The Impact of Digitalization on Business Process Management

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“The only thing that is constant is change.”

Heraclitus

This doctoral thesis marks the end of a journey that began in June 2011 in a lecture room at the University of Applied Sciences in Augsburg, in which I was sweating over a German language test compulsory for admission to German higher education institutions.

Having passed the test, I had an entry ticket for studying at the University of Augsburg. There some time later fate would have me meet and work with my supervisor-to-be – Max – who has ever since supported and encouraged me in my academic endeavors and beyond. Thank you, Max, for almost ten years of working together!

Since naming some would do others injustice, I would like to thank ***all*** *my wonderful colleagues and friends for their continuous support, inspiration, and the countless learning opportunities, with which they have provided me!*

Finally, I am eternally grateful for my family, who have been bringing me down to Earth in the good and cheering me up in the not so good moments. In the words of Sir Winston Churchill: “Success is not final; failure is not fatal…”

Abstract

Driven by the fast emergence and adoption of digital technologies, digitalization is a development with profound consequences for individuals, organizations, and society. In an organizational context, it leads to a dynamic and opportunity-rich environment that poses diverse opportunities and challenges on multiple levels of the enterprise architecture including organizational business processes. As the discipline ensuring efficient and effective business processes, business process management (BPM) is, therefore, naturally affected by this development. Despite the uptake of mature BPM methods and tools, the corresponding organizational capability, which is responsible for implementing a BPM program, has not been thoroughly explored in light of digitalization. Thus, this thesis aims to investigate the implications of digitalization on BPM as an organizational capability.

To this end, this cumulative doctoral thesis takes the perspective of the enterprise architecture model (Urbach and Röglinger 2019), which comprises fiver layers of the enterprise architecture including business processes as well as action fields (e.g., digital transformation and digital disruption) to facilitate examining the field of digitalization. Accordingly, the thesis first provides insights into the role of BPM in digital disruption and digital transformation by investigating the effects of digital transformation on business processes as well as the disruptive potential of process mining as a data-driven BPM approach. Further, this thesis focuses specifically on the effects of digitalization on the business process layer of the enterprise architecture as well as the relevant organizational capability by investigating the implications of the future of work and exogenous shocks as two digitalization-induced phenomena. Thereby, the well-adopted BPM capability framework by de Bruin and Rosemann (2007b) is used as an analytical lens. Finally, the thesis explores general challenges/opportunities of digitalization on BPM and proposes an updated BPM capability framework consisting of 30 capability areas geared toward digitalization. Most of these capabilities are either completely new or feature an enhanced meaning compared to established ones. At the same time, no extant BPM capabilities lose their relevance in light of digitalization.

This thesis advances current knowledge on digitalization's impact on BPM by first exemplifying BPM's role in digital transformation digital disruption. Next, drawing from the resource-based view of the firm the thesis contributes to conceptualizing BPM as an organizational capability in light of digitalization by discussing the implications of digitalization-induced phenomena and presenting an updated capability framework in view of digitalization. While confirming that extant BPM capabilities have not lost their relevance, the findings call for expanding BPM's domain to related disciplines in order to ensure the discipline remains instrumental in driving organizational success. Thereby, this thesis lays the foundation for future research aiming at validating and expanding the identified BPM capabilities as well as investigating prescriptive approaches for advancing them to capitalize on the opportunities and tackle the challenges of digitalization.

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I. Introduction[1]

1 Motivation

Digitalization is a development that leads to transformational socio-technical changes for individuals, organizations, and society, and is primarily driven by the fast-paced emergence and adoption of digital technologies (Legner et al. 2017; Pfeiffer 2021). Digital technologies are characterized by their (1) re-programmability separating functional logic from physical embodiment, (2) the ability to homogenize data by displaying it in sets of binary numbers, and (3) a self-referential nature that spurs the creation of ever more digital content and digital devices (Yoo et al. 2010). The variety of digital technologies is considerable ranging from industry cloud platforms, the metaverse, to cognitive computing and advanced analytics (Gartner 2022). Accordingly, the so-called Gartner Hype Cycle for Emerging Technologies provides a continuously updated overview of over 2,000 relevant digital technologies (Gartner 2022). Due to their variety digital technologies can be classified along multiple criteria. For instance, Baier et al. (2023) develop a purpose-based taxonomy to structure digital technologies and identify a number of digital technology archetypes featuring co-occurring taxonomy characteristics. The archetypes range from platform provision, to sensor- and actor- based data execution, and analytical insight generation as well as augmented and natural interaction (Baier et al. 2023). In addition to their substantial variety, digital technologies also feature an ever-increasing speed of adoption. For instance, ChatGPT – an application of Large Language Models – has reached 100 million users in two months (Vidgof et al. 2023).

Driven by the fast emergence and adoption of digital technologies, digitalization is a significant contributing factor for the rise of a fast-moving, connected, and opportunity-rich environment (Kreuzer et al. 2022; Oberländer et al. 2021). Accordingly, researchers and practitioners refer to the onset of a so-called "VUCA world" – that is, one characterized by *v*olatility, *u*ncertainty, *c*omplexity, and *a*mbiguity (Bennett and Lemoine 2014). Such an environment is commonly associated with a plethora of opportunities and challenges for organizations in terms of strategy, structure, and processes (Thorén and Vendel 2019). Urbach and Röglinger (2019) propose investigating the effects of digitalization on organizations along five layers of enterprise

1 This section is partly comprised of content taken from the research articles in this thesis. To improve the readability of the text, I have omitted the standard labelling of these citations.

architecture: business model, business processes, people and application systems, data and information, and technological infrastructure (Figure 1). Organizations face strategic decisions regarding the use of digital technologies along all layers of the enterprise architecture necessitating addressing action fields concerning related interdependencies among the layers. For instance, digital technologies can *enable* entirely new products and business processes (*digital disruption*) enhancing the design space of the upper layers of the enterprise architecture. *Digital business* deals with development and evaluation of innovative, service-, platform-, ecosystem, and data-oriented business models. Finally, *digital transformation* entails *aligning* the lower layers of the enterprise architecture with innovative business models and associated value propositions.

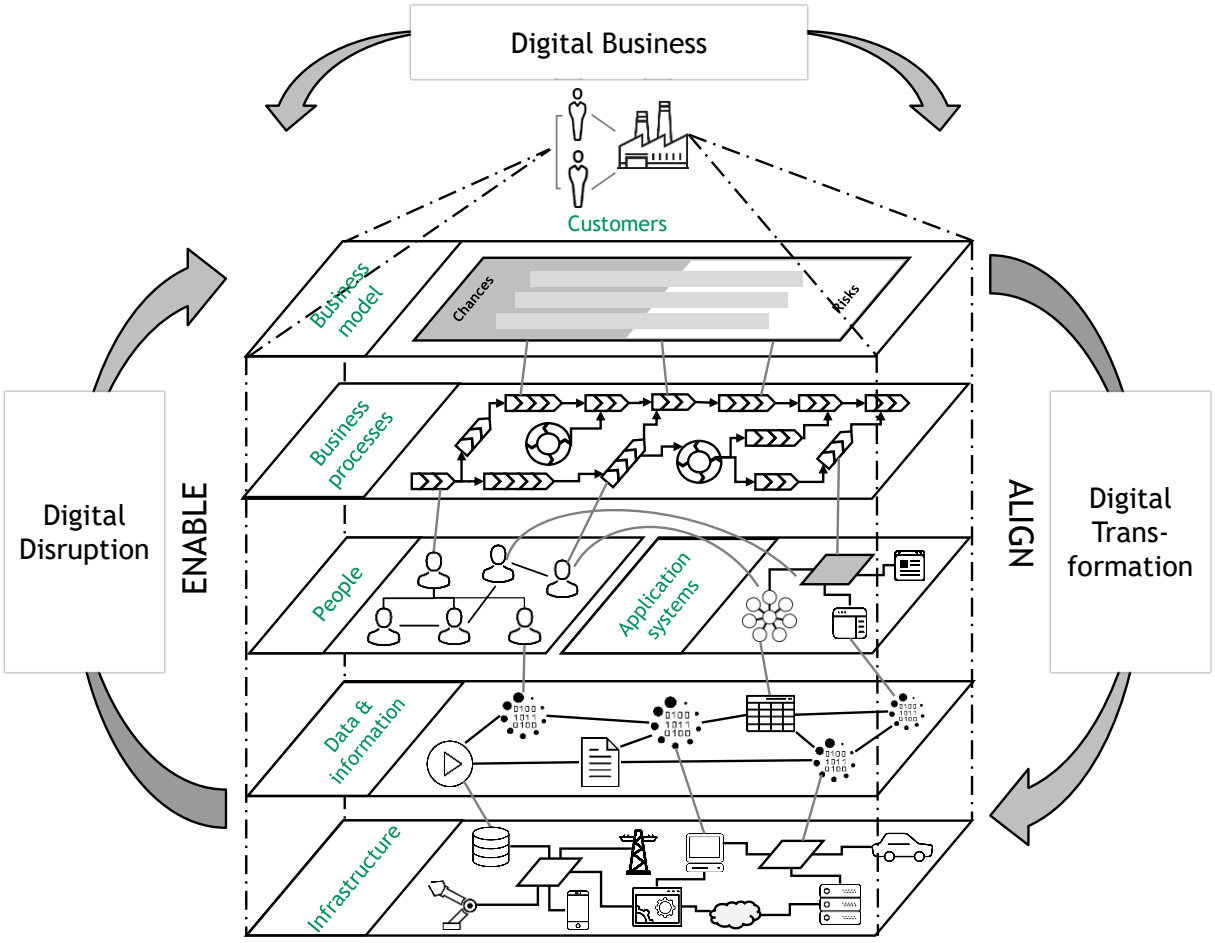

Figure 1. Five layers of enterprise architecture as per Urbach and Röglinger (2019)

Digitalization has multiple implications for the business process layer in the enterprise architecture. Business processes represent orchestrations of tasks, in which established and emerging technologies are leveraged to enable effective and efficient cross-functional work in line with organizational objectives (Harmon 2019; Harmon and Tregear 2016; vom Brocke and

Rosemann 2015a). For instance, the Internet of Things (IoT) and the Industrial IoT enable data-driven monitoring and control as well as applications with predictive features (Oberländer et al. 2018). IoT and blockchain also allow for decentralized and trusted processes (Oberländer et al. 2018; Viriyasitavat et al. 2020). Finally, robotic and intelligent process automation enable the automation of unstructured and complex tasks (Chakraborti et al. 2020; van der Aalst et al. 2018). As the science and practice of overseeing how work at an operational level is performed to ensure consistent outcomes and take advantage of improvement opportunities (Dumas et al. 2018; van der Aalst 2013), business process management (BPM) is profoundly affected by the challenges and opportunities that digitalization and digital technologies pose.

Investigating the effects of digitalization on business processes and BPM as the corresponding organizational discipline can be pursued through two analytical lenses: the various phases of the BPM lifecycle (i.e., process identification, design, analysis, implementation, execution, and improvement) as well as the BPM capability itself (Niehaves et al. 2014; van der Aalst 2013; van Looy et al. 2017). Each lifecycle phase features well-adopted methods, techniques, and theoretical insights (Recker and Mendling 2016), which have received substantial attention in research. Examples of such developments include advanced process automation, adaptive process execution, and agile process improvement (Dumas et al. 2022; Kerpedzhiev et al. 2021). From a capability perspective, which builds on the resource-based view of the firm, BPM is responsible for the successful implementation of a BPM program (Dumas et al. 2018) enabling effective and efficient business processes driving organizational success (de Bruin and Rosemann 2005; Lehnert et al. 2016). The overarching BPM capability is structured by means of capability frameworks, which comprise capability areas regarded as crucial for the successful implementation of business processes in organizations (Pöppelbuß et al. 2015; vom Brocke and Rosemann 2015a).

The BPM literature features multiple BPM capability frameworks. For example, Jurisch et al. (2014) compile capabilities for process change, whereas van Looy et al. (2014) analyze capability areas for business process maturity. Based on the work of de Bruin and Rosemann (2007b), Rosemann and vom Brocke (2015) propose a comprehensive BPM capability framework that includes capability areas structured around the core elements of BPM (i.e., strategic alignment, governance, methods, information technology (IT), people, and culture). de Bruin and Rosemann (2007b) define the core elements as follows: Strategic alignment designates the continual tight linkage of organizational priorities and enterprise processes enabling achievement of business goals. Governance refers to establishing relevant and

transparent accountability and decision-making processes to align rewards and guide actions. Methods includes approaches and techniques that support and enable consistent process actions and outcomes. IT comprises the software, hardware, and information management systems that enable and support process activities. People refers to the individuals and groups who continually enhance and apply their process-related expertise and knowledge. Finally, culture represents the collective values and beliefs that shape process-related attitudes and behaviors.

The framework has been widely embraced in BPM research, adopted by several companies (van Looy et al. 2017) and has been used as a structure for other influential works in the field of BPM (vom Brocke and Mendling 2018; vom Brocke and Rosemann 2015a, 2015b). The underlying six BPM core elements take on a comprehensive perspective of BPM surpassing the focus of the BPM lifecycle on process support. Figure 2 represents the six core elements of BPM including corresponding capability areas as per de Bruin and Rosemann (2007b).

Strategic Alignment	Governance	Methods	Information Technology	People	Culture
Process Improvement Planning	Process Management Decision-Making	Process Design & Modeling	Process Design & Modeling	Process Skills & Expertise	Responsiveness to Process Change
Strategy & Process Capability Linkage	Process Roles and Responsibilities	Process Implementation & Execution	Process Implementation & Execution	Process Management Knowledge	Process Values & Beliefs
Enterprise Process Architecture	Process Metrics & Performance Linkage	Process Monitoring & Control	Process Monitoring & Control	Process Education	Process Attitudes & Behaviors
Process Measures	Process-Related Standards	Process Improvement & Innovation	Process Improvement & Innovation	Process Collaboration	Leadership Attention to Process
Process Customer & Stakeholders	Process Management Compliance	Process Program & Project Management	Process Program & Project Management	Process Management Leaders	Process Management Social Networks

Figure 2. de Bruin and Rosemann's (2007b) capability framework

Despite the outlined profound effects of digitalization on BPM as an organizational capability, related capability frameworks including the one by Rosemann and vom Brocke (2015) do not specifically account for these effects. This lack of insights regarding the development of the BPM capability in light of digitalization contrasts with the above-mentioned observation regarding the mature state of techniques and methods in the BPM lifecycle stages. The need for rethinking and challenging extant BPM capabilities has been already pointed out in the BPM literature (e.g., Klun and Trkman (2018)). In this regard, Recker (2014) even argues that established capability areas "have too readily been accepted and taken for granted" (Recker 2014, p. 12). Therefore, to ensure that BPM remains a key driver of organizational performance

it is essential to understand the implications of digitalization on BPM from a capability perspective.

2 Research Goal and Structure of the Thesis

In line with the outlined developments regarding digitalization and the BPM state-of-the-art the overarching goal of this cumulative doctoral thesis is *to investigate the implications of digitalization on BPM as an organizational capability.* To this end, the thesis is structured into two main sections covering BPM-related digital disruption and digital transformation as well as the business process layer in the enterprise architecture as per Urbach and Röglinger (2019). Thus, section II exemplifies the role of BPM in enabling digital disruption as well as aligning business processes with the goals of digital transformation. Section III concentrates on the business processes layer and the conceptualization of BPM as an organizational capability in view of digitalization.

Section II includes two research articles (#1 and #2). Research article #1 addresses a case study of a German market-leading manufacturer of car wash systems and reveals five organizational tensions arising due to competing demands in the scope of the ongoing digital transformation initiative at the case organization. Depending on the relationships of the underlying competing demands the tensions belong to four distinct tension types with different implications for organizational business processes, which need to be aligned with the objectives of the digital transformation. Research essay #2 presents the results of a Delphi study with international academic and industry process mining experts. The study provides an overview of opportunities and challenges of process mining in an organizational context as an example of a data-driven BPM approach. The results exemplify the diverse possibilities, in which BPM approaches can enable new design options disrupting established notions and routines in all layers of the enterprise architecture.

Section III includes three research articles (#3, #4, and #5) exploring the future of BPM as an organizational capability in view of digitalization. Thereby, articles #3 and #4 deal with the implications of the future of work and exogenous shocks on BPM. Digitalization is a contributing factor to these two developments since it induces changes in the nature of work and creates a dynamic business environment, characterized by uncertainty and volatility. Research article #3 proposes constitutive features of the future of work derived by means of a literature review. Using the BPM capability framework of de Bruin and Rosemann (2007b) as analytical lens, respective implications for the BPM capability are discussed. Research article

#4 first systematizes characteristic effects of exogenous shocks on organizational process performance and proceeds to examine implications of exogenous shocks on BPM along the six core elements of BPM. Finally, research article #5 provides an overview of general challenges/opportunities for BPM, which serve as the basis for developing a corresponding BPM capability framework geared toward digitalization.

Section IV summarizes the contribution of the doctoral thesis and elaborates on avenues for future research. Figure 3 represents the outlined structure of research articles included in the doctoral thesis.

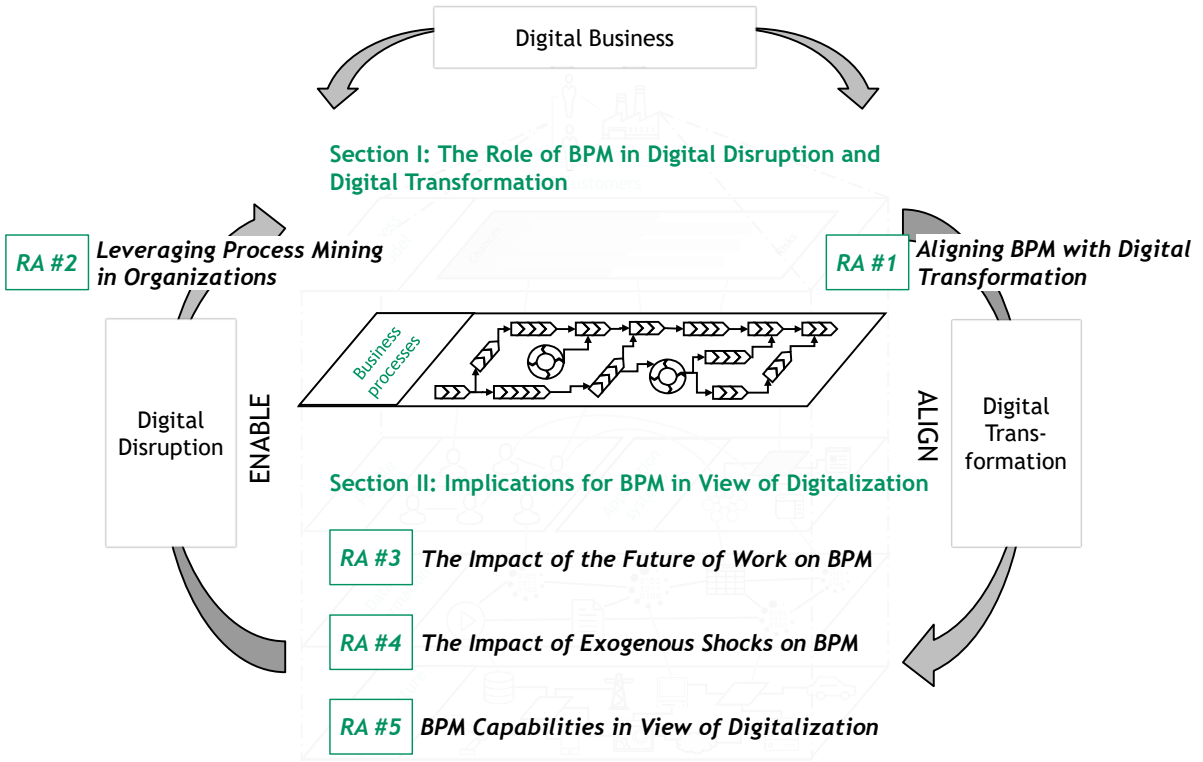

Figure 3. Structure of the research articles in the doctoral thesis

Investigating the implications of digitalization on BPM as an organizational capability, this doctoral thesis contributes primarily to descriptive BPM research. It provides insights into the potential of BPM to drive digital disruption as well as the effects of digital transformation on the business process layer of the enterprise architecture and BPM as the corresponding management discipline. Further, it informs research on BPM capability development by first identifying challenges and opportunities for the discipline in light of digitalization and then conceptualizing BPM capability areas covering these. Thereby, the resulting capability areas enable new research opportunities at the crossroads of BPM and related disciplines. Thus, this thesis complements extant works on BPM capability identification and maturity model

development as well as initiatives dealing with the future of the discipline such as those of Klun and Trkman (2018), Rosemann (2014), and van der Aalst (2013).

II. The Role of BPM in Digital Disruption and Digital Transformation[2]

1 Aligning BPM with Digital Transformation

As outlined in the introduction digital transformation entails aligning the layers of enterprise architecture with novel business models and value propositions, which can profoundly impact organizations regarding their visions, strategies, structures, processes, capabilities as well as culture and identity (Gurbaxani and Dunkle 2019b; Wessel et al. 2021). In digital transformation initiatives organizations navigate multiple challenges in embracing new digital opportunities while capitalizing on existing offerings (Oberländer et al. 2021; Svahn et al. 2017b). Consequently, digital transformation often is characterized by a clash of the *old* and *new* (Gregory et al. 2015; Lanzolla et al. 2021; Soh et al. 2019b). This clash leads to the emergence of competing demands invoking organizational tensions between established and emerging routines, value propositions, identity etc. (Lanzolla et al. 2021; Svahn et al. 2017b). This conflict is especially relevant for incumbent organizations, which feature long-established practices (Wiener et al. 2018).

Research article #1 provides a nuanced understanding of tensions in digital transformation initiatives and lays the foundation for deriving implications for organizations including BPM and business processes. The article presents the findings of an exploratory case study with WashTec – an internationally operating market leader in the provision of car wash systems going through a digital transformation at the time of conducting the study. WashTec has traditionally addressed business customers (i.e., car wash systems operators) and has focused on developing, producing, marketing, and maintaining car wash system solutions. Aiming to leverage its favorable market position WashTec initiated a digital transformation to digitalize its offerings and explore new business models. The conducted case study with the organization resulted in the identification of five tensions at the case organization corresponding to four distinct tension types with specific effects on organizational business processes. These tensions include a dialectic (*B2B versus B2C Identity*), a trade-off (*Local Adoption versus Centralization*), two dualities (*Material versus Immaterial Solutions* and *Cost-based versus*

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Value-based Revenue Logic), and a paradox (*Strengthening the Core versus Embracing the Unknown*). Table 1 summarizes the tensions including their implications regarding organizational business processes.

Table 1. Overview of tensions at WashTec

ID	Tension	Classification and rationale	Exemplary implications for business processes
1	***B2B versus B2C Identity***	**Dialectic:** Addressing business and end customers leads to a cannibalization effect (i.e., end customers switching from one operator to another). However, the competing demands are interrelated and feature synergy potential. As a result, WashTec pursues a new B2B2C identity (i.e., accounting for the needs of end customers to offer added value to business customers) representing a synthesis of the demands exemplified by the *EasyCarWash* app.	Dedicated processes targeting end customers' needs are to be introduced. These need to accommodate both synergies and potential risks of the B2B2C orientation.
2	***Local Adoption versus Centralization***	**Trade-off:** The centralized and local development of digital solutions contradict each other and cannot be present to their full extent at the same time. However, the demands can coexist and are not interrelated (i.e., they are independent). As a result, WashTec considers establishing routines for a speedy and professional centralized development of digital solutions while still allowing a degree of local autonomy in customizing solutions to local needs.	Guidelines regarding the degree of centralization of developing digital solutions need to be established to capitalize on tailored yet compliant solutions.
3	***Material versus Immaterial Solutions***	**Duality:** The development and support of material and immaterial solutions are not oppositional and can be pursued at the same time. Further, they feature significant synergy potential in terms of physical products complemented with digital services. As a result, WashTec embraces the fusion of material and immaterial solutions, which enables new value propositions in the form of smart products and services (e.g., predictive maintenance).	Processes need to support novel value propositions resulting from the fusion of material and immaterial solutions
4	***Cost-based versus Value-based Revenue Logic***	**Duality:** Implementing cost- and value-based revenue logic are not oppositional and can be pursued at the same time. Further, they feature significant synergy potential enabling individualized customer offers. As a result, next to established cost-based revenue logic, WashTec embraces value-based monetization (especially for digital offerings) enabling new value propositions.	The incorporation of the new value-based revenue logic calls for challenging existing and coordinating new processes to capitalize on new value propositions.
5	***Strengthening the Core versus Embracing the Unknown***	**Paradox:** Exploitation and exploration initiatives are both oppositional and highly interrelated. They are also complementary and can be pursued at the same time. As a result, WashTec initiates both exploitation and exploration initiatives to ensure the short- and long-term success of the organization leading to new organizational routines.	Processes need to cater to both exploration and exploitation as well as feature enhanced transparency regarding corresponding goals and resource allocation.

The first tension (*B2B versus B2C Identity*) constitutes a dialectic. It emerges as WashTec – traditionally oriented toward the needs of business customers – realizes that it could profit from addressing end customers via digital channels. At the same time, a pure B2C focus would cannibalize existing relationships with business customers, meaning that the demands are contradictory. Nevertheless, incorporating B2C elements in the existing product portfolio is beneficial for addressing business customers. Consequently, a synthesis of the two demands emerges (i.e., a B2B2C identity), which exploits the synergies between the traditional B2B and the newly enabled B2C orientation. The synthesis requires processes that incorporate the end customer's perspective to enhance offerings for business customers.

The second tension (*Local Adoption versus Centralization*) tackles the development and support of digital solutions. It represents a trade-off between imposing centralization and granting autonomy of globally dispersed organizational units regarding the development and support of digital solutions. A centralized approach benefits from high degree of scalability and professionalization while local adoption entails flexibility when catering to specific needs, legal requirements, digital culture etc. of globally dispersed organizational units. The two competing demands imply that more of the one means less of the other (typical for a trade-off). The demands are not interrelated with limited synergy potential. Related business processes need to observe guidelines regarding the degree of centralization to benefit from an autonomous yet compliant approach to developing and supporting digital solutions.

The third tension (*Material versus Immaterial Solutions*) is a duality and concerns the traditional focus of WashTec on the development of physical solutions (i.e., car wash systems) and the emerging need for digital ones (e.g., mobile applications for end customers, support portals for car wash systems operators). Compared to material solutions, digital ones call for different organizational processes, mindset, and routines. While the two demands seemingly contradict each other by entailing different approaches, they are also highly interrelated and synergetic. Therefore, WashTec needs to be aware of both and pursue them simultaneously to enhance existing and explore new value propositions. Accordingly, new processes that capitalize on the synergies between material and immaterial solutions are needed.

The fourth identified tension (*Cost-based versus Value-based Revenue Logic*) is also a duality. It stems from the opposition of the traditional cost-based revenue logic and the emerging need for a value-based one. While the former relies on one-off sales of physical equipment, the latter is tailored to digital solutions, which exhibit markedly different cost and value structures. The two approaches require different organizational processes and imply different monetization

strategies. However, they also complement each other and allow WashTec to leverage tailored offering to various customer segments. New business processes are needed to support the novel value propositions.

The final tension (*Strengthening the Core versus Embracing the Unknown*) constitutes a paradox. It arises due to the intention to exploit the existing business model and explore new digital business opportunities. The two demands pursue different goals, have different risk/benefit and temporal profiles, and compete for the allocation of limited organizational resources. However, they also complement each other (i.e., an exploration initiative such as predictive maintenance can help streamline the support of car wash systems) Therefore, WashTec aims to accommodate both demands and leverage respective advantages. Both exploration and exploitation need to be operationalized by business processes that pursue transparent goals and resource allocation.

By investigating tensions related to digital transformation and their core features research article #1 provides detailed insights into tensions occurring during the digital transformation of an incumbent, B2B manufacturing organization. Surpassing the common focus on paradoxical tensions the article elaborates on underlying characteristics of competing demands and classifies tensions into corresponding established categories. Further, it provides the foundation for examining implications of digital transformation organizations along the five layers of enterprise architecture. Thus, the article contributes to an in-depth understanding of the implications of digitalization from an organizational perspective and sheds light on relevant implications for organizational business processes and BPM.

2 Leveraging Process Mining in Organizations

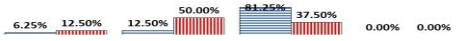
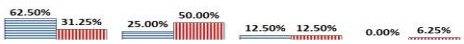
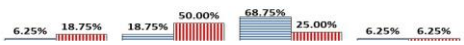
Understanding the effects of digital technologies for all layer of the enterprise architecture is essential in capitalizing on their potential. An example of the role of BPM in digital disruption is the use of process mining as a data-driven digital method/technology for business process analysis, monitoring, and improvement (Kerremans et al. 2020). A substantial amount of process mining research has concentrated on advancing process mining algorithms, methods, and tools (Thiede et al. 2018) regarding topics such as predictive process monitoring (e.g., Kratsch et al. (2021); Teinemaa et al. (2017)), data quality (e.g., Fischer et al. (2020)), and domain-specific algorithms such as in healthcare (e.g., Chiudinelli et al. (2020)). Yet, the use of process mining in organizations has been mostly covered by means of case studies examining the use of one or more process mining techniques in specific organizational contexts (e.g.,

Reinkemeyer (2020)). However, such insights – though valuable – are limited to observations in single organizations.

Aiming for a more comprehensive understanding of the potential of process mining as a disruptive technology research article #2 investigates relevant opportunities and challenges to inform process mining research and practice. To this end, a ranking-type (in the study *rating* was chosen instead of *ranking*) Delphi study with process mining experts from academia and industry was performed. Delphi studies are an iterative qualitative research method consisting of iterative expert survey rounds aimed at gathering insights and achieving consensus on a given topic (Gupta and Clarke 1996; Kerpedzhiev et al. 2021; Skinner et al. 2015b). The study comprised three phases: In the brainstorming phase, an initial list of opportunities and challenges for the use of BPM in organizations was collected and validated. In the narrowing-down phase, the lists of opportunities and challenges were reduced to a manageable number. In the final rating phase, the shortlisted items were rated regarding their comparative relevance. Thereby, the experts were divided into an academic and practitioner subpanel to gather insights into structural differences and commonalities regarding the perceived comparative relevance of items between academics and practitioners. Thus, the study resulted in a list of rated 30 opportunities and 32 challenges for the successful use of process mining in organizations. Table 2 and Table 3 summarize these main results of the study. The opportunities and challenges were both structured along the established six core elements of BPM. Opportunities in the core element Methods/IT (the two core elements Methods and IT were merged) were additionally classified into the phases of the BPM lifecycle (Dumas et al. 2018).

Table 2. Opportunities for the use of process mining in organizations

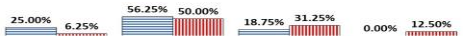
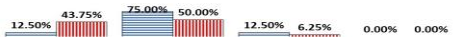
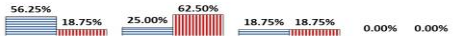
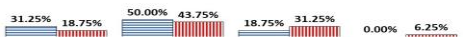
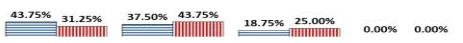
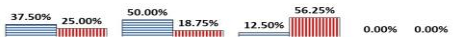
ID	Strategic Alignment	ER	MR	SR	IR
O.1	**Enabling inter-organisational value creation**** PM enables value creation by fostering inter-organisational interaction and collaboration.	6.25% 56.25%	62.50% 12.50%	31.25% 25.00%	0.00% 6.25%
O.2	**Facilitating strategic decision-making** PM facilitates strategic decision-making by objectively assessing the congruency of operational practices and corporate strategy.	6.25% 12.50%	75.00% 62.50%	18.75% 18.75%	0.00% 6.25%
O.3	**Supporting digital transformation***** PM supports identifying digital transformation initiatives as well as designing digital transformation strategies.	0.00% 56.25%	68.75% 31.25%	31.25% 12.50%	0.00% 0.00%
	Governance				
O.4	**Maintaining an up-to-date business process repository** PM enables maintaining an up-to-date business process repository.	12.50% 25.00%	62.50% 25.00%	25.00% 50.00%	0.00% 0.00%
O.5	**Supporting data management** PM helps identify relevant data and highlights potential data management issues.	31.25% 18.75%	56.25% 43.75%	12.50% 37.50%	0.00% 0.00%
	Methods/IT - Overall				
O.6	**Complementing management approaches and techniques** PM instils process and data awareness into other management approaches and techniques.	6.25% 37.50%	68.75% 31.25%	25.00% 31.25%	0.00% 0.00%
O.7	**Supporting IT management** PM helps derive insights that are useful for the selection, implementation, and improvement of IT systems, tools, and interfaces.	6.25% 12.50%	75.00% 68.75%	18.75% 12.50%	0.00% 6.25%
	Methods/IT - Process discovery				
O.8	**Accelerating as-is business process modelling*** PM accelerates as-is business process modelling and makes it more objective compared to data-agnostic methods.	37.50% 81.25%	62.50% 18.75%	0.00% 0.00%	0.00% 0.00%
O.9	**Enhancing business process transparency** PM increases the transparency of business processes by visualising the actual business process flows based on real-life data.	87.50% 81.25%	12.50% 18.75%	0.00% 0.00%	0.00% 0.00%
	Methods/IT - Process analysis				
O.10	**Analysing business processes from the resource perspective** PM permits the retrieval of actionable insights into the resource involvement and collaboration patterns in a business process.	75.00% 56.25%	18.75% 18.75%	6.25% 25.00%	0.00% 0.00%
O.11	**Analysing business process variants and exceptions*** PM allows the analysis of business process variants and exceptional business process instances, supporting initiatives such as business process standardisation.	68.75% 100.00%	25.00% 0.00%	6.25% 0.00%	0.00% 0.00%
O.12	**Understanding business process compliance** PM allows efficient and comprehensive compliance checking of business process executions as well as understanding the reasons for deviant behaviour and fraud.	93.75% 75.00%	6.25% 18.75%	0.00% 6.25%	0.00% 0.00%
O.13	**Detecting business process drift*** PM enables the detection of business process changes and getting insights into the evolution of business processes over time.	25.00% 50.00%	68.75% 18.75%	6.25% 31.25%	0.00% 0.00%
O.14	**Enabling business process comparison and benchmarking** PM enables comparative analysis and benchmarking of business processes or business process variants.	62.50% 75.00%	25.00% 25.00%	12.50% 0.00%	0.00% 0.00%
O.15	**Enhancing business process risk management** PM enables assessing business process risks and supports the definition of risk mitigation actions.	6.25% 31.25%	62.50% 43.75%	31.25% 25.00%	0.00% 0.00%
O.16	**Identifying business process waste** PM supports the identification of business process waste such as non-value-added tasks or bottlenecks.	75.00% 75.00%	18.75% 18.75%	6.25% 6.25%	0.00% 0.00%
	Methods/IT - Process redesign and implementation				
O.17	**Enabling business process automation*** PM supports the identification of automation potential in business processes.	43.75% 25.00%	37.50% 75.00%	18.75% 0.00%	0.00% 0.00%
O.18	**Enhancing business process improvement and redesign** PM enhances business process improvement and redesign, ranging from the identification of improvement options to the evaluation of its effects.	93.75% 93.75%	6.25% 6.25%	0.00% 0.00%	0.00% 0.00%
O.19	**Improving resource assignment in business processes**** PM allows organisations to improve resource assignments at the levels of tasks and team composition.	62.50% 18.75%	37.50% 43.75%	0.00% 37.50%	0.00% 0.00%

	Methods/IT - Process monitoring and controlling	
O.20	**Enabling decision-making at run-time** PM enables run-time decision-making as well as resource assignment.	
O.21	**Evaluating business process performance** PM supports organisations in assessing and continuously monitoring the performance of business processes.	
O.22	**Predicting outcomes of running cases**** PM supports prediction at run-time regarding expected business process paths and outcomes.	
	People	
O.23	**Enhancing employee training*** PM supports the assessment and improvement of business process training.	
O.24	**Enriching domain knowledge through data** PM encourages domain experts to actively analyse business process data.	
O.25	**Generating intuitive visualisations for business users** PM generates intuitive business process visualisations for business users without technical expertise.	
O.26	**Supporting knowledge management** PM helps make implicit knowledge explicit by unveiling good and bad practices in business processes.	
	Culture	
O.27	**Fostering a business process- and data-centric mindset** PM fosters a cross-functional process- and data-centric mindset by visualising business processes and providing data-backed insights.	
O.28	**Fostering a continuous improvement mindset***** PM stimulates a continuous improvement mindset by encouraging employees to systematically scrutinise business processes.	
O.29	**Nurturing evidence-based communication and decision-making** PM acts as a catalyst for evidence-based communication and decision-making, encouraging objective conversations related to business processes.	
O.30	**Supporting a culture of customer centricity** PM supports a culture of customer centricity when retrieving insights in business processes with an explicit focus on the customer's perspective.	

*A: academics(); P: practitioners(); significance codes: p0.001: ***, p0.01: **, p0.05: *;*

Table 3. Challenges for the use of process mining in organizations

ID	Strategic Alignment	ER	MR	SR	IR
C.1	**Elusive business value** The business value of PM is difficult to determine with regard to the alignment of strategic and operational goals as well as the quantification of costs and benefits.	56.25% 25.00%	31.25% 62.50%	12.50% 12.50%	0.00% 0.00%
C.2	**Lack of management support** Initiating, funding, and conducting PM initiatives requires a strong management commitment.	62.50% 87.50%	37.50% 6.25%	0.00% 6.25%	0.00% 0.00%
C.3	**Unclear success factors** It is unknown which organisational setups and properties ensure an efficient and effective use of PM.	50.00% 31.25%	37.50% 62.50%	12.50% 6.25%	0.00% 0.00%
	Governance				
C.4	**Constraining data access barriers** Limited data access across departmental and organisational boundaries restricts PM.	50.00% 12.50%	43.75% 68.75%	6.25% 12.50%	0.00% 6.25%
C.5	**Lack of interdisciplinary and cross-functional teams*** PM suffers from a lack of interdisciplinary and cross-functional teams covering sponsors, IT, and data specialists as well as business users and project managers.	25.00% 68.75%	56.25% 12.50%	18.75% 18.75%	0.00% 0.00%
C.6	**Missing implementation guidance** There is a lack of comprehensive guidance on the implementation of PM for different organisations, domains, contexts, and strategic goals.	18.75% 12.50%	68.75% 56.25%	12.50% 31.25%	0.00% 0.00%
C.7	**Poor data quality*** Source or event data are often inaccurate, noisy, and/or incomplete.	93.75% 56.25%	6.25% 43.75%	0.00% 0.00%	0.00% 0.00%
C.8	**Restricting data privacy regulations** Compliance with data privacy and security regulations limits the detail of what can be discovered and analysed through PM.	37.50% 25.00%	56.25% 37.50%	6.25% 31.25%	0.00% 6.25%
C.9	**Unavailability of data***** The availability of event data needed for PM is limited.	93.75% 31.25%	0.00% 50.00%	6.25% 12.50%	0.00% 6.25%
C.10	**Unclear organisational anchoring***** It is unclear how PM expertise should be anchored within the organisation.	12.50% 37.50%	25.00% 62.50%	56.25% 0.00%	6.25% 0.00%
	Methods/IT				
C.11	**Challenging (real-time) system integration**** Insufficient real-time system connectivity or integration into existing IT infrastructure negatively impacts deriving insights through PM.	37.50% 43.75%	62.50% 25.00%	0.00% 31.25%	0.00% 0.00%
C.12	**Complex data preparation** Substantial effort is required for data extraction and pre-processing.	62.50% 50.00%	37.50% 25.00%	0.00% 25.00%	0.00% 0.00%
C.13	**Difficult analysis of process exceptions** PM lacks support for deriving insights from process exceptions.	25.00% 12.50%	50.00% 43.75%	25.00% 31.25%	0.00% 12.50%
C.14	**Difficult handling of unstructured data** PM provides limited support for exploiting unstructured data that is not available in activity-based semantics or event format.	37.50% 43.75%	56.25% 18.75%	6.25% 31.25%	0.00% 6.25%
C.15	**Fragmented solutions**** There is a lack of comprehensive PM solutions supporting a wide range of conceivable use cases.	43.75% 6.25%	50.00% 31.25%	6.25% 56.25%	0.00% 6.25%
C.16	**Incomprehensible outcomes***** Non-standard visualisation techniques used in PM may lead to overcomplicated and hardly understandable business process models.	62.50% 6.25%	37.50% 37.50%	0.00% 50.00%	0.00% 6.25%
C.17	**Insufficient prescriptive capabilities** PM tools are limited regarding their prescriptive capabilities.	25.00% 25.00%	56.25% 31.25%	18.75% 37.50%	0.00% 6.25%
C.18	**Lack of advanced features** PM lacks advanced features such as automation, simulation, and data anonymisation.	18.75% 18.75%	37.50% 37.50%	43.75% 43.75%	0.00% 0.00%
C.19	**Underrepresentation of declarative models** PM relies disproportionately on imperative business process models and largely disregards declarative/hybrid process models.	0.00% 0.00%	56.25% 18.75%	37.50% 75.00%	6.25% 6.25%
	People				
C.20	**Insufficient domain expertise** The lack of comprehensive domain and business expertise inhibits the ability to customise PM as well as to adequately interpret the results.	50.00% 37.50%	37.50% 50.00%	12.50% 12.50%	0.00% 0.00%
C.21	**Insufficient analytical skills** The lack of fundamental analytical skills, including business process modelling and optimisation, impedes deriving value from PM.	75.00% 37.50%	18.75% 31.25%	6.25% 25.00%	0.00% 6.25%
C.22	**Insufficient technical skills**** The lack of sufficient training in technical skills required to implement PM is detrimental to setting up and conducting PM.	81.25% 25.00%	12.50% 50.00%	6.25% 18.75%	0.00% 6.25%

	Culture	
C.23	**Aversion to transparency** PM leads to an undesired level of transparency, revealing unpleasant results and triggering defensive mechanism in employees.	
C.24	**Insufficient data orientation***** A lack of data orientation causes doubts regarding the validity of PM outcomes.	
C.25	**Insufficient process orientation***** A lack of process orientation causes doubts regarding the value of PM.	
C.26	**Invasive work monitoring** PM is perceived as intrusive and raises concerns about privacy and individual performance controlling.	
C.27	**Lack of continuous incorporation** PM is perceived as a one-off initiative, creating a barrier for scaling up and establishing continuous PM.	
C.28	**Lack of trust in insights** PM results and their potential to generate value are discredited since applied techniques are not understood or perceived as a black box.	
C.29	**Misleading overconfidence** Overconfidence in current business process performance downplays the improvement potential through PM.	
C.30	**Resistance to change** Unwillingness to break down long-established routines negatively affects acting on PM insights.	
C.31	**Unsubstantiated expectations** More is projected into PM than can realistically be achieved leading to false expectations and disappointment with the obtained results.	
C.32	**Unwillingness to share domain knowledge*** PM stakeholders are unwilling to share domain knowledge due to the fear of providing too much business information or becoming obsolete.	

*A: academics(); P: practitioners(); significance codes: p0.001: ***, p0.01: **, p0.05: *;*

Both the opportunities and challenges address all BPM core elements as well as various cultural, technical, and managerial aspects. In accordance with to the observation that, though driven by digital technologies, digitalization is a broad and complex topic (Tabrizi et al. 2019b), many of the opportunities and challenges cover non-technical aspects (e.g., 13 out of 30 challenges are not classified into the core element Methods/IT).

The results fit into and confirm extant observations in the literature on process mining (e.g., Syed et al. (2020) and Grisold et al. (2021)). Further, they indicate that the most frequently cited limitations regarding the use of process mining of Claes and Poels (2013) (i.e., limited data access (C.4), high cost of data preparation (C.12), and understanding process mining output (C.16)) are still relevant at the time of conducting the study. Despite multiple advances over the years the mentioned difficulties are persistent and need to be addressed by the process mining community. However, a number of the identified opportunities and challenges also extend the state-of-the-art in process mining. Such items concern for instance process mining governance (e.g., O.4 and O.5), strategic decision-making (O.2) as well as enabling business process comparison and benchmarking (O.14). In terms of novel challenges, unclear success factors (C.3), difficult in analyzing process exceptions (C.13) as well as handling of unstructured data (C.14) can be mentioned.

The study also provides insights into the comparative relevance of opportunities and challenges according to academic and industry process mining experts. A number of items are considered by both groups of experts as extremely relevant. These tend to be centered around the technical aspects of process mining and include central prerequisites for successful process mining initiatives – data quality and preparation (C.7 and C.12) as well as management support (C.2). In terms of insightful differences between the subpanels, academics tend to rate both challenges and opportunities as more relevant than practitioners suggesting considerable potentials in advancing both process mining methods and tools as well as other topics related to the BPM core elements People and Culture.

Identifying opportunities and challenges for the organizational use of process mining, research article #2 contributes to a comprehensive and sharpened awareness of the potentials and pitfalls of process mining in order to reap the benefits of digitalization. The results facilitate guiding managerial attention in process mining initiatives and structuring research agendas based on the perceived relevance of the opportunities and challenges. Thereby, the study confirms the notion that opportunities and challenges of employing digital technologies are not limited to technical aspects and have far-reaching organizational, cultural, and strategic implications that require comprehensive understanding to inform managerial action.

III. Implications for BPM in View of Digitalization[3]

1 The Impact of the Future of Work on BPM

As outlined thus far, digitalization has far-reaching implications for the business process layer of the enterprise architecture. Thereby, it is a major contributor for the rapidly changing nature work in terms of "the application of human, informational, physical, and other resources to produce products/services" (Alter 2013, p. 75). For instance, digital affordances enable new collaboration models in distributed teams independent of time and location (Allen 2016; Brynjolfsson and McAfee 2016; McAfee 2009) and lead to the rise of new digital mindset associated with customization and flexibility rather than uniformity and consistency (Adecco Group 2022). The umbrella term *future of work* is commonly used to refer to such novel opportunities regarding the way work is organized and performed.

Research article #3 investigates constitutive features of the future of work and their impact on BPM by means of a three-phase research method. First, a literature review revealed core propositions constituting the future of work. It resulted in a list of 23 propositions stemming from 526 quotations in 37 sources. Second, a subsequent mapping of these propositions to the six core elements of BPM was conducted with a panel of ten BPM experts. They were asked to assign the propositions to the BPM core elements that are affected most strongly. Finally, a subsequent discussion of the influence that propositions have on the corresponding BPM core elements conducted in a series of workshops in the author team reveals insights into the effects of the future of work on each BPM core element. Accordingly, the two main results of the research article are a list of 23 propositions characterizing the future of work mapped to the BPM core elements and a corresponding discussion of how BPM can evolve as an organizational capability as a result of the future of work. Table 4 includes the 23 propositions including the number of sources supporting them as well as the mapping of the propositions to the BPM core elements. The core elements are indicated by their initial letter (i.e., *S* for Strategic alignment, *G* for Governance, *M* for Methods, *I* for IT, *P* for People, and *C* for Culture).

3 This section is partly comprised of content taken from the research articles in this thesis. To improve the readability of the text, I have omitted the standard labelling of these citations.

Table 4. Propositions regarding the future of work and their mapping to BPM core elements

ID	Proposition	Sources	BPM Factors					
			S	G	M	I	P	C
P01	Ethical and work values as well as reputation will play an important role.	11	2	1	0	0	4	**9**
P02	Technology will complement human abilities.	10	1	0	0	**10**	**5**	2
P03	Work assignments and routines will change constantly.	11	0	**8**	**8**	0	1	0
P04	Work will be carried out independent of time and place.	17	0	0	0	**8**	0	**9**
P05	Work will require higher cognitive and creative capabilities.	15	0	0	0	0	**10**	0
P06	Workers will be highly specialized.	8	0	0	1	0	**10**	0
P07	Workers will be required to learn constantly on the job.	11	0	0	0	0	**10**	2
P08	Workers will require entrepreneurial thinking.	3	0	0	0	0	**9**	**6**
P09	Teams will be assembled and changed dynamically.	6	0	**8**	1	0	2	3
P10	Technology will be used to automate tasks.	11	1	0	2	**10**	0	0
P11	Work will be communication- as well as knowledge-intensive.	26	0	0	2	1	**9**	0
P12	Work will be conducted predominantly in projects.	7	0	**7**	**8**	0	0	3
P13	Workers will be free agents.	15	0	0	0	0	**8**	**6**
P14	Workers will be highly connected in communities.	16	0	0	0	1	**8**	**7**
P15	Collective intelligence will be important in decision-making.	6	0	**5**	1	0	4	**8**
P16	Decision-making will be decentralized.	10	0	**9**	1	0	0	4
P17	Finding and cultivating talents will be a key challenge.	4	**8**	1	0	0	3	**6**
P18	Information will be readily available independent of time and place.	6	0	0	1	**10**	0	1
P19	Low-skill, out-of-competence work will be outsourced.	7	**7**	**10**	0	0	0	1
P20	Market principles will be applied within organizations.	7	**10**	4	0	0	0	3
P21	Organizational hierarchies will be loose and flat.	17	0	**7**	0	0	0	**9**
P22	Organizations will exhibit a core-periphery structure.	4	**8**	**8**	0	0	0	2
P23	Technology will support all kinds of interactions.	5	1	0	2	**9**	0	1

The propositions vary regarding the extent to which they had been already incorporated in work practices at the time of the research. While some such as P10 are relatively broadly adopted, others such as P20 are still to be fully embraced by organizations. Similarly, the propositions differ in the number of supporting sources – an observation that may be partially attributed to their varying degree of adoption and partly to the degree of perceived relevance of the propositions to the future of work. Some propositions can be viewed as central to operational work (e.g., P04) and others feature a more distant connection (e.g., P08).

The outcome of the mapping procedure implies that not all BPM core elements are equally affected by the future of work. The core elements Governance, People, and Culture were assigned eight propositions each, while Methods, IT, and Strategic alignment feature two, five, and four propositions, respectively. This observation is further evidence that also in the context of BPM digitalization has implications surpassing technical aspects.

In terms of the effects of the propositions on individual BPM core elements, Strategic alignment is expected to deal with rapidly changing organizational setups featuring cross-organizational processes and value-chains leading to a more flexible organizational periphery. This development requires corresponding process architectures. Further, catering to the needs of individuals such as internal and external customers, managing organization's talent pool and matching employees' capabilities to strategic goals gain in importance. Process metrics need to increase the transparency of value generation in and outside of organizational boundaries.

In a more dynamic working environment BPM and process governance mechanisms need to account for changing external environment, decentralized decision-making, and flat organizational hierarchies. As a result, new process roles and responsibilities arise especially as work takes on a more pronounced project character. Defining and enforcing process-related standards is more challenging in blurry organizational boundaries.

BPM methods need to accommodate tools and techniques supporting a broad spectrum of project and process work as well as creative, knowledge-intensive, and routine tasks. As a result, the definition and monitoring of performance metrics becomes more challenging. Further, BPM methods need to support the compilation of process variants due to changing requirements and conditions at run time. Assisting the exploration of innovation opportunities next to exploiting operational improvements is another topic relevant for future BPM methods.

Similar to the core element Methods, IT needs to incorporate a broad range of tools supporting routine work (i.e., process automation) as well as creative- and knowledge-intensive tasks.

Methods regarding explorative process improvement opportunities as well as operational improvements require IT support. BPM needs to account for the integration of autonomous software agents as well as networks thereof as equal process stakeholders as that the interplay of IT, smart things, and humans leads to new forms of interactions.

The core element People is affected by the emergence of increasingly independent workers, who operate as free agents. Since work is increasingly becoming communication- and collaboration-intensive, soft skills as well as knowledge in various disciplines need to be emphasized. A workforce with digital mindset is suited to deal with an increasing portion of ad-hoc and unstructured processes.

In terms of Culture, a human-centric mindset will be important despite the uptake of digital technologies. As hierarchies flatten and employees become more independent human capabilities and skills become more crucial. Nurturing a mindset that embraces constant change and cultivating entrepreneurial values is necessary to capitalize on improvement opportunities. However, engagement with processes is challenged as work is separated from physical locations and time.

In sum research article #3 investigates core features of the future of work driven by digitalization and demonstrates a broad range of respective effects on BPM. As an organizational capability targeting the effective and efficient work BPM needs to address a number of developments characterizing the future of work with far-reaching implications. These include blurring boundaries between process and project work, complex value networks, broad range of processes ranging from routine to knowledge- and data-intensive as well as leveraging emerging opportunities for process exploration and operational process improvement.

2 The Impact of Exogenous Shocks on BPM

The VUCA world, to which digitalization contributes significantly, is characterized by uncertainty and volatility increasing the chances for sudden events beyond the control of organizations (International Monetary Fund 2003). Such events constitute exogenous shocks and can be defined as *unanticipated, low-likelihood, potentially high-impact events originating from an organization's external environment* (Chakrabarti 2015). An example is the outbreak of the COVID-19 pandemic in early 2020. Apart from the significant humanitarian cost, the pandemic profoundly affected the global economy (Chakraborty and Maity 2020). Amongst others it led to the collapse of supply chains, dramatically increased share of employees working

from home, and fast innovation and product go-live cycles (Gruszczynski 2020; Guan et al. 2020; Seetharaman 2020). Other examples of exogenous shocks include the global financial crisis in 2008 (Roy and Kemme 2020), the Fukushima nuclear disaster (Wakiyama et al. 2014), and Brexit (Todd 2017). Exogenous shocks can have diverse origins (e.g., related to politics, healthcare, natural disasters, and military conflicts).

Apart from the effects of exogenous shocks on a societal and market level, they impact individual organizations including corresponding managerial and operational processes and the BPM capability itself. Research article #4 documents the results of a four-step research approach investigating and systematizing these effects. To this end, first, the interplay of BPM and exogenous shocks is in terms of process performance is conceptualized and corresponding typical effects of exogenous shocks are derived. Second, based on the typical effects of exogenous shocks on process performance key challenges and opportunities for BPM are identified and consolidated with the help of senior BPM scholars. Third, the challenges and opportunities are reviewed and further consolidated. Finally, the results are discussed against extant literature on BPM and related disciplines.

In a BPM context, exogenous shocks represent a specific form of process change. In contrast to intentional process change, which typically intends either incremental or radical process improvement, exogenous shocks elicit unintentional radical process change with adverse effects on process performance. The strength of this impact depends on the exact nature of the shock and on organizational context factors (vom Brocke et al. 2016). Nevertheless, the effects of exogenous shocks on processes typically evolve along five phases (I to V) as depicted in Figure 4.

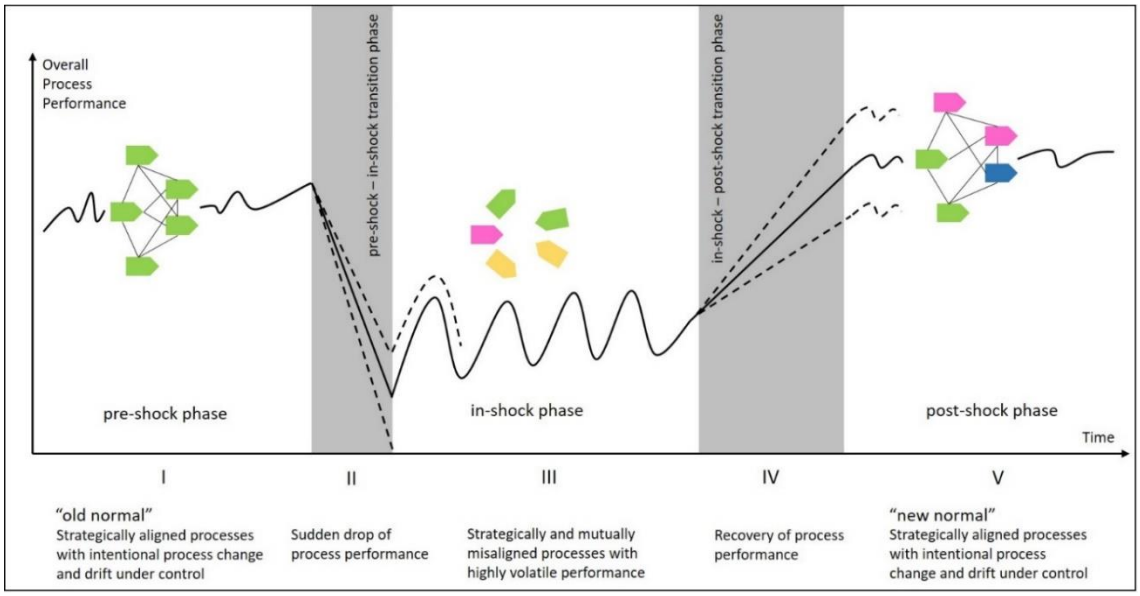


Figure 4. Potential effects of exogenous shocks on organizations' overall process performance

Exogenous shocks occur unexpectedly disrupting an organizations' external environment rendering the pre-shock (I) business processes and related change initiatives inadequate. As a result, business process performance drops in the pre-shock-in-shock transition (II) possibly endangering the existence of the organization. Even though some processes may benefit from positive demand-side effects (i.e., video conferencing providers in the COVID-19 pandemic), overall process performance is likely to suffer because of capacity limitations, longer lead times etc. Aiming at reconfiguring processes to address the effects of the exogenous shocks, organizations experience high uncertainty leading to volatile process performance including possible "aftershocks" in the in-shock phase (III). In the in-shock-post-shock transition (IV) organizations regain process performance as they adapt to the new conditions brought about by the exogenous shock. Finally, the level that process performance reaches in the post-shock phase (V) depends on a host of internal and external factors.

BPM can be leveraged in multiple ways to curb the outlined adverse effects of exogenous shocks on organizational process performance. It can contribute to limiting the initial adverse effect of exogenous shocks in the pre-shock-in-shock transition as well as its duration (II). Further, it can also help mitigate the volatility of process performance in the in-shock phase (III). Next to possible interventions regarding the magnitude of process performance, BPM can contribute to shortening the duration of phases III and IV and even stabilizing process performance at a higher level than in the pre-shock phase (I). With these possibilities in mind, BPM can enrich existing as well as accommodate new approaches increasing preparedness to deal with shocks (e.g., organizational resilience), respond to them (e.g., business continuity,

disaster recovery), and deal with (possibly capitalize on) their aftermath (e.g., organizational learning).

In light of the outlined impact of exogenous shocks on process performance BPM faces concrete opportunities and challenges in mitigating and even capitalizing on the negative effects of exogenous shocks. These opportunities and challenges are outlined in Table 5 and are structured along the six BPM core elements.

Table 5. Challenges and opportunities of exogenous shocks for BPM

Core Element	Challenges		Opportunities	
Strategic Alignment	C1	Sudden obsolescence of organizational strategy and uncertainty regarding the permanence of changes	O1	Need for novel (potentially process-based) value propositions and radical improvement of existing business processes
	C2	Enforced reprioritization of business process improvement efforts	O2	Improvement of process-enabled shock resilience
Governance	C3	Sudden inadequacy of existing BPM and process governance setups	O3	Development of robust, multi-context BPM and process governance
	C4	Need for fast switches between different governance modes	O4	Potential to instill process-oriented governance in an organization's "DNA"
Methods	C5	Lack of agile process (re)design methods	O5	Development of simplified and resilient business processes
	C6	Inadequacy of existing process roll-out and change management methods	O6	Insights into the vulnerability of business processes
Information Technology	C7	Absence of scalable and remotely available process management tools	O7	Adoption of lightweight process automation, deployment, and experimentation techniques
	C8	Obsolescence of existing process monitoring setups	O8	Increased transparency through increased digitalization
People	C9	Absence of scalable process training concepts	O9	Scaling of organization-wide process thinking and digital literacy
	C10	High individual stress owing to misaligned business processes, reset of experience curve effects, and communication overload	O10	Leveraging the creative potential of employees for process improvement
Culture	C11	Potential deprioritization of customer orientation at the expense of internal shock management	O11	Utilization of the shock experience as a foundation for future radical process changes
	C12	Necessity to effectively unlearn existing business processes	O12	Transition toward a results-oriented culture of trust with improved work-life balance

As for the core element Strategic alignment BPM can establish process-based approaches to enhance existing organizational resilience methods and extend works on this intersection such as Zahoransky et al. (2015) or Antunes and Mourão (2011). Further, BPM can aid in achieving a new BPM/strategy fit and developing approaches to manage the short- and long-term impact of shocks as well as enable new process-led value propositions (e.g., Johannsen (2018)) in line with explorative BPM (Grisold et al. 2022). Targeted process performance metrics geared toward exogenous shocks that consider strategic priorities need to be developed.

In terms of Governance understanding the various types of exogenous shocks and developing specific, context-sensitive governance models is essential. Thereby, BPM can build on existing topologies of crises (e.g., Kuipers and Welsh (2017)) to conceptualizes proper responses based

on shock archetypes. At the intersection of flexibility and organizational resilience BPM needs to examine workarounds and process deviance in the context of exogenous shocks building on existing initiatives (e.g., König et al. (2019b), Weinzierl et al. (2022)).

The BPM methodological base needs to be extended in light of exogenous shocks. Thus, it can incorporate and/or extend approaches from business continuity (Niemimaa 2015), agile methods regarding the short-term response to exogenous shocks (Thiemich and Puhlmann 2013), and balancing short-term emergency handling against strategic process change in process portfolios (Lehnert et al. 2016). Moreover, BPM methods should support implementing organizational resilience by means of the design of resilient processes leveraging flexibility-by-design and flexibility-by-deviation concepts, for instance. Measuring organizational resilience is another topic, to which BPM methods can contribute.

Regarding the core element IT digital technologies can be leveraged to detect and respond to changing external conditions as well as explore process opportunities. Real-time process monitoring and the prediction of disruptions are two possible areas for development. Further, flexible and process-aware IT architectures can be informed by approaches regarding high-reliability organizations (Salovaara et al. 2019) and resilient BPM (e.g., Antunes and Mourão (2011)).

In terms of People, BPM can incorporate ideas from the domains of human resource and emergency management. It can also contribute to enhancing organizational learning to sustain newly acquired competencies due to exogenous shocks (e.g., Antonacopoulou and Sheaffer (2014)). BPM also needs to deal with the difficulties arising as process stakeholders facing non-functional processes by absorbing concepts from human resource development such as leadership styles (Wang et al. 2009), for instance.

Exogenous shocks affect BPM culture as well. Examining the suitability and durability of established process values and beliefs (i.e., customer orientation, excellence, responsibility, and teamwork) in light of shocks is a priority. Exploring approaches from organizational unlearning can prove useful in establishing an open mindset questioning existing routines and practices and embracing radical process change (Tsang and Zahra 2008).

By exploring the intersection of exogenous shocks and BPM research article #4 outlines typical effects of exogenous shocks on process performance, identifies corresponding challenges and opportunities for BPM, and discusses relevant implications for the BPM core elements. Since exogenous shocks are more likely to occur in a dynamic VUCA environment spurred by

digitalization, research article #4 provides BPM research and practice with important insights regarding tackling the challenges and capitalizing on the opportunities of exogenous shocks.

3 BPM Capabilities in View of Digitalization

Research articles #3 and #4 take a targeted perspective on the implications of the future of work and exogenous shocks, respectively, on business processes and BPM. In contrast, research article #5 deals with the overall impact of digitalization on BPM. By means of a two-phase Delphi study conducted with international BPM experts from academia and industry, first a list of challenges and opportunities for BPM in light of digitalization is compiled and validated. Then, based on the challenges and opportunities, an updated BPM capability framework comprising 30 capabilities in view of digitalization is derived. Finally, the novelty of the capability areas is discussed against the widely adopted capability framework of de Bruin and Rosemann (2007b).

The updated BPM capability framework includes 30 capability areas relevant for BPM in view of digitalization. Figure 5 presents the capability areas including their novelty in terms of the original BPM capability framework of de Bruin and Rosemann (2007). Thereby capability areas are classified into *as-is* ones (i.e., their content is covered by existing capabilities), *enhanced* (i.e., their content is partially covered by existing capabilities), or *new* (i.e., their content is not covered by existing capabilities). As in research article #2 the core elements Methods and IT are joined, since methods are typically supported by related tools and vice versa. As can be seen in Figure 5, digitalization has substantial effect on BPM capabilities and only three capability areas have remained constant as-is, while the rest are either entirely new or have enhanced meanings. At the same time, no extant capability has lost its meaning because of the effects of digitalization.

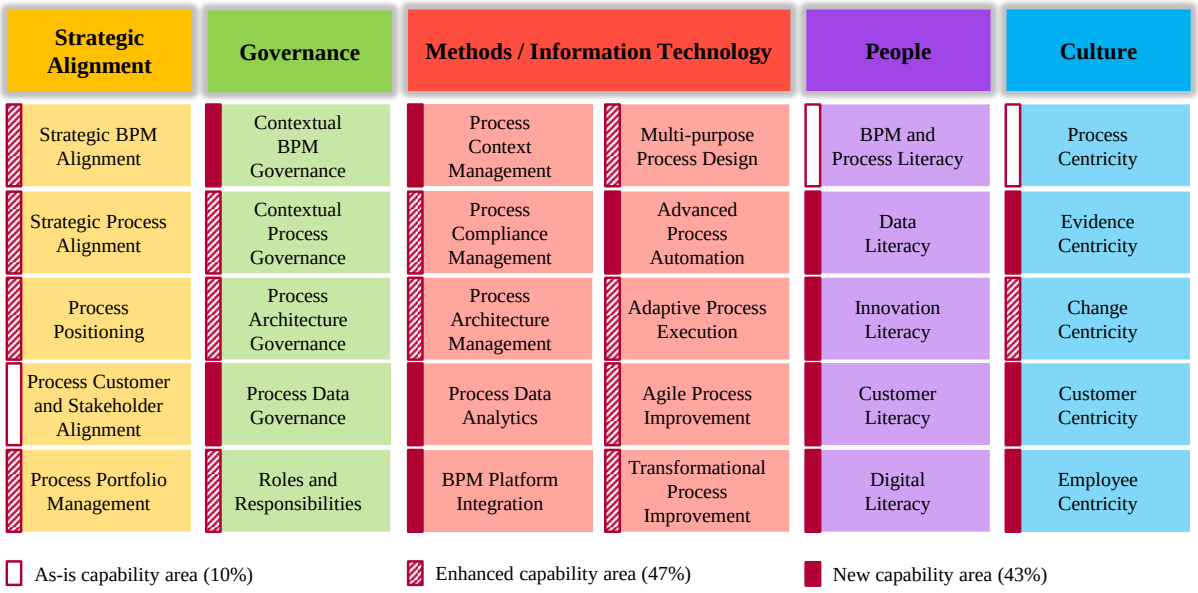


Figure 5. Updated BPM capability framework (including capability areas' novelty)

The core element Strategic alignment includes one as-is and four enhanced capability areas. In light of digitalization BPM should ensure its as well as processes' alignment with organizational purpose and strategy to guarantee transparent value contribution. Also, BPM needs to account for individual processes in complex enterprise architectures and manage process portfolios in terms of agile and transformational improvement accounting for intra- and inter-organizational processes. Processes need to meet the expectations and requirements of relevant stakeholders including customers.

BPM governance features two enhanced and three new capability areas. BPM methods and tools as well as process standards and guidelines need to cater to a variety of process types and contexts. Further, process architectures have to account for intra- and inter-organizational processes. Elaborated data governance for leveraging structured and unstructured data including non-process related data will be required. Finally, digitalization necessitates standards and guidelines for new process roles, collaboration models, and process participants along the BPM lifecycle.

The joint core element Methods/IT comprises four new and six enhanced capability areas. BPM methods and tools will have to enable collaborative and multi-purpose process design, manage process context and complex architectures, and ensure compliance. Advancing process automation for structured and unstructured tasks and leveraging process data are two further key BPM capabilities. Next to enabling adaptive process execution depending on context and other parameters, BPM needs to facilitate agile as well as transformational process change.

The core element People features one as-is capability area – BPM and process literacy – and four new ones. These include knowledge about data analysis techniques and data privacy and security; innovation methods such as design thinking and open innovation; customer analysis techniques such as customer journey mapping and customer valuation; and digitalization mechanisms including opportunities associated with emerging technologies.

In terms of BPM culture, next to one as-is capability area there is one enhanced and three new ones. Commitment to think and work cross-functionally and in interconnected teams – a central pillar of BPM – continues to remain highly relevant. Basing decision on evidence instead of gut feeling and committing to constantly scrutinizing processes to leverage agile or radical process improvement are also required. Finally, BPM culture in view of digitalization implies focusing on customers, embracing customer feedback, and accounting for the needs of employees as well as granting them sovereignty to make self-dependent decisions.

Research article #5 investigates the effects of digitalization on BPM as an organizational capability by first identifying corresponding opportunities and challenges and building on them to explore corresponding BPM capabilities. Almost all identified capabilities are new or have enhanced meaning due to digitalization. Simultaneously, existing BPM capabilities remain highly relevant implying that BPM will need to maintain existing and accommodate new topics to remain relevant. Thus, the results of the research article advance current understanding of BPM as an organizational capability and extend current works on the future of BPM such as those of van der Aalst (2013) and Rosemann (2014). From a managerial perspective, the findings facilitate planning initiatives to enhance the BPM capability in organizations to address the challenges and opportunities of digitalization.

IV. Summary and Future Research[4]

1 The Impact of Digitalization on BPM

Driven by the adoption of digital technologies, digitalization is a socio-technical development, which has broad implications for individuals, organizations, and society. From an organizational perspective it affects all layer of enterprise architecture (i.e., business model, business processes, people, data and information, and infrastructure). In terms of its effects on business processes and BPM as the corresponding management discipline, digitalization affects both individual stages of the BPM lifecycle (i.e., process identification, design, analysis, implementation, execution, and improvement) as well as the BPM capability itself, which is key in structuring BPM programs. While BPM research has concentrated on the development of mature BPM methods and tools, BPM capabilities have not been sufficiently investigated in light of digitalization to ensure that the discipline remains instrumental in driving organizational success. Thus, the goal of this thesis is to explore the implications of digitalization on BPM as an organizational capability. To this end, the thesis first exemplifies the role of BPM in digital disruption and digital transformation before investigating the effects of digitalization on the BPM capability and conceptualizing it to tackle corresponding challenges and capitalize on opportunities.

The first two articles (#1 and #2) of the thesis comprising Section II contribute to an understanding of the role of BPM in digital disruption and digital transformation. Based on a case study with a market-leading manufacturing organization in Germany, research article #1 provides insights into organizational tensions arising in digital transformation initiatives. These tensions are caused by a clash of established organizational practices and value propositions and novel ones enabled by digitalization. The tensions feature a variety of relationships among the underlying competing demands and have multiple effects on organizational business processes and BPM. They imply that new business processes need to be established and existing ones require realignment to support new opportunities (e.g., value propositions) emerging during digital transformation initiatives.

4 This section is partly comprised of content taken from the research articles in this thesis. To improve the readability of the text, I have omitted the standard labelling of these citations.

Research article #2 examines the enabling role of process mining as a disruptive data-driven digital technology/method. A Delphi study with experts from industry and academia resulted in opportunities and challenges regarding the organizational use of process mining as well as their comparative relevance. Thereby, the study revealed that implications of process mining reach beyond technical aspects and include issues related to organizational mindset, management, and culture. Thus, the results of research article #2 demonstrate that exploiting and exploring the full potential of digital technologies requires comprehensive management actions across multiple disciplines.

Section III comprises three research articles (#3, #4, and #5) and concentrates on the effects of digitalization on the BPM capability itself. Thereby, research article #3 deals with the implications of the changing nature of work induced by digitalization on BPM. It includes the results of a literature review on constitutive features of the future of work in the form of corresponding propositions. These propositions are mapped to the established six core elements of BPM and reveal effects on the six BPM core elements. The results reveal that the future of work has diverse implications for BPM as an organizational capability including the uptake of agile and knowledge-intensive processes, blurring boundaries between project and process work, and a shift from individual processes to process portfolios.

Research article #4 examines the interplay of exogenous shocks and BPM since the former are likely to be more frequent in a dynamic environment driven by digitalization. The article conceptualizes typical effects of exogenous shocks on organizational overall process performance and elaborates on possible measures BPM can employ to mitigate corresponding adverse effects and capitalize on chances stemming from exogenous shocks. Related opportunities and challenges are again identified and structured along the six core BPM elements. Again, the results show that all core elements are affected by exogenous shocks demonstrating the broad implications for organizations. The results call for active research at the intersection of BPM with related research communities such as crisis management, organizational resilience, and high reliability organizations. Transferring and adapting methods and approaches among the fields features synergy potentials benefitting all related disciplines.

Finally, research article #5 complements the investigation of the effects of digitalization on BPM by conceptualizing BPM as an organizational capability in light of digitalization. Via a Delphi study with a panel of internationally renowned BPM experts from academia and practice a new BPM capability framework consisting of 30 capability areas geared toward digitalization is proposed. A comparative analysis of new and established capability areas of established

framework of de Bruin and Rosemann (2007b) reveals that the majority of the BPM capabilities either feature enhanced meanings or are completely new. At the same time, no established capability area loses its meaning. Therefore, to remain relevant and ensure efficient and effective organizational outcomes in light of digitalization, BPM needs to expand its scope and cater to new topics such as innovation management, entrepreneurship, data science, and agile software development.

Overall, the thesis advances current understanding of BPM's role in view of digitalization. Using the enterprise architecture model as a structure, it explores BPM's role in digital disruption and digital transformation as well as the business process layer itself, which is governed by BPM. Thus, this thesis contributes to the descriptive knowledge of BPM and complements initiatives on the future of the discipline such as those of Klun and Trkman (2018), Rosemann (2014), and van der Aalst (2013). Thereby, it outlines concrete opportunities and challenges for BPM given developments connected with digitalization and builds on them to conceptualize the BPM capability, thus, extending research on BPM capabilities and maturity models. Employing a capability perspective, which builds on the resource-based view of the firm, allows abstracting from the implications of digitalization on concrete methods tools or individual stages of the BPM lifecycle and rather views BPM as a management discipline responsible for implementing a comprehensive BPM program. Using the established six BPM core elements as an analytical lens for investigating the BPM capability, the thesis enables comparative analyses of extant and newly identified BPM capabilities. From a managerial perspective, the results help inform decision-makers on potential areas of interest in advancing organizations' BPM capability.

2 Limitations and Future Research

As with all research, this doctoral thesis is subject to limitations that open avenues for further research. While the individual research articles in Appendix 3-7 address detailed limitations of the studies, this section takes an aggregated perspective.

In terms of the role of BPM in digital disruption and digital transformation the thesis offers specific insights. On the one hand, these include specific organizational tensions occurring in organizations as well as corresponding implications for BPM and business processes. On the other hand, the thesis investigates the potential of process mining as a data-driven BPM digital method/technology in an organizational context. While valuable, the corresponding findings are only *indicative* of the role of BPM in digital disruption and digital transformation and do

not claim exhaustiveness. Therefore, to understand how business processes and BPM interact with the other layers of the enterprise architecture in light of digitalization in further detail, other exploratory studies need to be conducted that can also take a more holistic approach abstracting from specific BPM methods/technologies or organizations. In a further step, the findings of such studies can be consolidated in meta-analyses to reach result validity and comprehensiveness.

Regarding the implications of digitalization on the business process layer and BPM, correspondingly, this thesis relies on the six BPM core elements as an analytical lens. While this approach allows structuring and comparing the effects of digitalization on BPM along established notions, this thesis does not explicitly question fundamental concepts of BPM such as the six BPM core elements and the BPM lifecycle. In this respect challenging the utility and suitability of established concepts in view of digitalization is a worthwhile research endeavor, which can lead to the development of entirely new approaches to BPM.

With research articles #3 and #4 this thesis investigates the specific effects of the future of work and exogenous shocks as two digitalization-induced developments on the BPM capability. While they offer valuable insights, these two perspectives do not exhaust the spectrum of digitalization-related phenomena impacting BPM. Future studies can, therefore, examine the influence of other developments relevant for BPM, to which digitalization contributes. These include, for instance, implications of specific technological developments in the areas of (process) automation, machine learning as well as cybersecurity. Synthesizing the results of such targeted research initiatives via meta-analyses would significantly contribute to establishing a broader and yet detailed understanding of the BPM capability in view of digitalization. Corresponding results could be compared to these of research article #5, which takes on a holistic perspective of digitalization in identifying BPM capabilities. Further, from a methodological standpoint the three articles in Section III are based on exploratory research approaches (e.g., literature study, Delphi study). To claim validity of the results replication and confirmatory studies are required. Establishing a comprehensive and validated understanding of the role of BPM in view of digitalization could serve as the basis for systematizing the suitability of present BPM approaches, methods, and tools and deriving corresponding research agendas on a BPM lifecycle level.

In terms of effects of digitalization on BPM the thesis can serve as the foundation for deriving prescriptive BPM knowledge. Thereby, further research can build on the results of this thesis and proceed to identify concrete strategies to equip BPM with the tools, methods, and

approaches to leverage the effects of digitalization as well as to develop the identified BPM capabilities. These can include, for instance, maturity models based on the BPM capability framework presented in research article #5.

In sum, this thesis' goal is to explore digitalization's effects on BPM. To this end, it exemplifies BPM's role in digital disruption and digital transformation and conceptualizes BPM as an organizational capability in light of digitalization. The results reveal that BPM can play an instrumental role in leveraging digital technology and implementing digital strategies. From a capability standpoint BPM is affected by digitalization in diverse ways surpassing purely technical aspects. Consequently, ensuring the discipline remains relevant in driving organizational success requires a comprehensive set of both new and enhanced BPM capabilities stimulating the examination of the intersection of BPM and other domains. Thus, the thesis sets the foundation for future research aiming to complement and validate the presented insights, enhance the understanding thereof, and suggest related prescriptive approaches. In this regard, I strongly hope the findings prove useful and inspirational for researchers and practitioners alike in driving the discourse concerning the future of BPM in light of digitalization.

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VI. Appendix

1 Index of Research Articles

Research Article #1: More Than Paradox: Unpacking Tensions and Their Transformative Effects During the Digital Transformation of an Incumbent Organisation

Kerpedzhiev G, Grisold T, Oberländer AM, Sardouk S (2022) More Than Paradox: Unpacking Tensions and Their Transformative Effects During the Digital Transformation of an Incumbent Organisation.

(Working paper)

Research Article #2: Opportunities and Challenges for Process Mining in Organizations: Results of a Delphi Study

Martin N, Fischer DA, Kerpedzhiev GD, Goel K, Leemans SJJ, Röglinger M, van der Aalst WMP, Dumas M, La Rosa M, Wynn MT (2021) Opportunities and Challenges for Process Mining in Organizations: Results of a Delphi Study. Business & Information Systems Engineering 63(5):511–527.

(VHB-JOURQUAL 3: Category B)

Research Article #3: The Future of Business Process Management in the Future of Work

Kerpedzhiev G, Lehnert M, Röglinger M (2016) The Future of Business Process Management in the Future of Work. Proceedings of the 24th European Conference on Information Systems (ECIS).

(VHB-JOURQUAL 3: Category B)

Research Article #4: Exogenous Shocks and Business Process Management

Röglinger M, Plattfaut R, Borghoff V, Kerpedzhiev G, Becker J, Beverungen D, vom Brocke J, van Looy A, del-Río-Ortega A, Rinderle-Ma S, Rosemann M, Santoro FM, Trkman P (2022) Exogenous Shocks and Business Process Management. Business & Information Systems Engineering 64(5):669–687.

(VHB-JOURQUAL 3: Category B)

Research Article #5: An Exploration into Future Business Process Management Capabilities in View of Digitalization

Kerpedzhiev GD, König UM, Röglinger M, Rosemann M (2021) An Exploration into Future Business Process Management Capabilities in View of Digitalization. Business & Information Systems Engineering 63(2):83–96.

(VHB-JOURQUAL 3: Category B)

2 Individual Contribution to the Included Research Articles

In this cumulative thesis, five research articles build the main body of this work. All research articles were developed in teams with multiple co-authors. Thus, this section details the respective research settings and highlights my individual contribution to each research article.

Research article #1 (Kerpedzhiev et al. 2022) (working paper) was developed together with four co-authors. Being the leading author, I had a main role in initiating the research project and contributing by co-developing and driving it. Thereby, I participated in setting up and conducting the research project (i.e., data collection, preparation, and analysis) as well as developing the main artifact of the article based on input from my co-authors. Additionally, I was responsible for embedding the results in a suitable theoretical framework and elaborating on the theoretical and practical implications. I also took a key role in revising the article for re-submission. Although the research article represents my work to a large extent, the four co-authors were involved in all parts of the project and significantly helped in advancing our contribution.

Research article #2 (Martin et al. 2021) was developed together with nine co-authors with a core operational team of four. The initial research idea was conceived by my co-authors. I contributed to this article by co-developing the research project. Thereby, I was specifically responsible for devising and coordinating the research design based on the Delphi method. I also engaged in the development of the research idea, the synthesis and presentation of the research results, as well as the textual elaboration. I also had a key role in revising the article for re-submission.

Research article #3 (Kerpedzhiev et al. 2016) was developed together with two co-authors. The research idea and research design were conceived and discussed in the author team. I mainly contributed to this article by conducting the research method as well as the corresponding literature work and drafting the manuscript. Thereby, I also prepared and participated in research discussions, and implemented the resulting feedback on the manuscript's content and structure. I also took a key role in textual elaboration and preparing the article for submission.

Research article #4 (Röglinger et al. 2022) was developed with twelve co-authors with a core operational team of four. I was primarily responsible for researching and structuring the theoretical background on exogenous shocks, putting together the underlying literature work, co-supervising and -developing the research method and results. I was also involved in the

discussion of the key results and their implications and played a key role in the textual elaboration of the manuscript.

Research article #5 (Kerpedzhiev et al. 2021) was developed together with three co-authors. The research idea was developed in the author team. I was primarily responsible for conducting the research method, preparing, and structuring discussions in the author team as well as driving the textual elaboration. Thereby, I contributed to the synthesis and presentation of the research results. I also took a key role in revising the article for the subsequent re-submissions.

3 Research Article #1: More Than Paradox: Unpacking Tensions and Their Transformative Effects During the Digital Transformation of an Incumbent Organisation

Authors: Kerpedzhiev GD, Grisold T, Oberländer AM, Röglinger M, Sardouk S

Working Paper

Extended abstract:

Incumbent organizations need to mitigate severe challenges during digital transformation as they embrace new digital opportunities while exploiting existing offerings. To this end, repeated observations emphasize how digital transformation in incumbent organizations is driven by *a clash of the old and the new*, which invokes organizational tensions (Lazolla et al. 2021). Such tensions have been typically described as paradoxes (Wimelius et al. 2021). In an exploratory case study with WashTec – an incumbent business-to-business (B2B) market leader in manufacturing car washing systems headquartered in Germany – we explore relevant organizational tensions and challenge the assumption regarding the prevalence of their paradoxical nature.

We found that tensions in digital transformation initiatives take on various forms depending on the relationship of underlying competing demands. By means of an in-depth analysis of how these competing demands emerge, take shape, and are addressed, we found that paradox is only one of several types of tensions emerging during digital transformation. Drawing from research in the organizational sciences, we identified five tensions representing four tension types in the context of WashTec's digital transformation, including a dialectic (B2B versus Business-to-Customer (B2C) Identity), a trade-off (Local Adoption versus Centralization), two dualities (Material versus Immaterial Solutions and Cost-based versus Value-based Revenue Logic), and a paradox (Strengthening the Core versus Embracing the Unknown).

Distinguishing between various tension types provides a much more nuanced view of digital transformation. First and foremost, our findings show that tensions differ in terms of how tensions form, how underlying competing demands relate to each other, and in what way they can be addressed. Our study reveals a variety of possible managerial responses based on concrete tension types. In particular, these responses have implications for organizational business processes and, consequently, BPM. In addition, our findings related to the different

tension types during digital transformation allow us to explain the transformative effect of these tensions in terms of how and why novelty emerges during digital transformation (Wessel et al. 2021). The degree to which old and new routines, value propositions, and identity are realized differs depending on core tension features determining its type.

Our findings have several implications for research and practice. From an academic perspective the insights of the case study reveal that that different tension types have different impact on the degree to which organizations change their routines, value propositions, and identity. This, in turn, strongly depends on core features of tensions (i.e., the relationships between the underlying competing demands). Accordingly, we suggest that tension types differ in terms of what we refer to as transformative effect – the degree to which the interplay of competing demands can lead to change in the context of the digital transformation. From a practical standpoint our findings underscore that understanding and responding to different tension types can have far-reaching implications that affect the organizational structure (Vial 2019) and identity (Wessel et al. 2021). They also help practitioners gauge the implications of tensions on the digital transformation.

Keywords: Digital Transformation, Case Study, Tensions, Paradox, Transformative Effect

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Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., & Blegind Jensen, T. (2021). Unpacking the Difference Between Digital Transformation and IT-Enabled Organizational Transformation. Journal of the Association for Information Systems, 22(1), 102–129. https://doi.org/10.17705/1jais.00655

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4 Research Article #2: Opportunities and Challenges for Process Mining in Organizations: Results of a Delphi Study

Authors: Martin N, Fischer DA, Kerpedzhiev GD, Goel K, Leemans SJJ, Röglinger M, van der Aalst WMP, Dumas M, La Rosa M, Wynn MT

Published in: Business & Information Systems Engineering

Abstract: Process mining is an active research domain and has been applied to understand and improve business processes. While significant research has been conducted on the development and improvement of algorithms, evidence on the application of process mining in organizations has been far more limited. In particular, there is limited understanding of the opportunities and challenges of using process mining in organizations. Such an understanding has the potential to guide research by highlighting barriers for process mining adoption and, thus, can contribute to successful process mining initiatives in practice. In this respect, the paper provides a holistic view of opportunities and challenges for process mining in organizations identified in a Delphi study with 40 international experts from academia and industry. Besides proposing a set of 30 opportunities and 32 challenges, the paper conveys insights into the comparative relevance of individual items, as well as differences in the perceived relevance between academics and practitioners. Therefore, the study contributes to the future development of process mining, both as a research field and regarding its application in organizations.

Keywords: Process Mining, Opportunities, Challenges, Barriers, Delphi Study, Process Mining Adoption, Process Mining Use, Business Process Management

5 Research Article #3:

The Future of Business Process Management in the Future of Work

Authors: Kerpedzhiev G, Lehnert M, Röglinger M

Publishes in: Proceedings of the 24th European Conference on Information Systems (ECIS)

Abstract: Business process management (BPM) is a corporate capability that strives for efficient and effective work. As a matter of fact, work is rapidly changing due to technological, economic, and demographic developments. New digital affordances, work attitudes, and collaboration models are revolutionizing how work is performed. These changes are referred to as the future of work. Despite the obvious connection between the future of work and BPM, neither current initiatives on the future of BPM nor existing BPM capability frameworks account for the characteristics of the future of work. Hence, there is a need for evolving BPM as a corporate capability in light of the future of work. As a first step to triggering a community-wide discussion, we compiled propositions that capture constitutive characteristics of the future of work. We then let a panel of BPM experts map these propositions to the six factors of Rosemann and vom Brocke's BPM capability framework, which captures how BPM is conceptualized today. On this foundation, we discussed how BPM should evolve in light of the future of work and distilled overarching topics which we think will reshape BPM as a corporate capability.

Keywords: Business Process Management, Capability Development, Future of Work

6 Research Article #4:

Exogenous Shocks and Business Process Management

Authors: Röglinger M, Plattfaut R, Borghoff V, Kerpedzhiev G, Becker J, Beverungen D, vom Brocke J, van Looy A, del-Río-Ortega A, Rinderle-Ma S, Rosemann M, Santoro FM, Trkman P

Published in: Business & Information Systems Engineering

Abstract: Business process management (BPM) drives corporate success through effective and efficient processes. In recent decades, knowledge has been accumulated regarding the identification, discovery, analysis, design, implementation, and monitoring of business processes. This includes methods and tools for tackling various kinds of process change such as continuous process improvement, process reengineering, process innovation, and process drift. However, exogenous shocks, which lead to unintentional and radical process change, have been neglected in BPM research although they severely affect an organization's context, strategy, and business processes. This research note conceptualizes the interplay of exogenous shocks and BPM in terms of the effects that such shocks can have on organizations' overall process performance over time. On this foundation, related challenges and opportunities for BPM via several rounds of idea generation and consolidation within a diverse team of BPM scholars are identified. The paper discusses findings in light of extant literature from BPM and related disciplines, as well as present avenues for future (BPM) research to invigorate the academic discourse on the topic.

Keywords: Business Process Management, Exogenous Shocks, Challenges, Opportunities

7 Research Article #5:
An Exploration into Future Business Process Management Capabilities in View of Digitalization: Results from a Delphi Study

Authors: Kerpedzhiev G, König UM, Röglinger M, Rosemann M

Published in: Business & Information Systems Engineering

Abstract: Business process management (BPM) is a mature discipline that drives corporate success through effective and efficient business processes. BPM is commonly structured via capability frameworks, which describe and bundle capability areas relevant for implementing process orientation in organizations. Despite their comprehensive use, existing BPM capability frameworks are being challenged by socio-technical changes such as those brought about by digitalization. In line with the uptake of novel technologies, digitalization transforms existing and enables new processes due to its impact on individual behavior and needs, intra- and inter-company collaboration, and new forms of automation. This development led the authors to presume that digitalization calls for new capability areas and that existing frameworks need to be updated. Hence, this study explored which BPM capability areas will become relevant in view of digitalization through a Delphi study with international experts from industry and academia. The study resulted in an updated BPM capability framework, accompanied by insights into challenges and opportunities of BPM. The results show that, while there is a strong link between current and future capability areas, a number of entirely new and enhanced capabilities are required for BPM to drive corporate success in view of digitalization.

Keywords: Business Process Management, Capability Framework, Delphi Study, Digitalization