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EDITORIAL

# Editorial: KI-SI: Business Process Management (BPM) in the Era of AI (BPM-AI)

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In the 1990s, Business Process Management (BPM) was a management hype. Slogans such as "everything is a process", "every process can be improved" and more, were on the daily agenda of managers.

Nowadays, BPM is an established sub-field of business informatics mainly consisting of different research streams, with different research approaches, spanning from mathematical oriented questions, over engineering to behaviors, and management-oriented topics. BPM consists of several sub-areas such as business process strategy, business process modeling, business process implementation, business process automation and execution, business process monitoring and control, and continuous business process improvement.

As many other disciplines identified, BPM also recognized intensive changes and transformations in the kind of research questions and approaches to investigate. From a historical perspective, this is not surprising: Herbert Simon, the inventor of the general problem solver, one of the founding fathers of AI, ACM touring price winner, also received the Economic Nobel price for his work on management and decision making within organizations. For more than 50 years ago, Simon published work such as:

- Administrative Behavior. A Study of Decision-Making Processes in Administrative Organizations. New York/ London 1947,
- Organizations. 1958, Blackwell, Malden (Mass.) 1993, ISBN 0-631-18631-X (mit James G. March) or
- The Shape of Automation: for Men and Management. Evanston, New York 1965.

Nowadays, the theoretical and methodological results and technological options of AI tremendously changed.

However, BPM and AI developed differently from the last decades. Since few years, there are some attempts to combine these two lines of research, e.g.:

- particular workshops on AI and BPM in major BPM conferences;
- workshops on AI and BPM in major AI conferences;
- AAAI bridge program.

This special issues tries to overview this live research approach.

A typical BPM system processes a variety of data on business process executions, e.g., the relevant steps of a process, their causal order, and temporal sequence, required and deployed human and technical resources, captured sensor data. Tapping into these data sources using AI-based techniques for pattern analysis, data mining and information extraction is a traditional standard application of AI techniques in BPM. However, many other interesting research applications are now emerging at this interface. BPM as an application field, in turn, opens interesting new fundamental questions. For example, the core concept of a business process is like the concept of an event sequence or a time series. However, in typical business cases, a process is distributed and does not consist of a sequence of events and should therefore be understood as non-sequential. These and other characteristics pose new fundamental questions in the field of AI.

This special issue aims at providing an overview of the work in AI and BPM. The topics of interest include, but are not limited to, the following topics:

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- Business Process Monitoring, predictions and recommendations,
- Natural language processing and process modeling,
- AI-based techniques for new business models,
- AI-based techniques for process mining,
- AI-assisted process design,
- Automated-planning for business processes,
- Business Process rule mining,
- Decision support systems for business processes,
- Robotic Process Automation (RPA),
- Trustworthy AI, explainability, transparency in the field of BPM.

The special issue welcomed technical contributions (of up to 20 pages), abstracts (4 pages), e.g., on doctoral theses or habilitations, system descriptions (4 pages), project reports (4 pages), or discussion articles (4–8 pages).

Submission deadline for articles was November 1, 2023. All submissions were peer-reviewed. In total, this special issue contains:

- 1 survey,
- 6 technical contribution,
- 1 AI transfer paper,
- 2 project reports,
- 1 discussion paper, and
- 2 PhD Thesis overviews.

All received and accepted submissions are published in two separated journal issues. This issue collects, besides the papers offering an overview and a discussion on the topic, that is the survey and the discussion papers, the papers more focused on the Business Process Monitoring aspects, that is two technical contributions, the AI transfer paper, as well as the two project reports of the Special Issue.

## 1 Survey: BPM and AI

The survey by Fettke and Di Francescomarino classifies and analyzes the field of BPM and AI based on papers presented and published at the Artificial Intelligence for Business Process Management (AI4BPM) workshop—a workshop collocated with the BPM conference—along its 8 editions. In total 55 papers were analyzed by looking at them from a BPM, an AI, as well as an application domain perspective. The analysis leads to a discussion of the results as well as to further research opportunities from a theoretical, methodological and empirical point of view.

## 2 Discussion Paper

The special issue also contains a contribution under the category "Discussion". In detail, Kampik et al., in their work *Large Process Models: Business Process Management in the Age of Generative AI*, propose Large Process Model (LPM), a conceptual framework combining Large Language Models (LLMs) with knowledge-based and automated reasoning approaches for BPM, discussing potential, as well as limitations of of LLMs and foundational models for BPM.

## 3 Technical Contributions

Two technical contributions can be categorized as related to business process *monitoring*.

In *Interpretability in Predictive Process Monitoring using Process Maps: An Expert Evaluation of the VisInter4PPM Framework*, Maita et al. present an expert evaluation of usability and ease of use of VisInter4PPM, a framework that visually enhances the interpretability of predictions in Predictive Process Monitoring.

In *Prescriptive Process Monitoring Under Resource Constraints: A Reinforcement Approach*, Shoush & Dumas face the problem of prescriptive process monitoring under resource limitations and intervention uncertainties. To this aim, the authors propose an AI-based solution, that is an online RL-based approach that takes into account the uncertainty of predictions and the resource utilization level.

## 4 AI Transfer Papers

One work of the special issue belongs to the "AI Transfer" category.

In *Predictive Process Monitoring for Airport Operational Support*, Gunnarsson et al. show how AI and BPM research can be concretely deployed in a real-world context. They indeed apply advanced predictive process monitoring techniques for enhancing luggage handling operations at an international airport.

## 5 Project Reports

The special issue also includes two project reports, both focusing on the process monitoring aspects.

In the work *EASY: Energy-Efficient Analysis and Control Processes in the Dynamic Edge-Cloud Continuum for Industrial Manufacturing*, Schultheis et al. report about the EASY project, which focuses on the integration of AI techniques

and BPM processes through the creation of an Edge-Cloud Continuum to optimize the execution of analysis and control processes in the industrial manufacturing.

In *Improve hospital management through process mining, optimization, and simulation: the CH4I-PM project*, Ronzani and Sulis present the CH4I-PM project, which deals with the application of AI and Process Mining techniques to hospital information data.

This first part of the contributions to the Special Issue on Business Process Management (BPM) in the era of AI (BPM-AI) will continue in the next issue with a second part.