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Published in:
Communications of the Association for Information Systems

DOI:
10.17705/1CAIS.05223

Publication date:
2023

Document version:
Final published version

Citation for pulished version (APA):
Wurm, B., Becker, M., Pentland, B. T., Lyytinen, K., Weber, B., Grisold, T., Mendling, J., & Kremser, W. (2023). Digital twins of organizations: a socio-technical view on challenges and opportunities for future research. *Communications of the Association for Information Systems*, *52*(June), 552-565. Article 23. https://doi.org/10.17705/1CAIS.05223

Communications of the Association for Information Systems

Volume 52 Paper 23

3-28-2023

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Recommended Citation

Wurm, B., Becker, M., Pentland, B. T., Lyytinen, K., Weber, B., Grisold, T., Mendling, J., & Kremser, W. (2023). Digital Twins of Organizations: A Socio-Technical View on Challenges and Opportunities for Future Research. Communications of the Association for Information Systems, 52, 552-565. https://doi.org/10.17705/1CAIS.05223

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Communications of the Association for Information Systems

Panel Report DOI: 10.17705/1CAIS.05223 ISSN: 1529-3181

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Abstract:

Digital twins of organizations are software models that leverage operational and other data streams in order to dynamically monitor, analyze and improve organizational activities over time. Despite surging interest in practice, there is little research about this emerging topic. In this report, we draw from a panel discussion that has taken place at the International Conference on Business Process Management in 2021. Panelists and discussants included scholars from the information systems field, organization science, and computer science. Summarizing and integrating the variety of involved perspectives, we present a socio-technical view on this emerging phenomenon. We point to several implications for future research.

Keywords: Digital Twin, Cyber-Physical Systems, Digital Model, Digital Shadow.

This manuscript underwent editorial review. It was received 11/04/2022 and was with the authors for three months for one revision. Christoph Peters served as Associate Editor.

1 Introduction

A digital twin is a "virtual representation that serves as the real-time digital counterpart of a physical object or process" (Koulamas & Kalogeras, 2018, p. 95). As such, a digital twin can be used to monitor, simulate, and influence the behavior of a physical entity (van der Aalst et al., 2021). In many cases, the digital version may exist before the physical one. Baskerville, Myers, and Yoo (2020) refer to this as the ontological reversal of digital technologies. Digital twins are well-known in different domains, such as the automotive and aerospace industries (Negri et al., 2017).

More recently, the concept of digital twins has been extended to whole organizations (Parmar et al., 2020). Digital twins of organizations are considered to be a key enabler of the Industry 4.0 (Uhlemann et al., 2017), also referred to as the Industrial Internet of Things (Sisinni et al., 2018). In theory, the idea of digital twins of organizations has far-reaching potential; in practice, however, it comes with several profound challenges. This is for different reasons. From a technical perspective, for example, enormous amounts of data need to be generated, collected, and analyzed (Koulamas & Kalogeras, 2018). From a sociological perspective, authors question whether such a twin could possibly represent all relevant aspects that define an organization (Becker & Pentland, 2021).

To fully embrace the implications of what a digital twin of an organization means, we organized a panel discussion with eminent scholars from various fields, including information systems research (Kalle Lyytinen), organization science (Brian Pentland), strategic management (Markus Becker), and computer science (Barbara Weber). The panel took place at the International Conference on Business Process Management in 2021. The conference is particularly well-known for its contributions in the area of process mining, a technology that allows organizations to analyze their business processes based on execution-data from information systems (Badakhshan et al., 2022) and that some consider an important step towards the creation of digital twins of organizations (van der Aalst et al., 2021). In this panel report, we present and synthesize the panelists' key arguments and subsequent discussions. Each discipline offers a distinct perspective on the phenomenon of digital twins of organizations. This diversity enables us to sketch a socio-technical view (Sarker et al., 2019) of digital twins of organizations that recognizes the social as well as technical aspects of this emergent phenomenon. We outline key challenges and avenues for future research.

The remainder of this paper is organized as follows. Section 2 outlines the literature on digital twins of organizations. Section 3 presents three perspectives on digital twins of organizations offered by the panelists. Section 4 integrates and discusses implications that arise for future work. Section 5 concludes this panel report.

2 Digital Twins of Organizations: A Socio-Technical Phenomenon

Digital Twins are an emerging phenomenon that is similar yet different from other forms of digital representations (van der Valk et al., 2020). Figure 1 compares and differentiates digital twins (c) from related concepts, including digital models (a) and digital shadows (b) (van der Aalst, 2021).

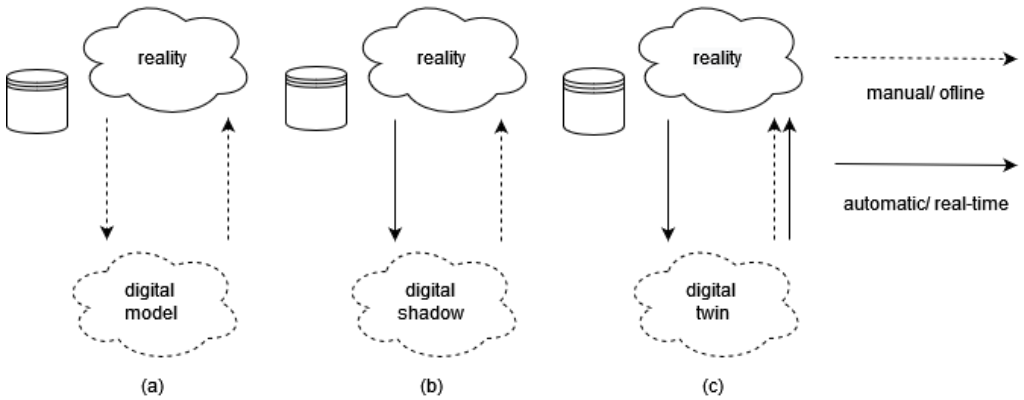

Figure 1. The difference between a digital model (a), a digital shadow (b), and a digital twin (c) (adapted from van der Aalst et al., (2021)).

A digital model (a) is a manually created, digital representation of a physical entity. Instances of digital models are, for instance, process models or technical drawings. There are no automatic changes from the entity to the model and vice versa, and any changes to the model need to be made manually.

A digital shadow (b) is automatically created based on data that an associated physical entity and its sensors produce. Because data is continuously generated and streamed, the model is adapted when the physical entity changes. For example, streaming-based process mining software (Budner et al., 2022) automatically updates the derived process model when the process is performed. The collected data can further be used to carry out detailed simulations of the physical entity. Yet, there is no automatic feedback loop from the digital shadow to the physical entity (van der Aalst et al., 2021); humans need to make decisions on how to adapt the physical entity and implement changes accordingly.

Last, digital twins (c) are virtual representations of physical entities that do not only mirror a physical entity, but can influence it. Based on collected data, algorithms can automatically propose or induce changes to a physical entity. For example, D'Silva & Lawler (2022) report that Vistra, a major U.S. power producer, employs a digital twin of its power production system. This enables the company to continuously collect, combine, and analyze a variety of data streams pertaining to the energy production system. Every 30 minutes, the digital twin provides recommendations on how to adapt the system to maintain its optimal temperature. System operators can then decide whether or not to follow recommendations based on the provided information. While in some cases, the digital twin may automatically adapt to the physical entity, van der Aalst et al. (2021) emphasize that humans must be kept in the loop to make digital twins more resilient.

Over the last few years, the concept of a digital twin has been extended from single or smaller entities to whole organizations. This goes way beyond classical use cases that see digital twins essentially as technical systems with a digital control loop. Gartner proposes the following definition: "A digital twin of an organization […] is a dynamic software model of any organization that relies on operational and/or other data to understand how an organization operationalizes its business model, connects with its current state, responds to changes, deploys resources and delivers exceptional customer value" (Kerremans & Kopcho, 2019). Because digital twins of organizations bridge the physical and the cyber-space, they are considered to be a key-enabler for the Industry 4.0 (Uhlemann et al., 2017) or what is also referred to as the Industrial Internet of Things (Sisinni et al., 2018; Tao & Qi, 2019). In light of the many advantages that are associated with digital twins of organizations, they receive increasing attention from a variety of industries. Accenture has identified digital twins as one of the five key technology trends for 2021 (Accenture, 2021), and companies like DHL and Unilever draw on digital twins to optimize logistics and factory management (Dohrmann et al., n.d.; Sokolowsky, 2019). Similarly, global corporations, such as IBM or McKinsey, seek to leverage the concept for business applications (e.g., McKinsey and Company (n.d.); Parmar et al. (2020)).

Researchers acknowledge that digital twins of organizations are a "grand challenge" (p. 616) from several perspectives (van der Aalst et al., 2021). Research around this topic is in its infancy and currently mainly addresses conceptual and technical aspects (e.g., Fuller et al., 2020). These perspectives pertain to a technical view of digital twins, for example, to data aggregation and model creation (Tao & Qi, 2019). At the same time, however, we see indications that digital twins of organizations come also with profound social implications. Since digital twins of organizations are systems of systems (van der Aalst et al., 2021), there are dynamic feedback loops of behavior that are difficult, if not impossible, to capture and represent (Becker & Pentland, 2021). Similarly, we know little, for example, about the implementation processes of digital twins of organizations (Yıldırım et al., 2021). Some scholars go so far as to ask "Digital Twin of an Organization: Are You Serious?" (Becker & Pentland, 2021, p. 243), indicating that digital twins of organizations cannot possibly capture all relevant aspects of a given organization, such as social dynamics that evolve and change over time.

In light of the emerging challenges, and the largely technical research that exists around the topic, we initiated a panel discussion with eminent colleagues from relevant research fields, including information systems (Kalle Lyytinen), organization science (Brian Pentland), computer science (Barbara Weber), and strategic management (Markus Becker) to share and discuss their perspectives on this topic. In particular, the workshop chairs invited panelists from different fields to illuminate the subject of digital twins from different perspectives. As most of the current debate around digital twins is still taking place in computer science, it was important to include an expert from this subject area who knows current technical possibilities and limitations. Furthermore, strategic management and organization science provide an angle that is largely technology-agnostic and focused on organizational aspects of digital twins. Finally,

information systems, positioned at the intersection of information technology and management, is interested in the unique socio-technical aspects of the phenomenon and links the other disciplines invited. The diversity of the panelists' backgrounds thus allows us to capture and combine the technical as well as social aspects of digital twins of organizations, thereby enabling a socio-technical view (Sarker et al., 2019) on the phenomenon. We outline the panel and the arguments of the panelists next.

3 Digital Twins of Organizations: Insights from Three Research Fields

In this section, we outline the panel discussion on digital twins of organizations. The panel was held at the 1st Workshop on Business Process Management and Routine Dynamics in conjunction with the 19th International Conference on Business Process Management in Rome, Italy, in September 2021. The workshop chairs organized the panel around the paper by Becker & Pentland (2021), which was shared with the other panelists prior to the workshop. Originally, the paper had been submitted as a regular workshop paper, but the workshop chairs realized that the paper had many interesting arguments that could be leveraged for a larger discussion. One of the authors (Jan Mendling) provided a brief introduction to the panel and served as a moderator for the discussion. Markus Becker and Brian Pentland first presented the key arguments of their paper with perspectives grounded in organizational science and management. Second, Barbara Weber presented perspectives from computer science highlighting current technological challenges. As a third position, Kalle Lyytinnen shared his perspective from the standpoint of information systems, which allowed him to reflect and comment on the arguments of the prior speakers through a socio-technical lens. Two of the workshop chairs took notes during the panel that served as a basis for writing this report. The workshop chairs also invited all panelists to contribute to this report by providing written summaries of their talks. In the following, we present the standpoints of the panelists in the order of presentation at the workshop.

3.1 Viewpoint from the Organization Sciences: "Digital Twin of an Organization: Are You Serious?" (Markus Becker and Brian Pentland)

The first talk started from the observation that a digital twin can be seen as a computational model of a system that is sufficiently valid and reliable such that it can be used for design, prediction, maintenance, and other valuable use cases (Gartner Group, 2019). Markus Becker and Brian Pentland argued that a valid, reliable digital twin of an organization is not a realistic goal unless we can model some foundational features of organizations, such as:

1. Agency: Agency involves the capacity to reflect on the past and anticipate the future (Emirbayer & Mische, 1998). Agents can behave strategically in their own interest (Jensen & Meckling, 1976).
2. Conflict: Conflict is common in organizations (Cyert & March, 1963), but it is often suppressed by "truces", which can be hidden until they are broken (Salvato & Rerup, 2018).
3. Learning and forgetting: Organizations are open systems that change through experience (Mintzberg, 1979).
4. Networks of interdependent processes: Many processes in organizations are interdependent, but interdependence is like air; it surrounds everything in an organization, but it is difficult to see (Pentland et al., 2015).
5. Emergence: A great deal of behavior in organizations "depends upon entities at a lower level, but the behavior is neither reducible to, nor predictable from, properties of entities found at the lower level" (Hodgson, 2007, p. 103).

Because of these qualities, organizations are more difficult to model than physical systems. Consider the following analogy. Leonardi (2012) studied the use of digital twins to simulate car crashes and improve automotive safety. Each part of a car is relatively simple, but the safety of the vehicle depends on the ensemble of parts and their interconnections and interactions, which are extremely complex. Now, imagine simulating a car crash where some of the individual parts can act in their own interest, learn from experience, form coalitions, and choose if or when they will react to sudden deceleration. The analogy to organizations is imperfect but instructive. The combination of agency, conflict, interdependence and learning adds to the challenge of creating valid, reliable models.

Ideally, a digital twin of an organization should help managers understand how to intervene to solve novel organizational problems, and design organizational structures, policies, and incentives. To the extent that

managers need to address problems that extend beyond prior experience, fitting a model to historical data does not seem adequate. A digital twin of an organization needs to be built and evaluated with respect to generalizable theory. Finite state machines (e.g., Petri nets) that encode recent history are a reasonable way to model repetitive business processes (van der Aalst, 2015), but do not seem sufficient to capture key features of human organization. Organizations are not deterministic mechanisms; they are woven from interdependence, agency, conflict and learning. They contain latent structures that are difficult to observe. For a digital twin of an organization to be taken seriously and trusted as a tool for managerial action, it needs to take these fundamental aspects of organizational science into account.

3.2 Viewpoint from Computer Science: "Technical Hurdles to Digital Twins" (Barbara Weber)

Following Becker and Pentland, Barbara Weber elaborated on technical hurdles to digital twins of organizations. To reflect the complexity of the subject matter, she proceeded from digital models, over digital shadows to digital twins of organizations (Fuller et al., 2020; van der Aalst et al., 2021).

Creating a model of an organization is certainly the core challenge for digital twins of organizations to come into existence. The foundational characteristics of an organization (agency, conflict, learning and forgetting, networks of interdependent processes, and emergence) as outlined by Becker and Pentland (2021) make the modeling of a digital twin of an organization far more challenging when compared to creating digital twins of physical objects. Additionally, the question of what the boundaries of an organization are is less clear for an organization than for a physical object (van der Aalst et al., 2021). Is it enough to understand the organization as a set of interrelated processes? To which extent should employees, customers, and suppliers be included? Should the environment and the interactions of the environment with an organization be considered as part of the model (e.g., legal or regulatory changes might have an influence on processes).

Digital twins are typically created in a modular manner (e.g., part twins, asset twins, system twins, and process twins (Singh et al., 2021)). In the presence of the above challenges, the creation of a digital twin for an entire organization might seem out of reach. However, it could be an option to start small and create digital twins for some smaller parts of an organization which can then eventually be combined into a digital twin of an organization. This would then raise questions concerning meaningful granularity levels and the value that such smaller-scale twins could already provide.

To move from a digital model to a digital shadow, it is required to keep the virtual representation with the real-world object or process in sync. For this, relevant state changes of the real-world object need to be observable and connectivity is required to propagate these state changes to the digital counterpart. In the context of classical digital twins, this observability is typically achieved through sensors. When it comes to a digital shadow of an organization, then the first question that arises is whether and to which extent can we assume observability. Even if observability is possible from a technical point of view, there might be privacy concerns limiting what can or should be practically done. An answer to these questions will highly depend on how we define the boundaries of an organization. Does a digital shadow of an organization refer to the current state of all business process executions? Alternatively, does it refer to the current state of all business process executions including the state of all resources (humans or machines) that are participating in the process? Digital traces of process executions as used for process mining are available in many organizations already and could serve as a starting point (van der Aalst et al., 2021).

To transition from a digital shadow to a digital twin, it is not sufficient to have a real-time snapshot of an organization, but also the flow from the virtual representation to reality needs to be automatic and real-time. In this vein, digital twin technology is often characterized as reconfigurable, through the sensors on the physical objects, artificial intelligence and predictive analytics. When it comes to a digital twin of an organization, then, it cannot be just assumed that changes in the virtual representation lead automatically to the expected changes in reality. Humans have agency and might decide to deviate from what is suggested or they might react to interventions unexpectedly (Dumas, 2021). Moreover, there might be major temporal delays between a change in the virtual representation and until it takes effect in reality.

The presence of latent structures that are difficult to model and/or observe could constitute a serious challenge for creating reliable digital twins of organizations that are able to intervene effectively. In particular, when moving from descriptions (the digital twin of an organization as a mere representation of the current state of an organization) towards cause-effect relationships, predictions, and interventions, these exogenous variables might play a crucial role to determine how to intervene in a specific situation.

For example, the Covid pandemic forced many organizations to change their processes (e.g., due to novel Covid restrictions, shortages in the supply, and staff members falling sick). When considering the model of a digital twin of an organization to only represent the organization itself with its processes, but not its environment, then the causes for these changes will not be captured, which brings us back to the core challenge of how to model an organization for the purpose of creating a digital twin of an organization.

3.3 Viewpoint from Information Systems: "Digital Twin of an Organization: A Hopeless Search for a Fixed Foundation?" (Kalle Lyytinen)

As the final speaker, we welcomed Kalle Lyytinen who reflected on the history and the concept of digital twins of organizations. As he reasoned, the claim of digital twins of organizations appears to be a natural result of the ongoing pervasive digitizing of phenomena in all walks of human enterprise. The logic goes, that if we can just mirror in the digital the "real", we can then analyze and manipulate the mirror and gain full control, predictability and efficiency in how the "real" behaves.

Alas, in the words of former baseball player Yogi Berra, the recent rise of the idea of digital twins of organizations organized around activities and their digital traces is "déjà vu all over again". The claim of digital twins of organizations was made in its earliest form during the 70's when the notion of data and system-based control of organizational processes and operational decision making was introduced in IBM's COPICS (IBM, 1972) and Blumenthal's MIS framework (Blumenthal, 1969). At that time, the idea was to mirror organizational activities and record related data for control and decision-making. Several criticisms were launched against these ideas – most notable being Beer's model of how organizations work like brains – not like mechanistic databases and algorithms (Beer, 1972). These organizational models, however, later led to the creation and development of complex application frameworks, which currently are known as Enterprise Resource Planning (ERP) systems.

The idea of a digital twin of an organization was next reintroduced in the early 80's as part of standardizing conceptual schema languages for databases. Now the ideal was dressed in the engineering notion of complete and accurate "reality modelling" where all "relevant" facts about an enterprise would be defined in an organization's conceptual schema and then the facts could be used for explanation, analysis, and prediction. Again, such models never worked and were subsequently subjected to extensive criticisms (for a good history of these ideas and related criticisms see Hirschheim et al. (1995)). However, these models and related technical developments later resulted in multiple novel high-level modelling capabilities as manifested in the launch of extensible markup languages (XML), metamodeling and semantic web (Jarke et al., 1998). All these are now widely used as part of enterprise reference models in many industries and settings.

Given the history of the rise and fall of the idea of digital twins of organizations, while computerization and digitizing have advanced, we may rightly question what will be the fate of the last round of the discourse on digital twins of organizations and whether or not they will ever work. My position is that the idea as such will not work as the criticisms and arguments against the very idea of digital twins of organizations are still valid. This does not imply that the recent effort will be useless and nothing good will come out of it! But, I will posit that the currently stated goal and idea of a full digital twin (model) or even a shadow of an organization "that is sufficiently valid and reliable" for control and prediction are not reachable. I will state next a few main arguments that have not been addressed or discussed in recent debates in favor of digital twins of organizations.

Per definition, a digital twin must always be a "twin" of something (activities, facts, structures etc.). The character and nature of this "something" are rarely questioned and analyzed in the debates i.e. how the original is constituted and how it relates to the digital twin. There are two key issues raised with respect to the idea of digital twins of organizations. The digital twin of an organization position posits a Tractatus view of the world: language mirrors the organizational reality (as a twin). Against this position are the constructive and performative views which state that how we see and understand the organizational world is constituted through language. The world is also "performed" through the uses of language (Beer, 1972). This implies that the organization as reality to be mirrored in the twin is never fixed or exhausted and it is all the time subject to negotiation and change which happens through language (Beer, 1972). The second criticism of the "twin" argument emerges from its recent uses in product modelling and related life cycle management (BIM). In this case, the twin shares an iconic resemblance with the original where the relationships between the twin and the original can be relatively easily calibrated and established based on principles of geometry and equivalence. In the case of digital twins of organizations, the situation is different. You first need to address the question of what an organization is and how can I represent it?

Fundamentally, an organization forms an abstract, socially and linguistically mediated, recurrent and relatively permanent set of relationships, events, and states between humans, locations, artifacts, money, etc. Here, the relationships between the mirror and the original are always symbolic and based on practice-based negotiation and conventions and determined by local practices which dictate how the twin and the original relate to one another (as pointed also by Becker and Pentland). But, how such local relationships are established and maintained is never discussed in the literature on digital twins of organizations (for an extensive analysis see Hirschheim et al., (1995)). In actuality, both the original and the twin are part of and constitutive to specific organizational practices.

The twin is not the original and it makes only sense if the original matters to some outsider. So, if you had a digital twin of an organization, the digital twin would have to be something for which some agent has a stake or interest as part of their activity (life form). Consequently, the sheer presence of a digital twin would change what this organization is to this organizational agent. When this happens, the twin will not be a twin anymore as the "original" has changed. In this sense, a digital twin of an organization will be primarily used by agents who form part of the original and the twin. The relationship of the digital twin of an organization to the organizations' members is thus performative, not just representational.

Generally, we can note that the idea of a digital twin of an organization will be useful if it can address a specific range of questions related to how agents' activities in an organization are performed and/or how they can be feasibly organized. This is nothing radical as such – we have used models and advanced models as part of our organizing activity at least for 2000 years. The form and substance of the model may change, but the ultimate role and benefit (or drawback) of the models will not change. As a "life form", the organizing will change as new digital twins are built about organizing. These digital twins help us understand and reflect better on ongoing activity and, as parts of it, we change due to the novel analysis and discovery around the twin. But we should not fool ourselves to believe that the digital twin is the original, buzzing organization, or that you really know the "original", if you know something new thanks to the twin.

3.4 Summary

In summary, the panelists presented three distinct perspectives on digital twins of organizations. First, Markus Becker and Brian Pentland shared their perspectives from organization science highlighting that organizations are not mere compositions of physical entities, but also comprise social components that make the overall system more dynamic. Barbara Weber continued by outlining the technical key challenges that arise when moving from models to digital twins of organizations. In particular, she emphasized that digital twins of organizations need not only to accurately represent an organization (i.e., be an accurate digital shadow), but that digital twins are not self-regulatory such that interventions taken on the basis of the digital representation cannot simply be assumed to translate into corresponding organizational change. Finally, Kalle Lyytinen reminded us that the idea of digital twins of organizations is not entirely new. He further reasoned that the debate on digital twins does not sufficiently reflect the entity that the digital twin captures as well as how this entity and the twin are related. Overall, all panelists agreed that digital twins of organizations can be useful, but that there are important research challenges ahead. We continue with a discussion of research opportunities of digital twins of organizations from a socio-technical perspective (Sarker et al., 2019).

4 Discussion

As the panel discussion has highlighted, there are major challenges associated with the development and use of digital twins of organizations. At the same time, digital twins of organizations have sparked the interest of practitioners and academics alike and may serve more as a grand vision than an immediately available product. Spurred by the increasing availability of sensor information, the capabilities of digital twins (of organizations), their respective precursors, as well as their applications in practice are likely to increase. While research on digital twins of organizations has so far mainly been technical (e.g., Fuller et al., 2020), they are inherently socio-technical. We thus believe that the information systems discipline can make a considerable contribution to research on digital twins of organizations. In this section, we reflect on the question "*How can information systems contribute to the development and use of digital twins of organizations?*". In the following, we outline five research ideas and directions that we deem particularly promising.

How do organizations scope and implement digital twins?

When it comes to the use of digital twins of organizations, a foundational question is indeed the maturity and scope of the digital twin. Organizations need to strike a balance between what is technically feasible and what is economically valuable. As with traditional models (e.g., process models), one needs to decide what to model and why. Organizations will rarely profit from capturing themselves in their entirety as a digital twin but will focus on specific sub-systems that are relevant to a particular problem or analysis. One reason why digital twins are tightly associated with the Industrial Internet of Things (Sisinni et al., 2018) is the availability of machine-related and sensor data on the shop floor level. While the conceptual ideas of digital twins date back several decades, organizations now have new technical opportunities that allow them to collect, monitor, analyze and develop interventions based on these data. In this respect, it will be interesting to observe which of their parts organizations will choose to represent (e.g., processes or structures), what level of sophistication they chose (digital model, digital shadow, or digital twin), and what technologies they combine in order to do so.

What does the life cycle of digital twins look like?

Taking a processual perspective, we can study the life-cycle of digital twins of organizations. How do organizations develop, test, implement, extend, and maintain digital twins of organizations? Because digital twins of organizations are such a grand endeavor, organizations will likely first experiment on a small scale before subsequently increasing the scope of digital twins of organizations. Understanding how organizations proceed in developing and implementing digital twins and how they overcome challenges can prove to be an important learning opportunity. Similarly, we might ask how digital twins of organizations develop and change over time as well as how changes in one (i.e., the digital twin or the actual organization) affect the other?

How do organizations use digital twins?

From a behavioral perspective, information systems scholars can investigate how people use digital twins of organizations and how they affect what people do. Digital twins contribute to and are also dependent on what has been termed “behavioral visibility” in organizations (Leonardi & Treem, 2020), that is, the observation that more and more activities are being recorded, stored and visualized, and can be used for monitoring activities. One can examine how individuals, groups, and whole organizations react to or make use of this visibility. For example, how does managerial decision-making change due to behavioral visibility provided by digital twins of organizations and how do organizations manage the trade-off between behavioral visibility and data privacy (Bélanger & Crossler, 2011)?

4.1 What are the implications of digital twins for algorithmic management in traditional industries?

With the increasing prevalence of digital twins, we expect that algorithmic management (Benlian et al., 2022), i.e., the delegation of management responsibilities to algorithms, will also advance in traditional industries, such as manufacturing. So far, algorithmic management has been studied in platform businesses, e.g., Uber (Möhlmann et al., 2021; Wiener et al., 2021). Through the use of digital twins, traditional organizations gain information about resources, processes, and structures, and it is plausible that this will lead to algorithms taking over (some) managerial functions. Here, it will be interesting to see whether findings from the platform economy can be transferred to other types of organizations and whether digital twins will afford new classes of algorithmic management altogether.

4.2 How can data from digital twins inform research on organizational behavior?

Finally, digital twins collect and employ data that could be used for research purposes. Extracting and analyzing these trace data can lead to novel insights about a variety of different phenomena that pertain to organizations and how they perform work. For example, data on organizational processes can be analyzed with process mining algorithms (Grisold et al., 2020; Pentland et al., 2021), leading to novel insights and theories about how organizational processes are enacted and change over time. This approach might be especially promising when different types of data (e.g., process data and data on organizational structure) are combined.

5 Conclusion

In this paper, we reported on a panel discussion on digital twins of organizations held at the 1st Workshop on Business Process Management and Routine Dynamics in conjunction with the 19th International

Conference on Business Process Management. We summarized key perspectives on digital twins of organizations from management science, computer science, and information systems presented by four highly esteemed colleagues. Reflecting on their arguments, we sketched a socio-technical view of digital twins of organizations that is relevant to information systems and related fields of study. We outlined key challenges and opportunities for research on digital twins of organizations and proposed avenues for future research.

Acknowledgments

We thank all attendees of the 1st Workshop on Business Process Management and Routine Dynamics for their attendance and the lively discussion. We further would like to acknowledge that the workshop has profited from funding from the Erasmus+ program by the European Union [2019-1-LI01-KA203-000169]: “BPM and Organizational Theory: An Integrated Reference Curriculum Design”. The research by Jan Mendling was supported by the Einstein Foundation Berlin under grant EPP-2019-524 and by the German Federal Ministry of Education and Research under grant 16DII133.

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