# Managing Dynamics in and Around Business Processes

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## 1 Introduction

Some automation enthusiasts might enjoy a world where business processes, once digitalized, remain static and unchanged over time, complying with their initial design specifications. In the digital age, however, where change is constant and occurs incrementally and even disruptively (Grover and Lyytinen 2023), the dynamics of business processes are pivotal to organizational survival and success. Following Peter Drucker, who is credited with saying that "the greatest danger in times of turbulence is not the turbulence; it is to act with yesterday's logic," it becomes imperative to embrace the dynamics of business processes and explore how they can be managed.

Research on business process management (BPM) is increasingly concerned with the dynamics of business processes in the digital age (e.g., Baiyere et al. 2020;

Mendling et al. 2020; Rosemann et al. 2024). While being at the core of process mining research for some time (van der Aalst 2016), recent works approach this phenomenon from managerial and organizational points of view, specifically in connection with novel digital technologies (Eggers et al. 2021; Grisold et al. 2022; Pentland et al. 2021). This stream of research emphasizes the broader socio-technical relevance and scope of the dynamics of business processes (Baiyere et al. 2020; Mendling et al. 2020; vom Brocke et al. 2024).

But is it possible to manage the dynamics of business processes at all? This is a difficult question. After all, the terms "manage" and "dynamics" can appear contradictory. Dynamics imply a degree of change, which can be linked to uncertainty, indeterminacy, and unexpectedness. It is challenging, at least, to consider them in to-be business process designs (Röglinger et al. 2022). Management, in contrast, presupposes control, which is tied to some degree of anticipation. With these considerations in mind, we set out to explore the dynamics of business processes and attempts to manage them. This topic is essential not only for advancing the state-of-the-art in research (Baiyere et al. 2020; Mendling et al. 2020; Rosemann et al. 2024) but also for practitioners (Rinne 2021).

In this special issue, we present four studies that deal with managing dynamics in and around business processes. These studies cover various managerial, organizational, and technical aspects and address timely topics in BPM, such as process mining, digital innovation, and the connection between business processes and business models. Furthermore, we are grateful that we could interview Tom Davenport – one of the most influential figures in the BPM field – who shares his views about the dynamics of business processes and the broader future of the BPM field. We are indebted to all authors who contributed their findings and

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viewpoints to this special issue. We also extend our gratitude to all reviewers who helped develop the accepted papers and the editorial team of Business and Information Systems Engineering for providing us with the opportunity to realize this special issue.

In the remainder of this editorial, we reflect more systematically on managing the dynamics of business processes. We ground our discussion on two central observations. On the one hand, we distinguish dynamics along lower or higher levels of determinateness, that is, the extent to which we can make assumptions about future dynamics based on what we know in the present. On the other hand, we suggest that managing the dynamics of business processes can occur at two levels, namely the business process level and the surrounding context level. Against this backdrop, we propose a matrix encompassing four approaches to manage dynamics in and around business processes. We contextualize the papers of this special issue within this framework, and we illustrate how our matrix can inform both researchers and practitioners.

## 2 Defining Dynamics in and Around Business Processes

BPM refers to the science and practice related to analyzing, designing, implementing, monitoring, and improving business processes (Dumas et al. 2018). Over the past decades, the field has evolved by developing prescriptive knowledge in models, methods, and software systems. This knowledge supports various activities related to managing individual business processes and advances BPM as a corporate capability (Rosemann and vom Brocke 2015; van der Aalst 2016). Among many other things, the BPM literature includes lifecycle and capability models (Dumas et al. 2018; Kerpedzhiev et al. 2020), process and workflow modeling languages (BPMN 2014), process improvement and innovation methods (Grisold et al. 2021; Reijers and Limam Mansar 2005), and process mining algorithms that leverage process data in different ways (van der Aalst 2016). Central to these approaches is that they seek to enable the management of business processes by establishing control and organization of cross-functional organizational work along sequences of activities and events.

One of the core revelations in the recent BPM literature has been that business processes are much less stable than generally assumed. The key insight here is that business processes change not only through deliberate top-down managerial actions such as those in process design, continuous process improvement, and business process reengineering efforts. Rather, business processes also dynamically change in unintended, sometimes even undesired, ways. We observe that the BPM discipline has been investigating the dynamics associated with business processes from different angles, where dynamics can be broadly defined as "forces that produce movement" or "forces […] that produce change inside a group or system" (The Cambridge Dictionary 2024). Along these lines, it has been suggested that business processes are constantly at drift (Beverungen 2014), and research has been focusing on associated triggers and events. For instance, dynamics can emerge due to endogenous events (Andrews et al. 2018), just as much as in response to exogenous events with potentially low likelihood and high impact (Röglinger et al. 2022).

A closer look at the literature reveals that the term dynamics comes with diverse connotations in the BPM field and neighboring disciplines. To establish an integrative understanding (Mendling et al. 2021; vom Brocke et al. 2024), we show how the term dynamics is used in different communities (BPM, computer science, organization science, and management science) and for different concepts and phenomena (process flexibility, drift, routine dynamics, and dynamic capabilities). Table 1 provides an overview.

In the BPM field, dynamics often highlight the mismatch between a to-be process model and an as-is process model that simply cannot catch up with change (Dumas et al. 2018). The management view of processes advocates continuous process monitoring and improvement and more radical process changes (Davenport 1993; Hammer and Champy 1993). Essentially, these approaches highlight the importance of adapting business processes quickly and effectively during design time and execution. Several strategies support such flexible process designs (Schonenberg et al. 2008). Examples are the selection of the most appropriate pre-defined process variant during execution (flexibility-by-design), the handling of occasional unforeseen behavior by allowing deviations from pre-defined process designs (flexibility-by-deviation), or the under-specification of process designs at specific points where the best execution strategy can only be determined during execution (flexibility-by-underspecification). Traditional means for implementing these strategies are configurational process modeling (Rosemann and van der Aalst 2007), declarative process modeling, late binding and dynamic exception handling (Adams et al. 2005), and, recently, so-called light-touch process designs (Baiyere et al. 2020).

(Concept) drift is commonly used in the computer sciences and process mining. It typically describes how dominant process executions change over time (Bose et al. 2013). Concept drift may happen for several reasons, sometimes in response to changes in the process context, while at other times due to process participants' preferred way of working. It is well-known that a running process may deviate from a pre-defined process model, indicating

**Table 1** Exemplary uses of the term dynamic(s) in different disciplines

| Concept | Meaning | Implication of the term dynamics |
| --- | --- | --- |
| Process flexibility (Business process management) | Different strategies ensure the adaptability of business processes during execution | Process executions can change in a variety of ways; it is important to anticipate possible scenarios and provide means for (re)action |
| Drift (Computer science) | Changes occur in the execution of a business process for endogenous and exogenous reasons | Process executions can change over time. This drift must be observed and understood over time to apply appropriate process management |
| Routine dynamics (Organization science) | The same business process can be performed in different ways as actors create and recreate it over time | Business processes are not stable, static, mindless or dead. Rather, they are constantly 'in the making,' strongly influenced by what is happening within and around them |
| Dynamic capabilities (Management science) | An organization can have capabilities to sense triggers of change, seize appropriate measures, and transform existing structures accordingly | Organizations cannot anticipate what will be happening in turbulent environments. Thus, they must institutionalize capabilities related to dynamically sensing, seizing, and transforming |

that dynamics are at play. This observation is reflected in other concepts focusing on process variants (Suriadi et al. 2014), process deviance (König et al. 2019; Mertens et al. 2016), and workarounds (Soffer et al. 2023).

A different yet related use of dynamics can be found in the organization sciences. Research on routine dynamics highlights how business processes can be seen as social practices with internal dynamics (Feldman and Pentland 2003; Feldman et al. 2016; Mendling et al. 2021). The focus of this research stream is on how actors reflect on and learn about their actions and interactions and how the context of business processes changes over time, leading to emergent, novel, and even unanticipated ways of executing them (Dittrich and Seidl 2018; Pentland et al. 2012). There is a duality to a business process in that it is stable and the same (because we can recognize it as a specific process), yet it is continuously changing and 'in the making' (because participants establish new ways of performing the process). From this point of view, the term dynamics not only refers to the actual changes in how a particular business process is executed and re-created over time (Feldman and Pentland 2003), but also emphasizes that it is not automatic, mindless, and static (Howard-Grenville and Rerup 2016).

The term is widely used in the management sciences in dynamic capabilities theory (Pavlou and El Sawy 2011; Teece et al. 1997). Generally, capabilities are collections of routines and repeatable patterns in the use of assets (Wade and Hulland 2004). These are related to, yet different from, business processes. While capabilities focus on what is important for corporate value creation, business processes focus on how these can be realized. Dynamic capabilities help integrate, build, and reconfigure operational capabilities (Teece et al. 1997; Zollo and Winter 2002) – specifically in settings of environmental turbulence or dynamism. To this end, organizations must sense challenges and opportunities arising from internal and external environments, seize them for their benefit, and transform existing structures accordingly. In this view, dynamics imply an organization's strategic flexibility and adaptability that may relate to, but is by no means limited to, business processes. When linking dynamic capability theory to BPM, dynamic capabilities are typically associated with management processes, including BPM itself (Lehnert et al. 2016).

Based on these illustrative usages of the term dynamics, we stress two broader observations. First, the term dynamics is associated with different assumptions about what is or can be known about the future states which a business process or organization will be confronted with. On the one hand, it can be assumed that dynamics can be foreseen and anticipated at least to some extent. Hence, it is possible to consider them in process designs (e.g., process flexibility) and to detect them in analysis (e.g., concept drift). Further, current and future performances of a business process to some extent are dependent on and evolve based on past performances (e.g., routine dynamics). On the other hand, it can be assumed that the future is uncertain, open-ended, and unknown. Since it can be very different from what an organization has done in the past or is doing in the present, an organization needs to prepare for an unknown future (e.g., dynamic capabilities), especially when dynamics are unintentional and do not result from intended changes. The second observation is that the term

dynamics has been used to draw management attention to different levels of analysis. One can be focused on what is happening at the level of the actual workflow, that is, the actual business process (e.g., concept drift) and how to approach it (e.g., process flexibility). Alternatively, dynamics imply a broader contextual perspective, such as what is happening around the execution of a business process (e.g., routine dynamics) or the broader environmental context in which organizations operate (e.g., dynamic capabilities). We use the distinction between these two observations to discuss more systematically how the dynamics of business processes can be managed in the next section.

## 3 Managing Dynamics in and Around Business Processes

### 3.1 Managing Dynamics in Closed- and Open-Ended Futures

One dimension refers to what we know about dynamics that may (or may not) occur in the future. To this end, organizations act as if the future comes with certain attributes, characteristics, or expectations (Blagoev et al. 2023; Wenzel 2022).

If the future is thought to be known and certain, we may refer to what we know in the present, typically by drawing from what we have learned in the past (Seligman et al. 2013). In some cases, we have reasons to assume that whatever will happen in and around business processes in the future will closely resemble what is happening now or has happened in the past. Process mining builds on the idea that we can use event logs from the past to extrapolate what will happen in the future (zur Mühlen and Shapiro 2015). All of this implies that the future is to some extent closed-ended, that is, we can extrapolate from facts that are known and established as well as from past data and experiences to focus on one or a small set of scenarios that are self-evident and attempt to manage dynamics within a pre-defined set of assumptions.

In other cases, we know much less about the future. We may know, for instance, the general purpose of a business process, yet various factors may influence how it is or should be enacted in the future. Hence, the future is more open-ended. This may not only be the case for distant futures but also for turbulent ones (Ansoff et al. 2018). Acronyms like VUCA (volatile, uncertain, complex, ambiguous) and BANI (brittle, anxious, non-linear, and incomprehensible) have become popular in business practice to characterize dynamic and open-ended environments (Bennett and Lemoine 2014; Cascio 2020). In an open-ended future, we have to account for a magnitude of

scenarios with different impacts for which probabilities sometimes cannot be reasonably estimated (Markley 2011). Hence, the notion of open-ended futures stresses that we may be unable to foresee and anticipate future states in and around business processes.

### 3.2 Managing Dynamics on the Operational and the Contextual Levels

Another way to look at managing the dynamics of business processes refers to the focus of analysis. First, we can focus on the actual business process. We can analyze and design the control-flow perspective or the workflow of business processes, focus on involved activities, resources, and events, and apply all sorts of performance measures (Dumas et al. 2018; Kettinger et al. 1997; Reijers and Limam Mansar 2005). In other words, we can choose to manage the dynamics of business processes by understanding how they play out along the more or less defined sequences of activities and events during process design and execution. We refer to this as the operational level, which is well covered in BPM textbooks and offers a plethora of modelling and analysis methods to choose from.

Second, we can take a broader and more abstract point of view. Instead of focusing on the actual business process, we can focus on the broader conditions in which the dynamics of business processes occur (vom Brocke et al. 2021). This perspective aligns with arguments that context is helpful for thinking about process design and analysis (Dumas et al. 2005; Rosemann et al. 2008). For instance, we can provide broad patterns or guidelines that roughly specify a process design (Grisold et al. 2021) or we can think of BPM capabilities that organizations should seek to develop (Kerpedzhiev et al. 2020). Hence, we can focus on the contextual level around a business process, thereby seeking to influence the broader conditions in which dynamics can or should occur.

### 3.3 Four Approaches to Manage Dynamics in and Around Business Processes

Bringing the two dimensions introduced in Sects. 3.1 and 3.2 together, we suggest four broad approaches to manage dynamics in and around business processes. These approaches, along with distinct management practices, are depicted in Fig. 1.

#### 3.3.1 Approach I (Closed-Ended/Operational)

The general idea with Approach I is that the focus is on the business process itself while considering that the future is (more) closed-ended. We can anticipate future dynamics
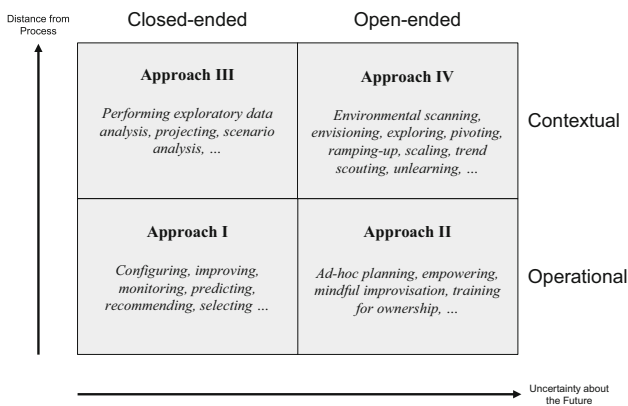
**Fig. 1** Four approaches to manage dynamics in and around business processes

with a relatively high degree of certainty. Accordingly, knowledge, data, and experiences from past process executions can be used to predict the dynamics of a business process, including expected performance and outcomes. Due to its operational and closed-ended nature, suitable BPM methods can be qualitative and quantitative. Given the abundance of process data in the digital world, analytical and computational approaches have recently gained popularity. This approach encompasses traditional BPM approaches to continuous process improvement (e.g., Six Sigma) and radical process improvement (e.g., business process reengineering). Moreover, process management practices – including novel ones such as prescriptive process monitoring, assisted process business redesign, and automated A/B testing of lightweight process changes during execution – fall into Approach I, highlighting that this type currently receives much attention in the BPM field. Key practices related to the management of dynamics in Approach I include selecting, configuring, and improving business processes, monitoring and predicting process performances and outcomes, and recommending actions during design and execution.

### 3.3.2 Approach II (Open-Ended/Operational)

Approach II retains our focus on business processes, but we assume that the future is (more) open-ended, meaning that we cannot predict or anticipate future dynamics with certainty. Since knowledge gained from studying the past is a less reliable source, we need alternative approaches for managing the dynamics of business processes. For instance, there is much more emphasis on the fact that we cannot prescribe future states in present designs. Therefore, business processes must be designed with certain degrees of freedom (e.g., declarative modelling, underspecified process models, or templates). Pure analytical means, including process mining, are less helpful under these

circumstances, as business processes can be "non-routine" (Lillrank 2003). Accordingly, in Approach II, practices imply that process participants are trained for end-to-end ownership, can mindfully improvise and plan ad-hoc within light-touch process designs in light of future dynamics and current circumstances, and are empowered in decision-making autonomy and accountability (Mendling et al. 2020).

### 3.3.3 Approach III (Closed-Ended/Contextual)

Approach III is concerned with the context in which business processes are performed, considering a close-ended future that can be anticipated with reasonable certainty. This implies that the execution of business processes moves into the background while broader contextual aspects become more relevant. That is, the quality of process outcomes relies heavily on contextual knowledge and judgment of the subject matter to make precise forecasts about future events or trends and account for them in managing the dynamics of business processes. Accordingly, Approach III involves gathering targeted insights from experts through structured methods such as Delphi studies, expert panels, and structured frameworks, such as capability and maturity frameworks (Kerpedzhiev et al. 2020). Importantly, Approach III presupposes we know which broader contextual factors are or will be important and can answer well-defined questions accurately to proceed within closed-ended scenarios. Key practices include projecting broad and abstract future states to be achieved without being too specific on ways of getting there (e.g., maturity stages) based on expert advice (e.g., process owners or participants), employing exploratory data analysis, or undertaking scenario analyses.

### 3.3.4 Approach IV (Open-Ended/Contextual)

Approach IV deals with unknown dynamics in open-ended futures by accounting for broader contextual factors surrounding business processes. This implies a focus on uncertainty in various dimensions, most prevalently in terms of probability of occurrence, significance of impact, and credibility as in acceptance at organizational or policy level (Markley 2011). The key is that any assumption about the future is abstract. For instance, one means is building on scanning societal and technological megatrends and exploring novel process-led value propositions (Grisold et al. 2021). Such scenarios have largely been neglected in existing BPM research. Key practices in Approach IV include envisioning narratives about possible and desirable futures, allowing organizations to prepare for unknown outcomes. Moreover, environmental scanning and trend scouting help understand the dynamic interplay of various

forces, such as social, technological, economic, environmental, and political origin. Finally, the abilities to explore and pivot process-led value propositions, ramp up and scale new processes, and unlearn once-established practices are essential in open-ended environments.

## 4 Papers in this Special Issue

We have included four research articles in this special issue that focus on different aspects of managing dynamics in and around business processes.

In their article, "Watt's Next? Leveraging Process Flexibility for Power Cost Optimization: A Prescriptive Process Monitoring Approach", Hermann et al. (2024) explore how prescriptive process monitoring can help address an issue of high societal relevance, namely, energy flexibilization. Because energy flexibilization is linked to changes in supply, it is key to dynamically ensure "smoothly running processes." The authors leverage prescriptive process monitoring to recommend flexible processes under fluctuating power prices. To this end, their approach considers both workflow and resource dependencies. In relation to our framework, Hermann et al. (2024) suggest that an organization can restrict the set of parameters to ensure energy flexibility by pinpointing which factors will likely remain relevant in the future. Hence, this study represents Approach I.

In their paper, "Building the Processes Behind the Product: How Digital Ventures Create Business Processes That Support Their Growth," Wuttke et al. (2024) explore how digital ventures address dynamics of change by incorporating the potential of new digital technologies and redesigning their business processes over time. In their inductive, process-based research design, they identify four patterns through which digital ventures grow: (1) minimum viable process designs shift most responsibility to process participants, (2) encapsulated business process designs entail specialized IT systems with control and data flows, (3) centralized control flow interventions involve IT systems interacting with the control flow to streamline business processes, and (4) centralized data interventions pertain to unified data repositories to enable decision-making. From a broader point of view, Wuttke et al. (2024) locate the dynamics of business processes at the contextual dimension and propose generalized patterns of process change in digital venture growth. For the most part, this study represents Approach III.

In their paper, "Improving Process Mining Maturity: From Intentions to Actions," Brock et al. (2024) depart from the observation that process mining is a promising tool for managing the dynamics of business processes. Yet, despite strong interest in this technology on the part of

organizations, successful process mining implementations have remained elusive. In response, the authors propose a process mining maturity framework to assess and further develop the use of process mining in an organization over time. They find five factors that are crucial for process mining maturity, which pertain to (1) the organization, (2) data foundations, (3) knowledge about process mining, (4) the scope of process mining activities, and (5) governance. Based on these factors, they develop a framework to assess process mining maturity and identify actual steps to advance it dynamically. Brock et al. (2024) take a contextual and closed-ended perspective on managing the dynamics of business processes. They suggest how an organization can assess and develop technological means – here, in the form of process mining – to visualize and manage the dynamics. Their core assumption is that the relevant factors can be defined upfront and that they will hold in the future. Hence, their study reflects Approach III.

Finally, in their article "Navigating Business Model Redesign: The Compass Method for Identifying Changes to the Operating Model," Machado et al. (2024) explore how changes in a business model can translate into changes in the operational model, that is, the ways through which the organization delivers value to its customers. Their study presents a systematic approach to decomposing business model change into specific, business process-related questions. At the core of their approach is that an organization envisions a business model that represents the most innovative solution to a problem. The key objective is to explore redesign options by identifying components in business processes that should be "new," "redesigned," or "obsolete." Therefore, their key assumption is that an organization can envision a desired future state relevant to its value generation in the foreseeable future. Accordingly, business process redesign initiatives are based on a closed-ended future scenario. In light of these considerations, this study represents Approach I.

## 5 Concluding Remarks

Managing dynamics in and around business processes is an important issue. To this end, we have proposed four approaches, structured according to a closed-ended vs. open-ended future and an operational vs. contextual level. Each approach has its own management practices to address associated requirements.

The BPM community can draw from mature methods, models, and systems, specifically when dealing with dynamics on the operational level and the contextual level, under the closed-ended future assumptions (Approaches I and III). This is reflected in the accepted papers of our special issue where two papers represent Approach I, and

two papers represent Approach III. As we move away from closed-ended scenarios towards open-ended futures, managing dynamics in and around business processes is less explored. Hence, open-ended futures, both on the operational and contextual levels (Approaches II and IV), will require more focus in the future.

In conclusion, we see the expansion of BPM knowledge and techniques as both a necessity and an opportunity to guide academia and industry in managing the dynamics of business processes. To return to Peter Drucker's introductory quote, we should do so not by using yesterday's tools and logics, but by approaching today's (and tomorrow's!) turbulences with novel methods and the awareness that dynamics are an inherent and invigorating part of our present and future processes.

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