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A NEW PARADIGM FOR AUTOMOTIVE OEMS IN THE RIGHT TO REPAIR ERA: TRANSFORMING REGULATORY COMPLIANCE INTO COMPETITIVE ADVANTAGE WITH AI AND STRATEGIC COMPLEMENTARITY

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Abstract
The Right to Repair (R2R) era is transforming the automotive industry, requiring a balance between protecting OEM innovations and ensuring consumers' freedom to choose aftermarket repair options. For automotive OEMs, R2R presents both a regulatory challenge and a strategic opportunity. This study uniquely integrates the emerging R2R discourse with Artificial Intelligence (AI), proposing a holistic, three-pillar strategy that combines technology, business model innovation, and legal tech adoption. Grounded in the theory of strategic complementarity, it demonstrates—using qualitative secondary data—that coordinated efforts across these pillars generate significantly greater value than isolated initiatives. By aligning AI-driven compliance with competitive strategy, OEMs can convert R2R obligations into market advantages. Supported by real-world case studies, the paper provides forward-looking recommendations illustrating how synergistic integration of technology, legal frameworks, and governance mechanisms enhances sustainability, innovation, and long-term competitiveness in the automotive ecosystem.

Keywords: Right to Repair, Artificial Intelligence, Smart Devices Industry, Data Privacy, Business Strategy

1. Introduction

The Context: The Right to Repair (R2R) movement is redefining the automobile industry's legal, technological, and fundamental doctrine. R2R is essentially a response to rising consumer demand for access to spare parts, repair manuals, and diagnostic tools needed to repair and maintain their vehicles independently.
Legislatures across regions are introducing legal frameworks forcing original equipment manufacturers (OEMs) to remove long-standing obstacles to repairability. These legislative changes have broad ramifications and are crucial to the future of automotive invention, consumer rights, and competitive strategy. Users and third-party entities are entitled to obtain the requisite tools, components, and manuals relevant to a product. This would enable users to repair a device rather than relying on the manufacturer.

1.1 The research problem: Need for automotive OEMs to balance compliance with R2R regulations, while remaining competitive

The R2R era presents both a legal requirement and a strategic turning point for automotive OEMs. The stakes go far beyond just following rules; compliance is no longer optional. Reactively managing R2R compliance could damage proprietary advantages, customer loyalty, and market share. However, if handled properly, R2R compliance can inspire innovative ideas, create brand distinction, and promote environmentally friendly development, ensuring the long-term and sustainable growth of the business. Thus, automotive OEMs must resolve two apparently conflicting issues in the R2R era, which are: (a) Maintain OEM rights to protect the right to invent (protected by IP rights) to stay competitive and preserve aftermarket repair revenue in a fair, open, and legally compliant manner. (b) Navigate through various conflicting legislations in multiple jurisdictions related to environmental protection, antitrust, vehicle, and driver data privacy, etc.

1.2 OEM Business model and R2R compliance gaps

There are significant gaps in OEMs' legal compliance with R2R regulations, and an innovative business model that retains OEMs' aftermarket services revenue, redefines value for customers while remaining responsive to the changing expectations of regulators, consumers, and independent repair parties.

1.2.1 Retaining aftermarket revenue: Monopolizing the aftermarket services

In the current economic climate, when uncertainty, high inflation, and high loan rates have forced many businesses to postpone capital projects, the significance of the aftermarket and service has become more pronounced and acute. When compared to aftermarket and service investments, including maintenance or upgrades to the current installed base, capital expenditures for new manufacturing lines are typically larger. As a result, automakers use anticompetitive strategies to control the supply of parts, technical information, and diagnostic equipment, thereby monopolizing aftermarket services. Several class anti-trust lawsuits have been filed against OEMs, such as Deere & Co. (In re Deere & Company Repair Services Antitrust Litigation, No. 3:22-cv-50188 (N.D. Ill..), Tesla (Morand v. Tesla, Inc., 2025), Harley-Davidson (KIRSCH 2025).

1.2.2 Data Privacy and Security

A recent Mozilla Foundation article (Caltrider, Rykov, & MacDonald, 2023) addressed privacy concerns of the drivers, including excessive data collection, sharing, and selling. OEMs acquire personal information. According to the research, privacy issues were at their worst. Car makers utilize direct trackers, cameras, microphones, and sensors to track drivers. The research recommends quick management and investigation of driver privacy rights. Several lawsuits have been filed against companies for deliberate violations of driver data privacy, including the Toyota North America (Siefke v. Toyota Motor North America, Inc., 2025), GM OnStar Lawsuit (AboutLawsuits 2025), and Advance Auto Parts Settlement (In re: Snowflake, 2024), to name a few.

1.2.3 No Integration of Technology, Legal, and Business Model

The existing literature primarily discusses the R2R in terms of consumer rights, sustainability, and regulation. And the OEMs often view R2R compliance as a binary trade-off, whereas in reality it isn't either-or situation. AI adoption in various industries is rapidly transforming risk management and compliance, growth-oriented business strategy, IP protection, and legal process automation (Mahabir 2024). However, Traditional automakers, accustomed to long product cycles and extensive safety regulations, are often slow to adopt AI (Krishna 2024).

The existing research on AI use cases in the automotive industry shows that OEMs view AI as a tool for :

(a) Technology enablement: AI-driven process improvement in supply chain, demand forecasting for better inventory management, combating counterfeits, and autonomous vehicle improvement (Hossain 2025).
(b) Legal measures: IP management, data privacy compliance, and legal process automation (Rana and Bala 2021)
(c) Business strategies: Sales, marketing, and customer service are increasingly AI-driven, such as dynamic pricing, lead qualification, and conversational agents that help teams convert faster and support customers 24/7, and monetization of aftermarket spare sales and services (Matthew et al., 2025).

This fragmented perspective overlooks the potential of a holistic approach that integrates technology, legal, and business models, with AI as the intertwining strand, to support compliance and competitiveness.

1.3 The Research Question

This research aims to answer the key question: Can AI help bridge the gap between consumer rights and OEM profitability, enabling OEMs to fulfill their legal obligations while enhancing efficiency, engagement, and competitiveness? By placing AI at the core, the study explores the validity of a novel perspective on integrating three strategic pillars—technology, legal, and business models—with AI as the common thread that connects them into a cohesive, holistic solution.

2. Literature Review

The literature review was conducted to gather relevant data and develop a framework that helps us clearly interpret, explain, and generalize our findings, as well as identify potential approaches to solving the research problem.

Three levels of sources were used:

(a) Primary doctrinal sources include regulatory, legislative, and case law documents, along with accompanying explanatory or policy comments. This outlines the current regulatory landscape regarding repairability and recent policy advancements.
(b) Academic secondary sources primarily originate from the fields of law, ethics, and socio-legal studies.
(c) Grey literature and press include mainstream news articles and outputs from social advocacy organizations and NGOs that highlight current social movements related to R2R. Their findings provide evidence of prevailing arguments, trends, and sources that shape the discourse, thereby clarifying the main themes or considerations in repairability discus- sions. While not universally applicable, these movements generally advocate for a more "idealized" or progressive per- spective compared to existing doctrinal realities.

The materials used in this literature review are not comprehensive on a global scale. These social advocacy activities serve as a basis for comparison because they are primarily conducted in the primary economic zones, i.e., the USA and the EU. The researchers are based in India, so they only consider that country, along with the US and the EU.

2.1 R2R-related Legislative Landscape

2.1.1 Legislation in the USA

The Legal framework consists of state-level laws (not yet federal). (a) The 2020 amendment to the Massachusetts Motor Vehicle Owners' Right to Repair Law (Massachusetts Acts, 2020), offers protection for data access, telematics, and diagnostics. Dealerships and OEMs are included. The Federal Trade Commission supports federal action, while state AGs and courts enforce the law. (b) Maine has also passed legislation (Me. Rev. Stat. tit. 29-A, § 1810, 2024), that contains this provision, which applies to motor vehicles sold in Maine. Enforcement Bodies include State AGs and courts, while the Federal Trade Commission is supportive of federal action. Penalty for Non-Compliance varies by State (fines, litigation) Likely Future Trends: Legislation in the USA seeks to protect consumer choice, promote a fair marketplace, and ensure the safe operation of the nation's 292 million registered passenger and commercial vehicles, 70% of which are serviced by independent repair shops. One of the lawsuits that helped the 'right to repair' movement gain momentum is the case filed by a group of 16 farmers against John Deere, one of the largest farm equipment companies in the world (McGregor 2025). However, the Right to Equitable and Professional Auto Industry Repair Act (REPAIR Act), H.R. 906 (H.R. 906, 118th Cong. , 2023), was introduced in the 118th Congress on February 9, 2023, is still under review, and has not yet been enacted. The REPAIR Act recognizes the importance of privacy and cybersecurity protection while allowing data access, with the Federal Trade Commission (FTC) and the National Highway Traffic Safety Administration (NHTSA) tasked with considering these factors when designating shareable data.

2.1.2 Legislation in the EU

The Legal Framework is based on The Eco-design for Sustainable Products Regulation (ESPR) (Regulation (EU) 2024/1781), which came into force on July 18, 2024, and aims to improve the environmental performance of products throughout their lifecycle by promoting durability, repairability, and resource efficiency. This includes measures to extend product durability, encourage reparability, and increase the use of recycled content. In 2021, France introduced a mandatory repairability index (ITU 2021) that requires manufacturers to label products, such as smartphones and laptops, with a score indicating their repairability. The automotive manufacturing industry ranks among the largest consumers of primary raw materials, such as steel, aluminium, copper, and plastics; however, it uses recycled materials sparingly. Although the recycling rates of materials from ELVs are generally high, the scrap metals produced tend to be of low quality, and only a small amount of plastic is recycled. Every year, over six million vehicles in Europe reach the end of their life and are discarded as waste. When end-of-life vehicles (ELVs) are not adequately managed, they can cause environmental issues, and the European economy loses millions of tons of materials. Enforcement Bodies are the European Commission and national regulators. Penalties for Non-Compliance include administrative penalties and market bans.
Likely Future Trends: EU-wide automotive digital access rules via the Circular Economy Packages are expected by 2026. Data portability and interoperability are expected under DPP and GDPR aligned policies

2.1.3 Legislation in India

Multiple agencies drive the Legal Framework. In 2023, the Right to Repair Framework was introduced by the Ministry of Consumer Affairs. The automotive sector is included, but implementation is still pending. Access to parts, manuals, tools, and diagnostic data is expected to be enabled in the future; however, the specifics of data sharing have not yet been codified. Currently, the Competition Act of 2002, amended in 2023 (Competition (Amendment) Act, 2023), is in effect, and the office of Consumer Affairs is linked to MoRTH (Ministry of Road Transport & Highways, Government of India). Penalty for Non-Compliance, though not specified yet, there are instances of fines by the Competition Commission of India (CCI) – e.g., imposing penalties on automotive companies, for restricting the sale and supply of genuine spare parts in the open market (Hariharan et al. 2019).
Likely Future Trends: Possible integration into the Motor Vehicle Act (Motor Vehicles (Amendment) Act, 2019) or BIS (Bureau of Indian Standards) standards for auto parts.

2.1.4 Consumer Rights, Environmental Protection, and OEMs' Views

Should consumers have a legal right to take their vehicles to independent repair shops or fix them themselves? Yes, that is what instinct tells you. That straightforward response is fueling the right-to-repair movement and the consumer protection advocacy groups working to make it a reality.
However, it is a complex issue that spans various policy areas, including environmental protection, antitrust, and intellectual property rights, such as copyright. To understand the broader and more far-reaching implications and the complexities of passing legislation on R2R, a summary of 'R2R Advocates' Supporting Arguments' and 'OEM Industry Associations' Counter Arguments' on key issues from different literature is shown in Fig. 1.

3. Proposed Strategic Framework to solve the Research Problem

3.1 Proposed Cross-Disciplinary Approach

This paper adopts a cross-disciplinary approach that integrates insights from various fields, exploring AI as a technological enabler, a strategic driver for new business models, and a governance tool for legal compliance. It examines business strategy from the perspective of technological opportunities and regulatory constraints, reinterprets law and policy as

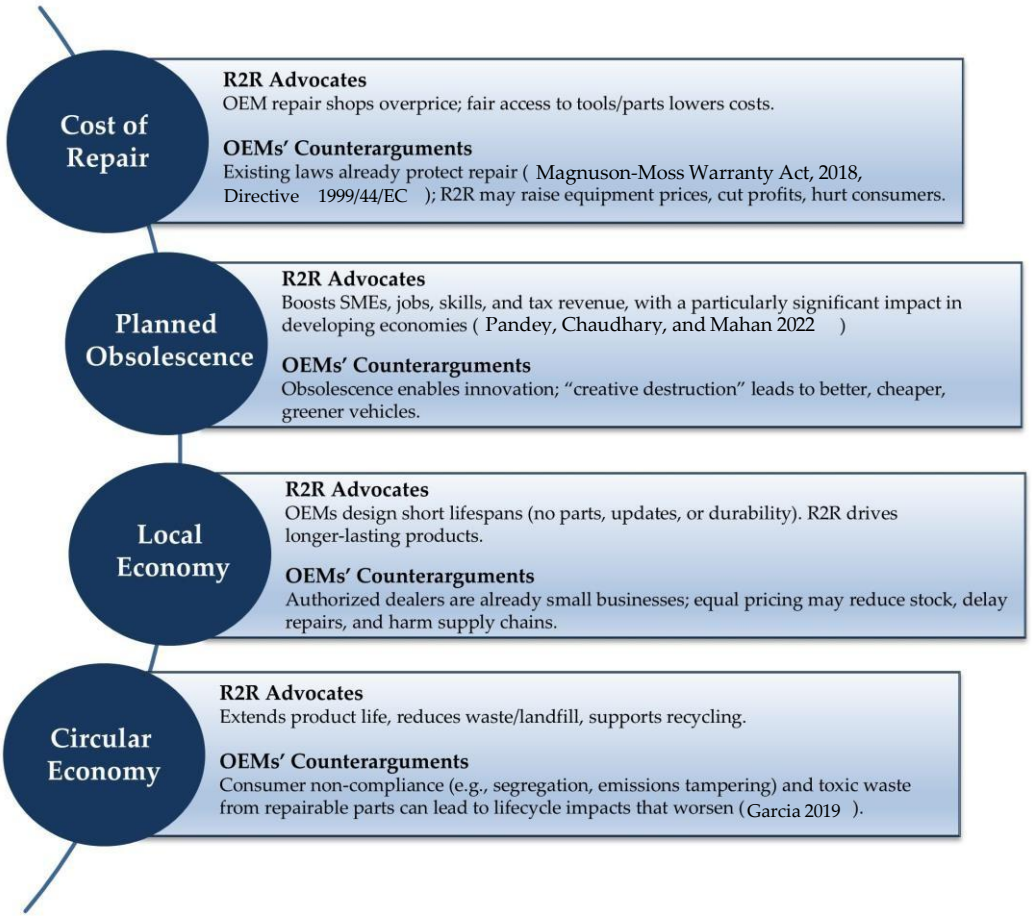

Fig. 1 Summary of 'R2R Advocates' Supporting Arguments' and OEM Industry Associations' Counter Arguments

competitive advantages through AI-powered legal tech, and incorporates AI across these domains. This approach transcends disciplinary boundaries, offering new insights for OEMs to navigate compliance, competition, and innovation, while demonstrating its cross-disciplinary contributions to both theory and practice.

3.2 Why This Is the Hypothesis in this Research Cross-Disciplinary

a) Integration (Combining Perspectives)

Knowledge and expertise from various fields collaborate on a shared goal, each bringing their unique viewpoints and techniques to the problem. In our research, AI (tech) is not isolated but directly incorporated into business strategy and legal compliance.

b) Synthesis (Applying Concepts)

Knowledge and methods from one discipline are used to solve problems or understand issues in a different, often unrelated, field. In the current research, business model design is influenced by both AI innovation and regulatory frameworks.

c) Transcendence (Creating New Knowledge)

By combining insights from different disciplines, new theoretical frameworks and practical solutions can be developed. In this research, Law is seen not just as a constraint but as an enabler when paired with AI-driven governance.

3.3 Synergistic value of combining three strategic pillars

While each pillar of the proposed AI-driven framework—technological innovation, business model adaptation, and legal-tech adoption—offers standalone benefits, their integration creates compounded value that exceeds the sum of its parts, as elaborated in Table 1.

Table 1: Cross-Disciplinary Integration and Synthesis leading to Transcendence

Integration	Synthesis: Core Focus in R2R Context	Transcendence: AI-enabled new, unique processes		
		Intersection with Tech	Intersection with Business	Intersection with Law/Policy
Business & Law/Policy	Diagnostic tools, predictive maintenance, dataanalytics, cybersecurity, digital twins	_	Enables new business Models (AI-driven Aftermarket services, subscription models)	AI-assisted compliance (monitoring repair data flows, detecting IP misuse, ensuring secure sharing of repair manuals)
Technology & Law/Policy	Revenue protection, customer loyalty, competitiveness, and value creation beyond hard- ware.	AI-enabled innovation (platforms, predictive customer insights, digital ecosystems)	_	Compliance-driven business model pivots (balancing openness with IP, liability management, and governance frameworks)
Technology & Business	Consumer rights, access to repair data, IP protection, and regulatory compliance	AI-powered legal tech (automated compliance checks, contract analytics, governance dashboards)	Influences strategic choices (market positioning, competitive advantage via compliance leadership)	-

3.4 Implementing Cross-Disciplinary Integration and Synthesis: AI-driven, three-pillar strategic framework

By strategically embracing openness and creating value beyond just vehicle hardware and software, OEMs can remain compliant, competitive, and customer-focused in the R2R landscape by integrating AI-driven solutions that leverage three strategic pillars. In this paper, the following hypothesis is proposed, with three sub-hypotheses as narrated below:

3.4.1 Hypothesis (H)

An AI-driven, three-pillar strategic framework (covering technology, business model innovation, and legal-tech adoption) enables automotive OEMs to comply with Right to Repair (R2R) regulations while sustaining or even enhancing competitive advantage.

3.4.2 Sub-Hypotheses

a) **H1 (Technology Pillar): (**a) AI-enabled anticounterfeit measures, product authentication, blockchain-based "clean supply chain"(to reconcile anti-counterfeit protections with legally compliant access to third-party repair services), (b) AI-enabled vehicle diagnostics and repair, OTA software update (for better, faster service), (c) predictive analytics to predict vehicle parts failure (ACEA 2020).

b) **H2 (Business Model Pillar):** OEMs that leverage AI-driven aftermarket service monetization models (e.g., repair- as-a-service, digital marketplaces, predictive maintenance) can offset revenue losses from mandated R2R compliance (Ahramovich 2025)

c) **H3 (Legal-Tech Pillar):** AI-driven IP management, compliance tracking, and contract automation, along with data privacy techniques like Federated learning, Differential privacy, Homomorphic encryption, and Secure multiparty com-putation (Guides 2024), can lower regulatory risk and litigation exposure while enhancing OEM governance.

3.4.3 The proposed solution architecture to implement the strategic framework

The components of the proposed solution architecture are shown in Fig. 2, and explained below:

1. Modern Data Architecture combines data cataloging, privacy management, and governance within a single framework that uses artificial intelligence (AI) and machine learning (ML) to discover, manage, and protect enterprise data. The data catalog organizes and indexes datasets with unique identifiers, while data quality processes ensure the consistent delivery of accurate, relevant, and trustworthy information across data management activities.
2. Data Ingestion and Integration enable the smooth transfer of both structured and unstructured data into cloud-based data lakes at any speed. This is supported by high-performance connectors that can manage various file formats, databases, and applications in both batch and real-time modes.
3. Real-Time Analytics enable continuous data querying and event detection, supporting use cases like online brand monitoring, process optimization, and supply chain tracking systems.
4. Application and API integration creates interoperability between different platforms—such as supply chain management, legal case repositories, and intellectual property database enabling automation and data-based decision making.
5. Alternative Data Repositories store frequently accessed datasets, which reduces redundant API calls. For example, once

relevant intellectual property and patent data are retrieved, they can be efficiently reused from the repository for future analyses.

6. Data provisioning guarantees that curated data is accessible for AI research, model development, and governance across the three strategic pillars—technological, legal, and governance domains—thereby supporting robust AI and ML applica- tions, including legal-tech and anti-counterfeit systems.
7. Holistic integration across these pillars is enabled by an AI- and ML-powered automation layer that facilitates workflow orchestration and data exchange.
8. AI Governance and Risk Management offers a structured framework of ethical guidelines, privacy protections, and cybersecurity measures to ensure responsible AI deployment and compliance with regulations.

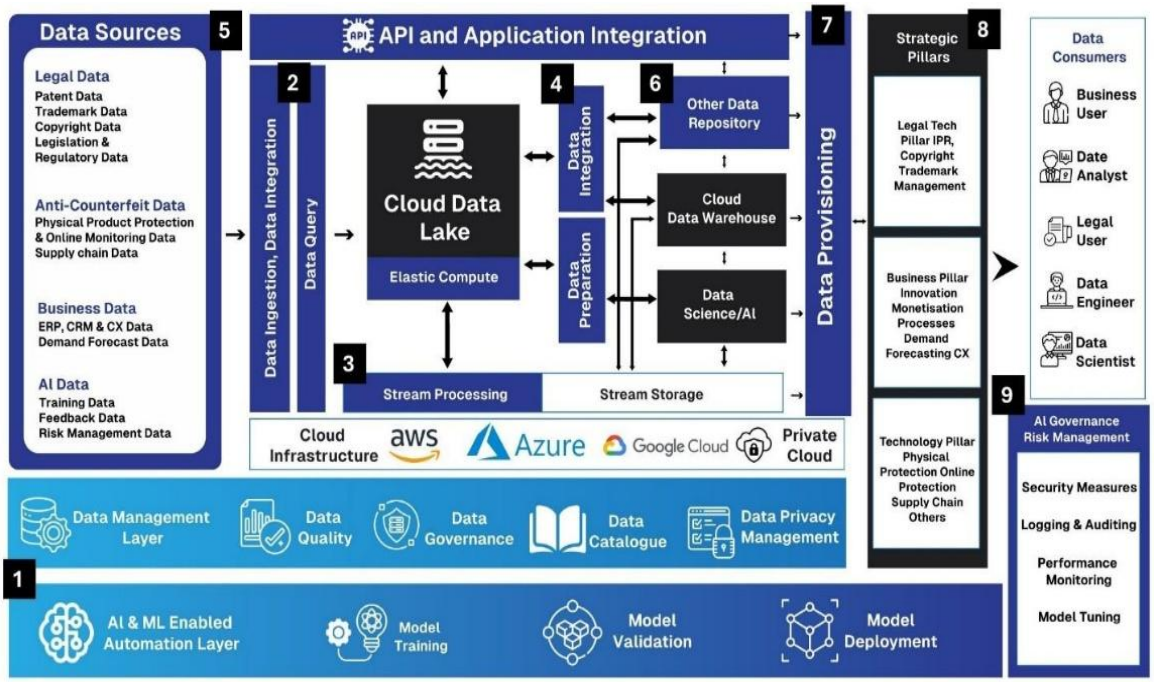

Fig. 2 Architecture of the proposed integrated AI-driven Pillars

The study hypothesizes that while each pillar yields independent value, their AI-enabled integration produces synergistic outcomes that enhance compliance, trust, and competitiveness, offering a cross-disciplinary framework for sustainable innovation.

3.5 Unique solution helping the automotive OEMs in the R2R era

a) Bridging Two Evolving Domains:

Most existing literature on the Right to Repair (R2R) mainly covers the legal and policy aspects or the automotive industry's technical and market reactions. This paper is unique because it connects the R2R discussion with the growing role of artificial intelligence in shaping OEM strategies—a perspective rarely examined in depth within the automotive field.

b) From Compliance to Competitive Advantage

Instead of viewing R2R merely as a regulatory compliance burden, the article reframes it as an opportunity for invention, customer loyalty, and revenue growth. This position is underrepresented in existing research.

c) Forward-Looking, Action-Oriented Recommendations

Rather than just analyzing challenges, the article offers practical, actionable, and AI-enabled strategies for OEMs to stay competitive in an open, repair-friendly market.

3.6 Proposed Hypothesis: Complementarities and Fit Strategy - Integration of the Three Pillars for Ensuring Compliance while Enhancing Business Value of the OEMs

The integration of all three pillars transforms the isolated functions into a cohesive, strategic, and complementary system (Fig. 3). For example, AI-enabled diagnostics (technology) can be embedded in subscription-based repair services (business model), while simultaneously ensuring compliance with jurisdiction-specific R2R mandates (legal technology). This synergy enables OEMs to convert regulatory obligations into trusted consumer offerings that are legally robust and technologically secure. The outcome is a self-reinforcing cycle:

Technology builds trust, business models monetize while remaining compliant, and legal-tech reduces risks - together generating a competitive advantage that none of the pillars could achieve independently. In other words:

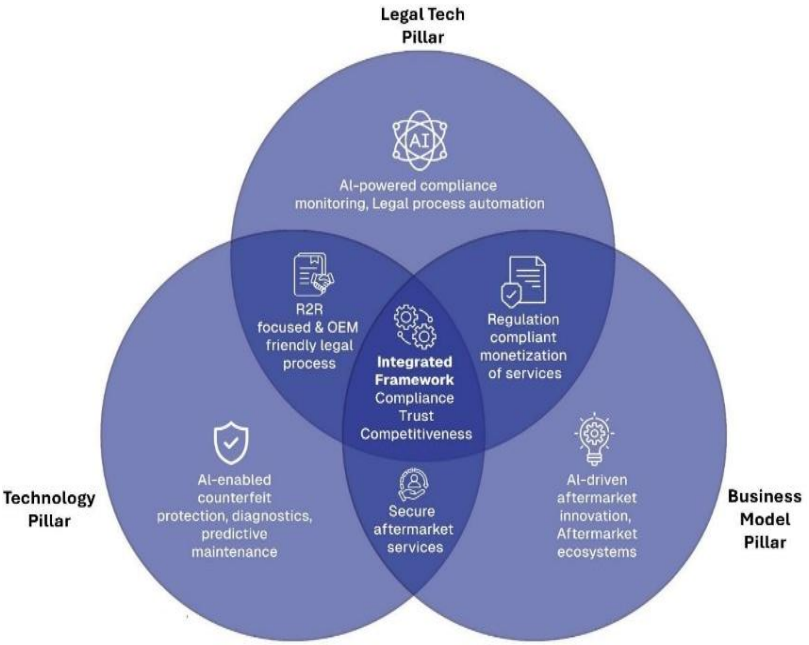

Fig. 3 Complementarities and Fit Strategy: Synergistic Benefits of Integrating Three Pillars

a) Technology alone = secure but costly.
b) Business model alone = innovative but legally risky.
c) Legal tech alone = compliant but defensive.
d) All three integrated = competitive, trusted, and compliant ecosystem.

3.7 Potential Benefits of the Strategic Framework

3.7.1 Benefits of R2R-focused combined Business Model and Technology

The technology pillar ensures secure, repair-friendly ecosystems through AI-enabled authentication and diagnostics; however, without complementary business models, these capabilities risk being viewed as compliance costs rather than revenue sources. This is elaborated in Table 2.

Table 2: Benefits of R2R-focused, AI-enabled combined Business Model and Technology: Secure and safe aftermarket service

Challenge / Gap	Current OEM Approach	Gaps in Current Approach	Solution Measures
Restriction of In-dependent Repair	AI in vehicle firmware (ECU checks, part pairing, OEM digital signatures) (Analog Devices n.d.)	Blocks safe, compliant 3rd-party parts; OEM lock-in; reduced consumer choice; anti- trust risks	AI compatibility checks vs. standards; interoperability mandates (API-style) (Sambhwani 2025); "grace mode" operation pending review
Data Access & Transparency Deficit	Proprietary OEM datasets; closed AI models; anti-counterfeit programs with limited repairer input	Opaque decisions; no open APIs; repairers can't integrate or challenge flags (AutoInc. 2020)	Public verification criteria; licensed APIs (FRAND terms); advocacy group audit rights on anti- counterfeit AI
Weak Consumer Protection Alignment	AI tuned for IP, brand integrity, warranty enforcement	Ignores consumer rights, affordability, and sustainability; doesn't validate lawful after- market parts (Acviss 2025)	Dual-objective AI (IP + consumer rights); consumer disclosures on part compatibility & options; independent lab certifications for aftermarket parts

3.6.2 Benefits of R2R-focused combined Legal-Tech and Business Model

Business model innovation can generate new service streams, yet without technological safeguards, it risks jeopardizing intellectual property and exposing OEMs to counterfeit threats. This is elaborated in Table 3.

Table 3: Benefits of R2R-focused combined AI-driven Legal-Tech and Business Model: Regulation-compliant monetization of aftermarket services

Challenge / Gap	Current OEM Approach: Monetization Strategy	Gaps in Current Approach	Solution Measures
REPAIR Act and State Laws	Eliminate multiple state regulations and potential conflict with the upcoming federal regulation	No AI-driven R2R cross-jurisdictional mapping; OEMs/repairers struggle with real-time obligations (Oluwagbade 2025)	AI global R2R mapping dashboards; dynamic alerts on legal changes; APIs for automated compliance, to ensure jurisdictional compliance in the USA (R2R laws)
Telematics Data Control & API Licensing	Fleet data subscriptions - Developer API licensing - Insurance & analytics partner-ships	Massachusetts Data Access Law mandates open telematics access; OEMs resist citing cybersecurity	Dynamic API Gateways with ML-based pricing – AI-based data classification & anonymization (Kozłowski and Wiśniewski 2025), to ensure privacy-compliant access logs (GDPR, CCPA, DPDPA compliance)
Controlled Access Platforms (Repair Portals)	Subscription-based access - Per-use fees - Paid certifications & training	OEMs must prove "rea-sonable access" without undermining safety/ security (European Union, n.d.)	AI-powered repair certification & skill testing – Predictive quality scoring - AI-based tool verification. This prevents misuse while enabling access and cybersecurity & safety compliance, with auditable logs for regulators
Secure Gateway Architecture (SGWs)	Paid authentication platforms - Premium APIs - Certified tool sales (Topdon, n.d.)	OEMs must justify SGWs as safety measures, not access denial	AI smart access management platforms - Context-aware access (role/risk/jurisdiction) - Real-time pol- icy enforcement. Meets "reasonable access" man- dates - Risk scoring of repairers - Jurisdictional customization (e.g., MA vs. others)

3.7.3 Benefits of R2R-focused, OEM-friendly, combined AI-enabled Technology and Legal- Tech

Legal-tech adoption may streamline compliance processes, but without supportive technology and business strategies, it remains a defensive measure rather than a growth driver. This is elaborated in Table 4.

Table 4: Benefits of R2R-focused, combined AI-enabled Technology and Legal-Tech: Hassel-free process for Independent Repair Providers

Challenge / Gap	Current Uses / State	Gaps in Current Uses	Solution Measures
Overreach of Anti- Counterfeit Controls	AI verification: block-chain tracking, RFID/microchips, computer vision, ML supply- chain scans	Misclassifies legitimate aftermarket/refurbished parts as counterfeit; creates repair bans; consumer rights risks (Autoparts24 2025)	Multi-level authentication (OEM / after- market/ counterfeit) (Oort Knowledge Base 2025); retraining with aftermarket datasets; AI arbitration for disputes
No Differentiation Between Counterfeit & Aftermarket	Image recognition, watermarking, and serialization flag all non-OEM	Binary detection only (OEM vs non-OEM); penalizes legitimate after-market	AI models with quality/safety checks; ISO-style aftermarket registries; multi-label classification (OEM, licensed after-market, compliant non-OEM, counterfeit)
Data & Law Accessibility Gap	Proprietary AI legal tech for OEM compliance (IP, liability, supply chains)	No open, standardized R2R legal database; scattered info; repairers lack affordable guidance (UNCTAD 2025)	Open R2R legal data platforms; localized AI legal assistants; regulator–NGO–tech partnerships for neutral, affordable tools

Challenge / Gap	Current Uses / State	Gaps in Current Uses	Solution Measures
Overemphasis on IP Enforcement	AI tools prioritize brand/IP protection	Rarely distinguish lawful aftermarket/ refurbished parts; over-blocking risk (Madan 2025)	Dual-mode analysis (IP + R2R rights); context-aware classification; enforcement protocols requiring R2R exception checks
Regulatory Mapping Deficit	Some tools map global trade compliance	No AI-driven R2R cross-jurisdictional mapping; OEMs/repairers struggle with real-time obligations (Oluwagbade 2025)	AI global R2R mapping dashboards; dynamic alerts on legal changes; APIs for automated compliance
Lack of Dispute Resolution Support	AI in e-discovery, con- tract review	No mediation/ ombuds-man platforms for R2R re- pair disputes (Singh 2025)	AI R2R mediation platforms; automated drafting (notices/complaints); escalation paths to formal proceedings
Weak Integration with Repair Data	Legal-tech systems are separate from diagnostic/repair tools	No real-time check of re-pair restrictions against R2R law; data Integration/privacy/secur ity challenges (Codeless Plat- forms 2023, Ballejos 2025)	Legal–technical bridges; automated law- fulness checks; shared compliance dash- boards for OEM & independent teams

4. Research Methodology

4.1 Qualitative data analysis using the case study method, grounded in the theory of strategic complementarity, to establish the validity of the central Hypothesis

4.1.1 Why the case study method is used in this research

Case studies are particularly effective for examining complex, multidimensional situations that are difficult to understand through quantitative methods alone, as they provide a deep understanding of the dynamics and connections within a specific environment (Annamalah 2025).

Despite widespread experimentation and, in some cases, the adoption of AI applications in the automotive industry, significant obstacles hinder more rapid and widespread implementation, especially in complex, safety-critical systems, due to safety and regulatory concerns, data privacy issues, and the high cost of integrating with legacy systems (Uniyal 2025). Much of the data from the Automotive Service and Repair Ecosystem is as complex as the industry itself: highly diverse, somewhat messy, with inconsistent terminology. In other words, it is not always usable. While "Right to Repair" may make data accessible, the methods and reasoning for integrating AI in a Right-to-Report (R2R) context are still being developed, as this is an emerging discipline (Seng 2023).

Empirical research using actual data is scarce in this emerging field. Case studies focus on real-world phenomena, providing empirical evidence and anchoring academic ideas in practical settings. This is particularly crucial because of the ab- stract and rapidly changing nature of AI technology and its regulation. Systematic case studies enable researchers to ex- amine how strategies are created and implemented, helping to clarify decisions, challenges, and results.

Since this research focuses on AI-driven business strategy and examines AI as the unifying element linking technology, business practices, and legal frameworks in the automotive industry during the R2R era, the case study method is the best option.

4.1.2 Use of the Theory of Strategic Complementarity to establish the validity of the central Hypothesis

This research method is grounded in the theory of strategic complementarity (Milgrom and Roberts, 1994), which posits that combined efforts generate greater value than individual ones. The complementarity approach supports qualitative, case-study-based analyses in which, once validated, conclusions can be drawn directly from the complementary structure without extensive mathematical modelling.

Based on the theory of strategic complementarity, this study employs qualitative analysis of published case studies to verify the hypothesis that, while each strategic pillar offers unique benefits, their combination produces synergistic effects that improve compliance, trust, and competitiveness. Using empirical, publicly available data, the study provides a real-

world basis for testing this hypothesis. The results aim to show that the synergistic interaction among the three pillars is not just theoretical but observable in practice—supporting the idea that the combined approach yields greater strategic value than when implemented separately.

4.2 Empirical support for the benefits of the Synergistic value of combined layers from secondary data (real-world case evidence)

We will analyze real-world data to verify whether the core part of the hypothesis is valid: that each pillar provides its own numerical benefits. However, when combined, they deliver complementary and synergistic effects. By integrating the three strategic pillars, we create a robust repair ecosystem that protects privacy, operates independently, complies with legal standards, and earns the trust of institutions. No single layer can achieve this alone. This empirical support demonstrates that a key part of the hypothesis is supported by real-world evidence rather than just theory.

4.2.1 Conceptual Framework

Synergistic Implementation: The case studies, based on real-life use cases across various industries, involve the technical, legal, and governance layers that are implemented to reinforce one another rather than operate in silos to achieve adequate privacy protection in the R2R era.

Synergistic Benefits: Synergy occurs when the results of several applications outweigh the total benefits of individual pillars (Fig. 2), for (a) Mutual Reinforcement, (b) Holistic Consumer Protection, (c) Scalability & Adaptability, (d) End-to-End Protection. This empirical evidence, grounded in real-life case studies, shows that together, the three layers form a self-operating, legally compliant, and institutionally credible privacy shield to deliver the synergistic value as envisaged in the Hypothesis of this research.

5. Results & Discussions

5.1 Data Analysis

5.1.1 Case Study 1: Retail Banking - AI-driven AML System

A prime example is how leading banks like HSBC, J.P. Morgan, Citi, and Standard Chartered use AI to ensure personalized anti-money laundering (AML) compliance and fraud detection. An innovative AI-driven business model is used to combine industry-specific technology (such as transaction monitoring and risk assessment) with legal requirements (AML regulations). AI boosts competitiveness by reducing financial losses through analyzing large datasets to spot suspicious patterns, thereby improving compliance accuracy and speed. It also increases customer satisfaction by providing more secure and efficient services and by reducing false positives that could inconvenience legitimate customers (Ghimire 2025).

The components of this example are delineated below:

(i) Technology that is specific to a particular industry (Kellton 2025):

(a) Real-time Transaction Monitoring: Artificial intelligence (AI) continuously evaluates financial transactions for anomalies and suspicious activities that may suggest fraud or money laundering,

(b) Machine Learning (ML) for Risk Assessment: ML algorithms predict potential hazards and evaluate creditworthiness, enabling more precise financial decision-making,

(c) Natural Language Processing (NLP): The process of extracting pertinent information for compliance by analyzing unstructured data from consumer interactions and legal documents.

(ii) Regulatory and Legal Framework (Ibitola 2025):

(a) To prevent illicit financial activities, banks are required to adhere to stringent anti-money laundering (AML) regulations. AI can assist in the automated identification and reporting of suspicious activities by analyzing transaction data in a complex manner,

(b) Fraud Prevention: Robust systems that can efficiently detect and prevent fraudulent transactions are necessary to comply with legal requirements to safeguard customers from fraud.

(iii) Novel Business Model (Tookitaki, n.d.):

(a) Proactive Compliance: AI allows banks to transition to a proactive compliance model, identifying hazards before they escalate and become legal issues, rather than relying on a reactive approach.

(b) Improved Customer Service: AI enhances customer experience by reducing false positives from fraud detection and expediting transactions, resulting in a more dependable and seamless experience.

(c) Personalized Financial Services: Banks can enhance customer relationships by providing more personalized financial advice and products, which are enabled by AI insights derived from customer data.

(iv) Impact:

(a) Enhanced Compliance - AI automates intricate analyses, resulting in more precise and timelier adherence to AML and other regulations.

(b) Enhanced Competitiveness - Banks gain a competitive edge by providing innovative services, lowering operational costs, and reducing financial losses from fraud.

(c) Increased Customer Satisfaction: A positive customer experience is fostered by faster service, enhanced security, and personalized financial advice, which in turn fosters loyalty and trust.

5.1.2 Case Study 2: Retail and E-commerce - AI-driven business transformation

The retail and e-commerce industry clearly demonstrates AI's transformative impact in B2C environments, with companies like Amazon, Walmart, and Sephora leading the way in improving compliance, competitiveness, and customer experience.

(i) Industry-Specific Technology

(a) Personalization and Recommendation Engines: AI forecasts user preferences to provide tailored experiences that enhance engagement and loyalty, e.g., Netflix (Product Space 2025)

(b) Frictionless Retail – Self-Checkouts: Using computer vision and sensor fusion, stores like Amazon Go enable customers to select items and leave without waiting in line, increasing convenience and lowering costs (Wankhede 2018).

(c) Advanced Demand Forecasting and Supply Chain Optimization: Walmart uses AI algorithms to match supply with anticipated demand, reducing stockouts and excess inventory while boosting efficiency (Alhajri 2025).

(ii) Regulatory and Legal Framework

Personalization engines must adhere to privacy laws such as the GDPR and CCPA to ensure consent, data transparency, and security. Frictionless retail systems need to safeguard in-store movement data, while forecasting tools must protect shared supply chain data from breaches.

(iii) Novel Business Models

AI-driven personalization enhances engagement through intuitive shopping journeys; self-checkouts cut staffing costs and waiting time; and demand sensing increases turnover ratios and fulfillment rates, boosting revenue.

(iv) Impact

AI delivers measurable benefits—Netflix attributes over 80% of viewing to its recommendation system, Amazon Go reports 46% of shoppers prefer self-checkouts, and Walmart records 20–35% lower inventory, 25–30% fewer stockouts, and up to 15% lower logistics costs (Nguyen 2025 and Sadh 2025).

5.1.3 Case Study 3: Healthcare - AI-Powered Lung Nodule Detection

Companies like Philips and Siemens Healthineers are developing and deploying AI tools to assist radiologists in detecting lung nodules on CT scans. AI is the foundational technology that enables these advancements by enhancing diagnostic capabilities, improving workflow efficiency, and personalizing patient care.

(i) Technology Specific to a Specific Industry (Philips 2022):

AI algorithms are trained on extensive datasets of medical images to detect subtle changes and potential abnormalities that may be overlooked by the human eye, particularly when time is of the essence.

(ii) Legal and Regulatory Compliance:

Siemens Healthineers' AI-Rad Companion Chest X-ray ensures compliance with diagnostic and regulatory standards for early disease detection. The digital X-ray is securely transmitted to cloud-based AI software compliant with EU GDPR. After processing, the AI-annotated study returns to the PACS, where radiologists can view both original and annotated images on a multi-reader workstation, enabling efficient and accurate clinical interpretation (Uhlenbrockund 2021).

(iii) Innovative Business Model:

(a) This technology is frequently sold through a service-based model, which allows hospitals and radiologists to access advanced diagnostic capabilities without the need to invest in and maintain complex AI infrastructure themselves. This approach is a step toward a "software-as-a-service" model (Chandel 2025),

(b) Enhanced Compliance: Through the provision of more precise and timely detection, the AI system assists healthcare providers in adhering to the compliance standards for cancer screening and early intervention protocols.

(c) Enhanced Competitiveness: Hospitals and radiology departments that implement these AI tools can provide more precise and expedited diagnostics, thereby increasing their ability to attract patients and provide superior care. AI-based lung nodule detection can perform nodule search 26% faster, detecting 29% of previously missed nodules compared to manual inspection (Eruchalu 2021)

(iv) Impact:

Enhanced Customer (Patient) Satisfaction - The patient's experience and health are ultimately enhanced by the earlier and more accurate detection of lung nodules, which results in better patient outcomes. Some studies have demonstrated a significant increase in the rate of early diagnosis and a reduction in reading times.

5.2 Example in Automotive - AI-powered predictive maintenance

Daimler India Commercial Vehicles (DICV), a wholly owned subsidiary of Daimler Truck AG, has introduced a pioneering uptime assurance program named 'BharatBenz Rakshana' aimed at assisting BharatBenz customers in improving their business profitability. BharatBenz Rakshana Program provides compensation to customers if service or repair takes longer than 48 hours.

(i) Industry-Specific Technology:

The new Driver State Monitoring System (DSM) (Odisha Diary 2018) on BharatBenz cars in India tries to keep drivers from falling asleep or getting sidetracked. The BharatBenz DSM uses cutting-edge computer vision and artificial

intelligence to look at patterns in people's faces, such as the eyes, the way they look, how they stare, and other natural signs. Based on this, it can tell the difference between safe driving conditions and those caused by a tired or distracted driver and give them an audible and visual warning. The system has been trained to work with people of most races, and it can tell the difference between day and night.

(ii) Legal Frameworks:
(a) Regulations Regarding Fleet Uptime: A minimum vehicle uptime is mandated, or excessively lengthy service intervals are penalized in numerous industries, particularly logistics and transportation, that operate under legal requirements. AI's capacity to anticipate malfunctions facilitates compliance with these legal obligations,
(b) Transition to Proactive Safe Driving Training: The BharatBenz Simulated Driver Trainer (Daimler Truck Asia 2023a), an all-inclusive training program with 27 driving modules taught in five languages, offers an immersive, multimodal digital experience that prepares drivers for use in hilly, mining, highway, and intra-city contexts. AI generates reports for improvements and improves the driver training procedure.

(iii) Business Model Innovation:
(a) Profitability gains for fleet owners: DICV spearheaded the industry-leading 'BharatBenz Rakshana' uptime assurance program to assist BharatBenz clients in increasing their business profitability. Within 48 hours, the Rakshana initiative promises to service and deliver BharatBenz vehicles and buses. When trucks and buses arrive at BharatBenz service centers, more than 98% of them are serviced and dispatched to clients within 48 hours. BharatBenz will reimburse the consumer in line with the terms and conditions of the Rakshana program, but if the service delivery takes longer than 48 hours. The Rakshana Program is therefore among the most distinctive customer service programs in the Indian commercial vehicle sector. A portion of the service's total cost will be awarded as compensation for the delay in completion (Daimler Truck Asia 2023b).
(b) "Pay-per-Uptime" Models: This can result in innovative business models for fleet operators that offer service contracts based on vehicle uptime, rather than just materials and labor, by manufacturers or fleet operators. This establishes a relationship with the consumer that is based on performance.

(iv) Impact:
(a) Improved Compliance - Fleets can more consistently adhere to safety standards, meet reliability requirements, and maintain operational readiness, reducing downtime (fewer accidents, faster turnaround time for maintenance),
(b) Improved Competitiveness: Fleet operators gain a substantial competitive advantage by reducing downtime, lowering maintenance costs, and improving vehicle reliability.
(c) Enhanced Customer Satisfaction: Fleet owners experience a more consistent and dependable fleet performance, fewer unforeseen failures, a longer lifespan of their vehicles, and more predictable service.

5.3 Validity of the Central Hypothesis
Based on the theory of strategic complementarity, the research used a qualitative (published) case study approach, which is most suitable for the current study due to the still-developing integration of AI in the automotive industry. This approach provided empirical evidence supporting the most critical part of the hypothesis: that while each pillar alone offers quantitative benefits, their combined effects generate complementary and synergistic results that boost compliance, trust, and competitiveness. The evidence established that this key aspect of the hypothesis is not just theoretical but is supported by real-world data.

5.4 Implications for OEM Strategy
For automotive OEMs, AI should be a backbone in a cross-disciplinary strategy, not just a single function. The three-pillar model guides R2R compliance, boosts competitiveness, and innovation. Although initial costs are higher, long-term benefits, such as reduced compliance risk, increased customer trust, and revenue diversification, justify the integrated approach.
Predictive maintenance exemplifies how AI is transforming automotive operations (Dabhi 2025). Traditionally, maintenance was scheduled or triggered by failures, but AI-driven predictive maintenance radically alters this approach. Contemporary technologies continually monitor various vehicle components, seeking patterns that can anticipate issues before they occur. Fleet operators have reported a significant positive impact on their enterprises.
i) Cut downtime by 35% to 50%.
ii) A 20-30% reduction in maintenance costs.
iii) Adding 15-25% to your vehicle's lifespan
iv) Enhanced safety by decreasing breakdowns during operation.

A Capgemini report (Winkler, M. et al., 2019) predicted that AI would transform vehicle OEMs worldwide, and large OEMs can boost their pre-tax operating profit by 5%–16% by scaling up AI Implementation. OEMs will evolve into software companies that support SDVs and SDM services. AI will soon be embedded in software to enhance driving,

safety, and cybersecurity.
Software-defined goods and mobility services are expected to generate significant revenue for OEMs. The report projects that OEMs' total revenue will triple, with SDMs accounting for more than half of it by 2035.
The report shows that automotive OEMs will mainly benefit from partnering with tech companies and hyperscalers for software, cloud, and data services. OEMs understand the importance of collaboration; few now have joint ventures, but about one-third plan to do so within three years.

6. Conclusions

6.1 Uniqueness of this research

The global movement for the 'Right to Repair' links to important legal discussions on sustainability, consumer control, and balancing intellectual property rights with market competition. 'The right to repair is essential for ensuring vehicle owners have access to affordable and convenient repair options. While OEMs have rightfully been concerned about protecting their IP rights, ensuring customer safety and security, and promoting innovation, these efforts should also allow consumers to access the latest and best products.
This article makes a novel contribution by strategizing ways to address the emerging Right to Repair (R2R) movement in the automotive sector with strategic use of artificial intelligence (AI). This connection has not been thoroughly examined in previous research. While existing studies mainly view R2R as a regulatory or operational challenge, this study advances the discussion by proposing a "holistic, three-pillar AI-driven strategic framework" that combines technology measures, business model innovation, and legal tech adoption. Based on the theory of strategic complementarity, the paper demonstrates that the interaction of these pillars creates more strategic value than each alone, helping automotive OEMs turn compliance duties into competitive advantages.
This integrated, cross-disciplinary approach marks a significant step beyond existing literature and provides a strategic plan for industry's development amid a rapidly evolving regulatory and technological environment.

6.2 Limitations

The automotive industry is making slow progress in moving AI from experimentation to enterprise-scale. This is due to several factors, including high implementation costs, complex integration with legacy systems, and a shortage of skilled talent. Other significant barriers include concerns about data security and privacy, evolving and uncertain regulations, and the ethical dilemmas of AI-driven decision-making in situations such as accidents.
Though it is outside the purview of the R2R domain and is therefore excluded from this research, there is little doubt that these areas require further research to address them holistically, to avoid potential conflict with consumer aspirations and expectations regarding the R2R movement, and to accelerate the adoption of consumer-friendly, R2R- compliant processes.

6.3 Recommendations for legislation

We urge that the legislators to acknowledge that in many industries, where rapid innovations happen—such as software, financial services, pharma, and healthcare—the main challenges involve balancing three key factors: (a) allowing consumers to benefit from innovations through the protection of OEMs' IPR, (b) ensuring consumers' vehicle safety, data privacy, and security, and (c) preserving consumers' right to choose from various available options. This requires legislatures to walk a fine line between enabling ongoing innovation without being hampered by overly strict laws and passing appropriate legislation that guarantees consumers the freedom to select among market options.

6.4 Recommendations for the OEM

Our recommendation is to acknowledge that the R2R movement is no longer voluntary or discretionary; it is a critical and essential driver of the OEM's automotive strategy and consumer rights. The Right to Repair doesn't mean the end of OEM control, but rather a redefinition of value. While it challenges OEMs' traditional business models and IP control, OEMs that adopt transparency, embrace interoperability, and data stewardship can not only comply but also gain a decisive competitive advantage. The winning OEMs will be those that strategically embrace openness and monetize their data, software, and intelligence layers by shifting to data-centric, subscription-based, and platform-driven models, enabling them to profit from vehicle repair beyond just dealerships. The most effective way to achieve this would be to adopt the proposed unique, AI-driven, multi-pronged approach.
The proposed unique strategy will align with R2R for automotive OEMs by redefining consumer trust, unlocking innovative and sustainable business models, and ensuring future-proof brands in an increasingly connected and regulated mobility ecosystem.

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Abbreviations

AG	Attorney General
AI	Artificial Intelligence
BIS	Bureau of Indian Standards
CCI	Competition Commission of India
CCPA	California Consumer Privacy Act
DMCA	Digital Millennium Copyright Act
DPDPA	Digital Personal Data Protection Act
ELV	End-of-Life Vehicles
EU	European Union
EULA	End User License Agreement
FRAND	Fair, Reasonable, and Non-Discriminatory FTC Federal Trade Commission
GDPR	General Data Protection Regulation IP Intellectual Property
LLM	Large Language Model
ML	Machine Learning
NCLAT	National Company Law Appellate Tribunal
NLP	Natural Language Processing OEM Original Equipment Manufacturer OTA Over-the-Air
R2R	Right to Repair
SDM	Software Driven Mobility SDV Software Defined Vehicles
SLA	Service Level Agreement SWG Secure Web Gateway
WIPO	World Intellectual Property Organization WTO World Trade Organization

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