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# Agile business process management

## A systematic literature review and an integrated framework

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### Abstract

Business Process Management (BPM) is key for successful organisational management. However, BPM techniques are often criticized for their inability to deal with continuous and significant change and uncertainty. Following recent calls to make BPM more agile and flexible towards change, this study presents the results of a systematic literature review (SLR) of agile concepts in BPM. Analysing and synthesizing previous works and drawing on agility research in the field of IS, this paper introduces a framework for agile BPM. Integrating different components that define agility in the context of BPM, this framework offers a number of important implications. On the theoretical side, the authors argue that the concept of agile BPM departs in some important ways from traditional BPM research. This, in turn, points to various opportunities for future research. On the practical side, the authors suggest that emerging technologies, such as process mining, embody important features that help organisations to be more responsive to change. The paper aims to discuss these issues.

### Keywords

Literature review, Adaptive BPM, Agile business process management, BPM agility, BPM framework

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## 1. Introduction

Business process management (BPM) is a management approach concerned with analysing, designing and implementing processes across organisational units (vom Brocke and Rosemann, 2014). In order to establish efficiency and continuity in organisational work, BPM offers a variety of tools and methods to define and realise sequences of activities that provide value to the customer (Rosemann and vom Brocke, 2015). Traditionally, BPM initiatives have sought to establish control and stability and have been concerned

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with identifying and solving problems that occur along sequences of activities and events (Rosemann, as cited in Kohlborn *et al.*, 2014).

As important as stability and control are in BPM, recent work emphasises the need for flexibility and change in the use of BPM (e.g. von Rosing *et al.*, 2015). Organisations are embedded in highly dynamic business environments, and business processes must respond to exogenous changes. Paraphrasing Bill Gates who said that “success today requires the agility and drive to constantly rethink, reinvigorate, react, and reinvent”, we suggest that the success of BPM depends on the agility and to rethink, redesign and innovate processes.

Similarly, leading scholars in BPM emphasise the need for more contingent approaches to BPM, where processes can be managed in such a way that they adopt to exogenous dynamics and work “from the outside in” (Rosemann, as cited in Kohlborn *et al.*, 2014). For example, vom Brocke *et al.* (2014) stress that one principle of good BPM is that processes are context-dependent and that they fit external requirements, while Trkman (2010) points out that one success factor of BPM is based on a fit between processes and the business environment.

A variety of research stresses that business process needs to align with external dynamics. Thus, managing process changes is central to achieving BPM’s strategic objectives in an organisation (Minonne and Turner, 2012; Reijers *et al.*, 2010). At the same time, authors have emphasised that organisations are facing various pitfalls. These pitfalls fall into categories like strategic issues (Bandara *et al.*, 2007; Indulska *et al.*, 2006; Malinova and Mendling, 2018; Sadiq *et al.*, 2007), but all relate to managing initiatives that are related to process changes like change-management issues (e.g. resistance to change), communication problems, and lack of stakeholder involvement, governance, or a lack of a common understanding of BPM. Furthermore, organisations often face problems with being late in understanding the issues and so being late with initiating process-change practices. Overdoing process-change projects is another problem that consumes resources and creates costs for organisations (Thiemich and Puhlmann, 2013).

One way of addressing the need for change in BPM while also addressing the pitfalls may be found in the concept of agility. Research in the fields of organisational studies, management sciences and information systems (IS) have continuously found that agility is a key factor for organisational success. It reduces complexity, improves alignment, fosters communication among customers and employees, and enables organisations to respond to change opportunities in efficient and effective ways. For example, in the field of IS, agile management approaches are acknowledged in the IS literature (Abrahamsson *et al.*, 2009; Conboy, 2009) and it has been observed that agile working can be found across 95 per cent of software teams in regulated, large-scale and distributed projects (Abrahamsson *et al.*, 2009; Dingsøyr and Moe, 2013; Hobbs and Petit, 2017).

Although a number of articles address agility in BPM, their approaches lack cohesion and a stable theoretical foundation to enable a cumulative body of knowledge to accumulate. For example, while Meziani and Magalhães (2009), Rito-Silva *et al.* (2009) and Meziani and Saleh (2010) are concerned with the quick adoption of agile BPM to address changing business environments and incremental improvements, Gebhart *et al.* (2014) are concerned with the lean side of agility and study the role of process quality models on agile BPM. Although some researchers, such as von Rosing *et al.* (2015), study the agile

BPM way of working by considering the Kaizen improvement model, most of the literature on agile BPM is concerned with process modelling and considers flexibility and agility as similar concepts.

In this article, we seek to establish a shared understanding of agile BPM. By conducting a systematic literature review (SLR) on agility in the BPM literature, we pursue four objectives. First, we show how the term has been used so far and how it has been connected with various aspects of BPM. Second, we develop a holistic framework for agile BPM that supports organisations in dealing with issues in managing process change. Third, we point to blind spots and open questions and propose a number of directions for future research to pursue. Fourth, we present a number of implications that agility has on BPM practice.

We will proceed as follows. In the next section, we will argue why BPM research may be in need of agile perspectives. We will then present the method we used in this study, and we will present the findings along with an integrated framework for agile BPM. Finally, we will discuss the implications and provide recommendations for future research.

## 2. Theoretical background

### 2.1 Business process management

BPM is broadly understood as a management discipline that is concerned with business analysis and continuous process improvement in organisations (Zairi, 1997), the goal of BPM is to establish effective and efficient ways for organisations to create value for their customers (Malinova and Mendling, 2018; vom Brocke and Rosemann, 2014). Various definitions of BPM, as provided by Weske (2012), McCoy (2011), Van Der Aalst *et al.* (2003), vom Brocke and Rosemann (2015) and Dumas *et al.* (2013), show that the main concerns of BPM are categorised in three groups: business/work/process performance; consistent business set-up and outcomes that support organisations with their objectives; and the use of resources, tools and techniques for management, control, monitoring, operational and implementation purposes. Therefore, BPM can be broadly described as an ambidextrous management discipline that provides methods and frameworks and uses technologies in support of the strategic alignment and governance that facilitate consistent outcomes of organisational/operational processes and contribute to business performance by continuously codifying and integrating requirements, and understanding, documenting, designing, analysing, simulating, executing, and monitoring business processes.

BPM needs to be oriented towards specific organisational purposes (vom Brocke *et al.*, 2014), and successful BPM is key to reaching diverse organisations' strategic objectives. Success in using BPM as a management discipline helps to ensure the success of business processes, which has a direct impact on business success (Thompson *et al.*, 2009). Research has also presented methods to evaluate the value-driven consequences of process changes by means of financial indicators, such as the return on process transformation (vom Brocke *et al.*, 2010; vom Brocke, 2016). It is widely acknowledged that process change management helps to ensure successful BPM adoption. However, research stresses that organisations face a number of strategic, tactical and operational issues in managing process change (Bandara *et al.*, 2007; Indulska *et al.*, 2006; Malinova and Mendling, 2018; Sadiq *et al.*, 2007). Thiemeich and Puhlmann (2013) address several of these issues, including time-consuming over-analysis of problems and customers who are not aligned with project changes at the right time and cause delay in BPM projects.

To decrease the risk of BPM failure, researchers have developed frameworks and guidelines on how to guide and facilitate business process change. For instance, Thompson *et al.* (2009) propose enablers to ensure process efficiency, process quality and process agility. They relate to strategy, culture, people/resources, governance, IT and methods, and they influence business success by considering cost efficiency, client experience and business agility (De Bruin and Rosemann, 2007; Rosemann and vom Brocke, 2015). Thompson *et al.* (2009) also highlight that there should be a balance of reaction and proaction in process improvement initiatives. vom Brocke *et al.* (2014) provide a set of ten principles for good BPM that guide BPM planning and coordination initiatives, and Trkman (2010) provides a set of critical success factors based on contingency theory, task-technology fit, and dynamic capabilities to ensure continuous improvement in BPM practices. The literature also offers other success models and success factors related to other aspects of BPM. For instance, Ravesteyn and Batenburg (2010) provide success factors for BPM systems implementation, and Alibabaei *et al.* (2017) refer to the differences among BPM success factors in various industries.

Despite such efforts to help companies succeed in BPM adoption, there is an increasing need for rapid, flexible and lean approaches to BPM that will help companies respond quickly and efficiently to changing environments. Timely actions regarding process change and quick wins show stakeholders the value and importance of BPM by increasing the visibility of BPM. In this line of thinking, recent technologies, such as a process mining or collaborative modelling, allow for fast and easy performance evaluations of business processes (Houy *et al.*, 2011).

In short, recent approaches in BPM emphasise the need for continuous alignment between business processes and environmental dynamics, implying that BPM initiatives need to be able to anticipate changes and embody flexibility in their business process work. This, in turn, resonates with principles of agility. Exploring and aligning the foundations of agile software development with BPM may increase process transparency, improve process governance and enterprise agility (Bruno *et al.*, 2011), improve the level of customer orientation (e.g. by gathering requirements quickly), establish process flexibility and leanness, and facilitate organisational change management (Thiemich and Puhlmann, 2013). In short, by supporting better management of process change, agility has the potential to help BPM overcome issues in process change by proactively or reactively creating or embracing and learning from change.

## 2.2 Agile methodologies

The concept of agility was introduced to IS through the publication of Fowler and Highsmith's (2001) manifesto and has been embodied in approaches like XP and Scrum (Boehm, 2002; Highsmith, 2002; Highsmith and Cockburn, 2001). These approaches depart from highly formalized approaches to work in favour of faster, more user-centric and more dynamic methodologies that enable continuous delivery, requirement changes and reflection. These approaches have been applied successfully across diverse contexts and domains (Boehm, 2002; Gary *et al.*, 2011; Lindvall *et al.*, 2002) and have even been extended to heavily regulated environments like biomedical research (e.g. Kane *et al.*, 2006) and healthcare settings (e.g. Aronsson *et al.*, 2011). Agile adoption has also attracted the increasing interest of research (Dingsøyr *et al.*, 2010; Fitzgerald *et al.*, 2006; Nerur *et al.*, 2005; Wang *et al.*, 2012).

There are two dominant perspectives on agility in the field of IS, and both indicate the extent to which agility is present in an organisational context. Within the adherence-based perspective, agility is measured

as the extent to which commercially labelled “agile” practices are implemented. For example, adherence can be measured by metrics that pertain to XP (Layman *et al.*, 2004; Mangalaraj *et al.*, 2009) or Scrum (Downey and Sutherland, 2013; Scharff, 2011; Scharff *et al.*, 2012). However, an extensive review and synthesis of discussions around the concept of agility (Conboy, 2009) identifies a number of shortcomings, in the methodologies that form the basis of adherence, including lack of clarity, lack of theoretical glue, lack of parsimony, limited applicability, and naivety regarding the evolution of the concept of agility in other fields, such as manufacturing. As a result, adherence-based assessments of agility make it difficult to compare methodologies, assess in-house methodologies, apply staged adoption of agility and consider context.

The second approach to agility assessment is based on a value-based enquiry. This perspective does not consider pre-defined practices or methods from a pre-defined selection of commercial methodologies, but it focuses on goals and values that are relevant for agility (Ågerfalk and Fitzgerald, 2005; Lindstrom and Jeffries, 2004). Thus, the value-based perspective is concerned with the level of agility (the value) afforded by a practice or set of practices. In that regard, Conboy (2009) reviewed the use of agility across relevant disciplines, such as manufacturing and management, where the concept originated, matured, and has been applied and tested over time. On that grounds, he presents a formative taxonomy of agility (Figure 1). In specifying the components of agile methodologies, the taxonomy considers: the inherent agility-adding value of a set of practices, rather than simply measuring whether commercially labelled agile practices are used; that agility needs to be assessed “in context”, thus acknowledging the differences among business environments; and allows a staged adoption of agility in environments where more extreme levels of agility are not feasible or necessary.

Conboy’s (2009, p. 340) definition of agility encompasses flexibility and leanness: “the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change and learn from change while contributing to perceived customer value (economy, quality and simplicity), through its collective components and relationships with its environment”.

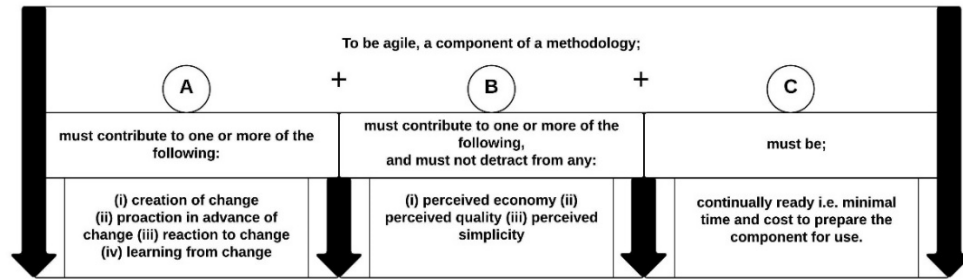
On the grounds of this definition, Conboy introduced a taxonomy indicating that agile methodologies entail components that need to fulfil certain criteria. As indicated by column A, agility needs to facilitate change in at least one of four ways: by facilitating the creation of change; by pre-empting change if it is created elsewhere; by providing reactive measure to change after it has occurred; and by facilitating learning from change to improve creation, proaction and reaction to change in the future.

The second part of the taxonomy (column B) specifies that any methodological component contributes to perceived economy, quality or simplicity. Importantly, it must not perform poorly in any of the three. For example, a 400 page requirements document that details all specifications in minute detail might increase quality, but it would not be considered agile if perceived economy is poor because of, for example, the document’s rapid obsolescence or lack of use.

Finally, column C indicates that a methodological component should be continually ready. If needed, organisational actors should be able to use and apply it immediately. For example, acceptance tests contribute to agility in some circumstances, but if it takes hours to prepare the tests upon usage, they cannot

be considered agile. Rather, agility is provided when automated acceptances run instantaneously at any point in time.

These criteria are also applicable to BPM. Standard, one-size-fits-all methodologies are unlikely to cover the range of applications for BPM, so a value-based discretionary approach is necessary for studies that take place in live development environments.



Overall, agility and BPM together can help organisations manage process-change initiatives. The connection between agility and BPM provides a fruitful research agenda, so the next section reports on an SLR that is conducted to facilitate advancement of a common understanding and clarity in agile BPM.

### 3. Agility in BPM: a review of the literature

#### 3.1 Research method

To assess the state of the art of agility in the BPM research, we conducted an SLR. More specifically, we drew on the approach of vom Brocke *et al.* (2009, 2015), which consists of five steps: defining the scope of the review; conceptualising the topic; searching for literature; analysing and synthesising literature; and developing a research agenda. Agile components (flexibility, leanness and continual readiness) and their sub-components are used for conceptualising the topic. Additionally, similar concepts to agile BPM, including dynamic BPM and adaptive BPM, were considered in literature search to understand how researchers are approaching the topic.

We used different sources for our reviews, including AIS Electronic Library, EBSCO BSP, Science Direct and Emerald. The results from Google Scholar were derived from “Harzing’s Publish or Perish” and used as a complementary database. The search in Google Scholar was conducted based on title words only. Since this SLR is concerned with the agile management of business processes, not agile processes, management is central in the search strings (Table I).

|                   |  |
|-------------------|--|
| Search string I   | ["agile business process management" OR "agile BPM"]       |
| Search string II  | ["business process management agility" OR "BPM agility"]   |
| Search string III | ["dynamic business process management" OR "dynamic BPM"]   |
| Search string IV  | ["adaptive business process management" OR "adaptive BPM"] |

Table I. List of search strings

A database keyword search conducted in September 2018 resulted in 121 papers. There are papers pointing to business process agility and concepts like process model flexibility (e.g. Chen *et al.*, 2014; Seethamraju, 2009; Seethamraju and Sundar, 2013), which are supporting agility in BPM. However, these papers are removed from the SLR due to the focus on management side of BPM. Additionally, there are studies like Triaa *et al.* (2016), Vykhovanets and Yatsutko (2013), Ohlsson *et al.* (2017), Goldstein *et al.* (2019), Reichert and Dadam (1997) and Cao *et al.* (2009) point to dynamic or adaptive BPM while contributing to the list of agile components. After removing duplications and non-English publications along with reviewing the papers' titles and abstracts, 30 papers were selected for the SLR. The selected papers, listed in Table II, summarise the state of the art in agile BPM. In the following, we will discuss the main findings of the SLR.

### 3.2 Findings

The literature reviewed is shown in Table II. It displays the components and sub-components that define agility (Conboy, 2009); continual readiness, flexibility (creation, proactivity, reaction and learning), and leanness (economy, quality and simplicity). Thereby, it provides an overview about the different aspects of agility that are considered in the BPM literature.

It is important to note that studies might have different focus and directions and they do not necessarily focus on all agility aspects simultaneously. For instance, one can focus on creation of change or proaction to change without reporting on quality or simplicity. However, in practice if a change is decreasing the quality or simplicity then it is not contributing to agility. The findings from the reviewed literature is explained in the following.



| Reference                      | Concepts    |           |          |          |          |         |            |                        |
|--------------------------------|-------------|-----------|----------|----------|----------|---------|------------|------------------------|
|                                | Flexibility |           |          |          | Leanness |         |            | Continual<br>readiness |
|                                | Creation    | Proaction | Reaction | Learning | Economy  | Quality | Simplicity |                        |
| Tao et al., 2006               | x           | -         | x        | -        | -        | -       | -          | x                      |
| Schatten & Josef, 2007         | x           | x         | x        | -        | -        | -       | -          | x                      |
| Rimassa & Burmeister, 2007     | x           | x         | x        | -        | -        | x       | x          | -                      |
| Meziani & Magalhães, 2009      | x           | -         | x        | -        | -        | -       | -          | x                      |
| Rito-Silva, A. et al., 2009    | x           | -         | x        | -        | -        | -       | -          | x                      |
| Marjanovic, 2009               | -           | -         | -        | -        | -        | -       | -          | -                      |
| Carroll et al., 2010           | -           | -         | -        | -        | -        | -       | -          | -                      |
| Perin de Souza & Rabelo, 2010  | -           | -         | -        | -        | -        | -       | -          | -                      |
| Holzmüller-Lae & Göde, 2011    | -           | -         | -        | -        | -        | -       | -          | -                      |
| Bruno et al., 2011             | x           | -         | x        | -        | -        | -       | -          | x                      |
| Meziani, R., & Saleh, I., 2010 | x           | -         | x        | -        | -        | -       | -          | -                      |
| Kolar & Pitner, 2012           | x           | -         | x        | -        | -        | -       | x          | -                      |
| Mevius & Wiedmann, 2013        | x           | -         | x        | -        | -        | x       | x          | x                      |
| Thiemich & Puhlmann, 2013      | x           | -         | x        | -        | -        | -       | x          | x                      |
| Meyer & Schiffner, 2014        | x           | -         | x        | -        | -        | x       | x          | -                      |
| Gebhart et al., 2014           | -           | -         | -        | -        | -        | x       | x          | -                      |
| Triaa et al., 2016             | -           | x         | x        | -        | -        | -       | -          | -                      |
| Weißbach et al., 2016          | -           | -         | -        | -        | -        | -       | -          | -                      |
| Bider & Jalali, 2016           | -           | -         | -        | -        | -        | -       | -          | -                      |
| Martins & Zacarias, 2017       | x           | -         | x        | -        | -        | -       | x          | -                      |
| Zacarias et al., 2017          | x           | -         | x        | -        | -        | x       | -          | -                      |
| Rialti et al., 2018            | -           | -         | -        | -        | -        | -       | -          | -                      |
| Gong & Janssen, 2012           | -           | -         | -        | -        | x        | -       | x          | -                      |
| von Rosing et al., 2015        | x           | -         | x        | x        | -        | x       | x          | x                      |
| Sauer et al., 2011             | x           | -         | x        | -        | -        | x       | -          | -                      |

|                              |   |   |   |   |   |   |   |   |
|------------------------------|---|---|---|---|---|---|---|---|
| Vykhovanets & Yatsutko, 2013 | - | - | x | - | - | x | - | - |
| Ohlsson et al., 2017         | x | - | x | x | - | x | x | x |
| Goldstein et al., 2018       | - | - | x | - | - | - | - | - |
| Reichert & Dadam, 1997       | - | - | x | - | - | - | x | - |
| Cao et al., 2009             | - | - | x | - | - | - | x | - |

*Table 2. Concept matrix*

### 3.2.1 Use of the term “agile” in the BPM literature

A central finding of the SLR is that the BPM community uses the term agility in a limited sense. For example, agility is equated with flexibility (Bider and Jalali, 2016). Although flexibility is one part of agility (Conboy, 2009), agile BPM also requires a focus on leanness and continuous readiness for change. Bruno *et al.* (2011, p. 298) argue, “BPM capable of reacting quickly to external and internal events is named agile BPM”. However, quick reaction to changes is one aspect of flexibility, but agile BPM is also concerned with other aspects, such as proaction, learning and leanness.

Also, the terms dynamic and adaptive are similar to agile. Dynamic BPM on the one hand is defined in the Gartner IT glossary as “the ability to support process change by any role, at any time, with very low latency”. However, dynamicity should not be confused with agility only because both focus on the flexibility of business processes and autonomous procedures. Adaptive BPM on the other hand is mainly introduced by several BPMS providers and is concerned with providing a flexible and collaborative environment for process modelling, knowledge and work-sharing, and managing business rules, process and role changes on a real-time base.

Some publications use the term agile BPM without describing the meaning in any depth or providing a definition. However, they provide a foundation to define agile BPM and move toward the agile management of business processes. Schatten and Josef (2007) propose an agile process–management approach based on a sense-and-respond loop. Rimassa and Burmeister (2007) introduce agile BPM as a way to have more flexible ways of working, to reduce the time taken to react to changes and to embrace changes in a complex business environment.

Although they do not directly consider agile BPM, they contribute to the agile components of flexibility and leanness. For instance, through various use cases such as agile service networks (Carroll *et al.*, 2010), BPM and service-oriented-architecture integration (Perin de Souza and Rabelo, 2010), inverse workflows (Sauer *et al.*, 2011), agile business process development through knowledge transformation (Bider and Jalali, 2016) and other studies such as Marjanovic (2009), Holzmüller-Laue and Göde (2011), Mevius *et al.* (2013), Rialti *et al.* (2018) and Gong and Janssen (2012), who refer to BPM and agile/agility in their work.

### 3.2.2 Factors for Agility in BPM

Our literature review reveals that better collaboration, knowledge sharing and participation of people are important factors to enable agility. Accordingly, Bruno *et al.* (2011) address the challenges and the role of social software in enabling agile BPM through seven key approaches, including fostering the motivation to participate, sharing knowledge and fostering collaboration. Meyer and Schiffner (2014) focus on increasing

employees' involvement and by presenting an agile BPM approach, they enrich process models iteratively and reduces models' size and complexity. Additionally, another challenge that organisations are dealing with is efficient project and change requirement gathering. For this purpose, Kolar and Pitner (2012) address the importance of agile principles in BPM adoption and propose agile techniques for gathering requirements and using an iterative process design.

### 3.2.3 Agile BPM methodologies

Additionally, authors propose to develop an agile BPM methodology to allow for efficient process analysis, flexibility, readiness for change and responsiveness. To this end, Thiemich and Puhlmann (2013) propose an integrated BPM project methodology framework that combines BPM with Scrum and focusses on the technical implementation of business processes. Martins and Zacarias (2017) propose an agile BPM methodology that contains three main steps – process discovery, supervision and assessment – and compare various BPM methodologies such as AGILIPO and Agile BPM Project. Zacarias *et al.* (2017) compare four meta-model and propose an agile BPM meta-model. von Rosing *et al.* (2015) connect agility and BPM by proposing an agile BPM method that includes four main areas – analysis, planning, design and building – where business goals, application goals and technology goals are part of analysis and planning. This method introduces the Kaizen principles of improvement to BPM with the goal that the BPM centre of excellence works quickly. Tao *et al.* (2006) propose knowledge-based flexible BPM, which is concerned with the role of knowledge management on reacting to change while being continuously ready for change. Meziani and Magalhães (2009) propose AGILIPO as an agile BPM method that goes hand-in-hand with Rito-Silva *et al.*'s (2009) AGILe busIness PrOcess method that facilitate rapid adoptions to a changing business environment. Meziani and Saleh (2010) also consider AGILIPO but apply slight changes, as their expectation of agility focuses on flexibility.

### 3.2.4 Contexts of agility research

The BPM literature reveals different contexts in which agility is being investigated. Business process quality management and process modelling are two important challenges that researchers need to direct their attention to. Several researchers connected these aspects with agile approaches. For instance, Gebhart *et al.* (2014) point to the role of process quality models in agile BPM by presenting a new version of an approach introduced by Mevius *et al.* (2013), which gathers the requirements of activities in processes to design the initial process model. Also, Weißbach *et al.* (2016) focus on business process modelling and its related challenges in BPM projects.

Considering the concept matrix (Table II) along with the findings of the SLR, the agile BPM framework is formed to provide a holistic overview of agility in BPM research and proposed in the following. This framework points to the components that are needed to build consistent foundations for agile BPM in both research and practice.

## 4. Agile BPM framework

The SLR indicates a strong need of agility for BPM to deal with the challenges of managing process change. Emerging technologies in BPM, such as process mining, machine learning and the Internet of Things (IoT), enable organisations to evaluate processes on a real-time basis through real-time connectivity, so process

criteria like time, quality and cost can be evaluated on an ongoing basis. Modern technologies help organisations to identify and prioritise processes rapidly, initiate necessary process changes and manage process models timely.

Agility in BPM can enable both flexibility and leanness. Flexibility on the one hand emphasises BPM's continuous readiness in a changing environment either to create change through process innovation (explorative BPM) or to embrace change and follow with process improvements (exploitative BPM) and learning from change. The cycle of change and learn should be continuous in order to ensure BPM's continuity. Leanness on the other hand emphasises iterative value creation, requires simple, cost-effective tools and techniques (simplicity and economy) and continuous evaluation of the quality of processes to satisfy customers' need for high-quality external processes and employees' need for high-quality internal processes.

In the following, we present an agile BPM framework that adopts Conboy's (2009) agile taxonomy and puts flexibility, leanness and continuous readiness in relation to change-related tasks in BPM. Central to this framework is the systematic integration of new technologies, which allow for agile management of business process work. The framework is shown in Figure 2. This framework is needed because the literature is not concerned with BPM as a holistic management approach to dealing with issues related to managing process change, because the BPM literature has no precise definition of agility. This framework is not only important to form a research agenda for agile BPM, but it can also support BPM practitioners in developing and managing agile BPM initiatives.

The agile BPM framework provides an overview of how agility and BPM can be linked in a systematic way. The upper part of the framework refers to the taxonomy of agility while the lower part of the framework points to corresponding examples of BPM to manage process change initiatives. More specifically, the lower part of the framework conceptualises all actions in environments that include elements like technologies, methods, tools, BPM capabilities and various ways of managing business processes. The right use of these elements is key to enabling agile BPM and leads to success in managing process change through BPM.

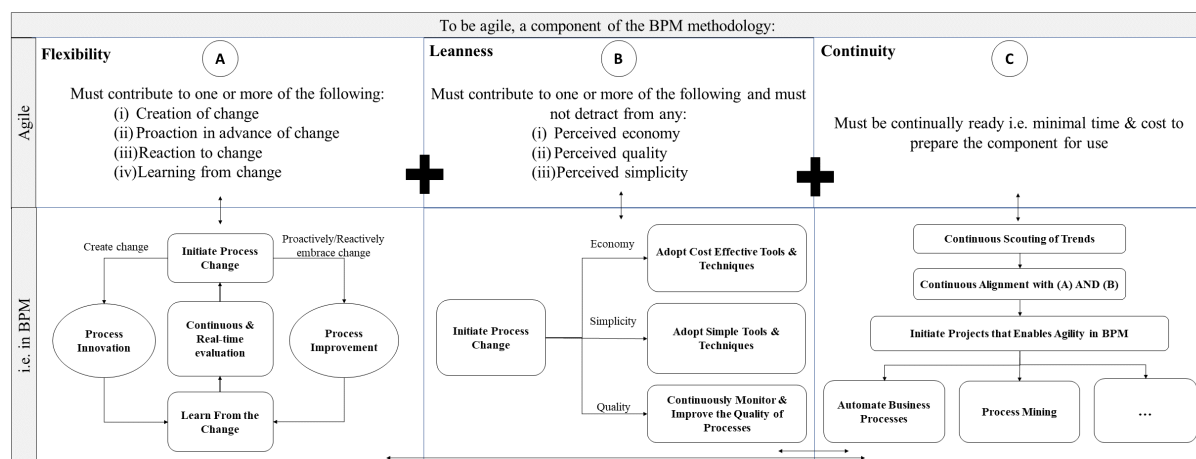


Figure 1. Agile BPM framework

The first column on the left side of the framework (column A) is concerned with organisations being continuously ready for process changes. Accordingly, agile BPM initiatives are creating value if they are contributing to at least one or more of the following:

1. pioneering in process innovation and creation of change (e.g. introducing and developing new technologies and designing new business processes, new business models, and innovative ways of doing things);
2. being proactive in dealing with change (e.g. adapting emergent technologies, acting before competitors do, recognising and implementing necessary changes in processes proactively, predicting and preventing potential issues in processes);
3. reacting to change opportunities (e.g. adopting the necessary technologies before market opportunities are lost, adopting new process models, changing inefficient processes timely, and continuous reviewing and adopting best practices); and
4. learning from inter- and intra- organisational changes (e.g. learning continuously from BPM practices, case studies, trainings and so on to support future process-change opportunities and to create an organisational culture that is not resistant to change).

Column B indicates that none of the activities should decrease the quality, economy and simplicity perceived by customers but should increase their levels by adopting cost-effective BPM tools and using up-to-date methods and techniques that can increase the quality of work (e.g. continuous and almost real-time performance evaluations using process mining, automating business processes, and using BPM systems).

Column C is concerned with the changing environment. Organisations should continuously scan the environment for trends (e.g. technologies) that can enable agility in BPM and align them with continual readiness and efforts to increase quality, economy and simplicity to ensure they create value before initiating a related project. For instance, process-mining technology (e.g. Celonis) enables almost real-time connectivity and real-time evaluation of business processes. Adopting this technology enables organisations to evaluate processes continuously and identify process issues on time. Features of machine learning that are integrated into this technology enable the forecasting of process changes and detect changes in real time. Accordingly, change can be initiated innovatively, proactively, or reactively based on each process and its issues.

Another example of projects that can enable agility in BPM is automating business processes. When a process has little data availability and is highly manual, process-mining technologies are difficult to use. Although it is possible to use technologies like IoT to enable real-time connectivity in processes, process automation is needed to support the continuity of BPM and contribute to simplicity, economy and evaluating the process's quality. Process automation builds the foundations for process mining and continuous process evaluation, which lead to process-change initiatives.

As mentioned previously, the agile approach serves to overcome the pitfalls of the traditional BPM in order to stay competitive in the changing environment. In this regard agile approaches should complement conventional BPM. Therefore, the goal of the agile BPM framework is to draw on established approaches in BPM, while at the same time, it illustrates how they can be made more agile. As an example, process change has been an important topic in BPM research. However, the focus of the agile BPM framework is on enabling efficient and effective process change while learning from these changes through real-time

connectivity. For instance, features of new technologies are enabling organisations to learn from changes in their processes and hence, they can also recommend necessary actions in order to make processes more efficient at the right time. These recommendations can appear as notifications for process owners to perform things on time or they can appear as necessary actions in order to avoid issues in the business process (e.g. the action engine feature of Celonis intelligent business cloud).

As an example, on-time delivery is one of the main concerns of purchasing organisations. Machine learning and AI can evaluate the performance of the process, check the current status of purchases and take two central actions. One is to notify the process owner that the process will be delayed (e.g. because one critical activity is delayed). The other action is to recommend alternatives (e.g. better collaboration with the supplier or changing to an alternative supplier) in order to avoid delays in delivery of the purchases. Accordingly, the organisations can improve the quality of the process by a great performance on on-time delivery and they can monitor the process continuously, detect issues on-time, and take necessary actions at the right time.

The above example on on-time delivery is a result from a real practice example that shows the value of the agile BPM framework. The organisation has realised the process mining technology that integrates machine learning features and adopted the technology to continuously monitor the procurement process. Although they have invested relatively high, the findings report on high-quality process through a simple and intuitive environment. The real-time connectivity provided by this technology has enabled the organisation to detect issues (e.g. late/soon deliveries of goods) and initiate necessary changes within the process. Machine learning techniques are continuously learning from each process instance and enabling efficient and effective process change.

## 5. Discussion

This paper proposes that agile approaches to BPM are important for organisations that seek to adopt and maintain successful BPM because they ensure flexibility and leanness. To clarify the current state of agile BPM, an SLR was conducted that revealed the need for such agile approaches to BPM to overcome BPM's major pitfalls. Agile approaches should fit the precise definition of agility and follow Conboy's (2009) agile taxonomy. The Conboy's taxonomy is selected for two main reasons. First, to have a clear understanding of agility through the precise definition. Second, the important role of flexibility and leanness in successful BPM that are included in the taxonomy. Therefore, an agile BPM framework is designed upon the agile taxonomy that provides a big picture on how agile BPM should function.

All of the papers we reviewed stress that in light of the ever-increasing dynamics of today's business environments, BPM is facing challenges to rapidly make changes and continuously deliver value to customers. These challenges illustrate that traditional BPM approaches lack agility. Most of the research articles are concerned with process instances and business process agility, but only a few had focus on the management side of business process. Some articles mention that BPM focuses only on operational agility. However, BPM as a management discipline is also concerned with organisational agility, as well as customers and partnerships.

In addition, some of the papers use the term "agile BPM" but do not make clear the exact meanings of agility and agile BPM. Therefore, based on the definition of agility and the description of BPM, agile BPM

can be described comprehensively as an ambidextrous management discipline that is aware of the changing competitive environment. By considering BPM capabilities, can make BPM continuously ready to create change rapidly or inherently, embrace change proactively or reactively, and learn from change with the purpose of facilitating consistent outcomes of business processes and contributing to business performance and perceived customer value (economy, quality and simplicity). This can be done by continuously codifying and integrating requirements, and understanding, documenting, designing, analysing, simulating, executing and monitoring business processes.

BPM is considered to be agile if it includes an effort to create value by contributing to creating change and/or proactivity in advance of change and/or reaction to change and/or learning from change while contributing to and not detracting from consumers' perceptions of a process's economy, quality and simplicity. In addition, the actions taken should be continuous and require minimal time and costs.

## 5.1 Implications for research

Our research points to a number of implications that arise for BPM research from different perspectives.

### 5.1.1 Integrating emerging technologies and management approaches

Highlighting that new and emerging technologies can play a crucial role in ensuring agile business process work, a major implication of our study is that management approaches should be organised around such technologies. New technologies should not only be integrated into management practices (thus, ensuring that these technologies are accepted and used) but we propose that technologies afford new interpretations and understandings of what management can mean in the context of BPM. How should managers deal with real-time evaluations and instant feedback about process work? What technologies are relevant for agile organisations and on what basis should they be evaluated? How can organisations not only detect changes in business process work but how do they scout and assess new developments in technology? We believe that these questions underline the holistic scope of agile BPM and are central for future research.

### 5.1.2 Assessing technologies with respect to agility application

Following our framework, future research should focus on new technologies like IoT, and innovative process mining algorithms to explain their potentials for agile BPM. Actions and tasks such as robotic process automation, process predictions and change forecasts, and real-time evaluation of performance can be enabled by these digital technologies. Researchers may rethink ways of working while considering new digital technologies and the influence of BPM agility on organisational structure. Research can study how tools and their features can influence the responsibilities of various roles in BPM, such as process owners.

### 5.1.3 Social implications of agile BPM

Another important implication that follows from our research is the social component of agile BPM. Organisations operating on the principles of flexibility, leanness and continuous readiness are dependent on actors who carry out their work accordingly. This is challenging in two respects. On the one hand, organisational structures are required that facilitate communication, collaboration and fast decision making, among other factors (Suša Vugec *et al.*, 2018). On the other hand, organisations need to ensure that human resource activities support agile BPM initiatives. For example, the agile BPM methodology may create a new responsibility for the BPM team, which is managing the backlog of processes. The agile development processes such as Scrum gets the product backlog (e.g. a number of features to be developed) as an input

and select sprint backlog due to priorities, and the product increment is being delivered as an output. Teams need to be trained to handle such instances accordingly, and furthermore, organisations need to ensure that recruitment processes are aligned with agile initiatives.

#### 5.1.4 Learning, unlearning and relearning in agile BPM

Central to our framework is that agile business process work is flexible and continuously changing with respect to external dynamics. This, however, poses severe challenges for actors who manage or carry out business processes. In fact, literature in the organisational sciences stresses that actors routinise their work overtime and establish ties, form habits and create mental shortcuts. Those allow for efficient processing, but they also make those processes more resistant to change. For example, Miller *et al.* (2012) argue that process work requires and establishes declarative, procedural and transactive knowledge. If processes change and actors are asked to do things differently, they might struggle to intentionally unlearn their old knowledge in order to acquire new ones. This holds both for those responsible for BPM initiatives (e.g. process owners) and those who carry out process work (e.g. workers). While the BPM literature has acknowledged the significance of knowledge in business process work (e.g. knowledge sharing), we suggest that future research should consider learning, unlearning and relearning (Klammer and Gueldenberg, 2019).

#### 5.1.5 From traditional to agile BPM: areas for future research

In light of the predominantly exploitative orientation of the BPM literature (Kohlborn *et al.*, 2014), we argue that future research can shed light on the other side of the BPM coin, i.e., enriching established views through agile perspectives. Therefore, research can address agile BPM capabilities by developing new capabilities based on agile characteristics and principles. For example, a global Delphi study could be conducted over the six the main groups of capabilities: IT, methods, people, culture, governance and strategic alignment. Similarly, research could explain the relationship between agile and BPM principles and develop insights into agility's contribution to successful BPM adoption. For instance, agile approaches facilitate continuous process evaluation and process change by ensuring the organisation is aware of tools and techniques and by using the organisational culture.

Table III represents several suggestions for future research by considering the core elements of BPM (De Bruin and Rosemann, 2007; Rosemann and vom Brocke, 2015) and addressing potential research activities.

| Research area       | Suggested future research activities   |
|---------------------|--|
| Strategic Alignment | <ul style="list-style-type: none"> <li>- Assessing the impact of agility on linking organisational strategy and process capabilities.</li> <li>- Assessing the impact of agility on rapid embedding BPM in the organisational structure.</li> <li>- Assessing the impact of agility on process change plans as well as facilitating smart/intelligent BPM (Mendling, Baesens, Bernstein, and Fellmann, 2017) and consequently the organisational agility.</li> </ul> |
| Governance          | <ul style="list-style-type: none"> <li>- Assessing the impact of agility on increasing transparency within processes and how it supports the decision-making process.</li> <li>- Assessing the impact of agility on process performance and quality, and vice versa, assessing the impact of process performance on agility</li> <li>- Assessing the impact of agility on the organizational roles and responsibilities.</li> </ul>                                  |



|                        |  |
|------------------------|--|
| Information Technology | <ul style="list-style-type: none"> <li>- Assessing the impact of adopting up-to-date organizational technologies such as process mining, and social software (e.g. Bruno et al., 2011) on fostering BPM agility within organisations.</li> <li>- Assessing the impact of agility on efficient and effective usage of technologies.</li> <li>- Assessing the impact of agility on improving the level of “Technology Appropriation” as one of the BPM principles (vom Brocke et al., 2014) and BPM success drivers.</li> <li>- Assessing the impact of agility on facilitating continuous process evaluation.</li> </ul>    |
| Methods                | <ul style="list-style-type: none"> <li>- Assessing the impact of agility on enabling consistent outcomes with perceived quality within organisations.</li> <li>- Assessing the impact of agility on facilitating continuous improvement and continuous innovation as well as (re)actions towards improving business performance.</li> <li>- Assessing the role of agility in selecting simple and cost-effective tools and techniques that supports continuous monitoring and enables iterative value creation.</li> </ul>   |
| Culture                | <ul style="list-style-type: none"> <li>- Assessing the impact of agile approach on organisational culture regarding responsiveness to process change.</li> <li>- Assessing the impact of agility on enabling continuous learning and developing skills.</li> <li>- Assessing the impact of agile BPM on organisational readiness to accept changes AND/OR initiate changes.</li> </ul>   |
| People                 | <ul style="list-style-type: none"> <li>- Assessing the impact of agility on continuously utilizing the skills and knowledge of people in order to rapidly and continuously create value.</li> <li>- Assessing the impact of agility on making BPM visible within organisations and show the value of BPM to people.</li> <li>- Assessing the impact of agility on improving process collaboration and communication.</li> <li>- Assessing the impact of agility on active involvement of stakeholders in BPM initiatives as well as enabling precise accountabilities by providing people with proper autonomy.</li> </ul> |

*Table 3. Suggestions for future research*

## 5.2 Implications for practice

Responsive decision making is becoming more crucial for organisations and the traditional structure of organisations makes decision making longer and less responsive. Agility can ensure that organisations react to changes and identify opportunities for process improvements and innovations. Drawing on Conboy’s taxonomy of agility, we presented an integrated framework for agile BPM. It specifies what is needed for BPM to be agile and it suggests how the three principles – flexibility, leanness and continuity – can be brought to life.

Continuous and real-time evaluation and the commitment to integrate changes is a precondition for agile BPM. Central to our framework is that technology and management act complementarily; new technology enables agile practices and agile practices make use of new technologies. One example of such a technology is process mining. For its ability to provide real-time feedback about process performance, this technology can offer an important point of leverage to achieve agility.

Agile BPM helps organisations with effective communication among stakeholders, so it increases transparency in organisations. By reducing the time spent on the different phases of BPM, such as long process analysis and design, agile BPM enables organisations to react quickly to changes and to identify opportunities for process improvements and innovations. BPM experts that focus on the business side of BPM are understanding BPM differently than the experts who focus on the IT side of BPM. The agile approach has the potential to solve issues related to this difference by forming BPM teams with the diversity

needed to connect employees efficiently. The agile approach is needed in BPM because knowledge and creativity are necessary to deal with unstructured work as well as repetitive processes.

Based on the framework and the initial findings from our current research, we believe that the following points are important to anyone who is planning to integrate agility into BPM initiatives.

#### 5.2.1 See your processes as one-out-of-many possibilities

Business processes may work well but there can always be opportunities to change, adjust or innovate them. Agile BPM means that decision-makers allow for novelty, spontaneity and experimentation. New trends or technologies can provide means to improve business processes, and much in the same way, the business process might offer potentials for automation or improvement.

#### 5.2.2 Utilise new technologies and real-time data

New technologies offer potentials for managing business processes. Process mining and IoT illustrate that new technologies allow for recording and replaying patterns of activities, which in turn, can be the basis for adjustments and improvements. Hence, it is important to reflect on how such technologies can be implemented in existing processes. If applied in meaningful ways, such technologies can shed a whole new light on business process execution in the organisation.

#### 5.2.3 Enable flexible process change and continuous decision making

As much as technology is important for agile BPM, agile process work primarily depends on the people. Being agile means that actors can deal with uncertainty and unclarity. Decisions often lack clear rules, and even if things have worked for long, people need to be ready to unlearn established ways of doing things in order to learn new ones. It is essential that organisations embrace an appropriate corporate culture (Spiegel *et al.*, 2017).

#### 5.2.4 Never stop learning

Essentially, being agile means that organisations are always on the move. It implies that business environments change and yield opportunities to improve and innovate business processes. Due to today's highly dynamic business environment, not all changes might be anticipated. Staying open, being willing to change and experiment, and being committed to integrating new opportunities characterize agile BPM.

## 6. Conclusion

Researchers are trying to overcome the pitfalls of BPM by focusing on the concepts described above. The integration of new technologies can support organisations to decrease analysis time and improve the process in various ways. For instance, by using process mining technology for the procurement process, the process owners can detect process issues such as number and value of rework activities such as price changes on a real-time basis right after discovering the as-is process. This allows the process owners to rapidly get insights over their process and initiate process change accordingly. Changes can be implemented and be monitored continuously to evaluate process performance. In another example, considering the purchase requisition process, managers can rapidly get an overview on how much time they have spent on various approval steps or how much time they have spent on various activities related to invoice reconciliation. By considering the net order value of requisitions, their amount and the regularity of the requisitions, managers

can decide on the grounds of real-time data if they should change their approval steps or the purchasing strategy as a whole.

The literature review shows that agility in BPM is enabled by both bottom-up and top-down approaches among process change initiations. The process change, on the one hand, can be initiated from the top (e.g. internal or external forces) through continuous evaluation of processes or necessary changes caused by the transformation of business models. On the other hand, it can be initiated from the bottom (e.g. change requests from departments) in an open and innovative culture and through a proper collaborative working environment.

An integrated agile BPM framework is proposed by the authors to have an overview of the main components of the agile BPM methodology. Several directions for research are addressed along with implications of agile approach in BPM for practitioners.

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