

Beyond Robot Ownership: A Lease-Based Framework for Lifecycle Governance of High-Risk Embodied AI (Extended Abstract)

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Abstract

High-risk embodied AI challenges legal models designed for static consumer goods. A care robot may move through a home, collect sensitive information, and depend on continuing software, cloud services, and maintenance. If an update changes its navigation or grasping behavior and a caregiver is injured, formal ownership alone does not identify who must detect the risk, preserve evidence, coordinate repair or recall, and provide access to redress. More generally, updates, adaptive behavior, hardware degradation, user modification, and changing deployment contexts may alter a robot's safety and privacy profile long after transfer. A one-time sale may therefore separate continuing technical control from continuing responsibility (Calo 2015; Moon and Rhim 2024; Perzanowski and Schultz 2016).

This paper develops a lease-based framework of limited use rights for systems combining meaningful physical agency with substantial operational autonomy. Leasing is used as an institutional governance structure rather than merely a payment mechanism. Users receive context-specific authorized use, while a licensed or otherwise formally authorized lessor serves as the presumptive lifecycle counterparty. The lessor coordinates authorized onboarding, registration and a dynamic digital passport, inspection and maintenance, material-change assessment, graded incident reporting, evidence preservation, repair, reauthorization, recall, and insurance-backed redress. Existing frameworks recognize lifecycle monitoring, traceability, change management, incident response, and post-market duties; the proposed model adds an identifiable institution responsible for coordinating those duties throughout the robot's operational life (NIST 2023, Manage 4.1-4.2; OECD 2024, section 1.5(b)-(c); European Union 2024, arts. 72-73).

The framework separates external accountability from internal responsibility allocation. Lessees and other affected persons should have a visible reporting and remediation pathway without first reconstructing the robot's technical supply chain. Behind that front door, responsibility remains allocable among manufacturers, AI system providers, integrators, maintainers, deployers, platform providers, and users according to actual control, knowledge, contribution, preventive capacity, and assigned duties. Registration, software-version

records, maintenance histories, authorization profiles, and insurance information support a distributed, traceable, and reviewable backend.

The proposal is presumptive rather than universal. Ordinary ownership remains the default outside the proposed high-risk category, and an ownership-based arrangement remains acceptable where it demonstrably preserves functionally equivalent lifecycle accountability. Governance intensity should remain risk-calibrated. Because leasing may itself enable surveillance, lock-in, remote suspension, repair restrictions, service withdrawal, unequal access, or market concentration, the framework includes reciprocal safeguards: purpose limitation and data minimization, perceptible sensing indicators, portability, qualified repair, service-continuity duties, notice and review, competition oversight, and public supervision (Nissenbaum 2010). The paper offers a normative institutional model rather than an empirical evaluation. Its central claim is that, for a defined class of high-risk embodied systems, continued use should remain connected to continued responsibility.

Full paper: <https://doi.org/10.2139/ssrn.7177278>

Funding Statement

This research received no external funding.

Adverse Impact Statement

The framework could cause harm if applied too broadly or implemented without reciprocal safeguards. Continuing technical relationships may enable surveillance, lock-in, remote suspension, repair restrictions, unequal access, discriminatory pricing, or market concentration. Licensing and insurance requirements may also advantage large incumbents. Risk-calibrated scope, data limits, portability, qualified repair, service-continuity duties, procedural review, competition oversight, and independent public supervision are therefore necessary to prevent lifecycle accountability from becoming a new source of dependency or concentrated private power.

Declaration on the Use of AI

During the preparation of this work, the author used OpenAI's ChatGPT and Moonshot's KIMI for language editing, consistency checking, and identifying claims and citations requiring verification. The research question, conceptual framework, normative arguments, selection and interpretation of sources, and conclusions were developed by the author. All AI-assisted suggestions were critically reviewed and independently verified by the author, who takes full responsibility for the final content of the paper.

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