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Article

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Journal of Organization Design

Provided in Cooperation with:

Organizational Design Community (ODC), Aarhus

Suggested Citation: Steinberger, Tom; Jung, Ju Yeon (2019) : Designing the microstructure of routines, Journal of Organization Design, ISSN 2245-408X, Springer, Cham, Vol. 8, Iss. 18, pp. 1-18, <https://doi.org/10.1186/s41469-019-0058-5>

This Version is available at:

<https://hdl.handle.net/10419/217478>

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RESEARCH

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Designing the microstructure of routines



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Abstract

Coordinating organizational routines is a strategic challenge in contexts ranging from healthcare to software development. Yet, we have few theories of the design of routines. This paper compares field data on routines at two Korean restaurants to theorize their design. We identified a core coordination challenge as the need for concurrency—the simultaneous coordination of diverse activities of indeterminate order. The restaurants enabled concurrency using distinct solutions for providing information to agents about their routine activities. We normatively frame these solutions as firm-level strategies for coordinating routines based on uniformity (providing information about fixed sequences of activities) or compatibility (providing information about particular performances of activities). While prior work assumes strategies for coordinating routines depend on extensive codification, our framework shows how extensive codification is specific to a uniformity strategy. We argue that the compatibility strategy characterizes how firms increasingly coordinate routines amid blurring firm boundaries and discuss implications for landscape design.

Keywords: Organizational design, Microstructure of organizing, Organizational routines, Concurrency

Routines are fundamental to a firm's capabilities (Nelson and Winter 1982; Abell et al. 2008; Salvato and Rerup 2011). Though routines can in one sense be viewed as more or less automatic behaviors that merely reflect a firm's capabilities (Cyert and March 1963), coordinating routines can itself be a capability of strategic importance. Healthcare practices depend on nurses and physicians to perform complex handoff routines (Pentland et al. 2017; Lebaron et al. 2016). Business format chains compete based on the non-trivial replication of routines across multiple units (Winter and Szulanski 2001). Software developers depend on sophisticated version control systems to engage in day-to-day routines for collaboratively writing lines of code (Rahmandad and Reppenning 2016).

Given the coordination challenges, routines would seem to hold rich implications for organizational design. Yet, with rare exceptions (Helfat and Karim 2014; Gupta et al. 2015), we have few theories regarding the design of routines. A sticking point is that theories of the design of routines need to allow for how routine activities are situated in particular contexts and performed a bit differently every time (Abell et al. 2008; Bechky and Okhuysen 2011; Feldman et al. 2016; Salvato and Rerup 2018). Traditional design solutions premised on dividing up tasks, roles or product components in advance are far from sufficient. People enact routines by performing interdependent patterns of action at particular times and places and by generatively creating shared understandings about these patterns (Pentland and Feldman 2008; Okhuysen and Bechky 2009; Obstfeld 2017). Design solutions need to enable agents to intelligently

respond to complex environments that arise from ongoing changes in routine performances and understandings (March 1999).

The organizational design field has, of course, devoted much attention in recent years to the issue of how firms may adaptively respond to complex environments. Platforms, ecosystems, collaborative networks, crowdsourcing, open sourcing and outsourcing all represent design solutions to meet the need to coordinate complex, continually evolving interactions among diverse actors. Yet, such solutions by and large get their flexibility by taking classic organizational design elements of tasks and roles and structuring them into building blocks specified at a far more macro-level than would be directly useful for coordinating routines. Routines for coordinating these tasks and roles are black-boxed in a platform strategy.

We believe that the very microstructural processes of coordinating routines that tend to be black-boxed in recent discourse on organizational design are in fact of growing strategic interest. The same blurring of firm boundaries that has enabled novel and powerful platform strategies and business models has also diminished firms' direct control over the bread-and-butter routine activities that drive their value proposition. To execute their strategies, firms need to coordinate the routine activities not of contractually bound line and staff employees, but of sets of agents who act more like "franchisees" of the firm (Gulati et al. 2012). An Uber driver, a lab scientist working on drug discovery for a pharmaceuticals company, or a data science startup that contracts with Amazon Web Services all perform routine activities in accordance with firm-level goals, yet independently and specific to their contexts. Coordinating routines depends on intelligently enabling agents to perform activities in diverse, evolving task environments for which the firm cannot sufficiently plan.

Recent developments suggest newfound momentum for theorizing the design of routines. In the organizational design literature, attention has been shifting towards a microstructural view based on solutions for aggregating patterns of individual actions (Joseph et al. 2018). This attention has arisen from a view that "understanding the micro is necessary, if not sufficient, to truly understand and re-design the macro" (Puranam, 2018: 14). In practice, a growing need to coordinate users' activities over the cloud has prompted advances in modeling intelligent systems to enable routine activities of creating, storing, analyzing, and sharing digital data. Beyond the information technology sector, these advances have revived earlier work on systems design with generalizable implications for coordination in complex systems such as organizations (see Hewitt (1988)). In this work, a core challenge in coordinating routines is the need for "concurrency," or the simultaneous coordination of diverse activities of indeterminate order (Hewitt 2010). Solutions to support concurrency are intensely microstructural, concerning rules for guiding the basic patterns by which individual agents and artifacts provide information to one another.

In this paper, we draw on these recent developments in both organizational design and intelligent systems design. We seek to theorize the design of routines by examining firms' microstructural solutions for addressing the challenges of concurrency that arise in coordinating routine activities. To do so, we compared field data on the routines of two Korean restaurants, sampling for variation. First, we examined coordination in a chain restaurant, which closely replicated the routines of other units in the chain. Second, we examined coordination in an independent restaurant. Restaurants offer a familiar setting and cooking has been a frequent metaphor for characterizing routines (e.g., Winter 1968).

Our analysis found that the restaurants addressed the challenges of concurrency in coordinating routine activities based on solutions for providing information to agents about their activities. Solutions to information provision functioned as a substitute for conventional design solutions of dividing up tasks and roles that was especially well-suited to the situated, performative nature of routine activities. In the chain restaurant, agents provided information regarding fixed sequences of activities captured as standard operating procedures and checklists. In the independent restaurant, agents provided information based on using memos and face-to-face communication.

This difference—a chain restaurant that relied on standard operating procedures versus an independent restaurant that did not—is on the surface hardly noteworthy. The paper's contribution is to unpack the strategic implications of these different solutions to offer a normative framework for designing the microstructure of routines. First, providing information about fixed sequences offered a powerful means of enabling concurrency but depended on extensive codification effort and required uniformity in outcomes and task environments. We identify such solutions for coordinating routines by providing information based on fixed sequences as a uniformity strategy. Second, providing information about any aspects of particular performances of activities did not allow for uniformity in outcomes and task environments but enabled information to be compatible with changing situations. Also, by not depending on uniform outcomes and task environments, solutions for providing information about particular performances of activities had the advantage of not requiring extensive codification effort. We identify such solutions as a compatibility strategy.

Our paper contributes a theory regarding the neglected issue of the design of routines. The resulting framework contributes to raising novel questions regarding long-standing assumptions about routines and coordination. Prior work has assumed that strategies for coordinating routines depend on extensive and costly codification (e.g., Winter and Szulanski 2002; Zollo and Winter 2002). Our framing reveals how codification, as viewed from a design perspective, is specific to a “uniformity” strategy. We argue that a less-explored “compatibility” strategy in fact characterizes how firms increasingly coordinate routines, in particular amid blurring firm boundaries. We discuss implications for designing adaptive landscapes based on coordinating routines. To set up our framing, we next give background on the role of information provision in coordinating routines.

Background—coordinating routines based on information provision

According to recent work on the microstructure of organizing (e.g., Puranam 2018), a firm's design can be identified as its particular microstructural solutions to universal problems of the division of labor and the integration of effort. Problems of the division of labor concern task and role allocation; problems of integrating effort concern providing information and rewards.

Much of the research on coordination in the organizational design literature has been based on the first set of problems that have to do with how tasks and roles are allocated (e.g., Thompson 2017; Baldwin 2015). A limitation of this research in theorizing the design of routines is that it assumes a fairly known and stable decomposition of tasks, roles, and their interdependencies underlying the firm's activities. The situated, performative nature of routines highlights how important interdependencies in activities

exist not just among tasks and roles, but also between a particular task and the particular time, place, and communication channels in which the task is performed (Joseph and Ocasio 2012; Pentland et al. 2017). In routine activities, “interdependencies between different pieces of work may be uncertain or challenging to identify, making it difficult to know who should be involved in work and whether there is a correct order in which parties should complete their own specialized work” (Okhuysen and Bechky 2009: 468).

Solutions to information provision

On the one hand, the inability to specify a clear and stable formal structure of tasks and roles implies that coordination depends more on informal structure. Informal structure can be harnessed by employing broad design variables such as decentralization of decision-making authority (Mintzberg and Waters 1985), tuning how much agents “explore” different decisions or actions (Levinthal and Warglien 1999) or incentivizing rich communication (Galbraith 1974). The microstructural perspective emphasizes, however, that interdependencies between dimensions such as tasks and roles may neither require formal nor informal coordination of tasks and roles. Many interdependencies among tasks and roles may be epistemic, meaning that they exist in an abstract sense, but do not necessarily depend on explicit coordinating actions for their performance (Puranam et al. 2012). The implication is that formal structures of tasks and roles can be substituted for not just by informal structure, but by formal structures regarding activities that are not tied to detailed assumptions about these tasks and roles.

Given that the firm cannot sufficiently decompose tasks and roles in advance, effectively designing routines instead can draw on more abstract solutions to integrate effort based on generally providing information to agents about their routine activities. By developing solutions for providing information regarding routine activities, the firm may enable coordination to emerge effectively even without much a priori specification of tasks and roles. Imposing even simple shared “maps,” for example, can serve as a basis for information provision by inducing effective self-organizing dynamics among agents (Levinthal and Warglien 1999; Puranam and Swamy 2016).

Recent advances in modeling intelligent systems (e.g., Hewitt 2013) have developed theories of coordination that do away with a priori assumptions about tasks and roles in favor of abstract formal structures for information provision. Work in this area has centered on the concept of concurrency to characterize the core challenge of providing information for coordinating activities. We argue that this concept of concurrency can serve as a basis for theorizing the design of microstructural solutions to information provision for coordinating routines.

Concurrency

Concurrency refers to the simultaneous coordination of diverse activities of indeterminate order (Hewitt 2010). Concurrency should be distinguished from simply performing tasks or activities in parallel. “Simultaneous coordination” refers to the possibility that agents need to be ready to perform a diverse set of tasks and activities at any particular time. “Indeterminate order” refers to the fact that tasks and activities can play out differently each time that they are performed. Likewise, routine activities comprise patterns of action that have a characteristic, but ultimately indeterminate rhythm and

rhyme (Pentland et al. 2017). Routine activities may be overlapping and asynchronous and depend on embodied actions by agents working together in a shared space (Lebaron et al. 2016). Information provision may concern commitments to perform a task right away (i.e., nurses and physicians treating a patient in an ICU), or concern understandings that may become relevant only later (i.e., nurses and physicians referring to the ICU records in monitoring the same patient throughout an extended hospital stay). Concurrency captures the coordination challenges of this indeterminacy in task type and task order that arise from the situated, performative nature of routine activities.

In the systems design literature, solutions to support concurrency in coordination are based on rules for actors to provide information to one another in the form of exchanging understandings and commitments (Hewitt 1988). The idea is that, as actors provide information to one another about their activities, they can effectively compose routine activities without any a priori decomposition of tasks and roles. This idea has been stylized in this literature through a baseline example of an organization's email system. An organization's email system typically requires no assumptions about how tasks or roles are allocated. It requires only minimal rules about the actions underlying information provision itself—actors can create, send, and receive email messages of any content for exchanging understandings and commitments. Any actor with an address can send a message to any other actor in the organization who has an address, while the receiver can designate how they receive the message (e.g., respond, delete, place in spam, block). The order in which messages are received need not be the same order in which responses are given; some messages may be relevant immediately, while others may require a response only at a later date.

In the systems design literature, these basic actions underlying activities are referred to as “message passing” (Hewitt 2010). Drawing on this metaphor, we consider solutions to information provision in the context of organizational design as a set of rules for passing messages intended to enable agents to exchange understandings and commitments necessary for coordinating their routine activities.

Fixed sequence in information provision

In models of concurrency from the systems design literature, the indeterminate order and multiple temporal scales of routine activities create a tradeoff in solutions to information provision. The central issue is the extent to which the messages that agents create and send should be tied to fixed sequences of activities within a routine (i.e., standard operating procedures) (Hoare 1978), or whether agents should be allowed to send messages about anything they deem relevant (Hewitt 2010). Passing messages regarding fixed sequences of activities may impose coordination costs by requiring the fixed sequence to be synchronized with other messages or completed before another message can be passed. On the other hand, allowing agents to send any sort of messages may fail to harness inherently fixed sequences in activities.

This tradeoff in the use of fixed sequences in how messages are passed has been central to models of concurrency in contexts ranging from computer operating systems, the internet, scientific communities, and office work. We argue that this tradeoff similarly should apply to how organizations provide agents with information regarding their routine activities. To understand how the role of fixed sequences in providing information

affects the coordination of routine activities in the context of organizations, we next analyze field data gathered on the routines of two Korean restaurants.

Methods and research setting

To develop a theory and framework regarding the design of organizational routines, we observed how two Korean restaurants, both located within Korea, coordinated their routine activities. The restaurants both faced challenges of concurrency in that they could not fully anticipate in advance how tasks needed to be structured and scheduled, which ingredients would be used, or how many customers would place orders and when. To concurrently coordinate routine activities for cooking, serving, cleaning, and otherwise operating the restaurants, agents depended on an ongoing exchange of understandings and commitments in regard to particular situations and performances of their activities.

Data collection

We collected the data for this study through observational fieldwork and semi-structured interviews at a highly standardized chain restaurant (and its parent company headquarters) in central Seoul, and at a highly idiosyncratic independent restaurant in a rural area of Korea. Our data collection strategy was to sample from the “extremes” of our phenomenon of interest (coordinating routines in restaurants) to generate robust, if exploratory, theory regarding the design of routines. Field observation and interviews in Korean and English were conducted by both of the authors. Many studies of routines have drawn on ethnographic and ethnomethodological methods to generate thick descriptions of how people collectively enact and interpret routines (e.g., Lebaron et al. 2016). For our purposes of theorizing the design of routines, we focused more narrowly on observing how agents provided information to one another in coordinating their activities. Our data collection strategy was closer to a process engineering approach (see an analogous methodological distinction in Pentland (2013)), in which we were interested in observing what could be abstracted out from agents’ enactments and interpretations to serve as a formal basis for design. We next briefly describe the two restaurants that served as our research settings, and the basis for their comparison.

Chain restaurant

Our data drew from a chain restaurant in central Seoul. The primary source of data was observational field notes. We conducted 11 sessions of observation (3–6 h each) at our primary site, which was located within the headquarters of the parent company. The location within the parent company headquarters was advantageous as an “extreme sample,” as there was particularly tight control over coordinating activities. We checked the robustness of our findings by conducting observation sessions at nine other units of the chain. These units were distributed across diverse physical settings (e.g., from the basement of a mall to a university campus dining facility) and extended to two other countries (USA and Singapore).

During observation sessions at the main site, we sat outside a large, glass-windowed kitchen, which offered a relatively neutral and open site for observing how agents coordinated their routine activities. Our observations were primarily of the kitchen, as the

staff and managers prepared for and executed operations during the lunch and dinner shifts. During these sessions, we observed how agents interacted with the overall facility, equipment, tools, and ingredients in performing routines during set-up in the mid-morning, the lunch rush, and the evening dinner rush. We were also shown various artifacts such as menus and manuals for reference and training.

In addition to observational field notes, we conducted semi-structured interviews with nine members: five members of the chain headquarters responsible for overseeing the restaurant, as well as four onsite employees including the restaurant manager. Members' experience ranged from several months to 3 years, though two of the members had been with the larger conglomerate that owned the chain for over 10 years, and focused on uncovering their core challenges and solutions for coordinating routine activities in the restaurant. The interviews lasted from 30 min to 3.5 h. We conducted the interviews over a period of 16 months. The interviews also covered aspects such as hiring, business models, location choice, and communication between staff and the restaurant manager, and between the restaurant manager and headquarters.

Independent restaurant

Our data also drew from an independent restaurant in the Korean countryside, about 300 km outside of Seoul. The location in the countryside was advantageous as the restaurant was not subject to any direct standardization from a parent company, such that its routine activities were far more idiosyncratic than those of the chain. We spent a total of nine full-day sessions, and three two-day sessions observing and conducting semi-structured interviews. We conducted the visits largely as in the chain restaurant, observing how agents in the restaurant coordinated their routine activities. We were able to observe the kitchen areas and storage facilities, as well as restaurant service periods. In addition to observational field notes, we conducted five field interviews (of 90 min and 45 min) with the owner of the restaurant and 11 interviews (between 30 min and 2 h) with both cooking and service staff. As in the chain restaurant, the interviews focused on the challenges and solutions to coordinating their routine activities.

Basis of comparison

Despite the differences in standardization, the restaurants shared fundamental characteristics that made a comparison of how they coordinated their routine activities appropriate. Both produced everyday Korean meals at a moderate price level (under \$10 for a meal). While encompassing a great variety of ingredients, everyday Korean meals have a signature structure of rice, soup, and primarily vegetable side dishes, anchored by fermented flavor bases (soy sauce, soybean paste, chili-soybean paste, and preserved fish or shrimp sauce) (Kim et al. 2016). Both settings also performed the same sets of routine activities such as waiting on tables, dishwashing, refilling serving trays, making rice, sautéing, and boiling stews.

The need for concurrency in coordination was ubiquitous in both settings. Service staff needed to be continually informed on the state of table settings, such as whether a table with customers had napkins, whether water glasses were empty, and whether side dishes were being provided in a timely manner. To coordinate between the kitchen and dining areas, wait-staff and cooks needed to communicate regarding the flow of customer orders. When orders

got backed up, coordination failures arose in the form of poor task performance or inefficient sequencing of tasks. For example, a set of orders (i.e., by a table of customers) needed to be synced in regard to cooking tasks and service so that they came out at the same time. Service also depended on sufficient amount and quality of inventory of raw and prepped ingredients. Given unpredictable order flow and diverse ingredients and prep activities, maintaining inventory required continually updated information. Finally, flavor bases, pickles, and certain other core ingredients were developed over much longer time periods or distances. The chain restaurant depended on a fermented sauce supplied by its parent company's headquarters; the independent restaurant developed a similar sauce by monitoring its fermentation onsite over multiple years.

Analytic approach

Our analytical process began by open coding and memoing of the data to generate themes about how agents in the two restaurants provided information to one another to coordinate their routine activities. We developed a view that both the solutions and sources of coordination challenges in the restaurants importantly concerned the distinct ways in which agents provided information to one another regarding their activities. We iterated between coding and memos to generate themes in regard to the role of information provision in our settings. In examining the organizational design literature, we found that the emerging micro-structural perspectives on design (Puranam 2018) fit well with what we had observed in regard to the critical role of information provision in both restaurants in aggregating action without a priori task structures. Drawing on the constant comparative method (Glaser and Strauss, 1967), we then zeroed in on the two restaurants' distinct solutions to information provision for addressing challenges of concurrency in coordinating routines. The chain provided information tied to fixed sequences of activities, while the independent restaurant provided information regarding any relevant aspects of routines without being tied to sequences. We found that these distinct solutions mapped closely to two perspectives in the systems design literature on addressing challenges of concurrency (Hoare 1978; Hewitt 2010). Drawing on this literature, we brought the restaurants' solutions to information provision within the domain of organizational design by framing their distinct solutions as a strategic choice for designing the microstructure of routines.

Next, we describe our findings, which layout in greater detail the solutions to information provision that the two restaurants developed for providing information to address challenges of concurrency in coordinating their routine activities.

Findings

Despite common challenges of concurrency in coordinating routine activities, we found that the two restaurants differed in their solutions to these challenges. In the chain restaurant, agents provided information regarding fixed sequences of activities captured by standard operating procedures and checklists. In the independent restaurant, agents provided information regarding any aspect of a particular performance of activities using memos and configuring the workspace to enable face-to-face communication.

Providing information about fixed sequences of activities

In the chain restaurant, agents provided information to one another in the form of orders for performing fixed sequences of activities tied to standard operating procedures or checklists. Routines were composed of sets of sequences of activities. Limits to coordinating routines arose from the need to assume uniform outcomes, and as the details in checklists and standard operating procedures constrained control over uniformity.

Performing maintenance routines with checklists

A common means of providing information regarding activities in the chain restaurant was in the form of checklists. Checklists were used especially in regard to maintenance routines in the restaurant for so-called QSC, or quality, service, and cleanliness. The restaurant manager continually referred to checklists that were printed out and stored on clipboards and used these checklists as a basis for communicating with the service and kitchen staff regarding quality control.

QSC related to standards for diverse variables such as order speed, order accuracy, value for money, courtesy, attentiveness, energy, cleanliness (doors/windows, restrooms, counter, seating, exterior), professional appearance, product quality (temperature, properly followed rules, containers closed and safe), ingredients storage and handling time, and hold time. Agents frequently referred to checklists stored on clipboards in order to coordinate prep and maintenance activities. In so doing, the agents were able to get the restaurant in shape for service routines by ensuring that the facilities were clean and organized, and that a sufficient amount and quality of raw and prepped ingredients were on hand.

Performing service routines with manuals

During lunch or dinner hours, a service routine would begin when a member of the waitstaff at the restaurant entered in customer orders into the restaurant's POS system. Customer orders were transmitted to display monitors in the kitchen, where the cooks and kitchen manager decided which activities to do next. Each order triggered a fixed sequence of activities, namely, a dish or a collection of dishes ordered by a table of customers to be cooked. The customer orders related to a sequence of activities that could be relevant to multiple stations of the kitchen and arrived continually and unpredictably. The fixed sequences of activities concerned tasks for making an entrée, stew, or other individual dish, putting together a meal comprising several standardized dishes, or putting together a set of meals for a table. With diverse and continually arriving orders, fulfilling these orders depended on adjusting the order and composition of activities on an ongoing basis.

The restaurant manager, waitstaff, and cooks adjusted activities by using face-to-face communication mediated by checklists. For example, the manager used a clipboard holding multiple checklists to lead a "restaurant opening routine." The routine comprised checking the table settings in the dining area and the quality of ingredients on hand in the kitchen, while both referring to the clipboard and talking with the head waiter and chef. The restaurant manager also led a "closing" routine, in which he communicated with staff to adjust the next day's reservations and check inventory levels. Further, managers engaged in ongoing monitoring routines by talking with staff and

customers to gain feedback, tasting food to check quality and freshness, and even measuring the temperature of prepped ingredients with a thermometer.

Agents depended on standard operating procedures captured in manuals to provide information regarding activities in service routines. Managers and kitchen staff made use of a set of manuals regarding cooking recipes and rules for prepping ingredients and maintaining restaurant operations. The restaurant had five voluminous manuals (COLD, cold dishes; HOT1, HOT2, cooked dishes; RAW MATERIALS, inventory, and quality control for ingredients; and QSC, or “quality, service, cleanliness” standards for restaurant maintenance).

Each manual contained detailed instructions and pictures regarding the activities of the restaurant. For example, one cook mixed a sauce by measuring ingredients on a digital scale according to the manual. In other cases, cooks weighed out rice, sugar, and salt on digital scales according to the manual. For prepping ingredients, agents used the manuals as a resource reference. For example, to prepare vegetables, two cooks consulted the RAW MATERIALS and COLD manuals to determine the type and order of tasks to perform next. These standard operating procedures served as resources for agents to refer to in order to control activities underlying service routines.

Both the checklists and standard operating procedures comprised solutions to challenges of concurrency in coordinating routine activities based on providing information linked to fixed sequences of activities. For example, an “order” using a checklist involved an agent or group of agents working sequentially from top to bottom through the items of the checklist. Next, we describe contrasting solutions to information provision regarding independent activities that were developed in the independent restaurant.

Providing information about particular performances of activities

In the independent restaurant, the cooks and waitstaff expressed their belief that standard operating procedures or checklists would impede their ability to coordinate routine activities efficiently and effectively. Agents used various forms of memos (handwritten notes, labels, social media messages) to provide information about the status of a particular activity. Agents distinctly used face-to-face communication to coordinate based on continually reconfiguring the physical space in which a particular activity was performed.

Avoiding standard operating procedures

The cooks and waitstaff at the independent restaurant emphasized that the same routine activities needed to be performed a bit differently every time. In one case, they would adjust the brining time for cabbage used in making kimchi based on sensing the water content of the particular cabbage, which varied according to the time of year. They also expressed that using written “recipes” or ingredients specifications would make coordinating routine activities needlessly complicated. A common task in the cooking activities of the chain restaurant, for example, was deliberately measuring out ingredients on a digital scale, according to the specifications in the manuals. At the independent restaurant, agents instead just used boxes to calculate basic ratios of ingredients (i.e., rice and water).

Performing maintenance routines with memos

Rather than use standard operating procedures or checklists, the agents at the independent restaurant provided information in the form of memos. By memos, we refer broadly to any information written down about a particular performance of an activity. We distinguished providing information using memos from providing information using checklists in that memos augmented agents' memory about activities and did not typically serve as a command or request for a sequence of activities to be performed. Memos included handwritten notes that agents posted or laid on equipment, containers, or ingredients; labels affixed to containers of fermented and dried ingredients; instant messages or emails sent among agents; and books for keeping ledgers as well as more extensive notes about the particular performance of a recipe.

The content of most of the memos primarily concerned not fixed sequences of activities, but observations describing the basic specifications and state of a particular activity. In regard to service routines for the current day or in anticipation of the next day, memos functioned as reminders, updates, or questions to adjust particular routine activities. For example, one cook instant-messaged the other cooks that the amount of rice was too low. Another cook left a note for the upcoming shift that the rice had already been soaked sufficiently. These two memos provided information for updating the state of routines for making rice.

The use of memos in adjusting activities to coordinate routines had the advantage over standard operating procedures and checklists of being able to capture idiosyncratic details of routine activities. Agents could provide information specific to a particular performance. A memo could be newly created at any time, but unlike orders used in the chain restaurant, memos did not need to be either immediately used or negotiated at the current time. For example, a label for sliced chestnuts made in October only became relevant a month later when the chestnuts were used in making kimchi in November. Information provided by the memos emerged when the situation for performing the activity made such information relevant.

Performing service routines by configuring the workspace

Another difference in the independent restaurant concerned the ability of agents to continually configure the physical workspace in which routine activities were performed. The chain restaurant depended on a heavily standardized physical space to reliably use standard operating procedures and checklists. The kitchen was "nailed down" in the sense that the counters, cabinets, sinks, and stoves were connected in one layout and could not be moved. Ingredients and tools were largely inside cabinets and refrigerators and not visible.

In the independent restaurant, most ingredients were stored on trays made visible at all times, and tools were hung on the wall or kept on mobile trays. Agents performed activities using a small number of general pieces of equipment and tools—large bowls for mixing and cleaning vegetables, a "sink" embedded in the floor, and a large cast-iron vessel that could be easily converted into either a pot, steamer, or grill. The main sinks and worktables were surrounded by open space, rather than part of a counter, which allowed multiple agents to work in circles. Other areas of the kitchen were continually assembled and disassembled for particular activities. For example, to prep vegetables for pickling, a group of five agents set up a low table which they sat on in a

circle and performed the prepping. In another case, a cook left a big colander of prepped vegetables sitting on the floor. Being able to continually configure the kitchen into impromptu workspaces enabled face-to-face communication to provide information regarding any aspects of performing activities that happened to be relevant. The ability of multiple agents to work together and directly observe a particular performance of an activity led to rich face-to-face feedback in regard to performing an activity.

Overall, the independent restaurant addressed challenges of concurrency in coordinating routine activities by enabling agents to provide information about particular performances of activities by using memos and by reconfiguring workspaces for face-to-face communication. In Table 1 below, we contrast the solutions to information provision that the two restaurants used in coordinating their routine activities. In the next section, we develop a normative framework in which we consider the two restaurants' solutions to information provision as firm-level strategies for coordinating routines.

Strategic framework: designing the microstructure of routines

In both restaurants, we found that conventional divisions of tasks and roles were insufficient for concurrently coordinating activities underlying routines. To address the challenges of simultaneously coordinating diverse activities of indeterminate order characteristic of routines, the restaurants depended on solutions to information provision.

Next, we develop a normative framework that highlights the strategic tradeoffs of both solutions to supporting concurrency in coordinating routine activities. In the chain restaurant, agents provided information to one another regarding fixed sequences of activities captured in standard operating procedures and checklists. Since the chain restaurant's solutions to information provision regarding fixed sequences depended on uniform outcomes and task environments, we identify such solutions as a uniformity strategy. In the independent restaurant, agents provided information primarily as memos and face-to-face communication regarding particular performances of activities. Since the independent restaurant's solutions to information provision depended on outcomes and task environments merely compatible with particular performances of routines, we identify such solutions as a compatibility strategy.

Uniformity strategy

By providing information regarding fixed sequences in standard operating procedures specified in manuals and checklists, the chain restaurant was able to tightly control how particular activities were performed and to establish a basis of communication for composing service and maintenance activities concurrently. Yet, tying information to

Table 1 Solutions to information provision for coordinating routine activities: chain and independent restaurants

	Basis of information provision	Solutions: maintenance routines	Solutions: service routines
Chain restaurant	Fixed sequences of activities	Checklists	Standard operating procedures
Independent restaurant	Particular performances of activities	Memos	Configuring workspaces for face-to-face communication

fixed sequences of activities imposed limits to coordination in requiring uniformity of outcomes. Coordination was limited to tasks that could be evaluated based on uniform outcomes. The standard operating procedures in manuals concerned the basic use of tools to combine or assemble ingredients, such as the use of a grinding device for dicing onions or chopping spinach. Information provided in checklists concerned whether or not a set of tasks had been done satisfactorily or whether ingredients on hand had gone bad or not. Evaluation criteria concerned whether a procedure or checklist was performed or not, rather than an inquiry into the details of how a particular activity was performed. Any task in a procedure or checklist therefore had to be well-defined with a precise measurable and standardized outcome and task environment.

Maintaining uniformity depended on additional activities for information provision that limited the restaurant's ability to address challenges of concurrency. For example, adopting "QSC" standards for performing tasks led to a need for deliberate coordination regarding the detailed criteria in these standards. Details had to be accounted for each time a routine was performed. Since agents could only attend to a small proportion of the details (Joseph and Ocasio 2012), details in manuals and checklists were checked on a partial and frequently ad hoc basis. This phenomenon of amplifying the need for deliberate coordination has been documented in literature on business format chains as a problem of "rotations of control," or where the firm cannot control all the details of activities and thus simply rotates attention to aspects of these activities (Bradach 1998: 121). To the extent that deliberate attention is required and can simply not be ignored, the firm may face both inflated coordination costs and an inability to control the details of routine activities.

Compatibility strategy

By providing information using memos and physical spaces configured for face-to-face communication, the independent restaurant was able to induce control over how particular activities were performed and to also establish a basis of communication for composing service and maintenance activities concurrently. By explicitly not tying information to fixed sequences of activities, the restaurant was not bound to uniform outcomes. Evaluation criteria could be specific to a performance of an activity, which we refer to as "compatibility" of routine activities with the particular situation in which they were performed. This "compatibility" strategy, however, came with the tradeoff of not being able to harness fixed sequences of activities.

By not tying information provision to standard operating procedures, coordination in the independent restaurant tolerated diversity in the types of activities and in how particular activities were performed. Tasks could be evaluated based on outcomes deemed compatible with a particular situation, where the standards for compatibility could be enacted each time through processes of face-to-face communication. For example, memos could be generated without standard procedures regarding sensitive routine activities such as brining the cabbage for kimchi, trimming crabs, seasoning vegetable side dishes, or using feel to account for variation

in vegetables according to the time of year. In theories of concurrency, this quality of compatibility is referred to as robustness to inconsistency in evaluation criteria across particular performances of routine activities (King and Star 1990; Hewitt 2013). The advantage versus a uniformity strategy was that evaluation criteria could be based on idiosyncratic details of how a particular activity was performed.

Focusing information provision on particular performances of activities, however, also led to limits to coordination. Evaluation criteria did not cover uniform outcomes of tasks, and agents thus lacked a basis for deliberate coordination of sequences of activities. Agents were not able to learn and adapt routine activities that had fixed sequences, such as syncing orders during the lunch rush. Prior theories of organizing emphasize that even highly standardized representations can enable agents to perform activities flexibly in response to particular situations by establishing a shared basis for adaptation and learning (Puranam and Swamy 2016; Carlile 2004). To the extent that information provision based on fixed sequences is not supported, the firm loses a valuable source of coordination.

Next, we discuss the normative implications of our framework and contrast these implications with extant perspectives on the strategic coordination of routines.

Discussion

This paper contributes a theory and framework for understanding the long-neglected topic of the design of routines. We identified microstructural solutions to information provision as powerful substitutes for conventional divisions of tasks and roles well-suited for the design of routines. Our theory is that solutions to information provision can be effective by supporting concurrency in coordinating routine activities. The firm can induce its agents to coordinate diverse activities of indeterminate order that are characteristic of routines. We frame a strategic choice of whether the firm should provide information regarding fixed sequences or particular performances of activities. Strategies for providing information regarding fixed sequences require assuming mostly uniform outcomes and task environments. Strategies for providing information regarding particular performances of activities require that information be merely compatible with particular outcomes and task environments.

Next, we give normative implications of our strategic framework for designing routines and give some directions for future work. We discuss how our theory and framework problematize the prevailing assumption in strategy research that coordinating routines requires extensive codification. We then discuss how the compatibility strategy that we identified holds novel implications for design beyond firm boundaries and for designing the adaptive dynamics of routines.

Codification is a blunt instrument for designing routines

A debate arose among healthcare practitioners a few years back regarding a proposal for reforming the US healthcare sector to improve innovation and quality control. The proposal was that the healthcare sector should be re-organized to be more like the Cheesecake Factory—a casual restaurant chain known for reliably producing a large variety of dishes based on standard operating procedures and checklists (Gawande

2012). Critics of the “Cheesecake Factory proposal” responded that the context-specific (i.e., situated, performative) aspects of diagnosing individual patients would make a standardized approach to organizing the health care sector ineffective. They argued that the sector should be organized into networks of clinics, with each clinic treating patients according to their particular criteria while idiosyncratic information would be integrated into the network for collective learning. The Cheesecake Factory proposal assumes that coordination— whether of casual dining dishes or medical procedures— can be controlled based on information regarding fixed sequences of activities (i.e., standard operating procedures captured in artifacts such as standard operating procedures and checklists). The “networks of clinics” approach assumes continually evolving information regarding the treatment of a clinics’ particular patients.

The debate points to a central challenge that firms face—whether in restaurants, healthcare, or another sector—of how to standardize information provision for coordinating routines across diverse situations. Yet, discussion of this challenge of situatedness in coordinating routines has been largely missing in the strategy literature on organizational design. As noted before, we have had few theories of the design of routines. Meanwhile, in the strategy literature on routines, the overwhelming emphasis has been on the replication of highly standardized processes akin to those of the Cheesecake Factory (e.g., strategies for transferring knowledge about standardized processes in business format chains, or Intel’s “Copy Exactly” strategy for replicating semiconductor fabrication plants). These strategies are premised on the extensive codification of processes underlying routines (Winter and Szulanski 2001). Changes to firm-level codifications (i.e., deviating from the firm’s manual) by agents are found to lead to lower firm performance (Jensen and Szulanski 2007). This research reflects a broader understanding in the strategy literature on firm capabilities that effectively coordinating routines depends on extensive firm-level codification of processes (Zollo and Winter 2002).

Our paper reframes the role of extensive codification in coordinating routines from an organizational design perspective. Extensive codification relates to a strategy of providing information regarding fixed sequences of activities for coordinating activities concurrently that can easily inflate coordination costs and limit possible outcomes. Relying on fixed sequences can be the enemy of effectiveness in that the need for concurrency in how these fixed sequences are composed can place an enormous burden in synchronizing information provision (Hewitt 1988; Hewitt 2010).

The implication of our reframing of the role of codification in coordinating routines is that firms should be careful in adopting a uniformity strategy à la the Cheesecake Factory. Extensive codification required in a uniformity strategy should be used only where outcomes and task environments are inherently and unavoidably uniform. In certain organizational contexts (e.g., business format chains, Intel’s fabrication plants), such conditions may predominate. In most contexts, however, we argue that firms can benefit by identifying routines for which coordination can be effectively induced with a compatibility strategy. Future work could operationalize and empirically test variation in companies’ use of uniformity versus compatibility strategies (i.e., by relating routine activities to the presence and use of standard operating procedures and checklists) on variables such as coordination costs and tolerance for diversity in activities.

Information provision for routine activities is fundamental to coordinating amid blurring firm boundaries

Firms increasingly coordinate activities beyond their traditional boundaries, where agents are mostly autonomous rather than internal employees (Benner and Tushman 2015). Organizational design scholars and practitioners have made sense of the implications of blurring boundaries in a number of ways. Under a relatively macro-level design lens, scholars find that blurring boundaries offers novel opportunities for creating and capturing value based on the design of business models, platforms, and ecosystems. Extant micro-structural perspectives have explored how blurring boundaries have also been characterized by novel solutions to providing rewards, such as crowdsourcing, online communities, and the blockchain. Little has been said, however, regarding the implications of a shift towards coordination beyond traditional firm boundaries for our understanding of the fundamental issue of how firms coordinate routines.

The theory and framework developed in this paper can inform future work on the relationship between routines and firm boundaries by focusing on how blurring boundaries shape the nature and effectiveness of a firm's solutions for providing information. Consider firms that depend on coordinating the routine activities of agents who are not employees (e.g., GitHub's coordination of the collaborative coding activities of independent teams of developers with its open-source software repository). Coordination in these firms should be characterized by the compatibility strategy that we identified, based on providing information according to evolving situations underlying particular agents' routines (e.g., GitHub's version control system that provides relevant information on the state of a software project at a particular time). In our study, we examined such a strategy within a single restaurant. Future work could extend our characterization of the compatibility strategy in the restaurant to cases such as GitHub that involve large numbers of agents. The basic research questions would be to seek to understand how firms can use solutions to information provision to coordinate routine activities beyond their boundaries at scale.

Information provision for routine activities — a novel basis for designing adaptive landscapes

Future work could integrate assumptions from theories of concurrency (e.g., Hewitt et al., 1973; Hoare, 1978; Hewitt, 2010; Pike 2015) into extant models of landscape design to model the design of the adaptive dynamics of routines. Processes of firm adaptation have been an area of substantial interest for strategy and organizational design scholars (e.g., Levinthal and Warglien 1999). Research on firm adaptation has developed insights into both routines (e.g., Nelson and Winter 1982; Winter and Szulanski 2002; Salvato and Rerup 2011) and organizational design (e.g., Rivkin and Sigelkow 2003). At the same time, theories of routines and theories of design in the literature on firm adaptation have been only loosely connected. Research on design and firm adaptation —e.g., landscape design—has primarily been understood in terms of choices for tuning the level of exploration and exploitation among a population of self-organizing agents (e.g., Levinthal and Warglien 1999).

The strategic choices that landscape design research has examined can be usefully extended to account for routine activities by drawing on the compatibility strategy

identified in this paper. In the compatibility strategy, a difference in coordinating adaptive dynamics of routines is that information provision is compositional. That is, information is provided in regard to particular performances, rather than decomposed from a given set of tasks, components, or policies. This characteristic of the design of routines suggests that solutions can be developed incrementally, without extensive a priori codification of fixed sequences of activities, and therefore with less risk of path dependencies. This characteristic of incremental composition with less risk of path dependence is suggestive of research on neutral landscapes, or landscapes in which variation can often proceed without selection effects (Fontana 2008; Jain and Kogut 2013). We suggest that future work could also use our theory and framework to develop models of neutral landscapes for adapting to the novel challenge of concurrency in the coordination of routine activities.

Conclusion

In this paper, we drew on field data on two Korean restaurants to theorize the design of routines. We identified a core coordination challenge of a need for concurrency and framed design strategies for supporting concurrency based on solutions to information provision. The firm faces a strategic design choice of whether to provide information regarding fixed sequences of activities or particular performances of activities. Our theory and framework contribute novel and timely insights for theory and practice given the long neglect of the design of routines. Further, our contributions offer rich room for future work regarding firms' use of codification, coordinating routines amid blurring firm boundaries, and designing the adaptive dynamics of routines.

Acknowledgements

We thank the editors along with two anonymous reviewers for their guidance in developing this paper. Gerardo Okhuysen and Margarethe Wiersema provided numerous helpful comments. The authors thank participants at the Laguna Knowledge Conference and seminar members from the School of Informatics at UC Irvine for valuable feedback.

Declarations

As per the submission guidelines, we attest that our paper does not share data with another under-review or published article.

Authors' contributions

TS contributed as the primary author of this work. JJ contributed as the secondary author both to the field data collection and interpretation and to the conception and design of the theory and framework. Both authors read and approved the final manuscript.

Funding

No outside funding was used to support this work.

Availability of data and materials

Our own field data was used in this article.

Competing interests

Both authors declare that they have no competing interests.

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Received: 28 August 2019 Accepted: 12 September 2019

Published online: 09 October 2019

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