

**An Exploration into Future Business Process Management  
Capabilities in View of Digitalization – Results from a Delphi Study  
(Appendix)**

**Appendix A: Demographic Information about the Delphi Panel**

	<b>Academia (15 experts)</b>		<b>Industry (14 experts)</b>	
<i>Country of main activity</i>	United States	1	United States	4
	Brazil	1	Brazil	3
	Germany	1	Germany	2
	Spain	1	Spain	-
	Austria	2	Austria	-
	Estonia	1	Estonia	-
	Australia	4	Australia	1
	Italy	1	Italy	-
	Israel	1	Israel	-
	Slovenia	1	Slovenia	-
	Netherlands	1	Netherlands	-
	United Kingdom	-	United Kingdom	1
	Canada	-	Canada	2
	Switzerland	-	Switzerland	1
	<i>Experience</i>	<i>Years holding a PhD</i>		<i>Years of work experience</i>
>10		11	>10	13
5-10		4	5-10	1
<i>Academic Background</i>	Economics/Management Science	3	Economics/Management Science	2
	Information Systems	3	Information Systems	2
	Computer Science	7	Computer Science	3
	Mathematics	1	Mathematics	1
	Business Process Management	1	Business Process Management	1
	Engineering	-	Engineering	4
	Social Sciences	-	Social Sciences	1
<i>Position</i>	Professor	10	Director	5
	Associate Professor	4	Consultant/Analyst	4
	Assistant Professor	1	Department Head	2
			CxO	3
<i>Employees</i>			>1,000	4
			101-1,000	2
			10-100	4
			<10	4

## **Appendix B: Delphi Study Procedure**

### *Round 1 – Brainstorming of challenges and opportunities*

In round 1, we provided the experts with a description of the overall study design including central design decisions and one-sentence definitions of the core elements as well as general information about Delphi studies. In line with the chosen greenfield approach, we asked 34 experts to name at least five challenges and opportunities they believed BPM will face in the next five to ten years. We also asked for short descriptions to facilitate the coding and gathered demographic information about the experts. In total, we received 180 propositions for challenges and opportunities, which we consolidated into 48 challenges and opportunities.

### *Round 2 – Validation of challenges and opportunities*

In round 2, we asked the experts to validate the coded challenges and opportunities. The panelists received their responses from round 1, the randomized coding results, and details on the coding procedure (Paré et al. 2013). We asked for comments as well as for suggestions for further challenges and opportunities. New ones were added if they had not already been covered by or could not be incorporated into existing ones. The coding resulted in 27 challenges and opportunities (Appendix D). In line with our study design, we grouped the revised challenges and opportunities according to the core elements of BPM to facilitate a smooth transition to the second phase of our Delphi study after round 3. To that end, we developed an assignment of challenges and opportunities to core elements within the author team, which the experts approved in round 3.

### *Round 3 – Narrowing-down of challenges and opportunities*

Round 3 intended to reduce the number of challenges and opportunities to a manageable number. To that end, we asked the experts to vote for those challenges and opportunities they deemed most important (König et al. 2018; Okoli und Pawlowski 2004). Items that exceeded a specific number of votes were shortlisted and used as input for the second phase. To grant the experts sufficient degrees of freedom, we asked them to select 15 challenges and opportunities – about half the number identified in round 2. All experts received their prior responses, the randomized coding results, and a change log (Paré et al. 2013). To ensure that the perspectives of academic and practitioners were fairly represented, we chose the following selection rule: *Those challenges and opportunities selected by at least 66% of the academics or by at least 66% of the practitioners are shortlisted.* The shortlist included fourteen challenges and opportunities (Appendix D).

In this round, the coding satisfaction increased from 5.00 to 5.39, and the overall satisfaction increased from 5.11 to 5.43. Moreover, we received no feedback that the assignment of challenges and opportunities to the core elements of BPM performed in round 2 did not match the experts' assessment or that any challenge or opportunity could not be assigned to the core elements.

#### *Round 4 – Brainstorming of capability areas*

Round 4 marked the start of the second phase, which intended to identify BPM capability areas that tackle the challenges and opportunities shortlisted in round 3. We provided the experts with an overview of the results from round 3 and asked them to nominate capability areas, to provide short descriptions, and to assign capability areas to the core elements of BPM. We also shared the selection rule used for shortlisting challenges and opportunities. We accounted for the many-to-many relationship between challenges and opportunities on the one hand and capability areas on the other. That is, challenges and opportunities may be tackled by one or more capability areas, while capability areas may also tackle one or more challenges and opportunities. Accordingly, the experts could nominate multiple capability areas per challenge and opportunity and assign them to multiple core elements. To reduce the workload, each expert was asked to nominate capability areas only for those challenges and opportunities they had voted for in round 3.

Overall, we received 388 nominations for BPM capability areas. The coding yielded 66 capability areas. To foster traceability, we deliberately chose a low level of aggregation in this round, since experts were exposed to only a subset of challenges and opportunities. In line with our design decisions, we reminded the experts already at the beginning of this round that we strived for a parsimonious and balanced capability framework.

In this round, the coding satisfaction increased from 5.39 to 5.67, a value close to strong satisfaction, which supported our confidence in the shortlisted challenges and opportunities. The overall satisfaction dropped from 5.43 to 5.07, as some experts reported to have struggled with the open-ended nature of this round. Yet, the experts did not criticize the mapping procedure or any other aspect of the study design.

#### *Round 5 – Validation of capability areas*

In round 5, we asked the experts to validate the coding results of round 4 (Paré et al. 2013; Schmidt et al. 2001). They received their nominations along with the complete list of BPM capability areas and a short change log. We asked them to comment on names and descriptions, to nominate further capability areas, to suggest the deletion of capability areas, and to offer suggestions for merging capability areas. Many experts noted that already nowadays most BPM methods can be applied in organizational settings only if supported by IT, which is why we merged the core elements Methods and IT based on their recommendation.

In line with our design decision of striving for a parsimonious and balanced capability framework, we increased the level of aggregation as communicated before. We decided to reduce the number of capability areas to 30 for the following reasons: Paré et al. (2013) observed that the vast majority of investigated Delphi studies included 30 final items or less. As striving for less than 30 capability areas neither matched the interdisciplinary nature of BPM nor the amount of input we

received in round 4, we used the number of capability areas included in de Bruin und Rosemann (2007) framework as lower boundary. Nevertheless, we admit that, although it had been approved by almost all experts in round 6, the final number of capability areas has been chosen partially subjectively by us. Importantly, we did not lose content when increasing the level of aggregation. This is because we merged not dropped capability areas. The latter would have had happened in a narrowing-down round.

The coding satisfaction, which referred to the initial 66 capability areas, amounted to 5.61 with a standard deviation of 0.82. The overall satisfaction rose to 5.74 with a standard deviation of 0.74. At this point, we decided to conduct another validation round for several reasons. First, significant changes had been made to the names and descriptions of the capability areas in response to both the increased level of aggregation and the experts' feedback. Moreover, in round 5, the experts were provided with the full list of BPM capability areas for the first time.

#### *Round 6 – Validation of capability areas*

Round 6 concluded the Delphi study. We asked the experts to validate the refined BPM capability areas from round 5. Two experts expressed slight concerns with the increased level of aggregation but they did not express concerns with the content itself. This explains the slight rise of the standard deviation of the coding satisfaction to 1.14, while the mean coding satisfaction increased in line with the overall satisfaction. The vast majority of participants was strongly satisfied with the results as reflected in the overall satisfaction of 5.91 (standard deviation of 0.93) and in the coding satisfaction of 5.78 (standard deviation of 1.14). Furthermore, several experts stated that the results had converged in their opinion. Based on the feedback, we fine-tuned some names and descriptions. Together, the supportive feedback, the marginal changes between round 5 and 6 as well as the positive development and level of the satisfaction made us confident that the Delphi study had converged. So, we decided to terminate the study after six rounds, a number that complies with recommendations in the literature (Skinner et al. 2015).

### Appendix C: Overall and Coding Satisfaction

ID	Round 1	Round 2		Round 3		Round 4		Round 5		Round 6	
	P	OS	CS	OS	CS	OS	CS	OS	CS	OS	CS
A01	yes	5	5	4	4	3	4	5	5	4	3
A03	yes	-	-	5	5	5	5	6	5	6	6
A04	yes	5	5	5	5	5	5	7	7	7	7
A05	yes	5	7	6	6	5	7	6	6	6	7
A06	yes	5	4	5	5	5	6	6	5	6	6
A07	yes	6	6	5	5	5	6	6	6	-	-
A08	yes	6	6	5	6	5	5	-	-	5	5
A09	yes	5	5	7	7	5	5	6	6	6	3
A10	yes	5	5	6	6	5	7	5	5	6	6
A12	yes	4	4	4	5	4	5	4	4	5	5
A13	yes	6	5	6	5	5	5	6	6	7	6
A14	yes	7	7	7	6	7	6	7	7	7	7
A15	yes	5	3	6	6	5	5	5	5	5	5
A16	yes	7	7	6	4	5	6	7	7	7	7
A17	yes	5	5	4	4	4	5	5	6	4	5
I01	yes	5	5	6	6	5	6	5	5	7	7
I02	yes	5	5	5	5	3	5	-	-	5	5
I03	yes	5	5	4	4	-	-	5	5	-	-
I04	yes	5	4	5	4	6	7	6	6	6	6
I06	yes	6	7	7	7	6	6	-	-	-	-
I07	yes	-	-	5	5	4	6	-	-	-	-
I08	yes	4	3	-	-	-	-	-	-	-	-
I09	yes	4	3	5	6	6	6	6	5	5	5
I10	yes	5	5	6	7	5	5	6	6	6	7
I11	yes	4	4	5	5	6	7	6	6	7	6
I12	yes	5	6	6	6	6	6	5	4	7	7
I14	yes	4	4	6	6	6	6	6	6	6	6
I15	yes	5	5	6	6	6	6	6	6	6	6
I17	yes	5	5	5	5	5	5	-	-	-	-

*P* = Participation in Round 1 *OS* = Overall Satisfaction *CS* = Coding Satisfaction

*A* = Academic expert *I* = Industry expert

**Appendix D: Longlist of Challenges and Opportunities (Round 2)  
and Voting Results (Round 3)**

	<i>T %</i>	<i>A %</i>	<i>I %</i>
<b>Strategic Alignment</b>			
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
<b>Governance</b>			
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-organisational process networks.	64.3	73.3	53.8
BPM should support the execution of processes in organisations with highly decentral decision-making.	50.0	53.3	46.2
<b>Methods</b>			
BPM should enable dealing with unpredictable, inter-organisational, fragmented, and knowledge-intensive business processes.	64.3	73.3	53.8
BPM should be applicable in fast-changing and hyper-competitive organisational contexts.	60.7	53.3	69.2
BPM should enable purpose-driven transformational process improvement.	50.0	46.7	53.8
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

	<i>T %</i>	<i>A %</i>	<i>I %</i>
<b>Information Technology</b>			
BPM should explore new ways of automating unstructured tasks and complex decisions. (**)	78.6	80.0	76.9
BPM should enable seamless integration of BPM systems with other technical systems.	35.7	33.3	38.5
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	46.2
BPM should enable secure data exchange in inter-organisational process networks.	28.6	20.0	38.5
<b>People</b>			
BPM should consider that process teams may need to be reassembled fast and often.	57.1	60.0	53.8
BPM should recognise that people expect consistent and convenient experience when using technology.	50.0	53.3	46.2
BPM should account for the effects of business processes on people's work lives.	64.3	60.0	69.2
BPM should account for the physical and mental condition of people involved in processes.	17.9	26.7	7.7
<b>Culture</b>			
BPM should foster an opportunity-driven mind-set. (*)	46.4	26.7	69.2
BPM should treat process analysis and documentation as a means, not an end.	50.0	60.0	38.5
BPM should promote process thinking within and across organisations.	53.6	60.0	46.2
BPM should continuously integrate customer feedback.	46.4	40.0	53.8
BPM should foster process experimentation.	50.0	40.0	61.5
BPM should leverage synergies with other disciplines.	35.7	46.7	23.1
BPM should acknowledge people, smart things, and software agents as equal process participants.	50.0	46.7	53.8

*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.*

## Appendix E: Matching Tables for the Comparison of BPM Capability Areas

Core Element Strategic Alignment		Capability areas (CAs) from de Bruin und Rosemann's (2007) framework					Novel Facet(s)
		Process Im- provement Planning	Strategy & Process Capability Linkage	Enterprise Process Architec- ture	Process Measures	Process Customer & Stakeholder Alignment	
Capability areas (CAs) from the updated framework	Strategic BPM Alignment <i>(ENHANCED)</i>	(✓)	(✓)	(✓)	(✓)	(✓)	<i>Increased focus on value contribution and benefit realization</i>
	Strategic Process Alignment <i>(ENHANCED)</i>	(✓)	(✓)	(✓)	(✓)	(✓)	<i>Increased focus on value contribution and benefit realization</i>
	Process Positioning <i>(ENHANCED)</i>	X	(✓)	(✓)	X	X	<i>Consideration of intra- and inter-organi- zational process dependencies</i>
	Process Customer and Stakeholder Alignment <i>(AS-IS)</i>	X	X	X	X	✓	-
	Process Portfolio Management <i>(ENHANCED)</i>	(✓)	(✓)	(✓)	(✓)	X	<i>Increased focus on value contribution; consideration of intra- and inter-organi- zational process dependencies</i>

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Core Element Governance		Capability areas (CAs) from de Bruin und Rosemann's (2007) framework					Novel Facet(s)
		Process Management Decision Making	Process Roles and Responsibilities	Process Metrics and Performance Linkage	Process Related Standards	Process Management Compliance	
Capability areas (CAs) from the updated framework	Contextual BPM Governance (NEW)	X	X	X	(✓)	(✓)	<i>Consideration of many process types and contexts simultaneously</i>
	Contextual Process Governance (ENHANCED)	(✓)	(✓)	(✓)	(✓)	(✓)	<i>Consideration of many process types and contexts simultaneously</i>
	Process Architecture Governance (ENHANCED)	X	X	(✓)	(✓)	(✓)	<i>Consideration of intra- and inter-organizational process dependencies</i>
	Process Data Governance (NEW)	X	X	X	X	X	<i>Increased focus on process- and non-process-related data</i>
	Roles and Responsibilities (ENHANCED)	(✓)	(✓)	X	X	X	<i>Consideration of new types of process participants</i>

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Core Element Methods/IT		Capability areas (CAs) from de Bruin und Rosemann's (2007) framework					Novel Facet(s)
		Process Design and Modelling	Process Implementation and Execution	Process Monitoring & Control	Process Improvement and Innovation	Process Program & Project Management	
Capability areas (CAs) from the updated framework	Process Context Management (NEW)	X	X	X	X	X	<i>Consideration of many process types and contexts simultaneously</i>
	Process Compliance Management (ENHANCED)	X	(✓)	(✓)	X	(✓)	<i>Increased focus on security, privacy, and constructive non-compliance</i>
	Process Architecture Management (ENHANCED)	(✓)	(✓)	(✓)	(✓)	(✓)	<i>Consideration of intra- and inter-organizational process dependencies</i>
	Process Data Analytics (NEW)	X	X	X	X	X	<i>Increased focus on process- and non-process-related data</i>
	BPM Platform Integration (NEW)	X	X	X	X	X	<i>Integration of specialized or phase-specific BPM solutions</i>
	Multi-purpose Process Design (ENHANCED)	(✓)	X	X	(✓)	(✓)	<i>Consideration of various stakeholder needs and purposes</i>
	Advanced Process Automation (NEW)	X	X	X	X	X	<i>Increased integration of non-process technologies</i>

Core Element Methods/IT		Capability areas (CAs) from de Bruin und Rosemann's (2007) framework					Novel Facet(s)
		Process Design and Model- ling	Process Im- plemen- ta- tion and Execution	Process Monitoring & Control	Process Im- provement and Innovation	Process Program & Project Manage- ment	
Capability areas (CAs) from the updated frame- work	Adaptive Process Execution  (ENHANCED)	X	(✓)	X	X	X	<i>Consideration of many pro- cess types and contexts sim- ultaneously</i>
	Agile Process Improvement  (ENHANCED)	X	(✓)	X	(✓)	X	<i>Considering of insights from agile software development</i>
	Transforma- tional Process Improvement  (ENHANCED)	X	(✓)	X	(✓)	X	<i>Increased integration of non-process technologies and benefit realization</i>

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Core Element People		Capability areas (CAs) from de Bruin und Rosemann's (2007) framework					Novel Facet(s)
		Process Skills & Expertise	Process Management Knowledge	Process Education	Process Collaboration	Process Management Leaders	
Capability areas (CAs) from the updated framework	BPM and Process Literacy (AS-IS)	✓	✓	✓	(✓)	(✓)	-
	Data Literacy (NEW)	X	X	X	X	X	<i>Consideration of insights from data analysis</i>
	Innovation Literacy (NEW)	X	X	X	X	X	<i>Consideration of insights from innovation management and entrepreneurship</i>
	Customer Literacy (NEW)	X	X	X	X	X	<i>Consideration of insights from customer relationship management</i>
	Digital Literacy (NEW)	X	X	X	X	X	<i>Consideration of insights related to digitalization and emergent technologies</i>

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Core Element Culture		Capability areas (CAs) from de Bruin und Rosemann's (2007) framework					Novel Facet(s)
		Respon- siveness to Process Change	Process Values & Beliefs	Process Attitudes & Behaviors	Leadership Attention to Process	Process Manage- ment Social Networks	
Capability areas (CAs) from the updated framework	Process Centricity (AS-IS)	X	✓	X	✓	✓	-
	Evidence Centricity (NEW)	X	X	X	X	X	<i>Increased focus on process- and non-process- related data</i>
	Change Centricity (ENHANCED)	(✓)	X	(✓)	X	X	<i>Consideration of insights from innovation management and entrepre- neurship</i>
	Customer Centricity (NEW)	X	X	X	X	X	<i>Consideration of insights from customer relationship management</i>
	Employee Centricity (NEW)	X	X	X	X	X	<i>Consideration of insights from innovation management and entrepre- neurship</i>

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