Bus Inf Syst Eng 63(2):83–96 (2021)
https://doi.org/10.1007/s12599-020-00637-0

RESEARCH PAPER

An Exploration into Future Business Process Management Capabilities in View of Digitalization

Results from a Delphi Study

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Received: 31 May 2018 / Accepted: 22 January 2020 / Published online: 20 March 2020

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

Accepted after three revisions by Daniel Beverungen.

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s12599-020-00637-0) contains supplementary material, which is available to authorized users.

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1 Introduction

Process orientation is an accepted paradigm of organizational design that drives corporate success (Kohlbacher and Reijers 2013). Hence, business process management (BPM), which deals with the implementation of process orientation, receives constant attention from academia and practice (Dumas et al. 2018; Harmon 2018). Moreover, mature methods and tools are available for all phases of the BPM lifecycle (Recker and Mendling 2016; van der Aalst 2013).

Apart from lifecycle models, BPM is structured by means of capability frameworks, which identify and bundle those capability areas regarded as most important for the successful implementation of process orientation in organizations (Pöppelbuß et al. 2015; Rosemann and vom Brocke 2015a). The idea is that an institutionalized BPM capability enables effective and efficient business processes, which in turn drive corporate success (de Bruin and

Rosemann 2005; Lehnert et al. 2016). BPM capability frameworks have shaped up as an effective management tool due to their close relation to maturity models, which support fit/gap analyses, the derivation of roadmaps, and the prioritization of BPM investments. Capability frameworks also offer a common ground and a well-defined scope for academic discourse. Hence, many BPM capability frameworks and maturity models have been proposed (van Looy et al. 2017). A seminal pragmatic framework is included in Hammer's (2007) Process and Enterprise Maturity Model. A comprehensive and widely adopted framework from academia, which also plays a central role in our work, is that of de Bruin and Rosemann (2007), which includes 30 capability areas structured according to six so-called core elements of BPM; that is, Strategic Alignment, Governance, Methods, Information Technology (IT), People, and Culture (Rosemann and vom Brocke 2015c).

Despite their usefulness, existing BPM capability frameworks are being challenged by socio-technical changes such as those brought about by digitalization (Gimpel et al. 2018; Legner et al. 2017). In line with the uptake of new 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 (Berger et al. 2018; Gimpel et al. 2018). For example, social collaboration platforms facilitate the assembly of teams working on knowledge-intensive processes independently of time and location (Colbert et al. 2016; Motahari-Nezhad and Swenson 2013). Robotic and cognitive process automation enable the automation of unstructured tasks (van der Aalst et al. 2018; Willcocks and Lacity 2016; Zarkadakis et al. 2016), while the Internet of Things and blockchain enable decentralized and trusted processes (Oberländer et al. 2017; Viryasitavat et al. 2018).

These examples led us to presume that, in view of digitalization, different capability areas are needed for BPM and that, as a result, existing capability frameworks need to be updated. We found support for this presumption in the literature. Recker (2014), for instance, claims that the once-proposed BPM capability areas have too readily been accepted and taken for granted. Moreover, recent papers on the future of BPM underscore the need to challenge current BPM capability areas (Klun and Trkman 2018; Rosemann 2014; van der Aalst 2013). However, neither existing BPM capability frameworks nor papers on the future of BPM account for the challenges and opportunities brought about by digitalization. Hence, our research question is: *Which BPM capability areas will be relevant in the future in view of digitalization?*

To answer this question, we conducted a Delphi study with international BPM experts from academia and industry. The Delphi method fits our explorative intention as it is geared toward forecasting, issue identification, and framework development (Okoli and Pawlowski 2004; Paré et al. 2013). Moreover, it is repeatedly applied in information systems and BPM research (Becker et al. 2015; Lang et al. 2018; Schmiedel et al. 2013; Skinner et al. 2015). Our primary contribution is an updated BPM capability framework of possible capability areas, accompanied by insights into challenges and opportunities of BPM as a secondary contribution. We focus on BPM capability areas as they are the basis for maturity models. However, we discuss the further development of our capability framework towards a maturity model in the outlook.

The remainder of this paper is organized as follows. In Sect. 2, we provide the theoretical background on BPM and capability development. In Sects. 3 and 4, we outline our research method and present the results of our Delphi study. In Sect. 5, we assess the identified capability areas' novelty by comparing them to existing ones, and we conclude in Sect. 6 with the implications, limitations, and avenues for future research.

2 Theoretical Background

BPM is the science and practice of overseeing how work is performed to ensure consistent outcomes and take advantage of improvement opportunities (Dumas et al. 2018; van der Aalst 2013). It strives for efficient and effective execution and the continuous management of business processes, as well as for the development of organizations' BPM capability (Harmon 2018; Rosemann and vom Brocke 2015a, b). Processes are sets of activities in which humans and technology co-create value (Dumas et al. 2018). Though most commonly split into the areas of core, support, and management, processes can also be classified according to repetitiveness, knowledge intensity, interdependence, and variability (vom Brocke et al. 2016; Zelt et al. 2018b). To implement process orientation in organizations, successful BPM requires capability areas related to the core elements of BPM: Strategic Alignment, Governance, Methods, IT, People, and Culture (Rosemann and vom Brocke 2015c). Thereby, method- and IT-related capability areas are commonly structured according to the phases of the BPM lifecycle; that is, process design, implementation, execution, monitoring, and improvement.

BPM has a strong link to capability development, which builds on the resource-based view of the firm (Pöppelbuß et al. 2015; Trkman 2010; van Looy et al. 2014). The reason is that processes and capabilities deal with the same phenomenon, the difference being that processes focus more on "how" while capabilities put more emphasis on

Table 1 Definitions of the BPM core elements (de Bruin and Rosemann 2007)

Core element	Definition
Strategic Alignment	The continual tight linkage of organizational priorities and enterprise processes enabling achievement of business goals
Governance	Establishing relevant and transparent accountability and decision-making processes to align rewards and guide actions
Methods	The approaches and techniques that support and enable consistent process actions and outcomes
Information Technology	The software, hardware, and information management systems that enable and support process activities
People	The individuals and groups who continually enhance and apply their process-related expertise and knowledge
Culture	The collective values and beliefs that shape process-related attitudes and behaviors

"what" (Sharp 2013). Accordingly, organizations are collections of resources (Barney 2000) split into assets and capabilities (Wernerfelt 1984). While assets are tangible (e.g., a machine) or intangible (e.g., a company brand) objects, capabilities are repeatable patterns of action in the use of assets (Wade and Hulland 2004), including technical and managerial skills (Amit and Schoemaker 1993). From a capability perspective, BPM comprises the skills and routines required to implement incremental and radical process change as well as to execute business processes (Pöppelbuß et al. 2015). The capability perspective informs not only BPM but also other disciplines, such as enterprise architecture management or quality management (Johannsen and Fill 2017; Wißotzki 2015).

The research located at the intersection of BPM and capability development has evolved along three streams. The first stream, which serves as a basis for the other two, decomposes the overall BPM capability into subordinate capabilities. These are (hierarchically) abstracted into capability (sub-/main) areas and/or grouped according to factors or core elements and eventually compiled into capability frameworks (Rosemann and vom Brocke 2015a; van Looy et al. 2014). In the literature, no unified nomenclature is used when referring to distinct hierarchy levels or groups of capabilities. Capability frameworks are the basis for maturity models that address how capabilities can be developed along an anticipated, desired, or logical path (Röglinger et al. 2012). While descriptive maturity models extend capability frameworks through assessment criteria and methods, prescriptive models also include good practices for capability development and decision logic for determining suitable maturity levels (Röglinger et al. 2012). The second stream investigates how organizations actually develop their BPM capability and which context factors influence BPM capability development (Pöppelbuß et al. 2015; vom Brocke et al. 2016; Zelt et al. 2018a). Built on this foundation, the third stream aims at designing methods and tools that assist organizations in BPM capability development. This includes BPM maturity models, decision models for prioritizing BPM projects, and tools for selecting BPM maturity models (Lehnert et al. 2016; van Looy et al. 2017).

As alluded to in Sect. 1, one of the most comprehensive and widely adopted BPM capability frameworks from academia is that of de Bruin and Rosemann (2007). This framework, which was also established using the Delphi method, includes 30 capability areas grouped according to the core elements of BPM. Related publications have been cited more than 1000 times according to Google Scholar, and the framework has been adopted by several companies (van Looy et al. 2017). The framework has been used to structure the Handbook on BPM (Rosemann and vom Brocke 2015a, b), to classify real-world BPM success stories (vom Brocke and Mendling 2018), and as a foundation for many other BPM capability models. Moreover, the core elements take a comprehensive perspective on BPM, which, for example, transcends the focus of the BPM lifecycle on operational process support. Hence, we used de Bruin and Rosemann's (2007) framework to structure our results and assess their novelty.

Table 1 contains single-sentence definitions of the core elements taken from de Bruin and Rosemann (2007), while Fig. 1 shows the respective capability framework. Detailed descriptions of the capability areas used to assess the identified capability areas' novelty in Sect. 5 can be found in Rosemann and vom Brocke (2015c). In line with the central role of de Bruin and Rosemann's (2007) work for our research, we adopted their nomenclature and henceforth distinguish capability areas grouped according to the core elements of BPM.

3 Methods

3.1 Delphi Study as a Research Method

Delphi studies strive for consensus on a specific topic with a panel of experts over multiple rounds by means of questionnaires interspersed with feedback (Dalkey and Helmer 1963). Experts remain anonymous throughout the

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

Fig. 1 de Bruin and Rosemann's (2007) BPM capability framework

entire study to avoid any bias as a result of direct confrontation or in defense of preconceived notions (Okoli and Pawlowski 2004; Skinner et al. 2015). In each round, experts share opinions and feedback, which is anonymized, consolidated by the researchers, and shared with the panel until stable results are achieved or predefined termination criteria are met (Paré et al. 2013). Depending on the setup, rounds can focus on brainstorming, validation, narrowing-down, or ranking (Paré et al. 2013). Over the last several years, many rigor criteria and good practices related to Delphi studies have been proposed, which we abided by (Keeney et al. 2006; Okoli and Pawlowski 2004; Paré et al. 2013; Schmidt 1997).

3.2 Central Design Decisions

In line with our research question, we strived for an updated BPM capability framework. Before outlining preparatory activities and the Delphi procedure, it is important to share central design decisions. We communicated these design decisions repeatedly to the experts before and during the study, and the experts could comment on them anytime. Acknowledging that these design decisions affect our results, we also address precautions to offset potential bias and validity threats in Sect. 3.4 and include related limitations in Sect. 6.

First, to support the compilation of an updated BPM capability framework, we chose a two-phase approach. While the first phase focused on challenges and opportunities that BPM will face in the next 5–10 years, the second phase aimed at deriving related capability areas. This established a common ground across the panel, which included experts with diverse backgrounds. It also facilitated the derivation of BPM capability areas in response to challenges and opportunities. Accordingly, the first phase included brainstorming, validation, and narrowing-down rounds, whereas the second phase encompassed brainstorming and validation rounds. We decided against narrowing down the results of the second phase (e.g., by focusing on the most important capability areas) because this would have compromised the framework's conceptual completeness. By contrast, several validation rounds ensured convergence toward stable results without losing content.

Second, to assess the novelty of the identified BPM capability areas, we planned to compare them to established ones. To that end, we adopted de Bruin and Rosemann's (2007) capability framework. On the one hand, we used the core elements of BPM to group the challenges, opportunities, and capability areas, acting on the assumption that the core elements have remained constant over time. The core elements helped account for the comprehensive scope and interdisciplinary nature of BPM. For the same reason, we did not require capability areas to be BPM-exclusive but rather to have a BPM-specific interpretation or impact. On the other hand, we used de Bruin and Rosemann's (2007) capability areas to assess which identified capability areas are new, are enhanced versions of existing ones, or are included as-is. In line with our goal of proposing an updated BPM capability framework, we did not require capability areas to be new. Finally, to facilitate communication and adoption in research and practice, we aimed for a parsimonious (in terms of the overall number of capability areas) and balanced (in terms

of the number of capability areas per core element) capability framework, analogous to that of de Bruin and Rosemann's (2007) work.

Third, we intended to judge the quality and convergence of our results quantitatively and qualitatively. Hence, we followed the common practice of measuring the experts' satisfaction with the coding of challenges, opportunities, and capability areas (coding satisfaction) and their overall satisfaction (König et al. 2018; Schmiedel et al. 2013). To that end, we used the following 7-point Likert scale: 1 (fully dissatisfied), 2 (strongly dissatisfied), 3 (unsatisfied), 4 (neutral), 5 (satisfied), 6 (strongly satisfied), and 7 (fully satisfied). This enabled us to judge the development and the level of convergence as well as to check for selection bias, ensuring that satisfaction had not risen because experts had dropped out due to dissatisfaction but because the remaining experts had become more satisfied with the results (Heckman 2010). Overall, we strived for a positive development throughout the study and a high level of satisfaction, accompanied by supportive expert feedback and marginal changes between subsequent rounds (Paré et al. 2013).

Finally, we decided to invite experts from academia and industry as well as experts with a management and technology background to accommodate the diversity of the BPM field (Okoli and Pawlowski 2004). To ensure broad coverage, we invited experts from different countries, backgrounds, and sub-communities (Schmiedel et al. 2013). We specifically invited researchers who had already published on the future of BPM and included practitioners to complement the view of academics with first-hand experience. Formally, we required academic experts to have held a Ph.D. for at least 5 years, and industry experts to have at least 5 years of experience in a key role representing their organization's BPM function or as BPM consultants (König et al. 2018).

3.3 Preparatory Activities

Prior to the main study, we conducted a pilot study (König et al. 2018; Paré et al. 2013; Skinner et al. 2015). As we had already decided to use the core elements of BPM for structuring the shortlisted challenges and opportunities as well as BPM capability areas, and had communicated this, the pilot study aimed to determine a suitable format for brainstorming in round 1. We investigated two options. The first was a greenfield approach where experts had to come up with challenges and opportunities without further guidance. The second involved asking experts to identify challenges and opportunities per core element (Kasiri et al. 2012). We assessed both options using two groups of three Ph.D. students, with the first group receiving the unstructured and the second the structured questionnaire. While the first group had no issues with the open questions, the second group argued that the presence of core elements constrained their creativity. Accordingly, we decided to use the greenfield approach in round 1.

Simultaneously, we invited experts to participate in the Delphi study in line with the selection criteria mentioned above (Okoli and Pawlowski 2004). Given the required commitment and experience, we primarily recruited experts from our networks. Initially, we identified 60 experts from 20 countries. By asking them to nominate further experts we increased the pool of potential experts to 62, 34 of whom agreed to participate in the study. This amounts to a response rate of 55%. Judging by the experts' backgrounds, the panel was balanced in terms of technically- and business-oriented experts as well as in terms of researchers and practitioners. As for the geographical distribution, the panel covered 14 countries from five continents. Academic experts who participated in round 1 had held their Ph.D. for 17 years on average, while practitioners had 27 years of work experience on average. More background information on the panel can be found in Online Appendix A.

We also agreed on guidelines for coding the experts' responses in the brainstorming and validation rounds. Methodologically, we used iterative coding (Krippendorff 2013; Schmidt 1997). In each round, one co-author anonymized all responses, whereupon two other co-authors coded the experts' responses independently before they were consolidated in joint workshops (Okoli and Pawlowski 2004; Schmidt et al. 2001). After each workshop, we checked whether the results were linked to the experts' input to ensure that they reflected the experts' ideas—not ours by ensuring that all results can be traced back to at least one expert input. Our guidelines also covered the formulation of challenges, opportunities, and capability areas (Schmidt et al. 2001). We strived for short denominations and single-sentence descriptions while abstracting from the domain-specific and technology-centric vocabulary. Finally, we decided to avoid references to de Bruin and Rosemann's (2007) work wherever possible, except for the core elements of BPM. This ensured that our framework could evolve as independently as possible, which was an important prerequisite for comparing it to de Bruin and Rosemann's (2007) framework.

3.4 Delphi Study Procedure

The Delphi study took 4 months. In each round, the experts had 1 week to provide feedback via email or online questionnaire. In addition to open-ended feedback on the current round, experts could comment on the study in general. In each round, we provided instructions and definitions, responses from the previous round, and a change log

Table 2 Overview of the Delphi study and important key figures

	Phase I			Phase II		
Round	1	2	3	4	5	6
Purpose	B	V	N	B	V	V
Active experts from academia	15	14	15	15	14	14
Active experts from industry	14	13	13	12	9	9
Number of challenges and opportunities*	48	27	14	–	–	–
Number of BPM capability areas*	–	–	–	66	30	30
Satisfaction study overall (mean)**	–	5.11	5.43	5.07	5.74	5.91
Satisfaction study overall (SD)**	–	0.79	0.86	0.90	0.74	0.93
Satisfaction coding (mean)**, ***	–	5.00	5.39	5.67	5.61	5.78
Satisfaction coding (SD)**, ***	–	1.15	0.90	0.77	0.82	1.14

B brainstorming, *V* validation, *N* narrowing-down, *SD* standard deviation

*After coding or voting; ** Likert scale from 1 to 7; *** Reflects the satisfaction with the coding of the previous round

(Keeney et al. 2006; Paré et al. 2013; Skinner et al. 2015). Table 2 provides an overview of the Delphi study and relevant key figures. Insights into the experts' participation and satisfaction follow. Details about each round and the precautions we took to offset potential biases are compiled in Online Appendix B.

Between 23 and 29 experts participated per round, a number complying with recommendations in the literature (Paré et al. 2013). With 29 experts participating in round 1 and 23 in round 6, we had an end-to-end dropout of 21%. In round 1, we invited all experts who had agreed to participate in the study. In all subsequent rounds of the first phase, we invited those 29 experts who had participated in round 1, amounting to an initial no-show rate of 15%. This ensured a high diversity of input while guaranteeing that all experts were familiar with information shared before and during the study (e.g., related to the design decisions). As the results of the second phase built on the first phase, we invited those 28 experts in the second phase who had participated in rounds 1 and 3. Despite the dropout that typically occurs in Delphi studies, the panel remained balanced in terms of industry and academia experts and background.

In terms of quality and convergence, satisfaction increased during the study. The only exceptions were the overall satisfaction in round 4 and the standard deviation of the coding satisfaction in round 6. We comment on this in Online Appendix B. Together with the expert feedback and the fact that almost no changes had occurred between rounds 5 and 6, the development and level of satisfaction gave us confidence that the study had converged after six rounds. Upon completion, we also checked for selection bias by analyzing the last satisfaction values of all experts who had dropped out (Online Appendix C). A mean overall satisfaction of 5.00 (out of 7.00) and a mean coding satisfaction of 5.17 before dropout suggests that experts did not leave due to dissatisfaction.

4 Results

4.1 Challenges and Opportunities of BPM

The first phase of our Delphi study yielded a shortlist of challenges and opportunities that BPM will face in the next 5–10 years. This shortlist is shown in Table 3, along with the experts' votes in the narrowing-down round. For our study, the challenges and opportunities represent an intermediate result and a secondary contribution, which enabled the derivation of BPM capability areas. The longlist of challenges and opportunities is included in Online Appendix D.

4.2 Updated BPM Capability Framework

The second phase of our Delphi study yielded the updated BPM capability framework (Fig. 2), which is our primary contribution. The framework includes 30 capability areas, which, according to our panel, will be relevant for BPM to contribute to corporate success in view of digitalization. Our study also yielded a description of each capability area (shown in Tables 4, 5, 6, 7, 8).

5 Comparison of BPM Capability Areas

To assess the novelty of the identified BPM capability areas, we compared them to those from de Bruin and Rosemann's (2007) framework. With both frameworks resulting from different Delphi studies, neither a one-to-one mapping nor a simple matching of names could be performed. Rather, we applied an interpretative approach where we considered the descriptions of all capability areas. Hence, we assessed whether the content of all identified capability areas was fully, partially, or not covered by existing capability areas. To support the comparison, we created a matching table per core element, juxtaposing related capability areas from both frameworks

Table 3 Challenges and opportunities of BPM in the next 5–10 years

Challenge/opportunity	T%	A%	I%
Strategic Alignment			
BPM should deliver purposeful, measurable results of strategic importance (*)	53.6	40.0	69.2
BPM should take an integrated perspective on business goals, processes, systems, participants, and data	71.4	60.0	84.6
Governance			
BPM should ensure end-to-end process control and compliance without unnecessarily constraining process participants (**)	67.9	66.7	69.2
BPM should treat business processes as parts of intra- and inter-organizational process networks.	64.3	73.3	53.8
Methods			
BPM should enable dealing with unpredictable, inter-organizational, fragmented, and knowledge-intensive business processes	64.3	73.3	53.8
BPM should be applicable in fast-changing and hyper-competitive organizational contexts	60.7	53.3	69.2
BPM should leverage digital technologies for streamlining and innovating business processes (**)	89.3	86.7	92.3
BPM should enable fast and intuitive process design, deployment, analysis, and improvement (*)	67.9	80.0	53.8
BPM should enable customer-centric process design, analysis, and improvement (*)	60.7	40.0	84.6
Information Technology			
BPM should explore new ways of automating unstructured tasks and complex decisions. (**)	78.6	80.0	76.9
BPM should leverage data for predictive and prescriptive purposes. (*)	60.7	73.3	46.2
BPM should explore the potential of unstructured and non-process-related data (*)	75.0	100.0	46.2
People			
BPM should account for the effects of business processes on people's work lives	64.3	60.0	69.2
Culture			
BPM should foster an opportunity-driven mind-set (*)	46.4	26.7	69.2

T total votes, *A* votes of academic experts, *I* votes of industry experts

*Difference between the votes of academic and industry experts > 25%-points

**Difference between the votes of academic and industry experts < 5%-points

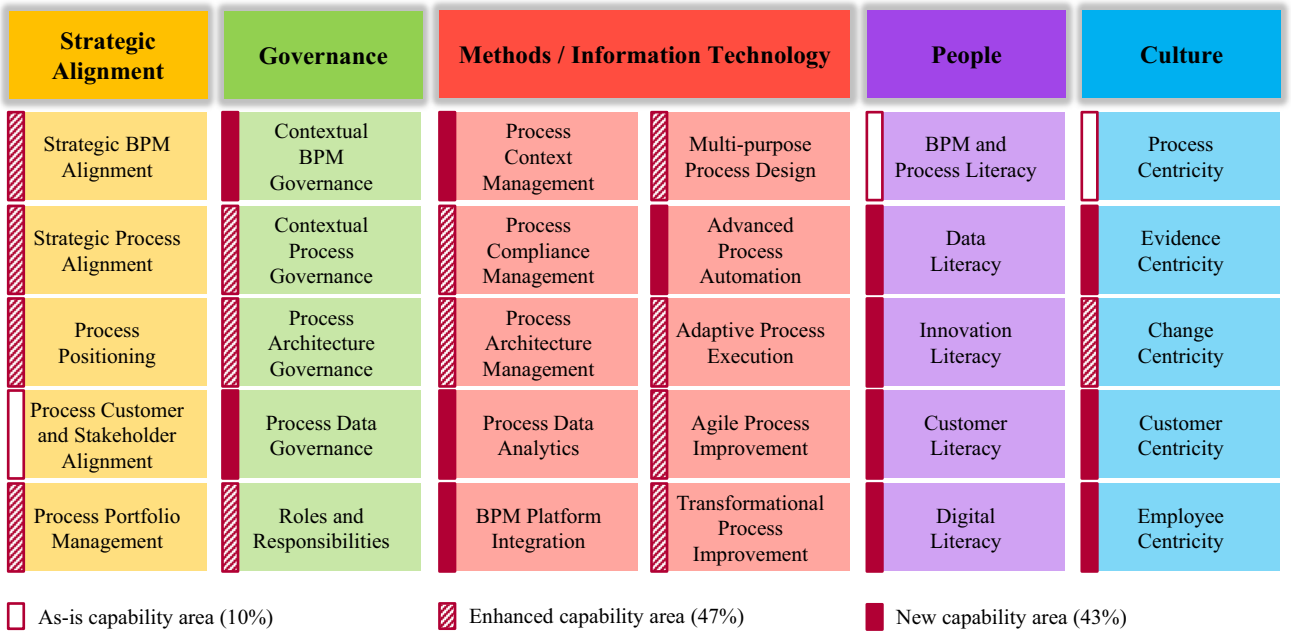

Fig. 2 Updated BPM capability framework (including comparison)

Table 4 Capability areas related to the BPM core element *Strategic Alignment*

Capability area	Description
Strategic BPM Alignment	Alignment of BPM goals with the organization's purpose and strategy, transparency about the value contribution of BPM (along with that of other management disciplines), and ensuring that the benefits of BPM are realized
Strategic Process Alignment	Alignment of business process goals with the organization's purpose and strategy, transparency about the value contribution of business processes, and ensuring that process benefits are realized
Process Positioning	An integrated view on how business processes are positioned in the enterprise architecture as well as in inter-organizational value networks
Process Customer and Stakeholder Alignment	Alignment of individual business processes and BPM with the needs and expectations of all relevant stakeholders, including customers
Process Portfolio Management	Prioritization of business processes for agile and transformational improvement in line with their need for improvement and their contribution to corporate purposes, while accounting for dependencies among inter- and intra-organizational processes

and—in the case of no or partial coverage—highlighted novel facets found in our study (Online Appendix E). Two co-authors compared the capability areas independently, consolidated their findings, and validated them with one of the existing framework's co-authors (Lacity and Janson 1994; van Looy et al. 2014). We also checked for dependencies across the core elements. Based on the matching tables, we classified the capability areas from our framework as *as-is* (i.e., content is fully covered), *enhanced* (i.e., content is partially covered), or *new* (i.e., content is not covered) in respect of de Bruin and Rosemann's (2007) framework. The results are included in Fig. 2.

According to our analysis, the core element Strategic Alignment includes one as-is and four enhanced capability areas. The as-is capability area, Process Customer and Stakeholder Alignment, caters for the alignment of BPM and business processes with the needs of process participants and other stakeholders. All other capability areas are enhanced versions related to measuring process output and performance, enterprise process architectures, and ensuring a link between corporate strategy, BPM, and business processes. In the updated framework, these ideas are enriched by stressing the importance of value orientation, benefits realization, and dependencies in intra- and inter-organizational process networks.

The core element Governance comprises three enhanced and two novel capability areas. Enhanced capability areas concern process standards and guidelines for process decision-making, accountability, and compliance. Based on our results, the scope of these capability areas will be augmented by the idea of distinguishing standards for many process types and contexts simultaneously. Moreover, process architectures will span organizational boundaries while accounting for dependencies. Likewise, roles and responsibilities will extend to new actors such as crowd workers, robots, smart things, and software agents. Contextual BPM Governance, a novel capability area, also accounts for the idea of aligning BPM methods and tools with multiple process types and contexts simultaneously. Stipulated by the increasing availability of event logs, Process Data Governance (the second novel capability area) specifically covers guidelines for leveraging process- and non-process-related data.

The joint core element Methods/IT covers six enhanced and four novel capability areas. Enhanced capability areas primarily relate to the phases of the BPM lifecycle. For example, process design explicitly accounts for various stakeholder needs and purposes. Process Architecture Management needs to cope with process dependencies. Furthermore, process execution must deal with unexpected changes during execution, processes without models, and streams of digital signals such as transmitted by smart things, all of which are driven by novel process types. Process Compliance Management will not only focus on detrimental but also on constructive (non)compliance as well as on trust in and security of business processes. Finally, process improvement, captured as one capability area in de Bruin and Rosemann's (2007) framework, is split into an agile and a transformational mode to account for intuitive, fast, and data-driven versus large-scale redesign. Thereby, agile process improvement draws from ideas related to agile software development, whereas transformational process improvement aims at leveraging the benefits of non-process technologies. Regarding novel capability areas, Process Context Management focuses on the specification and handling of diverse process contexts. As captured in the capability area Process Data Analytics, new data collection, storage, extraction, and analysis methods are needed in all BPM lifecycle phases to leverage process- and non-process-related data. Another novel topic is the integration of BPM tools into single platforms across the BPM lifecycle. Finally, novel technologies call for

Table 5 Capability areas related to the BPM core element *Governance*

Capability area	Description
Contextual BPM Governance	Selection, configuration, and scrutinization of BPM methods and tools for all BPM lifecycle phases, while accounting for relevant process types and contexts (in line with corporate governance)
Contextual Process Governance	Definition of standards and guidelines for process decision-making, process change, process compliance, process security, and process performance measurement for relevant process types and contexts (in line with corporate governance)
Process Architecture Governance	Definition of standards and guidelines related to process architectures, accounting for dependencies and trust barriers among inter- and intra-organizational business processes (in line with enterprise architecture governance)
Process Data Governance	Definition of standards and guidelines for the extraction, collection, quality assurance, correlation, storage, analysis, security, and privacy of structured and unstructured process data, including non-process data whenever reasonable (in line with corporate data governance)
Roles and Responsibilities	Definition of standards and guidelines related to roles and responsibilities for all BPM lifecycle phases and individual processes, while accounting for emerging working and collaboration models as well as for new types of process participants (e.g., crowd workers, robots, smart things, software agents)

methods and tools that automate and support unstructured tasks.

In the updated capability framework, capability areas related to the core element People center around five literacies, enabling organizations to capitalize on other capability areas. This includes one as-is and four novel capability areas. BPM and Process Literacy is included as-is from de Bruin and Rosemann's (2007) framework. Complementing other data-related capability areas, Data Literacy covers employees' knowledge about data analytics, privacy, and security. Likewise, Innovation Literacy refers to innovative techniques that facilitate the design of new processes and improvement ideas. Finally, Customer and Digital Literacy refer to techniques to analyze customer needs and knowledge about the mechanisms governing digitalization, respectively. These literacies build on ideas related to disciplines such as innovation management, entrepreneurship, data science, or customer relationship management.

The core element Culture includes one as-is, one enhanced, and three novel capability areas. The need for process participants to embrace cross-functional thinking as well as shared process values remains unchanged as it is fundamental for the implementation of process orientation in organizations. Change Centricity, the enhanced capability area, emphasizes continuous change by not only challenging established processes but also embracing fast trial-and-error approaches for process design and improvement (minimum viable processes), as promoted in innovation management. Regarding new capability areas, the notion of basing BPM- and process-related decisions on evidence complements other data-related capability areas. As evident in the capability area Customer Centricity, strong responsiveness to customer feedback and a commitment to delight customers through outstanding processes will gain importance. Finally, as captured by the capability area Employee Centricity, organizations must empower employees by granting them the right to make processes-related decisions. Analogous to the core element People, many new facets draw from disciplines that have, to date, rarely been discussed in connection with BPM.

Summing up, three out of the 30 capability areas (10%) from our framework (which cover fundamental topics) are included as-is content-wise from de Bruin and Rosemann's (2007) framework. Moreover, 14 out of 30 capability areas (47%) are included from de Bruin and Rosemann's (2007) framework but require a scope enhancement. The remaining 13 capability areas (43%) are new. In line with our findings, no capability area from the existing framework will become obsolete.

6 Discussion and Conclusion

6.1 Contribution

Considering socio-technical changes such as those brought about by digitalization, our research was motivated by the presumption that digitalization calls for new BPM capability areas and that extant capability frameworks need to be updated. Hence, we aimed to compile an updated capability framework via a Delphi study with international BPM experts from academia and industry.

Our primary contribution is an updated BPM capability framework, as discussed in detail in Sect. 5. This framework includes 30 capability areas structured according to the core elements of BPM. A comparison of these capability areas to those proposed by de Bruin and Rosemann (2007) revealed that 27 of 30 capability areas are either new or enhanced versions of existing ones. Only three capability areas are included as-is. Moreover, according to our results, no capability area from de Bruin and Rosemann's (2007) framework will become obsolete. While all core elements include enhanced or new capability areas,

Table 6 Capability areas related to the BPM core element *Methods/IT*

Capability area	Description
Process Context Management	Specification of process contexts (e.g., in line with organizational contexts and the contexts of involved participants) as well as detection, monitoring, and handling of context changes, leveraging predictive techniques whenever reasonable
Process Compliance Management	Specification of requirements regarding regulations, goals, performance, risks, security, privacy as well as detection, monitoring, and handling of detrimental and constructive process (non-)compliance, leveraging predictive techniques whenever reasonable
Process Architecture Management	Design and usage of multi-level process architectures that cater to all facets of business processes (e.g., data, controls, outcomes, IT systems, process participants) and account for dependencies among inter- and intra-organizational processes
Process Data Analytics	Collection and extraction of process data, correlation with business processes, storage in an integrated repository, and exploitation in all BPM lifecycle phases using analytical methods (e.g., simulation, verification, mining, and machine learning), leveraging unstructured and non-process data whenever reasonable
BPM Platform Integration	Establishment and maintenance of a BPM platform with integrated components for all BPM lifecycle phases and standardized interfaces (application programming interfaces) with other platforms and systems (e.g., other BPM platforms, enterprise systems, smart things, event processing engines)
Multi-purpose Process Design	Collaborative design of business processes and process decisions in line with multiple purposes (e.g., customer centricity, flexibility awareness), leveraging reference processes and process fragments as well as supporting personal processes tailored to the needs of individual process participants
Advanced Process Automation	Systematic exploitation of automation technologies (e.g., robotic process automation, cognitive automation, social robotics, and smart devices) to assist human process participants in unstructured tasks and complex decisions or to fully automate such tasks and decisions
Adaptive Process Execution	Context-aware completion and re-design of business processes, recommendation of next best actions, and execution of processes without process designs while accounting for task modalities, data flows, resource availability, process performance, process dependencies as well as for process participants' skills and mental states
Agile Process Improvement	Fast and iterative improvement of business processes as well as fast evaluation of new process designs based on performance data and feedback from process participants (particularly from customers)
Transformational Process Improvement	Large-scale reengineering of business processes to leverage the opportunities for emerging technologies, including change management, and ensuring that the associated benefits are realized

the most strongly affected core elements are Methods/IT, Culture, and People.

Our secondary contribution, which also constitutes the foundation of the updated BPM capability framework, is a shortlist of challenges and opportunities that BPM will face in the next 5–10 years. A closer look revealed that, first, all core elements of BPM are affected. Second, some challenges and opportunities are driven by digitalization, while others are not. For example, while delivering purposeful results of strategic importance is timeless, leveraging novel technologies for streamlining and innovating business processes is related to digitalization. Third, the experts' votes shed light on differences and similarities as perceived by academics and practitioners. For instance, there was a consensus about the importance of leveraging novel technologies and exploring new ways of automating unstructured tasks. However, practitioners stressed the importance of delivering purposeful results of strategic importance, establishing customer-centric process design, analysis, and improvement methods, as well as cultivating an opportunity-driven mind-set in BPM. In contrast, topics of interest for researchers included leveraging data for predictive and prescriptive purposes as well as the ability to explore the potential of unstructured and non-process-related data.

6.2 Implications

From a theoretical perspective, the updated BPM capability framework implies that substantial further development is required for BPM to drive corporate success in view of digitalization. Despite the strong link between the current and identified BPM capability areas, which becomes evident in the high number of as-is and enhanced capability areas, about the same number of new capability areas are required to tackle the identified challenges and opportunities. To that end, the scope of BPM needs to expand. While BPM is positioned at the intersection of the management and computer sciences today, it needs to incorporate knowledge from further disciplines such as innovation management, entrepreneurship, customer relationship management, data science, and agile software development. Moreover, BPM needs to capitalize on technologies beyond traditional process technology, for example: the Internet of Things, which allows for smart objects to become self-dependent process participants; blockchain,

Table 7 Capability areas related to the BPM core element *People*

Capability area	Description
BPM and Process Literacy	Knowledge about relevant BPM methods and tools as well as about relevant process domains and related business processes in the organization
Data Literacy	Knowledge about data analysis techniques (e.g., statistical methods, data mining, machine learning, data quality management), data privacy and security as well as about corporate data assets as far as related to business processes
Innovation Literacy	Knowledge about innovation techniques (e.g., creativity techniques, lateral thinking, design thinking, lean start-up, open innovation, business model innovation) and ongoing innovation activities in the organization
Customer Literacy	Knowledge about customer analysis techniques (e.g., customer journey mapping, customer valuation, customer segmentation) as well as about customers' needs, personal processes, and interaction preferences in omni-channel environments
Digital Literacy	Knowledge about the mechanisms underlying the digital economy as well as about the opportunities associated with emerging technologies

which facilitates the decentralized and trusted coordination of inter-organizational processes; and artificial intelligence, which enables the automation of unstructured tasks. As for challenges and opportunities, BPM researchers are advised not to lose sight of the challenges that BPM practitioners are facing in their daily business, while at the same time making sure that their latest achievements are known and adopted in practice.

Our results not only advance the understanding of BPM as a corporate capability but also extend papers that discuss the development of BPM. For example, we complement the works of van der Aalst (2013) and Rosemann (2014). Whereas van der Aalst (2013) proposes process modeling languages, process enactment infrastructures, process model analysis, process mining, and process flexibility as important future topics, Rosemann (2014) emphasizes value-driven BPM, ambidextrous BPM, and customer process management. All these topics are covered in our framework. Moreover, our updated BPM capability framework operationalizes vom Brocke et al.'s (2014) principles of good BPM, which include the principles of context awareness, holism, technology appropriation, and purpose among others. The principle of context awareness, for example, is covered by capability areas such as Contextual BPM Governance, Contextual Process Governance, and Process Context Management. We confirmed all these observations by validating them with the respective researchers. Our results add to the descriptive knowledge of BPM. Considering the research streams located at the intersection of BPM and capability development (Sect. 2), they contribute to the first stream, which decomposes the overall BPM capability. Given the high fraction of new and enhanced capability areas, we also consider our presumption that digitalization calls for new BPM capability areas to be confirmed. Both the identified capability areas and the challenges and opportunities stimulate future research and a community-wide discussion on the future of BPM.

As for managerial implications, our results equip BPM practitioners with guidance for structured discussions on how to further develop their organization's BPM capability. Specifically, the capability framework ensures that all components constitutive of BPM in view of digitalization can be considered. Thereby, our finding that no capability area from de Bruin and Rosemann's (2007) capability framework will become obsolete instills confidence that past BPM investments have not been in vain. Moreover, although the capability framework still needs to be extended towards a maturity model, it can be used as a foundation for fit/gap analyses. Finally, the capability framework—particularly the capability areas related to Methods, IT, and People—shows how corporate BPM training programs should be enhanced to provide employees with the skills required for enabling efficient and effective processes in the future. In line with the extended scope of BPM, practitioners are advised to join forces with colleagues from other corporate functions more strongly than in the past. Finally, as indicated by the challenges and opportunities, practitioners should actively seek exchanges with BPM researchers, be receptive to the latest research, and experiment with new technology in order not to miss developments that help tackle the challenges and opportunities of BPM.

6.3 Limitations and Future Research

Our study is beset with limitations rooted in the nature of Delphi studies and our design decisions. First, as is typical for Delphi studies, our results are based on the perceptions of a limited number of experts recruited from our networks. Hence, we can make no formal claims about representativeness—even if the targeted composition of our panel and the experts' supportive feedback and high satisfaction make us confident about the validity of our results. Despite the precautions taken to offset subjective bias, we admit that our results are influenced by the design decisions. This includes the use of de Bruin and Rosemann's (2007) core elements of BPM for structuring challenges, opportunities, and capability areas as well as our decision regarding the

Table 8 Capability areas related to the BPM core element *Culture*

Capability area	Description
Process Centricity	Commitment to think and work cross-functionally in terms of interconnected intra- and inter-organizational business processes as well as to establish business processes as an essential management topic
Evidence Centricity	Commitment to ground BPM and process decisions on evidence and analytical insights
Change Centricity	Commitment to continuously scrutinize business processes, to capitalize on opportunities of emerging technologies, to tackle unprecedented challenges in the corporate environment, to learn from failure, and to embrace fast and iterative approaches to change
Customer Centricity	Commitment to take the customer perspective, to embrace customer feedback in all BPM lifecycle phases, and to delight customers with business processes that yield excellent products and services
Employee Centricity	Commitment to involving employees in BPM and process decisions, to account for the effects of these decisions on employees' work lives, to contribute to employees' satisfaction and self-fulfillment, and to grant employees the sovereignty to make self-dependent decisions

overall number of capability areas. As is typical for many information systems research problems, there is no universal answer to the research question. Hence, our updated BPM capability framework represents one possible set of capability areas and a starting point for a community-wide discussion in line with the exploratory nature of Delphi studies. The same holds true for the identified challenges and opportunities.

Second, we did not question the fundamental concepts of BPM. This includes business processes, the core elements of BPM, and the BPM lifecycle. It may be argued that this decision was not radical enough for a study exploring BPM capability areas in view of digitalization. Yet, by drawing on accepted concepts, we established common ground across the panel. Perhaps more importantly, it allowed us to compare the identified to existing capability areas. As our Delphi study was initiated in line with the greenfield approach and 27 of 30 capability areas are either new or enhanced, we are confident that this design decision neither constrained the experts' creativity nor the future-oriented character of our study. Moreover, we treated digitalization as an umbrella term, abstracted from the effects of specific technologies. Finally, it needs to be highlighted that capability frameworks do not lead to benefits themselves. Rather, they should be used as a basis for deriving organization-specific capability development roadmaps and concrete projects.

Both the results of our research and the limitations inspire future research. First, we recommend conducting replication studies with different panels, including studies that abandon accepted BPM concepts as well as studies that investigate the effects of specific technologies on capability areas. The findings of these studies should eventually be consolidated through a meta-analysis to reach consensus at the community level. Second, to complement the explorative nature of the Delphi method, we recommend applying confirmative methods to analyze which capability areas drive corporate success in different contexts. To that end, our capability areas can serve as independent variables, constructs such as BPM, process, and corporate success as mediating variables (de Bruin and Rosemann 2005), and context factors such as those included in the BPM context framework as moderators (vom Brocke et al. 2016). The updated BPM capability framework and the results of confirmative research help identify ideal–typical BPM capability configurations for different organizational contexts. Third, substantial research is required to address enhanced and novel capability areas. Finally, even if future research may extend the BPM capability areas identified in our Delphi study, our results can be used to update existing BPM maturity models. This includes developing assessment criteria and methods as well as compiling good practices. Such updated BPM maturity models will help practitioners conduct fit/gap analyses, derive capability development roadmaps, and prioritize investments to purposefully drive corporate success through BPM in view of digitalization.

Acknowledgement Open Access funding provided by Projekt DEAL.

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