Coordinated Interdependence: How Patterning Governs Flexibility in a Routine Cluster

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ABSTRACT   Adopting a routine dynamics perspective, we use an ethnography of agile project work to explore how emergent and effortful performances of single routines influence dynamics within a cluster of interdependent routines. We find that emergent accomplishments in single routines constrain cluster-level dynamics, thereby inhibiting flexibility. However, effortful accomplishments in single routines facilitate cluster-level dynamics, thereby enhancing flexibility. We make three contributions to the literature on routine dynamics and process studies. First, we show how coordinated interdependence based on chaining, orchestrating, and reflecting creates and maintains clusters of routines, and uncoordinated interdependence based on stumbling, irritating, and detaining endangers clusters of routines. Second, we analyse how cluster-level flexibility results from maintaining a stable pattern across routines, despite pressures to vary routines. Finally, our findings contribute to practice and process studies by analysing interdependence and coordination together as '(un)coordinated interdependence'.

Keywords: coordination, ethnography, interdependence, process studies, routine cluster, routine dynamics

INTRODUCTION

Whereas early research on routines focused on dynamics within single routines (Feldman, 2000), researchers have recently begun to focus on dynamics within clusters of multiple routines (Keller et al., 2022; Kremser and Schreyögg, 2016; Ozawa, 2021). When multiple routines interact, the centre of attention shifts to interdependence and

coordination. So far, researchers have generally analysed interdependence and coordination in loosely coupled ecologies wherein single routines interact and are only slightly interdependent (Hoekzema, 2020; Rosa et al., 2021). Yet most organizational tasks are accomplished through tightly coupled and highly interdependent clusters of routines where one routine provides the context for the performance of other routines (Kremser et al., 2019). Such clusters are defined as consisting of 'multiple, complementary routines, each contributing a partial result to the accomplishment of a common task' (Kremser and Schreyögg, 2016, p. 698).

In a cluster, effortful and emergent accomplishments of single routine performances become a source of dynamics, as single routines are always changing (Kremser et al., 2019). Emergent accomplishments within a cluster result from deviating from prescribed paths and interfaces between routines, whereas effortful accomplishments result from adhering to these paths and interfaces. Whereas effortful accomplishments of expected performance patterns in single routines result in stability, emergent accomplishments leading to deviation from expected patterns result in change. Such deviation affects the performance context for other routines, revealing the interdependence between routines in a cluster. Coordination is what maintains the relationships between routines, as it balances emergent and effortful accomplishments to stabilize a cluster's context while leaving room for flexibility. Therefore, cluster dynamics are influenced by interactions of interdependence and coordination that develop from emergent and effortful accomplishments of single routines (Kremser et al., 2019; Kremser and Schreyögg, 2016).

Whereas dynamics of emergent and effortful accomplishments in single routines have been well explored (e.g., Deken et al., 2016; Geiger et al., 2021; Pentland et al., 2012; Turner and Fern, 2012) largely based on the assumption that emergent performances enhance flexibility whereas effortful performances reduce it (Danner-Schröder and Geiger, 2016; Pentland et al., 2020), researchers have begun to explore the dynamics between multiple interdependent routines only recently. Tightly coupled clusters emerge when several single routines interact to accomplish a common task (i.e., due to the division of organizational work), and dynamics resulting from interdependencies between routines and their coordination differ from those of single routines (Kremser and Schreyögg, 2016). Moreover, the scarce research on cluster-level dynamics focuses primarily on cluster-level dynamics in the long term (Kremser and Schreyögg, 2016), so little is known about short-term dynamics in tightly coupled clusters.

Responding to calls for research on the influence of emergent and effortful accomplishments of single routines on dynamics in interdependent clusters of routines (Kremser and Xiao, 2021; Pentland et al., 2020), particularly those that enhance or reduce flexibility (Hoekzema, 2020; Kremser et al., 2019; Kremser and Schreyögg, 2016; Rosa et al., 2021; Turner, 2014), we argue that dynamics in tightly coupled clusters are entirely different from those of single routines and loosely coupled ecologies of routines. Specifically, we ask: How do effortful and emergent performances of single routines create either flexibility-enhancing or flexibility-reducing dynamics of multiple interdependent routines at the cluster level?

To answer this question, we draw on the routine dynamics perspective (Feldman et al., 2021) and an ethnographic study of a cluster of routines that supports rapid changes in project goals, tasks, or outcomes in the agile project work of an in-house

consultancy, i.e., the Scrum method. In this context, effective project fulfilment depends on cluster-level flexibility to respond to clients' demands. Consulting is a particularly appropriate setting for answering our research question because agile project work, which is highly dynamic, provides opportunities to observe the permanent coordination of multiple interdependent routines, associated cluster-level dynamics, and their influence on the cluster's effectiveness in fulfilling project goals. Moreover, the context of agile project work and the Scrum method facilitates the identification and demarcation of single routines, their boundaries, and interdependencies, as well as the cluster's composition, as the Scrum method is well documented and has clear prescriptions about the performance and results of individual steps.

Our ethnographic study reveals how patterns of (un)coordinated interdependence emerge from interactions among single routines and maintain or hamper the effective functioning of a cluster of densely interconnected routines. We identified three connected patterns of coordinated interdependence: *chaining*, which prefigures actions as the outputs of one routine constrain or enable the patterns of another routine; *orchestrating*, whereby patterns of routines share the same material, spatial, or temporal resources; and *reflecting*, whereby patterns between routines are aligned with a common goal in a shared context. Furthermore, we identified three patterns of uncoordinated interdependence: *stumbling*, where missing outputs of one routine do not orient the patterns of another routine; *irritating*, where patterns of routines do not rely on the same material, spatial, or temporal resources; and *detaining*, where patterns between routines are not aligned to a common goal. These patterns of (un)coordinated interdependence create cluster-level dynamics that result from single routines' emergent and effortful accomplishments. When performances of single routines lead to emergent accomplishments, the variation created results in coordination breakdowns at the cluster level and dynamics from uncoordinated interdependence constrain dynamics that enable flexibility. In contrast, effortful accomplishments in single routines create a predictable context for coordination, and the dynamics from coordinated interdependence lead to cluster-level flexibility, that is, the cluster's capacity to react to unexpected or changing conditions during routine performance without triggering a breakdown of coordination among routines. Therefore, we argue that promoting cluster-level flexibility requires effortful performances of single routines.

We make three contributions to the literature. First, we contribute to the debate on dynamics between interdependence and coordination in clusters of interdependent routines (Feldman et al., 2021; Hoekzema, 2020; Kremser et al., 2019) by identifying coordinated interdependence (e.g., Okhuysen and Bechky, 2009) as an effortful accomplishment and uncoordinated interdependence as an emergent accomplishment. We extend the literature about the governing structures in clusters (Hoekzema, 2020; Rosa et al., 2021) by identifying three patterns of coordinated interdependence (chaining, orchestrating, and reflecting) which enable seamless flows of routines across a cluster by suppressing variations in single routines. By introducing the conceptual pair of 'coordinated interdependence', it becomes clear that routines are Janus-faced: they have coordinating power, yet must be coordinated.

Second, we contribute to studies on process multiplicity and routine stability despite pressure to vary (D'Adderio and Pollock, 2020; Goh and Pentland, 2019; Pentland et al., 2020).

More specifically, we show how cluster-level flexibility is the result of maintaining a stable expected pattern across routines. We find that the pattern of reflecting confines and creates space for planned variation, thereby making room for new paths (i.e., process multiplicities). However, if paths are not reinforced through repetition, they can be easily 'crowded out' by different paths. Overall, as the number of paths increases, it becomes difficult to maintain cluster-level flexibility. Thus, we extend the debate on dynamics that occur when multiple routines affect each other's patterns (D'Adderio and Pollock, 2020; Goh and Pentland, 2019; Pentland et al., 2020) by analysing how effortful and emergent accomplishments expand, change, and contract the space of possible paths.

Finally, we add to the literature on interdependence and coordination by taking a routine-dynamics perspective on interdependence. Different from the classical literature on interdependence (Okhuysen and Bechky, 2009; Thompson, 1967), we show that analysing interdependence and coordination together as '(un)coordinated interdependence' helps to explain the dynamics between patterns that create or corrupt coordination. Thus, we offer a complementary view on interdependence and coordination based on a practice and process perspective.

CONCEPTUAL BACKGROUND: INTERDEPENDENCE AND COORDINATION OF ROUTINES

The routine dynamics perspective is an alternative conception of routines as 'regular and predictable behaviour patterns of firms' (Nelson and Winter, 1982, p. 14). This perspective is rooted in the finding that routines can be a source of change and variety (Feldman, 2000; Pentland and Rueter, 1994) rather than stability and inertia. Focusing on the endogenous dynamics of routines and their influence on flexibility-enhancing and reducing dynamics shifts the spotlight to patterns of action constituting a routine (Feldman et al., 2021). These patterns of action gain coherence through task orientation – in particular, sequences, repetitiveness, and thus, familiarity – and attempts to manage them through reflective regulation (e.g., artefacts, standard operating procedures) (Feldman et al., 2021). Analytically, routines can be differentiated into two mutually enabling processes: patterning, i.e., the abstract patterns and relationships between actions (ostensive aspect), and performing, i.e., the concrete actions of a routine's situated actions (performative aspect) (Feldman, 2016; Feldman et al., 2021).

Viewed from a process perspective, routine performances can be thought of as following repetitive and recognizable enacted paths defined as 'time-ordered sequences of actions or events in performing work' (Goh and Pentland, 2019, p. 1901). Because the same sequence of actions can be enacted repeatedly, the number of performances always equals or exceeds the number of observed (but not potential) paths. Patterning can then be described as the 'formation of new paths and the dissolution of old paths' (Goh and Pentland, 2019, p. 1901). All paths collectively form a pattern of action (Feldman et al., 2022). 'A pattern of action that is more varied encompasses more paths, with more possibilities for divergence or change. A pattern of action that is less varied encompasses fewer paths, with fewer possibilities for divergence or change' (Goh and Pentland, 2019, p. 1902). A pattern of action therefore refers to process

multiplicity as 'a space of possible paths' (Pentland et al., 2020, p. 2) that depends on the (sequential, temporal, spatial, meaningful, etc.) relations between actions.

Performances in these action patterns are seen as 'effortful accomplishments' (Pentland and Rueter, 1994, p. 488) and 'emergent accomplishments' (Feldman, 2000, p. 613) that influence a routine's flexibility. Effortful accomplishments increase routine stability, whereas emergent accomplishments describe variations in performance that change patterns of action (Feldman et al., 2021). For example, Feldman (2000) identified striving, expanding, and repairing as accomplishments that generate flexibility-enhancing and flexibility-reducing dynamics in a single routine. These three accomplishments can be either emergent or effortful, depending on the circumstances of their performance, as 'new patterns of action (change) may emerge through the gradual accretion of actions required to reproduce the same (i.e., stable) pattern of action' (Feldman et al., 2021, p. 15). Flexibility-enhancing and flexibility-reducing dynamics can refer both to a pattern of action and its outcome (Farjoun, 2010). Research on routine dynamics has recently shifted from patterns of action in single routines to larger phenomena involving multiple interdependent routines (Feldman et al., 2016). In such ecologies (loosely coupled routines) (e.g., Sele and Grand, 2016) and clusters (tightly coupled routines) (e.g., Kremser and Schreyögg, 2016), coordination and interdependence become central to understanding flexibility-enhancing and flexibility-reducing dynamics at the aggregate level.

As in classic organizational design research (March and Simon, 1993; Okhuysen and Bechky, 2009), the interdependence of actions based on the division of labour is a central aspect of research on routines. From a classic organization design perspective, interdependence arises when work units depend on the same resources (McCann and Ferry, 1979; Thompson, 1967; Ven et al., 1976) or when the benefit of one work unit depends on actions of another work unit (Puranam et al., 2012; Victor and Blackburn, 1987). A common conceptualization of interdependence dates back to Thompson (1967), who studied the sharing of resources between work units and identified: (a) pooled interdependence, wherein work units make independent contributions to the organization; (b) sequential interdependence, wherein the outputs of one work unit are inputs for another work unit; and (c) reciprocal interdependence, wherein the output–input relations between work units are cyclical. Recently, organizational design scholars have extended these forms of task interdependence to include goal interdependence, whereby actors share a common goal beyond interdependent tasks, and knowledge interdependence, whereby actors depend on each other's expertise and skills (Raveendran et al., 2020).

From a routine dynamics perspective, interdependence is an inherent feature of a routine, which is defined as 'a repetitive, recognizable pattern of interdependent actions, involving multiple actors' (Feldman and Pentland, 2003, p. 96). Interdependence in a single routine is a result of patterns of action. The performance of one action creates a constraining or enabling context for subsequent actions. As the relationships between actions are constituted by how they are performed, the resulting patterns of action constituting the routine are ongoing accomplishments emerging from their performance. Therefore, interdependence in a single routine emerges from actions that create contexts for each other and are performed by specific actors in specific spaces at specific times (Kremser et al., 2019).

In addition to the interdependencies in single routines, routine dynamics researchers have begun to analyse interdependencies between routines. In organizations, routines 'occur in complex ecologies, nested hierarchies and networks' (Pentland et al., 2011, p. 290). In complex settings involving multiple routines, interdependencies emerge between routine performances when one routine creates an enabling or constraining context for another routine (Kremser et al., 2019). Interdependence between routines is revealed when the performances of single routines deviate significantly from the expected pattern, leading to a breakdown of actions (Kremser et al., 2019). Performances within a single routine may vary as long as they are recognizable to participants in other routines in the cluster.

Interdependence creates a need for coordination (Okhuysen and Bechky, 2009) to ensure stable patterns of action. From a routine dynamics perspective, coordination is not a stable organizational feature, but an emergent accomplishment of routine performance. Therefore, coordination can be understood and defined as a form of patterning that maintains expected patterns within and across routines. In a single routine, coordination is supported by a shared understanding of the routine's sequence or timing (Turner and Rindova, 2012, 2018), shared expectations about patterns (Danner-Schröder and Geiger, 2016; LeBaron et al., 2016), the stability of the context in which the routine is embedded (Howard-Grenville, 2005), and the inscription of patterns of action in artefacts (Bapuji et al., 2012; Bertels et al., 2016; D'Adderio, 2011). However, in single routines, the reactions to deviation from expected patterns is more direct and swifter, so coordination is easier to accomplish under changing conditions. Coordination between multiple interdependent routines is more complex. When multiple routines intersect in loosely coupled ecologies, the boundaries between them play a central role (Geiger et al., 2021; Kremser et al., 2019). Coordination is supported by triggering signals (Dönmez et al., 2016), meta-routines to organize unfolding processes (Mahringer, 2019) and the enactment of roles (Kremser and Blagoev, 2021). Similarly, when an interdependent routine yields unexpected outcomes, actors can coordinate by engaging in routine work such as flexing, stretching, and inventing (Deken et al., 2016) or skilful ad hoc balancing of various patterns (Spee et al., 2016). When multiple routines support the accomplishment of a common task in a cluster of routines, coordination is facilitated by designing interfaces to prescribe expectations about the role of a routin''s output in subsequent routines (Kremser and Schreyögg, 2016); in turn, patterns of action between routines become inscribed in artefacts (Glaser, 2017). Therefore, coordination between routines relies on actors to follow expectations and orient their actions toward expected outcomes and interfaces between routines. Reducing possible variations in routine performance enables stable patterns of action between routines (Goh and Pentland, 2019; Pentland et al., 2020).

Several studies have shown that when multiple interdependent routines interact, coordination can create a stable context for routine performances to flow into each other without compromising the overall patterns of action between them.

Coordinating interdependencies among multiple routines can create a stable context for their performance, whereas emergent accomplishments that diverge from expected patterns are central to creativity and innovation (Deken et al., 2016). However, accumulated variations can lead to a breakdown of the patterns across routines used

by participants to accomplish tasks (Pentland et al., 2020). Findings indicate that, to achieve similarity in patterns of action (stability), actors must 'suppress possible irregularities and novelties', thereby reducing flexibility between routines (Danner-Schröder and Geiger, 2016, p. 645). However, enhancing flexibility among routines requires patterns to be open to deviation (change) (Pentland et al., 2020). Enhanced and reduced flexibility between interdependent routines result from effortful and emergent accomplishments of patterning actions, respectively (Pentland et al., 2020). For example, in coordinating the interdependencies of multiple routines, actors must balance the goals of flexibility and standardization (Danner-Schröder and Geiger, 2016; Spee et al., 2016). Therefore one challenge is to understand the smoothness of coordinating interdependencies between routines from a more processual perspective (Pentland et al., 2020) by recognizing that what seems to be a smooth flow of performances between routines in a cluster is always in the making.

Overall, researchers have tended to analyse ecologies of routines with fewer interdependencies, rather than highly interdependent routines in clusters (Hoekzema, 2020; Rosa et al., 2021). Researchers also have focused on similar patterns in routines, rather than on how variations in single routines stemming from many possible paths of performance influence the dynamics between interdependent routines (Feldman et al., 2021). Kremser and Xiao (2021, p. 10) noted that in settings involving interdependence, 'we have only scratched the surface on the ways routine participants coordinate and govern within and among multiple, self-managed routines'. Furthermore, research on cluster-level dynamics has focused on long-term dynamics rather than short-term dynamics (Kremser and Schreyögg, 2016). Multiple studies have pointed to the need for further research on how the performances of single routines influence the dynamics that lead to enhanced or reduced flexibility between interdependent routines (Hoekzema, 2020; Kremser et al., 2019; Kremser and Schreyögg, 2016; Rosa et al., 2021; Turner, 2014). Given the lack of studies on dynamics in routine clusters in the short-term resulting from emergent and effortful accomplishments, we ask: How do effortful and emergent performances of single routines create either flexibility-enhancing or flexibility-reducing dynamics of multiple interdependent routines at the cluster level?

METHODOLOGY

To explore these dynamics, we adopted an ethnographic approach, which enables researchers to focus on complex, situated sequences of social action (Dittrich, 2021). We studied a project in which in-house consultants for an international company used Scrum, a structured, agile method for managing projects that require significant flexibility. This context was particularly appropriate for an investigation of how individual routine dynamics result in flexibility-enhancing or flexibility-reducing dynamics at the cluster level. Generally, we define cluster-level flexibility as the cluster's capacity to process unexpected input and react to changing conditions during routine performance without triggering a breakdown of coordination among routines.

The ethnography is based primarily on participatory observations and unstructured ethnographic interviews, and is supported by data from artefacts and formal interviews.

All data were imported into MaxQDA, a CAQDAS software. Data protection, anonymity, and confidentiality were assured beforehand, and all informants provided informed consent. At the beginning of the ethnography, the first author communicated the topic of the study to all team members, consultants, and client employees.

Data Collection

Observations. During three months in 2018, the first author collected approximately 600 hours of observational data (Becker and Geer, 1957; DeWalt and DeWalt, 2011). Observation is especially appropriate for research on routines because it enables the researcher to focus on actions and actors while being immersed and situated in a context (Dittrich, 2021). The observations took place primarily at the client's offices. The first author, a consultant and a doctoral student, harnessed his embeddedness in the project to conduct an 'opportunistic ethnography' (Riemer, 1977) whereby the researcher's membership in a group of interest enables deep insights (Jones and Bartunek, 2021; Karra and Phillips, 2008; Tracey et al., 2011).

In research on routine dynamics, such active participation with the purpose of enhancing 'the understanding of what organizational members know and feel' (Feldman, 2000, p. 614) is common (e.g., Danner-Schröder and Geiger, 2016; Glaser, 2017; Kremser and Blagoev, 2021). In our case, the first author supported two senior consultants, but did not actively influence routines in the sense of choosing them, changing their patterns of action, or directing their performance, because the project manager had already decided how to set up and manage the project and was using Scrum as an organizational tool. To maintain critical distance as a researcher (Schwartz and Schwartz, 1955), the first author jotted down observations and participants' reactions and comments as they occurred, reflected on them in analytical memos in MaxQDA within 24 hours, and systematically reflected on them later with the two co-authors (Emerson et al., 2011).

As an embedded investigator, the first author was trusted by other consultants and the client, had a deep understanding of terminology, and dealt with fewer social desirability constraints than a typical external researcher (Brannick and Coghlan, 2007; Dittrich, 2021). This deep embeddedness enabled the first author to collect in-depth data and background knowledge of daily work routines (Jones and Bartunek, 2021), attend meetings, participate in calls, and support the other consultants in the daily project work and training. The first author had an assigned desk at the client's office from Monday to Thursday next to the desks of the consultants and the client's project manager. This afforded the opportunity to observe these actors' activities and the use of the project room, which was only a few metres away. The first author used this proximity to make and record detailed observations of activities and verbatim reports. The advantage of such 'insider' status was that the researcher had access not only to formal meetings, but also to many casual conversations which enriched the observational data (Dyer and Wilkins, 1991; Weick, 2007).

Artefacts. To illustrate observations and theoretical insights with more 'non-reactive' data, the first author regularly took photographs of the Kanban board – a physical

representation of the status of project goals and project tasks (Brechner, 2015) – and the project room to document how these artefacts were used and changed over time. Another particularly important artefact of the applied routines was the Scrum Guide (Schwaber and Sutherland, 2017), a manual that is widely used in practice to manage routines (Scrum Alliance, Inc., 2018). In addition, documents like project proposals, presentations, and training manuals were collected to triangulate observational data and interview data.

Formal interviews. Observational data were triangulated and corroborated by means of formal interviews with all three key informants to enhance the data's trustworthiness (Guba and Lincoln, 1985; Yin, 2018). Two consultants and the client's project manager were the only individuals who directly and continuously managed the project and its focused routines. Semi-structured interviews lasted between 30 and 45 minutes, took place in meeting rooms at the client's offices, and were audio recorded and transcribed. The interviews focused on perceptions of the routines and the challenges and critical incidents experienced by informants (Chell, 2004). Because most informants convey smooth versions of events that are scrubbed of any embarrassing or unfavourable details and are congruent with their self-perceptions (Fischhoff, 2012; Huber and Power, 1985; Nisbett and Ross, 1980), they fail to reveal many nuances of performance. Our observational data played a critical role in overcoming these limitations (Alvesson, 2003; Becker and Geer, 1957).

Ethnographic interviews. In addition to formal interviews, unstructured and spontaneous ethnographic interviews (Emerson et al., 2011) lasting between 5 and 20 minutes were conducted with 48 of the client's engineers, team leaders, project managers, top managers, and others (Spradley, 1979). These employees and managers were involved in the project primarily as members of established improvement teams or leadership teams, and thus did not directly enact the routines, but were indirectly influenced by them. They often began conversations by articulating how routines (e.g., the status routine) organized their project work and what they liked or disliked about them. During these conversations, the researcher posed questions while working in the client's office before or after meetings or training sessions and during coffee breaks, so the conversations occurred naturally. Because these conversations were unplanned and informal, answers, comments, and reactions were jotted down afterward on a mobile phone or laptop. Table I provides an overview of the data and how we used it in the data analysis.

Data Analysis

Data analysis comprised four main stages and followed the qualitative approach described by Miles et al. (2014). After ordering the raw data along five routines, we analysed the performances, thus adopting a practice perspective (Howard-Grenville and Parmigiani, 2011). Building on this foundation, we examined the data on interdependencies and coordination at the project level (i.e., the cluster level of routines). Finally, we investigated and analysed dynamics at the cluster level that resulted from the interplay

Table I. Sources of data collected between June and September 2018

Source	Type	Amount	Use in analysis
Overall observations	Client's offices (multiple sites)	560h	Participant observation yielding insight into interdependencies and coordination of routines and effects at the cluster level, as well as normal project work
	Various locations (office of the consultancy, metro, hotel lobby)	40h	
Observations of routines	Goal routine	4 performances	Insights into effortful and emergent accomplishments of routines
	Planning routine	7 performances	
	Status routine	28 performances	
	Client-feedback routine	8 performances	
	Team-feedback routine	7 performances	
Artefacts	Photos of the Kanban board and project room	30	Use and development over time as the interface for routines
	Scrum Guide	1	Proxy for the ostensive aspect of routines
	Number of relevant documents (project proposals, presentations, training manuals)	14	Insights into timeline of events, baseline for project goals established in the consulting proposal, abstract understanding of routines from the consultant side
Formal interviews	Senior consultant	1	Insights into perceptions and interpretations of performances of routines from the consultant side
	Project manager (consultants)	1	
	Project manager (client)	1	Insights into perceptions and interpretations of performances of routines from the client side
Unstructured ethnographic interviews	Top management, including C-level	4	Insights into efforts to drive the improvement project with the help of agile methods like Scrum
	Middle management, including project manager	16	Insights into perceptions and interpretations of performances of routines and the improvement project
	Employees, including engineers and project team members	28	Insights into perceptions and interpretations of performances of routines

of both dynamics within routines and interdependencies between routines. Throughout data analysis, we constantly compared our findings with the extant literature on routine dynamics.

During the first stage of data analysis, we approached the field by creating abstract conceptualizations of the focal routines using the Scrum Guide (Schwaber and Sutherland, 2017). Borrowing from recent approaches (Geiger et al., 2021; Kremser et al., 2019; Kremser and Blagoev, 2021; Kremser and Schreyögg, 2016) to demarcate and identify separate routines analytically, we determined whether actions (a) were directed toward the same operational task, and (b) were reflective of each other (Kremser and Schreyögg, 2016). We identified five recurrent patterns of action for various operational tasks that 'created an immediately relevant and situation-specific context for each other' (Geiger et al., 2021, p. 229). We later named our routines (i.e., goal, planning, status, client feedback, and team feedback) after these operational tasks. As boundaries between the patterns of action of different routines can be blurry (Kremser et al., 2019), we drew from other studies in the field of interdependent routines to identify boundaries between routines and the resulting intersections. Doing so, we analysed how their intersections were performed by sending or receiving 'impulses' (Spee et al., 2016, p. 15) or 'triggering information' (Kremser and Schreyögg, 2016, p. 7). We identified project goals and tasks in the form of socio-material artefacts (i.e., Post-its on a Kanban board) as the main intersecting impulses between routines.

We compiled our initial list of codes directly from the Scrum guidelines for assigning patterns of action to routines (i.e., inspecting and adapting project goals, planning project tasks, exchanging status in the team, getting feedback from the client, and giving team feedback) and from artefacts (project room, Kanban board). We assigned the code 'project work' to other actions that neither contributed to the operational tasks of the five identified routines nor qualified as routines due to a lack of recurrent action patterns. Table II shows the five routines, which are named after the operational tasks to which they contributed, and corresponding steps.

Next, we interpreted these five routines as a 'cluster' of 'multiple, complementary routines, each contributing a partial result to the accomplishment of a common task' (Kremser and Schreyögg, 2016, p. 698). Unlike more loosely coupled and informally coordinated routine ecologies, routines associated with the project were tightly coupled, as is typical for clusters of routines (Hoekzema, 2020).

During the second stage of data analysis, we built on fundamental work on routine dynamics and differentiated performances into *effortful accomplishments* (Pentland and Rueter, 1994) and *emergent accomplishments* (Feldman, 2000). For example, if a pattern of action was (re)produced in the planning routine (Table II), we coded it as an effortful accomplishment. If a pattern of action varied due to, for example, adjusting to new situations, we coded it as an emergent accomplishment. Therefore, effortful accomplishments adhered to prescribed paths and programmed interfaces, whereas emergent accomplishments deviated from them.

During the third stage of data analysis, we iterated between the literature on interdependence in routines (Kremser et al., 2019; Pentland and Recker, 2016; Thompson, 1967) and our data to differentiate the interdependencies between single routines. We analysed patterns of interdependence and explored how interdependencies were integrated by coordination

Table II. Overview of observed routines and corresponding steps

Routine	Steps
Goal routine: Inspecting and adapting project goals	• The team screened and reviewed the project goals with the client and asked if there were any changes that should be reflected. • For each change, one of the consultants wrote a new card and put it on the upper half of the Kanban board in the 'Targets' section. • The team created sub-goals (i.e., 'sprint goals') for the upcoming sprint cycle based on the project goals. • Team members derived project tasks from these sprint goals, wrote them on cards, and put them on the Kanban board under 'New Topics'
Planning routine: Planning project tasks	• The team clarified what was meant by each new project task. • The team prioritized and selected project tasks to work on in the upcoming sprint. • In case of a veto, such as when a team member did not feel confident that all selected project tasks could be finished in the sprint, the set of selected tasks typically was modified. • Cards for selected project tasks were moved from 'New Topics' to 'Ranked Backlog' or 'Plan/Prepare' on the Kanban board. • For each new card in the 'Plan/Prepare' column, the initials of the responsible 'owner' were written on the card.
Status routine: Exchanging information about task status with the team	• Team members informed each other about the status of their project tasks by describing what they had achieved the preceding day. • Team members shared what project tasks they wanted to tackle on the current day by running through the cards in the 'Do' and 'Plan/Prepare' sections of the Kanban board to identify possible conflicts or prioritization changes. • Team members explained issues they had experienced with the project tasks and asked for support, if needed.
Client-feedback routine: Soliciting client feedback	• The team showed the current output(s) of the project tasks to the client. • The client inspected the output(s) and gave the team feedback as to what degree they matched the company's expectations or still needed refinement. • The team asked the client questions to clarify possible changes or new requirements for the project tasks. • The team systematically reviewed all cards on the Kanban board in the 'Check' column and moved them forward or backward (column-wise) based on the client's review.
Team-feedback routine: Exchanging team feedback	• Team members wrote cards individually to give each other feedback on how they experienced the routines and project work within the collaboration. • Team members pinned their cards to a bulletin board, clustering them in three categories (me, the team, and the rest) and two columns (+ and −). • Team members presented their own cards and explained what they meant and what had led to their impressions. • After everyone presented their cards, team members discussed the more controversial cards. • Team members discussed which areas required the most urgent improvement. • The team generated measures they wanted to implement to improve the selected areas and created cards in another colour for them. • The initials of a responsible 'owner' and a due date were written on the card for each measure. • A photo from a mobile phone was taken to document the discussion results and agreements.

patterns at the cluster level. We delved into the performances and interdependencies observed so far, revisited initial codes, and consulted, in particular, the literature on temporal dimensions of routines (Ancona et al., 2001; Orlikowski and Yates, 2002; Turner, 2014; Turner and Rindova, 2018). We found three connected patterns of coordinated interdependence: *chaining*; *orchestrating* and *reflecting*. We also found three connected patterns of *un*coordinated interdependence: *stumbling*; *irritating*, and *detaining*. Figure 1 shows the data structure that underpins the coding of patterns of (un)coordinated interdependence.

Figures 2 and 3 show two exemplary trails of evidence and how these patterns of (un)coordinated interdependence coordinate or fail to coordinate across routines. A more nuanced narrative of the critical performances in these two weeks can be found in the two vignettes in the Appendix 1.

During the last stage of data analysis, we analysed how the performances of single routines reflected or ignored interdependencies played out at the cluster level. We focused on their compound effects on cluster-level flexibility, which we defined as the cluster's capacity to process unexpected input and react to changing conditions during routine performance without triggering a breakdown of coordination among routines. We operationalized this general definition specifically to our case of agile project work using Scrum as the capacity to adapt project goals, tasks, or project outcomes quickly to changes like new client demands, since this was the cluster's required functionality (Conforto et al., 2016). Step by

Pattern of coordinated interdependence	
Chaining	**Prefigures actions as the outputs of one routine constrain or enable the patterns of another routine** ▪ John looked at the project goals and suggested to concentrate on the ,Establish improvement teams'-project goal and to setup a mechanical engineering improvement team this week as sprint goal (fn.) ▪ While I point at my own project tasks on the Kanban [board], I explain what I have tried yesterday about (…) and ask for support today (fn.)
Orchestrating	**Patterns of routines share the same material, spatial, or temporal resources** ▪ Because the project room is already used by an ad-hoc meeting we need to find another room since participants keep already arriving (fn.) ▪ Next, I replace the printed-out timetable on the project room's door with an updated one to prevent confusion (fn.)
Reflecting	**Patterns between routines are aligned based on a common goal resulting from the establishment of a shared context** ▪ John objects to Claire that we have to protect our project scope and helping to firefight problems in ongoing projects in Indonesia or Brazil would counteract our own improvement goals (fn.) ▪ We first write individually on cards, what we think went well and what went badly in our collaboration, processes and project. Then we go one by one to the bulletin board and pin our cards down while explaining what we mean by it (…) (fn.)
Pattern of uncoordinated interdependence	
Stumbling	**Missing outputs of one routine do not orient patterns of another routine** ▪ Since team members did not have the Kanban board at hand, the status exchange occurred without referring to the project tasks and team members subsequently missed a few work packages that we should have discussed (fn.) ▪ Although Marc and his updates on the electrical improvement team were missing, Claire started the Review [client feedback] anyway (fn.)
Irritating	**Patterns of routines do not rely on the same material, spatial, or temporal resources** ▪ During the phone call [regarding a new client demand], I tried to check if this fits to our project goals but could not remember them all by heart, since I was not in the project room (fn.) ▪ Claire tells John, that she has a private appointment where he had scheduled the meeting to plan our next week [planning routine] (fn.)
Detaining	**Patterns between routines are not aligned to a common goal** ▪ During the training, [manager] insisted several times, that we have to stall these improvement activities and focus instead on sales (fn.) ▪ Suddenly the door bursts open and [manager] interferes in our daily exchange, demanding that we validate his project portfolio budget immediately, claiming that elsewise ,there won't be any projects to help with' (fn.)

Figure 1. Data structure of patterns of (un)coordinated interdependence
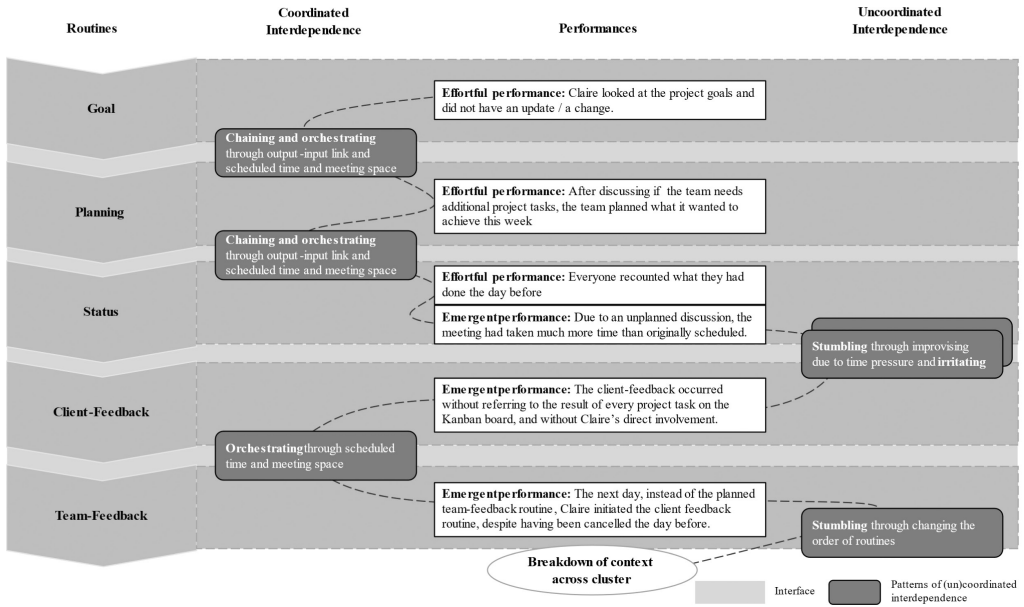
Figure 2. Exemplary trail of evidence (predominantly emergent accomplishments)
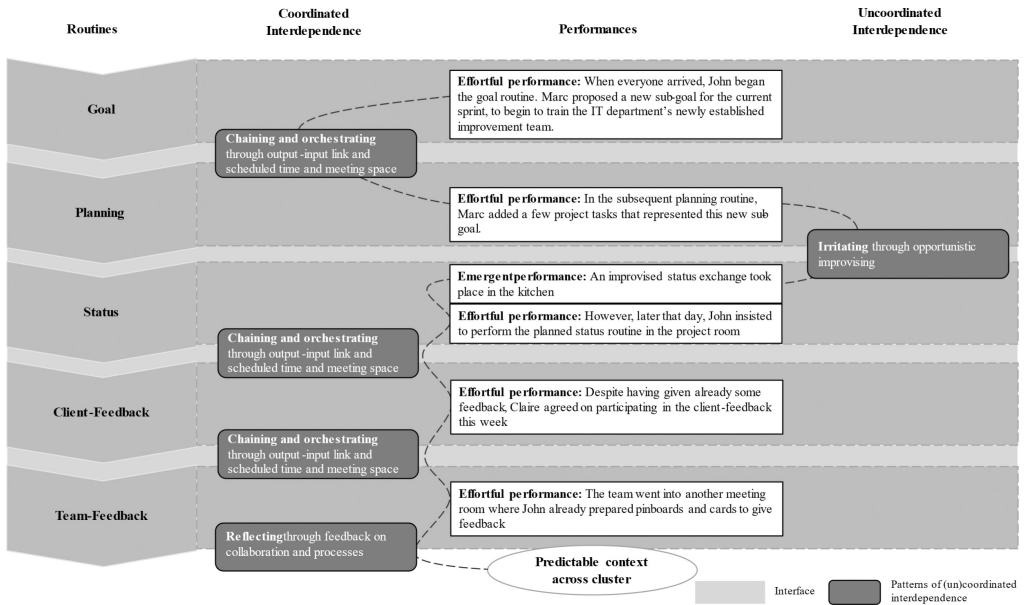

Figure 3. Exemplary trail of evidence (predominantly effortful accomplishments)

step, a framework reflecting these flexibility-enhancing and flexibility-reducing influences emerged, grounded in both theoretical conceptions and empirical data.

We followed recommendations for qualitative research (Guba and Lincoln, 1985; Maxwell, 2008; Tracy, 2010) at all stages of data collection and data analysis to ensure

the quality of our findings. We also balanced the first author's involvement as an embedded investigator with outside perspectives from the other authors. On several occasions, the second and third authors critically reviewed and evaluated codes and interpretations, and tested whether they were supported by the data.

FINDINGS

In this section, we introduce the project and its actors before presenting data on the emergent accomplishments and effortful accomplishments of interdependent routines in a cluster. The abbreviations 'fn' and 'obs' are used for data from field notes and observations, respectively.

Project Work and Actors

The focal project was an improvement initiative for a business with international operations. The company (hereafter, 'the client') asked the in-house consultancy to improve engineering practices to enhance its financial results and ensure its long-term survival. The consultants' main project tasks included training and coaching several improvement teams on common Lean Management (e.g., 'A3' or 'value stream analysis') methods aimed at generating and standardizing improvements. Improvement teams were composed of company employees.

The client wanted the consultancy to use agile methods because the flexibility to respond to changing circumstances was a critical focus. Collectively, the Scrum routines associated with the project formed 'sprints' that were typically completed each week, starting on Thursdays. Figure 4 provides an overview of these routines and project work.

The core team responsible for regularly performing the routines over the 3-month observation period consisted of two senior consultants, the client's project manager, and the first author. During the project, several additional individuals from the client and the consultancy participated in the routines, but only temporarily, sporadically, or selectively. To ensure anonymity and identity protection, we use pseudonyms for all informants. 'John' was an
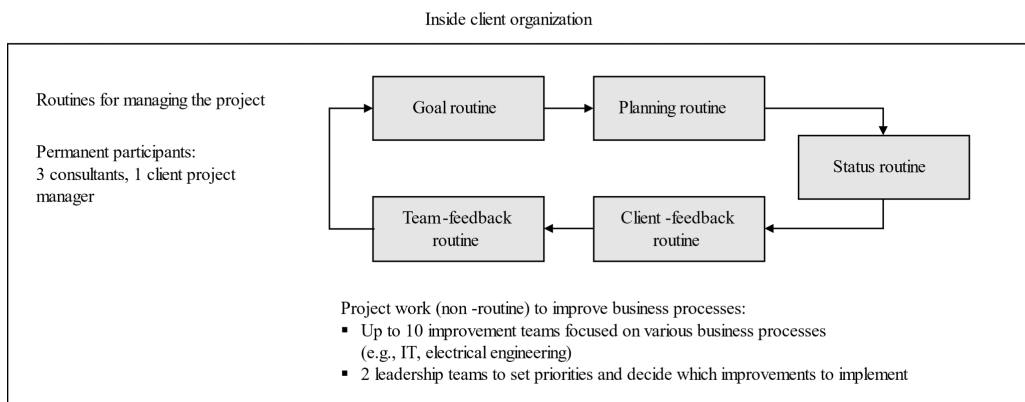
Inside client organization

Routines for managing the project

Permanent participants:
3 consultants, 1 client project manager

Goal routine → Planning routine → Status routine

Team-feedback routine ← Client-feedback routine

Project work (non-routine) to improve business processes:
- Up to 10 improvement teams focused on various business processes (e.g., IT, electrical engineering)
- 2 leadership teams to set priorities and decide which improvements to implement

Figure 4. Focal routines

experienced senior consultant who served as the project manager for the consultancy. 'Marc' was a senior consultant and an expert in Lean Management. 'Claire' was the client's project manager for the overall improvement initiative and the consultants' direct contact. The first author supported the other two consultants while participating openly in the research by observing and interviewing those involved in the initiative.

Patterns of (Un)Coordinated Dynamics at the Cluster Level

While the identified routines served to organize, manage, and coordinate project work, they had to be coordinated themselves because they were interdependent. Here, we show how the coordination that resulted from interdependencies unfolded and how it affected project work at the cluster level. Given our research focus on how dynamics in single routines influence cluster-level dynamics, we first systematically illustrate patterns of (un) coordinated interdependence using examples from our data and describe how emergent versus effortful accomplishments within these patterns affected cluster level dynamics. Additional data can be found in two vignettes in the Appendix 1 that illustrate the effects of emergent and effortful accomplishments in single routines and resulting dynamics in the cluster.

Emergent accomplishments and flexibility-reducing dynamics at the cluster level. In this section, we describe emergent accomplishments associated with each of the three patterns of uncoordinated interdependence (stumbling, irritating, and detaining) and the cluster-level dynamics they triggered.

Stumbling. The first indication of interdependence is what we call *stumbling*, whereby missing outputs of routines do not orient patterns of other routines. The interfaces between the routines were designed to receive the output from the former routines as own input. For example, we observed that outputs of the goal routine (i.e., 'sprint goals' for the week) were normally used in the planning routine as criteria for selecting or creating project tasks to achieve those goals. In turn, the selected or created project tasks became inputs for the status routine. Likewise, the status of project tasks became inputs for the client feedback routine, the result of which became the input for the next goal routine, marking the beginning of a new cycle. The only exception was the last routine in one cycle, the team feedback routine, in which results from the other routines did not play an important role because the focus was on collaboration and feedback. A Kanban board which physically represented sprint goals and project tasks with coloured Post-it notes was the main coordination mechanism. Activities progressed sequentially from 'New Topics' through 'Ranked Backlog', 'Plan/Prepare', 'Do', 'Check', 'Act', and 'Done'.

However, when the project was under pressure, we observed that routines stumbled upon interdependence when they were improvised (i.e., as emergent accomplishments) without using the Kanban board, such as when the project room with the Kanban board was occupied, routines were running behind schedule, or individuals were not aware of the schedule. The core team had to react to these unanticipated situations by performing routines without the Kanban board, which seemed better

than not performing them at all. Furthermore, some routines, such as the status routine and the client feedback routine, were often triggered on the way to the kitchen, where the core team grabbed coffee together and exchanged project news, updated the status of project tasks, or planned for the next week. Although these patterns of action were never formally planned, they became increasingly customary as the project work progressed. Core team members took advantage of informal situations when they happened to be together to perform organizational and project management routines. Sometimes routines were performed via teleconference, such as when John or Claire had to travel to another site for several days because improvement teams complained about 'missing guidance'. Improvisational routine performance also occurred when members of the core team were absent. Sometimes these improvisations delayed changes because outputs were not produced in time to be used as inputs in successive routines. For example, the cancellation of a particular project goal only became visible to the entire core team two days later when associated tasks were removed from the Kanban board (fn).

All of these emergent routine performances responded flexibly to situations that changed suddenly. The routines could be performed, but stumbled upon interdependence with other routines at the cluster level. Participants who performed routines in an emergent manner and did not use the Kanban board often forgot some project tasks that provided necessary inputs to other routines, which resulted in, for example, incomplete status exchanges (missing project tasks in the status routine) or incomplete planning for the next week (missing project goals in the planning routine). Incomplete inputs led to incomplete outputs, and ignored interdependencies affected subsequent routines until somebody noticed.

For example, when the goal routine was performed via a teleconference originally scheduled for another purpose, Claire told Marc to 'develop a rough roadmap for the next year, when the consultants would be gone' (fn). The goal routine was accomplished in an emergent manner based on the situation at hand and appeared quite reasonable at the time. However, this new project goal did not show up on the Kanban board, so no project tasks were planned for it, and nothing was done. Not surprisingly, this omission led to some unpleasant confusion when a client manager asked John for the roadmap. The absence of this new project goal reduced the cluster's flexibility to adapt by delaying the creation and allocation of project tasks required to develop a first draft of the roadmap.

Similarly, when project tasks were not placed or updated on the Kanban board, who was working on what became unclear, resulting in redundant work or missed opportunities to obtain support on project tasks from individuals who were more knowledgeable. John mentioned this problem at the beginning of the project, when an improvement team member suggested that the project task being discussed should be updated on the Kanban board. John responded, 'Yes, yes, but we hardly use it anymore. If tasks are not updated and don't move, … then I can't use [the Kanban board] to manage!' (obs). In short, when the Kanban board was not used as an interface between routines, project work stumbled, became increasingly uncoordinated and dispersed, and adapting to changing project requests became cumbersome. This slow adaptation of project goals, tasks, or outcomes to changing client demands indicates reduced cluster-level flexibility.

Irritating. The second pattern of uncoordinated interdependence we identified was *irritating*, whereby routines failed to share the same material, spatial, or temporal resources. Typically, routines were coordinated in the project room where the Kanban board was installed. The project room was shared among several improvement teams, leadership teams, and the core team. In addition to the core team's focused routines, project work and quick improvised meetings were held in the room, so the performance of routines was planned based on the room's availability. Routine performance depended on the temporal and spatial requirements of previous and subsequent routines. Because the entire core team performed the focused routines, only one routine could be performed at a time. Therefore, performing the routines in a predictable order was the main coordination mechanism to address temporal interdependence.

This pattern of uncoordinated interdependence is strongly linked with stumbling, because an irritating of routines could result in missing inputs for subsequent routines or the need to reschedule all other routines. For example, when the project goal to 'set up improvement teams' was suddenly extended to two more teams in Brazil and Indonesia in an ad hoc performance of the goal routine during a sprint, the planning routine had already been performed, so this new input could not be processed. Since the planning routine was not repeated in the respective sprint, its outputs (planned project tasks) were not altered by changes in project goals. No one communicated with managers in Brazil and Indonesia, which led to complaints about a lack of response to the new request. This slow adaptation of project goals, tasks, or outcomes to changing client demands indicates reduced cluster-level flexibility. In theory, the routines were prescribed by the Scrum Guide, and team members were trained in their sequencing beforehand, but in practice we observed that coordinating interdependencies by sharing material, spatial, or temporal resources required considerable effort, did not always succeed, and was not as simple as the Scrum Guide suggested.

Moreover, the predictability of the sequence of routines varied. In particular, the client feedback routine and team feedback routine often deviated from the normal process. John sometimes engaged in ad hoc performances of the client feedback routine during discussions with Claire even though some core team members were missing. For example, John described how he had met with Claire until 22:00 one evening to work on the escalation concept and plan next steps, and how he had taken advantage of the opportunity to initiate reciprocal feedback about the prior week's workshop (fn).

Due to intense time pressure, especially at the beginning of the project, the client feedback routine and team feedback routine were often performed only when the client or consultants deemed them necessary. For example, when a client manager began to give critical feedback on the training level of an improvement team, the core team tried to switch to the client feedback routine (fn). Similarly, the team feedback routine was performed spontaneously after tensions emerged with another consultant who had temporarily supported the project (fn). However, such emergent accomplishments of routines were often missing actions or actors. For example, if a meeting began late, an emergent accomplishment of the status routine would involve everyone providing a quick

summary of what they did the previous week, forgoing any discussion about plans for the upcoming week (fn). Likewise, routines would be modified if some team members were unable to attend a meeting. For example, when John and Claire were unable to attend a status meeting, the first author quickly summarized his tasks, shifting them forward and backward on the Kanban board, and Marc explained what he was working on in a few sentences before shifting the discussion to technical topics (fn).

In addition to incomplete or missing inputs, emergent performances often altered the sequence of routines in the cluster. It was no longer clear whether a routine would be performed regularly with all participants in its original position in the sequence. Often, improvised emergent accomplishments crowded out a routine's regular performance. For example, after spontaneous feedback was exchanged with the client regarding who should be part of a leadership team at another site, the planned routine for communicating feedback was skipped because 'we already talked', even though some routine participants were absent and not all project tasks and outputs had been discussed. At the cluster level, an altered or unclear sequence of routines reduced predictability, and thus coordination. Irritating and thus omitting the client feedback routine made it less predictable that this routine would be performed before the team feedback routine and after the status routine during the next sprint. Furthermore, when some core team members were not involved in emergent performances, valuable information was not always shared with and understood by all participants, resulting in decreased effectiveness, delayed responses to feedback, and other negative effects which reduced cluster-level flexibility, understood as how quickly project goals, tasks, or outcomes were adapted to client requests. Vignette 1 in the Appendix 1 illustrates how emergent accomplishments at the routine level can reduce flexibility at the cluster level.

Detaining. The last pattern of uncoordinated interdependence, *detaining*, involved missing alignment of routines with a common goal. In our research setting, the common project goal (i.e., the sole reason for performing the routines) was to manage and organize an initiative to improve the client's internal business processes. Each of the observed routines contributed to this goal, as they involved adapting project (sub)goals, planning project tasks, providing status updates on project tasks, and exchanging feedback on preliminary results, which is what made them a cluster of routines. The team feedback routine in particular addressed this interdependence by enabling the team to regularly reflect on what needed to be changed in the collaboration and the other routines to ensure alignment with the common project goal (see Table II).

Sometimes client demands did not align well with the common project goal. For example, a representative from the project management office called unexpectedly one evening to communicate the need to support two project managers in Indonesia and Brazil, emphasizing that 'this has also already been passed to [a member of the management board]' (obs). This new demand was unexpected, and its relationship to the existing project goals was unclear to the consultants, because supporting projects in 'firefighting mode' ran against the agreed-upon project goals of training and coaching improvement teams dedicated to preparing for upcoming projects rather than addressing urgent issues.

The requested action detained the normal sequence of routines because the planning routine had already been performed, and raised questions regarding the alignment between this new demand and the common goal. During an impromptu meeting (an improvised team feedback routine), the consultants realized that addressing the new demand would require routines beyond the applied Scrum routines, such as routines to control and update risk mitigation measures for engineering. Until they rejected the new demand with Claire's help a few days later, the planning and adaptation of project tasks were detained due to heightened uncertainty about repercussions for project work. Among other things, this led to complaints from the client manager about the lack of response to this new request. This detaining of routines caused by a lack of alignment between the new demand and the common goal once again created flexibility-reducing dynamics at the cluster level, given the slow adaptation of project goals, tasks, and project outcomes to the new demand.

Our findings show how emergent accomplishments in single routines resulted from the situations at hand and were driven by the actors involved. These performances diverged from established patterns and introduced variation. At the cluster level, emergent accomplishments ignored interdependencies between routines, resulting in fragmentation and impeding effectiveness. Paradoxically, emergent accomplishments created flexibility-reducing dynamics at the cluster level.

Effortful accomplishments and flexibility-enhancing dynamics at the cluster level. In this section, we describe effortful accomplishments associated with the three patterns of coordinated interdependence (chaining, orchestrating, reflecting) and the cluster-level dynamics these performances triggered.

Chaining. Our data show how effortful routine performance enables the performance of other routines through the *chaining* of results. Effortful accomplishments of project tasks were physically represented on the Kanban board and were referenced, modified, and moved to other columns (e.g., from 'Do' to 'Done') as routines were performed. For example, project goals that were updated during the goal routine were referred to during the next planning routine as consultants revised the associated project tasks and planned the next sprint. Project tasks were processed during normal project work and referred to daily as part of the status routine. Finally, at the end of the sprint, the (sometimes provisional) results of project tasks were reviewed in the client feedback routine. Throughout each sprint, the Kanban board was used to track the state of all project tasks from start to finish and the person responsible. This approach presupposes an effort to perform all routine steps and to bring together multiple actors, despite time pressure and emerging situations that call for deviations. For example, John effortfully reminded the core team about every step in the status routine (i.e., What did I achieve yesterday? What am I going to do today? Where do I need help?) and ensured that the routine's output was reflected in the status of each task on the Kanban board (i.e., Act, Check, Do, Plan, Backlog) (fn).

At the cluster level, such effortful accomplishments resulted in the chaining of routines' results, which appeared seamless, but oftentimes was quite difficult. When

relevant input was articulated (e.g., a client's demand to prioritize a particular project goal for the next three weeks), the effort invested in performing the routines as intended paid off, because such changes were able to be implemented quickly, thereby enhancing cluster-level flexibility. Corresponding project tasks were prioritized as well. The capacity to quickly reprioritize project goals preserved the cluster's core functionality to allow for project flexibility, ultimately resulting in client satisfaction. Vignette 2 in the Appendix 1 illustrates how effortful accomplishments at the routine level enhance cluster-level flexibility.

Orchestrating. With regard to the second pattern of coordinated interdependence, *orchestrating*, we observed effortful accomplishments regarding the sharing of material, spatial, or temporal resources between routines, primarily those with fixed time slots. The planning routine and the status routine were scheduled via recurring appointments in Microsoft Outlook. After some repetition, and with the help of a shared calendar, the timing of routines became more predictable (e.g., the planning routine was performed Thursday afternoon and the status routine began at noon on Tuesday). In addition, a printed timetable was hung near the project room door to make the time slots transparent to everyone, including non-core project team members who did not receive digital invitations. Routines typically were assigned to fixed time slots on the timetable after two to three weeks. As their timings became more predictable, routine performances began to require less effort. For example, the planning routine began to take as little as 15 minutes (fn).

We also saw effortful accomplishments within single routines when actors were required to adhere to specific steps. For example, participants did not always retain their focus on the current routine when they were running short on time, had conflicting appointments, or prioritized other project tasks and failed to attend meetings. On several occasions, John had to effortfully remind participants again and again to maintain focus on the routine itself and not, for example, engage in technical discussions about possible solutions to project tasks: 'That doesn't belong to this task. Since we have a certain structure, let's hold to it, please' (fn).

At the cluster level, the orchestrating of routines, which was facilitated by a predictable sequence, led to effective and quick processing of changes and enhanced the cluster's basic functionality to enable project flexibility. For example, performing the client feedback routine from the management board's office several hours away required extra effort from consultants. The trip had to be planned and the time slots of several routines had to be rearranged to fit the new schedule, as smooth effortless transitions between routines were impeded by distance. Yet, this additional effort to sustain the chaining of routines often yielded useful information, such as an urgent need to develop an 'escalation concept' for certain projects (fn) which had not previously appeared as project goal, task, or outcome. Performing this routine as intended and in temporal order required a high level of effort at times that ultimately enabled quick adaptation of project goals and tasks to this new project outcome – that is, cluster-level flexibility.

Reflecting. With regard to the third pattern of coordinated interdependence, *reflecting*, we observed how the alignment of routines with a common goal was effortfully accomplished and coordinated via the team feedback routine, which functioned as a meta-routine. Effortful performance of all steps of the routine required significant time, and thus had to be scheduled in advance. During the meeting, participants documented what went well and what went badly on different coloured Post-it notes clustered into three categories: 'me', 'the team', and 'the rest' (see Table II) (fn).

We observed that this meta-routine had been omitted during the first weeks of the project because other project work seemed more important and urgent. Since this meta-routine was the only routine that affected other routines but had no immediate effect on project tasks, and since limited time was allocated to project work or other routines, it seemed easier to crowd out and sacrifice than the other routines. That is, its performance seemed too effortful during the first few weeks. Later, its performance became less effortful as demands and changes from the client side jeopardized the original project goals while detaining other routines, and the core team sensed that they should take time to discuss these changes and potential impacts on the common goal.

For example, the client decided to cancel a project goal to instal leadership teams in two other departments, but only communicated this information to John, creating confusion for other project members. Therefore, during a team feedback routine it was established that the goal routine should be performed only when all team members were present. Accordingly, the time slot for the goal routine was changed to better fit everybody's schedule, and the step 'Check if all team members are present, otherwise postpone' was included in a checklist for this routine. Effortfully accomplishing the feedback routine to adapt other routines ensured their alignment with the common goal, thereby enabling cluster-level flexibility. Later, John reflected in a formal interview that he found the team feedback routine most useful for dealing with upcoming conflicts and 'synchronizing everybody on the long-term' objectives (obs). While requiring effort to accomplish, the meta-routine helped participants reflect on and maintain alignment of all routines with the common goal, thereby enabling cluster-level flexibility.

These findings show how effortful accomplishments of single routines relate to performances that are planned and driven by patterns of interdependence, and in turn reproduce these patterns. At the cluster level, effortful accomplishments consider interdependencies, resulting in routine integration and increased effectiveness. Overall, effortful accomplishments create flexibility-enhancing dynamics at the cluster level, which are critically important in settings where flexibility is the core functional requirement for clusters of routines.

A FRAMEWORK OF THE DYNAMICS OF CONSTRAINING AND ENABLING CLUSTER-LEVEL FLEXIBILITY

Our analysis of agile project work using the Scrum method reveals that cluster-level flexibility results from dynamics associated with the emergent or effortful accomplishment of

interdependent routines, thereby responding to calls to develop a better understanding of the dynamics between single routines at the cluster level (Kremser et al., 2019; Rosa et al., 2021).

When performances of single routines lead to effortful accomplishments, and interdependencies are coordinated, a predictable context among routines enables flexibility at the cluster level results. Conversely, when performances of single routines lead to emergent accomplishments, and interdependencies are uncoordinated, a breakdown of context among routines and reduction of flexibility at the cluster level may result.

It is the interplay between patterns of interdependence and patterns of coordination – what we call *(un)coordinated interdependence* – that provides the link between emergent and effortful accomplishments. We found that patterns of coordinated interdependence maintain the context and suppress interdependencies that arise from variations in routine performance. When impromptu performance occurs unintentionally in a single routine, unexpected patterns and a possible breakdown of context for other routines result. However, if the resurfaced interdependence is effortfully coordinated, the cluster's flexibility can still be maintained.

Our findings show that patterns of coordinated interdependence result in a predictable context among routines, thereby enabling cluster-level flexibility. In other words – and responding to Kremser and Xiao's (2021) call – we found that the number of possible paths is reduced by patterns of coordinated interdependence that maintain a predictable and stable context for the performance of routines (Pentland et al., 2020). Conversely, we found that patterns of uncoordinated interdependence can lead to a breakdown of context across routines, thereby constraining cluster-level flexibility. One boundary condition of these findings is that our empirical context of agile project work – specifically, the Scrum method – is a highly structured and programmed setting in which interfaces and sequences of routines are closely prescribed and widely communicated (e.g., handbooks), so actors' expectations are predesigned.

In sum, our framework shows how effortful and emergent performances of single routines create flexibility-enhancing or flexibility-reducing dynamics, respectively, between multiple interdependent routines at the cluster level, and how patterns of (un)coordinated interdependence emerge in the cluster (Figure 5).

Our framework is a first step toward understanding how effortful and emergent accomplishments create dynamics that enhance or constrain flexibility through patterns of (un)coordinated interdependence between routines at the cluster level (Kremser and Xiao, 2021).

DISCUSSION

In an ethnographic study, we researched a cluster of interdependent routines associated with agile project work. After describing patterns of interdependence and coordination, we analysed how emergent and effortful accomplishments affected flexibility-reducing and flexibility-enhancing dynamics at the cluster level. Our findings enable us to make three theoretical contributions. First by identifying patterns of coordinated and uncoordinated interdependence, we contribute to the debate about
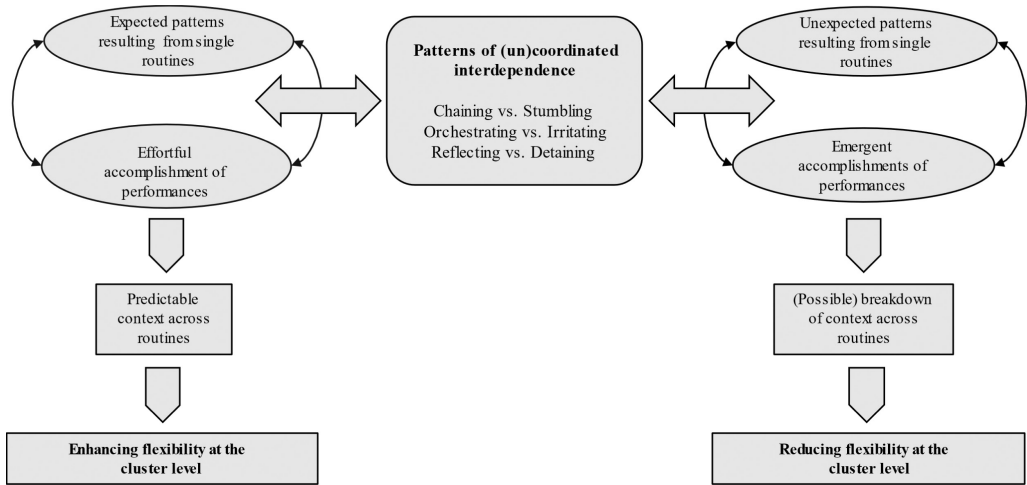
Figure 5. How patterns of (un)coordinated interdependence influence flexibility at the cluster level

dynamics within clusters of routines. Second, we contribute to studies on process multiplicity and routine stability by analysing how emergent accomplishments 'crowd out' established routine patterns and increase the number of possible paths. Finally, we add to the literature on interdependence and coordination by taking a routine-dynamics perspective as complementary view on interdependence and coordination and analysing interdependence and coordination together as '(un)coordinated interdependence'.

Our first contribution extends research on dynamics resulting from emergent and effortful accomplishments at the cluster level, as well as studies on interdependence and coordination between multiple routines from a routine dynamics perspective. Specifically, we have identified that coordinated interdependence balances flexibility-enhancing and flexibility-reducing patterns. Research has shown that coordinating dynamics that result from deviance in single routines are less complex than the dynamics of deviances between routines are. In our case, improvised performance of single routines became potentially problematic when patterns of interdependence were ignored (i.e., when patterns of uncoordinated interdependence emerged). Thus, we shed light on Turner's (2014) question as to when improvised performances of routines result in beneficial or unfavourable outcomes. In our case, variations in the performance of a single routine often resulted in patterns of uncoordinated interdependence (i.e., a breakdown of the context between routines), which led to uncoordinated and sometimes even chaotic project work. This contrasts with Deken et al.'s (2016) finding that variations in routines lead to innovation, rather than a breakdown of action. This difference can be attributed to the fact that the routines associated with agile project work in our study were tightly coupled in a cluster, creating a dense and predictable context for routine performance, unlike an ecology. Varied performances altered this predictable context, which had to be rebalanced through patterns of coordinated interdependence. In our case, emergent accomplishments highlighted interdependencies that were reduced by effortful accomplishments of coordination patterns. Unlike other research on interdependence and

coordination in which scholars have analysed the effortful, ad hoc balancing of interdependencies in a single routine (e.g., Bapuji et al., 2012; Danner-Schröder, 2021; Danner-Schröder and Geiger, 2016; Spee et al., 2016), we have analysed interdependencies between multiple routines and the resulting dynamics that affect cluster-level flexibility.

Furthermore, our analysis extends the literature on clusters of interdependent routines (e.g., Kremser and Schreyögg, 2016) by offering a perspective on how coordinated interdependence enables flexible reactions at the cluster level in the short-term. While our core argument that cluster-level dynamics differ substantially from the dynamics of single routines corroborates the pioneering work of Kremser and Schreyögg (2016) about routine clusters, we see three important differences. First, they investigated the introduction of new routines into an existing cluster of photofinishing routines and examined the cluster dynamics triggered by this change. In our case, changes did not relate to the introduction of new routines, but to emergent accomplishments of existing routines. Moreover, the functionality of the routine cluster in our case was to flexibly adapt project work to changing client demands, which differs substantially from the functionality of routine clusters associated with production processes. With the Scrum method we study a routine cluster empirically that is widespread in multiple contexts, is highly structured, and has highly prescribed steps, rather than a cluster of routines that is unique to one organization. Second, Kremser and Schreyögg (2016, p. 18) framed flexibility as the capacity to accommodate the 'incremental innovation' of a new routine and 'radical change' (i.e., changes in action patterns) in routines for digital photofinishing. In our work, flexibility refers to the cluster's capacity to react to unexpected or changing conditions – that is, changes in project goals, tasks, and outcomes in response to customer demands – during routine performance. This means we examined flexibility primarily as an *outcome* of action patterns, rather than as a *change* in action patterns (Farjoun, 2010). Third, Kremser and Schreyögg (2016, p. 20) studied long-term cluster dynamics, claiming that 'dynamics of routine clusters evolve over years rather than within months' because of past design decisions that create a sort of 'path dependence' (Sydow et al., 2009, 2020). In contrast, we studied how short-term cluster dynamics develop and generate impacts within mere days or weeks in agile project work.

We also contribute to research on process multiplicity. We found that variations and thereby new possible paths for patterning had the potential to crowd out expected performances. Ultimately, such irritating had the potential to reduce cluster-level flexibility when the new pattern could not be chained, orchestrated, or reflected across routines. That is, increased process multiplicity (i.e., a larger space of possible paths), makes coordination efforts harder. Thus, our study offers a rich example of how 'micro-level processes are intertwined dynamically and systemically constitute higher-level phenomena' (Cloutier and Langley, 2020, p. 13). At the micro-level of actions in single routines we saw that at 'any moment along a given path, there are possibilities for branching onto a different path' (Goh and Pentland, 2019, p. 1918). Importantly, this does not presuppose that different paths are dysfunctional and should be avoided; rather, they may be opportunities. Indeed, we found the emergence of new paths to be sensible, given the situations at hand. It is well established that paths are stabilized by reinforcement through repetition ('reinforcement loop', Goh and Pentland, 2019, p. 1913). A path taken in the past

influences (but does not determine) which path is taken in the future. Likewise, paths that are not repeated often can be more easily 'crowded out' by different paths. Importantly, unplanned variation does not automatically disturb the overall patterning of routines within the cluster. In contrast with Feldman et al.'s (2022) finding that established routine paths yield inferior outcomes relative to newly emergent paths after a catastrophe, we have shown that when changes are incremental, the effortful maintenance of established patterns within the cluster through reflecting, orchestrating, and chaining contains emergent accomplishments and maintains multiple possible paths to ensure cluster-level flexibility.

Furthermore, in line with Goh and Pentland's (2019) study of an agile software development project, the space of possible paths expanded in early stages of the project we studied and contracted later. We discovered emergent accomplishments that expanded the space of possible paths often hampered cluster-level flexibility. Thus, we can provide an initial answer to the question posed by Pentland et al. (2020, p. 17) as to whether multiplicity is (in)consequential and how the number of possible paths 'influence[s] important outcomes'. Our case shows that multiplicity is consequential: with an increasing number of possible paths, cluster-level flexibility is increasingly difficult to achieve. If the number of possible paths must remain stable to enable cluster-level flexibility (Farjoun, 2010), this must be effortfully accomplished since patterns do not automatically stay the same.

Thus, we arrive at an interesting conclusion: the evaluation of our findings depends on our reference point. Expanding patterns of action within single routines is a sensible response to emerging situations, yet it impairs cluster-level flexibility. In contrast, maintaining patterns of action by effortfully reinforcing expected paths and suppressing different paths facilitates cluster-level flexibility while impairing flexibility within single routines.

Importantly, in our case, the pattern of reflecting was intended to change the space of possible paths by 'replacing' less effective paths, 'expanding' to include more paths, and 'contracting' to eliminate some paths (Pentland et al., 2020, p. 16). The team feedback routine anchored the space for those changes within the overall pattern between routines in the cluster. We extend research on variations in routines as a source of flexibility (Deken et al., 2016; Turner, 2014) and research on the stability of patterns between routines (D'Adderio and Pollock, 2020; Goh and Pentland, 2019; Pentland et al., 2020) by showing that temporally and spatially limiting variations within the overall cluster of routines enables flexibility in patterns of action while maintaining cluster-level flexibility. Moreover, we extend research on 'reflective spaces' (Bucher and Langley, 2016), 'strategic episodes' (Hendry and Seidl, 2003) and 'metaroutines' (Adler et al., 1999) by adopting a processual perspective on flexibility that considers both patterns of action and related outcomes (Farjoun, 2010).

By identifying patterns of coordinated interdependence in a cluster, our research contributes to the debate about how establishing paths in a cluster of interdependent routines enables a seamless flow of routine performance (Goh and Pentland, 2019) and thus similarity among routines despite pressure to vary (D'Adderio and Pollock, 2020). In a slightly more generalist vernacular, our study shows how the flexibility of a routine cluster is the result of maintaining expected patterns across routines.

Finally, our study adds to a process and practice perspective on coordination and interdependence. With chaining, orchestrating, and reflecting, we offer three patterns of

coordinated interdependence, and with stumbling, irritating, and detaining, three patterns of uncoordinated interdependence, all of which are grounded in a practice and process perspective, as Feldman et al. (2021) and Pentland et al. (2020) suggested. However, unlike research focused on boundaries between routines (Kremser et al., 2019), our study also connects to classic research on interdependence (Thompson, 1967). Chaining and stumbling connect to sequential interdependence by defining steps; orchestrating and irritating are related to pooled interdependence, as it involves coordinating the sharing of material, spatial, and temporal resources; and reflecting and detaining are both related to the division of labour, where an overall goal is divided into interconnected sub-tasks that must be reconciled (March and Simon, 1993; Puranam et al., 2012), thereby requiring routine participants to connect to a common goal to fulfil the task (Yamauchi and Hiramoto, 2020). The cluster can be seen as reciprocally interdependent (Thompson, 1967) because each routine's output becomes another routine's input (see Figure 4). In contemporary organizational design, chaining and stumbling can be associated with task interdependence while reflecting and detaining link to goal interdependence (Raveendran et al., 2020). By linking interdependence and coordination based in a routine dynamics perspective, we showed that patterns of coordinated interdependence accomplished smooth functioning of clusters, while patterns of uncoordinated interdependence led to the emergence of coordination breakdowns. This finding goes beyond classic research on interdependence, as it allows us not only to distinguish patterns for accomplishing interdependence from patterns for breaking down interdependence but also to link interdependence and coordination. Our research on coordinated interdependence within routine clusters thus shows how adopting a process and practice perspective (Feldman et al., 2022) may complement classical research on interdependence and coordination. By focusing on patterns of action as the source of interdependence and coordination, the routine dynamics perspective helps open the black box of coordination mechanisms proposed by classical research by focusing on the emergence and dynamics of regulating interdependent inputs and interactions within unfolding coordination activities.

This paper has some boundary conditions. First, with the Scrum method we analysed a highly structured, well documented, and highly popular routine cluster, where expectations about performances and results are clear to participants. Further research could analyse, how the coordinated interdependence of a cluster of routines is 'anchored' in expectations of (external) stakeholders. Furthermore, research could analyse the coordinated interdependence in less structured and less documented clusters of routines, e.g., professional service provision or innovation. Second, we focused primarily on one cluster of interdependent routines. In the future, researchers could analyse interdependencies and coordination between multiple clusters in organizations which interact to accomplish a common goal. Building on our finding of 'coordinated interdependence', researchers could analyse how interfaces and patterns between multiple clusters support or constrain flexibility at the organizational level and how restricting or cultivating a multiplicity of paths across routine clusters enables or constrains innovation and change within organizations.

Our research shows the value of a perspective on coordination and interdependence that is based on practice and process theory. Our study shows that a routine-dynamics

perspective enables research to delve deeper into the mechanisms of interdependence found by classical literature. Our study answers calls to investigate routine interdependence and its effects among multiple routines (Feldman et al., 2016, 2019) and makes three important contributions to the literature on routine dynamics in clusters by showing how (a) coordinated interdependence governs flexibility in a cluster of routines and maintains the cluster's functionality, (b) emergent and effortful performances within single routines expand and maintain a multiplicity of possible patterns within routines, generating flexibility-reducing and flexibility-enhancing dynamics at the cluster level, and (c) interdependence and coordination can be analysed together as '(un)coordinated interdependence'. To enhance cluster-level flexibility, participants should dedicate themselves to the effortful accomplishment of single routines. Interestingly, freedom at the cluster level can be achieved by donning the chains of single routines.

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APPENDIX 1

Vignette 1: Emergent accomplishments that reduced flexibility at the cluster level

At noon on a Wednesday, the consultants, the client's project manager, and two other client managers went to the project room to perform the status routine as scheduled. However, after having recounted what everyone had done the day before, a big discussion arose between a client manager and John about a project team member's behaviour that morning (fn). By the time every member of the core team had discussed what they were going to do that day, the meeting had taken much more time than originally scheduled. When the meeting ended and participants began to leave the project room, John asked the client manager and Marc if they 'really need to go through all the results so far' (obs) and to collect feedback on them (thereby performing the client-feedback routine). In response, the client manager and Marc hastily summarized what they had heard from top management and from Claire, who had already returned to her desk. This exchange occurred without referring to the question about whether the result of every project task on the Kanban

board needed to be discussed, and more importantly, without Claire's direct involvement. Afterwards, because the performance of the client-feedback routine had been improvised and because everyone seemed to have a tight time schedule, John cancelled the formally scheduled client-feedback routine for that day and sent out a new invitation for the following week. Since there was no contradictory feedback, everyone worked on their project tasks as planned in the planning routine for that day. However, on the afternoon of the next day, Claire, who had been on a Skype call the entire morning, gave Marc a vexed look and demanded an immediate meeting so she could provide her feedback regarding a lack of quantified monetary benefits of improvements (fn). Thus, the client-feedback routine was performed, despite being cancelled.

The timing of this conversation was unfortunate, because improvement teams needed to receive that input the previous day in order to meet the client's expectations. This problem arose because John had changed the sequence of routines by cancelling the meeting for the client-feedback routine. Everyone, including Claire, had been relieved to have a bit more time to work on project tasks, but what seemed like an adequate adaptation to the specific situation at the routine level the day before turned out to be problematic at the project level the next day because the flexibility at the cluster level to adapt had been temporarily reduced.

Vignette 2: Effortful accomplishments that enhanced flexibility at the cluster level

In the early evening on a Thursday, Marc entered the project room to help update the project goals on the Kanban board with the core team (goal routine). After waiting for two minutes, he asked John, the consultants' project manager, if the meeting would be taking place. When John reluctantly joined and Marc wanted to start, John noticed that Claire, the client's project manager, was still missing. He walked to her desk and asked if she would come, too. Still absorbed with other work and somewhat resistant, Claire stood up and joined the meeting. When everyone had finally arrived, John began the goal routine by pointing to the project goals on the Kanban board and reminding the team that all project tasks should contribute to achieving them. Then he asked Claire whether she was 'still fine with these goals' and whether the team could 'deduct sub-goals for the following sprint from them' (obs). Although Claire had been distracted by a message on her mobile phone, when John addressed her, she reviewed the project goals on the Kanban board and responded in the affirmative. Then Marc proposed a new sub-goal for the current sprint, to begin to train the IT department's newly established improvement team. In the subsequent planning routine, he added a few project tasks that represented this new sub-goal.

The next Monday morning, Claire, Marc, and two of the client's project members entered the kitchen together, even though Marc had still coffee in his mug. While they were walking toward the kitchen, Marc asked if anything relevant to the project had happened on Friday, but Claire talked about the weekend with her kids instead. Once they were in the kitchen, in addition to small talk, they exchanged news about the project and touched on the current week's project tasks, which they had planned the previous Thursday. They all returned to the office space, where John had arrived in the meantime. Later that day, despite grumbling comments from Marc (i.e., 'Why do we have to do this again?') (obs), John insisted that the team meet in the project room in front of the Kanban board to perform the status routine. The status exchange addressed three questions that everyone was supposed to answer: What did I do yesterday? What am I doing today? Where do I need help? While answering, everyone referred to their tasks on the Kanban board and ran through the columns from right to left (from Act to Check, Do, Plan, and Backlog). Claire was unsure whether she had done everything correctly and glanced at the consultants, Marc ran through his tasks, and then John presented his tasks and added two tasks (obs).

In contrast to the more improvised status exchange in the kitchen, in the later, more effortful performance of the status routine, all project tasks were visible and those responsible were clearly documented on Post-it notes. This difference was apparent, as Marc remembered only in the second, effortful accomplishment of the status routine, that he had added project tasks to train the IT department's newly established improvement team on the previous Thursday.