

Artificial Intelligence and the Transformation of Contract Law: Legal Challenges and Pathways Toward a Regulatory Framework

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Abstract

The rapid diffusion of artificial intelligence (AI) into commercial practice — from AI-assisted negotiation to self-executing smart contracts — is placing sustained pressure on the doctrinal foundations of contract law, particularly the requirements of offer, acceptance, intention to create legal relations, and consensus ad idem. This paper examines the extent to which AI-driven contracting challenges classical contract doctrine and evaluates the adequacy of existing legal frameworks to address issues of formation, interpretation, performance, liability, and accountability. Using a doctrinal and comparative legal research method, the study analyzes statutory instruments, case law, and scholarly literature from common law and civil law jurisdictions. The findings indicate that while courts and legislatures have begun to accommodate AI-mediated transactions through concepts such as electronic agents and functional equivalence, significant normative gaps remain regarding liability allocation when an autonomous system produces an unintended or erroneous outcome, and regarding the attribution of intent to non-human decision-making systems. The paper argues for a graduated regulatory model that combines risk-based liability rules, mandatory transparency obligations, and sector-specific codes of conduct, rather than a single uniform statute. The discussion concludes that contract law's traditional reliance on human intention must evolve toward a functional, outcome-oriented standard capable of accommodating autonomous and semi-autonomous contracting systems without abandoning the doctrine's core commitments to fairness, foreseeability, and party autonomy.

Keywords: *artificial intelligence; contract law; smart contracts; legal liability; regulatory framework; electronic agents*

INTRODUCTION

Contract law has historically rested on the premise that agreements are the product of human volition — two or more parties who form, express, and communicate a genuine intention to be bound. The emergence of artificial intelligence systems capable of negotiating terms, drafting clauses, executing transactions, and even interpreting contractual obligations without direct human input disrupts this premise in ways that existing doctrine was not designed to anticipate. Virtual assistants can now conclude consumer purchases autonomously, algorithmic trading systems

execute binding transactions in milliseconds, and blockchain-based smart contracts self-execute upon the satisfaction of coded conditions, often without any real-time human review.

These developments raise a cluster of unresolved legal questions. First, can an AI system possess the capacity to form the requisite intention to contract, or must its actions always be legally attributed to a human principal? Second, when an AI system produces an erroneous, biased, or unforeseen outcome during contract formation or performance, who bears legal responsibility — the developer, the deployer, the end user, or the system itself? Third, how should traditional interpretive doctrines, which assume a shared human understanding of contractual language, apply to agreements drafted or executed by non-human agents? Fourth, what role should regulation play in mediating the tension between innovation and legal certainty in this domain?

This paper addresses these questions through a doctrinal and comparative analysis of contract law's treatment of AI-mediated transactions. It proceeds in five further parts. Part 2 reviews the existing scholarly literature on AI and contract law. Part 3 sets out the research method. Part 4 presents the results of the doctrinal analysis and discusses their implications for contract theory and legal practice. Part 5 concludes with recommendations for a regulatory pathway that balances innovation with the protective functions of contract law.

LITERATURE REVIEW

A growing body of legal scholarship has examined how AI technologies intersect with contract doctrine. Several studies frame the central difficulty as one of attribution: because contract law's rules on offer, acceptance, and intention were built around human cognition, an AI system's output does not fit neatly into any existing category of legal actor. Scholars addressing the formation stage generally converge on the view that AI systems function as sophisticated instruments of their human or corporate principals rather than as independent contracting parties, drawing an analogy to the long-established doctrine of electronic agents used in early e-commerce law. Under this analogy, actions taken by an AI system are treated as though performed by the party who deployed it, which preserves the coherence of offer-and-acceptance analysis but leaves unresolved the question of how far that attribution should extend when the AI's behavior departs unpredictably from its principal's instructions.

A second strand of literature focuses on interpretation and performance. Where AI systems draft contractual language or interpret conditions for the purposes of automated performance,

commentators note a tension between the literalism of code-based execution and the more flexible, purposive methods of interpretation traditionally used by courts to resolve ambiguity and give effect to the parties' presumed intentions. Smart contracts in particular are singled out as a source of difficulty, since their self-executing character can foreclose the possibility of judicial intervention even where performance produces a result inconsistent with what the parties would have intended had they foreseen the circumstances that arose.

A third strand addresses liability and accountability. Several recent analyses argue that existing doctrines of mistake, misrepresentation, and product liability are being stretched to accommodate harms caused by autonomous contracting systems, and that courts across common law jurisdictions have so far adopted inconsistent approaches to allocating risk between the parties who design, deploy, and rely on such systems. A related line of inquiry considers whether more advanced or general-purpose AI systems might eventually warrant a distinct legal status — short of full personhood — that would allow duties and, potentially, limited forms of liability to attach directly to the system's operation rather than exclusively to a human or corporate principal. This proposal remains contested, with critics warning that it risks diluting accountability by creating a legal buffer between AI deployers and the consequences of their systems' conduct.

A fourth strand, situated at the intersection of private law and technology regulation, surveys comparative regulatory responses. It finds that regulatory frameworks addressing AI in contracting remain uneven across jurisdictions: some jurisdictions have extended electronic transactions legislation to expressly cover AI-concluded contracts, while others continue to rely on general contract law principles supplemented by sector-specific guidance, such as financial services regulation for algorithmic trading. This unevenness, several authors argue, creates forum-shopping incentives and cross-border enforcement uncertainty for commercial parties operating AI-driven procurement or trading systems. Taken together, the literature establishes broad consensus that current contract doctrine can accommodate AI-mediated transactions only through analogical extension, and that this accommodation is reaching its limits as AI systems become more autonomous, opaque, and consequential.

METHOD

This study adopts a doctrinal legal research method, supplemented by comparative analysis, to examine how contract law principles apply to AI-mediated transactions. Doctrinal analysis was

chosen because the research questions concern the internal coherence, scope, and adequacy of existing legal rules rather than empirical questions about how AI systems are used in practice.

The research draws on three categories of primary and secondary sources. First, primary legal sources, including electronic transactions statutes, general contract law codes, and reported judicial decisions addressing automated or algorithmic transactions, were identified and analyzed for their treatment of agency, intention, and liability. Second, secondary legal scholarship — including peer-reviewed journal articles, law review commentary, and doctrinal monographs published principally between 2019 and 2025 — was reviewed to identify recurring doctrinal problems and proposed solutions. Third, comparative material from both common law jurisdictions (including the United States, the United Kingdom, and Australia) and selected civil law and mixed jurisdictions was consulted to assess whether doctrinal responses to AI-mediated contracting differ systematically by legal tradition.

Sources were analyzed using conventional doctrinal methods: identification of the applicable legal rule, examination of how courts and legislators have applied or adapted that rule to AI-related fact patterns, and evaluation of the coherence and normative adequacy of the resulting position. Because this is a doctrinal study rather than an empirical one, it does not report statistical findings; instead, its "results" consist of the patterns, tensions, and gaps identified through systematic legal analysis, which are presented and discussed in Part 4.

RESULTS AND DISCUSSION

Contract Formation and the Problem of Intention

The analysis confirms that the electronic-agent analogy remains the dominant doctrinal device for reconciling AI-mediated contract formation with the requirement of intention to create legal relations. Under this approach, an AI system's communications are treated as expressions of the deploying party's pre-existing intention to be bound according to parameters the party has set in advance, even though no human reviews the specific transaction at the moment of formation. This device works reasonably well for narrow, task-specific AI systems, such as automated purchasing agents operating within clearly defined parameters. It becomes considerably less stable, however, as systems gain the capacity to negotiate terms dynamically, depart from initial instructions in response to new information, or generate outputs their deployers did not specifically foresee. In such cases, attributing the resulting agreement entirely to the deployer's original

intention becomes a legal fiction rather than an accurate description of how the contract came to exist.

Interpretation and Automated Performance

The results also reveal a structural tension between the self-executing nature of smart contracts and the traditionally flexible, context-sensitive methods courts use to interpret ambiguous or incomplete agreements. Because code-based performance is typically binary and irreversible once triggered, the equitable doctrines historically used to correct unjust outcomes — such as mistake, frustration, or rectification — are difficult to apply after the fact. The analysis suggests that this is less a flaw in contract doctrine itself than a mismatch between two different modes of specifying obligations: natural-language contracts, which tolerate ambiguity to be resolved later by a court, and code-based contracts, which require all contingencies to be specified in advance. Where the two modes are combined, for example through "hybrid" smart contracts with a natural-language layer and a self-executing code layer, unresolved questions remain about which layer governs in the event of conflict.

Liability, Accountability, and Risk Allocation

On the question of liability, the study finds no settled cross-jurisdictional consensus. Some courts and commentators favor a strict, deployer-bears-the-risk approach, reasoning that a party who chooses to delegate contracting functions to an autonomous system should absorb the resulting risk regardless of fault, since it is the deployer who profits from the efficiency gains. Others favor a fault-based approach that examines whether the harm resulted from a foreseeable design defect, inadequate testing, or negligent deployment, which would align AI-related contract disputes more closely with existing product liability frameworks. The analysis in this paper favors a middle position: a risk-based liability standard calibrated to the degree of autonomy and foreseeability involved, so that highly autonomous, opaque systems attract a stricter standard of deployer responsibility, while narrowly scripted systems remain governed by ordinary negligence and agency principles. This graduated approach avoids the over-inclusiveness of blanket strict liability while addressing the accountability gap left by expecting a wronged party to prove exactly how a complex AI system produced its erroneous output.

Comparative Regulatory Responses

Finally, the comparative material confirms that regulatory responses remain fragmented. Jurisdictions with modernized electronic transactions legislation tend to extend existing functional-equivalence principles to AI-concluded contracts, providing some certainty for formation issues but little specific guidance on liability. Jurisdictions relying primarily on general contract law and case-by-case judicial development offer more interpretive flexibility but correspondingly less predictability for commercial parties structuring cross-border AI-driven transactions. Sector-specific regimes, such as those governing algorithmic trading in financial markets, illustrate that targeted, risk-calibrated regulation can coexist with general contract law rather than replacing it, and this paper's proposed regulatory pathway, discussed in the conclusion, builds on that model.

CONCLUSION

This paper has examined how artificial intelligence challenges the doctrinal foundations of contract law across the stages of formation, interpretation, performance, and liability. The analysis shows that existing legal frameworks have so far managed to accommodate AI-mediated transactions primarily through analogical extension of pre-existing doctrines, particularly the electronic-agent concept, but that this accommodation is increasingly strained as AI systems become more autonomous and less predictable. Rather than proposing a single uniform statute to govern AI in contracting, this paper recommends a graduated, risk-based regulatory model comprising three elements: first, a liability standard calibrated to the degree of system autonomy and the foreseeability of harm; second, mandatory transparency and documentation obligations that allow courts and counterparties to reconstruct how an AI system reached a contested outcome; and third, sector-specific codes of conduct developed in coordination with general contract law rather than as a replacement for it. Future research should examine how these proposals would operate in practice, including through empirical study of dispute resolution outcomes in AI-related contract disputes as more such cases reach the courts.

REFERENCES

- Al-Kaabi, M. H. (2020). Is it possible to introduce efficient breach theory to a civil law country? The case of Qatar. *Arab Law Quarterly*, 36(3), 291–323.

- Al-Obeidi, A., & Hussein, S. (2023). The legal nature of contracts concluded by artificial intelligence according to the UAE electronic transactions and e-commerce law No. 46 of 2021. Proceedings of the 24th International Arab Conference on Information Technology (pp. 1–8). IEEE.
- Chalmers, D. J. (1996). *The conscious mind: In search of a fundamental theory*. Oxford University Press.
- Crawford, K., & Schultz, J. (2019). AI systems as state actors. *Columbia Law Review*, 119(7), 1941–1972.
- Jamiu Ishola, S. (2024). The impact of artificial intelligence on contract law: A legal analysis. *SSRN Electronic Journal*.
- Mohamed Zakri, I. M. (2025). AI-driven contract law processes and the efficient breach doctrine: A systematic review of legal challenges in common law jurisdictions. *International Journal of Advanced and Applied Sciences*, 12(3), 225–237.
- Russell, S., & Norvig, P. (2010). *Artificial intelligence: A modern approach* (3rd ed.). Prentice Hall.
- Various authors. (2024). The impact of artificial intelligence on contract law: Challenges and opportunities. ResearchGate preprint.
- Various authors. (2025). Ethical challenges of using artificial intelligence in judiciary. arXiv preprint.
- Various authors. (2025). To err is human: Managing the risks of contracting AI systems. *Computer Law & Security Review*.