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***Subject : BUSINESS PROCESS MODELS ANALYSIS & AI***

**Introduction:**

What exactly is Business Process Management? BPM is a methodical, technological approach to optimizing a company's operational processes. Essentially, it is a methodology that guides a company's continuous improvement process, with the main aim of improving overall efficiency and performance. It enables the optimization of operational processes through the integration of technologies such as deep learning, advanced analytics, semantic modeling and process analysis.

Thanks to digital transformation, BPM is now evolving by increasingly integrating Artificial Intelligence (AI) to push back the limits of its efficiency. AI, in this context, characterizes the ability of machines to perform intellectual tasks that traditionally require human intervention. In the field of BPM, AI is therefore becoming an important strategic tool, enabling process automation, advanced data analysis, as well as the overall improvement of business processes.

The selected articles focus on the interaction between Business Process Management (BPM) and Artificial Intelligence (AI), revealing a complex and constantly evolving landscape. They reveal trends and complexities, highlighting the similarities and differences that characterize the development of these interdependent fields.

**Detailed analysis :**

Synthesis analysis reveals the financial impact of BPM digital transformation and highlights cost-related challenges. In addition, the perception of deep learning, a component of artificial intelligence (AI), is discussed, with a distinction made between strong AI, possessing intelligence equivalent to that of a human, and weak AI, specialized in specific tasks. This difference is illustrated through examples such as IBM Deep Blue<sup>1</sup>, the chess program, and Waze, the navigation application, highlighting the ability of machines to reproduce human intelligence in a general or specific way. Furthermore, fusion with Bayesian models shows a growing trend in integrating different methods, including statistical methods for process optimization based on Bayes theorem.

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<sup>1</sup> A computer using strong AI to rapidly evaluate millions of possible positions, analyze complex situations, make strategic decisions and compete with high-level human players in a specific field: chess.

Another perspective looks at the power of advanced analytics in BPM, which includes sophisticated methods such as Bayesian networks, which graphically represent probabilistic dependencies between a set of variables. Methods such as predictive analysis, which uses data, computer algorithms and statistical models to identify future outcomes, as well as machine learning, where systems learn automatically without being explicitly programmed, and process mining, characterizing the extraction of information from event logs to understand business processes, are also covered. These approaches enrich Business Process Management (BPM) by offering advanced analytical tools for predicting, adjusting and understanding business processes. They promote proactive management, the ability to adapt to change, and continuous optimization, reinforcing the positive impact of digital transformation in the BPM field. However, challenges remain, such as noisy data (inaccurate, incomplete or incorrect data) and the need for adaptive methods, highlighting concerns about flexibility in a changing environment.

Another angle of approach focuses on the semantic modeling of business processes, using symbolic representations such as Petri Nets<sup>2</sup>, a graphical tool for modeling distributed systems, and OWL<sup>3</sup> ontologies, knowledge representation structures used to describe relationships between entities. Semantic interoperability is highlighted as a crucial method, requiring a common understanding of meanings between business and IT departments for the successful integration of AI into processes.

Finally, with regard to business process analysis, methodologies such as Business Process Analytics (BPA) are introduced, involving the use of analytical tools to assess the performance of business processes. Explanatory AI, capable of transparently explaining the results obtained, and knowledge graphs (KG-XAI), characterized by graphical representations of relationships between entities, enrich this analysis. These elements signal an evolution towards process mining, which anticipates the company's future behaviors and activities by improving business processes through the processing of past and real-time data. They also underline the need for continuous improvement to remain competitive.

### **Common foundations of BPM and AI:**

The summaries agreed on several key points. Firstly, AI has become indispensable for optimizing business processes, whether through advanced analytics, machine learning or the integration of explanatory AI. In addition, business process modeling is identified as a key element, requiring graphical methods, semantic annotations, and semantic approaches to ensure process consistency, efficiency and adaptability. Finally, a cautionary note underlines the crucial importance of adapting to emerging trends, be they process mining, real-time analytics, or increased process automation.

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<sup>2</sup> Graphical modeling method used to represent and analyze interactions between different stages of a process

<sup>3</sup> Ontology Web Language: organized plans that help computers understand and process information on the web, by describing the relationships between different words and concepts in a clear way. Making it easier for machines to understand what information means and how it relates to each other.

**Contrasts and challenges:**

Despite these points of convergence, challenges persist. A limited understanding of deep learning in the business context is highlighted, creating an opportunity for increased awareness. The articles also highlight challenges related to noisy data (data that may contain unwanted elements or anomalies that can complicate analysis or modeling) and the adaptability of approaches in constantly changing environments. In addition, the need for close collaboration between business and IT departments is highlighted, indicating a possible divide in the understanding of requirements on both sides.

**Conclusion:**

In conclusion, these articles provide in-depth insights into the evolution of BPM in the AI era. While there is clear convergence occurring, including the increasing importance of artificial intelligence, modeling and adaptability to new trends, challenges remain. These challenges, whether related to deep learning, data management or awareness of cross-department collaboration, highlight the need for a comprehensive and adaptable approach to ensure the successful integration of AI into business process management. The future of BPM lies in a precise understanding of the nuances and challenges involved, and in constantly adapting to technological advances and changing market needs.

**Keywords:** Business Process Management (BPM), Artificial Intelligence (AI), Digital transformation, Deep learning, Advanced analytics, Process automation, Bayesian model, Predictive analysis, Machine learning, Process mining, Semantic interoperability, Semantic modeling, Business Process Analytics (BPA), Explanatory AI, Continuous improvement