PATH NETS: CONCURRENCE AND RECURRENCE IN THE DYNAMICS OF ORGANIZING

Brian T. Pentland
Michigan State University
pentland@broad.msu.edu

Waldemar Kremser
Johannes Kepler University Linz
waldemar.kremser@jku.at

Kenneth T. Goh
Singapore Management University
kennethgoh@smu.edu.sg

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AUTHOR BIOGRAPHIES

Brian T. Pentland (pentland@broad.msu.edu) is the Main Street Capital Corporation Intellectual Capital Endowed Professor in the Eli Broad College of Business at Michigan State University. His research is focused on the analysis of repetitive patterns of action, such as organizational routines.

Waldemar Kremser (waldemar.kremser@jku.at) is Professor and Head of the Institute of Strategic Management at Johannes Kepler University, Linz. In his research, he is combining a routine dynamics perspective on organizations with insights from complexity theory and other fields like strategy and organization design. He is most interested in open strategy processes, decentralized forms of organizing, self-reinforcing dynamics and radical innovations.

Kenneth T. Goh (kennethgoh@smu.edu.sg) is an associate professor of strategy & entrepreneurship at the Lee Kong Chian School of Business, Singapore Management University. He received his PhD from The Tepper School of Business, Carnegie Mellon University. His research explores the dynamics of change and innovation processes in teams and organizations.

ABSTRACT

This article proposes a link between temporal structuring and the dynamics of organizing that is manifest in a fabric of concurrent paths that we call a *path net*. Path nets are shaped by mechanisms of temporal structuring, such as entrainment, planning, agency, and chance. Path nets materialize the effects of temporal structuring "here" and "now" in the comings and goings of actors and resources, thereby setting the stage for doings and sayings of situated practice and shaping the dynamics of organizing. Path nets offer a parsimonious system of picturing the complexity of organizing that is built on a processual ontology of paths and events. Through the lens of the path net, we can picture temporal structuring as a motor for organizing that drives recurrence without assuming stability or change. Comings and goings are readily observable, so path nets open new directions for empirical research on temporality and the dynamics of organizing.

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INTRODUCTION

Because nothing exists outside time, temporal structures provide the foundation on which all other organizing unfolds. Temporal structures are patterns in the timing and sequence of events, such as typical paces and rhythms in organizational work (Geiger, Danner-Schröder, & Kremser, 2021). Within formal work organizations, temporal structures manifest as work schedules and deadlines, project timelines, calendars for meetings and events, and fiscal year planning cycles, all of which coordinate and regulate the timing and sequence of work-related activities (Blagoev, Hernes, Kunisch, & Schulz, 2023). Zerubavel (1981, p.2) argues that temporal structures (re)create a "socio-temporal order which regulates the structure and dynamics of life."

Empirical research in temporal structuring (Blagoev et al., 2023) and process organization studies (Langley & Tsoukas, 2016) has identified a number of different mechanisms, such as entrainment, planning, agency, and chance, each highlighting a different link between temporal structuring and organizational outcomes (e.g., Perlow, 1999; Turner & Rindova, 2018; Hilbolling, Deken, Berends, & Tuertscher, 2022; Hopp & Greene, 2018; Dille, Hernes, & Vaagaasar, 2023). These temporal structuring mechanisms have typically been analyzed independently of each other.

In organizations, however, the timing of events is typically not the outcome of a single mechanism. Rather, it emerges from a combination of different mechanisms. Consider a project meeting for a consulting team, as described by Kremser and Blagoev (2021). For the meeting to take place, the team needs to come together (physically or virtually). Regardless of how it is

planned or scheduled, if a key stakeholder has conflicting priorities or falls sick unexpectedly, the meeting could be delayed, rescheduled or canceled. Consequently, no single mechanism controls the flow of events as they unfold in time and over time.

Cloutier and Langley (2020: 5) argue that "Process theorists … need to identify the event-based contingencies that are likely to redirect pathways over time." We agree, but multiple pathways associated with different people and elements flow concurrently and influence each other. For example, each member of Kremser and Blagoev's (2021) consulting team engages in a temporally ordered progression of events that we conceptualize as their path (Goh and Pentland, 2019). These paths need to be woven together in time for the path of the project to progress. Furthermore, multiple projects are woven together by the paths of the consultants, the clients, and other resources. To grasp this complexity, we need to broaden our perspective from a view of single, independent paths to a more comprehensive view that considers the interactions of concurrent paths.

As we shift from individual paths to concurrent paths, we no longer aim to identify contingencies that redirect individual paths (e.g., "nudging", Thaler, 2008). Rather, we are taking a systemic view that explains the dynamics of stability and change in organizations and beyond (Cloutier & Langley, 2020). Thus, our question is framed more broadly: how does temporal structuring influence the dynamics of organizing? Across the diverse landscape of organizing processes, *when* and *where* events occur influence *what* happens, and vice versa. However, the theoretical link between temporal structuring and the dynamics of organizing remains murky.

To address this gap, we introduce path nets as a parsimonious way of conceptualizing and picturing the relations between events and paths. Path nets build on the idea that paths are formed by a temporal progression of events (Goh & Pentland, 2019). For example, we can think

of workflows, customer journeys and consulting engagements as paths. The events that form a path are formed by intersections with other paths. For example, the paths of clients and consultants intersect in client meetings. When concurrent paths are woven together in events, they form a path net.

To understand the implications of path nets for the dynamics of organizing, we borrow and translate ideas from anthropology (Ingold, 2016), sociology (Gerstel & Clawson, 2018), time geography (Hagerstrand, 1970; Pred, 1984), process mining (van der Aalst, 2011; Fahland, 2022), and project management (Lock, 2016). Path nets provide the missing link between temporal structuring and the dynamics of organizing as they help us to understand the shaping of opportunities available "here" and "now" (situated in place and time). By shaping the presence (or absence) of opportunities for actants to interact (or not), path nets set the stage for the subsequent dynamics of organizing.

Our theorization of path nets involves four conceptual innovations that advance the conversation about time, place and process in organizations: (1) path nets integrate multiple mechanisms of temporal structuring into a motor that drives recurrence; (2) they explicitly include concurrent paths as an aspect of temporal structure; (3) they offer a novel ontology where events and paths are mutually constitutive; and (4) they reconceptualize "here" and "now" as social places with duration rather than an instantaneous point in time and space. Path nets provide a parsimonious system of picturing (Tsoukas, 2017) the relationships between events and paths that reveal the connection between the mechanisms of temporal structuring and the dynamics of organizing.

Our paper proceeds as follows. First, we articulate the central puzzle: connecting temporal structuring to the dynamics of organizing. Then, we explain the link between temporal

structuring and path nets. We argue that the mechanisms of temporal structuring (entrainment, planning, agency and chance) do much more than shape temporal structures. Taken together, they shape the opportunities that arise from the comings and goings of actants that form a path net. We illustrate this argument with examples of path nets from everyday life. We discuss how the basic concepts of event, path and path net are defined and related to other theoretical concepts. Then, we articulate the link between path nets and the dynamics of organizing. Path nets provide a system of picturing the complexity of becoming and organizing (Tsoukas & Chia, 2002), and they account for the dynamic effects of concurrent paths. A focus on path nets allows us to see temporal structuring not just as a "change motor" (Van de Ven & Poole, 1995), but as a motor for the dynamics of organizing, which encompasses both stability and change. Finally, we discuss the implications for organizational research and practice of the conceptual innovations incorporated in path nets.

BACKGROUND: FROM TEMPORAL STRUCTURING TO PATH NETS

This article joins the conversation about temporal structuring (Orlikowski & Yates, 2002), process organization studies (Langley & Tsoukas, 2016) and what Blagoev, Hernes, Kunisch, and Schulz (2023) call the time-as-structure research lens. In this conversation, temporal structuring comes in many varieties, each with its own distinct mechanism. The existing literature identifies implicitly at least four basic mechanisms of temporal structuring, including (a) entrainment (e.g., Ancona & Chong, 1996; Pérez-Nordtvedt, Payne, Short, & Kedia, 2008); (b) planning/scheduling, as exemplified in the disciplines of project management (Lock, 2016) and operations management (Kreipl & Dickersbach, 2008); (c) agency (e.g., Orlikowski & Yates, 2002; Bansal, Reinecke, Suddaby, & Langley, 2022); and (d) chance (Abbott, 2001) or serendipity (Hilbolling et al, 2022). Each published study offers a useful

example of how temporal structures affect organizing, but the emphasis has been on identifying distinct mechanisms rather than proposing an integrated framework.

The lack of an integrated framework leaves a gap. Recently, Reinecke, Suddaby, Langley and Tsoukas (2020, p. 2) introduced an edited volume on *Time, Temporality, and History in Process Organization Studies* by pointing out the lack of a central theoretical puzzle and conceptual tools in this domain:

> Despite the growing interest in temporality and history, their precise relationship to processes of change remains woefully undertheorized. … Both subjects lack what Kuhn (1967) would describe as a defining "puzzle" or anomaly in how we understand organizational change or "becoming" (Tsoukas & Chia, 2002). Relatedly, we lack a coherent set of conceptual tools that can be applied to ongoing research directed to addressing the puzzle.

In this article, we propose a central puzzle: *How does temporal structuring affect the dynamics of organizing?* By temporal structuring, we mean the collection of mechanisms that generate temporal structures, such as entrainment, planning, agency and chance. Following Weick (1979) and Tsoukas and Chia (2002), we argue that the dynamics of organizing can be operationalized in terms of *recurrence*, which we define as the tendency of similar events to occur at different times (Marwan & Webber, 2015). Difference is inevitable in any processual phenomenon (Deleuze, 1994), so recurrence does not imply static repetition. Recurrence is needed for the continuation of existing paths and the formation of new paths (Sydow, Schreyögg, & Koch, 2020). We focus on recurring events because recurrence provides an elegant way to operationalize stability and change in organizations (Farjoun, 2010) and in complex dynamic systems (Dooley, 2004).

This research question provides a truly central puzzle because the connection between time and recurrence is axiomatic – there can be no recurrence without time, and time would become meaningless if there were no recurrence. Implicitly or explicitly, recurrence is

foundational for all levels of social organization, including routines (Feldman and Pentland, 2003), organizational path dependence (Sydow, Schreyögg, & Koch, 2020) and institutions (Ocasio, 2023). At any scale, the rhythm and dynamics of social organization are manifest through recurrence.

We cannot solve this puzzle in a single paper, but we can offer a conceptual toolkit for working on it: the path net. Path nets provide a system of picturing (Tsoukas, 2017) and an ontology of the social world that connects actants, place and time through the flow of paths and events. In a nutshell, temporal structuring does not simply structure time; it structures the recurrence of events that create (and preclude) opportunities for interaction and, in doing so, shape the dynamics of organizing.

Path nets in everyday life

To make our terminology as clear and concrete as possible, we begin with everyday life examples that show how the mechanisms of temporal structuring weave our paths together. We will use these examples throughout the article and supplement them with published illustrations.

Imagine you are a professor at a university. A typical day involves reading, writing, emailing, eating lunch, teaching class, and so on. You work at home, so you can do most of these things anytime, in any order, with minimal interruption. You can block out time for each activity or squeeze something in when the opportunity arises. Each day, this temporal progression of events forms your path.

Now, imagine that three of your colleagues live nearby. We will refer to you and your colleagues as A, B, C, and D. You are trying to get a project started, so you invite B for lunch at your favorite food truck. You plan to meet at 1:00 p.m. because that's when the food truck will be outside your building. By chance, you bump into your colleague, C, who you rarely see

because she works in another part of campus, but your colleague D is busy elsewhere. All of this is shown in Figure 1.

FIGURE 1
Lunch at the food truck

***** insert Figure 1 here *****

This simple example illustrates two ideas that provide the foundation for our theory. First, events like lunch are typically formed by a combination of the temporal structuring mechanisms of entrainment (Ancona & Chong, 1996), planning (Lock, 2016), agency (Bansal et al, 2022) and chance (Abbott, 2001). Lunch is *entrained* to biological rhythms and the rhythm of the food truck. B's willingness to join the lunch expresses his *agency*. You make a *plan* to meet B, but C joins you by *chance*. Second, events like lunch have a duration and a social place (Pred, 1984; Ingold, 2008), and both are constituted by the intersection of paths (A, B, C and the food truck). Events like lunch are social places that form when your paths come together and dissolve when your paths separate, as shown in Figure 1.[1]

Of course, typical days look more like Figure 2. D will be flying in from Los Angeles in the morning. Most of you will be teaching classes. That evening, there will be a reception for a conference that is scheduled to start the next day. For clarity, Figure 2 shows only the paths of you and your colleagues. In practice, everything has a path (Baygi, Introna, & Hultin, 2021): the food truck, the students, the other passengers on the flight, the flight crew, the plane itself, the other people attending the reception, and so on.

[1] There are many ways to visualize intersecting paths. We have deliberately drawn these figures to be as simple as possible, so anyone can sketch out a path net. We used the Apple Notes app in iOS and an Apple Pencil, but a real pencil and paper will work just as well. The figures are a little fuzzy because real paths and events are fuzzy. In these figures, the paths and events are all just lines, but the events are much wider to signify that they are comprised of multiple paths.

FIGURE 2
Concurrent paths and mutually exclusive events

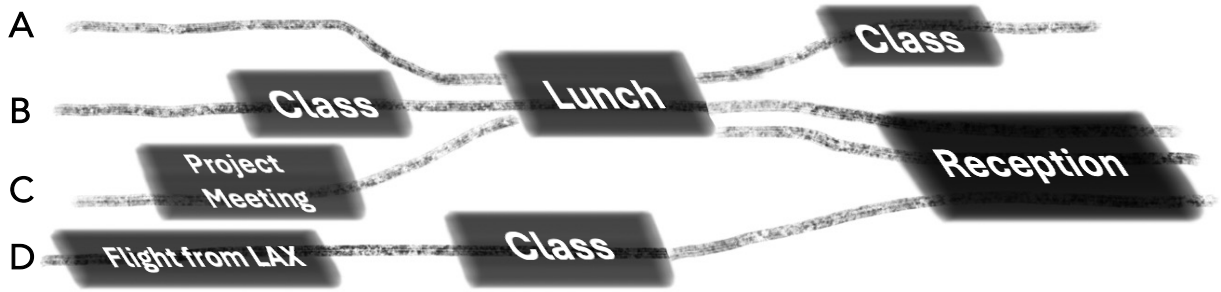
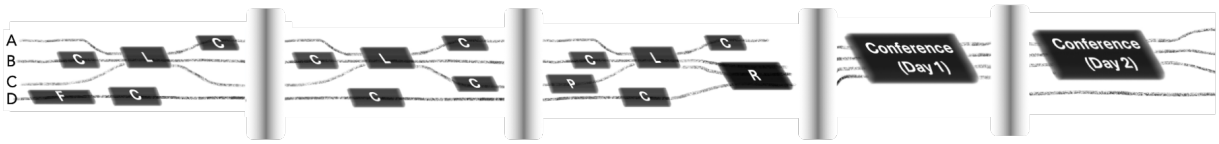


Figure 2 introduces two more key ideas: *concurrent* paths and *mutually exclusive* events. Each path in Figure 2 (A, B, C and D) is formed by a temporal progression of events. Some of them are sequentially dependent (Thompson, 1967). For example, D has to arrive from LA before her class. However, the specific sequence does not matter for many of these events, but the *timing* does. Timing is important because it can create schedule conflicts. When timing creates a schedule conflict, the events are mutually exclusive. For example, you have an evening class, so you cannot attend the reception. D cannot join you for lunch because of her class. As a result, D was excluded from a conversation that might lead to co-authorship on a paper. Opportunities and exclusions can be formed by chance, as well. For example, if her flight from Los Angeles is late or canceled, D will miss class, and she might ask you to fill in. If she can't get another flight, she might miss the reception, as well. Each of these events affords opportunities for interaction, but every event precludes other events because we cannot be in two places simultaneously. Some people meet for lunch, and others have class. Some people become co-authors, and others do not. This is the subjective experience and objective effect of path nets in everyday life.

Finally, in Figure 3, we can see how the days flow together. As we zoom out, we see *recurrence* in the flow of concurrent paths. Like the river of Heraclitus, every day is different. The specific events are never identical, but they can be recurrent if they include some of the same constituent paths (people, planes, trucks, classrooms, and so on). Lunches, classes and conferences can be recurrent on different time scales that extend beyond Figure 3 (week to week, year to year).

FIGURE 3
Recurrence in the flow of paths/events



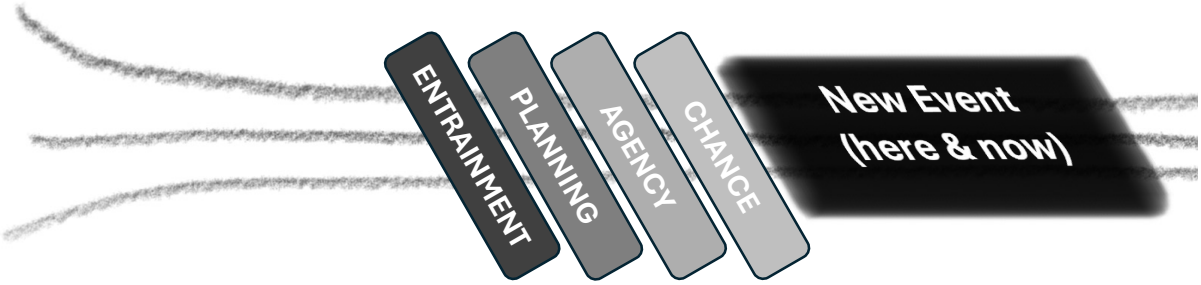
C = Class; F = Flight; L = Lunch; P = Project Meeting; R = Reception

The problem with current theory: a lack of integration

These simple examples suggest that entrainment, planning, agency, and chance interact to shape the comings and goings of actants and, consequently, the formation of events. The current literature does an excellent job of explaining each mechanism, but the theoretical story is incomplete because it overlooks the interactions of these mechanisms. Figure 4 provides a visual overview of the integrative perspective we propose here. In the following paragraphs, we examine how each of these mechanisms contributes to an integrative process of temporal structuring.

FIGURE 4

Temporal structuring weaves paths into events



Entrainment. Entrainment refers to the synchronization of organizational rhythms with dominant cycles within or outside of organizations (McGrath, Kelly, & Machatka, 1984). For example, lunch may be entrained to the rhythm of the food truck, which is entrained to the rhythms of the city. Entrainment ensures that temporal structures are aligned with each other and environmental patterns, such as market cycles or regulatory timelines (Ancona & Chong, 1996). It emphasizes the adaptive aspect of temporal structures, showing how organizations and teams adjust their temporal rhythms to external temporal pressures (Ancona & Waller, 2007; Khavul, Pérez-Nordtvedt, & Wood, 2010). Through entrainment, organizations achieve temporal fit with their environment, which can enhance efficiency and effectiveness (Pérez-Nordtvedt et al., 2008; Shi & Prescott, 2012).

Entrainment provides a natural engine for recurrence. Entrainment explains how one path becomes synchronized with other concurrent paths. Lunch is entrained to the food truck, which is entrained to the Earth's daily rotation. The conference schedule is entrained to the academic calendar, which is entrained to the Earth’s orbit around the sun. However, the basic theory of entrainment leaves little room for planning, agency, or chance. As a result, early versions of entrainment theory have been criticized for being rather mechanistic (e.g., Blagoev & Schreyögg, 2019).

Planning. Planning involves designing temporal rules (such as schedules, deadlines, Gantt charts, etc.) to achieve specific goals (Aeon & Aguinis, 2017). Planning is directed

towards the creation of artifacts (i.e., plans) that prescribe the legitimate sequence, duration, and timing of tasks (Brown & Eisenhardt, 1997). Planning can be seen as organizational because it reflects an agent's attempt to control its temporal environment, using schedules, deadlines, and timeframes to coordinate actions and resources (Drucker, 1967). Project plans provide a canonical example of rational planning (Obstfeld, 2012). Projects bring together a mix of actors and resources that varies over time, within projects and between projects. The conceptualization of planning assumes the predictability and controllability of time (Blagoev et al., 2023), aiming to optimize the allocation and use of time towards strategic objectives (cf. DeSnoo, Van Wenzel, & Jorna, 2011).

Like entrainment, planning tends to generate recurrence. For example, class meetings are scheduled at the same times each week, and class schedules are often copied from one year to the next. Every event in Figure 2 involves at least some planning (lunch, classes, flights, receptions…). However, plans are fragile and easily disrupted by competing priorities and chance events (Kremser & Blagoev, 2021). An essential actant (such as the classroom or the professor) may be unavailable on any given day. Students may need extra time to complete an assignment. The practice of project management underscores the integrative nature of temporal structuring. Good plans entrain with external temporal structures (e.g., seasons, calendars…) and include contingencies (e.g., slack in the schedule or budget) for chance events and the interests of key stakeholders (Lock, 2016).

Agency. Agency represents the capacity of actors to reflect on and influence temporal structures *as they enact them* (Orlikowski & Yates, 2002). This is different from the agency involved in planning, as the actions necessary to develop a temporal rule are different from those that enact it. Put differently, planners have agency, but the enactment of a plan will often depend

on the agency of others. Agency is deeply implicated in the social construction of time and vice versa (Emirbayer & Mische, 1998); temporal structures are created and recreated in and through human (inter-)action and reflection (Oborn & Barrett, 2021). In organizations, individual as well as collective actors can exercise agency, for example, by (re-)negotiating deadlines (Granqvist & Gustafsson, 2016) or (re-)prioritizing tasks (Kremser & Blagoev, 2021) to reflectively pace their work.

Agency can reinforce recurrent events like lunch at the food truck. For example, A, B and C may maintain a lunch schedule to facilitate a research collaboration. There are always competing priorities, so even a simple lunch meeting requires deliberate effort and attention (aka, agency, to make a plan and then enact it). Consequently, agency often introduces variability and flexibility into temporal structures as organizational members adapt to, resist, or reinterpret prescribed temporal norms and rules based on their interests, values, and interactions (Rowell, Gustafsson, & Clemente, 2016).

Chance. Chance events introduce unpredictability into the formation of temporal structures. Random events, unexpected disruptions, or serendipitous opportunities can alter the intended flow and timing of organizational activities (Morgeson, Mitchell, & Liu, 2015; Roulet & Bothello, 2023). To manage unpredictability, organizations often resort to resilience-building practices. In doing so, they will often develop capabilities to maintain operational continuity under varying temporal conditions (Stoverink, Kirkman, Mistry, & Rosen, 2020). This resilience enables organizations to withstand temporal disturbances and emerge stronger and more adaptable to future temporal challenges (Weick & Sutcliff, 2007).

Almost by definition, chance events seem to undermine recurrence. They can challenge both the synchronization of efforts through entrainment and the predictive logic of rational

planning (Pérez-Nordtvedt, Khavul, Harrison, & McGee, 2014) while, by definition, remaining exogenous to agency. At the same time, chance can also create "serendipitous moments of temporal alignment" (Hilbolling et al. 2022: 155), which might increase recurrence. In any case, because of chance, the flow of events is never entirely controllable, predictable or recurrent.

Authors have typically highlighted particular mechanisms in published accounts of temporal structuring, but other mechanisms are always present. For example, Dille et al. (2023) focus on entrainment in their analysis of an interorganizational project to implement a new national emergency communication system in Norway. This focus allowed them to show that none of the participating organizations simply entrained to an exogenous zeitgeber. Rather, the process of entrainment required effort and agency to translate between different temporal structures.

Other studies have put agency in the foreground. For example, Orlikowski and Yates (2002) analyzed a project with over 100 developers working to standardize the LISP programming language. Their account of that case illustrates the importance of agency in temporal structuring, both in planning and enacting temporal rules. They used the concept of agency to explain how the temporal structures in the project shifted from open-ended and event-based to being more closed and deadline-oriented. While Orlikowski and Yates (2002) focused on agency, planning was also present throughout the project, as designers and programmers scheduled meetings and milestones for their work.

Many studies put planning in the foreground (Claessens, Van Eerde, Rutte, & Roe. 2007). For example, De Snoo, Van Wezel, and Jorna (2011) analyzed qualitative and quantitative data from firms in the manufacturing, transportation, and service industries. Across a wide range of different scheduling situations, they found that activities to develop, adapt, and communicate a

schedule become more important in contexts characterized by higher levels of uncertainty. This points towards an interaction of two temporal structuring mechanisms, planning and chance. By focusing on planning, De Snoo et al. (2011) move chance to the background. Chance is treated as a variable that moderates the effectiveness of specific planning methods and not as a temporal structuring mechanism in its own right.

In contrast, Hilbolling et al. (2022) focus on chance as an independent temporal structuring mechanism. Their empirical analysis of the "living lab" initiative, designed to foster innovative approaches for boosting safety and economic growth in urban nightlife districts, reveals that chance does not simply affect the efficacy of planning. Instead, chance encounters with different organizational actors, each progressing on their own path with their own purpose, turned out to be critical for the development of this initiative. For example, Hilbolling et al. (2022) describe how the paths of one firm, one university, and two municipal departments "turned out to serendipitously coincide" (148). As a result, the organizations became aware of how they could help each other by jointly developing a research proposal to improve the area's safety and economic viability.

Each of these studies contributes to our understanding of a particular mechanism of temporal structuring. At the same time, they show that the mechanisms do not operate independently. Even a simple lunch meeting involves entrainment, planning, agency and chance. It should not be surprising that complex undertakings like standardizing a computer language or implementing a national emergency communication system involve multiple mechanisms, too.

Path nets as fabric with many concurrent paths

The mechanisms of temporal structuring are deeply interwoven because events form through the interaction of concurrent paths. Our choices, opportunities, and plans co-evolve with

the actions, schedules, and rhythms of everyone and everything around us. Schatzki (2020: 40) describes this as a *net of interwoven time-spaces*.

> The organization, regularities and settings of a practice engender a net of interwoven timespaces, a net of interwoven jointly instituted futures-presents-pasts and place-path arrays. This net, incidentally, is a property of the practice. The activities of individual people are what possess futures and pasts and are performed at particular places and paths.

Morin (2008: 5) describes this network as a "fabric of events, actions, interactions, retroactions, determinations, and chance that constitute our phenomenal world."

Fabric provides a powerful metaphor for our theory of path nets because fabric consists of many threads. In processual terms, we can capture the multiplicity of threads with the concept of *concurrency*. In computer science, concurrency refers to the ability of a system to perform multiple tasks simultaneously, with the tasks making progress independently (Van der Aalst, 2021). The relation to some outcome or result is what makes otherwise unrelated threads part of the same fabric. This relation can be close, like multiple processors executing different parts of a program to compute a single result, or more distant, like multiple users interacting with a website at the same time as part of a larger web application. The processors and users are operating concurrently, within the same time window, but not necessarily in lock-step or with sequential interdependence.

Concurrency can be seen in many organizational settings. For example, at a food truck, imagine that A places the order for A, B and C. Inside the truck, different staff members can work on separate orders concurrently, with one cooking burgers, another preparing side dishes, and a third handling the register. While there may be some sequential dependencies (e.g., the burger must be cooked before it's assembled), much of the work can progress independently and overlap in time, allowing multiple orders to be processed efficiently. The customers receive their

orders as they are completed, not necessarily in the sequence they were placed. In other words, there is concurrent activity both in order placement and order preparation. While concurrency is a foundational idea in computer science and process management (Van der Aalst, 2011), it is all but absent from organization theory, except for a small literature on concurrent engineering (e.g., Eppinger, 1991; Koufteros, Vonderembse, and Doll, 2001).

This omission is surprising because concurrency is pervasive in organizations. We speculate that concurrency has been overlooked because of our tendency as a discipline to simplify (Tsoukas, 2017). For example, in their study of video game developers, where many developers work concurrently on different parts of the game, Goh and Pentland (2019) trace the workflow as a unitary path between developers. Likewise, Hernes (2021) offers a theory of events based on the subjective experience of a single focal agent listening to *Time*, a song by Pink Floyd. The single-path perspective encourages a focus on habits, sensemaking, agency, and lived experience of a focal agent (Reinecke and Ansari, 2015; Introna, 2019; Hernes and Obstfeld, 2022). But it has left us with a blind spot: what about the other concurrent paths?

The gravity of this omission becomes clear when we realize that organizations consist of many settings, each of which is inhabited by a cast of characters that can include workers, customers, vendors, raw materials, work in process, machines, algorithms, and information, *all flowing concurrently* (Baygi et al., 2021). To understand the relationship between temporal structuring and the dynamics of organizing, we need a "system of picturing" (Tsoukas, 2017: 148) that allows us to theorize, visualize, and grasp the complex, unfolding fabric of events formed by concurrent paths.

PATH NETS: A PROCESSUAL ONTOLOGY OF ORGANIZING

This section provides more formal definitions of our central constructs (events, paths and path nets) and explains their relation to other concepts. Path nets are processual in the sense that they are based on temporal progressions of events (Van de Ven, 1992). Path nets relate to a vast array of literature and they describe an open-ended set of phenomena. Given all that, path nets are surprisingly parsimonious: just two constructs (events and paths), with simple definitions, that can readily be observed.

Events, paths, and path nets are mutually constitutive

Events, paths, and path nets are mutually constitutive in the sense that each is formed by the others. Table 1 provides an overview of these three concepts and a family of related concepts. We state all three definitions here to emphasize that they are a tight conceptual package. Then, we unpack each definition separately, explaining each in more detail.

Table 1
Definitions and related concepts

Concept	Definition	Related concepts
Event	A set of paths that intersect "here and now"	Correspondence (Ingold, 2016) Intersection (Fahland, 2022) Situation (Suchman, 1984) Site (Schatzki, 2002) Scene (Goffman, 1959) Setting (Leont'ev, 1975)
Path	A coherent, temporally ordered progression of events	Line (Ingold, 2007) Flow (Baygi et al, 2021) Process instance (Van der Aalst, 2011) Narrative (Abbott, 1992) Trajectory (Hernes et al, 2021)
Path Net	A fabric of events formed by concurrent paths	Meshwork (Ingold, 2008) Network of interwoven time-spaces (Schatzki, 2020) Gantt chart (Lock, 2016) Event knowledge graph (Fahland, 2022)

Concept	Definition	Related concepts
		Web of time (Gerstel and Clawson, 2018)

Events

We define events as paths that intersect "here and now" (i.e., in a specific place and time, as described below in more detail). Morgeson et al. (2015, p. 519) attribute a similar concept of events to Allport (1940, 1954): "When entities meet, events can occur." For Allport, an entity is any "explicitly denotable thing" – a person, object, artifact, algorithm, idea, symbol, team, organization – like an *actant* in actor-network theory (Latour, 2005). Our definition diverges in one small but important way: we say that events are formed by *paths*, not just *entities*. Equating entities and paths would erase the inherent temporality of paths, which are defined in the next section. As Morgeson et al. (2015) point out, this definition is extremely broad. Morgeson et al (2015) restrict their attention to exceptional, disruptive events, but we include mundane, repetitive events, such as lunch at the food truck.

Event belongs to a family of related terms, including correspondence (Ingold, 2008), situation (Suchman, 1987), scene (Goffman, 1959), site (Schatzki 2002), and intersection (Fahland, 2022). Some of these terms may seem like distant cousins, but the family resemblance is deep: they all involve the paths of multiple actants situated in place and time. Morgeson et al. (2015: 520) provide a succinct statement of the core idea: "Events are bounded in space and time (i.e., discrete) such that they have an identifiable temporal beginning and end and evolve in a specific setting." Events are always situated (Suchman 1987). Events are the scene of encounters (Goffman, 1967), the setting for activities (Leont'ev, 1975; Engeström, 2014) and associations (Latour, 2005), the site of the social (Schatzki, 2002) and the locus of lived experience (Ingold, 2008).

Duration. Every event has a *duration.* Some events are very brief; others can last for years. The duration of an event reflects both clock time (an objective quantity that an outside observer could measure) and process time (a subjective quality as experienced by the participants) (Reinecke & Ansari, 2017). For example, a class might last 80 minutes objectively, in clock time, but it might seem to last forever subjectively, in process time. Regardless, its duration will be bounded by the comings and goings of actants.

Place. Every event also has a *place*. We conceptualize *place* as a "constantly becoming human product" (Pred, 1984: 279) defined by intersecting paths, not physical coordinates in space. Places can be virtual (such as in an online class, project meeting, or conference), and they can move (such as in an airplane). Lunches, classes, meetings and conferences happen in places, but they need not be in fixed or co-located physical spaces. A conference can be virtual, with participants physically located worldwide. Events occur in social places formed by their constituent paths, not their physical coordinates.

Joining and separating. Following Allport (1940), events begin/end when the constituent paths join/separate. Therefore, the place and duration of an event are marked by the comings/goings of the actants. Flights, lunches, classes and conferences all operate on this principle. Comings and goings need not be synchronized; at conferences, people typically arrive and depart at different times.

To be very clear, we are <u>not</u> saying that merely putting actors in a scene will automatically result in an episode of joint action (Hilbolling et al, 2022) or meaningful correspondence (Ingold, 2008; Baygi et al., 2021). However, we <u>are</u> saying that joint action is precluded if paths have no opportunity to intersect. During an event, like a class or a conference,

paths provide context for each other. Events create opportunities for interaction that may or may not take place. Comings and goings are necessary but insufficient for doings and sayings.

Events are situated "here" and "now". Place and time are crucial to events because they provide a window of opportunity for interaction. Unfortunately, the present is often taken for granted:

> The weaving together of events takes place in what we call the present. However, in the literature, the present seems to have been taken somewhat for granted as an undefined temporal placeholder for past and future. (Hernes, 2021: 32)

The orthodox view of the present is Newtonian: a moving horizon that generates a new world with each passing instant (Mesle & Dibben, 2017: 34). In this view, the present is a "knife-edge of nowpoints" (Joas, 1997: 171) without duration. Similarly, the Newtonian concept of "here" is an infinitesimal point in 3-dimensional space.

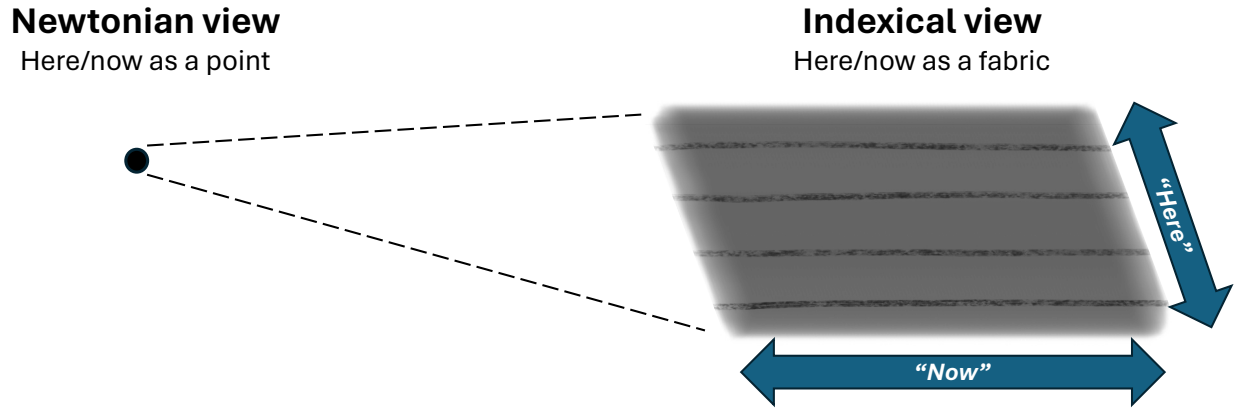
The Newtonian view is mathematically elegant, but it is a poor way to describe our lived experience in the social world, where the present has duration (Bluedorn, 2002; Kim, Bansal, & Hough, 2019; Hernes & Schultz, 2020) and place (Pred, 1984; Ingold, 2008). For example, in their research on tea producers in East Africa, Kim et al. (2019: 626) noted that the farmers saw time as an "extended present":

> … events were intricately woven together and could not be deconstructed into a single process or a discrete point in time. The present is thus not an instant, but an extended duration, so that the present, past, and future are inseparable, connected by a set of processes that seemed to only end when the next year of crops and income began.

To express this social reality, we propose an indexical approach (Abbott, 2001: 295) based on linguistic pragmatics (Levinson, 1983). In this view, "here" and "now" are indexical expressions (Attewell, 1974; Barnes & Law, 1976) that refer to particular places and times, but

they indicate a different referent at each place and time they are used. We depict here/now as a *fabric* rather than a Newtonian point, as shown in Figure 5.

FIGURE 5
Picturing "here" and "now" as a fabric



From an indexical view, "here" and "now" are not points in space or time; they refer to social situations. Situational specificity is inherent in indexical expressions. Indexical expressions evoke "the situational uniqueness that is characteristic of all practical action" (Tsoukas 2017: 132). Consider two simple examples: "Here and now, I am typing this sentence" and "Here and now, the earth is orbiting the sun." These expressions are both objectively true but refer to vastly different physical and temporal scales. In discourse and practice, "now" can extend from milliseconds to millennia; "here" can extend from classrooms to continents.

Past and future events. Finally, while we picture events as formed by comings and goings, here and now, others think of events as discursive structures (Abell, Stokoe & Billig, 2002) that shape and are shaped by doings and sayings. As discursive structures, events appear in the future (plans, projections, expectations), in the past (reports, histories, recollections, reconstructions), and in our imaginations (fables, fiction, fantasies and lies). Past and future events can be reconstructed and reinterpreted (Hernes, 2014; Hernes et al, 2020). A discursive concept of past and future events can be understood as complementary to our concept of events,

as it focuses the analytical attention on the sensemaking that drives dynamics of organizing, rather than on temporal progression as a structuring force. Both are important, but in this article, we focus on the latter.

Paths

Paths are *coherent, temporally ordered progressions of events.* The concept of path closely matches common terms in business and management, such as project, process, workflow, and customer journey. It has a family resemblance with concepts such as line (Ingold, 2007), flow (Baygi et al, 2021), trajectory (Hernes, Hussenot and Pulk, 2021), and narrative (Abbott, 1992). The common denominator among all these concepts is temporally ordered progression (Goh and Pentland, 2019). By *temporally ordered progression***,** we mean that paths unfold sequentially, one event after another. The events along a path mark the progression of time, whether subjectively experienced in process time (as emphasized by Baygi et al, 2021) or objectively measured in clock time (as emphasized by Fahland, 2022). For example, Hernes, Hussenot and Pulk (2021, p. 744) state that "a trajectory is an expression of continuity". We prefer the term path to trajectory because, in common usage, it refers to comings and goings, implying movement (Hagerstrand, 1970; Pred, 1984). In organization studies, the term path has a flexible meaning that can be applied at different levels of granularity and time scales (Sydow et al., 2020; Feuls & Hernes, 2023).

Paths have coherence. By *coherence*, we mean the degree of continuity of constituent paths from one event to the next (Pentland, Recker, & Wyner, 2017; Kim et al, 2024). Metaphorically, a path is like a rope. The rope is most coherent when the same fibers extend the full length. The rope is less coherent when the fibers overlap but do not extend the full length. If

the fibers do not overlap, it is not a rope but a pile of fibers. Likewise, an incoherent collection of events is not a path.

Consider a path that consists of multiple meetings, like a class or conference. The path is more coherent when the meetings occur in the same room, with the same participants; the path is less coherent if the meetings occur in different rooms with different participants. Coherence is an accomplishment that emerges as a path unfolds over time. If there is no coherence, then there is no path.

Paths progress through an open-ended here and now. We conceptualize paths as a temporal progression of events. As such they are always becoming and never repeat themselves (Tsoukas & Chia, 2002). No two events in a path will ever be exactly the same. Paths exist as temporal progressions, a movement through time that has flow (Baygi et al, 2021) and momentum of its own (Kremser & Sydow, 2022). In the here and now, this momentum emerges from the ways in which comings create opportunities for goings - we meet for lunch, and therefore at some point will also have to part ways again - and goings create opportunities for comings - after I have left the lunch meeting, I meet with a friend who happens to sit at a café just around the corner.

Path nets

A path net is a *fabric of events formed by concurrent paths.* Path nets also provide a parsimonious system of picturing that fabric. The path net joins a family of related ideas, including meshwork (Ingold, 2008, 2016; Baygi et al, 2021), the web of time (Gerstel & Clawson, 2018), the net of interwoven time-spaces (Schatzki, 2020), time-space (Hagerstrand, 1970; Pred, 1984) and the event knowledge graph (Fahland, 2022; Klijn, Mannhardt, & Fahland,

2021). The family resemblance of these concepts is based on the inclusion of multiple concurrent paths that are woven together.

Each of these terms refers to a network of concurrent paths from a different disciplinary perspective. For example, Ingold (2009: 38) describes the idea of "meshwork" as the binding together of paths:

> … the lines of the meshwork are not connectors. They are the paths along which life is lived. And it is in the binding together of lines, not in the connecting of points, that the mesh is constituted.

This neatly expresses the central idea of the path net: multiple concurrent paths that join and separate over time. This general idea has been used to describe phenomena at different temporal scales, from seconds to centuries. Fahland (2022) defines events as the intersection of specific paths at specific times and places. Using time-stamped digital trace data, they construct networks of business processes as they unfold, second-by-second. Gerstel and Clawson (2018) use the web of time to examine the effects of work/family schedules, and employment that unfold on the scale of hours and days. In structuration theory, Giddens (1984) used the concept of life paths to explain the regionalization of institutional structures that take shape and endure over the *longue durée*.

Our contribution is to recognize the commonality in this diverse work and its relevance for organization theory. By focusing on the commonality, path nets provide a parsimonious system of picturing that we can use to theorize about the effects of temporal structuring that are only visible when we include concurrent paths. Concurrency has been a blind spot in organization theory. This blind spot conceals path nets, which provide the missing link between temporal structuring and the dynamics of organizing.

IMPLICATIONS FOR THE DYNAMICS OF ORGANIZING

Path nets provide a system of picturing and theorizing about the effects of temporal structuring in a fabric of concurrent paths. With this idea in hand, we are ready to address the central puzzle: how does temporal structuring influence the dynamics of organizing? We address five specific topics: (1) conceptualizing stability and change in terms of recurrence; (2) generating new paths and potentialities; (3) generating patterns of inclusion and exclusion; (4) temporal cascades; and (5) the practical challenge of managing recurrence. Because temporal structuring drives recurrence, it plays a role in all of these phenomena.

Conceptualizing stability and change in terms of recurrence

Stability and change are important and enduring themes in organization theory (Farjoun, 2010; Van de Ven and Poole, 2021). As Tsoukas and Chia (2002) point out, the most common way to conceptualize change is to assume stability as the point of departure. Path nets provide a fresh perspective in this conversation because they assume only the temporal progression of events. We can visualize each new event as a little patch of fabric that weaves together a set of paths, here and now. Every event is new, and differences are inevitable (Deleuze, 1994), but events can be recurrent. For example, conferences, classes, flights, and lunch meetings can all be recognized as recurrent to a greater or lesser extent.

This shift in perspective has enormous implications for conventional theories of organizational dynamics. Path nets are based on a process-first ontology that allows us to see phenomena that are not readily visible with a conventional, thing-first ontology which assumes that change happens to a given *entity* or set of *entities*, and that the entities will remain stable unless acted upon by one or more "motors" of change (Van de Ven and Poole, 1995, 2021).

But consider how this looks from a path net perspective. In organization theory, recurrence is often equated with stability; it is treated as a synonym for simple repetition and a precondition for routines (Feldman and Pentland, 2003), organizational paths (Sydow et al, 2009), and institutions (Ocasio, 2023). However, the achievement of recurrence is also a critical precondition of any successful change effort because it is necessary to create new paths (Garud, Kumaraswamy, & Karnøe, 2010). Recurrence is constitutive of change because it reproduces differences (Deleuze, 1994). New patterns of action will not gain traction unless they become recurrent. Path formation depends on recurrence (Page, 2006; Sydow et al, 2009). Without recurrence, innovation and change are not possible. But with the thing-first ontology of change assumed by Van de Ven and Poole (1995) and others, the role of recurrence is difficult to see. Yet, recurrence plays a fundamental role in the dynamics of organizing because it is essential for the full spectrum of dynamic phenomena, including lock-in, stability, change, drift, innovation, path creation, and transformation. Without recurrence, motors of change such as life cycles, dialectics, evolution or teleology (Van de Ven & Poole, 1995) would not be recognizable.

While Van de Ven and Poole's (1995) change motors are based on an assumption of stability, Tsoukas and Chia's (2002) concept of organizational becoming is based on the opposite assumption: continual change. Drawing on process theories of James, Bergson, and others, Tsoukas and Chia (2002: 570) argue that change is "ontologically prior to organization". Building on Weick (1979), Tsoukas and Chia (2002: 570) locate change in the realm of beliefs and habits of action: "Change, we argue, is the reweaving of actors' webs of beliefs and habits of action to accommodate new experiences obtained through interactions."

Path nets are also based on continual change, but they offer a complementary picture that focuses on comings and goings. We can paraphrase Tsoukas and Chia (2002) by saying: *Change,*

we argue, is the reweaving of actors' paths to create opportunities for new experiences and interactions. Instead of reweaving *beliefs*, temporal structuring reweaves *paths*. Tsoukas and Chia (2002) focused on beliefs and habits of action, which are important, but they skipped over the comings/goings. As a result, their concept of change would be like re-writing a script without changing the stage directions. Without new comings and goings, it is difficult to imagine where the new experiences and interactions would come from.

A similar conceptual gap is evident in practice-based perspectives (Sandberg and Tsoukas, 2011; Feldman and Orlikowski, 2011; Goldenstein and Waldenbach, 2024). The methodological focus of practice-based research on situated doing and sayings leads us to overlook the comings and goings that are inevitably generated by temporal structuring. For example, Sandberg and Tsoukas (2011, p. 346) advocate a "shift from entities to entwinement" that appears to be fully consistent with the processual ontology we propose here. However, they seem to overlook the possibility that entwinement is bounded in time. Sandberg and Tsoukas (2011, p. 345) argue that

> …the notion of being-in-the-world stipulates that our most basic form of being is *entwinement*: we are never separated but always already entwined with others and things in specific sociomaterial practice worlds…

As we read it, "never separated but always already entwined" implies a continuous, perpetual association. In contrast, the path net ontology suggests that entwinement (or any kind of association, intersection or concurrence) is inherently bounded in time as paths join and separate. Due to comings and goings, associations can be recurrent, but they are never perpetual. When we enter or exit an airplane or a classroom, the situation changes. The necessary conditions for practice come and go constantly as the social places we inhabit form and dissolve. From the path net perspective, comings and goings introduce punctuations in practice. These punctuations may

not precipitate the breakdowns envisioned by Sandberg and Tsoukas (2011, p. 347-8), but they put boundaries on the situations where a particular practice is possible.

The implication is that theories of stability and change, as well as theories of practice in general, need to consider the comings and goings that (may or may not) provide recurrent opportunities for particular doings and sayings. In thing-first and in process-first theories, the importance of recurrence for change has been overlooked. Indeed, the term "recurrence" does not appear in the index of the *Oxford Handbook of Organizational Change and Innovation* (Van de Ven and Poole, 2021) nor in the index of the *Sage Handbook of Process Organization Studies* (Langley and Tsoukas, 2017). In theories of practice, comings and goings have been overlooked as an explanation for the inherent boundedness of practices in time and place. In all of these theoretical traditions, comings and goings are an important driver of newness that has remained undertheorized.

Generating new paths and potentialities

Single path perspectives overlook the most powerful and theoretically interesting aspect of temporal structuring: the capacity to generate new paths by recombining existing paths. At least since Schumpeter (1934), recombination has been recognized as an engine for evolutionary dynamics. Recombination is an essential part of technological evolution (Arthur, 2009), innovation (Kaplan & Vakili, 2015; Xiao, Makhija, & Karim, 2022; Karim & Kaul, 2015), and path creation (Garud, Kumaraswamy, & Karnøe, 2010). The power of recombination is especially evident in digital technologies (Henfridsson, Nandhakumar, Scarbrough, & Panourgias, 2018). However, in these literatures, (re)combinations refer to things or attributes of things (e.g., a smartphone is a phone and a camera). Here, based on the processual path/event ontology, we are talking about (re)combining paths.

In a path net, recombination is open-ended because events form paths and paths form events. Each new event combines a set of existing paths. New events can extend existing paths, or they can be the start of new paths, or both. For example, the lunch meeting in Figure 1 could be the start of a new collaboration that could generate further collaboration. Cloutier and Langley (2020: 5) describe this effect as a "multitude of potentialities":

> Process thinking, however, often requires a different kind of conceptualization, as time never stops. Moreover, as ongoing, flowing, emergent and performative accomplishments that may be shaped by contingent interactions, process pathways and outcomes may be multiple. Empirical data can help to pin down outcomes, and may seem to make theory building easier. However, concretely observed outcomes are often only one of a multitude of 'potentialities' that coexist in a particular situation at an earlier time period (Lord, Dinh, & Hoffman, 2015; Nayak & Chia, 2011). Empirical data may in fact mask that reality."

Empirical data tends to mask the multitude of potentialities because it is typically collected about a single, specific path or a particular kind of path (e.g., a customer journey). If we restricted the concept of paths to material entities (e.g., persons or things), it would make no sense to say that classes have paths, projects have paths, conferences have paths, and so on. These paths are not formed or marked by any single entity or actant; they are progressions of events woven into a fabric of other paths and events. This generativity is inherent in path nets but completely missing from single-path perspectives.

Temporal structuring as an engine of exclusion

Another aspect of the dynamics of organizing that is missing from the single path perspective is the exclusionary effect of temporal structuring. Weaving some paths together inevitably leads to the exclusion of others and the formation of separate paths. To see why this is so, we need to ask: what happens to paths that are excluded from an event? As path nets unfold over time, each event includes some paths and excludes others. For example, at the food truck. A, B, and C meet for lunch, but D is excluded. Over time, A, B, and C may collaborate on more

projects together without D, who will proceed on a different path. The same can be said of the students who are not in the class or those who cannot attend the conference: they proceed on different paths. So, weaving some paths together inevitably pushes other paths apart. This effect is not visible in a single-path system of picturing or any theoretical perspective that focuses on a *given* set of entities.

Exclusion can have a powerful effect on recurrence. By precluding opportunities, temporal structuring can contribute to the rapid formation and resistance to change often displayed by path-dependent processes. Page (2006: 90) notes that "the exclusion of other options drives the path dependence." He argues that any kind of constraint, including a temporal constraint, can lead to path dependence because it tends to limit variations and choices. Sydow et al. (2020) also argue that when a pattern of action becomes locked in, the "range of choices at that stage has dramatically narrowed, precluding the chance to seize alternative, possibly better, opportunities." By precluding opportunities, temporal structuring can prevent the discovery of alternatives with higher fitness.

Even without lock-in, temporal structuring puts boundaries on what paths are possible. In the simplest, most practical terms, we can only choose from feasible options. Turner and Rindova (2018) note that events tend to stabilize around temporal configurations that are feasible (e.g., "same time next week") because we have to avoid schedule conflicts. For example, you cannot teach a class and join your colleagues for lunch simultaneously. Schedule conflicts limit when events can occur and can prevent them from occurring at all.

The ordinariness of schedule conflicts does not lessen their importance or impact. Gerstel and Clawson (2018) discuss how work schedules influence employment opportunities and career paths. For example, women may be excluded from the workforce if there is a lack of childcare.

Similarly, people cannot obtain healthcare if their work schedule conflicts with available times at the clinic. Because of timing, events are often precluded based on feasibility rather than fitness. Feasibility is determined *ex ante*, before an event occurs, based on the timing of events in the fabric. In contrast, fitness (e.g., cost, speed, quality) is determined *ex post*, after the event occurs. To continue with the employment example from Gerstel and Clawson (2018), a lack of childcare can preclude qualified people from applying for jobs, regardless of their fitness for employment. Because of schedule conflicts induced by temporal structuring, they do not get the opportunity.

Temporal cascades

While the temporal structures materialized in path nets can suppress variation, they can also amplify variations that do occur. In the context of work schedules and family life, disruptions can cause what Gerstel and Clawson (2018) call temporal cascades. Temporal cascades are another quintessential effect that arises in path nets. Gerstel and Clawson (2018) illustrate this effect in terms of employment schedules. If an employer unexpectedly demands an employee extend work hours, employees who bear parenting responsibilities in a dual-income earning household or as a single parent will not have someone to step in and "deal with the chaos" (p.78) from the disruption to their parenting schedule. Temporal cascades are commonplace – we experience them as "scheduling problems". In a tightly woven path net, temporal cascades can propagate like falling dominoes as one event displaces and precludes others.

For example, on December 22, 2022, a snowstorm blanketed large portions of the United States, causing an avalanche of canceled flights. Each canceled flight disrupted other flights because flights move essential personnel and aircraft, not just passengers. In terms of event systems theory (Morgeson et al, 2015), temporal cascades can increase the duration or intensity

of a disruption. Temporal cascades may be initiated by unexpected events (e.g., snowstorms) or competing priorities (e.g., work and family), but they are not just random or agentic. They are an emergent product of all four mechanisms of temporal structuring. Tightly planned and synchronized schedules are more prone to cascades.

The key point is that all of these dynamic phenomena (stability, change, potentialities, exclusion, and cascades) are influenced by temporal structuring (entrainment, planning, agency, and chance). Through path nets, temporal structuring provides an engine for opportunities and potentialities (Cloutier and Langley, 2020), as well as differentiation and exclusion (Gerstel and Clawson, 2018). Temporal structuring does not just generate rhythms, calendars, and timelines; it drives the ongoing formation and recurrence of events through the (re)combination of paths.

Practical challenge of managing recurrence

The focus on comings and goings has obvious implications for practice. Sandberg and Tsoukas (2011) use Feldman's (2000) example of the "damage assessment" routine in university housing to illustrate the analysis of practical rationality. After students move out of university housing, the university assesses damages, parents pay the bills, and the students never have to take responsibility for their actions. University administrators were unsatisfied with the damage assessment routine because it did not embody their values as educators.

It would be difficult to think of an example that demonstrates the practical significance of comings and goings more vividly. The fact that damage assessment was carried out *after the students were gone* precluded an opportunity for the kind of feedback and learning that the university administrators valued. Simply having the students present while the damage they caused was assessed would have provided an opportunity for different doings and sayings that

aligned more closely with the educational values of the university. Temporal structuring may have been a root cause of the problem in the damage assessment routine.

By focusing attention on how temporal structures drive comings and goings, path nets help us see the damage assessment routine from a different point of view. Rather than starting with the frustration of the University administrators, we can examine the root causes of their frustration (e.g., students leaving campus before damage could be assessed). In doing so, we can ask questions about who would need to be in the same place at the same time (and who should not be there) to create the potential for a solution to emerge. A path net perspective allows us to theorize and think about creating a context that allows for change to become possible, or a context that fosters stability and resilience, if that is the desired goal.

The path net perspective emphasizes recurrence of events in the fabric rather than the design of individual paths. To manage recurrence, it may be more feasible to intervene at the level of comings and goings rather than attempting to change practice directly, at the level of doings and sayings. “Getting the right people and resources in the room” is a key part of any realistic approach to change management (Weick and Quinn, 1999), strategy formation (D’Oria,Crook, Ketchen, Sirmon & Wright 2021), innovation (Garud, Tuertscher & Van de Ven, 2013), and so on. Of course, as we have emphasized repeatedly, orchestrating an event is necessary but not sufficient for meaningful engagement. As in the case of Feldman’s (2000) damage assessment routine, the feasibility of getting the right people in the room depends on temporal structures. Disrupting and reorienting paths can be accomplished through temporal structures that make new paths and events feasible.

Fortunately, comings and goings are observable and, to some extent, controllable. For example, Bucher and Langley (2016) describe the use of reflective and experimental spaces to

redesign and redirect organizational routines. Bucher and Langley (2016, p. 597) ask: "How do "spaces" (in the form of bounded social settings) contribute to the intentional reorientation of recursive routine dynamics?" They define experimental and reflective spaces as "bounded social settings characterized by social, physical, temporal, and symbolic boundaries" (p. 594) that are deliberately formed to initiate change. In our vocabulary, the *spaces* are events -- intersections of paths. Bucher and Langley (2016) noted that reflecting and experimenting required new combinations of paths – not the same paths needed to reproduce the normal pattern of action. They show that reflection is needed to create a novel pattern, while experimentation is needed to work out the practical details so that the pattern can be performed recurrently and come to life as a new routine. Importantly, reflective and experimental places are decoupled from the regular rhythms and routines of organizational life which frees them from the constraints imposed by the temporal structures of regular work.

DISCUSSION

Path nets have implications for organization theory that extend beyond the dynamics of organizing: (1) they integrate multiple mechanisms of temporal structuring into a motor that drives recurrence; (2) they explicitly include concurrent paths as an aspect of temporal structure; (3) they offer a processual ontology where events and paths are mutually constitutive; and (4) they reconceptualize "here" and "now" as multiplicity of social places with duration. And because they are readily observable, path nets also provide new tools for research and practice.

Integrating the mechanisms of temporal structuring

As Zerubavel (1981) pointed out, temporal structures regulate the dynamics of life. Entrainment, planning, agency, and chance interact to shape the comings/goings that create and preclude opportunities. They drive the dynamics of organizing. To see and understand the effects of temporal structuring, we must examine comings and goings: how paths are woven together to

form a fabric. When we examine the paths or the mechanisms separately, it is difficult to see the fabric.

A central claim of this paper is that this metaphorical fabric has systemic consequences for organizations. The fabric matters because it affects which events are feasible, and events create opportunities for interactions, decisions, and everything else. This is a powerful argument, but it raises questions about the ontological status of the metaphorical fabric. Are path nets just representations (a system of picturing)? Or are path nets entities with agency that can create events and shape paths? Have we conjured up a new category of macro-actor or assemblage with its own goals and intentions?

In this article, we have tried to avoid implying that path nets have a life of their own. Path nets emerge from the processes of temporal structuring. They embody the combined effects of entrainment, planning, agency, and chance. When we say, "Path nets shape comings and goings", it can be read as shorthand for: "Through path nets, the mechanisms of temporal structuring shape comings and goings." Path nets should not be endowed with goals or personalities, but they do have properties (such as concurrence and recurrence), and they provide an essential theoretical nexus for integrating the mechanisms of temporal structuring.

Figure 4 summarizes the key insight: each event is new, here and now, so path nets are constantly becoming. In this way, they resonate with the spirit of Tsoukas and Chia (2002), Deleuze (1994) and other process-first perspectives, but temporal structuring shapes opportunities through comings and goings, not specific doings and sayings. As each new event is formed, agency and chance provide an open-ended capacity for novelty (new combinations, new opportunities). At the same time, entrainment and planning provide a tendency towards recurrence. We expect to see the food truck rolling up just before lunchtime and our students

entering the classroom before class. Through path nets, temporal structuring provides an endless capacity for novelty (never stepping in the same river twice) while also providing an expectation of recurrence. Temporal structuring drives the dynamics of organizing in ways that can involve widely varying levels of recurrence.

The inclusion of concurrent paths

Path nets are a fabric of *concurrent* paths. Concurrency has been a blind spot for much of organization theory but has been a salient aspect of organizational practice for decades. Project management provides a canonical example of concurrent paths in practice (Lock, 2016). Basic project management tools, such as Gantt charts (Yakura, 2002), explicitly show concurrent activities. These tools help project managers see how some events preclude other events. For example, if a key resource is busy, other tasks that depend on that resource may have to wait until later. However, as a tool of rational planning, project plans are always implicitly in the future tense; they refer to events that may (or may not) happen in the future. In contrast, path nets unfold in the present tense, "here" and "now."

The important lesson for organization theorists is that any particular path is impossible to enact without a set of concurrent paths. Patients will not have paths through the clinic unless clinical staff also have paths. However, in management and organizational research, we simplify this reality. When we trace one path at a time, concurrency cannot enter the picture. Concurrency enables a system for picturing the complexity of organizational practice in a way that is generally missing from organizational theory.

Concurrency fills an important gap in our understanding of interdependence, as well. Since Thompson (1967) published his classic framework, organization theorists have recognized pooled, sequential and reciprocal interdependence as the main categories. Pooled

interdependence refers to organizational units working independently but contributing to a common goal; sequential interdependence refers to a situation where the output of one unit becomes the input of the next unit, reciprocal interdependence refers to a mutual dependency between two or more units. Concurrency sits outside our familiar distinctions between pooled and sequential interdependence. With sequential interdependence, timing does not matter, but sequence does. With concurrency, the sequence does not matter, but the timing does. Recall the example of lunch at the food truck: A, B, and C can order and pay in any sequence as long as the food is served.

Fully manual processes can be concurrent, but concurrency becomes particularly salient when work is digitalized. Contemporary organizations operate on a tightly woven fabric of concurrent processes (Van der Aalst, 2021). Concurrency matters for every organization with distributed processes or algorithms interacting on a network (Fox & Hey, 2001), an Internet of Things (Gomathi, Baskar, & Shakeel, 2021), or "humans-in-the-loop" (Fischer, Greenhalgh, Jiang, Ramchurn, Wu, & Rodden, 2021). It is not surprising that Thompson (1967) overlooked these phenomena; his framework represented the state of the art when it was published, but digitalization has changed the world. As organizations become increasingly digitalized, with a blend of humans and algorithms, concurrency will be increasingly important. This is because the digital representation of a person, a workflow, a project or any other kind of entity can be present in many places at the same time. These digital traces can be woven into events and paths of their own.

A new ontology of paths/events

As described above, including concurrent paths enables a processual ontology of paths and events. To explain the significance of this ontology, we compare it to the familiar and

influential ontology of structure/agency found in structuration theory (Giddens, 1984) and examine its implications for familiar processual concepts, like workflows and customer journeys.

Reframing structure and agency. Path nets play the role of structure as outlined by Giddens (1984: 173-174): they open up certain possibilities of action while restricting or precluding others. However, path nets materialize temporal structures rather than structures of signification, domination, and legitimation. They materialize the timing of events as they unfold here and now. Path nets materialize time-as-structure (Blagoev et al., 2023), but these structures exist in an ephemeral, situationally specific way.

The idea of an ephemeral, constantly changing structure is a radical departure from the classical understanding of structure as enduring and stable (Levi-Strauss, 1966). In the classical view, structure is exogenous; it provides context that is located "out there" (Rosemann et al, 2008). In the path/event ontology, paths provide context for each other *within* each event. In this view, structure is situationally specific and it can change with the comings/goings of each new event. Conventional aspects of structure, such as institutions, technology, or culture, can influence comings and goings through the mechanisms of temporal structuring. Aspects of context that we conventionally think of as "structural", "durable", or "always already" present, are at best only recurrent.

Path nets have radical implications for the concept of agency, as well. Emirbayer & Mische (1998: 963) describe agency as a "temporally embedded process of social engagement, informed by the past (in its habitual aspect), but also oriented toward the future (as a capacity to imagine alternative possibilities) and toward the present (as a capacity to contextualize past habits and future projects within the contingencies of the moment)". This concept of agency has been very influential in the time-as-process research lens (Blagoev et al., 2023). It describes

agency from the point of view of a focal actor within a single temporal path of past-present-future.

From a single-path perspective, agency is often in the foreground, guiding the flow of action. Actions taken in the here and now mark the progression along one individual path. In the path/event ontology, agency is still present, but it is in the background. Events that happen in the here and now are explained as a consequence of the opportunities that arise through the intersections of concurrent paths. Agency is always implicated in temporal structuring, but focusing on comings and goings allows us to understand it as blended with entrainment, planning and chance.

As a result, the path net suggests a radical decentering of the individual agent. Baygi et al (2021) emphasize this point very strongly with the concept of "undergoing" (Ingold, 2008), where individual agents are potentially subject to the agency of others. In a fabric of concurrent paths (that include material resources, such as airplanes, food trucks and classrooms), our comings and goings are often *not* under our control (Baygi et al, 2021). For example, passengers on a flight from Los Angeles cannot simply hop off where they please. To the extent that this is true, path nets limit what is widely understood as a defining feature of agency: "the capacity to do otherwise" (Whittington, 2010: 147). Actants have agency; we may plan to attend or avoid certain events. We choose our paths to some extent, but our paths are always woven into a fabric (Morin, 2008), meshwork (Ingold, 2008; Introna, 2019), or network (Fahland, 2022) of other paths that has an inevitable physicotemporal reality (Zerubavel, 2021). Agents may choose to *go* somewhere else, but they can never choose to simply *be* somewhere else.

Disrupting parts and wholes. The disruptive power of the path/event ontology becomes apparent when we consider its implications for processual concepts in organization theory,

management, and related fields. We say that processes are composed of steps (Goh & Pentland, 2019), projects are composed of activities (Lock, 2014), customer journeys are composed of touchpoints (Følstad & Kvale, 2018), and so on. We are locked into a simple part-whole ontology in all these examples: one process has many steps.

The path/event ontology disrupts this taken-for-granted part-whole ontology of process. When we change our perspective to recognize the presence of multiple concurrent paths, we see that every event is composed of multiple paths. For example, every touchpoint involves a customer, a service provider, and some material entity, such as a food truck, a classroom, or an aircraft. When we focus on the customer, we tend to omit the concurrent paths constituting the customer journey. Similarly, we tend to make the same omission when we focus on an individual reflective agent (e.g., Hernes, 2021), a single step (e.g., Thaler, 2008), or a single sequence of steps (e.g., Goh & Pentland, 2019). This oversimplified view implies that a path can be changed by changing the steps. Paths never exist in isolation, so changing a path requires changing the fabric.

Extending the concepts of here and now

In paths nets, "here" and "now" are social places with duration. The move away from a Newtonian perspective has been advocated by many others (e.g., Bluedorn, 2002; Kim et al, 2019; Hernes & Schultz, 2020). In the time-as-process lens (Blagoev et al., 2023), the present gains temporal depth. Bluedorn (2002: 114) defined temporal depth as "the temporal distances into the past and future that actors typically consider when contemplating events that have happened, may have happened, or may happen." In this definition, the extended present exists in the mind of a reflexive agent who stitches together the past and future to imagine his or her own

subjective idea of "now". These perspectives extend the Newtonian knife-edge of "now" to an interval with duration and temporal structure.

We build on this insight by providing a way to picture the indexical present – "here and now" as a fabric. We have taken a crucial step by recognizing that "here" and "now" are indexical expressions (Attewell, 1974; Barnes & Law, 1976); their referent depends on the context in which they are used. Because of this quality, "now" and "here" can refer to vastly different scales of time and place. The indexical quality of "here" and "now" means that the path net and path/event ontology can be applied to processes at any temporal and physical scale. This flexibility relates to what Nicolini (2009) refers to as zooming in and out. At each level of temporal or social granularity (Kremser & Geiger, 2024), we can bracket off the other levels. In this article, we have focused on the stage directions (comings and goings) and bracketed off the script (doings and sayings). In doing so, we are calling attention to an aspect of practice that has not received much attention. When we zoom out, as in Figure 3, we begin to see the pattern of recurrent events over time. As we continue to zoom out, we see that those classes are offered every semester, and the conference happens once a year, but in different places. In other words, classes and conferences have paths, just like everything else.

FUTURE RESEARCH AND PRACTICE: A NEW FOCUS ON COMINGS AND GOINGS

Path nets provide a fresh point of view because they focus attention on comings and goings. From this point of view, we can ask new questions about events, paths and dynamics. If aphorisms like "90% of life is just showing up" are true, then path nets should help address questions that can get overlooked when we focus on doings and sayings. This is new territory because the emphasis is on opportunities and potentialities, not just time-bounded outcomes

(Cloutier and Langley, 2020). Some of the questions we raise here have a methodological flavor, while others are more substantive.

Concurrency

An important methodological issue is to establish bounds on the relevant set of concurrent paths. Given our theoretical interpretation of "place" as formed by concurrent paths, this is like asking, "where are we?" or "what is the site of this phenomenon?" We make this move implicitly in every research project, but the path net perspective encourages us to answer it explicitly in terms of intersecting temporal progressions (aka, paths).

We can also ask questions about the quantity, properties, and variety of paths that are "here". For example, how does the number of concurrent paths affect dynamics? Are events with a large number of paths different from events with a small number of paths? Intuitively, some paths are more important than others (e.g., in the context of a flight, a pilot seems more important than a passenger). How does the similarity or variety of paths affect dynamics?

Concurrency naturally leads to questions about the inclusion and exclusion of paths in events. On both a theoretical and practical level, inclusion and exclusion relate to a host of other topics: human resources, staffing, team formation, fairness, diversity, discrimination, accessibility, privilege, and so on. There is existing research on all these topics, but the path net perspective reminds us to consider events as (re)combinations, potentialities and temporal progressions, not just fixed outcomes.

Path formation

There is existing literature on path formation for innovation (Garud & Karnøe, 2001; Garud, Tuertscher, & Van de Ven, 2013) and strategic management (Feuls et al, 2023). Picturing these phenomena as path nets can complement and extend this work by focusing on

comings/goings in the context of concurrent paths. For example, are there situational contingencies that tend to bring paths together or keep paths apart? In process management, we expect that friction (Yi, Knudsen, & Becker, 2016) can generate workarounds, which may generate new paths (Alter, 2014; Beerepoot, van de Weerd, and Reijers, 2019).

Recurrence

Anything that helps us understand, predict, or control recurrence can be extremely valuable. For example, in quality control, organizations want to prevent certain events and ensure that other events always happen. Quality and process standards are intended to have these effects. Addressing these practical concerns engages a deeper theoretical question: how do comings/goings relate to doings/sayings? How does the recurrence of events (comings and goings) relate to the recurrence of situated practice (doings and sayings)? In other words, under what conditions does a similar combination of paths lead to a similar pattern of behavior? This question has enormous significance because behavioral recurrence is needed for new paths to gain traction. Innovations come alive through recurrence. The same can be said about organizational routines (Feldman et al., 2021), organizational paths (Sydow et al., 2009) and institutions (David, 1994): recurrence is both an antecedent and a consequence.

Other factors that influence events and paths

In this article, we focused on entrainment, planning, agency, and chance because they are prominently featured in the literature on temporal structuring and they have a clear, direct relationship to recurrence. Future research on path nets could include conventional, multidimensional constructs like culture (assumptions, values, rituals…), institutions (norms, rules, logics…), economics (scarcity, efficiency, optimization…), and power (positional, symbolic, resource-based, discursive…), and accumulation (all forms of capital, legitimacy, and

other resources…), all of which can be related to temporal structures (Zerubavel, 1981; Blagoev et al, 2023). Temporal structures influence the feasibility of events and paths, but these conventional mechanisms and value systems are likely to influence their dynamics, as well.

Designing organizations and services

Orchestrating flows of people and resources has always been an important aspect of organizing. A better understanding of path nets should have direct practical impact in terms of organizational design (Puranam, 2018) and service design (Holmlid & Evenson, 2008). For example, how do path nets of different shapes and sizes influence resilience/inertia? Suppressing variations will increase recurrence and stability, but will it also decrease resilience? For example, Omidvar and colleagues (2023) show how algorithmic routines, despite responding to changes in the environment, may also generate and maintain dynamic inertia with adverse consequences. At the same time, amplifying variations can introduce chaos. What policies or practices will tend to encourage recurrence of desirable events/paths? What steps can managers take to suppress the recurrence of undesirable events/paths? In all of these questions, picturing the underlying phenomenon as a path net makes the comings, goings, and recurrence more readily observable and potentially more manageable.

Operationalizing path nets in empirical research

While the language of shaping, weaving, and fabric is metaphorical, we have been careful to define events and paths so they are readily observable. The growing prevalence of digitalization will tend to increase the visibility of comings/goings, as technologies for tracing movement (e.g., RFID, Bluetooth, facial recognition) become more widespread (Leonardi & Treem, 2020; Alaimo & Kallinikos, 2022). Because of this observability, we can picture path

nets based on real data in a way that includes concurrency and does not mask the multitude of potentialities.

Path nets provide a way to operationalize the dynamics of organizing in terms of recurrence. In complex system theory, recurrence refers to the tendency of a system to return to the same state (Marwan & Webber, 2015). In real life, difference is inevitable (Deleuze, 1994).. Unlike pure repetition, recurrence always involves difference. Therefore, computational tools for quantifying recurrence use a threshold of similarity (Marwan & Webber 2015) or cluster similar states together (e.g., Zhang, Chowdhury, & Saggar, 2023) based on some measure of similarity. To picture a phenomenon as a path net, researchers can choose a threshold of similarity between events based on the constituent paths: an event is *recurrent* if it is constituted by a similar set of paths. For example, when A, B, and C meet repeatedly for lunch, as shown in Figure 3, lunch is a recurrent event. The doings/sayings within each recurrent event do not need to be the same. A, B, and C may not order the same food or discuss the same topics. Recurrence based on coming/going is readily observable. Path nets provide a conceptual platform for the analysis of recurrence in temporal networks (Zhang et al. 2023) and recurrence quantification analysis (Marwan & Webber, 2015). Thus, path nets provide a practical tool kit for progress on the central puzzle: the relation between temporal structuring and the dynamics of organizing.

CONCLUSION

Nothing exists outside time, so nothing can escape the fabric of time. In practice, agents operate within a web of temporal and material relations. Path nets materialize the processes of temporal structuring, thereby shaping what is possible and what is precluded. Path nets shape the *opportunities* for action here and now. We experience the effects of path nets in practice, but they have been overlooked and omitted from organization theory. Path nets provide a new tool

for analyzing temporal structuring and the dynamics of organizing. Now that path nets are visible, we look forward to seeing how they advance the conversation.

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FIGURE 1
Lunch at the food truck