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A Process Framework for Digital Transforming: Multilayered, Conjunctive and Cumulative Processes of Digital Materializing and Organizing

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An interest in the relationship between technology and organizational change has long characterized the Information Systems (IS) research field (Besson and Rowe, 2012). As the latest instantiation, Digital Transformation (henceforth DT) is gaining momentum. Despite its increasing relevance, however, the concept of DT is still nebulous, and there is no common understanding of its individual, or its relational, meaning. Within IS research in particular, recent discussions have revolved around whether DT should be considered as a unique phenomenon, and to what extent existing theory is useful for understanding and generating useful knowledge about it (Skog, 2019; Vial, 2019; Wessel et al., 2021). This discussion is particularly relevant considering the extensive experience the IS field has in studying and theorizing the relationship between technology use and organizational transformation (Besson and Rowe, 2012). Under the umbrella term IT-enabled Organizational Transformation (ITOT), recent research efforts have sought to outline the traditional view on this relationship, and explicate how it may be conceptually and empirically contrasted with DT (Skog, 2019; Vial, 2019; Wessel et al., 2021).

In this paper, our aim is to build on recent perspectives on DT (e.g. Hinings et al., 2018; Vial, 2019; Wessel et al., 2021) and extend them by developing a conceptual framework that captures the multilayered, temporally unbounded, and technologically multiplex characteristics of DT. In so doing, we explore how a process perspective on change (Langley and Tsoukas, 2017) and the discourse on digital materiality (Leonardi, 2017a, 2017b) can be adopted and synthesized into the DT discussion. Below, we present early ideas capturing the results of this process in terms of a digital materializing framework (see table 2) we believe to be useful for understanding how digital technologies evolving on different analytical levels over time set key conditions for DT processes and outcomes.

The key characteristics of DT

In the conceptual development of DT within IS research, several aspects are emerging as distinctive characteristics that sets DT apart from other change processes. Based on these aspects, we argue here that DT can be characterized in terms of what is assumed to change (transformative scope), for how long (temporal scope), and the core driving process (key driver).

First, DT is a process constituted by the conjunction of interrelated digitalization occurring at different levels e.g., at the level of individuals, organizations, industries and society (Hinings et al., 2018; Vial, 2019). These processes are interrelated so that when for example organizational DT is in focus, the outer context is still key to understand (Pettigrew, 1987) since it serves as a key motivator for DT's initiation and as a source for vital resources that fuel its progression over time. In other words, the digitalization of society, industries and markets including the increasing use of digital technologies to develop, distribute and capture value in new ways triggers and fuels the DT of organizations (Vial, 2019). Conversely, outputs of

organizational DT (i.e., new products, services and business models) drive and fuel the DT of wider contexts such as industries and ecosystems (Hinings et al., 2018; Skog et al., 2018).

Second, DT is a temporally unbounded process. It is in motion for as long as contexts are productive of triggering and enabling conditions, and actors decide to respond to them with innovation and change initiatives. In terms of triggers, Vial finds that organizational DT is initiated as a strategic response to the emergence and use of new digital technologies at the level of society and industries (2019). Similarly, Skog (2019) and Hinings et al. (2018) suggests that emerging digital technologies as well as the new behaviors and preferences that their use may result in at the level of markets and individuals provides key resources organizations use to initiate and sustain DT. In all, this suggests that for as long as we can see digitalization producing opportunities or threats at other levels (e.g., society or industry), we can assume DT to be ongoing on a related focal level (e.g., organizations).

Third, DT is suggested to be driven by not one but several digital innovation processes, technologies and outcomes over time (Hinings et al., 2018; Skog, 2019). Through digital innovation, actors (e.g., organizations or individual users) combine modules developed elsewhere by other actors with their own resources to create new processes, products and services (Henfridsson et al., 2018; Yoo et al., 2010). Such combinations tend to be highly dynamic with constitutive modules that are changing, upgraded, and recombined over time. As a result, we cannot rightly assume that DT can be delineated to one technology, system or implementation project.

Aspect	DT characteristics	Requirements for a digital transforming framework
Transformative scope	<i>Organization, ecosystem, industry, market and society:</i> DT processes are expansive, multilayered and interdependent so that processes on one level trigger and fuel the transformation of others.	Needs to help explain how DT may progress on different levels and how these processes interact over time
Temporal scope	<i>Inherently longitudinal:</i> DT processes remain in motion ongoing for as long as underlying motivators and enablers are active	Needs to capture DT as a cyclical, conjunctive, and cumulative process
Key driver	<i>Digital innovation:</i> Combining dynamic and distributed technology to produce new process, products and services.	Needs to capture multiplexity in terms of technologies and innovation processes involved

Table 1. Key characteristics of DT and requirements underlying a conceptual framework on digital transforming

Together, these characteristics provide a conceptual outline of DT as a multilayered process produced by actors acting on interrelated digitalization, as inherently longitudinal and cumulative, and as driven by several digital innovation processes. In turn, these characteristics suggest that the development of a new conceptual framework on DT needs to meet certain requirements. In what follows, we present our early efforts towards meeting them by adopting a process perspective on DT.

Towards a process perspective on DT

A process perspective on change strives to understand how and why things evolve over time. It is grounded in the assumption that there is little to no stability in the world, and that what may be seemingly stable substances are actually continuously produced by ongoing processes (Langley and Tsoukas, 2017). To emphasize process over stability, adopters of a process perspective tend to translate stable nouns into active verbs (e.g., organizing rather than

organization). Following this tradition, we henceforth refer to DT as digital transforming – a continuously ongoing process.

Besides lending us the foundational assumption that DT is a continuously progressing process, we see that the process perspective and process theory can help us meet the requirement of better explaining its multilayered nature. To that end, contextualization is an inherent part of process theorizing that rests on the assumption that interactions between actors and their inner as well as outer contexts often serve to explain why processes unfold in certain ways (Langley and Tsoukas, 2017; Pettigrew, 1987). In search for explanations of how and why things evolve in certain contexts and over time, process studies often involve tracing processes not only at the level where the focal phenomenon manifests, but also tracing what has or is happening at other levels of analysis. This has made a process approach particularly suitable for those seeking to link micro-processes to macro outcomes (Kouamé and Langley, 2017) such as when understanding how the actions of individuals may maintain and disrupt field-level institutions (Lok and de Rond, 2013)

Second, a process perspective on change strives to understand how and why things evolve over time by focusing on the events, activities, and interactions that direct and produce unfolding change. It does this through perceiving the world as constituted by a constant flow where present actions are shaped by actions taken in the past as well as by actions prospected for the future (Langley and Tsoukas, 2017). This could help us embed DT into its temporal context to better understand its longitudinal and cumulative nature. To move beyond static and linear explanations of DT, we perceive cyclical and conjunctive trajectories (Cloutier and Langley, 2020) to be promising avenues to explore.

Lastly, a process perspective can be used to better understand how digital innovation and digital technology on different levels may interact to produce DT. With its focus on flow rather than stability, a process perspective highlights the dynamism and relationships that underpin seemingly stable entities. To that end, it has been used successfully to mobilize social structures that are traditionally seen as stable, such as routines and institutions, into processes. While technological artifacts have so far tended to remain seen as stable things in process theorizing (Leonardi, 2017b), we see a possibility to apply a process perspective to better understand how digital technology evolves and how it may enable and constrain DT across and between different analytical levels. We expand on this below.

Digital materializing: multilayered and evolving materiality in DT

From the perspective of DT as a multilayered and processual phenomenon, and by building on how digital materiality has been used in extant research, we propose that digital materializing can be addressed at three relevant levels of analysis. Spanning on a continuum from universal properties to the features of specific digital artifacts and on to affordances emerging in specific contexts of use (see table 2).

	Societal level	Ecosystem level	Organizational level
Layer of digital materializing	<i>Properties:</i> The evolving universal material abilities latent in all digital artifacts that set universal conditions for organizing	<i>Features:</i> The evolving material constitution of specific digital artifacts that sets conditions for those organizing through using it	<i>Affordances:</i> The action potential that emerge as individual humans interpret and use an evolving set of digital artifacts in specific organizational contexts

Analytical focus	What makes “digital” different and what are the effects on wider systems and institutionalized activities?	What materials come to constitute the features that make up a specific digital artifact over time and how do these enable and constrain network organizing?	How do human actors make sense of features to derive the action potential in using a digital artifact and what are the effects on local organizing?
Examples in existing literature	Technical advancement: e.g., Moores law. Evolution of latent abilities: e.g., programmability, editability, traceability	E.g., Platform boundary resource configuration of Steam	E.g. rating, commenting, purchasing

Table 2. Emerging framework for different levels of digital materializing in DT

At the most general level (e.g. society), the material properties of digital technology refer to those abilities inherent in digital technology that span across particular technologies and contexts of use. Here, reprogrammability, combinability, and generativity are all examples of properties that have been argued to be latent in all digital artifacts. Such material properties of digital technology have been used in extant research to explain how and why key organizational activities, such as innovation (Yoo et al., 2010) and entrepreneurship (Nambisan et al., 2019) change fundamentally in character with increased digitalization.

At the other extreme, the features of a digital technology are given meaning in practice. At the organizational level, users interpret the features of a digital artifact to deduce its affordances and constraints, and to take actions with the artifact that may change work and how it is organized in local settings. At this level, “*affordances represent possibilities of using select features [of a digital technology] or combinations of features in a way meaningful to the user’s goals, abilities, and lines of action*” (Faraj and Azad, 2012, p. 254). As such, affordances are not properties or features of technology, nor are they properties in people, but rather, they “*are constituted in the relationships between people and the materiality of the things with which they come in contact*” (Leonardi and Vaast, 2017, p. 152).

A level less addressed in extant research is that of ecosystems. Referred to by Leonardi as the level of materials (2017a), digital materializing at this level concerns how individual materials are combined to constitute particular features, how features come to produce a particular artifact, and how these come to enable and constrain certain uses. We see this as a level relevant to understanding organizing at the network level (e.g. innovation networks or platform ecosystems) in relation to the evolution of digital technology.

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