and analyzing real-time vehicle data, Ron eventually accepted the long list of only three potential partners and sent out the high-level technical requirements.

Like Hillary, Will and Ron struggled to evaluate and compare the proposals they received. Will and Ron

discussed how to score the proposals and then compared the scores to arrive at a short list. Unsurprisingly, the high-level requirements yielded incomparable outcomes as they did for Hillary. However, Will realized that what they were looking for was not just an IT commodity supplier, but a partner with the capability to develop the complete IT system needed for realizing the novel business model around information-based services. Will realized that Ron's commodity approach was incompatible with such a capability approach. When Will updated his fellow marketing and sales managers on the difficulties he experienced in performing the Partner Selection routine, the managers began to realize that they would need a new approach to address this breakdown of the performance of the Partner Selection routine.

Responding to Surfacing Differences by Stretching the Quality Function Deployment Routine to Determine Partner Capabilities. Harry (the product planner from Narrative 1) thought of another way to evaluate the IT partners' proposals by using a routine familiar to him: the Quality Function Deployment (QFD) routine. This routine is normally used by product planners during the definition phase in the Toll Gate routine to unpack market and customer requirements. Now, the managers tried applying this routine to unpack the IT capabilities (for example, analytics and real-time data processing technologies) by going through their high-level technical specifications of the IT system. The managers were using the QFD routine for a different purpose than they usually would (determining and evaluating partner capabilities rather than customer requirements), and thus stretched its application to a novel intended outcome. Only the product planners were familiar with this routine, the other marketing and sales managers were not. This stretching work involved developing an Excel format in which they evaluated the different criteria and organized it according the basic tenets of the QFD routine. One manager said that they kept "asking 'how' questions" to further specify and clarify the operationalization of the partner capability they were looking for. After following this action pattern in a number of meetings, the managers felt it enabled them to operationalize and evaluate the capabilities required for developing the IT system for collecting and analyzing real-time vehicle data.

Surfacing of Differences in Performing the Stretched QFD Routine. Being convinced of the usefulness of the stretched QFD routine, the marketing and sales managers showed Ron how to use this routine for selecting a partner based on capabilities in the next partner selection meeting. Although Ron was initially willing to try the QFD approach, after evaluating the first partner using the method, he lost confidence. For Ron the main goal in the Partner Selection routine was to make the evaluation of partners transparent and objective by translating all detailed technical requirements into "total costs." In the stretched QFD approach, Ron felt they were not objectively scoring the proposals from the potential partners, and he did not see a way of determining "total costs." So the marketing and sales managers wanted to evaluate partners based on their capabilities (e.g., analytics), whereas Ron wanted to evaluate partners based on the total costs quoted for delivering the sought-after IT. Ron left the meeting concerned about using the stretched QFD approach for evaluating partners and asked his superior Lynn to join their next meeting. In that meeting, the mismatch between Ron's and the marketing and sales managers' approach led to a complete breakdown:

[Ron]: I prefer to go more into detail here—
[John]: Well, that is OK. But at the end of the day, we need to have the feeling that—
[Ron]: We at Purchasing do many large projects and we always use the [routine] with detailed criteria. I wonder how much you already know about the details here. If you just use your feelings and impressions, it is a slippery slope.
[John]: Well, I don't want to take down your [routine] or the entire Partner Selection process for that matter, but if we use your [routine], we will end up with the conclusion that we can use all the partners on the short list. Then what?
[Lynn]: Then we focus on the total costs.
[John]: No, I already told you before, I am not going to follow that approach here.
[Lynn]: Well, then I don't know what I am doing here [starting to gather his papers].
[John]: I don't know either.
[Lynn]: Goodbye then [Ron and Lynn leave the meeting].

(Meeting transcript 2011-06-24, interdepartmental decision meeting)

By stretching the QFD routine, the marketing and sales managers became even more convinced that they were searching for a partner who would contribute a complex and relatively new capability to the development process rather than a supplier of a well-specified IT commodity. Ron and Lynn from Purchasing felt differently: they were very concerned with how they could ever present such a "subjective evaluation" to the executive director of purchasing. These differences led to a complete breakdown: Purchasing no longer supported the program. Yet the requests sent out to the potential partners had sparked the interest of potential partner firms. During informal conversations with these firms, the marketing and sales managers realized that the capability they required would have to be jointly specified with one of these partners.

Responding to Surfacing Differences by Inventing the Joint Specification Approach. ITCorp (an international IT services company) was one of the potential partners that sent in a proposal. Service delivery specialists at ITCorp realized that the marketing and sales managers were not looking for a typical supplier relationship. Although

ITCorp already possessed strong analytics capabilities, they believed it would require a joint effort to tailor their capabilities to the development of the information-based services at AutoCo. They suggested a "joint specification" approach to collaboratively specify which capabilities were required for collecting and analyzing real-time vehicle data. After several joint workshops, ITCorp developed an offer in which they would take on the risks associated with the development of the program (i.e., they would make all the required upfront investments) to arrive at a "fee per vehicle per month" solution.

This proposal provided Ron and Lynn with their required "total costs" measure: they now had the technical and financial building blocks to engage their executive director of purchasing and to flex the Partnering Selection routine to establish a formal relationship between AutoCo and ITCorp. Based on the inventing work with ITCorp, the marketing and sales managers were eventually able to respond to the differences that surfaced between themselves and Ron and Lynn. Without the inventing work with ITCorp, the breakdown would have resulted in a full stop in the development of the new business model. The marketing and sales managers maneuvered around the breakdown with Purchasing by involving ITCorp to later be able to reengage Purchasing successfully and start the "developing contractual agreements" step in the Partner Selection routine.

Analysis of Narrative 2

By analyzing episodes of breakdowns, we now further explore how actors could progress their endeavor to realize novel intended outcomes in interdependent actions and when such efforts are interrupted. Recall that we discern between the types of routine work based on the familiarity of the actors involved in performing the routine work. We will show that actors' familiarity with the action patterns subject to routine work impacted how they experienced the novelty that affected further actions in the same routine or across routines.

Surfacing of Differences in Flexing Work. Both narratives show that actors often experienced the novelty associated with intended outcomes and emerging consequences differently. We highlight three flexing work episodes, which illustrate that such differences affected whether actors were able to accomplish interdependent actions. Narrative 1 describes that the invented Tree approach generated consequences for the Toll Gate routine, which were responded to by flexing work. What was not described in the narrative is that Harry and John initially estimated the routine work required to respond to these consequences differently, which resulted in a breakdown. Harry, in his role as product planner, anticipated that the board would expect them to deliver a "Toll Gate Program" as input for their decision to support and fund the program. John, based on his previous experiences with Toll Gate routine, felt Harry was only "duplicating work already done" and that the Toll Gate routine would only made them think in terms of "customer value as opposed to realizing internal cost savings." Because of these differences between their respective understandings of the ostensive patterns associated with the Toll Gate routine, the activities of the marketing and sales managers came to a halt. Further flexing work (i.e., by incorporating a way of representing internal costs savings in the existing Toll Gate Program format) enabled the managers to overcome the breakdown and engage the board to continue to support the new program.

Narrative 2 shows that Hillary and Will experienced the emerging consequences of Gate 1.5 similarly, and therefore could engage in two cascading episodes of routine work. They were both familiar with performing the Partner Selection routine and agreed that, as a result of starting this routine before having completed the definition phase, their technical requirements would be more "high-level" compared to past performances of the Partner Selection routine. Hillary, as a purchasing manager with 20-plus years of experience, had been involved in many innovation projects and estimated that the aims of this program were so radically novel that requirements could not be at the same level as she would normally work with. As a result, Hillary and Will engaged in successful flexing work (specifying "high-level technical requirements") and performed the flexed Partner Selection routine.

However, when Will tried to perform the flexed Partner Selection routine with Ron, it resulted in a breakdown. The flexing work by Hillary and Will entailed stretching work for Ron because it applied the routine for a purpose that he was unfamiliar with. As a commodity IT purchaser, Ron had very different past experiences of performing the Partner Selection routine: his understanding of the ostensive patterns was very different from Hillary's and Will's. Ron did not experience the consequences of introducing "Gate 1.5" like Hillary and Will did. The novel actions "developing high-level requirements" and "normalizing partner's proposals" were inappropriate according to Ron's understanding of the ostensive patterns: instead, he required highly "detailed technical requirements" and a solid "market scan" to carefully compare the "total costs" associated with the various partner proposals. These surfacing differences resulted in a breakdown of the routine work.

Both narratives show that interdependent actions are affected by differences in participants' understandings of ostensive patterns. Such understandings shape how actors estimate what type of routine work has to be done to generate the intended outcomes and what type of routine work could address the emerging consequences of earlier episodes of routine work. When more actors are involved, who likely have different past experiences in performing the routine and associated understandings of the ostensive patterns, it is more likely that differences surface. Such

different understandings make that participants anticipate different interdependencies between actions (recall how Harry anticipated the dependence between the Tree and the Toll Gate routines, whereas John did not). The narratives show that such differences resulted in breakdowns of routine work that were repaired in iterative episodes of routine work.

Stretching and Inventing Work Increase the Potential for Surfacing Differences. Since in stretching and inventing work only some or none of the actors involved are familiar with the routine, the actors unfamiliar with the routine are likely to draw on understandings associated with other routines to evaluate the stretched and invented performances. As such, in stretching and inventing work a potentially broader set of understandings will come into play, which increases the potential for surfacing differences and breakdowns in routine work.

As Narrative 2 shows, through their familiarity with the QFD routine, some of the marketing and sales managers expected that they could leverage this approach to determine partner capabilities. Ron, on the other hand, was unfamiliar with the QFD routine. In evaluating the stretched QFD performance, Ron drew on his understandings of the Partner Selection routine and found the QFD routine unacceptable for objectively estimating total costs. The other marketing and sales managers evaluated the stretched performance against their understanding that this routine would support determining the sought after partner capability as it would for complex market and customer needs. The surfacing of differences between Ron and the marketing and sales managers led to a significant breakdown between Marketing and Sales and Purchasing and an overall snag in the project.

Maneuvering Between Generating Novelty and Addressing Existing Interdependencies. Narratives 1 and 2 show that actors engaged in iterative and cascading episodes of routine work. Narrative 2 in particular shows that by shifting between different types of routine work, actors were able to maneuver between, on the one hand, realizing novel intended outcomes and, on the other hand, addressing existing interdependencies to engage other actors in the development of the new business model.

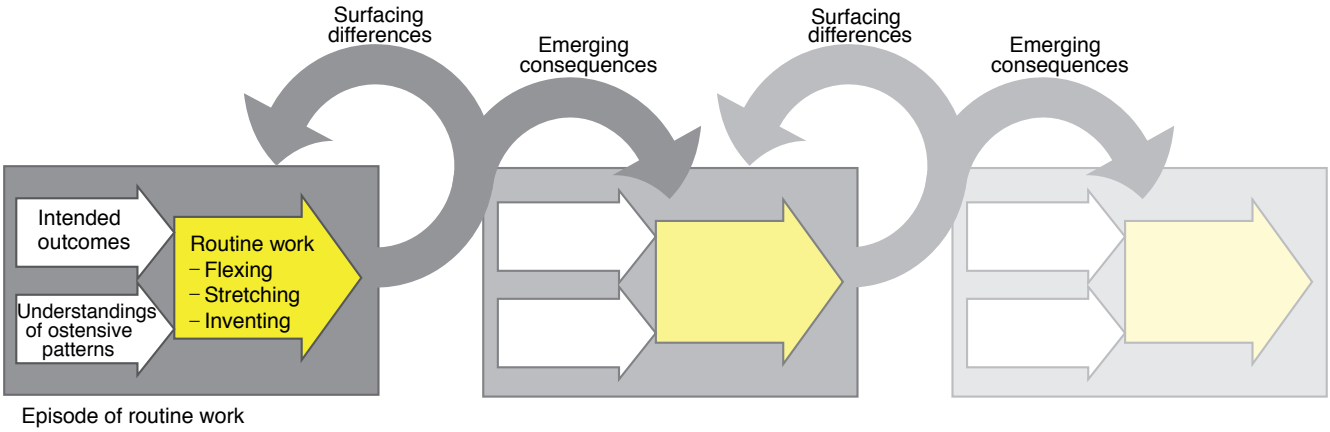
Recall how after the complete breakdown of the Partner Selection routine, the marketing and sales managers engaged in inventing work directly with ITCorp to jointly specify the required IT capability to support an information-based business model. This effort produced high-level specifications of the sought-after capability but also provided a means to calculate total cost (fee per vehicle per month). By engaging ITCorp through the invented Joint Specification routine, the marketing and sales managers created novel outcomes (i.e., high-level specs and total cost figures) that they used to successfully reengage Purchasing to establish the formal partnership between AutoCo and ITCorp. This sequence of flexing, to stretching, to eventually inventing work with ITCorp enabled the marketing and sales managers to generate novelty and then to reorient their routine work toward existing interdependencies. Even though the marketing and sales managers could pick up the work with Ron after this maneuvering through engaging in different types of routine work, the marketing and sales managers still had to respond to further consequences by flexing subsequent performances of the Partner Selection routine.

Discussion

In this paper, we set off to understand how multiple actors accomplish interdependent actions in routine performances that are directed at novel outcomes and how that affects routine dynamics over time. This question was ripe for examination since the extant literature mostly highlighted the constraining nature of interdependence, thereby leaving unaddressed how actors can realize novel outcomes and actions despite interdependence.

We integrate our overall findings in a process model (see Figure 1). First, the model illustrates that by engaging in

Figure 1 (Color online) Process Model of Routine Work



routine work, actors direct their actions at novel *intended outcomes*. The types of routine work (*flexing, stretching*, and *inventing*) are marked by increasing novelty. Second, the performances that result from routine work create *emerging consequences* for other actions across routines due to existing interdependencies and emerging (new) dependencies. These emerging consequences generate cascading episodes of routine work within or across routines (indicated by the rightward-oriented arrow). Performances can break down when significant differences surface regarding how actors experience the need for routine work and the emerging consequences associated with it due to their different past experiences with performances and corresponding *understandings of ostensive patterns*. *Surfacing differences*, potentially experienced as breakdowns, generated iterative episodes of routine work (indicated by the leftward-oriented arrow) to respond to those differences in understanding and resolve the potential breakdown. Next, we unpack how our conceptualization of routine work and the three identified types add to our understanding of routines as effortful and emergent accomplishments. Then we show how our findings add a temporal perspective to understanding interdependence in routine dynamics.

Routine Work

In this paper we have coined the term *routine work* to capture the efforts of people to create change and stability in routines. Pentland and Rueter (1994) directed attention to the efforts involved in accomplishing routine performances. Capturing these efforts in a single term helps us to further theorize different types of routine work and how these relate to routine dynamics. Prior studies showed that routine work may be oriented at stability as well as at change in both a responsive and proactive manner (e.g., Feldman 2000, Howard-Grenville 2005, Turner and Rindova 2012). Our study contributes to those findings by emphasizing the orientation of routine work not yet described in detail: proactive, change-oriented efforts by actors who intentionally try to generate novel outcomes through interdependent routines.

First, the three types of routine work that we distinguish offer a broader perspective on variability and divergence in routine dynamics. Most studies on the variability of routines focused on differences in how one or more focal routines were enacted (e.g., Essén 2008, Pentland et al. 2011, Pentland and Rueter 1994, Tucker and Edmondson 2003). This also holds for flexing work, which concerns adapting a routine that all actors involved are familiar with—nothing is surprising about the routine that is being used, only its particular instantiation. Stretching and inventing work, however, involve substantially more novelty. The routine performance is either stretched from other areas of application, so that only some of the actors involved are familiar with it, or newly invented, so that none of the actors are familiar with it. Thus, there is increasingly more novelty involved in flexing from stretching to inventing work.

This has implications for understanding the divergence of variable routine performances. Divergence has been conceived as the degree to which a performance differs from prior performances or from the ostensive pattern as understood by routine participants (Pentland and Feldman 2005, Turner and Fern 2012). The higher degree of novelty involved in stretching and inventing suggests that divergence entails more than just the distance from a specific routine pattern as enacted or understood. In stretching and inventing, some or all actors involved are unfamiliar with the particular routine and therefore have no prior experience to contrast the performance with. They may compare it against and relate it to multiple routine patterns that they are familiar with—not just different understanding of the same routine (Pentland and Feldman 2005). Thus, divergence concerns distance from multiple routines and associated understandings against which actors may evaluate a particular routine performance.

Second, our findings offer more insight in what enables routine work for divergent routine performances and when such routine work breaks down. We nuance Zbaracki and Bergen's (2010) observation that interdependent actions can proceed until performances become too divergent and therefore break down. We find that it is not the divergent performance itself that is decisive, but rather the presence or absence of shared understanding about the appropriateness of such divergent performances. The AutoCo data illustrate that when people aim to realize novel outcomes, they must reconsider *what* actions are possible and *why*. Differences in understanding *what* to do may emerge from different *why* understandings that went unnoticed or were taken for granted before. Actors who are unfamiliar with a routine may draw on different understandings and consider relations to other performances to inform *what* and *why* new actions are needed. Dionysiou and Tsoukas (2013, p. 190) argue that "participants in a routine strive to turn novelty into familiarity." When actors have different routines in mind (i.e., compare performances against ostensive patterns associated with entirely different routines), trying to reduce novelty by turning it into a familiar situation will increase the potential for surfacing differences between these actors and breakdowns of routine work.

Furthermore, our findings underscore the importance of who is involved in routine work (Parmigiani and Howard-Grenville 2011). Since *why* understandings are grounded in people's different past experiences with routine performances (Feldman and Rafaeli 2002), this may explain why some actors did not see the novelty or attempted to respond to it through flexing work, whereas other actors tried to deal with the novelty explicitly through inventing work. Narrative 2, for instance, showed that actors who had experienced different performances of the

same routine had different views of the ostensive patterns, and thus experienced the divergence of a new performance as more or less appropriate (recall how Hillary and Ron had different past experiences in performing the Partner Selection routine and how flexing work with Will led to breakdown with Ron but not with Hillary). Whether actors can proceed with routine work depends on the emergence of shared understanding between specific actors in a specific situation about what is appropriate in light of novelty.

Finally, the three levels of routine work reveal that proactive and responsive routine work should not be considered as distinct categories, but as two sides of endogenous routine dynamics. At AutoCo, routine work was initiated to generate novel outcomes, but also to respond to the emerging consequences of prior episodes of routine work and potential breakdowns. Proactive actions beget responsive actions, which beget proactive actions, which beget responsive actions. This reveals an endogenous mechanism for routine dynamics: routine work generates consequences and surfaces differences that need responding to by further routine work. Interestingly, Feldman (2000) observed another mechanism of endogenous change related to the same dynamic between proactive and responsive routine work, though starting from a responsive orientation. She distinguished between three responses to prior outcomes that may lead to emergent change in routines: repairing (when intended outcomes are not achieved or unintended outcomes emerge), expanding (when outcomes create new resources and possibilities), and striving (when actors see room for improvement as they compare the outcomes produced against their ideals). These three change responses may interact to create endogenous dynamics: when actors expand their expectations of a routine, this may trigger subsequent striving to meet those new expectations (Pentland and Feldman 2005, p. 805). Whereas these endogenous routine dynamics operate primarily in subsequent iterations of the same routine (Feldman 2000, Feldman and Pentland 2003, Pentland et al. 2012), our findings concern endogenous dynamics across routines, thereby offering a complementary mechanism.

The Temporality of Interdependence in Routine Dynamics

Whereas prior studies of routine dynamics have mostly taken routines and their parts as unit of analysis (Parmigiani and Howard-Grenville 2011, Pentland and Feldman 2005), we have broadened the scope to dynamics across routines. Although it is often acknowledged that routines are related to other routines in a "nexus" (Nelson and Winter 1982), "bundle" (Felin and Foss 2012), "collection" (Winter 2003), or "ecology" (Birnholtz et al. 2007) of interdependent routines, we have little insight in dynamics at that level beyond the stabilizing effect of interdependencies (Birnholtz et al. 2007, Turner and Rindova 2012). Whereas routine scholars have shown how interdependence constrains routine variability and change (Howard-Grenville 2005, Narduzzo et al. 2000), we find that variable performances are nonetheless possible as long as the consequences of interdependence are addressed in iterative and cascading episodes of routine work across different routines and over time. Thus, whereas concepts like "bundle" and "nexus" primarily build on spatial metaphors, we advance understanding of routine dynamics by conceptualizing the temporal trajectories across interdependent routines.

First, our findings highlight the importance of taking a temporal perspective on how interdependence affects routine dynamics. Instead of being merely constrained by interdependence, actors maneuvered between striving for novel outcomes and responding to existing interdependencies through iterative and cascading episodes of routine work. Because the development of information-based services was unlike anything else the AutoCo members had done before, they could not draw on an alternative ostensive pattern for improvement (D'Adderio 2014) or on a metaroutine for change (Adler et al. 1999) to deal with interdependence and novelty simultaneously. Flexing work emphasizes dealing with existing interdependencies because it augments known action patterns that others are familiar with, whereas stretching and inventing work enable attaining more novel outcomes. We find that when actors diverge more to strive for more novel outcomes, they have to reconnect later to existing action patterns through cascading episodes of routine work directed at other routines. This stresses the importance of studying dynamics across routines over time—not just a single routine embedded in a context.

Our findings suggest that the number of iterative and cascading episodes of routine work depend on whether actors can anticipate the consequences of novelty across interdependent routines. The AutoCo members in our study anticipated some consequences related to existing interdependencies and proactively addressed them, but did not oversee all possible consequences and, at times, were taken by surprise by the emerging consequences of their divergent performances. Interdependence is not just a starting condition that enables anticipation; dependencies also emerge from novel actions and outcomes, and actors have to identify and respond to the consequences of those dependencies to accomplish novel outcomes. This contextualizes Turner and Rindova's (2012) finding that managers anticipated the consequences of changing garbage collection routines for customers' routines to avoid disturbances. Our observation that managers were sometimes unable to foresee consequences may be caused by the higher degree of novelty involved in our study and because we studied reciprocally interdependent actions, whereas Turner and Rindova (2012) studied sequentially interdependent actions.

Second, taking a temporal view of interdependencies extends insight into routines as sources of both change and stability (e.g., Cohen 2007, Feldman and Pentland 2003, Pentland et al. 2011, Turner and Rindova 2012). Routine work is needed to generate novelty, but as change occurs, it has to be stabilized by responding to the consequences of novelty across interdependencies. For example, in both narratives, the significant effort to generate novel actions and outcomes resulted in significant change, but also breakdowns. After actors introduced changes through routine work, they had to reengage other actors (i.e., the board in Narrative 1 and Purchasing in Narrative 2) by orienting subsequent episodes of routine work toward existing interdependencies to sustain the intended changes. This also resonates with the findings by Jarzabkowski et al. (2012), who found that actors had to actively stabilize emergent routine patterns with other performances and organizational structures. Although the stabilizing tendency of routines has a strong influence on routines dynamics, we have seen how the rise of novelty and change occurs through routine work, but that it also must reengage with the stabilizing force of interdependence for that change to be realized.

This sheds further light on some of the classical arguments about the necessity of routines in providing consistency for coordinated actions (Okhuysen and Bechky 2009, Stene 1940) as well as creating predictability for individuals to address uncertainty (Cyert and March 1963, March and Simon 1958). Our empirical observations demonstrate not only how routine work generates novelty by diverting from established patterns, but also how routine work is used to reengage the necessary consistency for interdependent actions across routines. It should not be surprising that flexing work was more abundant than inventing work, because without significant stability, the introduction of novelty would not generate change across interdependent routines. So, change and stability are complementary and sequentially unfolding orientations of routine work, where temporary episodes of change are enacted in a larger context of stability.

Practical Implications

Our study has implications for people pursuing novel outcomes in organizations. As our analysis illustrates, change efforts that involve interdependent actions across routines are particularly problematic. Situations that involve high levels of novelty, where actions are dependent on each other, and where actors have different understandings are highly consequential. The development at AutoCo toward a new business model unfolded through many small steps of accomplishing routine performances through flexing, stretching, and inventing with other people. The implication of a relational approach is that the people pursuing novel outcomes must be aware that novelty is not an absolute category, but experienced differently by people. They therefore need to liaise with others and make an active effort to see their intended outcomes through the other's eyes to accommodate their intended goals as well as other actors' understandings of routines. If actors can achieve their intended outcomes by flexing or stretching work, this likely creates fewer emerging consequences and potential breakdowns than when their goals require inventing work. By comparison, the amount of novelty generated by inventing work likely exacerbates any initial difference in understandings and may surface unexpected differences, requiring further routine work. Similarly, when a routine is interdependent with many other routines, more actors become involved over time, and therefore the emerging consequences are likely to spread out further. The AutoCo case, and in particular Narrative 2, show that changing who does the routine work matters. As such, knowing the what and why of one's intended outcome can guide actors in selecting who to reach out to to encounter fewer breakdowns in routine performances.

Boundary Conditions and Suggestions for Future Research

Because our study relied on a specific case, we have identified contextual conditions (Whetten 1989) that may have emphasized certain dynamics and downplayed others. By identifying these conditions, we provide insight into the generalizability of our theorizing and potential boundary conditions that future research could investigate. First, AutoCo is an established, mature multinational company. Such organizations commonly have more standardized, formal work processes in place than less mature organizations (e.g., Rerup and Feldman 2011). With organizational age, the level of inertia is likely to increase (Hannan and Freeman 1984, Kelly and Amburgey 1991). Therefore, actors may have developed highly specific understandings of what constitute acceptable routine performances that may have exacerbated the effects of differences in actors' understandings.

Second, we only observed the first time AutoCo members used development routines to develop a novel business model around information-based services. It is unclear how performances and ostensive patterns might evolve in AutoCo's product development programs and future development of information-based services. Actors might revert to prior patterns, ostensive patterns might change altogether, or distinct patterns might emerge between which actors can switch, like D'Adderio (2014) found for switching between an alignment and an improvement pattern in the replication of production routines.

Third, the AutoCo members in our study strived to realize highly novel outcomes. Since key actors were aware of the radical nature of their endeavor, they were reflexive and strategic about their actions. These case characteristics could have increased the amount of intentional action we observed. A related point is that the AutoCo members' actions were directed at outcomes in

the future, as is typical for development programs but not for all types of routines. Therefore, the findings of our study are more likely to generalize to activities for which future orientation is a main characteristic, such as strategic planning, innovation, and product development, rather than to more operational routines. Future research should explore different orientations of routine work and emerging consequences for interdependent routine performances under varying degrees of novelty.

Supplemental Material

Supplemental material to this paper is available at http://dx.doi.org/10.1287/orsc.2016.1051.

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