

Designing Human–AI Collaboration Models for Commercial Decision Systems: A Business Management Perspective

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Abstract - The rapid integration of artificial intelligence into commercial decision systems has intensified the debate between automation and human judgment. While advances in AI have enabled faster and more data-driven decisions, fully automated approaches often struggle with issues of trust, accountability, and contextual understanding. At the same time, purely human-centered decision models face significant limitations in scalability, consistency, and responsiveness in data-intensive commercial environments. These tensions reveal that the central challenge is not technological capability, but the effective design of collaboration between human decision-makers and intelligent systems. This paper examines human–AI collaboration in commercial decision systems from a business management perspective. Rather than framing AI as a substitute for managerial judgment, the study conceptualizes human–AI collaboration as a socio-technical design problem in which authority, responsibility, and control must be deliberately allocated between humans and intelligent systems. The paper analyzes the limitations of fully automated and fully human-centered decision models and argues for hybrid collaboration architectures tailored to different types of commercial decisions. Building on insights from decision theory, management studies, and AI-enabled analytics, the study develops a set of design principles for human–AI collaboration models in commercial decision systems. These principles address task allocation, decision authority boundaries, feedback mechanisms, and governance structures that enable collaboration without eroding managerial accountability. The paper further examines the managerial implications of human–AI collaboration, highlighting how leadership roles, decision authority, and organizational learning are reshaped in collaborative decision environments. The study contributes to business management literature by providing a structured framework for designing human–AI collaboration models that enhance decision quality while preserving strategic control. For practitioners, it offers guidance on how to institutionalize collaboration between humans and AI as a scalable managerial capability rather than an ad hoc technological solution. The findings suggest that sustainable value from AI in commercial decision systems arises from deliberate collaboration design, not from automation alone.

Keywords – Human–AI Collaboration, Commercial Decision Systems, Managerial Decision Design, AI-

Augmented Decision-Making, Business Management Perspective

I. INTRODUCTION

Commercial decision-making has entered a period of structural transformation driven by the increasing integration of artificial intelligence into organizational processes. Pricing adjustments, customer prioritization, demand forecasting, resource allocation, and sales strategy execution are now frequently supported—or partially executed—by intelligent systems capable of processing vast amounts of data in real time. While these developments promise improvements in speed and analytical rigor, they also challenge traditional assumptions about managerial judgment, decision authority, and organizational control.

Early discussions around AI in commercial decision systems often framed the issue as a choice between automation and human decision-making. Fully automated systems were presented as a means of eliminating bias and inefficiency, while human-centered approaches were defended as essential for contextual understanding and ethical judgment. However, experience has shown that neither extreme provides a sustainable solution. Fully automated systems struggle with trust, accountability, and contextual nuance, whereas purely human-centered decision models fail to scale in complex, data-intensive commercial environments.

These limitations reveal that the central challenge is not whether humans or AI should make decisions, but how collaboration between humans and intelligent systems should be designed. Commercial decisions are inherently socio-technical: they are shaped by data, algorithms, organizational structures, incentives, and human judgment simultaneously. Treating AI as a standalone decision-maker overlooks the managerial and organizational context in which decisions are embedded.

From a business management perspective, the effectiveness of AI in commercial decision systems depends on the deliberate allocation of roles, authority, and responsibility between human actors and intelligent systems. Managers must decide which decisions should remain human-led, which can be augmented by AI, and which can be conditionally delegated to systems. These design choices influence not only decision quality, but also organizational trust, accountability, and learning.

Despite the growing adoption of AI-enabled decision tools, existing management literature offers limited guidance on how to design effective human–AI collaboration models for commercial contexts. Much of the current research emphasizes technical performance, predictive accuracy, or algorithmic sophistication, while underexamining the managerial implications of collaboration design. As a result, organizations often implement AI tools in an ad hoc manner, leading to fragmented decision processes and unclear authority structures.

This paper addresses this gap by examining human–AI collaboration in commercial decision systems through a business management lens. Rather than positioning AI as a replacement for managerial judgment, the study conceptualizes collaboration as a design problem that requires explicit consideration of decision authority, control mechanisms, and organizational readiness. The analysis emphasizes that collaboration models must be tailored to different types of commercial decisions, reflecting variations in risk, complexity, and strategic importance.

The objectives of this study are threefold. First, it seeks to establish commercial decision-making as a socio-technical system in which human and AI capabilities are interdependent. Second, it analyzes the limitations of fully automated and fully human-centered decision models, highlighting the need for hybrid approaches. Third, it proposes a managerial framework for designing human–AI collaboration models that enhance decision quality while preserving accountability and strategic control.

By reframing human–AI interaction as a managerial design challenge rather than a technological optimization problem, this paper contributes to business management literature on decision systems

and organizational design. For practitioners, it provides a conceptual foundation for institutionalizing human–AI collaboration as a scalable and governable capability within commercial organizations. Ultimately, the study argues that sustainable value from AI in commercial decision systems emerges not from automation alone, but from thoughtfully designed collaboration between human judgment and intelligent systems.

II. COMMERCIAL DECISION-MAKING AS A SOCIO-TECHNICAL SYSTEM

Commercial decision-making cannot be adequately understood as a purely technical or purely human activity. Decisions related to pricing, customer selection, promotion intensity, or resource allocation emerge from the interaction of data, analytical tools, organizational structures, incentives, and human judgment. This interdependence positions commercial decision systems as fundamentally socio-technical, requiring managerial attention to both technological capabilities and social dynamics.

From a technical perspective, commercial decision systems rely on data infrastructures, analytical models, and increasingly, AI-driven learning mechanisms. These components enable organizations to process information at scale and generate insights that exceed individual cognitive capacity. However, technical capability alone does not determine decision outcomes. Data quality, model assumptions, and system integration are shaped by organizational priorities and managerial choices.

The social dimension of commercial decision-making encompasses roles, authority structures, incentives, and norms that influence how decisions are interpreted and enacted. Managers bring experiential knowledge, contextual awareness, and value judgments to decision processes. Organizational culture shapes risk tolerance, accountability, and trust in analytical outputs. These social factors mediate how technical insights are translated into action.

The interaction between social and technical elements is particularly evident in AI-enabled decision environments. AI systems generate recommendations or actions based on patterns identified in historical and real-time data. Yet the

acceptance and effectiveness of these outputs depend on human interpretation, trust, and governance.

Decisions may be delayed, overridden, or selectively adopted based on managerial judgment, illustrating that AI does not operate independently of social context.

Viewing commercial decision-making as a socio-technical system clarifies why purely automated or purely human-centered approaches often fail. Fully automated systems may optimize technical objectives but overlook relational, ethical, or strategic considerations. Conversely, human-centered models may incorporate context but struggle with scale, consistency, and speed. Effective decision systems therefore require intentional integration of human and AI capabilities.

This perspective also underscores the managerial nature of collaboration design. Managers influence socio-technical systems through role definition, incentive alignment, and governance mechanisms. Decisions about who has authority, how feedback is incorporated, and when intervention is required shape the balance between human judgment and algorithmic intelligence. Collaboration is not an emergent property of technology adoption; it is a result of deliberate managerial design.

In large commercial organizations, socio-technical complexity is amplified by scale and diversity. Multiple markets, customer segments, and channels create heterogeneous decision contexts. AI systems offer a means of coordinating decisions across this complexity, but only when integrated within organizational structures that support collaboration and accountability. Without such integration, socio-technical misalignment can undermine decision quality and organizational trust.

In summary, commercial decision-making must be understood as a socio-technical system in which human and AI capabilities are intertwined. Recognizing this interdependence provides the theoretical foundation for designing effective human-AI collaboration models. The following section builds on this foundation by examining the limitations of decision models that privilege either automation or human judgment in isolation.

III. LIMITS OF FULLY AUTOMATED AND FULLY HUMAN-CENTERED DECISION MODELS

As artificial intelligence capabilities have advanced, commercial decision systems have often been designed around two opposing paradigms: full automation and full human control. Each paradigm reflects an attempt to resolve the challenges of complexity, speed, and uncertainty in commercial decision-making. However, empirical experience and managerial practice increasingly demonstrate that both extremes are structurally limited when applied in isolation.

Fully automated decision models are typically justified on the basis of efficiency, consistency, and analytical rigor. By removing human intervention, these systems promise faster execution, reduced bias, and scalable decision-making across large commercial operations. In routine and highly structured decision contexts, such as inventory replenishment or rule-based pricing adjustments, automation can deliver measurable performance improvements.

Yet fully automated models encounter significant limitations when applied to broader commercial decision systems. One critical issue is contextual blindness. AI systems operate on historical data and defined objectives, which may not fully capture evolving market dynamics, relational considerations, or strategic nuance. In commercial environments where customer relationships, brand positioning, or long-term trade-offs matter, automated decisions can produce outcomes that are technically optimal but strategically misaligned.

Accountability also becomes problematic in fully automated systems. When decisions are executed without human oversight, responsibility for outcomes can become diffused. Managers may struggle to explain or justify decisions to internal stakeholders, customers, or regulators, particularly when algorithmic logic is opaque. This erosion of explainability and ownership undermines trust and limits organizational acceptance of full automation.

Conversely, fully human-centered decision models emphasize managerial judgment, experience, and contextual reasoning. These models allow decision-makers to incorporate tacit knowledge, ethical

considerations, and relational factors that are difficult to encode algorithmically. In high-stakes or ambiguous situations, human-centered approaches remain indispensable.

However, human-centered decision models face their own structural constraints. Cognitive limitations, time pressure, and information overload restrict the ability of managers to process large volumes of data consistently. As commercial organizations scale, reliance on individual judgment leads to variability in decision quality, delays in execution, and difficulty in replicating best practices across markets and teams.

Human-centered models are also vulnerable to bias and organizational politics. Decisions may be influenced by personal incentives, risk aversion, or negotiation dynamics rather than objective evaluation. These factors can distort resource allocation and weaken strategic coherence, particularly in large organizations with complex hierarchies.

Importantly, both paradigms struggle with scalability. Fully automated systems scale technically but lack flexibility and legitimacy, while fully human-centered systems offer flexibility but fail to scale operationally. This trade-off reveals that neither approach adequately addresses the socio-technical nature of commercial decision-making.

The limitations of these extremes point toward the necessity of hybrid models that combine human judgment with algorithmic intelligence. Such models seek to allocate decision authority based on the nature of the decision, the level of risk involved, and the strategic importance of outcomes. Rather than replacing one paradigm with another, hybrid approaches aim to integrate the strengths of both while mitigating their weaknesses.

In summary, fully automated and fully human-centered decision models represent incomplete solutions to the challenges of modern commercial decision systems. Their limitations underscore the need for deliberately designed human–AI collaboration models that balance efficiency, accountability, and contextual judgment. The next section explores how such collaboration can be structured within commercial decision systems, establishing a foundation for effective hybrid design.

IV. HUMAN–AI COLLABORATION IN COMMERCIAL DECISION SYSTEMS

Human–AI collaboration in commercial decision systems refers to the deliberate integration of human judgment and artificial intelligence in the evaluation, prioritization, and execution of commercial decisions. Unlike traditional decision support approaches, collaboration implies an ongoing and structured interaction in which humans and intelligent systems contribute complementary capabilities rather than operating in parallel or isolation.

At the core of effective collaboration lies a clear differentiation of roles. Human actors contribute strategic intent, ethical reasoning, and contextual interpretation, while AI systems provide analytical scale, pattern recognition, and consistency. In commercial contexts, this differentiation is critical because decisions often involve both quantifiable outcomes and qualitative considerations such as customer relationships, brand implications, and long-term strategic positioning.

Human–AI collaboration can manifest across a spectrum of decision arrangements. In some cases, AI systems function as decision informants, generating insights that shape managerial deliberation. In other cases, AI systems act as decision partners, evaluating alternatives and proposing prioritized actions that managers approve or adjust. In more advanced configurations, AI systems may operate as conditional decision executors, acting autonomously within predefined boundaries while remaining subject to human oversight.

The effectiveness of these arrangements depends on how collaboration is embedded within organizational processes. Collaboration is not achieved simply by introducing AI tools; it requires alignment between system outputs and decision workflows. When AI-generated intelligence is disconnected from how decisions are actually made, collaboration deteriorates into symbolic adoption rather than functional integration.

Trust is a central element of human–AI collaboration. Managers must develop confidence that AI systems operate in alignment with organizational objectives

and values. This trust is built through transparency, consistent performance, and the ability to understand system behavior. Conversely, excessive reliance on AI without critical oversight can erode managerial accountability, while excessive skepticism can prevent organizations from realizing the benefits of collaboration.

Feedback loops further distinguish collaborative systems from static decision models. Human intervention—such as overrides, adjustments, or contextual input—provides valuable information that can refine AI behavior over time. Similarly, AI systems generate performance feedback that informs managerial learning. Collaboration therefore supports mutual adaptation rather than one-directional control.

Importantly, human–AI collaboration is not uniform across all commercial decisions. High-frequency, low-risk decisions are more amenable to AI-driven execution, while high-impact or ambiguous decisions require greater human involvement. Effective collaboration models explicitly account for these differences, allocating authority in a manner consistent with risk tolerance and strategic priorities.

In summary, human–AI collaboration in commercial decision systems represents a structured partnership between human judgment and algorithmic intelligence. Its success depends on clear role definition, process integration, trust, and feedback mechanisms. The following section builds on this understanding by examining how collaboration models can be deliberately designed to align with different decision contexts and managerial objectives.

V. DESIGNING HUMAN–AI COLLABORATION MODELS

Designing effective human–AI collaboration models for commercial decision systems requires moving beyond ad hoc tool adoption toward deliberate managerial architecture. Collaboration does not emerge automatically from the presence of advanced algorithms; it must be intentionally designed through clear role allocation, authority boundaries, and interaction mechanisms that reflect the nature of commercial decisions.

The first design dimension concerns task and decision allocation. Not all commercial decisions are

equally suited for AI involvement. High-frequency, repetitive decisions with measurable outcomes—such as demand prioritization or pricing adjustments within defined thresholds—are well suited for stronger AI participation. Conversely, decisions involving strategic trade-offs, reputational risk, or long-term customer relationships require sustained human involvement. Effective collaboration models classify decisions by risk, complexity, and strategic importance, and assign roles accordingly.

A second critical dimension is decision authority boundaries. Collaboration models must specify whether AI systems inform decisions, recommend actions, or execute decisions conditionally. Ambiguity in authority leads to confusion, duplication of effort, or disengagement. Clearly defined boundaries enable managers to retain accountability while leveraging AI for scale and consistency. Authority design thus becomes a managerial responsibility embedded in system configuration rather than an informal practice.

Interaction design represents a third dimension. Human–AI collaboration depends on how information flows between managers and systems. Interfaces, explanations, and alerts shape whether managers can effectively interpret AI outputs and intervene when necessary. Poor interaction design can undermine collaboration even when analytical performance is strong. Effective models emphasize interpretability, relevance, and timing of AI-generated inputs to support managerial judgment.

The fourth dimension involves feedback and learning mechanisms. Collaboration models must enable bidirectional learning: AI systems learn from outcomes and human adjustments, while managers learn from system feedback and performance patterns. Structured feedback loops transform collaboration into a dynamic capability rather than a static configuration. Over time, these loops support refinement of both decision logic and managerial understanding.

Governance considerations further shape collaboration design. Managers must define escalation protocols, override rights, and performance monitoring processes to ensure that collaboration remains aligned with organizational values and risk tolerance. Governance mechanisms protect against over-reliance on AI while preventing

excessive manual intervention that negates efficiency gains.

Finally, collaboration models must be context-sensitive. Organizational maturity, data quality, and cultural readiness influence which models are viable. A design that succeeds in one organization may fail in another if contextual factors are ignored. Managers therefore play a central role in tailoring collaboration models to organizational conditions rather than adopting generic templates.

In summary, designing human–AI collaboration models is a managerial design challenge that integrates task allocation, authority definition, interaction design, feedback mechanisms, and governance. When these elements are aligned, collaboration enhances decision quality, scalability, and accountability in commercial decision systems. The next section examines the managerial implications of these designs, focusing on how leadership roles and responsibilities evolve in collaborative decision environments.

VI. MANAGERIAL IMPLICATIONS OF HUMAN–AI COLLABORATION

The adoption of human–AI collaboration models in commercial decision systems has profound implications for managerial roles, responsibilities, and authority structures. As intelligent systems become embedded in decision processes, managers are no longer defined primarily by their ability to make individual decisions, but by their capacity to design, supervise, and govern collaborative decision architectures.

One of the most significant implications concerns decision authority and accountability. In collaborative models, authority is distributed across human actors and AI systems, yet accountability must remain clearly human. Managers are responsible not for each individual system-generated action, but for the objectives, constraints, and governance mechanisms that shape system behavior. This shift requires a reconceptualization of managerial accountability from episodic decision approval toward continuous oversight and system stewardship.

Human–AI collaboration also alters the skill requirements of managerial roles. Analytical

literacy, systems thinking, and the ability to interpret algorithmic behavior become critical competencies. Managers must understand how AI systems arrive at recommendations or actions in order to evaluate their appropriateness and intervene effectively. This does not imply that managers must become technical experts, but rather that they must develop fluency in working with intelligent systems as decision partners.

Leadership practices are similarly affected. Managers must cultivate trust in AI-enabled processes while maintaining critical judgment. Over-reliance on AI risks disengagement and erosion of responsibility, whereas excessive skepticism undermines collaboration benefits. Effective leadership involves setting expectations, modeling appropriate use of AI, and reinforcing a culture in which collaboration enhances rather than replaces human judgment.

Human–AI collaboration also influences organizational learning. Collaborative systems generate continuous feedback linking decisions to outcomes, creating opportunities for both system-level learning and managerial reflection. Managers play a key role in translating these insights into improved decision designs and organizational practices. When learning mechanisms are actively governed, collaboration supports adaptive capability rather than static optimization.

Finally, the introduction of collaboration models reshapes performance management. Traditional metrics focused on individual decision outcomes may no longer be sufficient. Managers must evaluate system performance, collaboration effectiveness, and alignment with strategic objectives. This broader performance perspective reinforces the managerial shift from decision execution toward decision system design and governance.

In summary, human–AI collaboration transforms management from a decision-making function into a design and governance function. The managerial implications extend beyond efficiency gains to encompass authority, leadership identity, and organizational learning. The following section examines how organizational readiness and governance structures condition the success of these collaboration models.

VII. ORGANIZATIONAL READINESS AND GOVERNANCE CONSIDERATIONS

The effectiveness of human–AI collaboration models in commercial decision systems depends not only on design quality but also on organizational readiness and governance capacity. Even well-designed collaboration architectures can fail if introduced into organizations lacking the structural, cultural, or managerial foundations required to support them. Readiness, therefore, is a prerequisite for sustainable collaboration rather than a byproduct of technology adoption.

Organizational readiness begins with data and process maturity. Human–AI collaboration relies on consistent, reliable data flows and clearly defined decision processes. Fragmented data ownership, inconsistent metrics, or informal decision routines undermine the credibility of AI outputs and weaken collaboration. Managers must ensure that foundational processes are sufficiently standardized to allow intelligent systems to operate effectively while still accommodating contextual flexibility.

Cultural readiness represents another critical dimension. Collaboration models require managers and employees to accept that decision authority may be shared with intelligent systems. In organizations where authority is closely tied to personal discretion or hierarchical status, this shift can generate resistance. Building cultural readiness involves communicating the purpose of collaboration, reinforcing that accountability remains human, and aligning incentives with collaborative outcomes rather than individual control.

Governance mechanisms play a central role in translating readiness into sustained performance. Governance defines how collaboration is monitored, evaluated, and adjusted over time. Clear policies regarding escalation, override rights, and exception handling ensure that managers retain control without undermining system efficiency. Governance also clarifies who is responsible for maintaining models, validating performance, and addressing unintended consequences.

Ethical and risk considerations further shape governance requirements. Human–AI collaboration models must be designed to mitigate bias, protect

customer interests, and comply with regulatory expectations. Governance frameworks that incorporate transparency, auditability, and ethical review help organizations maintain legitimacy and trust as AI systems influence commercial decisions more directly.

Importantly, readiness and governance are dynamic rather than static conditions. As organizations gain experience with collaboration models, governance structures must evolve to reflect changing capabilities and risk profiles. Managers play a critical role in periodically reassessing readiness and refining governance to ensure alignment with strategic objectives and organizational learning.

In summary, organizational readiness and governance considerations determine whether human–AI collaboration models can be effectively institutionalized. By investing in data maturity, cultural alignment, and adaptive governance, organizations create the conditions under which collaboration enhances decision quality and managerial control. The next section introduces an integrated business management framework that synthesizes these considerations into a practical guide for designing and governing human–AI collaboration in commercial decision systems.

VIII. A BUSINESS MANAGEMENT FRAMEWORK FOR HUMAN–AI COLLABORATION

Building on the preceding analysis, this section proposes an integrated business management framework for designing and governing human–AI collaboration in commercial decision systems. The framework is intended to translate conceptual insights into actionable managerial guidance, emphasizing that effective collaboration is the result of deliberate organizational design rather than technological adoption alone.

The framework is structured around three interdependent dimensions: decision criticality, collaboration intensity, and governance rigor. Decision criticality reflects the strategic importance and risk associated with a given commercial decision. High-criticality decisions, such as market entry or long-term customer commitments, require stronger human involvement, whereas lower-criticality, repetitive decisions can be more heavily

supported or executed by AI systems.

Collaboration intensity defines the degree of interaction between human managers and AI systems. At lower levels of intensity, AI functions as an informational resource that enhances managerial awareness. At higher levels, AI operates as a decision partner or conditional executor within predefined boundaries. Managers determine collaboration intensity based on decision type, organizational maturity, and risk tolerance, ensuring that authority allocation remains intentional and transparent.

Governance rigor represents the mechanisms through which collaboration is monitored and controlled. This includes performance metrics, escalation protocols, audit processes, and ethical safeguards. Governance rigor must increase as collaboration intensity increases, ensuring that greater reliance on AI is matched by stronger oversight. Through this alignment, organizations can scale collaboration without sacrificing accountability or trust.

Together, these dimensions form a dynamic framework that enables managers to tailor human–AI collaboration models to specific commercial contexts. Rather than prescribing a single optimal configuration, the framework encourages adaptive design that evolves as organizational capabilities and strategic priorities change. In doing so, it positions human–AI collaboration as a core managerial capability embedded within commercial decision systems.

IX. FUTURE DIRECTIONS OF HUMAN–AI COLLABORATION IN COMMERCIAL DECISION SYSTEMS

As AI capabilities continue to advance, the scope and nature of human–AI collaboration in commercial decision systems are likely to expand. Improvements in explainable AI, real-time learning, and contextual reasoning will enable deeper integration of intelligent systems into decision processes while maintaining transparency and trust. These developments may shift the boundary between strategic and operational decisions, requiring ongoing reassessment of collaboration models.

Future sales and commercial leaders will

increasingly be evaluated on their ability to design, govern, and adapt human–AI collaboration architectures. Leadership competencies will extend beyond domain expertise to include system stewardship, ethical oversight, and cross-functional coordination. From a research perspective, future studies should examine how different collaboration models perform across industries, regulatory environments, and organizational cultures, contributing to a more nuanced understanding of AI-enabled management.

X. CONCLUSION

This paper examined the design of human–AI collaboration models for commercial decision systems from a business management perspective. By framing commercial decision-making as a socio-technical system, the study demonstrated that neither full automation nor exclusive human control offers a sustainable solution. Instead, effective performance emerges from deliberately designed collaboration between human judgment and artificial intelligence.

The analysis highlighted the managerial nature of collaboration design, emphasizing role allocation, decision authority boundaries, governance mechanisms, and organizational readiness. The proposed framework provides managers with a structured approach to institutionalizing human–AI collaboration as a scalable and governable capability. Ultimately, the paper concludes that sustainable value from AI in commercial decision systems arises not from automation alone, but from thoughtful managerial orchestration of collaboration between humans and intelligent systems.

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