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Whitepaper

Delivering the full value of AI through business process management

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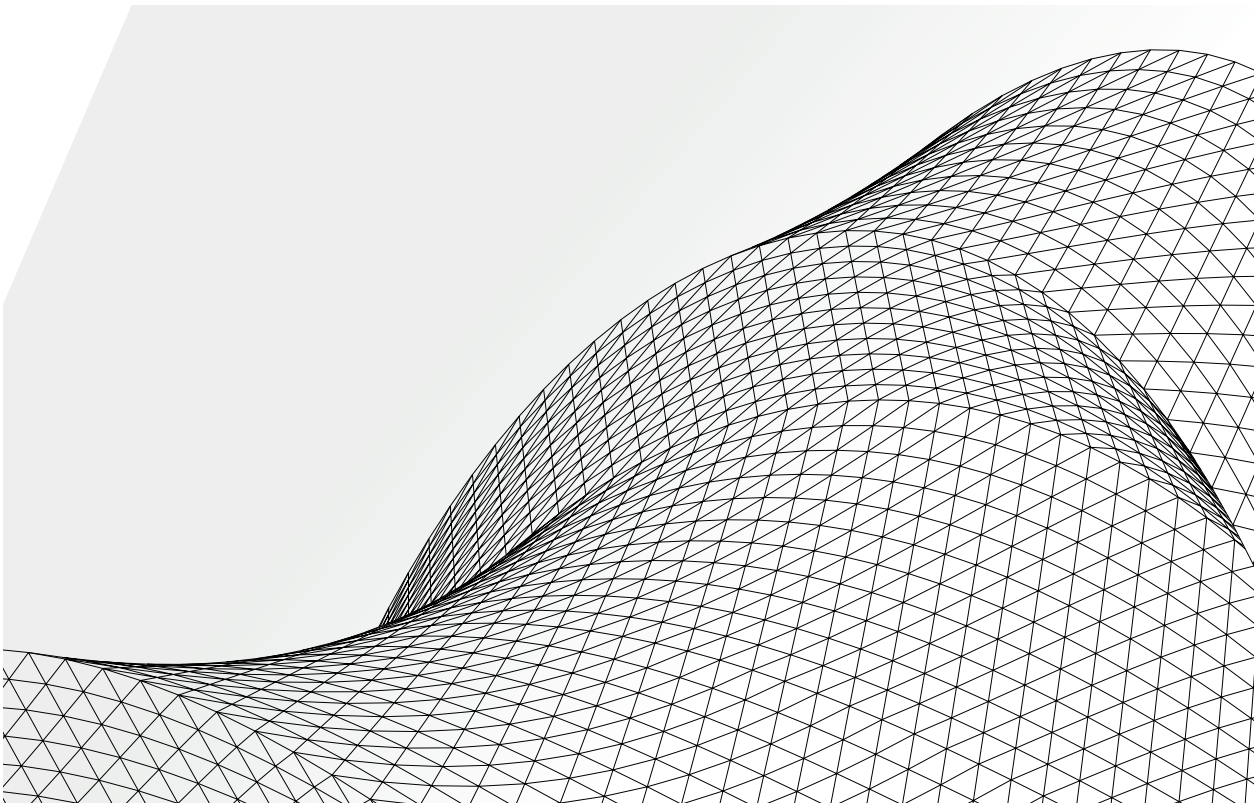

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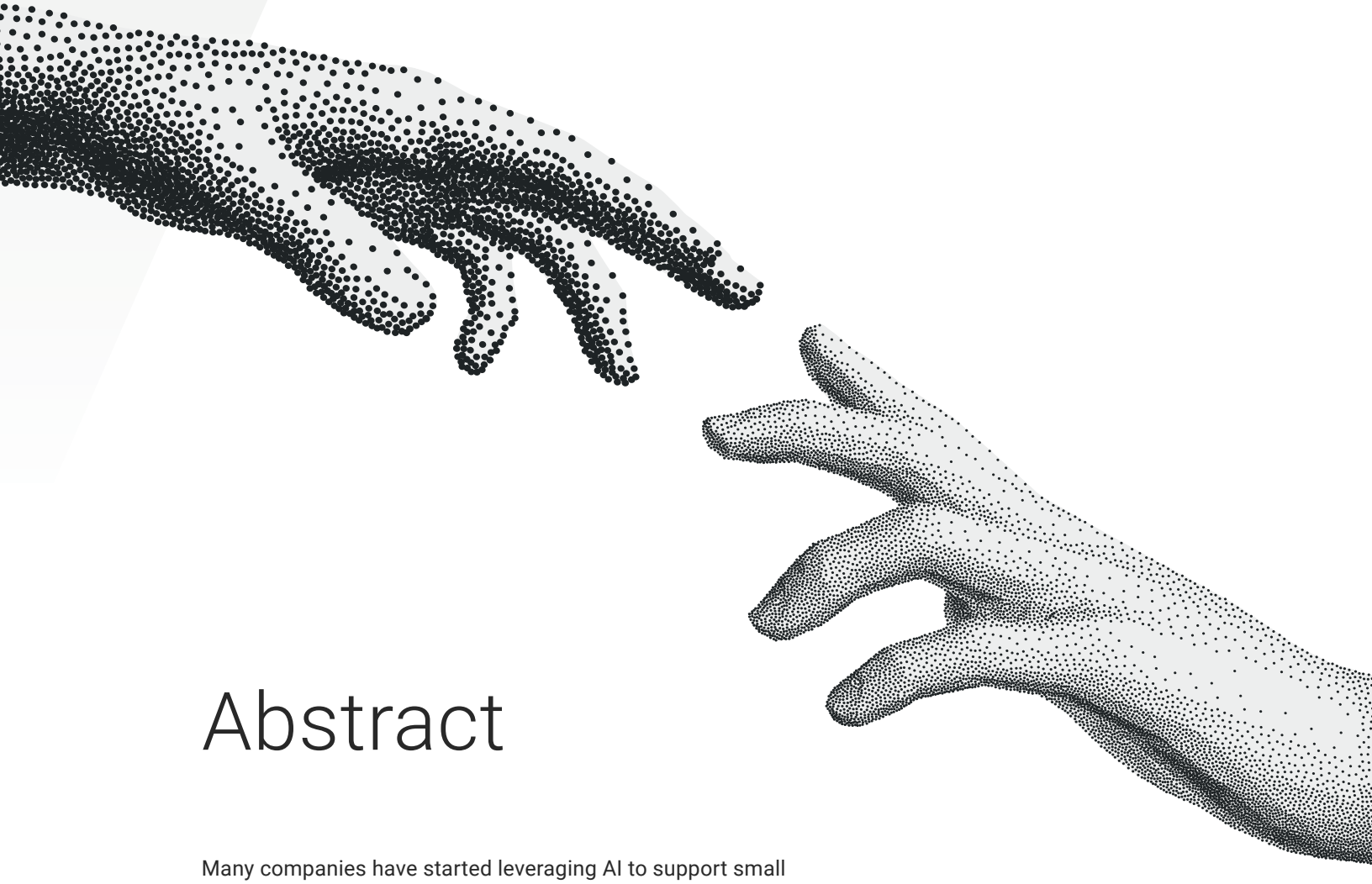

Abstract

Many companies have started leveraging AI to support small individual activities. However, in most cases this happens in isolated pilot initiatives or small usage scenarios, not through a systematic enterprise-wide roll-out. Business Process Management (BPM) can help to deploy AI-based solutions more systematically focusing on creating real business value. BPM helps to realize the full potential of AI by organizing the use of the AI applications to improve the performance of operational processes. It also leverages AI to improve the "process of process management, delivering higher quality results more efficiently. This article defines the role of BPM to deliver best value from AI. It outlines a business process-led approach to AI.

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The relation of business process management and AI

Delivering the full value of Artificial Intelligence (AI) systematically in an enterprise context is an important topic for many organizations. This whitepaper addresses that challenge. It is based on a previously published peer-reviewed article by the same authors[0].

The use of Artificial Intelligence (AI) applications, such as machine learning or deep learning, has become a key component of digital transformation initiatives[1]. An increasing number of organizations apply AI to improve performance in various areas. There are more and more examples of specific use cases[2–4]. However, to realize the full potential of AI, a systematic approach to its application and roll-out is required. Organizations need more than just a number of pilot initiatives randomly distributed across different company units2. They look for a controlled approach to realize the best value from AI. Business Process Management (BPM) can help to address this challenge. It focuses AI initiatives on high impact areas.

This paper defines AI and BPM as basis for the examination of the role of process management in delivering best value from AI technologies. The current status of AI usage is explained through selected case examples in sections 2 and 3. Those examples help to understand how the discipline of business process management can be applied to realize the full potential of AI. This is discussed in sections 4 and 5 and is a key contribution of this article. Based on those findings a possible way forward is explained.

What is artificial intelligence (AI)?

Currently there is no broadly accepted definition of Artificial Intelligence (AI)[5–7]. In general, it can be defined as an area of computer science that focuses on developing systems capable of performing tasks that typically require human intelligence[5]. Those tasks include, for example, the understanding of natural language, decision making or problem-solving capabilities. A similar common definition describes AI as systems demonstrating intelligent behavior by analyzing their environment and taking partly autonomous actions to achieve specific goals[7]. AI can be segmented into narrow AI, focusing on a specific task such as speech recognition and general AI with broader cognitive capabilities, across different domains5. This paper addresses both but focuses on general AI and specifically on its application in an enterprise context. It does not address the development of new AI software.

A key sub-domain of AI is machine learning (ML). ML focuses on developing and evaluating algorithms that extract patterns and functions from a dataset, hence, a number of examples. These algorithms, such as large language models (LLM), analyze a large dataset to identify underlying patterns in the data and relate input with output data. The outcome is a learned function that can then be used to convert input data into the appropriate output. The dataset could, for example, consist of the elements "annual income, "current debt" and "number of late credit payments". By examining a large number of such datasets, the algorithm can come up with a function that allows the prediction of a late payment based on the income and dept[8].

Deep learning is again a subdomain of ML where functions are represented as extensive neural networks. Each neuron of the network learns a simple function that is combined with others to deliver an overall complex function that can address more complex tasks. AI with its key subdomains is shown in figure 1[8]. Both sub-domains are relevant for this paper.

AI has entered practice in "transformation waves"[9]. The first wave is referred to as Predictive AI. Here AI helps to forecast trends and with that make data-driven decisions. Generative AI was the second wave. It allows to generate content and have conversations with humans in real languages. Now we are entering the third wave of AI: Agentic AI. This AI application can autonomously execute tasks, make decisions within defined parameters using a variety of data sources and interact with other AI agents. Agentic AI can carry out entire business processes. It is not just about reacting to prompts or generate content. AI Agents carry out complex tasks and act based on internal and external data sources. Hence, they open a new dimension of automation where process instances are created ad-hoc based on a combination of events[10]. The waves of AI are illustrated in figure 2. All three waves of AI a relevant for this paper.

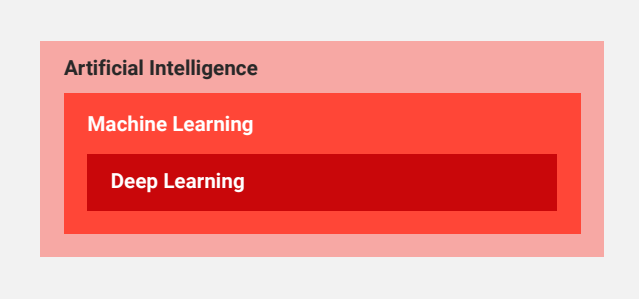

Fig. 1 Artificial Intelligence (AI) and its key subdomains[8]

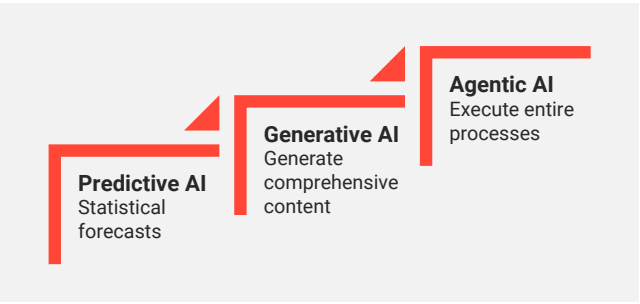

Fig. 2 "Transformation Waves" of Artificial Intelligence (AI)[9]

What is business process management?

Business Process Management (BPM) is the management discipline that moves strategy into people and technology-based execution, at pace with certainty[11, 12]. The discipline of BPM delivers the transparency over the operations of an organization required to take fast well-informed decisions and initiate related actions. This transparency enables the mitigation of trade-offs between conflicting goals, such as quality and efficiency, agility and compliance, external and internal alignment, innovation and conversation of good practices.

The BPM-Discipline manages the lifecycle of a business process, form strategy-based design, the implementation, execution and control of a processes. The control phase triggers the re-start of this lifecycle in case performance goals are not achieved or the business environment changes. The definition of the BPM-Discipline (BPM-D) is visualized in figure 3.

The BPM-Discipline is realized, as any other management discipline, though appropriate processes: the "Process of Process Management" (PoPM)[13]. The PoPM manages the business process lifecycle. It helps to focus on what matters most, improve in an end-to-end context, using appropriate approaches, and to sustain achieved performance, hence, keep processes on track through ongoing governance with performance and conformance management, value realization and further improvement when required.

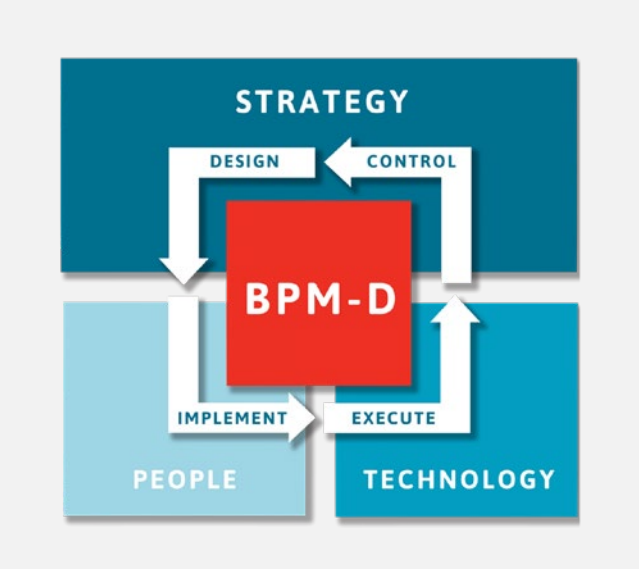

Fig. 3 Definition of the Business Process Management Discipline (BPM-D)[11]

How can business process management enable value through AI?

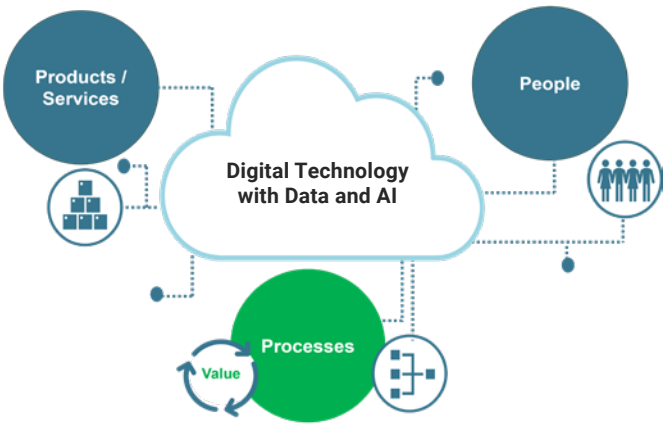

Fig. 4 Role of business processes for digital transformation[14]

Digital transformation in general delivers its value through new or significantly enhanced business processes[14, 15]. It is not just about technology and data but the improvement of an organization's performance – executed through appropriate processes[16]. That's why enterprises who realize the full potential of digital technologies have a comprehensive process management capability in place. They apply a process-led approach to digital transformation. AI is one of those technologies, hence it also benefits from the capabilities of a BPM-Discipline. The importance of the role of business processes in digital transformation is explained in figure 4.

However, AI is different to traditional digital technologies. It allows a degree of automation and information technology (IT) support never seen before. This leads to the questions, what role can the BPM-Discipline play specifically in the realization of the full business potential of AI? This topic is addressed in this paper. Process management creates the context for the use of AI in end-to-end processes so it can be used as an improvement tool. In addition, AI helps to improve the performance of business process management itself. This has an direct impact on the operational processes through faster or higher quality improvement initiatives. These mechanisms to enable the value of AI though process management is illustrated in figure 5.

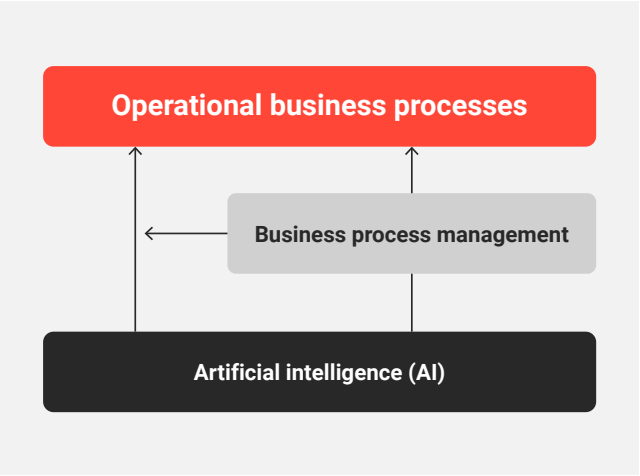

Fig. 5 Relation between Business Process Management (BPM) and Artificial Intelligence (AI)

Examples for the impact of AI on business performance

There is an increasing number of examples of achieving initial performance improvements through AI. There are also more and more examples for using AI to manage the business process lifecycle. This section presents some of these AI application examples to illustrate the current impact of AI. It then discusses the challenge for realizing the full business potential of AI.

Direct impact of AI on operational processes – examples

Examples for the successful use of AI can be found across different business processes in many companies of various industries[2, 3, 17, 18]. To illustrate the variety of usage scenarios and stress the fact that AI supports all areas of an organization, the examples are segmented according to Scheer's Y model[19], grouping

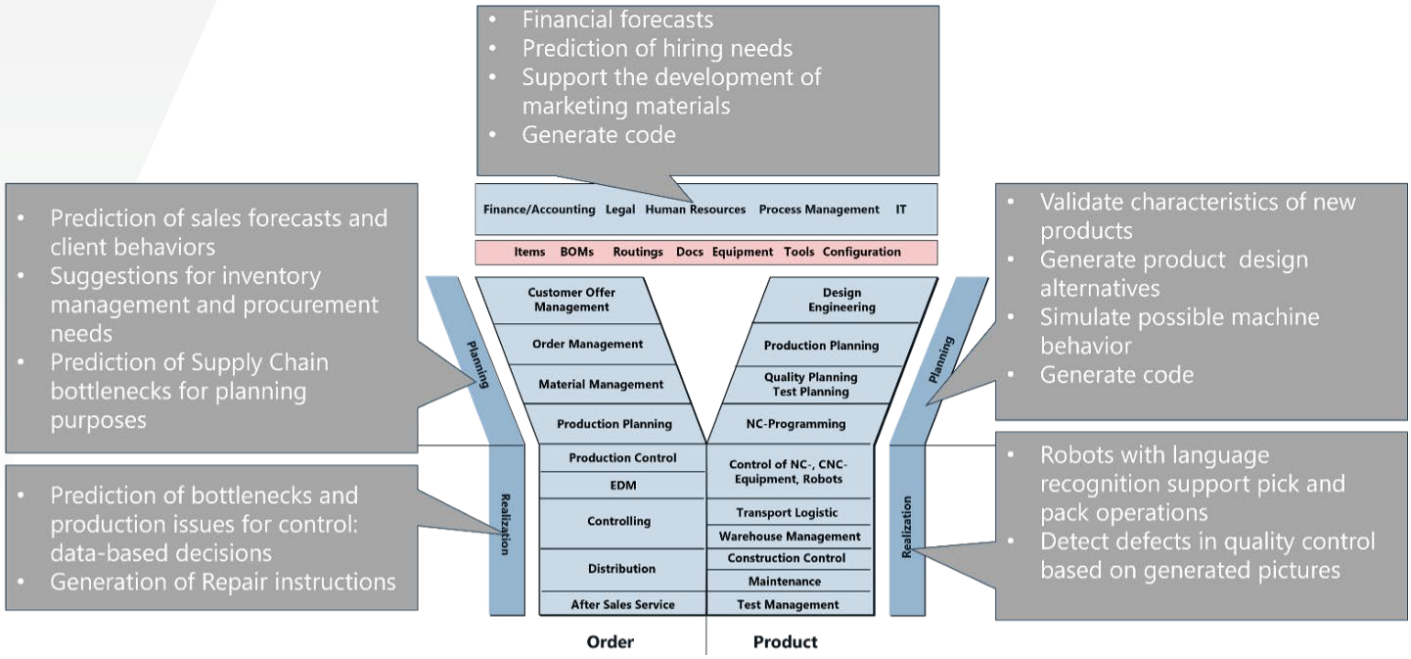

Fig. 6 Examples for the use of AI in operational processes segmented through Y-Model

business processes into planning and execution related processes, customer order and product related processes as well as overarching support processes.

In order-related planning processes AI is, for example, used to provide sales forecasts and predict client behaviors, generate suggestions for inventory needs and resulting procurement requirements, even in executing simple procurement processes fully automatically, or predict supply chain bottlenecks to support the supply chain planning process. Examples for order-related execution processes are the prediction of production issues based on machine control data or the generation of maintenance instructions, hence a combination of predictive and generative AI.

Product-related planning processes leverage AI, for example, to validate characteristics of new product design, generate design alternatives, simulate possible machine behavior or generate code for the control of computer-controlled machines. The support of pick and pack operations through natural language controlled robots or the generation of pictures to detect reliably defects in quality control are examples for product-related execution processes supported through AI.

Examples for the use of AI in support processes are the generation of financial forecasts, prediction of hiring needs and preselection of candidates, the support of the development of marketing materials or the generation of code as part of IT processes.

The AI usage examples are summarized in figure 6.

While those examples refer primarily to manufacturing companies, there are also many AI usage cases in service industries. Examples are the support of decisions in the claims process in insurance companies, the simplification of the underwriting process by generating applicant profiles or the acceleration of a loan approval process in a bank by generating required information.

Those examples illustrate the impact AI already has on business operations of a company.

Indirect Impact of AI through enhanced process lifecycle management

The examples for the use of AI to support process management itself, are structured leveraging the BPM lifecycle introduced earlier. Hence, usage scenarios for the process design, analysis, implementation, execution and control are identified. These examples are collected based on academic publications[20] as well as practice examples from process management tool vendors[21-24].

In the design phase generative AI can help identifying the goals of a specific process improvement initiatives by examining existing strategy documents. Based on those relevant value-drivers, areas for an improvement can be identified. Capturing process models from text, voice, images and other unstructured sources can replace or significantly shorten time consuming interviews. An initial version of the analysis of the captured processes can be generated through AI, leveraging the model information and best practice data. This simplifies and speeds up the identification of gaps and improvement opportunities. For the to-be design different alternatives can be generated, e.g. leveraging a database with appropriate reference models.

The implementation phase consists of people and technology-based realization activities. People change management documentation can be generated based on to-be process models and existing documentation, such as software-related electronic manuals. The IT-related implementation of a process can be supported through the generation of code or configuration settings of a software package as well as supporting user acceptance testing.

The degree of process automation can be significantly increased through the use of AI. Simple processes can be fully automated using a combination of AI agents to dynamically generate the process logic and execution of the resulting tasks through flexible, responsive workflows. People supporting a process can be enabled through the ad-hoc generation of training or other information simplifying their role in a business process.

In the controlling phase of the BPM lifecycle required improvement actions can be suggested or even executed based on process mining data. Monitoring dashboards can be automatically generated in the context of specific inquiries, users and goals. Users can ask for insights in natural language simplifying and accelerating the analysis of process instances.

Examples of the impact of AI on the process management lifecycle are summarized in figure 7.

Those examples illustrate how AI can improve efficiency and effectiveness of process management and with that the value BPM creates for the business processes of an organization.

The degree of process automation can be significantly increased through the use of AI. Simple processes can be fully automated using a combination of AI agents to dynamically generate the process logic and execution of the resulting tasks through flexible, responsive workflows.

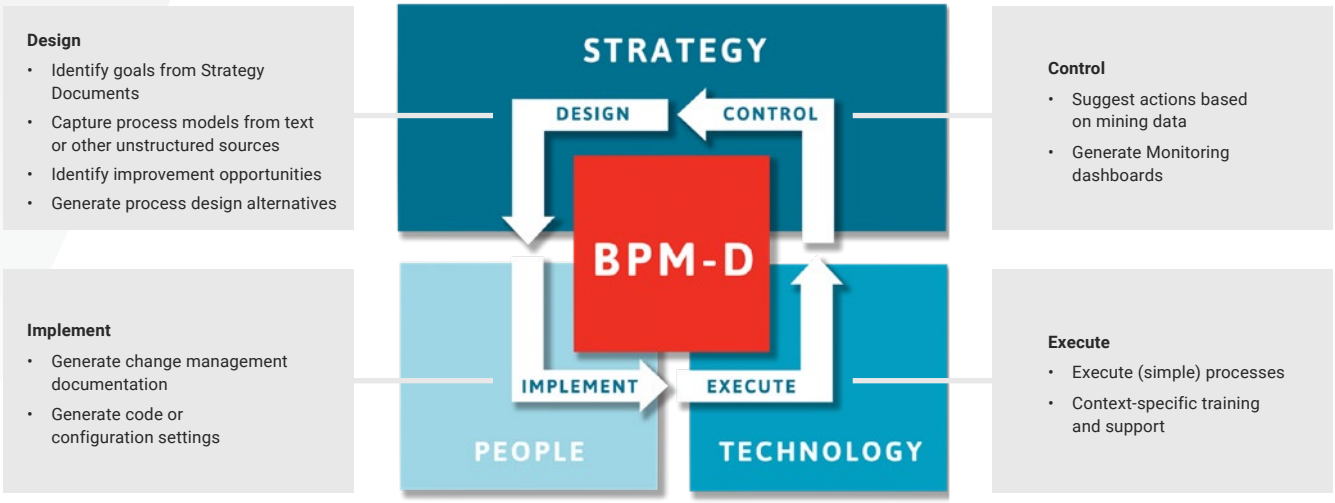

Fig. 7 Examples for the use of AI to support the process management lifecycle

Challenges to realize the full potential of AI

The discussed examples for the use of AI show the potential and the impact it can have. Organizations have started to embrace AI. However, they face challenges on this journey to the AI-enabled organization.

There are a few key questions to be addressed[2, 3, 25, 37, 38]:

- How does an organization apply AI enterprise-wide to get best value out of it and not just use it to address a few individual tasks in AI pilot initiatives?
- What's a good way to transfer successful AI usage scenarios from other organizations?
- How do we best adopt AI-based solutions on an enterprise-wide level while mitigating involved risk and ensure ethical use of data appropriately?

An increasing number of organizations has a general strategy in place to adopt AI. They pilot the impact of AI in various tasks in a bottom-up approach. However, they lack a comprehensive approach to link their overall strategic AI-related intent to their business operations, hence, to transfer their AI strategy into execution. Where shall AI be used in which form and how can it be implemented to deliver best business value? What are the implementation priorities to deliver best impact?

A value-driven, fast and reliable roll-out of AI requires a systematic transfer of good and best practices from other organizations. Companies lack appropriate accelerators to achieve this. How can we avoid "re-inventing the wheel"? How do we benefit from existing lessons learned?

A more systematic use and roll-out of AI also requires an appropriate management and governance approach. How do we address the risks AI can bring, such as data privacy or copy right violations, biases or wrong results through “hallucinations”? Organizations start defining related roles but the overall governance model and how it is embedded in the organization is in many cases unclear.

Process management can help addressing those questions.

Value-driven adoption of AI in operational processes

The discipline of process management is about moving strategy into execution. Therefore, it can support the value-driven and systematic adoption of AI in operational processes of an organization, using AI as an improvement tool. It provides the context to identify where to use AI and how to prioritize its roll out. BPM allows the systematic transfer of good practices through appropriate reference models, accelerating the roll out of AI. Process governance models with the related governance and management processes can be leveraged to address and mitigate the risks of AI implementations.

Provide the context for the systematic use of AI in operational processes

Process management helps to provide the context for the comprehensive use of AI. A process delivers, by definition, a result of value[11]. Hence, using AI to improve the performance of an end-to-end process or to replace it by a better one realizes the business potential of AI. The transparency BPM delivers helps to decide where to use AI in which way and what controls are needed. It helps to ensure a process is consistent, so AI drives the desired outcomes. It enables the identification of data and governance requirements.

With that, process management address key areas for a successful AI roll-out[39].

Process priorities defined, for example, through a process impact and maturity assessment, support the definition of appropriate priorities related to AI initiatives[26]. AI-related pilot initiatives can be lined up systematically to ensure they deliver best business impact by improving the end-to-end process.

A process-led approach to AI allows to increase the AI maturity systematically in a way that fits to the specific company environment[2]. The breadth of AI usage scenarios can be increased, the diversity of AI technologies employed grows. The value-driven roll-out of AI helps to increase leadership engagement and guides the use of data in decision making across the organization. The process context supports the development of the required AI resources, including data, people and technology. Process-led AI initiatives increase the number of real AI-based deployments as opposed to pilots to try out capabilities. The use of AI in an end-to-end process context also helps to establish the link to the overall operating model and strategy of the organization. It facilitates the incorporation of appropriate practices into processes to enable ethical use of AI.

The analysis of different views on a process, as described in the ARIS Architecture[27], helps to identify the opportunities and requirements for a use of AI systematically. It enables the identification of functions that can be supported or fully automated using AI. It guides the identification of related data needs and changes in the control flow of a process - if not generated through agentic AI. New or modified roles are determined and it is defined which of those can be taken over by AI agents leading to digital or hybrid workforce. And, very importantly, the analysis of the deliverables of a business process is used to examine if AI can create new or enhanced process output. Typical questions an AI-related process analysis based on ARIS addresses are shown in figure 8.

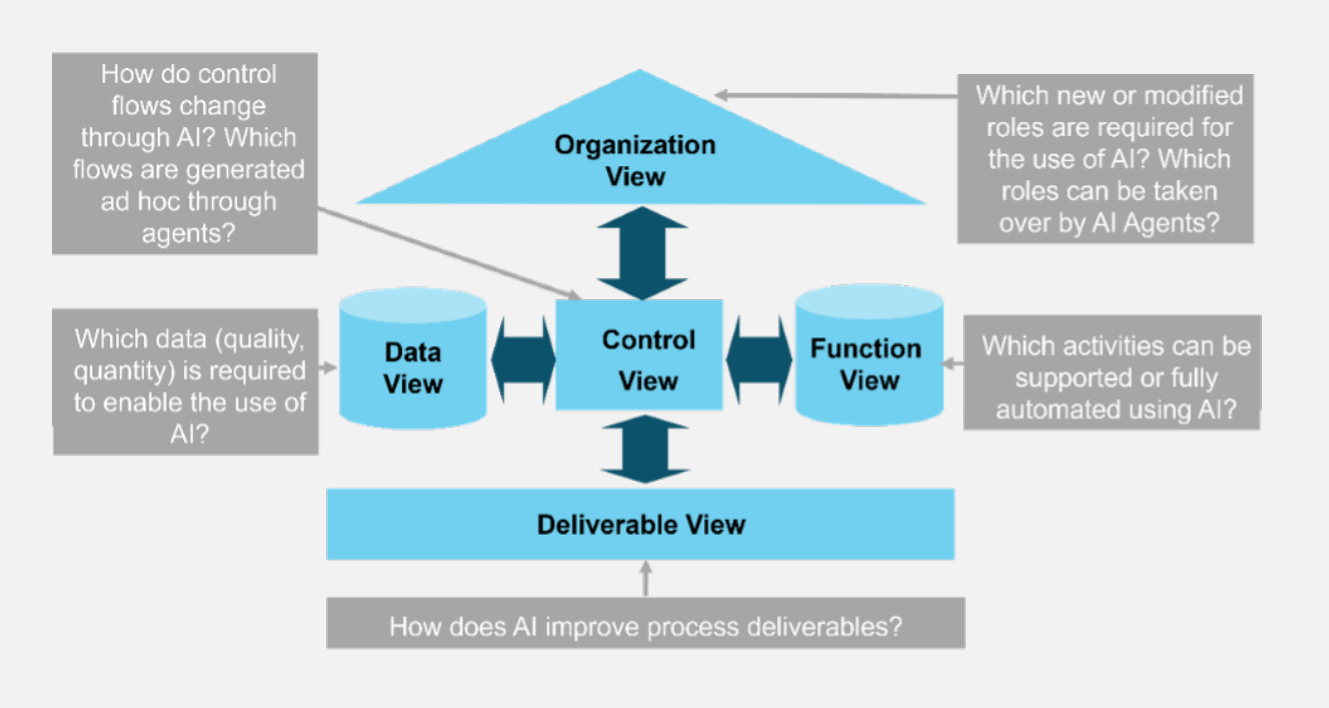

Fig. 8 AI-related questions an ARIS-based Process Analysis answers[25]

The identification of functions in a business process relevant for AI and the related data requirements[39] is a main aspect for a value-driven use of AI. A process described in a formal model, e.g. in BPMN format[28], shows all the "ARIS views", including functions and key data involved. Each function in the model can therefore be examined regarding the possible use of AI. Examples for typical criteria for the identification AI opportunities are the following:

- Use of natural language, pictures or other unstructured information
- Identification of anomalies in large datasets, systematic detection of exceptions
- Prediction of results based on large complex datasets
- Generation of language using ad hoc reports based on large complex datasets
- Match of data elements or variant analysis in large data sets

While the described approach helps to use AI based on the requirements of the existing process, it is important to examine also the AI-led design to achieve a potentially more transformational outcome of the initiative, especially for high impact processes. This means, we driven on one hand the use of AI through existing business needs, on the other hand we examine its capabilities to innovate and drive transformational change. It is important to understand the business opportunities AI can bring for a process, it's potential to move the strategy realization to the next level. This means to address questions like:

- Can AI be used to achieve new or better deliverables of value from the process?
- Does AI allow structural changes, reduction of hierarchies or decentralization of sub-processes?
- Can AI simplify the process control flow, e.g. by taking over decisions through agentic AI?

Figure 9 illustrates the mutual influence of operational business processes and AI.

A machinery company had a major issue in their maintenance service processes. When service technicians determined that a part needed to be replaced, they determined in over 50% of the cases a wrong material number since many of the thousands of spare parts looked very similar. An analysis of this service process showed how AI can be used to address the issue. The creation of a database containing the pictures of all parts was created. Instead of guessing a material number the technician just takes a picture of the part and AI selects the right number by comparing the picture to the data to determine the correct part number. Result is a correct number in over 90% of the cases. An excerpt of the AI-based service process is shown in figure 10. This also allows to simply the structure of the related service organization.

In a major commodity company, the financial month-end-closing is handled by 36 processes. In those processes the analysis showed that in 34 of those processes AI can have an impact. In five of those processes more than 10 functions have been identified as relevant for the use of AI. Examples for AI relevant activities are the matching of invoices in various unstructured formats with the related purchase order numbers, dynamic forecast of foreign exchange rates based on internal and external data, or the review and summarization of documents. This leads to a significant reduction of the month-end closing cycle time.

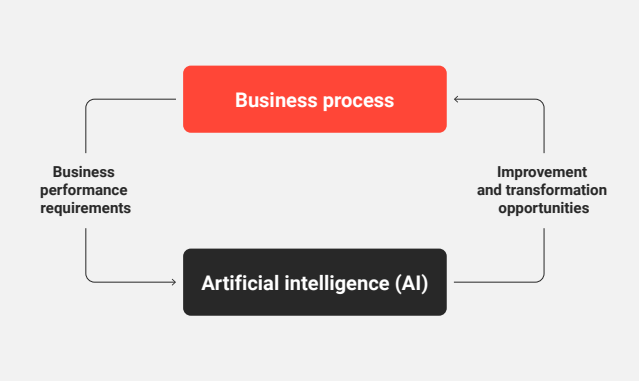

Fig. 9 Mutual influence of business process and AI

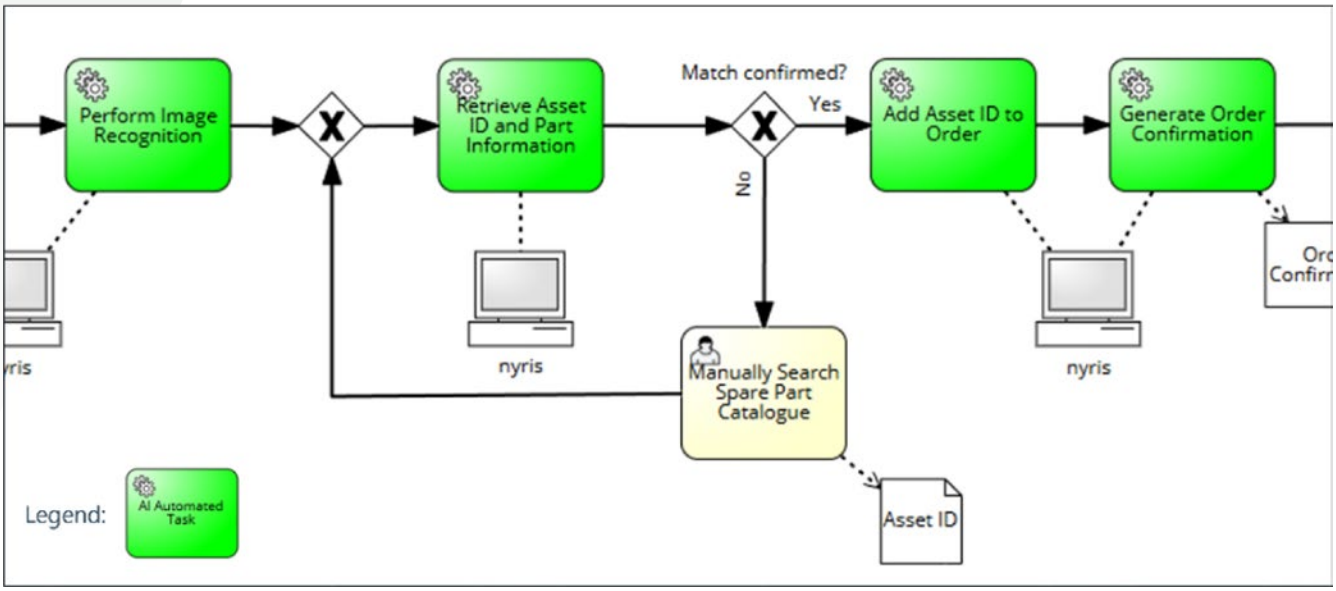

Fig. 10 Excerpt of an AI-based service process of a machinery company and AI

In a specialty pharmaceutical company, the examination of the early innovation processes regarding AI usage opportunities led to reduction of resources needs and cycle times. Process simulation showed that a traditional automation approach would lead to just over 20% cycle time reduction of key sub-processes whereas the systematic use of AI, especially for the generation of project specific reports, would lead to over 40% of efficiency gains.

The process context of the AI-based function forms the foundation for the selection and evaluation of the required AI assets, such as the appropriate Large Language Model (LLM) and the required data. Additionally, it provides guidance for the technical design of the interaction of different AI Agents to achieve the best possible degree of automation using agentic AI.

The simulation of different scenarios of the process models helps to predict the business impact the use of AI is expected to deliver. It supports the development and validation of related business cases.

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Provide governance and management processes for AI

Process management addresses different types of business processes11. Operational processes make sure things get done in the organization. Management processes focus on achieving best effectiveness and efficiency of operational processes. Governance processes provide the rules and guidelines for the management processes. Those governance processes are based on company goals, general trends, and internal or external regulations, such as legal compliance requirements. Since AI allows a higher degree of automation of operational processes, management and governance processes become increasingly more important. They operationalize the systematic application of AI-related risk policies which is crucial for a successful AI deployment.

If an operational process is highly automated using AI, for example through a combination of AI agents, it requires appropriate risk mitigation. Initially the results delivered by AI agents may have to be checked 100% to verify that results are logical and consistent and can be used by the next human or digital agent. After a certain period and possibly adjustments of the use of AI, the number of checks can be reduced. Management processes organize those checks. Governance processes describe the overarching guidelines in a systematic and actionable way. In the example, a governance process may define that initially a 100% check of results is required, after positive results over a number of weeks those quality controls can be reduced to 50% and another time span later to 10% or less. The use of AI is managed and governed appropriately. The roles of different business process types for AI are illustrated in figure 11.

In the context of AI, it is especially important to use governance processes to determine the right degree of freedom for the users to try out AI tools. In areas with high business risk, appropriate mitigation processes to avoid AI-related negative consequences need to be implemented. In lower risk fields people can get more freedom to try out new AI capabilities and with that move the adoption of AI forward.

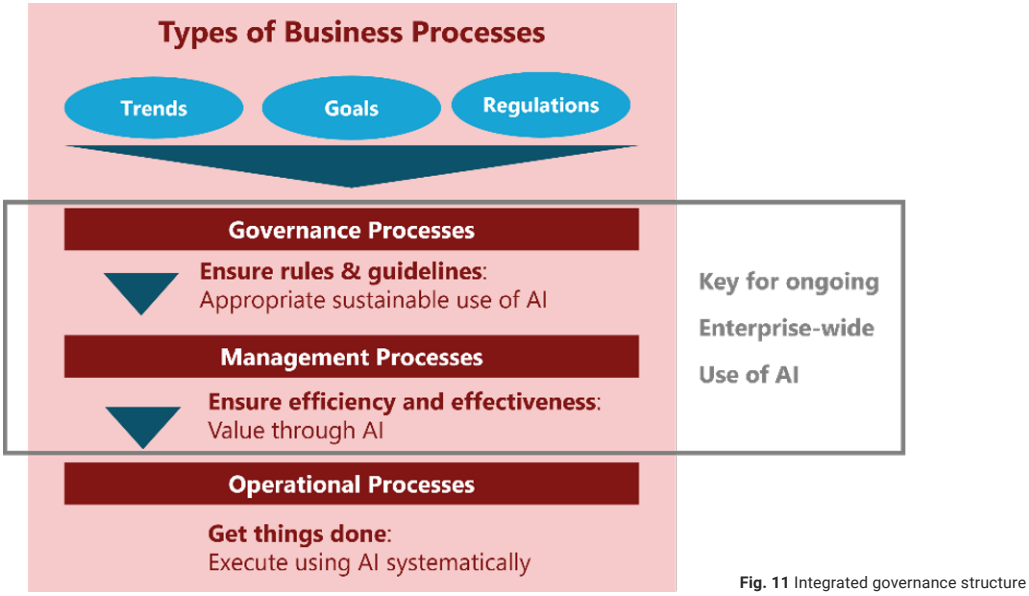

Fig. 11 Integrated governance structure

The overall process governance and management organization helps to establish AI related governance and management in a company. Collaboration model, roles and responsibilities, available infrastructure and other assets can be re-used and, as necessary, expanded for AI. This establishes AI as a process improvement tool in the organization[11, 12, 29].

AI Governance and Data Governance need to be aligned to ensure best outcome for the use of AI. Process management and specifically Process Governance can orchestrate that alignment since a process brings all those components together. Result is an integrated governance approach as illustrated in figure 12.

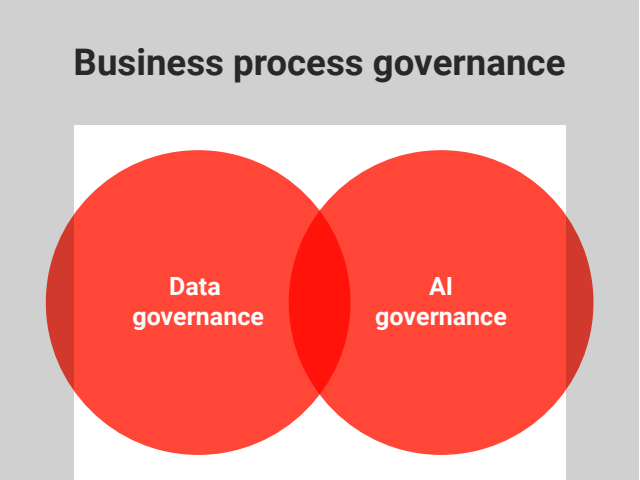

Fig. 12 Integrated governance structure

Transfer good AI practices using reference models

The transfer of good practices within an organization or between organizations can be supported and accelerated through the use of reference models. Reference models are generic conceptual information models that formalize recommended practices for a special domain[11, 30]. Reference models allow an exchange of good practices in a structured way that simplifies and speeds up their implementation.

In the area of AI, reference models show how AI is used enabling a specific business process. Most important for AI is the combination of business process and data reference models that describe the information required for an effective use of the AI-based solution. The reference model should also include information about the required infrastructure, such as technology requirements or access to external datasources. Such reference models could, for example, be provided by a software vendor that has already incorporated AI capabilities in an application, e.g. an ERP system[31].

The use of reference models provides a foundation for the definition of AI-based standards for an organization[32]. This simplifies the roll-out of good AI practices across the company, such as different regional units or various product units. It supports the "assetization" of AI solutions[33].

The structure of reference models leveraged for the exchange and roll-out of AI-based business practices is visualized in figure 13.

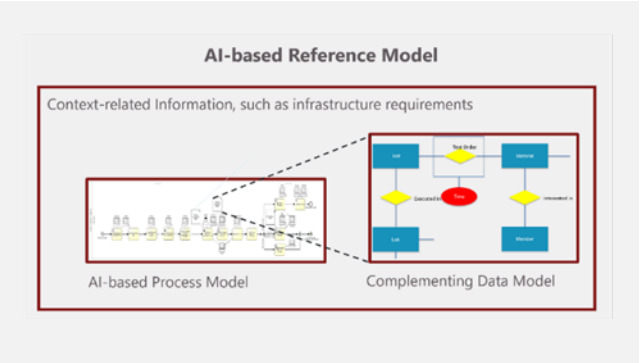

Fig. 13 Reference models for AI-based business processes

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Value-driven adoption of AI in process management

Adopting AI systematically for the BPM-Discipline means to use it in the context of a company-specific process of process management (PoPM). Hence, it is not just about piloting it for individual tasks related to the process lifecycle management but as enabler of an end-to-end PoPM. The PoPM also needs to be expanded to support the systematic use of AI in a company. Both aspects are discussed in this chapter.

Improve the process of process management through AI

The process of process management defines how a specific organization manages the business process lifecycle[13]. It shows how process management is embedded into the organization. This allows to enable BPM through AI the same way, other operational processes are handled.

The company-specific PoPM is designed to deliver on the specific strategy of the organization and the related stakeholder expectations. Enhancing the performance of the PoPM improves the impact of AI on the operations of the company, contributes to realizing the full potential of AI for the organization. It provides the required guidance how and where to use AI capabilities of process management tools[21-24], such as modelling and mining, to provide best value to the organization.

The commodity company mentioned before had not formalized process management capability in place. They decided to start establishing a BPM-Discipline to create the transparency allowing them to improve their processes more systematically, especially to reduce cycle times. Therefore, an initial basic PoPM was defined. It consists of 9 sub-processes and 41 functions. 16 of those tasks have been identified for AI-based improvements. The use of AI, for example, to generate alerts and trigger actions based on process mining results is expected to deliver transformational improvements since it allows to govern key processes more effectively and drive ongoing improvements. An excerpt of the PoPM with identification of AI opportunities is shown in figure 14.

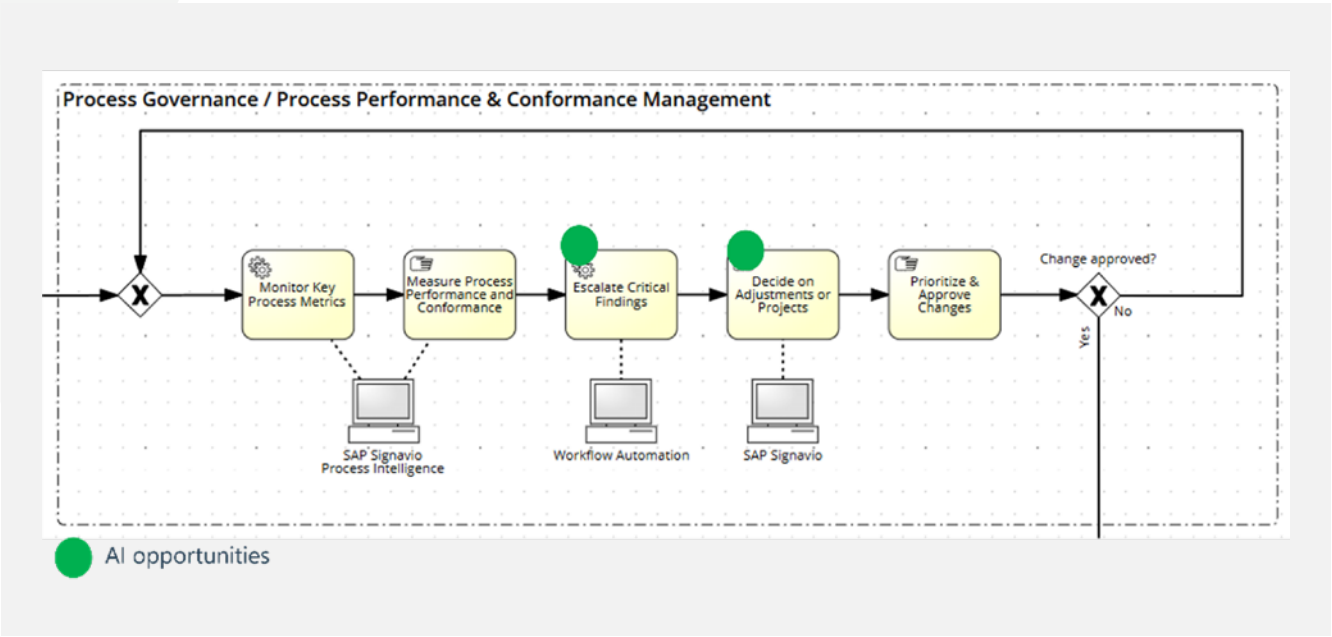

Fig. 14 Process of Process Management with identified AI usage opportunities - Excerpt

Expand process management capabilities for AI

In order to fully support the effective use of AI, BPM capabilities need to be expanded appropriately. New or modified approaches, methods and related tools are added to the PoPM. The lifecycle of the process is managed more effectively[20]. As discussed, the adoption of AI in operational processes requires an enhanced analysis of processes, expansion of governance models and development of AI-based reference models.

Automation through agentic AI requires new enhanced modelling approaches. AI agents execute tasks independently, take decisions and interact with other agents or with humans. As a consequence, detailed process instances are not defined upfront as process types, but generated in “run time” based on context information and the interaction of the various agents[10, 34]. Hence, an appropriate modelling approach is required to describe those process automation mechanisms. This expands the purely business-oriented process models through a combination of business and technology-related information.

> **AI agents execute tasks independently, take decisions and interact with other agents or with humans.**

Existing methods, like BPMN, can be extended to define agent-based processes, e.g. by using lanes to show an agent’s role in the automated process. In case of a hybrid workforce, there are lanes representing humans and others representing agents[35]. This shows how agents impact the control flow of process

instances. The underlying automation platforms require descriptions methods addressing the agent-specific behavior by specifying, for example, the LLM used, relevant interface (API) tools or the memory leveraged. The platforms are configured through those models[10, 36]. The definition of AI agent-based automation is illustrated in figure 15[16]. It includes relevant technical information, like the used AI model, data storage and interface (API) tools.

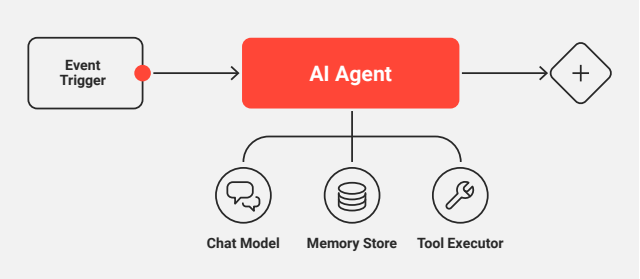

Fig. 15 Information model for process automation with Agentic AI – example / excerpt

The way forward

This paper shows how process management is used as the discipline to drive best value from AI through a systematic enterprise-wide adoption of different AI applications. It also shows how AI can enhance the BPM-Discipline itself, making a specific process of process management more efficient and effective. However, the journey of realizing the full potential of AI through process management has only started. There are still many important research and development opportunities for process-led AI, such as:

- Definition of process-centric usage scenarios in form of extended reference models:
  What do leading AI practices for a specific business process look like? What are the data and technical requirements? How do we package this information in easy-to-use reference models?

- Extension of process governance: How do the governance processes have to change for AI?
  How do we leverage process management tools, such as modelling and mining tools, to include AI-related governance? How do we best integrate process, data and AI governance?

- AI-enabled process management: How does the ideal process of process management leverage AI?
  How are BPM tools, further enhanced through AI? What is the best way to model agentic AI to support a business process? How are agentic AI systems architected and realized best?

Process management has become key enabler of value through enterprise-wide use of AI.
And the journey has just started.

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Scheer Americas is a consulting company that helps organizations achieve rapid, measurable business outcomes while building the business process management (BPM) capabilities needed for long-term success. We bring deep expertise in BPM to deliver results through short, high-impact improvement projects while enabling organizations to build lasting process management discipline.

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