From Process Mining to Augmented Business Process Management

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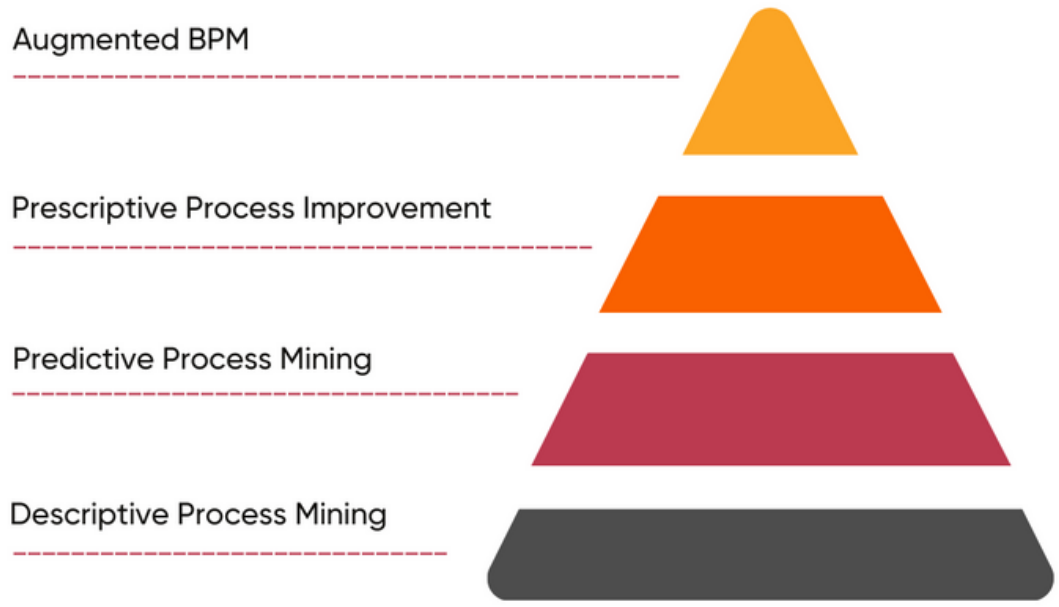

The Augmented BPM Pyramid

Introduction

The year 2021 was an exciting one in the field of Business Process Management (BPM). We have seen a stream of successful deployments and announcements in the areas of process mining, task mining, digital process twins, and predictive process monitoring, to mention a few.

And there's a lot more coming ahead! We are witnessing the gestation of a new approach to BPM: An approach that leverages data analytics and Artificial Intelligence (AI) methods to achieve continuous process improvement. We call this approach Augmented BPM.

As the year 2022 unfolds, we will see further steps in the direction of Augmented BPM. This article explores the trends driving the emergence of Augmented BPM and how organizations can start benefitting from these trends.

What is Augmented BPM?

Augmented BPM is an approach to manage business processes that relies on data analytics and AI to inform process improvement decisions both at design-time and at runtime.

Augmented BPM is more than the use of analytics and AI to execute individual tasks or to automate decisions (e.g. using a machine learning component to classify customer complaints). It is about using analytics and AI across-the-board to continuously monitor, adapt, and re-design business processes.

The Augmented BPM Pyramid

To better understand the scope of Augmented BPM, it is useful to conceptualize it as a pyramid of capabilities, as illustrated in Figure 1.

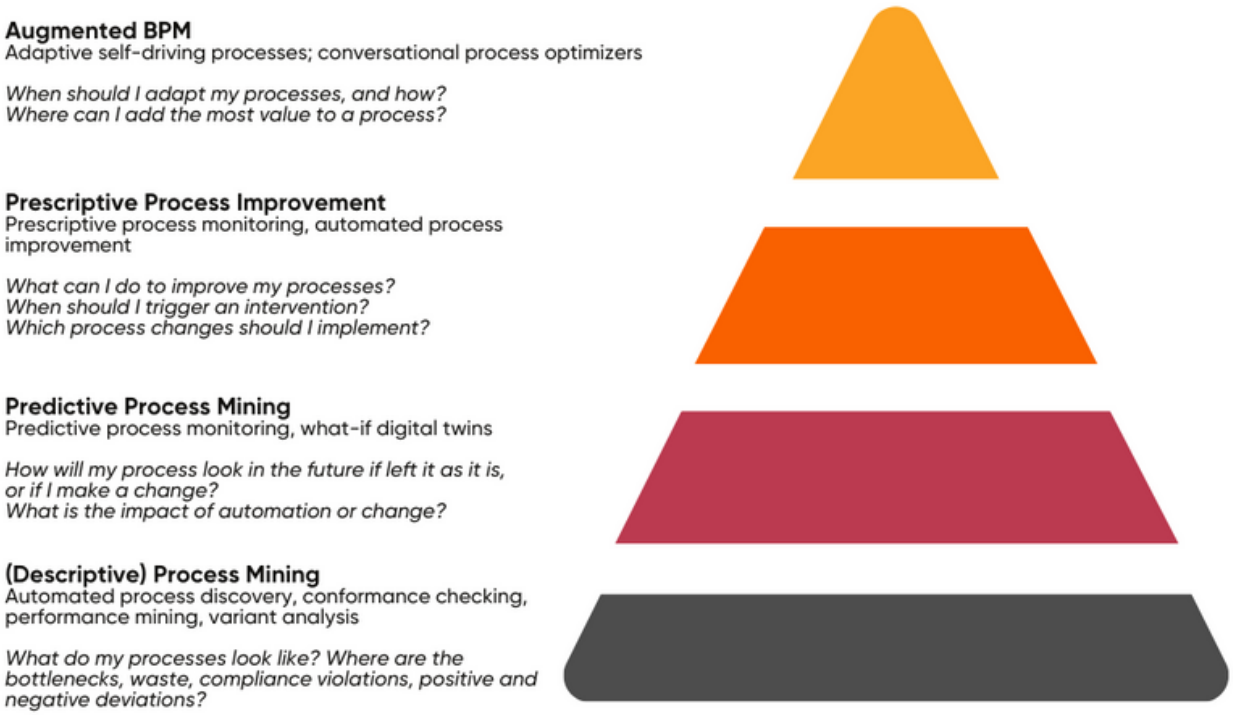

Figure 1. The Augmented BPM Pyramid

Layer 1: Descriptive Process Mining

At the lower layer, we find descriptive process mining (or process mining for short). Process mining is a family of techniques to analyze business processes using datasets extracted from enterprise systems. These datasets are called event logs. An event log is a collection of records, each of which captures the execution of an activity (or a step within an activity) in the context of a business process.

Process mining encompasses a range of techniques, which can be classified into four capabilities:

1. *Automated process discovery*
   - The ability to discover process models from data in order to put into evidence the main pathways and exceptions and to highlight wastes (e.g. rework, over-processing).

2. *Conformance checking*
   - The ability to detect deviations with respect to desired pathways, including violations of compliance rules (e.g. purchase orders without invoices) or deviations between the observed execution flows and normative pathways.

3. *Performance mining*
   - The ability to link quantitative performance measures to elements of a process, such as linking SLA violations to bottlenecks, linking excessive costs or defects to rework loops, etc.

4. *Variant analysis*
   - The ability to identify positive and negative deviance in a process by comparing how the process is performed for different subsets of cases (e.g. in different regions).

These capabilities allow us to identify bottlenecks, rework, compliance violations, and other friction points, to analyze the causes of these friction points, and their impact on key performance indicators (KPIs). Numerous organizations are using these capabilities to guide their continuous process improvement efforts.

While process mining is a valuable capability on its own, its long-term value comes from the fact that it opens the door to a wealth of other capabilities. Indeed, the very same datasets that organizations collect for process mining can be used to build predictive models capable of telling us both what will happen in the future.

Layer 2: Predictive Process Mining

This brings us to the second layer of the Augmented BPM pyramid: predictive process mining. While descriptive process mining allows us to understand how a process has performed historically, predictive process mining allows us to forecast how a process will unfold in the future. Predictive process mining encompasses two capabilities:

1. *Predictive process monitoring*
    - The ability to predict future states of a process. For example, in an Order-to-Cash (O2) process, a predictive process monitoring system can predict whether the products ordered by a customer will be dispatched on time or late. Typically, predictive process monitoring is implemented using machine learning techniques. We first train a predictive model on historical data, and then we apply it to a stream of events to produce a stream of predictions.

2. *Digital process twins*
    - The ability to predict the impact of a process change. For example, let's consider an O2C process executed on an ERP system. By applying descriptive process mining, we may find that a bottleneck in the packaging step of the process is causing many delays. By using process mining and machine learning, we can build a replica of the process, called a Digital Process Twin (DPT). We can then use this DPT to simulate what will happen if we add more resources to the packaging step. The DPT can estimate the impact of this and other possible changes on the percentage of late deliveries. This capability allows managers to estimate the ROI of process improvement efforts and to direct these efforts more effectively.

Layer 3: Prescriptive Process Mining

Predicting what's coming ahead in a process is informative. But predictions only create value when they are followed by action. This brings us to the third layer of the Augmented BPM pyramid: prescriptive process improvement. Prescriptive process improvement is about turning predictions into actions, optimally directed and timed to improve the performance of a process with respect to one or more KPIs.

In this layer, the focus shifts from "process mining" to "process improvement". Process mining focuses on discovering patterns from data and using these patterns to describe a process or to make predictions. In the third layer of the pyramid, patterns are secondary. Instead, we deal with actions.

Prescriptive process improvement encompasses two capabilities:

1. *Prescriptive process monitoring*
    - The ability to recommend actions to optimize the performance of a process with respect to one or more KPIs, in real-time or near-real-time. For example, a prescriptive process monitoring system may detect that a shipment is likely to be delayed. It may then recommend contacting the customer(s) who ordered these products and offer them the option to dispatch their products in two batches to minimize the impact of the delay.

2. *Automated process improvement*
    - The ability to recommend changes to a process to strike a tradeoff between competing KPIs, for example, lowering costs while minimizing defect rate and cycle times. An automated process improvement system may recommend to a process owner to change the allocation rules and work schedules of some resources, to alleviate certain bottlenecks that occur at the beginning of each week, or it may recommend performing additional verification steps for some types of purchase orders to prevent mishandled orders.

Recommendations such as the above ones can be generated using a technology known as causal inference, which discovers causal relations between actions and outcomes from historical data, and leverages these relations to determine in which cases (and when) it is best to perform certain actions. The intersection between causal inference and process mining is called causal process mining. Causal process mining is a very active field of R&D. We can expect this technology to reach maturity in 2022.

In prescriptive process improvement, the machine recommends possible actions to the human actors. The human actors decide whether to apply these recommendations or to ignore them. In other words, the interaction between the system and the human actors is one-way. What if the process improvement actions were the result of a conversation between human actors and the AI?

Layer 4: Augmented BPM

This brings us to the fourth layer: Augmented BPM. Augmented BPM goes beyond prescriptive process improvement in terms of the autonomy of the business process execution system and the richness of interactions between the machine and the human actors. Although Augmented BPM is still a nascent concept, we can already pinpoint two distinctive themes:

1. *Conversational process optimization*
    - The ability to automatically detect situations where the performance of the process degrades, to explain to human actors (e.g. the process owner), the causes of this performance degradation, and to evaluate counter-actions with a human actor. For example, a conversational process optimizer may detect that some types of shipments are often delayed. It may then suggest to the process owner that these shipments should be re-routed. The process owner may decide to offer to the affected customers a choice between the current route or a faster route (at an additional fee). The system then offers these options to customers who find themselves in similar situations in future. Over time, the system learns which options are most popular among customers for different locations.

2. *Adaptive self-driving processes*
    - The ability for an automated system to determine the possible next actions in a process, to determine which action to take next, and to detect situations where an escalation to a human actor is required. For example, a system may determine the verifications that should be done when a purchase order is received, based on historical execution data. When the system detects a new type of purchase order that it has never seen before, it escalates to the human operator, who determines which verifications should be done for this new type of order. The system records the decision of the human operator and applies it when a purchase order of this type is received again.

In this upper layer of the pyramid, we shift from "process improvement" to “BPM”. Indeed, augmented BPM is not only about discovering patterns, or generating process re-design recommendations. Augmented BPM is an approach to handle the entire BPM lifecycle.

What can my organization do to benefit from Augmented BPM?

For many readers, augmented BPM may seem too futuristic to deserve any immediate action. However, the first two layers of the pyramid are already widely used in practice. Also, the technology behind the third layer is rapidly evolving and already used successfully in other fields. The benefits of climbing the Augmented BPM pyramid are considerable. Organizations that do not make their steps to climb the pyramid are likely to be left behind. The opportunity cost is too large to ignore.

Organizations considering their journey along the pyramid might benefit from keeping in mind three important points along the way.

- Lay the foundations, start climbing, keep climbing, don't hold off. Many managers postpone the adoption of process mining by stating “we don’t have the data”, or “our data is not good enough”. Yes, getting the data for process mining is often a challenge. But the benefits have been demonstrated repeatedly, in thousands of successful deployments. And getting the data to do process mining opens many doors. The data that is used today for process mining can be used tomorrow for predictive process monitoring or to build digital process twins. Once the obstacle of data collection and curation has been overcome, the possibilities are endless. Note that task mining provides an additional channel for collecting data, when the enterprise system does not allow us to do so.

- Don't skip the layers. The lower layers of the Augmented BPM pyramid provide a foundation to derive business value from the upper layers. Organizations that wish to maximize the benefits of adopting the upper-layer capabilities need to master the lower layers.

- Align strategically and build governance incrementally. Any process mining, predictive monitoring, or prescriptive process improvement initiative needs to be grounded on the strategic priorities of the organization. The capabilities in the augmented BPM pyramid should first and foremost be applied to business processes that matter to the organization. It is also important to adopt these technologies incrementally, one process at a time. Over time, a governance structure is needed to ensure that the technologies in the pyramid create value predictably and repeatably. But before getting there, it is important to have a few success stories internally, to gain executive support, and to keep this support by showing that every capability in the augmented BPM pyramid produces tangible value.

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About Apromore

By providing advanced process mining capabilities using artificial intelligence and machine learning in an easy-to-use interface, Apromore enables business leaders to quickly visualize their business processes for transformation or optimization. The result of over a decade of extensive research and innovation, Apromore is the only market player offering open source and enterprise-grade processing mining solutions both on-premises and in the cloud. For more information please visit www.apromore.com

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