

Approaching Digitalization with Business Process Management

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Abstract. As digitalization sustainably alters industries and societies, small and medium-sized enterprises (SME) must initiate a digital transformation to remain competitive and to address the increasing complexity of customer needs. Although many enterprises encounter challenges in practice, research does not yet provide practicable recommendations to increase the feasibility of digitalization. Furthermore, SME frequently fail to fully realize the implications of digitalization for their organizational structures, strategies, and operations, and have difficulties to identify a suitable starting point for corresponding initiatives. In order to address these challenges, this paper uses the concept of Business Process Management (BPM) to define a set of capabilities for a management framework, which builds upon the paradigm of process orientation to cope with the various requirements of digital transformation. Our findings suggest that enterprises can use a functioning BPM as a starting point for digitalization, while establishing necessary digital capabilities subsequently.

Keywords: Business Process Management, Digital Transformation, Digitalization, Maturity Frameworks, PEMMDO

1 Introduction

As technological advancements have made the Internet ubiquitously available, customers have developed preferences for consistent information across multiple communication channels, innovative product-service combinations, and direct interactions with enterprises [1]. To address these needs, enterprises rely on holistic strategies that facilitate the streamlining of processes, the digitization of products and services, and the innovation of business and revenue models [2]. However, numerous studies suggest that especially small and medium-sized enterprises (SME) have not yet initiated digital transformation [3, 4] and, thus, have not yet embarked on the process of digitizing their business. As many SME operate in global markets shaped by competition, this can yield significant risks for their long-term business success.

While literature does not provide a generally accepted definition of digitalization, it is often referred to as a technology-induced transformation process that improves an enterprise's flexibility, agility, and responsiveness by simultaneously aligning its operations, strategy, business processes, and organizational and IT structures to

Multikonferenz Wirtschaftsinformatik 2018,
March 06-09, 2018, Lüneburg, Germany

technological advancements [5, 6]. Digitalization widens the scope of traditional digitization, which has mainly focused on the transformation of analogous information into a digital representation [7]. Digitization has led to the development of various approaches for business-IT alignment, including concepts for technology adoption, procedures for software selection, or data and information integration using information systems [8, 9]. However, to cope with digitalization, enterprises rely on new perspectives that enable a holistic harmonization of all their strategies, processes, operations, and IT systems [10]. Despite a growing interest and frequently encountered challenges in practice, research still lacks practicable recommendations on the formulation, implementation, and evaluation of corresponding strategies [11, 12]. To address these shortcomings, we follow Legner et al. [7], who demand transdisciplinary research to develop feasible digitalization approaches. Hence, we operationalize Business Process Management (BPM), as both concepts share similar goals and characteristics. Due to the wide adoption and maturity of BPM methods, techniques, and systems, we argue that a functioning BPM constitutes an optimal starting point for embarking on the journey of digitalization and to design a holistic maturity model as a management framework for SME. We summarize our research questions as follows:

- (1) *What are the requirements of digitalization endeavors?*
- (2) *How does BPM address the requirements and challenges of digitalization in SME?*
- (3) *What capabilities are necessary for SME to cope with the requirements of digitalization and how can we use BPM to increase the feasibility of digitalization in SME?*

This paper is organized as follows: In Section 2, we describe the applied research design to develop the artefact of this contribution. Section 3 introduces necessary foundations on BPM and digitalization. We present the results of a literature review on the challenges and requirements of digitalization in Section 4 and analyze how BPM maturity models support SME in addressing them. In Section 5, we use resulting implications to derive a set of necessary capabilities, which we integrate into a holistic management framework. This paper concludes with a summary of findings, limitations, and future research potentials.

2 Research Design

We apply a design-oriented research approach to develop our contribution. Following the knowledge contribution framework proposed by Gregor and Hevner [13], we consider our Design Science Research (DSR) contribution an exaptation of BPM to the design and implementation of strategies for the digitalization of SME. It has explanatory power and provides design practice theory for the formulation of digital strategies for SME. Hence, we use the guidelines provided by Peffers et al. [14] to answer our research questions. We summarize our research approach in Figure 1. Despite the importance of digital transformation for the future competitiveness of SME, literature does not yet provide practicable recommendations on the design and implementation of corresponding strategies.

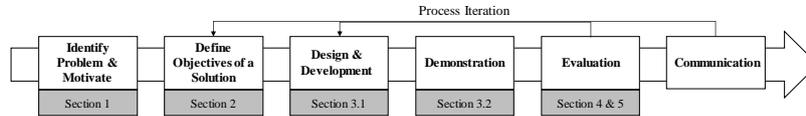


Figure 1: Research Methodology

Thus, we aim to develop a management framework that supports SME in coping with the requirements of digitalization by operationalizing existing organizational structures and systems. By defining design as a search process, we conduct a systematic literature review [15] to collect a representative set of requirements for successful digitalization. Subsequently, we analyze the capabilities of BPM to support and guide the underlying transformation process. We use the resulting implications for the design of our artefact, adapt the well-established Process and Enterprise Maturity Model (PEMM) [16] and extend it with an additional dimension for digitalization. We evaluate its applicability by controlling for its suitability to address the requirements of digitalization.

3 Business Process Management and Digitalization

3.1 Business Process Management

BPM constitutes a body of methods, techniques, and systems to identify, prioritize, analyze, improve, and monitor the business processes of an organization [17, 18]. It builds upon the paradigm of process orientation, which replaces the traditional functional perspective on organizational structures in order to address increasing market dynamics, a growing competitive pressure, and technological advancements [17, 18]. Potential benefits of BPM range from increases in flexibility, agility, and responsiveness to improvements in innovativeness and customer centricity [17-19].

Despite the manifold benefits, introducing BPM can be challenging, as it simultaneously affects multiple organizational levels and demands time, financial, and human resources [19]. For a successful BPM, enterprises must account for a variety of success factors that range from process standardization and automation, to stakeholder integration, and adequate employee training [17]. To support enterprises in managing BPM initiatives, several maturity models have been introduced to the literature. A comprehensive overview of these frameworks can be found in [20]. Due to the focus on SME, this paper builds upon Hammer [16], who introduced the PEMM framework to support all enterprises in planning and executing process-based transformations. As it does not require specific organizational characteristics, it is especially suitable for SME, which naturally differ by firm size, legal form, and organizational maturity [16].

PEMM builds upon the two dimensions of *process enablers* and *enterprise maturity*. The former dimension focuses on individual processes and determines requirements for a high process performance, including the five characteristics *design*, *performers*, *owner*, *infrastructure*, and *metrics* [16]. Each characteristic is further specified by a variety of sub-constructs to provide more detailed action recommendations. To account for the interdependencies between the characteristics, the model distinguishes four

process maturity levels, ranging from *P1*, indicating a minimum degree of process orientation, to *P4*, enabling the delivery of the best possible results to all stakeholders [16]. In order to reach higher maturity levels, enterprises must successfully address the requirements of all previous levels. In addition, the dimension of enterprise maturity defines *organizational capabilities* that are necessary to develop high-performance processes, including the areas of *leadership, culture, expertise, and governance* [16]. Similar to process enablers, the model defines sub-constructs for each area to specify corresponding requirements and determines four maturity levels. Both maturity dimensions are mutually dependent in a way that enterprises must exhibit necessary organizational capabilities to deliver a certain level of process performance [16].

3.2 Digitalization and its relationship to BPM

By transforming information into a digital representation, digitization yielded significant improvements in enterprises' information processing capabilities [7, 11]. To fully harness those benefits, organizations relied on the use of IT and the implementation of IT strategies, for example by increasing the agility and consistency of business processes through the use of information systems [21].

Simultaneously, digitization initiated an extensive digital transformation process that is changing industries and societies of today [7, 22]. This transformation is fueled by the convergence of social, mobile, cloud, and smart technologies and the growing need for big data applications, automation, and integration [23, 24]. The Internet further provides means to share user experiences, opinions, and preferences immediately and established new opportunities for customers and enterprises to interact [22].

To address the challenges imposed by digitalization, it is essential for enterprises to initiate a holistic socio-technical transformation process [7]. According to Singh and Hess [25], this requires the implementation of a comprehensive digital strategy, which accounts for the opportunities and risks from digital technologies and fosters the creation of values and revenues based on digital assets. It further entails establishing adequate capabilities in the areas of digital leadership and empowerment, data-driven agility, consumer and partner engagement, digital platform management, business model innovation, IT architecture transformation, process digitization and automation, digital security, and compliance [7]. This facilitates improvements in business performances by continuously integrating technological advancements in the areas of social media, mobile access, or embedded systems into an enterprise's operations [25].

Although they describe different research domains, we argue that BPM and digitalization inherently share fundamental assumptions and characteristics. BPM provides methods and techniques to improve an enterprise's business performance, by optimizing efficiency and productivity, while reducing costs and fostering collaboration [18]. Both concepts further require enterprises to account for cross-functional interdependencies and, thus, draw upon the concept of process-orientation. By facilitating automation and integration, technology supports BPM by providing capabilities for information management, information processing, and communication [26]. Introducing IT to an organization can also trigger BPM initiatives, as enterprises must align their organizational structure to the system's characteristics to fully harness

the expected benefits. While technology is a key enabler for BPM, it is central to digitalization, as it drives the underlying transformation process.

4 Demystifying the Requirements of Digitalization

4.1 Sampling and Meta-Analysis

First, we conduct a literature review to derive a representative set of requirements. To determine the scope of our literature review, we draw upon the classification of Cooper [27], who distinguishes the dimensions *focus*, *goal*, *organization*, *perspective*, *audience*, and *coverage*. We focus on research outcomes and applications. Furthermore, we aim to integrate the findings from literature to obtain a comprehensive understanding of the requirements of digitalization in organizations. We structure our results based on conceptual clusters, take on a neutral perspective during the reviewing process, and direct our research to general scholars and practitioners. However, we do not claim our results to be exhaustive, but rather to be a representative collection of relevant contributions on the requirements of digitalization.

We initially defined search terms and literature databases to initiate the literature search process. To ensure a high-qualitative sample, we queried the databases *AISel*, *EBSCO Business Source Complete*, and *EBSCO Academic Search Complete*, and exclusively considered peer-reviewed journals contained by the Senior Scholar’s Basket of Journals, the AIS Toplist, or outlets with a VHB JOURQUAL Ranking of *A* or *B*. We also considered additional databases but did not get adequate results. As the requirements of digitalization continuously change, we limited our search to papers published between 2007 and 2017. To identify relevant publications, we created a list of keywords based on the terms *digitalization*, *digitization*, and *digital transformation*. We specified our query strings by adding the expressions *strategy*, *approach*, *requirements*, as well as other associated concepts. Based on these search terms, we performed the literature search process in multiple phases [27]. Figure 2 summarizes the search strategy and corresponding results.

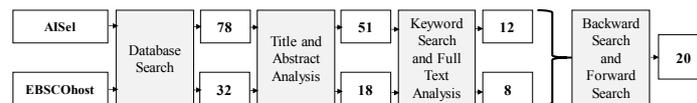


Figure 2: The Literature Search Process

First, we analyzed titles and abstracts of the identified contributions and eliminated papers that did not fit the thematic or organizational scope of our review. Second, we performed a keyword search and a full-text analysis to ensure the relevancy of our final sample. Finally, we performed forward and backward searches to widen the scope of our review, resulting in 20 publications that conformed to the predefined requirements. By analyzing the contributions’ years of publications, the resulting distribution suggests that the focus on digital transformation has been continuously growing during the last decade. Eight papers were published only in 2017, with the same number of articles

introduced between 2011 and 2013. We consider our literature collection as high-qualitative, as 19 contributions were published in outlets ranked *B* or higher. With twelve papers from the journal *MIS Quarterly Executive*, more than half of the publications follow practice-oriented research approaches.

4.2 Literature Analysis and Synthesis

Our literature analysis comprises two phases. First, we examined all identified contributions to collect a comprehensive set of requirements for digitalization. Afterwards, a group of domain experts analyzed each item in order to reduce the initial collection to a smaller number of summarizing concepts. We repeated this process in multiple iterations until all participants agreed on a final sample of requirements. Second, we followed Webster and Watson [28], who suggest constructing a concept matrix to structure the body of knowledge. Based on this procedure, our initial sample contained 225 requirements, which we reduced to eight summarizing concepts within six iterations. Table 2 presents the resulting concept matrix.

Table 2: Requirements of Digital Transformation

| Reference | <i>Req. 1:</i> Expertise | <i>Req. 2:</i> Org. Flexibility | <i>Req. 3:</i> Involve- ment | <i>Req. 4:</i> Digital Strategy | <i>Req. 5:</i> IT Strategy | <i>Req. 6:</i> Security | <i>Req. 7:</i> Collabo- ration | <i>Req. 8:</i> Culture |
|-----------|-----------------------------|---------------------------------------|------------------------------------|---------------------------------------|----------------------------------|----------------------------|--------------------------------------|---------------------------|
| [1] | | x | | x | x | | x | |
| [29] | | x | | x | x | | | x |
| [24] | x | x | x | x | x | | x | x |
| [30] | | | | | x | | | |
| [31] | x | x | | x | x | x | x | x |
| [32] | | | | | x | | | |
| [12] | | | | x | | | | |
| [33] | x | | x | x | x | | x | x |
| [34] | | x | x | x | x | | x | x |
| [2] | x | x | | x | x | | | x |
| [6] | x | x | | x | x | | x | x |
| [35] | | | | x | | | | |
| [36] | x | x | x | x | x | | x | x |
| [7] | x | x | x | x | x | x | | |
| [37] | | | x | x | x | | | x |
| [11] | | | | x | x | | | x |
| [10] | | | | x | | | | |
| [23] | x | x | x | x | x | | x | |
| [25] | | | x | x | | | x | x |
| [38] | x | x | x | x | x | | x | x |

The identified requirements range from cultural and organizational to strategical and technological aspects. Various authors highlight the need for IT and data-related skills and capabilities (*Expertise*) [2, 7, 25, 36, 37]. As tasks become more complex, enterprises can benefit from employee specialization but rely on knowledge management mechanisms to ensure consistent outcomes and to facilitate co-creation and collaboration [23, 24, 31, 34, 36, 38].

Continuously changing market conditions require an adequate degree of *organizational flexibility*, which includes organizational agility, scalability, and adaptability [1, 6, 7, 11, 23, 37, 38]. Hence, enterprises must take on a cross-functional perspective, capture benefits from standardization, and enable organizational

responsiveness through coordination and communication [23, 24, 29, 31, 37, 38]. [2, 6, 11] emphasize that the success of digital transformation strongly depends on the provision of sufficient funding, as unforeseen developments can challenge the initiatives.

To enable a comprehensive transformation, enterprises must formulate and implement an adequate *digital strategy* that includes goals, as well as an action and communication plan [2, 6, 31, 34]. This entails adaptations to an enterprise's business model, product service portfolio, and the alignment of recruiting strategies to the needs of digitalization [1, 2, 6, 7, 11, 24, 35, 38]. According to [6, 36, 37], digital transformation further requires enterprises to refocus their core competencies and to rationalize non-performing activities. By implementing adequate monitoring systems, enterprises can continuously align their digital strategy to market dynamics [2, 6, 24, 31, 36]. Ultimately, enterprises should foster innovation opportunities, for example by introducing innovation incubators [24, 31] or concepts of open innovation [6, 31, 38].

Due to ubiquitous communication channels, digital transformation demands for a stronger *involvement* of internal and external stakeholders [7, 23-25, 33, 34, 36-38]. On the one hand, customers seek to participate in the design and development of new products and services. On the other hand, enterprises benefit from the integration of data and processes within their supplier network [6, 23, 24, 31, 38]. As digitalization requires new skills and capabilities and alters organizational procedures, enterprises must further avoid imbalances between different parts of the organization [24, 36].

As they drive digitalization, organizations must continuously align their business operations to new technologies by implementing a consistent *IT strategy* [6, 7, 32, 36, 37]. This entails facilitating digitization and automation, as well as implementing an IT architecture to enable data integration, process orchestration, and the deployment of adequate data analysis capabilities [1, 7, 23-25]. [29, 33, 36] further recommend the implementation of holistic benchmarking methods that build upon data from internal and external sources and allow for real-time adaptation and forecasting opportunities.

To fully harness potential benefits from *collaboration*, production models provide means to coordinate co-creation in decentralized activities [1, 23, 31, 38, 39]. By modularizing processes and activities to standardized building blocks, enterprises can further increase operational flexibility and foster efficiency and innovativeness [6, 36].

As digitalization constitutes a holistic change process, it requires enterprises to adapt their *organizational culture*. Thus, it is necessary to create an open-minded environment that facilitates creativity and risk-taking [6, 34, 37]. Further, organizations should offer training and education opportunities and adapt management structures by introducing new organizational roles and/or responsibilities [2, 6, 24, 31, 34, 36].

Ultimately, as digitalization poses risks for IT and data *security*, enterprises must adapt compliance rules and account for IT security threats by formulating behavioral guidelines, risk management systems, and a comprehensive defense strategy [7, 31].

4.3 How BPM Addresses the Challenges of Digital Transformation

While digitalization result in organizational change processes, we argue that enterprises can increase their feasibility by establishing an adequate enterprise and process

maturity. Enterprises can address various requirements of digitalization with a process-based transformation, which we summarize in Table 3.

Table 3: Capabilities of BPM to Address the Requirements of Digitalization

| Requirement | Facilitation through BPM | Reference |
|------------------|--|-----------|
| Expertise | <ul style="list-style-type: none"> cross-functional knowledge spill-overs facilitate collaboration and co-creation process models enable knowledge management and information exchange | [17] |
| Flexibility | <ul style="list-style-type: none"> improved coordination and communication increase agility and flexibility | [40] |
| Involvement | <ul style="list-style-type: none"> process-orientation connects all part of an organization | [17] |
| Digital Strategy | <ul style="list-style-type: none"> process models facilitate focusing on core-competencies and foster innovation supports the awareness and acceptance towards change | [41] |
| IT Strategy | <ul style="list-style-type: none"> uses IT for process automation, digitization, and data integration aligns technological and business structures | [17] |
| Collaboration | <ul style="list-style-type: none"> uses production models to facilitate collaboration facilitates modularization through process building blocks | [39] |
| Security | <ul style="list-style-type: none"> entails the formulation of rules and guidelines | [18] |
| Culture | <ul style="list-style-type: none"> creates a cross-functional culture and defines roles and | [17] |

A functioning BPM addresses various requirements of digitalization. It can thereby increase the feasibility of the underlying transformation process. This entails that organizations can benefit from the mechanisms and structures established by BPM and use them as a starting point to initiate their digitalization journey.

5 PEMMDO – A Maturity Model for Digital Transformation

While BPM can serve as an enabler for digital transformation, it cannot fully address all requirements. Hence, organizations must establish additional capabilities to cope with digitalization successfully. To transform our findings into practicable recommendations for SME, we build upon the PEMM framework, which is universally applicable and, thus, accounts for the heterogeneity of SME. Although PEMM does not explicitly address the requirements of digital transformation, we have shown that process orientation and BPM constitute facilitating conditions (cf. Section 4.3).

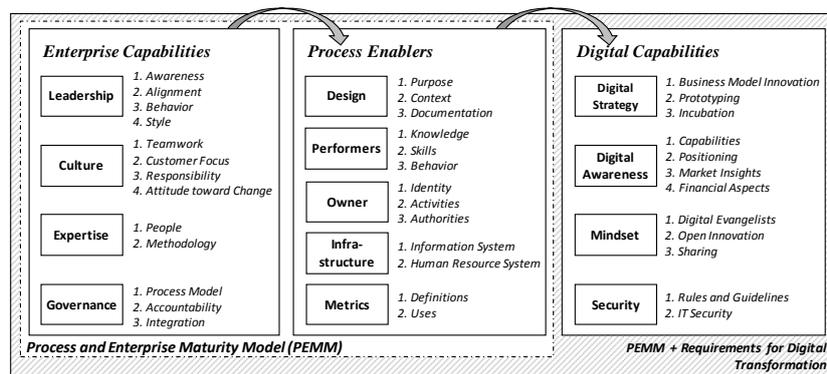


Figure 3: PEMMDO, PEMM enhanced by Requirements for Digital Transformation

However, to fully cope with the requirements of digital transformation, enterprises must further implement a *digital strategy*, increase *digital awareness*, adjust their *mindset*, and define *security standards*. We incorporate these *digital capabilities* and account for the facilitating effect of BPM by extending the PEMM framework with four digital capabilities. We illustrate the resulting *Process and Enterprise Maturity Model for Digitalized Organizations (PEMMDO)* in Figure 3. The framework intends to serve as an orientation for companies seeking to embark on the journey of digital transformation. As described by Hammer [16], the model's dimensions are mutually dependent, in a way that adequate enterprise capabilities foster operational excellence, which in turn facilitates digitalization.

Necessary capabilities to approach digitalization include:

- **Digital Strategy:** Enterprises must formulate a digital agenda that fosters innovation, aims for quick results, draws upon knowledge and resources from all available information sources, and facilitates customer-oriented products and services. Thus, enterprises must continuously challenge and innovate their business and revenue models. Furthermore, prototyping facilitates the adaptation of product and service specifications to dynamically changing consumer preferences, while reducing development times. Ultimately, incubation hubs can introduce new perspectives on digitalization, foster creativity, and lateral thinking, and augment existing structures with agile and flexible components.
- **Digital Awareness:** To cope with digitalization, it is essential for enterprises to monitor their distinct capabilities and business performance continuously. By implementing comprehensive benchmarking mechanisms, enterprises can evaluate and adjust their market positioning and use the resulting implications to adapt their business goals and strategy to customer preferences and market requirements. Ultimately, digital transformation requires enterprises to provide adequate financial resources that compensate for short-term setbacks and to support business models and strategies in competitive market environments.
- **Mindset:** Besides adaptations to organizational structures and strategies, digitalization requires an open-minded culture that fosters creativity and innovation. To facilitate the awareness towards and the adoption of digitalization respectively, enterprises rely on digital evangelists, which are typically well-connected and part of large social networks. Organizational culture must further promote risk-taking but also facilitate realistic expectations in a way that enterprises focus their available resources on the most feasible and beneficial projects and initiatives. In fact, not all projects yield cost reductions or performance improvement, but can also create new potentials for research and development. By providing comprehensive training and education opportunities, enterprises can equip employees with necessary skills and capabilities. These should address the concept of open innovation, the use of collaborative production models, and the benefits of knowledge sharing.
- **Security:** As digitalization seeks to digitize an enterprise's assets and operations, new threats for IT and data security arise, which can hamper the adoption of digital strategies and negatively influence business success. Enterprises must address those

risks in early stages of the digitalization process. Hence, they must define *rules and guidelines* that extend traditional compliance to account for digital risks. Furthermore, *risk management* can support enterprises in identifying critical organizational infrastructures as well as the most common threats. They must use the resulting implications to implement a comprehensive defence strategy.

6 Conclusion

To address the challenges of SME when approaching digitalization, this paper sought to introduce a management framework by drawing upon established concepts of BPM. Based on the similarity of both concepts, we formulated three research questions, which we answered by applying a DSR approach. First, we conducted a literature review to identify relevant contributions on digitalization and corresponding strategies. Analyzing the body of literature, we collected 225 requirements associated with digitalization and reduced them to nine summarizing concepts. Subsequently, we analyzed the capability of BPM to address these requirements and demonstrated how it provides an optimal starting point for digital transformation in SME. As traditional BPM does not account for all requirements of digitalization, we derived a set of key capabilities, which we conceptualized by introducing the PEMMDO framework. Hence, we consider adequate enterprise and process capabilities as necessary preconditions for digitalization. The resulting framework supports enterprises in formulating and implementing a strategy for digitalization.

Approaches of this kind have a variety of well-known limitations. First, we only considered high-qualitative contributions for our literature review and aimed to identify a representative, rather than exhaustive, sample. Hence, requirements and implications from neglected publications were not included in our analysis. Second, our findings exclusively build upon implication from theoretical contributions. Hence, digital transformation remains an emerging topic and requires further research to provide more definitive evidence for the applicability of our framework to support implementation projects in practice.

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