Time to Change: Temporal Shifts as Enablers of Organizational Change

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Nancy Staudenmayer died in November of 2000, at the age of 36, after battling a long illness. This paper is a testimony to Nancy's dedication, creativity, extraordinary colleagueship, and enthusiasm for her emerging career. Nancy was a gifted scholar whose love of learning shone in all her work. She brought energy, vision, and abundant talent to all that she did. She was an inspiring colleague who brought not just good ideas, but also the care and commitment to make those ideas happen. Nancy always contributed more than her share to projects, and she taught us all a good deal about the meaning of colleagueship and the importance of follow-through. As a friend, Nancy was unwavering, caring, thoughtful, and generous. She had a knack for reaching out to others and for providing just the kind words or warm gesture they needed. We feel extremely fortunate to have known Nancy as a colleague, a friend, a student, and a teacher.

Abstract

In this paper, we integrate findings from three field studies of technology intensive organizations to explore the process through which change occurred. In each case, problems were well recognized but had become entrenched and had failed to generate change. Across the three sites, organizational change occurred only after some event altered the accustomed daily rhythms of work, and thus changed the way people experienced time. This finding suggests that temporal shifts—changes in a collective's experience of time—can help to facilitate organizational change. Specifically, we suggest that temporal shifts enable change in four ways: (1) by creating a trigger for change, (2) by providing resources needed for change, (3) by acting as a coordinating mechanism, and (4) by serving as a credible symbol of the need to change.

(Time and Timing; Organizational Change; Punctuated Change; Qualitative Methodology)

Introduction

It is well accepted that the timing of events can shape the significance of the events themselves. McGrath et al. (1984), Ancona and Chong (1996), Barley (1988), Gersick (1988), Eisenhardt and Brown (1998) and others have all demonstrated the enormous power of time and timing to structure organizational life. The timing of events has been found to enforce routines, focus energies and attention, shape how people approach their tasks, and give meaning to actions and events. Albert (1995) showed that military policy and action in the Persian Gulf War were heavily influenced by the limited time window available to stage an attack. At a micro level, Van de Ven and Polley (1992) describe how "red flag" problems typically go unrecognized when they occur very early in a new technical project, but are attended to, at a much higher cost, in later stages. At a practical level, in many industries a promising new product becomes a mere also-ran if it is introduced just days after a competitor's offering.

In this paper, we explore the idea that the opposite is also true: In many cases, events shape time itself. We find that many unusual events are not only surprising in content, but they also alter entrenched organizational rhythms. Such rhythm-changing events, in turn, can change actors' experience of time. That is, such events can change actors' perceptions of time pressures and time horizons, their sense of competing time demands, their sense of control over time and, ultimately, the way they understand time. Furthermore, our data suggest that this ability of events to alter the experience of time can help

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to facilitate organizational change. This paper contributes to our understanding of the mechanisms that enable change in organizational structures, processes, and ways of acting and thinking. It suggests that disruptive events can facilitate change by altering the experience of time.

Theoretical Background

A fundamental question in the organizational literature is how companies and groups within them adapt and change as internal or external conditions evolve. The most well-developed view is that change generally is motivated by events in an organization's environment—some problem or surprise such as a shortfall in expected performance, unexpected moves by competitors, shifts in technology, or new customer demands triggers a change (March and Simon 1958; Cyert and March 1963; Hedberg 1981; Levitt and March 1988). In this view, repeated performance of an organizational task leads to routinization, efficiency, and eventually complacency. Unexpected problems, however, reveal weaknesses in established strategies and processes, and thus provoke adaptation and change. The link between problems and adaptation is both direct and logical. An unexpected problem triggers a realization that existing routines are insufficient, and this realization in turn triggers reevaluation and change.

The theory that problems provoke adaptation and change is elegant, intuitively attractive, and widely accepted in the organizational literature. However it is obvious that, in organizations and in everyday life, problems do not always induce change. Many well-known cases exist where problems were ignored or silenced until organizations experienced full-blown disasters—e.g., the Challenger disaster (Vaughan 1990) and the Pfizer heart valve debacle (Lawless 1997). Indeed, there is no empirical evidence that the level of problems organizations experience is associated with their propensity to undertake change (Mansfield 1961).

A great deal of research has attempted to explain the frequent failure of organizational change in response to problems. One explanation is the tendency to ignore disconfirming or discrepant information by individuals (Feldman 1981) and organizations (Kiesler and Sproull 1982). Another explanation is that organizations tend to adjust goals to fit actual outcomes, making it harder to notice, and therefore react to, problems (Lant and Mezias 1990). Some argue that small failures are likely to be ignored (Louis and Sutton 1991, Van de Ven 1986). Still others suggest that failure to react proactively to new problems is often the result of learned helplessness (Seligman 1975) or mindless behavior (Langer 1989).

In short, a major stream of work in the organizational literature focuses on how problems instigate (or don't instigate) change. There is however a second stream of research that explores how time and timing help to trigger change (Gersick 1988, 1989; Eisenhardt 1988; Weick 1990; Van de Ven and Polley 1992; Ancona and Chong 1996; Brown and Eisenhardt 1997; Eisenhardt and Brown 1998). These researchers' theoretical models and empirical data suggest that time (e.g., rhythms, patterns, markers, dependent paths, and legacy effects) plays a role in enabling people to refocus their attention and behave in nonroutine ways.

For example, in their investigation of firms that excel at constant product change, Eisenhardt and Brown (1998) describe the importance of time-paced transition processes. Predictable intervals (e.g., a new product required every two years) have been found to serve as a powerful punctuating device to help actors turn their attention to change (Gersick 1989). Ancona and Chong (1996) also reveal a relationship between time and change, explaining that cycles of activities often become entrained to powerful "metronomes" such as the fiscal year; thus, stasis and change often alternate in an almost predictable pattern. Dutton's (1993) work on opportunity framing also highlights the importance of time by suggesting that events labeled as "opportunities" often serve as "time signals" that shift an actor's focus from the past, or even the present, to the future and its possibilities.

Some work has been done to bring together theories of problem-driven change, on the one hand, and time-driven change, on the other. Indeed, March and Simon's (1958) classic work on problem-driven change made an early contribution by suggesting the importance of deadlines and time urgency for focusing attention on nonroutine behavior. More recently, Gersick has delved into the relationship between these two theories. Her work illuminates the different circumstances that create a tendency for event-based versus time-based change. An important point in Gersick's argument, however, is that event-based and time-based change are "distinct systems" (1994, pp. 36, 40), operating in different organizations facing different kinds of competitive and strategic environments.

Our work also focuses on bridging the views of event- and time-based change. However, we focus on the *interconnections* between event- and time-triggered change within an organizational setting. We show that many events—from well-considered managerial decisions to exogenous distractions—can alter or interrupt work rhythms. Following such rhythm-changing events, our data suggest that people and groups often experience time differently. Frequently, these groups then undertake significant organizational change and resolve previously entrenched problems. Our research thus documents the important role that such "temporal shifts" play in facilitating organizational change.

The origins of this paper are somewhat unusual. We draw on data from three separate field studies of organizational change—studies originally designed and executed by different people with different research agendas in mind. Only in retrospect did we realize the interesting questions about time and change that none of our research could address alone, but that we could explore collectively. Below we first briefly summarize the relevant aspects of the three original field studies. We next describe the methods we developed to collectively analyze our retrospective data. We then present our analysis and discuss our findings.

Three Field Studies of Organizational Change

Table 1 provides an overview of some of the dimensions along which the three original studies varied.*

Desktop.[1] At Desktop, a market leader in personal computer software, a central problem was how to create opportunities for reevaluation and revision during the product development process, to respond to frequent market shifts and unexpected events without sacrificing efficiency and speed. In response to this challenge, some development teams at Desktop began experimenting with inserting temporal space into their product development cycle, creating specific "buffer times" in the schedule. Buffer time enabled team members to periodically stop software production and turn their collective attention to broader issues, such as revising product strategy, schedules, or design. The original study examined buffer time in three major development projects, which included six buffer periods.

With buffer time, the software development cycle was typically broken down into alternating segments. The first segment consisted of several weeks of regular development time (for coding and testing of features), followed by a limited period of unallocated buffer time. At the end of the buffer period, the project team returned to multiple weeks of development and testing, followed by another buffer period. Project managers deliberately left unspecified the tasks to be performed during buffer time. Buffer time enabled teams to capitalize on unexpected competitive events in the industry, new customer demands, or to respond to problems or ideas discovered through "learning by doing" during product development. Buffer time also enabled teams to deal with internal events that would otherwise wreak havoc on preplanned schedules, such as an unanticipated illness.

Teams that experimented with buffer times attributed several benefits to their use. First, team leaders were able to more accurately schedule and predict market launch dates, and thus better meet customer expectations. Second, teams found that adding buffer time did not in fact lengthen schedules; it appeared to do so only if one based the comparison on unrealistically optimistic estimates for projects without buffers. Third, by monitoring what activities filled the buffer time, Desktop teams improved their project-management and problem-solving processes. Finally, Desktop managers and engineers gained a new way of thinking about scheduling and timing that helped them improve project outcomes.

BBA. At BBA, a precision metal manufacturer, the central problem was to understand how employees found opportunities for ongoing improvement to process technologies already in use, despite pressures to focus on current production requirements. Regular use of the technologies was not consistent with the kind of mental and physical effort required to develop and implement new ideas. Production schedules and efficiency requirements left little time or attention for experimentation and adaptation. Routines became established and, even when recognized as flawed or inefficient, were protected if they served to get the work done.

Adaptation was found to occur during brief and intensive spurts of activity that were almost always triggered by some disruptive event that caused a temporary line stoppage. Significantly, these events themselves did not signal a new problem with the technology itself—they merely interrupted the normal rhythm of production. Based on data from 41 projects, rhythm-changing events included introducing new machines or tools (17 cases, or 40%), adding new product or process requirements (11 cases, or 26%), taking the machine temporarily off-line (8 cases, 20%), and interrupting the production schedule, e.g., for a brief shutdown (3 cases, 9%). Only occasionally were disruptive events the outgrowth of technical problems, such as a sudden machine breakdown (2 cases, 6%). In each situation, project teams not only dealt with any immediate problem (e.g., corrected the source of the breakdown), but also attended to outstanding problems that had been ignored during normal production time and which had caused chronic inefficiencies or inconveniences. (See Tyre and Orlikowski 1994 for more details.)

Managers often recognized, in retrospect, that these temporal breaks in the action proved beneficial for a given project, enabling a team to make significant improvements to the technology. However, none of the engineers or managers recognized that interruptions in production might be consciously exploited. "Breaks in the action" therefore were never instituted as a legitimate mechanism for enabling technological improvement.

Table 1 Cross Study Comparison

	Desktop	BBA	Ditto
Industry	Personal computer software	High-precision metal components	High-tech office equipment
Research Setting	Main Western U.S. campus of dominant market player	Eight plants in three major geographic divisions (Italy, West Germany, U.S.) of a European-based firm	Main Eastern U.S. campus of a *Fortune* 500 company
Research Question	How does a company balance the need for rigorous planning during the development of very complex software products with the flexibility necessary to respond to frequent market shifts and unexpected events?	How do employees find opportunities for problem solving around new process technologies? Investigations focused on incremental technical changes made by users, as well as larger organizational changes that may have been triggered by experience with the new technology.	How do people use time at work (and at home)—And can the work structures be changed so that people can accomplish the same amount of work but also have more time to spend outside of work?
Firm Size & Age	17,000 employees 20 years old	10,000 employees Over 100 years old	100,000 employees 50 years old
Firm Culture	Entrepreneurial, internally and externally aggressive; "ship on time!"	Traditional, quality focused; "precision counts; build quality products"	Engineering, formal and bureaucratic
Organization Structure	Cross functional product teams organized within business units	Divisional with geographic subdivisions	Functional within product divisions
Research Methods	Field observation	Periodic field observation	Continuous field observation
Data	Hundred page field notebook; recorded interviews; project and company documents	Hundreds of pages of field notes, interviews, and in-depth questionnaires	Thousands of pages of field notes, interviews, tracking logs, half-day shadowing, and post-intervention survey
Number of Projects Studied	3	41	1
Interviews	34 (averaging two hours long, recorded and transcribed)	95 (averaging two hours long, recorded)	117 (averaging one hour long, recorded and transcribed); there were also hundreds of informal interviews.

Ditto. At Ditto, a manufacturer of high-technology office equipment, the problem was that engineers could not get their work done in a "reasonable" amount of time. Engineers had to come in early, stay late, and work weekends to complete their work. They continually complained about the lack of uninterrupted time to work during normal business hours.

The researcher first observed this group for four months. She noted that people constantly interrupted each other and thereby perpetuated a vicious cycle of crises and individual heroics, adversely affecting the product development process. She then designed a field experiment, collaboratively with the engineers, to explore whether work structures could be changed so that people could accomplish the same amount of work but also have more time to spend outside of work. Blocks of time during the day were set aside when engineers could not interact ("quiet time"). At the end of the intervention period, the formal "quiet-time" schedule was lifted. Even when interruptions were not constrained to certain periods of the day, there was still evidence of a lasting shift in attitudes and assumptions. One engineer noted: "I

believe people have begun to respect others' work time. The focus has moved from themselves to the team. Interruptions still occur, but people take the time to think about what they are doing before interrupting." Indeed, most engineers at Ditto agreed that the quiet-time intervention changed their ways of thinking about time use—from an individual's responsibility to the group's responsibility.

Managerial assumptions were also altered. The software manager originally had been greatly concerned about the "quiet-time" intervention. He worried about what would happen when a crisis arose during quiet time and he urgently needed one of his engineers. At the end of the intervention period, however, the same manager said: "The value was that I learned to define a task and then just give the engineers time to do it without constantly interrupting." This manager had come to recognize his own pattern of changing engineers' priorities only to change them back again later. He came to realize that if he just left the engineers alone, they would accomplish more of what ultimately needed to get done. The engineers noticed this change as well. One engineer said: "I do not feel like I am constantly looking over my shoulder. Managers are not constantly standing over me and pulling me to do other things." (See Perlow 1997, 1999 for more details.)

Methods

The integration of these three studies grew out of a series of informal "hallway" conversations among the authors. During these initial conversations we realized that our independent studies collectively contained situations where changes in work rhythms, and people's experience of them, appeared to be important factors in facilitating change. Intrigued by this commonality, we decided to explore it further. At this point, each of us returned to our original data set to highlight examples that documented the concept of time and its role in organizational change. Consistent with a multiple case-study design and inductive theory-building approach, we drew on our interviews, field notes, surveys, and archival records to construct an explanatory framework of the relationship between time and organizational change (Glaser and Strauss 1967, Eisenhardt 1989, Yin 1984).

We began with a broad research question—what role, if any, does time play in the change process? We then faced the analytical challenge of combining three completed studies to answer this question—an approach with few precedents (exceptions include Van Maanen and Kunda 1989, Tyre and Orlikowski 1994). We started by writing individual case histories describing the overall context and apparent relationship between time and change at each site. These early summaries enabled each of us to become more familiar with the other two sites and to recognize the unique pattern of relationships in each, before attempting to generalize across sites (Eisenhardt 1989). Once we had revisited our three sets of data and had become convinced there was indeed some relationship between time and change in each, we wanted to better understand what that relationship was. In other words, what about time and what about change were being affected? What did these concepts mean? What was their relationship to each other? And, how were the answers to these questions similar and different across our three sites?

To delve deeper into these relationships within and among the three sites, we decided to use "change stories" as an analytic tool to facilitate cross-site comparisons. We defined change stories as scenarios where changes were observed or reported to occur in the task behavior or cognitive belief structure of an individual or group as a result of a change in work rhythms. Because the changes in work rhythms (6 at Desktop, 41 at BBA, and 1 at Ditto) often had multiple effects, we wrote a different change story connecting each rhythm change with each effect. These effects were either observed by a researcher or recounted by a subject. Each change story outlined: the preexisting situation, the rhythm-changing event, how the person or people interpreted time and events in the situation, and the short-term and/or long-term nature of the resulting effect. We had 12 change stories from Desktop, 50 from BBA, and 20 from Ditto.

To analyze change stories, we used the constant comparative method (Yin 1984). We compared pairs of change stories first within and then across sites. Through this analysis, a basic overarching story began to emerge for each site. We also identified the core components that are shared across the three overarching stories and how they are similar and different for each site. These are outlined in Table 2. For example, at Desktop and BBA the temporal shift took the form of a full stop to routine activities, whereas at Ditto it represented a shift in the rhythm of ongoing activities. At Desktop and Ditto, the temporal shift was introduced to provide a reflective "time-out" from regular activities; at BBA, however, temporal shifts occurred because of unrelated and largely unpredictable events. Further, although the organizational change that resulted sometimes consisted of fundamental shifts in people's core beliefs, in other settings change was limited to the adaptation of specific technologies or operating parameters.

The analysis itself was a highly iterative process. We challenged each other's early conclusions and returned

Table 2 Core Components of Overarching Change Stories

	Desktop	BBA	Ditto
Primary Task	Software development and testing	Precision metal component manufacturing	High-level and low level software design coding
Pre-existing Problem	No opportunity to reassess software during development, leading to development delays and suboptimal product	Production inefficiencies become entrenched—hard to find opportunities to develop new routines	Engineers need to work very long hours to complete their work; products introduced late.
Principal Source of Rhythm Change	Project management decision to insert "buffer" periods into development cycle	Exogenous or random events, such as production shutdown to install new equipment	Outside researcher with cooperation of project manager
Principal Type of Rhythm Change	Prescheduled full stops in production of fixed duration (approximately two weeks)	Unscheduled full stops in production (e.g., for introduction of new equipment) lasting approximately one to three weeks	Alteration of work rhythm (dividing the day into individual work time versus times to discuss/meet with colleagues)
Intended Purpose	To enable team reflection and reassessment of technical and strategic goals	None, since time-outs were not intended by management	To better balance individual and group work
Types of Organizational Change	Changes in product design, feature set, schedule and work processes	Adaptation in technical features and routines	Team members internalized new interaction patterns; respect for "quiet time" remained after the imposed schedule was lifted.
Types of Cognitive Change	It is both possible and beneficial to add time into the schedule—Time is an input under the group's control.	None	Interrupting other people all day long harms the whole group's productivity.
Perception of Success Within Site	Products respond better to market need; on-time introduction with no increase in development time.	Useful technical improvements, but most managers thought of time-outs as "unavoidable evils."	More control over work time, on-time product launch

again and again to the data. During this period, we made sure to circle back to the overall environmental and organizational context of each site, reading and revising our case histories in the process. We also began to review the existing literature and to compare our preliminary findings to it.

Temporal Shifts in the Work Process

At each site, significant events occurred that changed or interrupted the normal rhythm or temporal structure of work. These rhythm changes, in turn, caused people to experience time in new ways—for example, to perceive different levels of production pressure or to feel greater (or less) discretion over their time. We refer to these changes in the way that organizational actors experienced time as "temporal shifts." In our cross-study comparative analysis, we noticed that in all three sites a temporal shift involved changes in five dimensions of people's experience of time. These five dimensions are outlined in Table 3. Below we overview a few of the key changes that occurred at each site.

In the case of Desktop, engineers experienced a temporal shift after management inserted specific "buffer periods" for reevaluation and revision into software development projects. Buffer periods provided a sense of "found time" because engineers' major productive activity (software coding) was suddenly suspended. Also, the time horizons that engineers considered shifted from the entire project (driven by end-of-project deadlines) to several-week chunks ("coding periods" with milestone reviews after each one and "buffer periods" for resynchronizing and strategic reevaluation). Engineers' sense of time pressure was also altered. While engineers still felt intense time pressure during buffer periods, they

Table 3 Temporal Shifts Involved Changes in Multiple Dimensions of People's Experience of Time

	Desktop	BBA	Ditto
Sense of Time Pressure: People's sense of externally imposed urgency to accomplish task	Nature of pressure changed: There was felt urgency for undertaking reassessment and revisions, but intense production pressure was sidelined.	Normal production pressures halted or modulated by disruptive events; time pressure for adaptation was significant but was perceived as less wearing.	Time pressure was still perceived as intense, but felt more manageable with fewer disruptions at work.
Perceived Discretion Over Time: People's sense of their own ability to determine how they allocate their time to various activities	Individual discretion over time decreased during buffer time (no coding allowed; many groups meetings), but groups' discretion increased (tasks were not specified).	Perceived discretion increased significantly during production shutdowns.	Perceived discretion increased with introduction of quiet time: People felt greater control over their time due to fewer interruptions.
Perceived Tension Among Competing Task Demands: People's sense that multiple tasks compete for attention during the same time and that not all requirements can be satisfied during that time slot	Buffers neatly separated revision time and coding time, so felt tension decreased with buffer use.	Schedule interruptions lifted demands for production, so production and adaptation no longer competed in the same time slot.	Quiet time led to a significant decrease in the felt tension between getting one's own work done versus responding to colleagues' questions and requests.
Time Horizon Considered: The length of time that people take into account when planning activities and measuring progress	From whole project to two (or more) week segments	From daily production to two to three week (average) period of production shutdown	From focus on current crises to preparation for longer term work requirements
Sense of "Found Time": Time that was previously perceived as allocated becomes available—providing the perception that more time is available	Buffer periods provided time (for revision and review) previously seen as unavailable.	Workers perceived unexpected "found time" (due to production halt) to devote to technical work.	Engineers found that reducing the number of interruptions gave them more time for productive work and for reflection.

reported that pressure to complete revisions felt different from normal pressure to complete software coding.

At BBA, events that halted normal production activities, such as new product introductions, process revisions, or equipment changes, also created temporal shifts. By halting the production line, such rhythm changes provided a sense of "found time" to workers. Rhythm changes also shifted workers' time horizons: The focus shifted from production periods of an hour or day to longer periods of days or weeks as individuals undertook special projects while the line was down. Workers' sense of discretion over time increased dramatically: In the absence of daily production, workers made their own decisions about how to allocate time. The time pressure felt by workers also changed. The urgency to complete changes and to return to production was often intense, but it was described as feeling less oppressive than normal production pressure.

At Ditto, an abrupt rhythm change (the introduction of an enforced "quiet time" during each workday) caused a temporal shift. Quiet time created an ordered work rhythm: It meant that engineers' days were broken up into discreet chunks (specific times for individual "quiet" work, other times for collaborative interactions with colleagues). As a result, engineers felt less tension between "getting my own work done" and "responding to constant interruptions" by colleagues. Engineers also reported an increased sense of control over their time. In addition, the time horizons that engineers considered shifted from the present (completing the most urgent tasks) to the future (planning their own work to better fit into quiet-time and interactive-time periods).

How Temporal Shifts Facilitated Organizational Change

The temporal shifts, in turn, appeared to enable organization change in four ways: (1) by creating a trigger for change, (2) by providing resources needed for change, (3) by acting as a coordinating mechanism, and (4) by serving as a credible symbol of the need to change. Below, we describe each of these functions in more detail, and compare and contrast each function across our three sites.

Temporal Shifts as Triggers

Temporal shifts helped to trigger reevaluation of the current situation and enabled people to entertain the possibility of change. Established temporal boundaries, such as normal schedules or project deadlines, were generally treated as inviolable in ways that prevented change. But this assumption of inviolability fell away when temporal shifts occurred. People suddenly found themselves cut loose from regular temporal routines, and thus were more open to change.

For example, at Desktop, engineers found that the change from normal production periods to "buffer time" often enabled a shift in outlook. During normal production periods, engineers focused on meeting specific project goals, often at the expense of being able to reflect about what they were doing and what was happening in their environment. As one engineer commented:

> [With an] end-date motivated schedule . . . developers were so busy meeting deadlines that there was no time for the reflection on 'where do we stand' . . . [We] did not stop and reassess problems . . . [just] plunged ahead.

In contrast, "buffer time" enabled teams to "shift gears" from a mode of getting things done, to one of reflection, awareness, and analysis. In the words of one engineer:

> [Buffer times] are a time for stopping and insisting that developers pull their heads up from their work for a reality check on progress. . . . Too often, teams are too close to projects to see and admit where they are falling behind.

Similarly, breaks in the action at BBA spurred unusual levels of analysis and change, even though this was not an intended or expected outcome of random production stoppages. For example, one project manager noted that:

> We did not really focus on our problems until the new placer was brought in [and the line was shut down for two weeks]; that sort of focused our attention.

The line shutdown not only triggered work on the specific problem raised by the new placer (the need to run the line at faster speeds), it also helped the project team stop and reassess several other previously ignored issues. When the team realized that it had an unusual two-week period to resolve these issues, people focused their energies. In another project at BBA, an engineer explained that the line shutdown required to bring in new tooling was a critical point of inflection (and reflection) in the project:

> When the new tools came in [and the line was stopped], we were forced to take the time to do a great deal of *mental* testing of the ideas suggested from [all] sides. So instead of running parts, we had to go through a lot of 'what-ifs' in our minds.

The production halt made it impossible for normal production to continue. Workers addressed problems through experimentation and reflection, instead of simply running the machine faster. During this period of "mental testing," project members reviewed project logs and their own recollections of events. In the end, they not only developed a successful new tooling package, but also addressed some longstanding problems with the new technology.

At Ditto, the insertion of "quiet time" into engineers' schedules triggered change in managers' notions of when interactions had to occur. Initially, managers were reluctant to schedule quiet time first thing in the morning. As one manager noted, "After the sunrise meeting (from 8 to 9 a.m. daily), I need access to my engineers to focus their work on the current issues." Managers felt that when these issues were urgent, if they could not be conveyed to engineers immediately, time would be wasted. However, as one of the managers most opposed to early morning quiet time admitted after a few weeks' experience using quiet time, "This has taught me that interactions can wait." In the end, quiet time created change in work patterns that in turn triggered rethinking of how work had to be conducted. By collectively agreeing to abide by quiet time, the engineers came to better understand their own interaction patterns; as a result, they became more conscientious and considerate of their timing when requesting information or help. This, in turn, minimized their disruptions of each other and increased team productivity.

At all three sites, while the pace of work did not slow down, rhythm changes triggered much more thoughtful attention to time and timing. The characteristics of the triggering process, however, were subtly different among our three sites. At Desktop and BBA, rhythm changes left groups without highly structured temporal routines to follow. At Ditto, in contrast, rhythm changes provided more, not less, structure to team members' days, because of the imposition of rigid quiet time. Further, unlike full-fledged time-outs at Desktop and BBA, the rhythm change at Ditto "merely" altered normal production rhythms, without halting production. Although one might expect that this would make the rhythm changes at Desktop and BBA

more powerful or noteworthy than was true at Ditto, we found no evidence to support this. Rather, engineers at Ditto expressed a profound sense that the rhythm changes they encountered had jolted them to recognize the problematic ways in which they had been interacting, and to see that their interruptions were often destructive to the group's productivity. Our findings therefore suggest there may be multiple ways in which rhythm-changing events trigger people to "stop and reflect." One way is to take people completely out of regular production mode (full stop to production); another way is to alter production rhythms so they are not completely "regular."

Temporal Shifts as Resources

Temporal shifts also provided time as a resource. One reason why well-recognized problems went unresolved for so long was that people felt they were simply too busy to address them. But a change in normal rhythms, and the resulting shift in people's sense of time, created a rare opportunity to focus on problems and pursue a change agenda. For instance, one project leader at BBA was explicit about the importance of being able to set aside time for change activities:

> [During the time when the line was stopped] we were able to set aside time and effort for a special job [involving changes to tooling and procedures]. . . . That gave a calm environment for making these changes, and the people involved could focus very well.

At Ditto, too, an alteration in daily rhythms gave people the temporal space to undertake new kinds of work. Ditto engineers felt constantly under intense pressure to get their product to market. But when the introduction of "quiet time" altered normal working rhythms, uninterrupted time blocks provided the time needed to focus on technical problem solving. Engineers also found that the creation of "quiet time" provided an opportunity to reflect on established patterns of interaction and how these patterns affected their group's effectiveness.

Across all three sites, when managers suspended normal work rhythms, those involved clearly recognized the *finiteness* of the time available for reflection and experimentation. Managers at Ditto and Desktop clearly defined special time periods in advance, and people were keenly aware of the length of these periods. At BBA, in contrast, line stoppages were largely unscheduled in advance and were almost never of a predefined duration. Nonetheless, there was always a knowledge that the clock was ticking during line shutdowns: Workers at BBA understood the need to return to the regular production schedule as soon as possible. There was a precious quality to the temporal space in all three organizations, which helped people to realize that they could not afford to waste time before making change.

Besides providing a period of time for considering and accomplishing change, temporal shifts also provided resources for change at a more conceptual level. At all three companies, managers and employees were normally so focused on speed and time efficiency that they simply viewed time as a constraint or outcome measure. However, once organization members encountered altered work rhythms, they often (but not always) began to see time as both an outcome measure *and* a variable to control what happens in a project.

This was certainly true at Ditto, where quiet time helped engineers understand that their old patterns of interaction—interrupting each other whenever they had a question—contributed to chaotic work schedules. Engineers came to realize they had considerable power to affect how much productive work time was available to the team as a whole during a given day. Similarly at Desktop, people discovered that time can be *used* differently, and that this can affect project outcomes. For example, a Desktop project manager explained: "The big secret . . . [is] we finally put time in the schedule." As he explained, this was not simply a matter of adding weeks to the schedule (what he termed "lazy and stupid time") but a matter of *using* time in novel and creative ways. This enabled people to do a better job in the same amount of time. For example, many teams used buffer periods to gather input from users and others to help prioritize potential product changes. As a result, products were often closer to market needs than they would have been without buffers. Products were introduced on time as well, since scheduling could be more accurate, and with no increase in overall product-development time compared to traditional schedules.

At BBA, by contrast, we found no evidence that temporal shifts caused workers or managers to come to new understandings about how they could use time to affect organizational outcomes. The difference may have been related to the contrasting ways in which managers in each organization framed rhythm changes as a resource for change. Desktop managers consciously and explicitly sent messages that buffer periods were to be used for evaluating and pursuing changes; they were not "free time" and were not to be "wasted" with routine coding. At Ditto, managers emphasized from the beginning that quiet time was not simply a way of providing time for accomplishing individual work, but a mechanism for encouraging people to recognize and review the ways they used other people's time. At BBA, however, workers and managers widely perceived line shutdowns as unfortunate

necessities that interfered with "real" productivity. Management was never heard discussing the value of production time-outs for reevaluation and change. Indeed, even when the researcher later presented the results of her study, managers were resistant to the idea that there was a highly constructive side to unavoidable shutdowns.

Another difference across the three companies studied was in the form of the "resource" that temporal shifts provided. At BBA and Desktop, temporal shifts provided less chaotic time (there were fewer competing demands on people's time) that was amenable to contemplation (people's pace was not dictated by relentless production schedules, but rather time use was more open-ended). At Ditto, quiet time did not interrupt production; the need to produce persisted during quiet time. However, because the pace of work felt less frantic without constant interruptions, quiet time helped engineers find time to consider problems and possible solutions.

Temporal Shifts as Coordinating Mechanisms

One of the reasons organizational change is difficult is that people and groups are usually so busy doing their own tasks that they do not have time to come together to implement change collectively. Yet, most kinds of change in complex organizations must be a concerted effort on multiple fronts. The temporal shifts we observed served to reconnect disparate actors and create a synchronized readiness for change among all those who needed to be involved. Thus, temporal shifts helped teams to undertake change activities in a coordinated way. By contrast, without some temporal shift it was often hard to capture the attention of the critical mass of people necessary to accomplish real change. According to one experienced project manager at BBA:

> For all the high-level managers and technical experts involved at different times with this machine, we were not able to get them to focus *together* on the [problem] until we were forced to take the machine off-line. So, we wasted a huge amount of time fixing things on the shop floor instead of attacking the real problem at the level of the technology. The whole process was very frustrating . . . . We wasted a lot of time.

At Desktop, buffer times provided important "resynching" points during product development. Engineers normally concentrated on coding and testing individual software components. This created a tendency for pieces to "drift apart," which often led to problems in the finished product. By temporarily, but collectively, stopping production to reassess project status at buffer points, team management ensured that the work of the team was coordinated.

As these examples illustrate, the exact form that coordination took was quite different across our three field sites. At BBA, line shutdowns were sufficiently serious and attention grabbing that they brought together, in ad-hoc groups, the experts needed to deal with long-standing problems. Often, these experts came from offices distant from the plant floor, in other facilities, or even outside of the company. In almost every case, a highly salient reason was required to gather them together. At Desktop, buffer times did not draw in new team members, but rather provided a time for all members of the existing product team to meet together to share information about their diverse efforts. Indeed, this was the primary purpose of buffer times. At Ditto, the schedule shift coordinated efforts in the sense that it imposed a schedule for individual work time versus interactive time on all team members simultaneously, but it also did not draw in new contributors to the team. Indeed, such a schedule change could not occur unless collectively respected.

Despite these important differences, underlying similarities among the sites are apparent. In each site, the different groupings brought about by the temporal shifts, enabled new patterns of interaction, evoked greater attention to group processes and problems, and brought diverse individuals (who were used to moving at their own pace) into greater syncopation. In turn, this enabled the groups to make organizational changes.

Temporal Shifts as Symbols of the Importance of Change

In each company we studied, changes in rhythm held high symbolic value. This symbolic role of rhythm changes further reinforced their role as a trigger, a resource, and a coordinating mechanism.

Because managers typically focused on maximizing speed to market or meeting tight production schedules, events that inserted real or perceived "time-outs" from relentless schedules had considerable power to demonstrate the importance of change. This was especially true at Ditto and Desktop. Here, time was considered the most valuable and scarce resource of all, yet changes in the normal rhythm of work were intentionally created, rather than simply a product of exogenous events. In the software industry, most firms focus on compressing the development cycle as much as possible. The notion of deliberately inserting unallocated "buffer" time into the development schedule, as Desktop management did, runs counter to current industry practices. As one Desktop engineer explained:

> [Traditionally,] what happens is when you schedule in buffer time . . . everyone goes crazy! They say 'you bozo, you idiot, how could you schedule [that]? That pushes our ship date way past the point we want it, get rid of that!'

By legitimizing breaks in the normal schedule, despite a crisis mentality, management ensured that people took notice of the equally important need to stay flexible and adaptive. Similarly at Ditto, the fact that quiet time was executed during a high-pressure period of product development was a strong symbol of management's commitment to addressing the problem of long and chaotic working hours and days. At both Desktop and Ditto, by explicitly and deliberately changing the pace of work, managers signaled their belief in the importance and, ultimately, the utility of reflection and change.

In particular, the symbolic content of these temporal shifts affected how people interpreted their change in schedules. For instance, at Desktop, instead of seeing buffer periods as times to rest or to finish up loose ends, project team members interpreted buffers as, in part, a message from management about the importance of reevaluation. At Ditto, quiet time signaled that management was committed to address issues with the work processes and with work-life balance. In both companies, the message sent by management helped actors impose the discipline necessary to use the temporal space provided for reflection and change, and not just as a catch-up period for regular work.

At BBA, by contrast, temporal shifts were the result of events outside of managers' control and were not intended to provide opportunities for reflection. They still carried symbolic weight, but in a different way. Because the need to meet production goals was normally so dominant, events that halted production had special power to signal that normal assumptions and constraints were not in place. As one manager commented, "a production halt speaks louder than words." Another manager explained, "It [a production halt] sticks out like a sore thumb." That is, a production halt dramatized that a situation was aberrant, and that action was needed. Numerous quotes like this provided further evidence that the one value shared across all levels of actors in BBA was that production must continue on schedule; any alterations in that schedule were perceived as a noteworthy aberration to which people attached important meaning.

Discussion

The above data suggest that temporal shifts are an important enabler of change in organizational settings. This finding emerged in all three of the settings we studied, despite significant differences in the organizational and competitive contexts involved, the role of management in supporting organizational change, and the nature of the rhythm-changing events observed. It also occurred despite differences both within and across sites, in the degree and size of the changes involved: Outcomes spanned small and large changes, incremental and more radical ones, and changes both in work content and organizational process.

Rhythm-changing events created temporal shifts that acted in four different ways to create organizational change. First, temporal shifts acted as a trigger, helping individuals and groups shift gears from production and productivity to reflection and reassessment. Thus, temporal shifts frequently served as "punctuating devices"—experiences that helped to shift organization members' attention from present routines to future possibilities, and to bring new, more conscious modes of thinking into use (Gersick 1988, 1991; Louis and Sutton 1991; Dutton 1993).

Second, temporal shifts provided a resource for undertaking organizational change: People could set aside time and attention that was not precommitted to routine activities. In this sense, temporal shifts were important at a practical level. Temporal shifts also were important psychologically. As Hedberg (1981, p. 17) points out, "a moment of hesitation is necessary in order to allow an organization (or group) to change from execution of action programs to genuine problem solving." That is, some otherwise uncommitted transition time is needed if actors are to disengage mentally and emotionally from routine activities and refocus on reassessment and change (Bushe and Shani 1991). Also important was that these relatively uncommitted blocks of time were finite: They provided much-needed breathing and thinking room, but people were always aware of the need to use such limited time wisely. By providing resources—but finite ones—for change, temporal shifts enabled individuals and groups to avoid both the rigidity that stems from overload (Dutton 1993) and the laxness that stems from too much slack (March and Simon 1958).

Third, temporal shifts acted as powerful coordinating mechanisms (Zerubavel 1981, Barley 1988). Such shifts grabbed the attention of the diverse and often far-flung individuals needed to undertake change, and helped ensure that all of them were focused on the need for change at the same time. In this sense, temporal shifts helped to entrain actors' schedules so that they could better work together (Ancona and Chong 1996).

Finally, temporal shifts were often symbolic of organizations' need for change and of management's commitment to action. In two of our sites, managers who normally pressed relentlessly for greater speed, deliberately altered the use of time to enable reflection and reassessment. In so doing, these managers used time not just as a simple linear measuring stick, but as a shaper of social reality and meaning (Bordieu 1977). Zerubavel (1981) points out that by assigning priorities, managers wield the

tremendous symbolic power of time. The schedule changes imposed by these managers indicated a commitment to change more forcefully than any simple pronouncement could have done. Even in our third site (BBA), where rhythm changes were unintended by management, an alteration in regular, high-pressure production schedules still signaled that normal operating assumptions were not in place. Just as unexpected "acts of God" such as floods or meteors often take on symbolic meaning (Rowley 1962), brief time-outs from relentless production pressures took on special meaning for participants. Such meaning, in turn, heavily influenced how people and groups responded to the opportunities available.

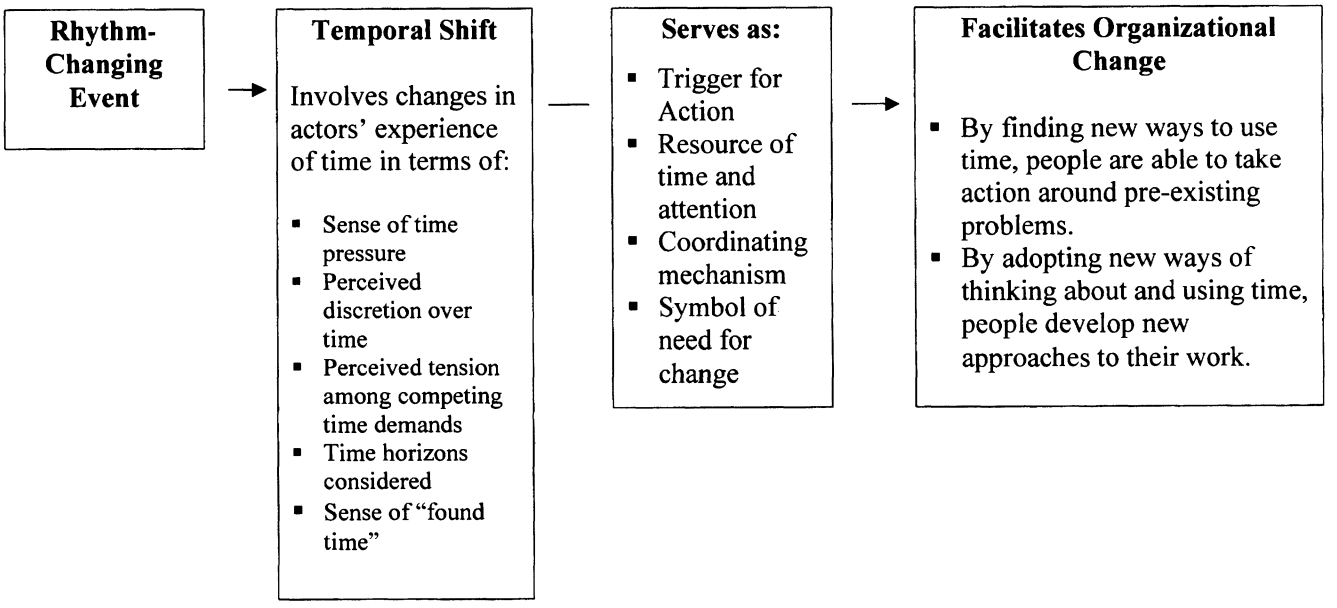
Figure 1 summarizes our findings. It describes *how* rhythm-changing events can help to jump-start action around pre-existing (but previously ignored or entrenched) problems by changing actors' experience of time.

Notably, in contrast to established theory, organizational change was not primarily problem driven in any of our sites. Problems were obviously relevant; they were generally well recognized and openly discussed (sometimes incessantly) by people at every level, but they somehow failed to provoke change. Thus, the source of any organizational inertia was not that problems were unrecognized. However, until there was some sort of shift in people's experience of time, those involved felt and acted as if they were unable to address these problems.

It is also important that most of the events that created temporal shifts—such as important schedule alterations or delivery of new equipment—were not problems. (The only exceptions to this were two cases out of the 41 studied at BBA, involving machine breakdowns.) Although the rhythm-changing events we studied altered actors' schedules, they were not disruptive to capabilities or assumptions in the way that a strike or natural disaster might be (e.g., Meyer 1982). Rather, rhythm-changing events were almost always introduced as a means of dealing with outstanding issues, and their only disruptive feature was the interruption in normal temporal routines that they produced.

This is not to say that problems cannot trigger change. The power of events, and specifically problematic events, as instigators of change is well documented in the organization literature (Cyert and March 1963, Nelson and Winter 1982, Kiesler and Sproull 1982). Our argument does not contradict that finding. Rather, we suggest an alternative route to change in cases where long-standing problems have become entrenched. Our findings also complement existing theory by suggesting an additional reason why problems may elicit change. That is, problems themselves are sometimes rhythm-changing events. Strikes, natural disasters, system breakdowns, and unexpected absences not only surprise and startle, they also insert a time-out or a change in entrenched rhythms. Thus, when problems do facilitate change, one way that they may do so is by altering familiar work rhythms and thus enabling people to think differently about time and how they use it.

Figure 1 The Role of Temporal Shifts in Facilitating Organizational Change



If we accept that rhythm-changing events and the resulting temporal shifts they cause can indeed be powerful facilitators of change, what explains their potency? One reason may be that our notions of time and our temporal routines are deeply entrenched and directly related to the way we see the world (Zerubavel 1981, Dubinskas 1988). During normal periods, we are constantly aware of the *passage* of time—in terms of deadlines, meeting times, departure times, and the like—yet we rarely question or examine our underlying assumptions *about* time. As social scientists and as organizational actors, we see time as merely the background against which things happen (Barley 1988, Dubinskas 1988). The presence of a known, reliable temporal structure is central to the way we interpret objects and events (Bordieu 1977, Zerubavel 1981). Even a mundane event (a friend calling to say hello or someone asleep in bed) demands a new interpretation if it occurs at an abnormal time.

This suggests that temporal shifts are essentially interpretive shifts: They involve new ways of thinking about time, how much control one has over time, and how one can best use time. Because such rethinking represents a departure from the assumptions that anchor our understanding of the world, experiencing a temporal shift helps people to entertain the idea that the world is shifting, conditional, and open to their own interpretation—instead of stable and easily defined (Langer 1989). Thus, a temporal shift is almost literally like the ground shifting under our feet, and has much the same effect. It encourages us to examine where and how we walk with unusual mindfulness.

An important difference, however, is that a real earthquake often leaves people feeling powerless. In contrast, a temporal shift often leaves people with the sense that time and temporal routines are at least somewhat under their own control, rather than simply a series of constraints. Recall that one manager at Desktop put it: "We finally put time into the equation." That is, their experience with buffer time helped people realize that time is malleable—it can be used in a variety of ways. In this and many other cases, when people began to treat time as a variable, partly under their control, they gained not only an immediate benefit (they resolved long-standing problems), but also a more lasting one (greater control over their environment).

Another reason why temporal shifts can have power to facilitate change is that they involve heightened emotions (Mandler 1975). As Weick (1990, p. 23) suggests, "interruptions . . . are sufficient and possibly necessary conditions for arousal and emotional experience." And as psychologists have noted, emotion-laden cognition is often the most thorough and the most apt to produce true cognitive shifts (Abelson 1963). Indeed, we witnessed situations where, following temporal shifts, people turned their attention to a wide spectrum of problems and issues that had previously been suppressed or ignored.

Given the potential power of temporal shifts to evoke fundamental change in how people structure work in organizations, it is also important to note that such shifts do not automatically lead to change. Indeed, it is interesting to recognize that even in the sites we studied, where change did occur, there was considerable variation in the degree of change involved. At Ditto and Desktop, temporal shifts produced fundamental and lasting changes in people's conceptions of time and in the work rhythms they established. At BBA, by contrast, temporal shifts helped people to undertake specific technical adaptations but left no lasting mark on individual or organizational ways of using and thinking about time. Nor did managers come to recognize that interruptions in regular production rhythms could be used (and even created) to considerable advantage.

We can only speculate about some reasons for this difference. First, managers at BBA were further removed from project reality than was true at our other sites. Indeed, the patterns observed at BBA—that significant technical change was generally undertaken only during an interruption in regular work schedules—was not even recognized by the managers in charge. Further, and perhaps an important reason for the above, rhythm-changing events at BBA were exogenous occurrences, seen as outside of managers' control and treated as inevitable interruptions of "real productivity." By contrast, at Desktop and at Ditto, managers consciously and purposefully created rhythm-changing events, both to enable technical change and to encourage greater reflection about the work and how it was being done. This suggests, not that accidental time-outs cannot have lasting effects, but that managers would be wise to understand that events such as shutdowns or accidents are not simply nuisances, but are also opportunities for change. When outside events interrupt organizational rhythms, managers may need to take deliberate action to exploit and build on the disruptive effects.

Conclusion

Seen in the context of previous research, this paper makes several contributions. First, we have presented and illustrated a novel methodological approach, which allowed us to reanalyze and integrate qualitative data from three separate and already completed field studies. Drawing on the work of Glaser and Strauss (1967), Yin (1984), and Eisenhardt (1989), we developed an approach for reanalyzing existing data and for integrating data from different

studies. This enabled us to address new questions, and we hope it will prove fruitful for examining other organizational phenomena in the future.

Second, while others have proposed intriguing connections among timing, rhythms, and change processes (March and Simon 1958, Gersick 1994, Brown and Eisenhardt 1997), we have sought to explore the mechanisms underlying these connections. The framework we propose, although clearly only suggestive, indicates that the interpretive shifts involved in a changed experience of time can facilitate collective reflection and action in four complementary ways (as summarized in Figure 1).

Third, we add to the discussion of the role of time and timing the observation that what matters is not only the objective facts of time in organizations (such as project deadlines, temporal milestones, or the tempo of work), but also the felt experience of time. As Hall has pointed out, "time is not just an immutable constant, as Newton supposed, but a cluster of concepts, events, and rhythms covering an extremely wide range of phenomena" (1983, p. 13). In fact, individuals and groups can experience a given block of time in diverse ways: as moving fast or slowly, as ample or too scarce, as passing by or being spent or pushing them ever faster (Dubinskas 1988). Indeed, our data illustrate that what is significant is often how individuals and, especially, collectives experience time—and the powerful impact that shifts in that experience can have.

Finally, this paper offers a way of viewing "event-triggered" change and "time-triggered" change as interrelated processes, not as separate systems. The management literature contains a long and distinguished tradition of research exploring how surprising or problematic events can enable groups and organizations to step out of established routines and undertake change (e.g., March and Simon 1958, Hedberg 1981, Meyer 1982). More recently, researchers have described and offered important insights about "time-paced" change in organizations (Gersick 1988, 1991; Brown and Eisenhardt 1997). However, to date, these two paths to change generally have been considered separate systems.

This paper builds on such insights by suggesting that time and events can work interdependently to facilitate organizational change. We show that, by affecting the established rhythms of work and by altering people's experience of time, events shape time itself. Further, we suggest that it is this very ability of events to shape time that helps organizational change occur. Thus, scholars and managers do not necessarily have to choose between two distinct approaches in thinking about the forces for change in organizations. Rather, scholars may gain deeper insight by understanding that unusual events can facilitate change both because they confront actors with problems and because they alter organizational rhythms. Similarly, managers might proactively facilitate change by creating events that break the expected temporal flow of work, thus using both time and events to trigger adaptation. In effect, we need to be alert to a wide variety of occurrences—from random distractions to managerial policy announcements—that have the power to alter how a collective perceives and uses its time, because such alterations can have profound effects on possibilities for change.

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Endnotes

*Additional details about the original studies are available from the second author.

[1]All company names are pseudonyms.

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