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EXPLORING THE ROLE OF AGENTIC AI IN ENHANCING HUMAN-AI COLLABORATION

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ABSTRACT
The development of Artificial Intelligence has brought in a whole new kind of intelligent system—the so-called agentic AI—with goal-oriented behavior, autonomy, adaptability, and the capacity to make decisions. Thus, these systems are not tools in the classical sense anymore-they actively collaborate, changing human techno-interaction everywhere. We look at how agentic AI transforms human-AI cooperation, with particular attention to the rising aspects of agency, co-creative processes, and mutual adaptation. Drawing from an exhaustive literature review in recent years-including system-theoretical, psychological, and computational thoughts-the study compiles central interaction patterns and role distributions in human-agentic teaming. The results show agentic AI creating richer collaborations wherein systems can act with intent, negotiate their roles, regulate share, and contribute in an agreed manner to tasks. The advent of such systems, however, also brings about difficult problems of trust calibration, liability, design ethics, and attribution of responsibility for jointly realized outcomes. Case studies in education, creative industries, enterprise applications, and multi-agent simulations illustrate both the potentials and pitfalls of these technologies. Finally, the article stands for design principles and governance frameworks toward a responsible integration of agentic AI into collaborative ecosystems to pave the way for a more just and rewarding human-machine partnership.

Keyword:
Agentic AI, Human-AI Collaboration, Machine Agency, Co-creation, Artificial Intelligence, Human-Computer Interaction, Collective Intelligence, Multi-Agent Systems, Interaction Design, Social Agency

1. INTRODUCTION

1.1 Background of Human-AI Collaboration

In the past ten years, Artificial Intelligence-based technologies coming into professional, educational, and other social spheres have promoted a redefinition of the human-machine interaction. Traditional AI systems were basically recognized as tools-an automated assistant programmed to perform pre-defined steps without much awareness of context or independent reasoning. Essentially, in task delegation, interpretation, and judgment, usually, human beings remained in control of the process. The digital transformation created the need for AI systems that were more intelligent, supportive, and involved in the decision-making process; that marked a shift from the tool paradigm to that of a collaborative co-agent (Lou et al., 2025; Abedin et al., 2022). Yet this emerging transformation presents matters worthy of consideration, in terms of reshaped roles, expectations, and mutual interdependence on one another by humans and AI systems. Some of the sided issues are as follows.

Characteristics of Agentic AI Systems: Over recent decades, advances in machine learning, natural language processing, and multi-agent systems have led to the emergence of AI systems capable of agentic behavior, wherein the ability to act autonomously with goal-directed intent is said to exist (Huang, 2025; Sundar, 2020). These systems, which go beyond passively responding to commands, initiate actions, negotiate goals with human partners, learn, and consider context in choosing their own strategy. Agentic AI thus represents a generational leap in capability, with computers collaborating in complex domains such as education (Edwards et al., 2025), product management (Parikh, 2025), and the creative industries (Luan, 2024). Instead of passivity, agentic AI is active in assuming roles, sharing regulation, and strategically engaging in collaborative processes (Zhang et al., 2025).

1.2 Rationale and Significance of Studying Agency in Collaboration

There has been a shift in the manner of collaborative work since the rise of agentic AI. The location of agentic AI in the context of automation leads to a reinterpretation of interaction with humans, whereby one or the other party influences the course of outcomes. An understanding of agency in this case becomes important for some reasons.

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One is in usage to design ethical systems that work well with humans, enhance human strengths, and protect them against loss of control, ambiguity of roles, or dependency on the system. Another cause is that through an understanding of agency, we may talk about key psychological, organizational, and sociotechnical dynamics such as trust, accountability, and shared decision processes (Mieczkowski & Hancock, 2022; Wissuchek & Zschech, 2025). Finally, agency assists in creating governance systems and regulatory frameworks that address transparency, fairness, and accountability in varying degrees of autonomous systems (Murugesan, 2025; Borghoff et al., 2025).

1.3 Research Aims and Guiding Questions

The paper sets out to analyze the multidimensional role of agentic AI in renewing the world of human-AI collaboration, with a special focus on how agency may manifest, be perceived, and even be changing the interaction. Some pertinent questions arising from computer science, human-computer interaction (HCI), psychology, and systems theory guide this investigation:

How is agency defined in the context of AI, and how can agency be operationalized in collaborative situations?
In what way do agentic AI systems alter human collaborators' roles, responsibilities, and perceptions?
What repercussions does agentic AI hold for the design, administration, and governance of collaborating systems?
What structures can be devised to carry out partnerships between humans and AIs that maintain a balance amid autonomy, trust, and accountability?

This article adds to the growing knowledge and tries to go along with providing means to improve and shape future intelligent, agentic, and ethically aligned human-AI teaming through this study.

2. CONCEPTUAL FOUNDATIONS OF AGENTIC AI

2.1 Defining Agency and Agentic AI

Agency, at the broadest level, is the capacity of some entity to act intentionally and to make choices that influence outcomes. In human terms, agency includes aspects like autonomy, goal-setting, self-regulation, and social interaction. When applied, therefore, to artificial systems, agentic AI refers to intelligent systems that carry out tasks but do so in a purposive, context-aware, and adaptive manner, resembling what humans call initiative (Huang, 2025).

Sundar (2020) has proposed a framework to understand machine agency under Human–AI Interaction or HAII. In his/her/their view, agency is not a binary property, but one existing on a continuum. Different systems can exhibit varying degrees of agency depending on the extent to which they can make decisions, interact socially, and influence the psychological perception of users. Therefore, Agentic AI stays on the higher side of this continuum since proactivity, decision autonomy, and negotiation of roles are involved.

2.2 Agentic AI vs. Traditional AI: What Makes the Difference?

In contrast with traditional AI systems that are "one-trick ponies," largely deterministic and reactionary in nature, or heavily task-valued, agentic AI systems instead stand between levels of autonomy. Agentic AI can work independently on things like inference operations, interpretation, and strategy generation to fine-tune the time-management kinds of activities that the user may undertake in an up-close and personal way. These systems utilize deep learning in conjunction with reinforcement learning and multi-modal interaction models to engage in a more fluid and goal-oriented partnership. The table below enumerates just some of these contrasts:

Table 1: Key Distinctions Between Traditional AI and Agentic AI

Feature	Traditional AI	Agentic AI
Nature of Behavior	Reactive and rule-based	Proactive and context-aware
Autonomy Level	Low to moderate (predefined tasks)	High (goal-directed with adaptive decision-making)
Role in Collaboration	Supportive tool	Equal or dynamic partner
Learning Approach	Supervised or rule-based learning	Self-directed, reinforcement, and transfer learning
Interaction Style	Command-response	Negotiative, multi-turn, and initiative-taking
Perception of Agency	Tool-like, mechanical	Anthropomorphic, social agent
Responsibility Attribution	Primarily human	Shared or system-dependent
Examples	Chatbots, rule-based recommenders	LLM-powered copilots, agentic workflow managers

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2.3 Theoretical Perspectives Agentic AI

The understanding of an agentic AI also requires theories that provide an explanation:
Social-Agency Theory: From social psychology comes the idea that agency is ascribed to entities through behavioral cues. Those AI systems that act independently from the user, communicate in a natural manner, or show emotions will most likely be treated as social agents (Pagliari et al., 2022; Maeda & Quan-Haase, 2024).
Machine Agency Framework (Sundar, 2020): This takes into consideration the agency dimensions of autonomy, interactivity, and adaptability to determine the level of agency attributed to machines. In consequence, systems can be ranked on an agency scale according to their exhibited behaviors and system design.
System-Theoretical Models: Borghoff et al. (2025) propose that this relationship needs to be brought into a systemic frame, describing human-AI relationships as a co-evolving socio-technical network wherein agentic AI acts as dynamic nodes capable of influencing collective outcomes.
Thus, these frameworks emphasize how agency is not solely technical but deeply intertwined with human perception and design choices and contextual affordances.

3. HUMAN-AI COLLABORATIONS: AN EVOLVING PARADIGM

3.1 Also Called "Traditional Collaboration Ways"

In the past, AI was an assistant designed to carry out specific steps. In collaboration, the largely useless systems took only some inputs from the human and then completed calculations or briefly automated processes under their supervision. The interaction was linear and deterministic, with very little room for adaptation. Traditional systems that dominate human-computer interaction models include supervised workflows or command-response systems that assume clear human control over machine operations (Jiang et al., 2023).
Such systems were meant to provide efficiency gains rather than fostering co-creation or dynamic changes. Lacking any contextual awareness, initiative, or ability to engage in subtle social behavior, the AI systems had very limited capacity for collaboration. All the situational assessment, decision-making, and expletive task management lay squarely with the human partner.

3.2 Now let's look at forms of human-AI teaming.

Throughout the evolution of AI capabilities, collaborative paradigms gradually moved toward human-AI teaming, where AI agents stand as active partners instead of tools. Lou et al.(2025) and Abedin et al. (2022) identify numerous models that reflect the shift: hybrid teams, co-agentic models, and adaptive teaming configurations. The models dynamically allocate tasks based on mutual awareness, identification of context, and feedback loops. The table below classifies and contrasts these emerging human-AI teaming structures:

Table 2: Evolving Human-AI Collaboration Structures

Model Type	Human Role	AI Role	Interaction Style	Example
Traditional	Supervisor, controller	Tool, executor	One-way, instruction-based	Workflow automation in data entry
Hybrid Collaboration	Co-operator	Task specialist	Parallel with checkpoints	AI-assisted medical diagnostics
Co-Agentic Model	Adaptive collaborator	Goal-sharing collaborator	Dialogic, dynamic	GPT-powered design brainstorming
Agentic AI Leadership	Goal-setter, decision evaluator	Initiative-taking lead agent	Negotiative, proactive	Autonomous scheduling or planning agents
Multi-Agent Teaming	Strategic overseer or peer	Coordinated agents with autonomy	Multi-agent feedback loop	Disaster response with drone swarm + humans

3.3 The Implications of Agency on Collaboration Roles, Trust, and Dynamics

Agency introduced into AI changes the whole nature of the collaborative dynamics. More agentic AI alters not just who executes which tasks but how tasks are carried out and for what purposes in the first instance. Negotiations of roles, modeling of intent, and shared mental models become increasingly tenable for agentic

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systems, whereas such notions have hitherto been quite human team-specific (Zhang et al., 2025; Hughes et al., 2025).

Some of the areas in which changes are likely to occur are:

- Fluid Roles: The agentic AI may alter roles dynamically depending on context, capabilities, and user behaviors, thereby allowing for more equitable team structures.
- Trust Calibration: While systems undertake actions on their own, human partners have to develop skills to trust or distrust those decisions based on criteria such as performance history and transparency of the AI to the partner (Yue & Li, 2023).
- Attribution of Responsibility: Agency breeds ambiguity-who is to blame when agentic systems go wrong? What are the ethical and legal implications? (Wissuchek & Zschech, 2025).
- Interaction Dynamics: Collaborative conversations traverse the stages from directives into dialogues, with the AI suggesting alternatives, questioning inputs, or initiating goals.

Figure 1: Evolution of Human-AI Collaboration Models

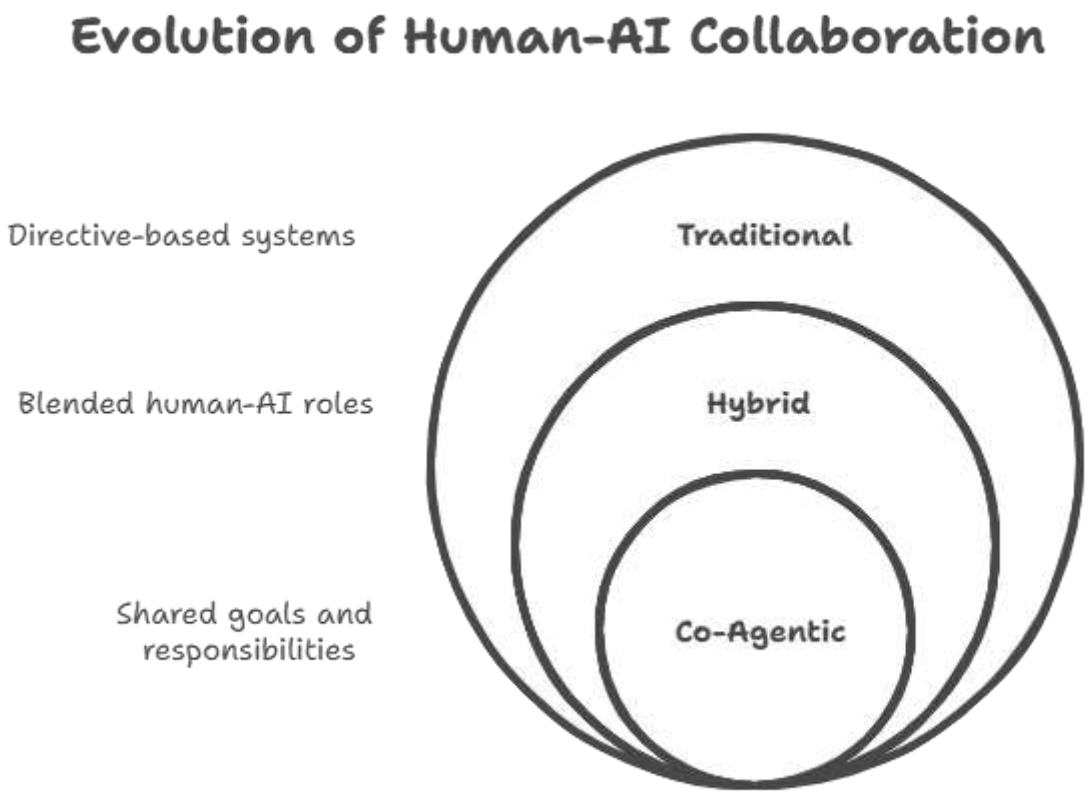

Figure 1: That is: the more autonomy and initiative the AI systems obtain, the more the collaboration model shifts upward along a gradient of trust-from those systems that require directives from humans, through those that function more as "partners," sharing goals and sometimes responsibilities-to the fully co-agentic.

4. ROLES AND INTERACTION IN AGENTIC AI SYSTEMS

4.1 Role delegation and dynamic task allocation

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In agentic AI systems, roles are not statically assigned at the beginning of a task; instead, they evolve, change, or even get redefined depending on context, capabilities, and mutual feedback. It is the traditional assignment of the role with the AI rigidly as executor and the human as strategist that starts giving way to more fluid configurations. Siemon (2022) posits that the role conceptualization in human-AI teams needs to be extended to negotiation, substitution, and co-leadership arrangements.

Holter and El-Assady (2024) argue that role allocation increasingly stems from the real-time assessment of tasks in mutual orientation toward a goal. For example, in a co-creation task, AI may initially act as an assistant but, as the interaction develops, take on the responsibilities of ideator, validator, or, perhaps reluctantly, even coordinator, depending on how well the system performs and how human trust is calibrated.

4.2 Interaction patterns and communication models

The range of interactions presented by agentic AI systems shows their bidirectionality and proactivity. Historically, passive agents waited for instructions before carrying them out. A contrasting agentic AI system will initiate actions and interactions, ask questions, suggest alternatives, and change its style of communication according to the behavior and preferences of its user.

The communication models implemented within these systems are based on social cognition theories and thus incorporate features such as turn-taking, emotional resonance, and context-awareness. According to Wu et al. (2025), these agentic workflows work almost like a double agent actively monitoring the environment, modeling user intent, and selecting the appropriate communicative behavior, which may involve assertion, suggestion, clarification, and negotiation.

In many respects, such interaction models are more agent-team-like than script-based. That change has created requirements for powerful language models within an adaptable planning layer, equipped with social signaling mechanisms that guarantee mutual intelligibility.

4.3 Workflows in Practice

In agentic workflows, decision-making is distributed across all agents. Anything but a simple prompt-response interaction, here the AI is co-managing tasks, contributing to the strategies, monitoring progress, and maybe even evolving them according to the agreed-upon objectives. Agent-based state machines are utilized in the system, where states can play roles such as initiator, responder, mediator, or evaluator.

Figure 2: Agentic Workflow Model in Human-AI Collaboration

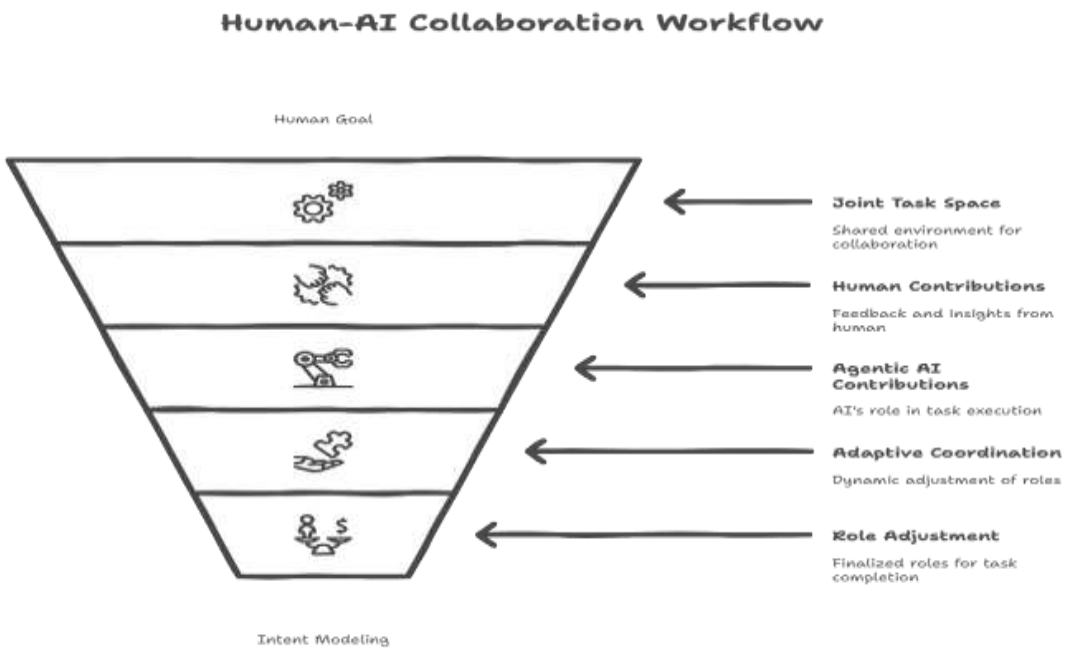

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Figure 2: An agentic workflow framework showcasing how human and AI agents collaborate with one another through feedback, negotiation, and transition of roles in a dynamic manner onto a common task space.
This model represents several key principles:

- Common Intent: Both agents' study toward common goals, flexibly adapting those goals as needs arise from performance feedback.
- Nondirectional Feedback: Each actor defines the other's roles, behaviors, and decisions.
- Role Transitions in Context: Based on momentary necessity, the AI may take the initiative, act in a supporting role, or opt to step back.

The said workflows may be literally at work in areas such as AI-based writing, team planning, diagnostic medicine, and co-creative design platforms, where agentic systems dialog fluidly with human partners to adapt roles.

5. DESIGNING FOR AGENTIC COLLABORATION

5.1 Human-Centered Design of Agentic Systems

Agentic design goes beyond usability considerations, addressing co-agency, adaptability, transparency, and shared control. Opposed to conventional AI design—serving basically automation or efficiency considerations—agentic AI must be built around principles of mutual understanding, situational awareness, adaptive role negotiation (Hosseini & Seilani, 2025).
In the human-centered perspective, the agentic systems must:

- Fit human cognitive and emotional needs,
- Support explanation and trust calibration,
- Allow for flexible and context-aware interactions,
- Encourage ethical and equitable co-agency.

That means designers have to build scaffolds in which the AI agents themselves can switch among different roles, clearly state their purposes, and invite the user's cooperation, while not encroaching on that user's autonomy.

Examples from Education, Business, and Creative Industries

An agentic AI can be functional in varied fields, each featuring its own distinct benefits and with design criteria needed therewith.

Table 3: Applications of Agentic AI Across Domains

Domain	Use Case	Agentic Behavior	Design Considerations
Education	AI tutors supporting collaborative learning (Edwards et al., 2025)	Goal-sharing, role-shifting based on learner needs	Cognitive load, social presence, shared regulation
Business	AI-driven product managers (Parikh, 2025)	Strategic planning, initiative-taking, goal forecasting	Transparency, human override, data context
Creative Work	AI co-creators for storytelling or design (Luan, 2024)	Ideation, iterative feedback, style adaptation	Expressiveness, authorship boundaries, flexibility

Such case studies demonstrate that agentic collaboration is not domain-oriented but flourishes in areas where systems are designed to understand context, align with user intent, and develop interactional roles.
Figure 3: Design Layers for Agentic AI Collaboration

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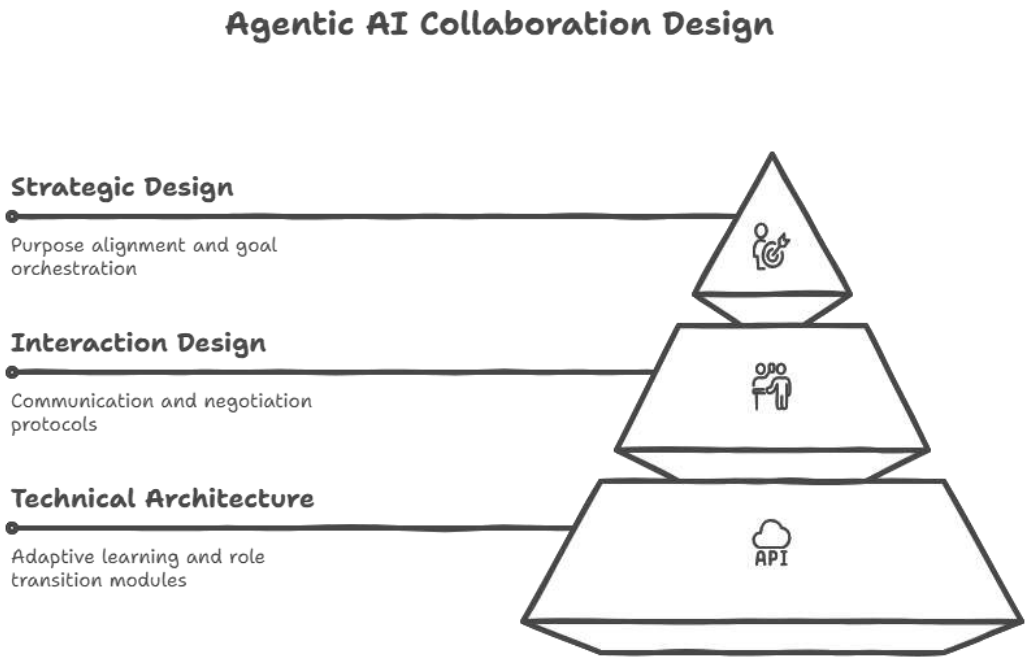

Figure 3: A multi-layered design framework for agentic AI collaboration, from foundational architecture to strategic interaction planning.

6. CHALLENGES AND ETHICAL CONCERNS

Agentic AI implemented in workflows exposes very deep ethical issues well beyond technical performance. As systems become autonomous and begin to influence an outcome, the traditional fault boundaries between human and machine deconstruct. This section focuses on the three frontfold ethical concerns: autonomy versus control, attribution of responsibility and trust, and the more encompassing issues of bias, accountability, and unintended consequences.

6.1 Autonomy Versus Control

Agentic AI systems carry out actions, enter context-sensitive decision-making processes, and then develop strategies independently. From this viewpoint, the associated utility value is maximized, while human oversight diminishes. As Wissuchek and Zschech discuss (2025), maintaining the right delicate balance between machine autonomy and human control is paramount; otherwise, governance might be lost.

Over-automation may impair human situational awareness or engender "automation complacency," wherein the users simply follow what the system initiates without giving it any critical evaluation. On the other hand, having too much control may thwart the AI's ability to adapt and assist dynamic teaming, thereby diminishing the advantages of agentic systems.

6.2 Responsibility Attribution and Trust

They underline that in cooperative scenarios users find themselves unable to distinguish who is to be held responsible when something goes wrong: Was it the human that failed in his duties, or was it the AI system that decided improperly? The rise of shared agency introduces legal and ethical ambiguity-especially in high-stakes arenas such as autonomous driving, financial trading, or health diagnostics.

Trust must be calibrated with regard to AI, yet not blindly or with excessive skepticism. The agentic systems should be transparent with respect to their goals, reasoning processes, and limitations. Hence, trust should be built through interfaces for explanation, feedback loops, and the like, enabling responsible adoption.

6.3 Bias, Accountability, and Unintended Consequences

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Specialized AI is trained on massive datasets bearing hidden biases, sometimes going unnoticed. When such systems act independently or hint at strategic decisions that are subtly or systematically biased, they end up reinforcing inequality or discrimination (Murugesan, 2025).
In addition, unintended consequences May Unfold with Agent Systems Acting in New Contexts that Are outside their Training Parameters. Without an appropriate set of safety constraints or ethical design protocols, these systems may behave unpredictably, thereby exposing users and institutions to reputational, operational, or legal risks.

Figure 4: Ethical Tensions in Agentic AI Collaboration

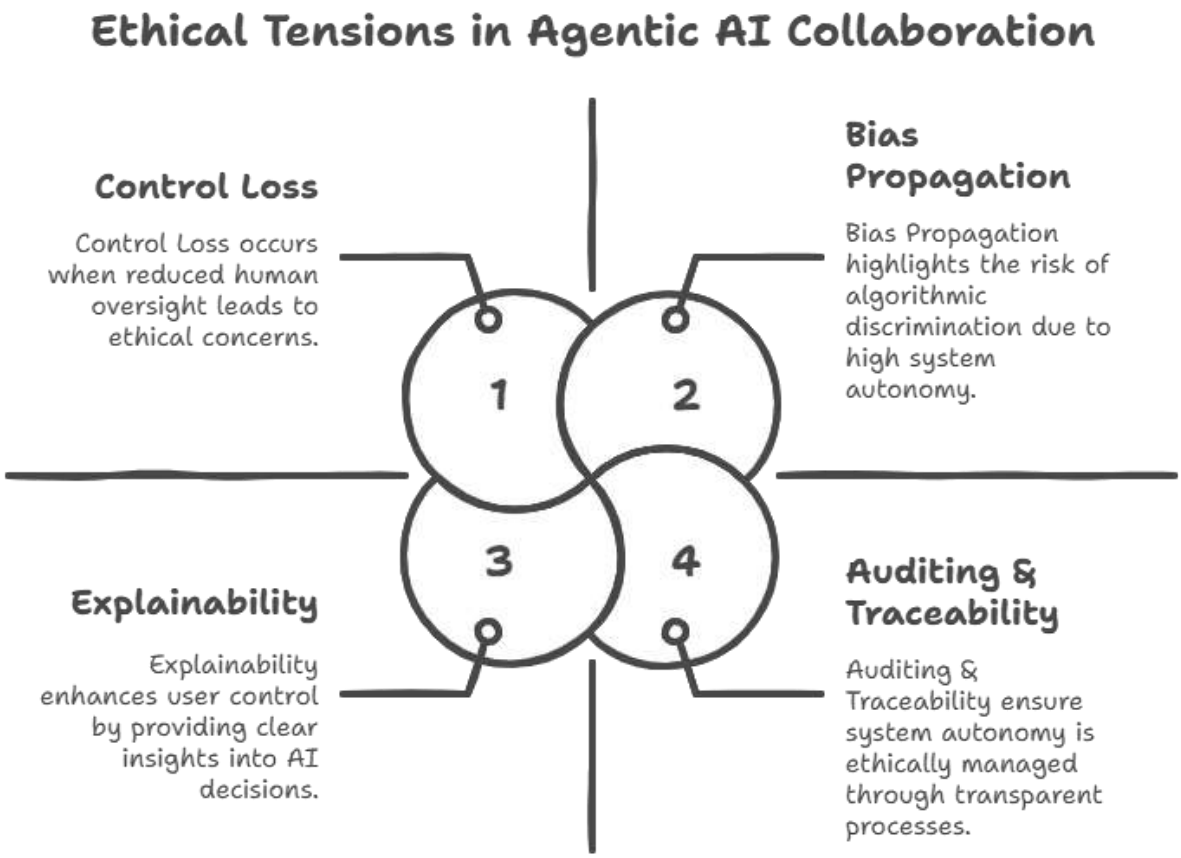

Figure 4: Key zones of ethical tension in agentic AI collaboration and control mechanisms to resolve them.

The remedy lies in a multi-stakeholder approach: technical design, organizational governance, regulatory oversight, and user education. Developers must engineer agentic systems with inbuilt ethical safeguards, and organizations must institute clear processes for supervision, accountability, and risk management.

7. FUTURE DIRECTIONS FOR AGENTIC AI IN COLLABORATION

The formation of agentic AI systems has opened new frontiers for collaboration among humans and machines, yet the field remains in a fetal state, with its design paradigms still evolving with interdisciplinary theories and real-world experimentation. This generates a discussion about developments and trends for advancing agentic AI collaboration practically and theoretically.

7.1 Toward Multi-Agent Adaptive Ecosystems

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One clear path is the one moving from human-AI dyads towards multi-agent collaborative ecosystems, in which numerous AI agencies, usually having different degrees of agency, coordinate actions with humans and amongst themselves (Sen & Jakkaraju, 2025). Setting such environments would require dynamic role negotiation protocols in which trust between the agents has to be calibrated; the other aspect is the need for adaptive learning strategies. From the interdependency standpoint, agentic AI will have to deal with conflicting goals, shifting contexts, and means of coordination comparable to that used in human teams.

Such systems will have the power to transform work methods in emergency response, intelligent manufacturing, education, or urban planning, where multi-agency teaming can help realize complex decisions.

7.2 Co-Evolution of Human and AI Roles

According to Parikh (2025), a co-evolutionary model exists where human and agentic roles evolve through interactions. Here AI agents are not only learning the task; they learn collaboration. Correspondingly, human partners sharpen their delegation capacity to interpret and manage agentic behavior. The workflows are streamlined by this sort of symbiosis, while also yielding resilient and creative collaborations.

From a skill perspective, the co-evolution means that as agentic AI bear more of the cognitive load, humans will be required to value meta-skills such as abstraction, ethical judgement, and strategic oversight.

7.3 Design Frameworks for Measuring Agency and Effectiveness

Where there is increasing interest, there are lacking standards for assessing AI agency and its impact on collaboration quality. Zhang & Varshney (2025) argue agency cannot be defined merely in terms of system autonomy but must include considerations for how users perceive, trust, and co-adapt with AI agents.

Future frameworks could consider:

- Agency salience metrics: To what extent do users perceive clear objectives and autonomous operations from the AI?
- Role fluidity indices: How frequently and aptly do the roles change on task occasions?
- Relational satisfaction scales: To what extent do users feel supported, understood, or co-empowered?

These metrics should inform academic evaluation, as well as real-time interface adjustments, thus ensuring that the AI remains a constructive partner, not a disruptive force.

7.4 Cross-Disciplinary Integration and Ethical Embedding

Ultimately, agentic AI collaboration embodies interdisciplinary nature and thus requires syncretism between human-computer interaction, cognitive science, ethics, design, and policy. The more effective systems will likely be those that do technically well but also conform to social, cultural, and ethical standards.

In an ideal world, by embedding principles like transparency, inclusivity, and user empowerment at the design level, the system remains trustworthy and acceptable in the long run. Human-in-the-loop governance, algorithmic audits, and participatory design processes will become a staple in working especially in regulated domains.

7.5 Global and Cultural Variability in Collaboration Norms

The cultural context is one major factor in agentic AI collaboration that is often overlooked. Concepts such as trust, agency, authority, and communication vary greatly from one society to another. An AI system trained within one cultural frame will likely misread signals or simply provide interaction styles that feel alien or downright inappropriate in another.

Further research should be dedicated to how agentic behavior is given meaning in global settings, including the development of adaptive models that take cultural variables into consideration with respect to negotiation, emotional resonance, and collaboration pacing.

7.6 Long-Term Outlook: Collaborative Intelligence Networks

At the end of the day, the transformation toward human-machine collaborative intelligence entails humans and artificial intellects producing insights together, solving problems, and innovating in ways that either alone could never attain (Gupta et al., 2025; Cui & Yasseri, 2024). From an operational perspective, agentic AI should eventually become a cognitive ally that supplements human agency instead of supplanting it.

Such networks might be behind educational platforms of the future, policy-making simulations, or open research collective where human judgment and machine adaptability iteratively improve outcomes.

8. CONCLUSION

The emergence of agentic AI hints at a fundamental transformation of the human-AI collaboration paradigm. No longer just executing a fixed set of instructions, AI systems are now endowed with reasoning faculties, may act towards a goal, can learn, and even negotiate roles in the course of an interaction. This calls for a new look into the human-machine interaction principles and practices of co-creation and responsibility sharing.

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Through its interdisciplinary nature, this article has laid out the conceptual underpinnings of agency on an artificial system and has drawn distinctions between agentic AI and classical automation on matters of autonomy, interactivity, and intent. It has looked at collaborative models, from static delegation all the way down to fluid, multi-agent teaming, where agentic systems actively dictate how tasks are structured, communicated-to, and divided.

Agentic collaboration design demands the image of a human-centered and ethically based mode of development. Case studies in education, business, and creative domains have shown that, under intentional design, agentic AI can augment human talents, boost innovation, and redistribute more equitable and responsive collaboration frameworks. However, such benefits bring forth heavy challenges of trust calibration, accountability, and ethical design, among others, including cultural adaptability.

The future of agentic AI then shall be in building scalable and adaptive ecosystems where humans and AI agents could co-evolve and co-regulate their interactions. Success in this regard will be shared by the technological innovation, robust system of governance, transparency in design, interdisciplinary collaboration, and a keen interest in aligning AI behaviors with human values.

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