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Process Science

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Process science: the interdisciplinary study of socio-technical change

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Abstract

Process science is the interdisciplinary study of socio-technical processes. Socio-technical processes involve coherent series of changes over time, entailing actions and events that include humans and digital technologies. The ubiquitous availability of digital trace data, combined with advanced data analytics capabilities, offer new and unprecedented opportunities to study such processes through multiple data sources. Process science is concerned with describing, explaining, and intervening in socio-technical change. It is based on four key principles; it (1) puts socio-technical processes at the center of attention, (2) investigates socio-technical processes scientifically, (3) embraces perspectives of multiple disciplines, and (4) aims to create impact by actively shaping the unfolding of socio-technical processes.

Introduction

We live in an age of process. Many core phenomena of our time speak to complex dynamics involving change: globalization, the platformization of economies, the rise of (generative) AI, as well as societal movements, or political decisions, have in common that we can learn a lot more about them if we think of them as ongoing processes, rather than stable entities or systems.

To study the emergence and development of contemporary phenomena, we need to embrace that contemporary processes are socio-technical. They comprises actions and events that involve humans (individuals or collectives) and digital technologies (e.g., mobile devices, organizational systems, AI). Socio-technical phenomena unfold, evolve and wane, they occur at macro, meso and micro levels and continually incorporate an ever-evolving frontier of technological innovation. Further, a process view sees the world primarily as flowing as opposed to being in a stable state (Rescher 1995). Taking this perspective is not a trivial; it goes against our deeply ingrained assumption that the world embodies stability and permanence (Chia 1999). An orientation towards socio-technical processes embraces a view of the world that is becoming and in a constant state of change (Baygi et al. 2021; Tsoukas & Chia 2002).

Process science as a field is particularly relevant because socio-technical processes produce *digital traces*. Digital traces represent recorded activities that are left behind when humans use digital technologies (Freelon 2014). Typically, digital traces are equipped with temporal information, allowing for granular insights into the dynamics through which socio-technical phenomena take shape (Lazer et al. 2020). Furthermore, an evolving frontier of computational techniques, such as process mining, enable increasingly sophisticated analyses of such data. Analysis of digital traces using these contemporary techniques can support data driven theorizing and generate new theories about all sorts of phenomena (Berente et al. 2019). Process science aims to integrate data from diverse sources, including organizations, environments, the human body, and others.

Process science pursues two broad types questions. First, it encourages researchers to develop a scientific understanding that is concerned with "what is changing?" and "how is it changing?" At the same time, advancing our understanding of phenomena in terms of their underlying processes provides us with new opportunities for generating and influencing change. Hence, since change both occurs naturally and can be constructed artificially, we need to further ask: "(how) can and should we influence change?" If we know why, how, and when certain changes occur, we can design and study interventions. This is important since many suggest that scientists should take on the roles of real-world problem solvers (Gaieck et al. 2020).

In this paper, we conceptualize process science as the interdisciplinary study of socio-technical processes in terms of their evolution, transition, and change at various levels of abstraction. The goal of process science is to reconcile methods, theories, and approaches of different scientific fields to establish a comprehensive understanding of socio-technical processes as well as means to design interventions to them. Process science is a platform for disciplines to jointly advance the study of processual dynamics and find ways to change them.

Conceptualizing process science

An interdisciplinary focus on processes

The term 'process' has been appropriated by various disciplines in different ways (Mendling et al. 2021; Pettigrew 1997; Van de Ven & Poole 1995). These include sociology, engineering, computer science, the natural sciences, or organizational science (e.g., Cornwell 2015; Dumas et al. 2018; Leenders et al. 2016). Regardless of the discipline, focusing on processes in a temporal sense provides an encompassing view on the dynamics of phenomena as they evolve over time (Langley & Tsoukas 2017; Rescher 2000). While processes might be constantly changing, people conceptualize processes in discrete ways. This happens at different levels of granularity.

The interest around processes in computer science, information systems, and management, often lies in the identification and analysis of sequences of activities and events, not only in the sense of how they give rise to and constitute phenomena (Blagoev et al. 2023), but also in terms of how the underlying dynamics change and take different shapes over time (Cloutier & Langley 2020). Yet, there is a continuum to what extent the conceptualization of processes would account for dynamics, either very closely (as in process mining research) or more remotely (as e.g. in business model research). As different research communities have applied a process perspective to different phenomena, they developed different methods to study them. Recent arguments have stressed that cross-fertilization among these fields may lead to new methods in order to study how and why certain phenomena evolve and change over time (Lazer et al. 2020; Mendling et al. 2021; Simsek et al. 2019). Therefore, process science strives to be an *interdisciplinary* field for studying socio-technical phenomena, providing a platform to foster continuous exchange across various specialized fields.

Embracing socio-technical processes

The acute relevance of process science is tied to the changes and shifts associated with digital technologies (Mendling et al. 2020). Regardless of whether we think of private, public, or work-related contexts, the majority of our everyday activities are performed with digital technologies. All forms of communication, collaboration and coordination are supported by or enabled through digital technologies, be it sensor technology, personal digital assistants, or smart environments. From a broader point of view, many global societal phenomena—such as social-media "shit storms," crowdsourcing, or cryptocurrency—are made possible only through digital technologies.

Taking these developments together, it is important that process science be *socio-technical*. It involves studying activities of humans – individual or collective – whose activities are tied to the use of digital technologies (Sarker et al. 2019). Since both human activities as well as digital technologies continuously change and evolve, process science embraces the study of this change in socio-technical processes. If processes appear stable, they are only stable "for now" (Feldman et al. 2016).

Leveraging digital traces and computational techniques

The socio-technical nature of these processes leads to new opportunities to study them and their underlying dynamics. This is because the use of digital technologies produces digital traces: digital records of activities that are typically equipped with temporal information (Freelon 2014; Pentland et al. 2020). Key is that such traces are produced even if actors do not decide so intentionally or willingly. In times of increasing connectivity between humans and digital technologies, "there is no opt-out; there is no way to be invisible." (Leonardi & Treem 2020, p. 1603). In other words, digital traces are produced in the performances of any kind of socio-technical process, and they are produced as naturally occurring (as opposed to research provoked) data (Lazer et al. 2020).

Digital traces offer insights into activities of actors that would not have been possible to study before (Akemu & Abdelnour 2020), since manually obtaining traces is not feasible at large scales. The growing availability of increasingly sophisticated computational tools affords new and more powerful approaches for analyzing trace data. Techniques involving process mining, sequence analysis, network analysis, and text and video analysis are continually progressing in terms of accuracy and precision in temporal data analysis. Machine learning applications of all sorts are capable of identifying ever more interesting patterns that would remain invisible to human sense-making (Lindberg 2020).

Digital traces offer new opportunities to study how phenomena evolve in terms of underlying sequences of events (Pentland et al. 2017). This opens up a powerful view to understand and predict how phenomena change and behave over time (Lazer et al. 2020;

Pentland et al. 2017), as well as to change them through these insights (Grisold et al. 2024; Oliver et al. 2020). With the use of digital trace data, we can study socio-technical phenomena at different levels, including the micro-, meso-, and macro-level (e.g., individual and organizational level). This can complement established theories (Lazer et al. 2020), or it can enable the development of new, more robust theories altogether (Tremblay et al. 2021). This opportunity has led to a recent movement to strengthen theories of socio-technical phenomena using digital trace data through "computationally intensive theory construction" (Miranda et al. 2022), which offers a step-by-step process for making theoretical contributions from trace data (e.g., Berente et al 2019; Lindberg 2020).

Embracing such opportunities and establishing a dialogue across disciplines to study socio-technical processes from an integrated viewpoint is at the core of process science.

Defining a language to study change over time

When studying processes, a critical step involves defining the language used to describe a process. This language enables the researcher to structure the temporal ordering of activities or events that influenced entities causing them to change state. Such languages can range from natural language to formal computer-executable specifications. Regardless of the specific focus, however, language defines the level of abstraction at which a process is studied.

A key issue when determining the language for socio-technical change involves deciding on an approach for temporally punctuating process data, and the researcher must decide how to reconcile discrete and continuous change. Especially in the context of digital technologies, the level of abstraction is often discrete. Rather than describing the continuous change process, the language describes the discrete moments in time when the change is significant enough to look at the process in two different states: one before and one after this time point. Often, even in a continuous process, such timepoints exist such as when processes move from phase to phase. For example, a criminal process might move from investigation to prosecution to sentencing to rehabilitation.

However, when studying continuous processes, sequences of activities or events can be difficult to specify. In such cases researchers must use judgement based on the goals of the research and the established approaches for dealing with similar situations. For example, one might formally specify a continuous process using sets of differential equations expressing the state at any point in time as a derivative of the continuous change process, e.g. when describing the volume of water in a bucket while emptying it.

A further choice that has to be made when describing processes in a language is the decision whether one aims to describe a specific instance of a process, or all possible instances of a process. A process can be specified by providing all possible activity sequences, for example, or perhaps by common patterns, or a particular instance. These decisions will be guided by goals for the analysis and the domain of study. For example, in disaster management, no two processes are ever executed in the same way, which makes strict workflow languages (describing the exact sequence of steps each process instance should follow) a poor choice for describing them.

Against this background, process science researchers study all aspects of process languages. From formal questions on how to quantify the relation between (the observed part of) a process and the language used to describe it, to more foundational questions on the suitability of a specific language for describing processes in general or even in a specific context, or higher level questions on how to best describe the evolution of the continuous changing process under consideration.

A definition for process science

Using the term 'process science', we draw on, pursue, and extend an existing intellectual trajectory. From a computer science perspective, van der Aalst and Damiani (2015) have used the term to denote "the broader discipline that combines knowledge from information technology and knowledge from management sciences to improve and run operational processes." (p. 2). By this account, process science extends data science which is "an inter-disciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from many structural and unstructured data." Furthermore, Mendling (2016) used the term in the context of business process management to call for more scientific and empirical research in the field. The term process science has also been used as a specific field of engineering that is concerned with fluids and circulation (Judd & Stephenson 2002; Velis et al. 2009). While these works approach process science from within the frame of a specific discipline, they share (for example) an interventional perspective. In turn, we intend to emphasize process science in terms of an interdisciplinary study of processes. Process thinking is put center stage and its use should not be limited to a specific research discipline.

Thus, we define process science as follows:

> Process science is the interdisciplinary study of socio-technical processes over time. By socio-technical process, we mean a coherent series of changes that involve actions including humans and technologies, and occur at different levels.

Key tenets of process science

Process science emphasizes the following key characteristics; (1) socio-technical process are in the focus; (2) socio-technical processes are investigated scientifically; (3) investigation occurs through an interdisciplinary lens, and (4) process science aims to change processes and create practical impact. We will explain these tenets in the following.

At the core of process science is the study of socio-technical processes (focus). It aims to describe, explain and intervene in these processes (objective). Thereby, it embraces an interdisciplinary viewpoint, integrating contributions from various disciplines (perspective); some of these disciplines are exemplified here.

Socio-technical processes are the focus

Process science inverts a basic assumption: by focusing on the processes themselves, this view backgrounds the entities involved with the process. Across a wide range of disciplines, we have been trained to think of entities first. For example, computer science and information systems adopt the stance that processes change the properties of entities that exist a priori (Wand & Weber 1993). Influential process modeling languages such as UML and BPMN share this commitment to representing entities first (Chinosi & Trombetta 2012; Fowler 2004). Other disciplines, such as biology, are beginning to question the "entity-first" perspective and consider a "process first" perspective.

Nicholson and Dupré (2018, p. 3) propose that “the living world is a hierarchy of processes, stabilized and actively maintained at different timescales.” They argue that the entities we recognize (e.g., cells or organisms) are the result of those processes. In organization studies, the “process first” perspective has also been proposed (Langley & Tsoukas 2017; Tsoukas & Chia 2002).

In practice, processes and entities always co-exist: the fire burns the wood and the wood fuels the fire. However, the shift in perspective from entity-first to process-first affords a novel way to think about familiar problems. For our purposes, the process-first perspective provides a useful way to see analogies across domains that have different entities but similar processes. Fundamental to the interplay between entities and processes is the concept of time, the ultimate process. Processes evolve as entities change over time. While the changes are continuous in nature, the chosen abstraction level to describe the process may make the entire process discrete for the purpose of the study.

Within process science, we take different perspectives to study such socio-technical processes, which can be informed by e.g. social sciences, such as organizational sciences, or technical research, such as computer science. Table 1 exemplifies that process science is concerned with a variety of socio-technical processes (Rescher 2000). We distinguish between different forms of socio-technical processes according to broader criteria and specific types of socio-technical processes, which all fall under the proposed definition of process science. We also provide specific examples for each type of process. To this end, we suggest that processes can have different structures (e.g., causal, related to problem-solving or social practices, and performatory). Furthermore, socio-technical

Table 1 Distinctions of process relevant for process science (drawing on and extending Rescher 2000)

Criterion	Distinction of process	
	Types of Process	***Example***
Structure of process	Causal processes (one event or process contributes to the production of another event or process)	Seed germination
	Problem-solving process (do this, then that)	Applying a business improvement method
	Social practice process	Communication
	Performatory process	Playing a video game
Form of socio-technical process	Equal involvement of social and technical components	Office workflows
	More focus on technical components	Car production
	More focus on social components	University teaching
Outcome of process	Productivity	Manufacturing process
	Solution	Solving a business problem
	Social performance	Gaining recognition on social media
Language of process	Continuous process	Assembly line production
	Discrete process	Deciding on a loan application
	Ad-hoc processes / one-off	Disaster management
Origin of process	Owned process (follows from thing or subject, intentional)	Call center agent
	Unowned process (non-intentional, do not come from subject or thing)	Rise of a pandemic

processes can take on different forms depending on the focus that is placed on social and/or technical components. Socio-technical processes can lead to different outcomes (e.g., productivity, solution or the accomplishment of a social performance). As described in "Defining a Language to Study Change over Time" section, such processes can also be described through different languages (e.g., continuous, discrete and ad-hoc/one-off processes).

A final criterion refers to the distinction between “owned” and “unowned” socio-technical processes (Rescher 2000). Processes are owned when they involve agency and intention. Unowned processes occur without the intentions of any agent. Owned and unowned socio-technical processes influence one another. Owned processes, such as production processes, influence unowned processes, such as environmental developments. Conversely, unowned processes have an impact on owned processes, as it has been shown dramatically by the Covid pandemic. As process scientists, we aim to study both forms of processes and how they interplay along a continuum where socio-technical processes are owned and unowned to different degrees (see Fig. 1).

In process science, the notions of owned and unowned processes extend further to owned and unowned activities or events within a socio-technical process. The unowned parts being those that cannot be controlled, changed or influenced by the owner of the process. In the studies of educational processes, for example, the actions of students can almost never be controlled whereas the actions of lecturers or institutes can. Hence, the parts of the processes pertaining to student behavior are unowned.

A science of discovering, explaining and intervening into socio-technical processes

Process science welcomes all approaches to generating new scientific knowledge about socio-technical processes through deduction, induction, and abduction. Its key idea is that a focus on process advances our understanding of various phenomena because it directs our attention to underlying causal-temporal relations constituting a specific phenomenon. When we know why and how a specific process unfolds, we are better prepared to re-direct and change it, if needed. Process science subsumes three broad activities, which are depicted in Table 2.

Discovery emphasizes the detection of (emergent) dynamics constituting the phenomenon of interest. It can be challenging to detect emerging and evolving processual dynamics and their significance may be understood retrospectively (Chia 1999). The discovery activity capitalizes on the potentials of digital trace data to explore all sorts of phenomena (Lazer et al. 2020).

Explanation aims at understanding the dynamics of socio-technical processes. It explains how and why they unfold. Explanation activities seek to identify cause-effect relations (Markus & Rowe 2018), specifically in relation to their situatedness, e.g., in temporal and spatial contexts. Access to a wide range of data sources will be beneficial, and again, the vast potentials associated with digital trace data may come into play (Lazer et al. 2009). Existing theory from about a domain will inform explanations, and analysis of new processes may inform that theory (Berente et al. 2019). An in-depth understanding of a process enables predictions about the possible future states of the process. Thereby, one can anticipate patterns arising in the sequence of activities and events in a specific context, or the evolvement of a process in relation to certain

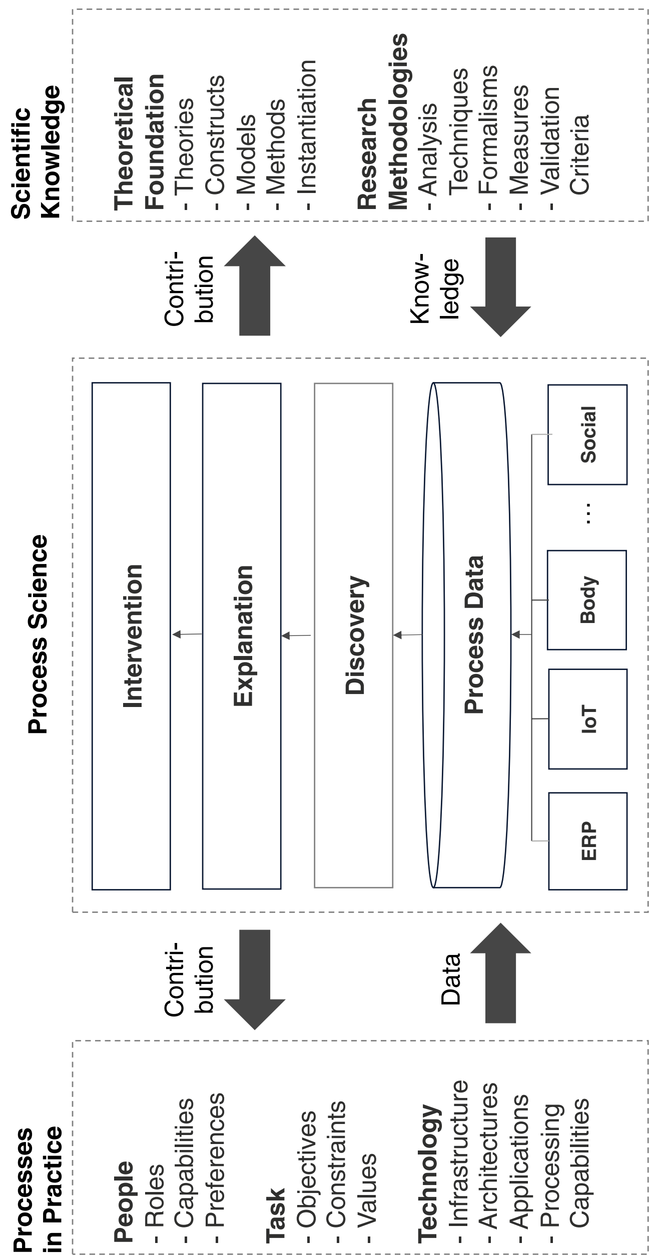

Fig. 1 Process science research framework

Table 2 Process science activities

Phase	Process science activities	
	Goals	***Exemplary Methods***
Discovery	Capturing and describing socio-technical processes	Techniques, such as process mining, to create descriptive representations of processes using digital event data; event-based architectures to organize data collection and storage as well as computational methods to analyze the data and to identify patterns in processes
Explanation	Understanding why, how and when a socio-technical process unfolds	Methods supporting sense-making around processes in a specific context, e.g. qualitative empirical research to study the context in which a pattern is situated. Leads to propositions or entire theories on cause effect relations embedded in a situational context
Intervention	Intervening and shaping the socio-technical process into desired direction	Methods to develop and evaluate interventions to processes. Applying e.g. design-oriented research, developing interventions based on explanatory research and evaluating effects of such interventions in process event data

indicators and factors, such as performance indicators in business environments (Poll et al. 2018; Vergidis et al. 2007). In terms of methodological approaches, it is important to establish a comprehensive understanding of a socio-technical process, for example, by collecting and integrating contextual information through complementary data sources, such as observations.

Intervention aims at changing socio-technical processes as they unfold. This resonates with recent claims across various fields that science should contribute more strongly to solving real-world problems (Gaieck et al. 2020; Oliver et al. 2020; Rosen 2018). Interventions to generate change build on the cause-effect relations identified before and can include one or many ways to interfere with how the process seems likely to unfold in the future. For instance, design-oriented research can generate prescriptions on how to organize a specific process, utilize a specific technology or communicate process change to people in order to meet specific objectives (Hevner et al. 2004; Van Aken 2005). Interventions are based on an envisioned goal, e.g., to prevent a process from causing damage. It aims for utility and develops knowledge on how to solve problems related to process interventions, presented e.g., by methods, models or principles. Borrowing established methodological approaches—such as design science research in the information systems field, policy development in social sciences or experiment design in the natural sciences —can provide frameworks to plan and evaluate intervention activities. An additional challenge for intervention is provided by the unowned parts of a process as these can only be influenced indirectly.

While these three activities are core to process science, not all of them have to be necessarily involved in a process science project. Depending on the phenomenon, and the questions being pursued, a study needs to make explicit its core focus: discovery, explanation or intervention.

Process science progresses by systematically making use of various and novel data sources. What is important, however, is that these data reveal temporal information to infer when they took place. We refer to these data as "event data" as they reflect the occurrence of something that happened at some point in time (Van Der Aalst 2016). Such data can come from traditional qualitative research designs or from digital trace data, such as time-stamped production data, sensor data, or social media data (Lazer et al. 2020). This data typically refers to the state-changes of entities involved in the process, i.e. the data is discrete in nature, or this data is an observation of the state of a process at a specific point in time, which is often the case for data from a continuous process. To understand the interplay of processes, it is important to use data collected across different levels of abstraction (Langley & Tsoukas 2017; Rescher 2000).

An interdisciplinary science

Process science is interdisciplinary. It is open to all disciplines that can make contributions to describe, understand and intervene into socio-technical processes. We do not suggest re-labeling existing fields or changing their agendas, but rather, we envision that process science integrates their contributions, their methods, and their theories to study processes. It is only through looking beyond single disciplines, and integrating such disciplinary views and findings, that processes will be understood more comprehensively. Similar arguments have been made before. For example, Abbott (1995) suggests that research in sociology can benefit from importing technical models from operational research to think about social processes. In a similar vein, claims in the business process management field assert that scholars should embrace openness, pluralism, and integration of other processual views to advance established views on process work (Kerpedzhiev et al. 2021).

Process science is inter-disciplinary in nature, synthesizing assumptions and methods from diverse scientific fields to promote a holistic study of processes. If we are interested, for instance, in reducing the impact of our economic and social behavior on the environment, it makes sense to not limit the view to organizations or the environment but to study socio-technical processes within the economy and society to capture all relevant effects, e.g. by synthesizing perspectives from business, economic, political, social and environmental studies (Hertz et al. 2020; Song et al. 2017). Table 3 shows how process science integrates a wide range of disciplines.

One contemporary field of research that exemplifies the key ambitions of process science is process mining. Process mining has been developed to analyze and visualize business process work by processing event log data that occur when people interact with information technology (van der Aalst et al. 2011). Over the past years, process mining has received considerable attention in research and practice, leading to a rich repertoire of techniques and algorithms (e.g. Augusto et al. 2018; Van Der Aalst 2016). While process mining research has been originally tied to the field of computer science, the technology has attracted increasing interest from a socio-technical perspective, including fields, such as management and organizational research (Davenport & Spanyi 2019). In addition to this, recent claims stress that process mining can also be used for other purposes, such as research on socio-technical phenomena. Accordingly, it offers new opportunities for theorizing in empirical research; for example, the technology can be used to find patterns in organizational change processes (Grisold et al. 2020; Pentland et al. 2021) or explore working practices (Malinova et al. 2019). Taken together, process mining provides a good example for what we envision to be at the core of process

Table 3 Exemplary disciplines contributing to process science from different perspectives

Perspective	Contributing to process science	
	Focus	***Exemplary Discipline***
Human	Cognitive and affective states of people and their change over time	■ Psychology ■ Neuroscience ■ Anthropology
Social	Social interactions and how they change over time	■ Social Science ■ Organization Science ■ Information Systems Research
Environmental	Changes in man-made and non-owned constructed or occurring systems	■ Natural Science ■ Urban Science ■ Architecture
Political	The governance of social behaviors and change	■ Political Science ■ Law ■ Ethics
Economic	Economic factors influencing processes, including mechanisms of value creation, in particular, the production, distribution, and consumption of goods and services	■ Management Science ■ Decision Science ■ Organization Science ■ Economics
Technological	Applications and algorithms involved in the enactment, capture, or analysis of change	■ Computer Sciences ■ Engineering ■ Data Science

science: a field of research that is strongly concerned with analyzing socio-technical processual phenomena blending the interests of various research domains and exploiting the potentials associated with digital trace data.

It should be noted that it may pose challenges for different disciplines contributing to process science. This is because they draw on different assumptions, theories and methods. For instance, organizational scientists draw on management science when studying processes (Sydow & Schreyögg 2013), but these exclude perspectives on cognitive processes from their analysis, as embraced, for example, by neuroscience and psychology. Nonetheless, we believe that accumulating knowledge from many disciplines will be highly beneficial, as long as such views are made transparent, and, thus, can be considered when interpreting and discussing results and designing interventions.

A science of impact

Process science strives to make an impact. Process science is inherently pragmatic as it aims to create knowledge that has instrumental value in solving real-word problems (Dewey 1946). As such, process science aims to produce knowledge that can make an impact on people, organizations and society. In light of the manifold and severe grand challenges we are facing today (George et al. 2016), process science should enable the development of effective solutions, such as new ways to organize socio-technical processes as well as new ways to intervene in processes.

The United Nations General Assembly, for instance, has collected 17 interlinked goals designed to be a "blueprint to achieve a better and more sustainable future for all", which are referred to as the "Sustainable Development Goals" or simply the "Global Goals". These goals include, among others, the end of poverty, good health and well-being, quality education, gender equality, affordable and clean energy, decent work and economic growth, as well as peace, justice and strong institutions, to name but a few. All of these goals are influenced by socio-technical processes at various levels, and accomplishing any one of these goals is going to be a process itself. For instance, the goal "good health and well-being" is dependent on dynamics that cover both non-owned processes, as illustrated (for example) by the spread of the pandemic, as well as owned processes, e.g. measures we take to improve the health and well-being of people. True to its mission, process science can investigate and design ways to influence the evolution of these phenomena for the better ('process science for good').

As we have argued before, contributions are also enabled by a rich and detailed understanding of how and why socio-technical processes unfold over time. Process science embraces processes on various levels and in different contexts, including both naturally evolving and intentionally designed processes, and examines how and why they interact over time. Insights we gain here shall enable and guide interventions to affect the course of processes over time. Process science is not only about capturing reality in flight—it is also about influencing it while it unfolds (Pettigrew 1997).

Figure 1 depicts a research model to provide support for process science research and education.

Process science connects socio-technical processes in practice and scientific knowledge production. Socio-technical processes in practice are characterized by humans and technologies performing certain activities in a given context. Scientific knowledge production builds on observations from practice and integrates both theoretical foundations as well as methodologies. Process science builds on digital trace data as well as other data.

Process data is captured in practice, often as digital trace data, and analyzed applying scientific methods. Process science may aim to discover, explain or intervene in processes, and it makes contributions both to practice and theory. Process Science invites a wide range of contributions. These contributions extend our knowledge of process requirements and design solutions, as much as our formal knowledge and empirical knowledge about processes (Mendling et al. 2023). The process science research framework presented in Fig. 1 helps to position and communicate different contributions to research. It also outlines important elements of process science proficiencies to guide the design of educational offerings to develop the next generation of process scientists both for research and practice.

Conclusion

This paper introduces and conceptualizes a new scientific field: process science. Process science is concerned with the capturing and understanding of socio-technical processes of different kinds aiming to inform interventions to and the design of processes, especially by leveraging digital trace data and computational techniques. The next important step is to start process science-*ing*: bringing process science to life and starting research projects that embrace and advance the field. Process science is in the making. Everyone who wants to engage with it is welcome to shape the field as it evolves.

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Authors' contributions
All authors whose names appear on the submission made substantial contributions to the conception or design of the work; drafted the work or revised it critically for important intellectual content; approved the version to be published; and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declarations

Competing interests
The authors declare that they have no competing interests.

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