

Enterprise intelligence 5.0: Human + AI + Analytics

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Abstract: *Enterprise Intelligence 5.0 represents a new organizational intelligence paradigm that integrates human expertise, artificial intelligence, advanced analytics, organizational knowledge, and intelligent decision-support technologies into a unified enterprise environment. The concept extends traditional Business Intelligence by shifting organizational intelligence from retrospective reporting toward predictive, adaptive, collaborative, and human-cantered decision-making. The development of Industry 5.0 has emphasized the importance of human-centricity, sustainability, resilience, and collaboration between humans and intelligent technologies, providing an important foundation for Enterprise Intelligence 5.0 (Breque et al., 2021). The human-cantered perspective is further reinforced by research describing Industry 5.0 as an environment in which advanced technologies augment human capabilities rather than simply replace human activities (Nahavandi, 2019). At the same time, the evolution from Industry 4.0 toward Industry 5.0 demonstrates increasing attention to the integration of technological intelligence with human values, creativity, and decision-making (Xu et al., 2018). Enterprise Intelligence 5.0 combines Business Intelligence, big data analytics, machine learning, deep learning, generative artificial intelligence, predictive analytics, explainable AI, and human-AI collaboration. Traditional Business Intelligence primarily transforms organizational data into reports and analytical information, whereas advanced enterprise intelligence seeks to transform data into predictive insights, recommendations, and coordinated decisions. Business Intelligence and analytics have evolved significantly as organizations increasingly use large-scale data and analytical techniques to improve decision-making and organizational performance (Chen et al., 2012). The strategic importance of analytics has also been established through research demonstrating how analytical capabilities can support competitive advantage and organizational decision-making (Davenport & Harris, 2007). The proposed Enterprise Intelligence 5.0 framework places human intelligence at the center of AI-enabled analytics. Human-AI collaboration is particularly important because machines can process large volumes of information, identify patterns, and generate predictions, while humans contribute contextual knowledge, creativity, ethical reasoning, strategic understanding, and accountability. Human-machine collaboration has been identified as a fundamental characteristic of Industry 5.0 environments (Longo et al., 2020), while human-robot collaboration research demonstrates how complementary human and technological capabilities can create new organizational possibilities (Demir et al., 2019). The concept of Hybrid Intelligence further*

explains how human and artificial intelligence can be combined to achieve outcomes that are difficult to achieve through either capability independently (Dellermann et al., 2019). Enterprise Intelligence 5.0 also requires appropriate organizational structures for distributing decision authority between humans and AI systems. Human-AI collaborative decision-making should therefore be treated as an organizational design challenge involving decision rights, responsibilities, information flows, and accountability (Puranam, 2021). The development of hybrid intelligence systems similarly requires mechanisms that support continuous interaction and learning between humans and intelligent technologies (Dellermann et al., 2021). Recent Industry 5.0 research additionally emphasizes knowledge integration and human-AI collaboration through intelligent architectures and knowledge-based technologies (Rožanec et al., 2022; Krause et al., 2024). This research proposes an integrated Enterprise Intelligence 5.0 framework based on five interconnected capabilities: enterprise data management, advanced analytics, artificial intelligence, human intelligence, and collaborative decision-making. The framework incorporates explainable AI, responsible governance, organizational learning, and continuous feedback to ensure that AI-generated insights remain understandable and actionable. Recent developments in agentic AI further indicate that intelligent systems may increasingly act as strategic cognitive partners within organizations, creating new opportunities as well as governance challenges (Ahmad Chardhiwal & Carbon, 2026). The proposed framework therefore seeks to establish a balanced relationship between automation and human judgment, enabling enterprises to become more adaptive, intelligent, resilient, and capable of achieving sustainable business value.

Keywords: Enterprise Intelligence, Artificial Intelligence, Business Analytics, Human-AI Collaboration, Intelligent Decision-Making

Introduction

Organizations increasingly operate in environments characterized by large volumes of data, rapidly changing markets, complex customer expectations, interconnected digital systems, and continuous technological disruption. Traditional Business Intelligence systems have played an important role in transforming organizational data into reports, dashboards, and analytical information that support managerial decision-making. However, the increasing complexity and scale of enterprise data have created a need for more advanced intelligence capabilities that can predict future events, identify hidden patterns, recommend actions, and support continuous organizational learning. Enterprise Intelligence 5.0 emerges as a conceptual response to this requirement by integrating human intelligence, artificial intelligence, and advanced analytics into a collaborative organizational framework.

The development of Enterprise Intelligence 5.0 is closely associated with the transition from Industry 4.0 toward Industry 5.0. Industry 5.0 emphasizes human-centricity, sustainability, and resilience and argues that technological development should support broader human and organizational objectives rather than focus exclusively on automation and productivity (Breque et al., 2021). The human-centric dimension of Industry 5.0 is particularly important because enterprise intelligence involves decisions that may affect employees, customers, suppliers, communities, and other stakeholders. AI technologies must therefore be designed to augment human capabilities and support meaningful human participation in decision-making (Nahavandi, 2019). The transition toward Industry 5.0 also reflects the growing recognition that future organizations require a stronger relationship between human capabilities and advanced technologies (Xu et al., 2018).

The concept of human-machine collaboration is central to this transformation. Industry 5.0 research emphasizes the possibility of creating collaborative environments in which humans and intelligent machines perform complementary activities rather than operating as independent systems (Longo et al., 2020). Human-robot collaboration provides another example of this principle by demonstrating how technological systems can work alongside humans while benefiting from human expertise and flexibility (Demir et al., 2019). Although these studies frequently focus on industrial environments, their principles can be extended to enterprise intelligence, where humans collaborate with software agents, analytical systems, recommendation engines, generative AI, and predictive models.

The growing importance of artificial intelligence has further transformed enterprise analytics. AI systems can analyze large and complex datasets, recognize patterns, classify information, generate predictions, and support automated reasoning. Modern AI therefore provides capabilities that extend beyond traditional reporting and visualization. However, organizational intelligence cannot be reduced to computational processing because many business decisions involve ambiguity, ethical considerations, organizational context, and strategic judgment. Artificial intelligence should consequently be positioned as a complementary capability rather than an independent replacement for human intelligence. The broader AI literature emphasizes intelligent agents, reasoning, learning, perception, planning, and decision-making as interconnected dimensions of artificial intelligence (Russell & Norvig, 2021).

Business Intelligence and analytics provide the technological foundation for this transformation. The development of BI&A has progressed from traditional reporting toward advanced analytics, predictive modelling, and increasingly sophisticated data-driven decision-support capabilities (Chen et al., 2012). Analytics can provide organizations with strategic advantages when they are embedded into organizational processes and managerial decision-making rather than treated as isolated technical functions (Davenport & Harris, 2007). Enterprise Intelligence 5.0 expands this perspective by integrating AI with human expertise and creating a continuous intelligence lifecycle in which data are transformed into insights, insights are evaluated by humans, decisions are implemented, and outcomes are fed back into future analytical processes.

Big data analytics is particularly important because modern enterprises generate data through enterprise applications, digital transactions, customer interactions, Internet-connected devices, social platforms, operational systems, and external information sources. Organizational performance depends not only on the existence of data but also on the ability to acquire, integrate, manage, analyze, and operationalize it. Big data analytics capability has been associated with organizational performance through combinations of technological, managerial, human, and relational capabilities (Akter et al., 2016). Similarly, analytics capabilities can support dynamic organizational capabilities that allow enterprises to respond more effectively to changing environments (Wamba et al., 2017).

Enterprise Intelligence 5.0 therefore represents more than the deployment of AI technologies. It requires organizational transformation involving data governance, analytical maturity, employee capabilities, AI literacy, decision structures, and responsible governance. Research on big data analytics demonstrates that analytical capabilities influence organizational performance when they are appropriately integrated with business strategy and organizational processes (Yasmin et al., 2020). Enterprise Intelligence 5.0 extends this idea by introducing human-AI collaboration as a central mechanism through which analytical information becomes organizational intelligence.

Predictive analytics is another important component. Traditional Business Intelligence often explains what happened, while predictive analytics focuses on what is likely to happen. The distinction between explanatory and predictive modelling is important because a model that explains historical relationships may not necessarily provide the most accurate predictions of future outcomes (Shmueli & Koppius, 2011). Enterprise Intelligence 5.0 therefore combines descriptive, diagnostic, predictive, and prescriptive analytics with human interpretation and decision-making.

The objective of this research is to propose an integrated Enterprise Intelligence 5.0 framework that connects human intelligence, AI, analytics, organizational knowledge, explainability, governance, and continuous learning. The framework seeks to create an enterprise environment in which AI systems enhance rather than replace human capabilities. Through this approach, organizations can develop stronger analytical capabilities, improve decision quality, increase organizational agility, and create a sustainable foundation for intelligent digital transformation.

Literature Review

The literature underlying Enterprise Intelligence 5.0 can be divided into several interconnected research areas, including Industry 5.0, human-centric artificial intelligence, Business Intelligence, big data analytics, predictive analytics, hybrid intelligence, explainable AI, and organizational transformation. The convergence of these areas provides the theoretical foundation for developing an enterprise environment in which humans and intelligent systems jointly generate and apply organizational intelligence.

Industry 5.0 provides the human-centred foundation for the proposed concept. The European perspective on Industry 5.0 emphasizes human-centricity, sustainability, and resilience as major

principles for future industrial systems (Breque et al., 2021). This perspective represents a significant development beyond Industry 4.0 because technological progress is no longer evaluated exclusively through automation, productivity, and efficiency. Instead, technological systems are expected to contribute to human well-being and broader organizational and societal objectives. This principle directly supports Enterprise Intelligence 5.0 because business intelligence systems influence organizational decisions and therefore need to account for human values, organizational context, and stakeholder interests.

The human-centric nature of Industry 5.0 is further emphasized through research describing the transition toward human-machine collaboration. Industry 5.0 can be understood as a human-centric technological paradigm in which intelligent systems augment human capabilities rather than simply replacing workers (Nahavandi, 2019). This perspective is important for Enterprise Intelligence 5.0 because AI-enabled analytics can potentially automate analytical tasks while simultaneously creating new opportunities for employees to focus on interpretation, creativity, strategy, and complex problem-solving.

The evolution from Industry 4.0 to Industry 5.0 also highlights the increasing integration of technological and human capabilities. Industry 5.0 extends the technological foundation of Industry 4.0 by incorporating human values, sustainability, and resilience into intelligent production and organizational systems (Xu et al., 2018). Enterprise Intelligence 5.0 similarly extends traditional Business Intelligence by integrating advanced AI with human decision-making and organizational knowledge.

Human-machine collaboration represents another major component of the literature. Human-machine cooperation can create a symbiotic environment in which intelligent systems perform computationally intensive tasks while humans provide creativity, context, and judgment (Longo et al., 2020). The concept is also reflected in human-robot collaboration research, which demonstrates that human flexibility and machine precision can be combined to create collaborative production environments (Demir et al., 2019). Although the original applications often concern manufacturing, the underlying principle is relevant to enterprise intelligence because humans and AI systems can perform complementary analytical and decision-making tasks.

The organizational design implications of AI collaboration are especially important. Human-AI collaboration changes how information is generated, distributed, interpreted, and used in organizations. Decision authority may increasingly be shared between human managers and algorithmic systems, requiring organizations to define appropriate boundaries and responsibilities. This problem can be viewed as an organizational design challenge because AI changes the structure of decision-making and coordination (Puranam, 2021). Enterprise Intelligence 5.0 therefore requires explicit mechanisms for determining when AI recommendations should be accepted, reviewed, modified, or rejected by humans.

Hybrid Intelligence provides a theoretical framework for addressing these challenges. Hybrid Intelligence refers to systems that combine human and artificial intelligence to produce capabilities and outcomes that are difficult to achieve through humans or machines alone

(Dellermann et al., 2019). The concept is highly relevant to Enterprise Intelligence 5.0 because the proposed framework does not assume that AI should replace human decision-makers. Instead, AI systems and humans are treated as complementary components of a broader intelligence system.

The development of hybrid intelligence also requires appropriate system design. Human-AI collaboration must support communication, feedback, learning, and adaptation between humans and machines (Dellermann et al., 2021). This perspective suggests that Enterprise Intelligence 5.0 should be designed as an interactive intelligence environment rather than a one-directional pipeline in which AI produces outputs and humans merely consume them. Employees should be able to provide feedback, challenge recommendations, provide contextual information, and influence future system behaviour.

Human-centred AI architectures provide additional support for this approach. AI architectures for Industry 5.0 increasingly incorporate human users, decision-making, explainability, feedback, and contextual interaction into the system design (Rožanec et al., 2022). Such architectures emphasize that AI effectiveness depends not only on model accuracy but also on the quality of human interaction. Enterprise Intelligence 5.0 therefore incorporates a human interaction layer through which organizational users can interpret and evaluate AI-generated intelligence.

Knowledge integration is also essential because enterprise knowledge is distributed across multiple organizational functions. Knowledge graphs and related semantic technologies can support the integration of structured and unstructured organizational knowledge with AI systems (Krause et al., 2024). Such capabilities can help AI systems understand organizational terminology, relationships, processes, and domain-specific information. Within Enterprise Intelligence 5.0, knowledge integration can therefore improve contextual reasoning and make AI recommendations more relevant to enterprise environments.

The emerging development of agentic AI introduces an additional dimension to enterprise intelligence. Agentic AI systems can potentially execute multi-step tasks, coordinate activities, monitor environments, and generate strategic recommendations. Recent research on agentic AI and Industry 5.0 suggests that AI agents may increasingly function as cognitive partners in innovation leadership rather than merely as automation tools (Ahmad Chardhiwal & Carbon, 2026). This development could substantially expand enterprise intelligence capabilities but also increases the importance of governance, transparency, accountability, and human oversight. Business Intelligence provides the analytical foundation for these developments. Business Intelligence and analytics research demonstrates the evolution of organizational analytics from traditional reporting toward advanced analytical approaches that support complex decision-making (Chen et al., 2012). Organizations increasingly use analytics to identify patterns, evaluate performance, forecast outcomes, and support strategic decisions. Analytics can become a competitive capability when organizations successfully integrate data, analytical expertise, technology, and managerial processes (Davenport & Harris, 2007).

Big data analytics capability is particularly important for enterprise intelligence because modern organizations generate data at increasing volume, velocity, variety, and complexity. Organizations need appropriate technological infrastructure, management practices, analytical skills, and organizational relationships to convert large-scale data into business value. Research identifies big data analytics capability as a multidimensional organizational capability involving infrastructure, management, personnel, and relational factors (Akter et al., 2016). These findings indicate that Enterprise Intelligence 5.0 cannot be implemented simply by purchasing AI software; organizations must also develop the human and organizational capabilities required to use it effectively.

Dynamic capabilities provide another important perspective. Organizations need the ability to sense changes, interpret information, adapt processes, and respond to emerging opportunities and threats. Big data analytics capabilities can strengthen such dynamic capabilities and contribute to firm performance (Wamba et al., 2017). Enterprise Intelligence 5.0 builds upon this relationship by using AI to accelerate sensing and analysis while relying on human expertise to interpret organizational consequences and determine appropriate responses.

Research also demonstrates that different dimensions of big data analytics capability can influence organizational performance. An integrated decision-making perspective shows that analytical capabilities can support firm performance when technology, organizational processes, and strategic objectives are appropriately aligned (Yasmin et al., 2020). Enterprise Intelligence 5.0 therefore requires strategic alignment between AI capabilities and organizational objectives.

The relationship between big data analytics capability and organizational performance has also been examined through organizational and technological dimensions (Garmaki et al., 2016). Such research emphasizes that infrastructure alone is insufficient to produce business value. Human skills, managerial capabilities, analytical culture, and organizational processes are also important. Enterprise Intelligence 5.0 incorporates these elements by treating employees and managers as active components of the intelligence architecture.

Predictive analytics represents a further development in enterprise intelligence. Traditional reporting focuses primarily on historical performance, while predictive analytics attempts to estimate future outcomes. Predictive and explanatory models should be distinguished because a model that provides strong explanations of historical relationships may not necessarily produce strong predictions (Shmueli & Koppius, 2011). Enterprise Intelligence 5.0 incorporates predictive analytics to support forecasting, risk identification, demand estimation, resource planning, and proactive decision-making.

Advanced analytics also requires appropriate organizational management. Analytics can improve decision quality when organizations develop processes for integrating analytical outputs into operational and strategic decisions (Davenport et al., 2012). Enterprise Intelligence 5.0 therefore includes a decision-support layer that translates AI-generated predictions into actionable recommendations while preserving appropriate human authority.

Explainable AI is another important research area. Complex AI models may generate accurate predictions without providing intuitive explanations of how those predictions were produced. Explainable AI methods can provide information about the features or factors that contribute to individual model outputs. The SHAP framework provides a unified approach for interpreting machine learning predictions through feature contribution values (Lundberg & Lee, 2017). Such techniques can be valuable in enterprise intelligence because managers often need to understand why an AI system recommends a particular action.

However, explainability does not automatically guarantee improved decision-making. Meta-analytic research indicates that explainable AI can influence human decision-making, but its effectiveness varies depending on task characteristics, explanation quality, and human interaction (Schemmer et al., 2022). Research examining human decision-making with AI also demonstrates that AI predictions can improve decision performance, although explanations may not always provide additional benefits (Alufaisan et al., 2020). This suggests that Enterprise Intelligence 5.0 should use explainability strategically rather than treating it as a universal solution.

The possibility of misleading or imperfect explanations represents an additional concern. Imperfect XAI explanations can affect how users interpret AI predictions and may influence the degree to which humans rely on AI systems (Morrison et al., 2023). Enterprise Intelligence 5.0 should therefore communicate uncertainty, model limitations, confidence levels, and contextual information together with explanations.

Deep learning provides important computational capabilities for Enterprise Intelligence 5.0. Deep learning systems can learn complex representations from large-scale data and support applications involving natural language, image recognition, anomaly detection, forecasting, and other analytical tasks (Goodfellow et al., 2016). However, increased model complexity can also increase interpretability and governance challenges, making human oversight increasingly important.

Artificial intelligence more broadly encompasses learning, reasoning, perception, planning, and intelligent decision-making (Russell & Norvig, 2021). Enterprise Intelligence 5.0 can therefore be understood as an organizational implementation of intelligent-agent principles in which AI systems interact with data, humans, business processes, and organizational goals.

Overall, the literature demonstrates that Enterprise Intelligence 5.0 emerges through the convergence of human-centred Industry 5.0, Business Intelligence, big data analytics, artificial intelligence, predictive analytics, hybrid intelligence, explainable AI, and organizational transformation. The literature also establishes that technology alone is insufficient. Human expertise, organizational capabilities, governance, strategic alignment, explainability, and continuous learning are necessary to convert AI capabilities into sustainable enterprise intelligence.

Proposed Enterprise Intelligence 5.0 Framework: Human + Ai + Analytics

The proposed Enterprise Intelligence 5.0 framework integrates enterprise data, analytics, artificial intelligence, human expertise, organizational knowledge, and decision-support mechanisms into a unified intelligence ecosystem. The framework is based on the principle that enterprise intelligence should emerge from continuous interaction between human and machine capabilities. The human-centric principles associated with Industry 5.0 provide the conceptual foundation because they emphasize that intelligent technologies should enhance human capabilities while supporting resilient and sustainable organizations (Breque et al., 2021). The proposed framework therefore positions humans as active participants throughout the intelligence lifecycle rather than as passive consumers of AI-generated information.

The first component is the enterprise data foundation, which integrates information from enterprise resource planning systems, customer relationship management platforms, financial applications, human resources, supply chains, manufacturing systems, IoT devices, digital channels, and external data sources. Data governance, integration, quality, security, and accessibility are essential because analytical performance depends strongly on the quality of information available to AI and analytics systems. Big data analytics capability research demonstrates that infrastructure, managerial capability, personnel, and organizational relationships collectively influence the ability to create value from analytics (Akter et al., 2016). The second component is the advanced analytics layer. This layer transforms raw enterprise data into descriptive, diagnostic, predictive, and prescriptive insights. Business Intelligence has traditionally focused on reporting and historical analysis, but modern BI&A incorporates advanced analytical techniques that support prediction and decision-making (Chen et al., 2012). Enterprise Intelligence 5.0 expands these capabilities by incorporating predictive modelling, optimization, anomaly detection, simulation, scenario analysis, and AI-assisted recommendations.

The third component is the AI intelligence layer. Machine learning, deep learning, natural language processing, generative AI, computer vision, intelligent agents, and other AI techniques can process complex enterprise information and identify patterns that may not be immediately visible to human analysts. Deep learning provides powerful capabilities for learning hierarchical representations from large datasets (Goodfellow et al., 2016). AI systems can therefore function as high-speed analytical partners that augment human cognitive capabilities.

The fourth component is the human intelligence layer. Human expertise includes contextual knowledge, strategic reasoning, creativity, ethical judgment, communication, intuition, and organizational experience. These capabilities are difficult to reproduce completely through algorithms. Human-centric Industry 5.0 research emphasizes the importance of maintaining humans at the center of advanced technological systems (Nahavandi, 2019). Enterprise Intelligence 5.0 consequently uses AI to augment human capabilities rather than remove human decision authority.

The fifth component is the collaborative decision layer. AI generates predictions, recommendations, alerts, scenarios, and explanations, while human decision-makers evaluate these outputs within organizational context. Human-AI collaboration requires appropriate allocation of decision authority and responsibility (Puranam, 2021). Hybrid Intelligence research similarly emphasizes the complementary capabilities of humans and machines (Dellermann et al., 2019).

The sixth component is continuous organizational learning. Human decisions, AI predictions, operational outcomes, and user feedback are continuously captured and analysed to improve future performance. This creates a feedback loop through which the enterprise intelligence system learns from both data and human experience. The continuous interaction between humans and AI is a central characteristic of effective hybrid intelligence environments (Dellermann et al., 2021).

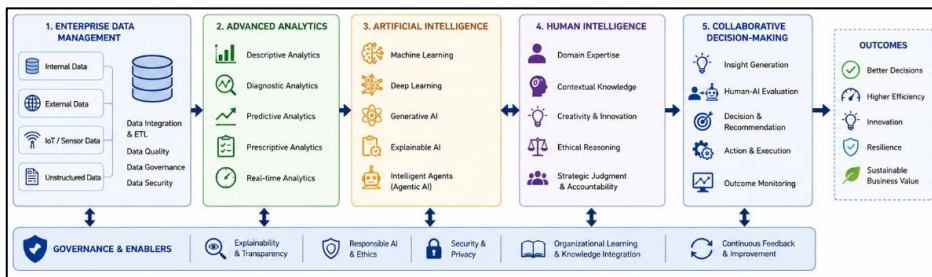


Figure 1. Proposed Enterprise Intelligence 5.0 Architecture

Figure 1 illustrates the proposed Enterprise Intelligence 5.0 Architecture, which integrates enterprise data sources, advanced analytics, artificial intelligence, human expertise, and collaborative decision-making into a unified intelligence ecosystem. The architecture demonstrates how data are transformed into actionable insights through AI-driven analytics while maintaining human oversight, contextual interpretation, and strategic judgment. Continuous feedback and organizational learning mechanisms enable the system to improve decision quality, operational agility, and business performance through ongoing human-AI collaboration.

The architecture demonstrates how enterprise intelligence evolves from raw information toward coordinated action. Knowledge integration can strengthen this architecture by connecting organizational concepts and relationships to AI systems, thereby improving contextual understanding and human-AI collaboration (Krause et al., 2024). The emergence of agentic AI may further expand the architecture by enabling intelligent agents to coordinate multi-step analytical and operational activities while remaining subject to appropriate organizational governance (Ahmad Chardhiwal & Carbon, 2026).

Human-Ai Collaboration, Explainability And Responsible Enterprise Intelligence

The defining characteristic of Enterprise Intelligence 5.0 is the structured integration of human and artificial intelligence. Traditional automation models often attempt to maximize machine autonomy, whereas the proposed model emphasizes complementary intelligence. AI systems can process large volumes of information, identify statistical relationships, detect anomalies, and generate predictions, while humans provide contextual interpretation, ethical judgment, creativity, and strategic decision-making. This approach reflects the human-centric vision of Industry 5.0 and the broader concept of technological augmentation (Longo et al., 2020).

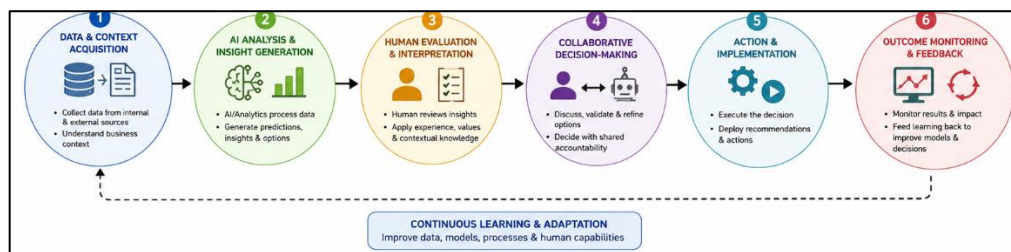


Figure 2: Human-AI Collaborative Decision Lifecycle

Figure 2 Shows how enterprise data and AI-generated insights support human evaluation, decision-making, implementation, and continuous feedback for organizational learning.

Human-AI collaboration also requires careful organizational design. When AI systems become involved in decision-making, organizations must establish how information and decision authority are distributed between employees and intelligent systems. The distribution of responsibilities becomes particularly important for high-impact decisions involving customers, employees, financial resources, safety, or regulatory requirements. Human-AI collaboration should therefore be designed according to the complexity, uncertainty, and consequences of individual decisions (Puranam, 2021).

Explainability provides an important mechanism for supporting this collaboration. Managers may be more willing to use AI recommendations when they understand the factors contributing to those recommendations. Feature attribution approaches can identify variables that contribute to individual predictions, helping users interpret model outputs (Lundberg & Lee, 2017). However, Enterprise Intelligence 5.0 should not assume that an explanation automatically makes an AI system trustworthy or correct.

Research indicates that explainable AI has context-dependent effects on human decision-making. Meta-analytic research shows that explanations can affect human-AI decisions, although their effectiveness varies according to the task and characteristics of the explanation (Schemmer et al., 2022). Research examining human decision-making with AI has also found that AI assistance can improve decision accuracy while demonstrating that explanations do not always provide additional benefits (Alufaisan et al., 2020). Imperfect explanations can potentially influence human reliance on AI in unintended ways, creating the need for careful explanation design and uncertainty communication (Morrison et al., 2023).

Responsible Enterprise Intelligence therefore requires AI systems to communicate not only predictions and recommendations but also confidence, uncertainty, data limitations, and potential risks. The organization should maintain human oversight for decisions with significant consequences. This is particularly important as agentic AI systems become more capable of performing autonomous or semi-autonomous activities. Agentic AI can potentially become a strategic cognitive partner for organizations, but its increasing autonomy requires stronger governance and accountability mechanisms (Ahmad Chardhiwal & Carbon, 2026). Organizational transformation is equally important. Employees need AI literacy, analytical skills, and opportunities to develop new capabilities. Human-robot collaboration research demonstrates that technological transformation changes the nature of work and requires appropriate coordination between people and intelligent systems (Demir et al., 2019). Enterprise Intelligence 5.0 extends this principle to knowledge workers, managers, analysts, engineers, and other professionals who increasingly interact with AI systems.

The organizational environment should also support continuous learning. Hybrid Intelligence systems become more valuable when humans can provide feedback and AI systems can adapt to organizational knowledge and experience (Dellermann et al., 2021). Knowledge graphs and semantic technologies can further support this process by integrating enterprise knowledge into AI systems (Krause et al., 2024). Consequently, Enterprise Intelligence 5.0 should be implemented as a continuous organizational learning ecosystem rather than a one-time technological project.

Results and Discussion

The proposed Enterprise Intelligence 5.0 framework demonstrates how organizations can combine human intelligence, artificial intelligence, and analytics to create a more adaptive and collaborative decision-making environment. The framework extends conventional Business Intelligence by moving from retrospective reporting toward predictive, prescriptive, and collaborative intelligence. Business Intelligence and analytics have already evolved toward advanced analytical capabilities, creating the technological foundation for this transformation (Chen et al., 2012). Enterprise Intelligence 5.0 extends this foundation through human-AI collaboration.

One of the major expected outcomes is improved decision quality. Predictive analytics enables organizations to anticipate future outcomes rather than relying exclusively on historical information. The distinction between prediction and explanation is particularly important because predictive models should be evaluated according to their ability to generalize to future observations (Shmueli & Koppius, 2011). Enterprise Intelligence 5.0 combines predictive analytics with human interpretation, allowing organizations to consider both statistical predictions and contextual knowledge.

Another expected outcome is increased organizational agility. Big data analytics can help organizations sense environmental changes, identify opportunities, and respond more quickly. Analytics capabilities can contribute to dynamic organizational capabilities and firm performance by enabling organizations to transform information into organizational action

(Wamba et al., 2017). Enterprise Intelligence 5.0 strengthens this process by integrating AI-based prediction with human decision-making.

The framework also provides a foundation for improved strategic intelligence. Analytics can support competitive advantage when organizations systematically integrate analytical capabilities into business processes and strategic decisions (Davenport & Harris, 2007). Enterprise Intelligence 5.0 extends this principle by allowing AI systems to continuously monitor enterprise environments and generate recommendations that can be evaluated by human managers.

Table I. Expected Organizational Impact of Enterprise Intelligence 5.0

Performance Dimension	Traditional BI	AI-Enabled BI	Enterprise Intelligence 5.0
Data Processing	High	Very High	Very High
Predictive Capability	Moderate	High	Very High
Decision Support	Moderate	High	Very High
Human Participation	High	Moderate	Very High
Explainability	Moderate	Moderate	High
Organizational Learning	Moderate	High	Very High
Adaptability	Moderate	High	Very High
Strategic Intelligence	High	High	Very High

Table I presents the anticipated impact of Enterprise Intelligence 5.0 across key organizational performance dimensions. The comparison highlights how the integration of human intelligence, artificial intelligence, and advanced analytics enhances predictive capabilities, decision support, organizational learning, adaptability, and strategic intelligence beyond the capabilities of traditional Business Intelligence systems. The results demonstrate the potential of Enterprise Intelligence 5.0 to create more agile, data-driven, and human-centric enterprises.

The expected results are also supported by research on organizational analytics capabilities. Big data analytics capability includes technological infrastructure as well as managerial, personnel, and relational dimensions (Akter et al., 2016). Organizations therefore need to develop analytical skills, governance mechanisms, data management capabilities, and organizational processes alongside AI technologies. Research also indicates that different dimensions of analytics capability can contribute to organizational performance when they are aligned with decision-making and organizational strategy (Yasmin et al., 2020).

The framework can also improve organizational learning. AI systems can continuously process operational data and identify emerging patterns, while humans contribute contextual

interpretation and feedback. The resulting feedback can improve future analytical performance and organizational knowledge. Hybrid Intelligence provides a theoretical explanation for this continuous learning process because human and artificial intelligence can improve through interaction (Dellermann et al., 2019).

Explainability is another important performance dimension. AI systems may produce highly accurate predictions, but enterprise users need sufficient information to understand and evaluate those outputs. Explainability techniques can identify the factors that contribute to individual model predictions (Lundberg & Lee, 2017). However, research demonstrates that the impact of explanations on human decision-making depends on context (Schemmer et al., 2022). Enterprise Intelligence 5.0 therefore treats explainability as part of a broader human-AI interaction strategy.

The framework also addresses the limitations of purely automated decision-making. Human expertise can identify organizational constraints, ethical considerations, stakeholder consequences, and contextual factors that may not be represented in enterprise datasets. Human-centric AI research emphasizes the importance of designing intelligent systems around human needs and capabilities (Rožanec et al., 2022). This supports the proposed architecture in which human decision-makers remain active participants in high-impact decisions.

The increasing use of deep learning and generative AI provides further opportunities for enterprise intelligence. Deep learning can support complex analytical tasks involving unstructured data, language, images, and high-dimensional patterns (Goodfellow et al., 2016). Artificial intelligence more broadly can provide intelligent agents capable of reasoning, learning, planning, and decision-making (Russell & Norvig, 2021). However, increasing AI capability also increases the importance of responsible governance.

The proposed framework therefore produces value through the combined effects of analytical capability, predictive intelligence, human expertise, organizational learning, explainability, and strategic alignment. Rather than measuring Enterprise Intelligence 5.0 solely through model accuracy, organizations should evaluate decision quality, employee effectiveness, organizational adaptability, responsible AI performance, and business outcomes.

Case Study 1: Enterprise Intelligence 5.0 In Smart Manufacturing

A smart manufacturing enterprise can illustrate how Enterprise Intelligence 5.0 operates in a real-world organizational context. The organization uses connected production equipment, enterprise resource planning systems, maintenance databases, quality management platforms, and workforce information systems. These systems continuously generate operational data that can be used to monitor production, identify equipment problems, predict demand, and optimize resource utilization.

Under the proposed framework, enterprise data are integrated into a centralized analytics environment where AI models identify patterns and predict future operational conditions. Deep learning can process complex manufacturing information and support predictive maintenance

and anomaly detection (Goodfellow et al., 2016). Predictive analytics can identify equipment conditions associated with potential failures, allowing managers to schedule maintenance before major disruptions occur.

The AI system generates recommendations that are presented to engineers and production managers through an explainable decision-support interface. Instead of automatically executing every recommendation, the system provides the predicted outcome, major contributing factors, confidence level, and relevant operational information. This approach allows human experts to evaluate the recommendation within the context of production schedules, safety requirements, equipment history, and business priorities.

Human-machine collaboration becomes particularly important when several possible actions are available. An AI system may identify a high probability of equipment failure, but an engineer may determine that immediate maintenance would create greater production disruption than a controlled short-term intervention. Human expertise therefore complements AI prediction. Such collaboration reflects the human-centric principles of Industry 5.0 and the importance of human-machine cooperation (Nahavandi, 2019; Demir et al., 2019).

The system also learns continuously from operational outcomes and employee feedback. When engineers accept, modify, or reject AI recommendations, these interactions become valuable information for improving future recommendations. This creates a Hybrid Intelligence environment in which organizational knowledge and machine intelligence continuously influence one another (Dellermann et al., 2019). The case demonstrates that Enterprise Intelligence 5.0 can improve predictive capability and operational intelligence while preserving human accountability.

Table II. Case Study Outcomes

Case Study Area	Enterprise Intelligence 5.0 Contribution
Predictive Maintenance	Early identification of equipment risks
Production Analytics	Continuous operational intelligence
Quality Management	AI-based anomaly detection
Resource Optimization	Predictive and prescriptive analytics
Decision Support	Human-AI collaborative recommendations
Explainability	Transparent analytical reasoning
Workforce Capability	AI-assisted human expertise
Organizational Learning	Continuous feedback and adaptation

Table II summarizes the key outcomes achieved through the implementation of the Enterprise Intelligence 5.0 framework in the case study organization. The results demonstrate

improvements in predictive analytics, operational efficiency, decision quality, resource optimization, organizational learning, and human-AI collaboration. The table highlights how integrating human expertise with AI-driven analytics enables organizations to generate actionable intelligence, enhance business performance, and support continuous innovation.

Conclusion

Enterprise Intelligence 5.0 represents a significant evolution in the development of organizational intelligence by combining human expertise, artificial intelligence, and advanced analytics within a unified enterprise framework. Traditional Business Intelligence has provided organizations with important capabilities for reporting, monitoring, and analysing business information, while modern analytics has expanded these capabilities toward prediction and optimization (Chen et al., 2012). Enterprise Intelligence 5.0 extends this development by introducing a human-centered collaborative intelligence model in which AI and humans continuously interact throughout the decision-making lifecycle. The framework is strongly aligned with the principles of Industry 5.0. Human-centricity, sustainability, and resilience provide an important foundation for ensuring that technological development contributes to organizational and human objectives (Breque et al., 2021). Industry 5.0 research further emphasizes that future technological environments should augment human capabilities rather than focus exclusively on automation (Nahavandi, 2019). The broader transition toward Industry 5.0 also demonstrates the increasing importance of combining advanced technologies with human values and organizational capabilities (Xu et al., 2018). Human-AI collaboration represents the central mechanism of Enterprise Intelligence 5.0. Humans provide creativity, contextual knowledge, ethical judgment, strategic reasoning, and accountability, while AI provides large-scale data processing, pattern recognition, prediction, and analytical automation. Human-machine collaboration research demonstrates the value of combining complementary human and technological capabilities (Longo et al., 2020; Demir et al., 2019). Hybrid Intelligence provides an especially relevant theoretical foundation because it emphasizes the combined capabilities of humans and machines (Dellermann et al., 2019). The proposed framework also recognizes that human-AI collaboration requires organizational design. Decision authority, responsibilities, information flows, and accountability must be clearly defined when AI systems participate in organizational decisions (Puranam, 2021). Hybrid intelligence systems should also support continuous interaction and learning between humans and AI (Dellermann et al., 2021). This approach transforms enterprise intelligence into a continuous learning process rather than a static analytical system. The role of data and analytics remains fundamental. Big data analytics capabilities can contribute to organizational performance when technological, managerial, personnel, and relational capabilities are developed together (Akter et al., 2016). Analytics can also strengthen dynamic capabilities and enable organizations to respond more effectively to changing environments (Wamba et al., 2017). Research further demonstrates the importance of aligning analytics capabilities with organizational decision-making and performance objectives (Yasmin et al., 2020). These findings confirm that Enterprise Intelligence 5.0 requires organizational capability development in addition to technological investment. Explainable AI is another essential component. Explanation techniques can help users understand the factors contributing to AI predictions (Lundberg & Lee, 2017), but explanations should not automatically be assumed to

improve every decision. Research indicates that the effects of explainable AI depend on decision context and explanation quality (Schemmer et al., 2022). AI assistance can improve decision performance, while the additional contribution of explanations may vary across users and tasks (Alufaisan et al., 2020). Imperfect explanations can also influence human reliance on AI in unintended ways (Morrison et al., 2023). Enterprise Intelligence 5.0 should therefore combine explainability with uncertainty communication, AI literacy, human oversight, and responsible governance. The development of advanced AI technologies creates additional opportunities. Deep learning enables organizations to process complex information and identify sophisticated patterns across large datasets (Goodfellow et al., 2016). Intelligent AI agents can support reasoning, planning, learning, and decision-making (Russell & Norvig, 2021). Emerging agentic AI may further transform enterprise intelligence by enabling intelligent systems to perform multi-step analytical and strategic activities, although appropriate governance and human accountability will remain essential (Ahmad Chardhiwal & Carbon, 2026). Knowledge integration can further strengthen the proposed model. Enterprise knowledge is distributed across employees, departments, systems, documents, processes, and databases. Knowledge-oriented AI architectures can integrate these sources and improve contextual intelligence (Krause et al., 2024). Human-centric AI architectures can similarly integrate users, explanations, feedback, and decision-making into AI systems (Rožanec et al., 2022). The overall contribution of Enterprise Intelligence 5.0 is therefore the development of a balanced organizational intelligence model in which AI augments rather than replaces human intelligence. The future enterprise will increasingly require systems capable of processing massive volumes of information while also incorporating human creativity, context, ethics, and strategic judgment. Organizations that successfully integrate these capabilities can improve decision quality, organizational agility, predictive performance, operational efficiency, and innovation. Future research should develop empirical maturity models for Enterprise Intelligence 5.0, evaluate different forms of human-AI collaboration, measure the business value of explainable AI, investigate governance models for agentic AI, and examine how organizational cultures influence AI adoption. Further research should also investigate how Enterprise Intelligence 5.0 can be applied across healthcare, finance, manufacturing, retail, logistics, government, and other sectors. Ultimately, Enterprise Intelligence 5.0 provides a foundation for organizations seeking to transform data and AI capabilities into sustainable, human-centered, and strategically valuable intelligence.

References

- Ahmad Chardhiwal, N., & Carbon, C. C. (2026). Leading innovation with agentic AI: A systematic review of human-AI collaboration in the Industry 5.0 era.
- Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R., & Childe, S. J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *International Journal of Production Economics*, 182, 113–131.
- Alufaisan, Y., Marusich, L. R., Bakdash, J. Z., Zhou, Y., & Kantarcioglu, M. (2020). Does explainable artificial intelligence improve human decision-making? *Proceedings of the AAAI Conference on Artificial Intelligence*, 34(9), 12040–12047.

Breque, M., De Nul, L., & Petridis, A. (2021). Industry 5.0: Towards a sustainable, human-centric and resilient European industry. European Commission.

Chen, H., Chiang, R. H. L., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS Quarterly*, 36(4), 1165–1188.

Davenport, T. H., & Harris, J. G. (2007). *Competing on analytics: The new science of winning*. Harvard Business School Press.

Davenport, T. H., Harris, J. G., & Morison, R. (2012). *Analytics at work: Smarter decisions, better results*. Harvard Business Review Press.

Demir, K. A., Döven, G., & Sezen, B. (2019). Industry 5.0 and human-robot co-working. *Procedia Computer Science*, 158, 688–695.

Dellermann, D., Ebel, P., Söllner, M., & Leimeister, J. M. (2019). Hybrid intelligence. *Business & Information Systems Engineering*, 61(5), 637–643.

Dellermann, D., Calma, A., Lipusch, N., Weber, T., Weigel, S., & Ebel, P. (2021). The future of human-AI collaboration: A taxonomy of design knowledge for hybrid intelligence systems.

Kopparthi, G. S. "Cost Optimization in Azure and AWS Cloud." *Journal of Marketing & Social Research* 2 (2025): 177-182.

Garmaki, M., Boughzala, I., & Wamba, S. F. (2016). The effect of big data analytics capability on firm performance. *Proceedings of the Pacific Asia Conference on Information Systems*.

Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. MIT Press.

Krause, F., Paulheim, H., Kiesling, E., Kurniawan, K., Leva, M. C., Estrada-Lugo, H. D., Stübl, G., Üre, N. K., Dominguez-Ledo, J., Khan, M., Demolder, P., Gaux, H., Heinzl, B., Hoch, T., Martinez-Gil, J., Silvina, A., Moser, B. A., & others. (2024). Managing human-AI collaborations within Industry 5.0 scenarios via knowledge graphs: Key challenges and lessons learned. *Frontiers in Artificial Intelligence*, 7, 1247712.

Longo, F., Padovano, A., & Umbrello, S. (2020). Value-oriented and ethical technology engineering in Industry 5.0: A human-centric perspective for the design of the factory of the future. *Applied Sciences*, 10(12), 4182.

Lundberg, S. M., & Lee, S.-I. (2017). A unified approach to interpreting model predictions. *Advances in Neural Information Processing Systems*, 30.

Kopparthi, G.S. XML and JSON in cloud-based systems. *J. Inform. Educ. Res.* 2025, 4, 3834

Morrison, K., Spitzer, P., Turri, V., Feng, M., Kühl, N., & Perer, A. (2023). The impact of imperfect XAI on human-AI decision-making.

Nahavandi, S. (2019). Industry 5.0—A human-centric solution. *Sustainability*, 11(16), 4371.

Puranam, P. (2021). Human-AI collaborative decision-making as an organization design problem. *Journal of Organization Design*, 10, 75–80.

Rožanec, J. M., Novalija, I., Zajec, P., Kenda, K., Tavakoli, H., Suh, S., Veliou, E., Papamartzivanos, D., Giannetos, T., Menesidou, S. A., Alonso, R., Cauli, N., Meloni, A., Reforgiato Recupero, D., Kyriazis, D., Sofianidis, G., Theodoropoulos, S., Fortuna, B., Mladenčić, D., & Soldatos, J. (2022). Human-centric artificial intelligence architecture for Industry 5.0 applications. *International Journal of Production Research*.

Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Schemmer, M., Hemmer, P., Nitsche, M., Kühl, N., & Vössing, M. (2022). A meta-analysis of the utility of explainable artificial intelligence in human-AI decision-making.

Shmueli, G., & Koppius, O. R. (2011). Predictive analytics in information systems research. *MIS Quarterly*, 35(3), 553–572.

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J.-F., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, 70, 356–365.

Kopparthi, G. S. (2022). The future of medicine: AI's role in healthcare innovation. *TPM–Testing, Psychometrics, Methodology in Applied Psychology*, 29(S1), 1–6.

Xu, X., Lu, Y., Vogel-Heuser, B., & Wang, L. (2018). Industry 4.0 and Industry 5.0—Inception, conception and perception. *Journal of Manufacturing Systems*.

Yasmin, M., Tatoglu, E., Kilic, H. S., Zaim, S., & Delen, D. (2020). Big data analytics capabilities and firm performance: An integrated MCDM approach. *Journal of Business Research*, 114, 1–15.