

Review Article

ENHANCING COMPLEX DECISION MAKING IN BPM THROUGH ARTIFICIAL INTELLIGENCE: A SYSTEMATIC EXAMINATION

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ABSTRACT

The Artificial Intelligence (AI) has been attributed a significant role in Business Process Management (BPM) and has substituted the paradigm of decision-making strategies of organizations with the complexity of the operational systems. This critical review focuses on the relation of AI and BPM and how smart systems are transforming the complexity of the workflow in decision making capability and efficiency of work in an organization. The literature review will be performed to determine the most significant AI methods and integration models and determine the position of AI in improving the processes. The paper confirms that AI-enhanced BPM suites are reported to achieve high returns in predictive analytics, process automation, and strategic decision support, and are also ineffective in implementation and integration issues. Based on our results, the cognitive AI that successfully gets integrated into BPM must be a formal procedure, which integrates the aspects of cognitive computing with the more commonly recognized process management concepts. The research can be useful in formulating the manner in which AI can alter business process decision-making paradigm.0.

Keywords: Business Process Management, Artificial Intelligence, Decision Making, Process Automation, Cognitive Computing, Digital Transformation

INTRODUCTION

The integration of AI with Business Process Management (BPM) has paradigm-shifting aspects in contrast to the traditional ways of process optimization based on rules. The conventional BPM systems have been performing quite well in the area of standardisation of routine procedures, yet they fail in dynamic areas, which require expedited changes and ingenious responses to dynamic situations [Kokala \(2024\)](#). Recent statistics in the industry indicate that organizations with conventional systems of BPM record a low success rate of 43% in managing unanticipated changes in the process, whereas AI-based systems record 78% success rates in the same cases. It has led to the need to use AI-enhanced BPM to process an ever-increasing amount of data in real-time and give an organization predictive strategic decision.

The traditional BPM systems due to their strict prescriptions cannot semantically respond to uncommon cases, demonstrate the implications and make positive decisions depending on time aspects. The AI-based learning software provides learning capabilities that are operating on the historical data, trend identification, and anticipation of the future process behavior, and all these are grounded on cognitive functions.

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This evolution makes BPM proactive, predictive and prescriptive management. As the ability of BPM is enhanced with AI, even organizations can anticipate what they require in relation to the processes and streamline processes prior to issues develop, a conceptual change in approach to the intelligent process management systems of the future.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

1) Evolution of BPM and AI Integration

Several of the key AI approaches have been demonstrated in systematic literature reviews to be useful in business processes settings. [Gomes et al. \(2022\)](#) mention a thorough study of artificial intelligence-related business processes, and methodologies of machine learning algorithms, natural language processing, and expert systems are the most important technologies in the BPM innovation [Gomes et al. \(2022\)](#).

Figure 1

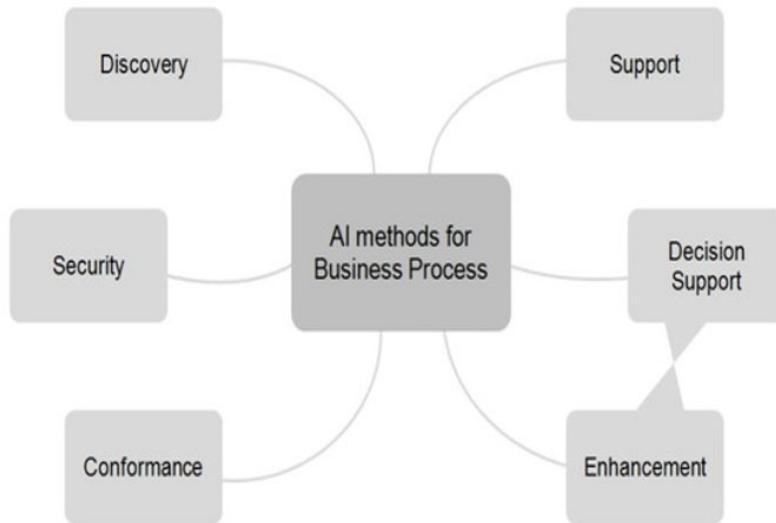


Figure 1 Artificial Intelligence-Based Methods

Source: <https://www.mdpi.com/2076-3417/12/5/2314>

Research shows that organizations that apply machine learning algorithms in their BPM systems realize a mean decrease in the process execution time by 34% and increased the accuracy of decisions by 52%. In the meantime, organizations that utilize natural language processing claim that processing a document is 67 times quicker than when it is done manually. Applications of these methodologies cross the various fields of process management in the lines of process discovery, conformance checking, performance prediction, and decision support. The tool approaches address specific complexities of the processes and machine learning algorithms, particularly excelling at pattern recognition and prediction modelling, but natural language processing enables human-system interaction to be improved and document processing automated.

2) Predictive Business Process Management

One of the greatest values of AI in BPM systems is predictive abilities. [Abbasi et al. \(2024\)](#) discuss the role of AI and machine learning in predictive business process management and identify the techniques or methods that could be used to predict future process behaviours, in terms of process enhancement and improvement [Abbasi et al. \(2024\)](#).

The predictive aspect of AI-enabled BPM allows an organization to shift out of reactive problem-solving and into proactive process optimization. AI systems can be used to derive insights based on analysing previous process data to indicate bottlenecks, process resource needs, and areas of potential failure so that organizations can act proactively instead of responding to events happening.

Figure 2

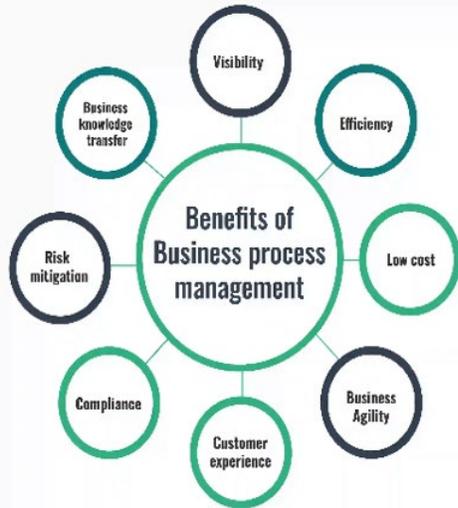


Figure 2 Business Process Management Benefits

Source: <https://www.mega.com/blog/what-is-business-process-management-bpm>

3) Process Automation and Emerging Technologies

The combination of AI with BPM has been revolutionary in process automation. In the study by Oliveira et al. (2025) the use of BPM in conjunction with the emergent technologies is discussed in regards to the process improvement of both services and industrial processes based on systematic automation Oliveira et al. (2025).

Such automation higher than basic automation of workflow and also to having some intelligence in the decision-making process of the automatic systems. Automation systems with the ability to respond to changing conditions, logically deal with exceptions, and optimise process flows based on analysis of live data will be a major improvement on the rigid automation systems presently used.

FRAMEWORK FOR AI-ENHANCED DECISION MAKING

1) Research Approach

This thorough paper is based on the broad literature research approach and examines peer-reviewed articles, conference papers, and technical reports published within the scope of 2022-2025. The paper is dedicated to the definition of the trends, patterns, and empirical evidence related to the improvement of the decision-making process with the help of AI in the BPM settings.

The research methodology presupposes the use of both the quantitative and qualitative analysis methods, but it evaluated case studies, implementation's structure, and performance measurements published in the literature. This will have a wholesome insight into theory and its application to AI, as far as BPM is concerned.

2) Framework for AI-Enhanced Decision Making

Resting on the review of literature, it is possible to develop a conceptual model, that is, describe how the AI enhances the use of decision-making in BPM in multiple layers that are interdependent:

Cognitive Layer: The bottom-level deals with the integration of machine-learning algorithms, the principle of natural language processing, and pattern-recognition skills to make the system learn and comprehend the process of data.

Analytics Layer: Additionally, cognitive functions, this layer contains predictive and prescriptive analytics to enhance complicated decision-making that forecasts the result of processes and give the optimal line of action.

Integration Layer: The layer offers an easy introduction of the AI capabilities and the old BPM infrastructure without affecting the consistency of the processes, but with additional opportunities of facilitating decision-making.

Optimization Layer: The final layer is continuous improvement, by which AI insights can be applied to keep on improving process designs, allocation of resources, and performance metrics.

KEY FINDINGS AND ANALYSIS

1) Value Creation Through BPM-AI Integration

The research by [Zebec and Indihar Stemberger \(2023\)](#) highlights that the process of constructing AI business value, of BPM capabilities, should be comprehensive that the technological capabilities should be interconnected with organizational goals [Zebec and Indihar Stemberger \(2024\)](#). Their findings reveal that the AI-based integration of BPM ensures the quantitatively effective growth in the efficiency, decision accuracy, and enhancement of agility on the organizational level. The study discovered that organizations that had successfully integrated AI-BPM claimed 41 percent decrease in operational efficiency and 29 percent decrease in decision making time and almost 85 percent of the executives indicated an increase in strategic agility.

Figure 3

Path	Relations	Unstandardised weights	Indirect effect	Z-score
AI → BPA → DMP → OP	AI → BPA	0.715 (0.063)	0.022* (0.012)	1.981 ^{§§}
	BPA → DMP	0.146 (0.063)		
	DMP → OP	0.215 (0.053)		
AI → BPA → DMP → BPP → OP	AI → BPA	0.715 (0.063)	0.013* (0.008)	
	BPA → DMP	0.146 (0.063)		
	DMP → BPP	0.278 (0.079)		
AI → OL → DMP → OP	BPP → OP	0.455 (0.048)	0.040*** (0.013)	3.261 ^{§§§§}
	AI → OL	0.576 (0.065)		
	OL → DMP	0.321 (0.046)		
AI → OL → DMP → BPP → OP	DMP → OP	0.215 (0.053)	0.023** (0.010)	
	AI → OL	0.576 (0.065)		
	OL → DMP	0.321 (0.046)		
AI → OL → BPP → OP	DMP → BPP	0.278 (0.079)	0.086*** (0.024)	4.191 ^{§§§§}
	BPP → OP	0.455 (0.048)		
	AI → OL	0.576 (0.065)		
AI → BPII → DMP → OP	OL → BPP	0.330 (0.060)	0.023*** (0.010)	2.875 ^{§§§§}
	BPII → OP	0.455 (0.048)		
	AI → BPII	0.304 (0.058)		
AI → BPII → DMP → BPP → OP	BPII → DMP	0.350 (0.054)	0.013*** (0.006)	
	DMP → OP	0.215 (0.053)		
	AI → BPII	0.304 (0.058)		
AI → BPIR → BPP → OP	DMP → BPP	0.278 (0.079)	0.045*** (0.016)	3.209 ^{§§§§}
	BPP → OP	0.455 (0.048)		
	AI → BPIR	0.241 (0.052)		
	BPIR → BPP	0.413 (0.082)		
	BPP → OP	0.455 (0.048)		

Note(s): + Boot Standard errors are indicated within the parentheses. **p* < 0.05, ***p* < 0.01, ****p* < 0.001.
^{§§} 2-tail z-score = $\frac{a*b*c}{\sqrt{a^2*SE_b^2 + a^2*c^2*SE_c^2 + b^2*c^2*SE_a^2}}$ for serial multiple mediation effect

Figure 3 Results of the Serial Multiple-Mediation Analysis
Source: [Zebec and Indihar Stemberger \(2023\)](#)

Value creation process entails a number of key considerations, including: the preparation level of an organization to adopt AI, the technical hurdles capability of the organization to accommodate, and the match of AI capabilities with targeted business processes requirements. Companies that are successful at the integration level also tend to be more mature and technologically advanced in processes.

2) Next-Generation BPM Systems

[Hildebrand et al. \(2024\)](#) give a hint on the future of BPM systems due to the fact that they review systematic literature on cognitive computing enhancement in BPM [Hildebrand et al. \(2024\)](#). Based on their investigation, cognitive BPM systems have been shown to perform better when dealing with complex, non-routine decisions that need an understanding of the contexts and flexible responses.

Figure 4



Figure 4 Business Process Management

Source: <http://www.colombus.com/business-process-management.html>

The new advanced AI technologies that are featured in these next-generation systems made the decision-making process more sophisticated, in terms of deep and, reinforcement learning, and cognitive computing architectures. The systems can cope with ambiguous incidents, learn by experience, and model their decision-making processes in response to changing environmental settings.

3) AI-Enhanced Business Intelligence

It has been observed that the combination of AI and business intelligence systems, particularly in decision awareness in complex processes, has been an effective strategy. Siddiqui (2025) discusses how BI systems combining AI can be used to optimise business decisions with systematic, data-driven insights within business, financial, and strategic planning Siddiqui (2025).

These systems also provide an advanced analytics capability to decision-makers, more than reporting to providing predictive modeling, scenario analysis, and a recommendation system. The AI-based approach is able to make more efficient decisions, as it is based on the possibility to withstand more available information and locate the patterns that would barely become visible to the members of the human team.

4) Knowledge Management Integration

Another valuable AI-enabled decision-making development is the combination of BPM and knowledge management systems. To investigate this integration, Berniak-Woźny and Szelągowski (2024) refer to the fact that the situation where knowledge management enhances the context of decision-making in the BPM systems is mentioned Berniak-Woźny and Szelągowski (2024).

This combination may cause exploitation of institutional knowledge, best practices and expertise by organizations in the decision-making process. The AI systems can access the organizational knowledge that can be utilized in the process of making decisions that are more informed and contribute new knowledge based on the experiences and results of the process.

IMPLEMENTATION CHALLENGES AND CONSIDERATIONS

1) Technical Integration Challenges

There are a few technical issues to be faced during the implementation of AI-enhanced BPM systems owned by an organization. According to Bharadiya (2023), the main challenges comprise the complexity of the system integration, the levels of the required data quality, and the specialized technical expertise that would be required Bharadiya (2023). Survey data reveals that 68% of organizations struggle with data quality issues during AI-BPM implementation, while 72% report difficulties in finding skilled technical personnel. About 45% of projects experience delays due to integration complexities.

Technical integration must be carefully considered and should be based on the existing architectures, data formats and processing specifications. In addition to that, organizations must ensure that AI elements can effectively interface with the existing BPM system without compromising system performance or reliability.

2) Organizational Change Management

The technical consideration will not be sufficient to integrate AI successfully into BPM as it will entail a comprehensive organization change management. The codified rule-based strategy that involves migration of programs to the faster artificial intelligence systems can potentially require radical business, corporation, training, and practice processes [Huy and Phuc \(2025\)](#).

Change management should also look at managing employee apprehension of adopting AI, and ensure training and development are availed as well as infrastructural changes to accommodate the new AI-empowered operations. In some cases, the human element is as important as the technical one in implementation.

3) Process Mining and AI Integration

There exist both opportunities and challenges in combining the techniques of process mining with the capabilities of AI. [Chaima and Khebizi \(2022\)](#) present an outline on how to exploit business process models in mining using artificial intelligence methods and how AI can be used to improve process discovery and its analysis [Chaima and Khebizi \(2022\)](#).

Figure 5

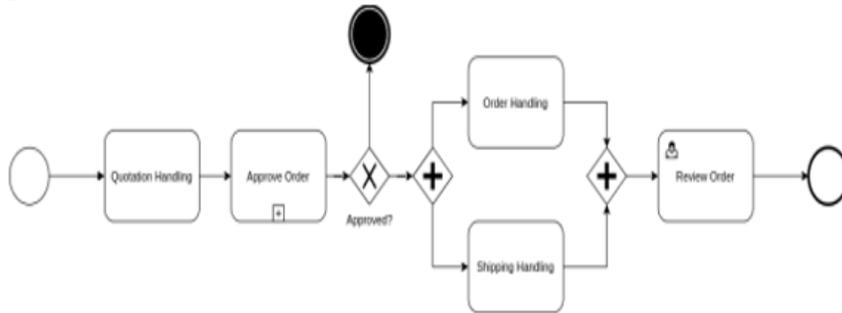


Figure 5 BPMN of Online Order Management Application's

Source: [Chaima and Khebizi \(2022\)](#)

AI-integrated process mining techniques allow organizations to automatically identify process patterns, find areas of potential improvement, and identify process deviations. These capabilities are, however, only implemented with the advanced data processing infrastructure and expertise in the analytical field.

EMERGING TECHNOLOGIES AND FUTURE DIRECTIONS

1) Generative AI in BPM

The latest advances in generative AI have presented the opportunity to improve BPMs. ProcessGPT and other AI-based business process management generators are discussed in the article by [Beheshti et al. \(2023\)](#) as an example of how the evolution of business processes can be significantly changed due to the introduction of natural language interfaces and automatic creation of complex business processes [Beheshti et al. \(2023\)](#).

Generative AI technologies are more natural and offer the human-system interaction; BPM systems can be addressed in natural language by process designers and participants. This is a major feature that reduces the technical edifice to BPM system utilization and enables the organization to patronize the entity more.

2) Dynamic Decision-Making Capabilities

It is an enormous move towards AI-based BPM with the development of dynamic decision-making capabilities. [Huy and Phuc \(2025\)](#) discuss the contribution of the BPM capabilities to the enrichment of the dynamic decision-making to the effective and sustainable digital transformation [Huy and Phuc \(2025\)](#).

Dynamic decision-making systems are able to update the decision criteria given the changing environmental conditions through learning the past decision outcomes. This is significant in a fast moving corporate world where set rules of business decision making are rendered extinct in quick succession.

3) AI-Augmented BPM Systems

The research of AI-enhanced business process management solutions offered by [Dumas et al. \(2023\)](#) includes a map of the future research directions and implementation significances [Dumas et al. \(2023\)](#). The analysis gives the areas of the research as intelligent process discovery, adaptive process execution and cognitive process monitoring.

IMPLICATIONS AND RECOMMENDATIONS

1) Strategic Implications

The AI in BPM will have critical business strategy employment. AI-enhanced BPM systems are extremely advantageous to companies capable of implementing them since they are known to increase the rate and accuracy of a decision, in addition to conferring consistency in the decisions. Achieving AI-enhanced BPM will need the commitment of an executive to allocate the appropriate resources and have a vision on how it fits organizational goals. Organizations are to build holistic AI plans that take into account BPM considerations as part of the larger plan rather than distinct projects.

2) Implementation Recommendations

Based on the systematic study, it is possible to make several recommendations to organizations aiming to improve their decision-making process with the help of AI-based BPM:

Gradual Integration Approach: Organizations should adopt a phased implementation approach, beginning with pilot projects in specific process areas before expanding to enterprise-wide deployment.

Investment in Data Quality: High-quality data is needed to implement AI successfully. The organizations need to invest in data governance, cleansing, and management competencies to facilitate AI-enhanced decision-making.

Skill Development: The organisation seeks to learn how to use technical capabilities of AI and how to run a process. This often needs specifically-developed training programs and recruitment.

Change Management: An sufficient change management should also be consider in effecting the adoption of the AI-enhanced processes in the company.

3) Future Research Directions

Certain directions are also few and should be where the further research should be directed. Further development of AI-BPM integration systems, which are specific to industries, would offer more specific advice. Better to the point, the aspect of the AI decision-making business use, in its turn, regarding the ethical consideration, should be investigated, of course, within the frames of transparency and accountability.

More sophisticated measures should be anchored on the success of the AI-BPM integration that would measure the outcome of performance and qualitative measures which would touch on the organizational agility and quality decision making processes. [Moreira et al. \(2024\)](#) state the significance of systematic approach in small and medium business, which proves that, the need to work out the scalable approach implementation methodology that must be applied in the organizations of other sizes and maturity levels [Moreira et al. \(2024\)](#).

CONCLUSION

The transformational prospect of the hybridization of Artificial Intelligence (AI) on Business Process Management (BPM) is illuminated in this review paper to revitalize the intricate process of making decision in companies. Time after time, research indicates that AI optimized BPM strategies are more accurate in their decision-making, faster and adaptable as compared to traditional strategies. Among the significant success factors recognized, there are organizational preparedness, technical infrastructure, information quality and change management. Generative AI and cognitive computing are the next-generation technologies that will take the BPM decision-making to the next level as it can understand the nature of significantly more complex problems and provide a more sophisticated human-machine interaction. The fusion of AI and BPM presupposes responding to technical, organizational, even establishment of the required competencies in order to attain them since the general change is obligatory. Measurements of the success, ethical considerations, and industry-specific frameworks are some of the problems which the future researchers are to consider. Finally, the AI-based BPM systems will turn out to be the new era of the management of processes within the organisations to allow organisations to respond to the dynamic environments.

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