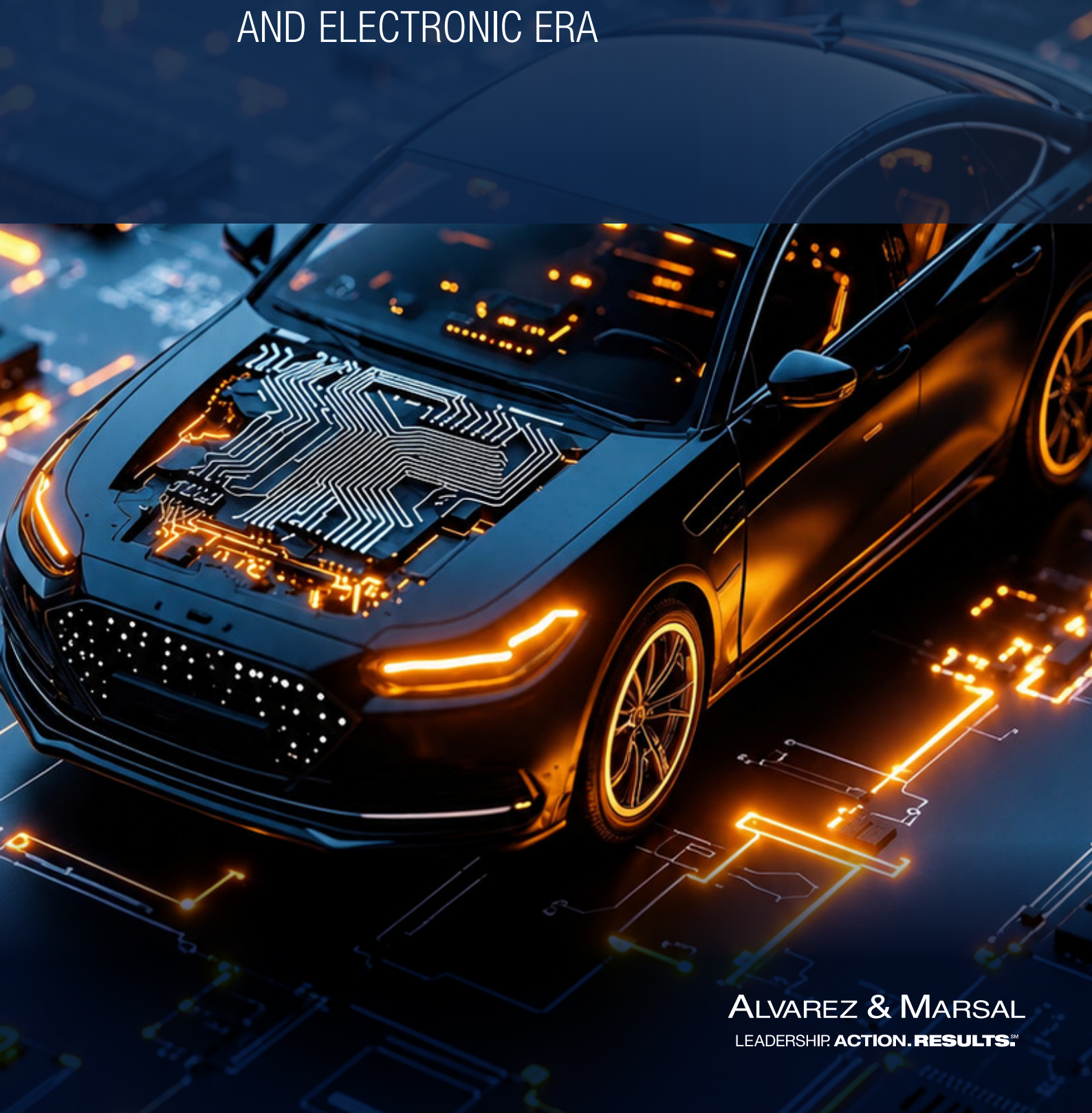




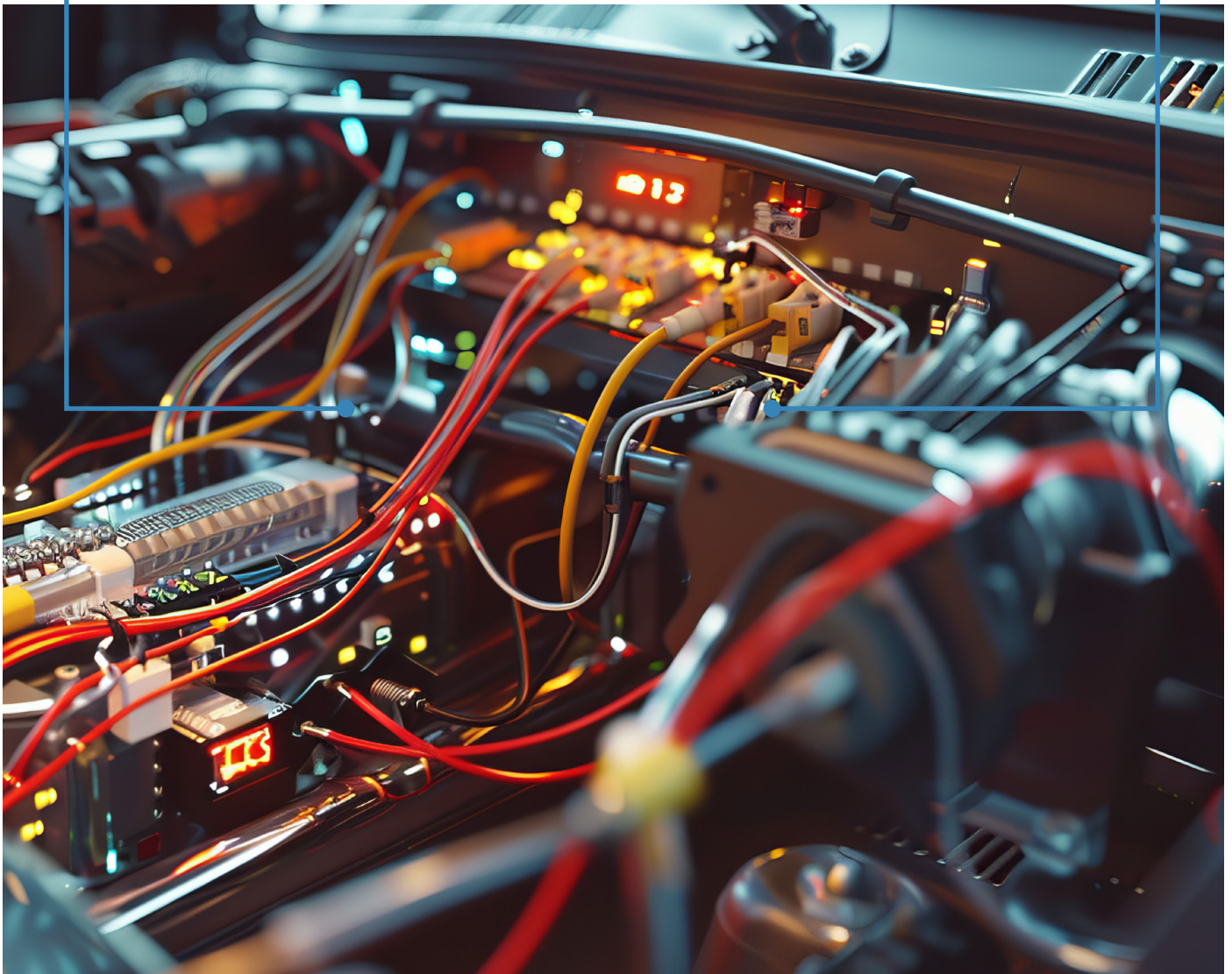
BEYOND HARDWARE: RESETTING AUTOMOTIVE SUPPLIERS TO CAPTURE VALUE IN ELECTRICAL AND ELECTRONIC ERA



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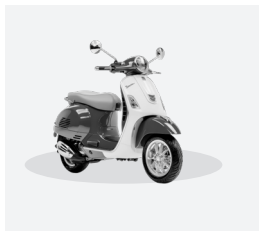
The global automotive industry is undergoing a structural transformation, driven by electrification, software-defined vehicles, and increasingly complex electronic and electrical (E/E) architectures. What was once a hardware-led, component-centric ecosystem, is rapidly evolving into a systems-driven, software-intensive value chain.

In the shift from mechanical to E/E-led vehicle architectures, functions once delivered through hydraulics, linkages, and passive components are increasingly being replaced by sensors, controllers, actuators, and software-controlled electronic systems that enable higher precision, adaptability, and integration with EV and software-defined platforms. This shift is creating one of the most significant strategic repositioning opportunities for Indian suppliers.



Understanding the Scale of the Opportunity

E/E content per vehicle is rising sharply across internal combustion engine (ICE), hybrid, and electric vehicles. The global E/E content is expected to exceed \$35 billion by 2030, driven by regulatory mandates, safety features, connectivity, and electrification.



2-Wheelers: From Mechanical Commuters to Intelligent Mobility

Electrification and connectivity are rapidly increasing electronics content in two-wheelers. Battery management systems, motor controllers, connected dashboards, GPS tracking, smart keys, and OTA diagnostics are becoming standard even in commuter segments: shifting two-wheelers (2Ws) from simple mechanical products to digitally managed mobility devices.



4-Wheelers: From Horsepower to Computing Power

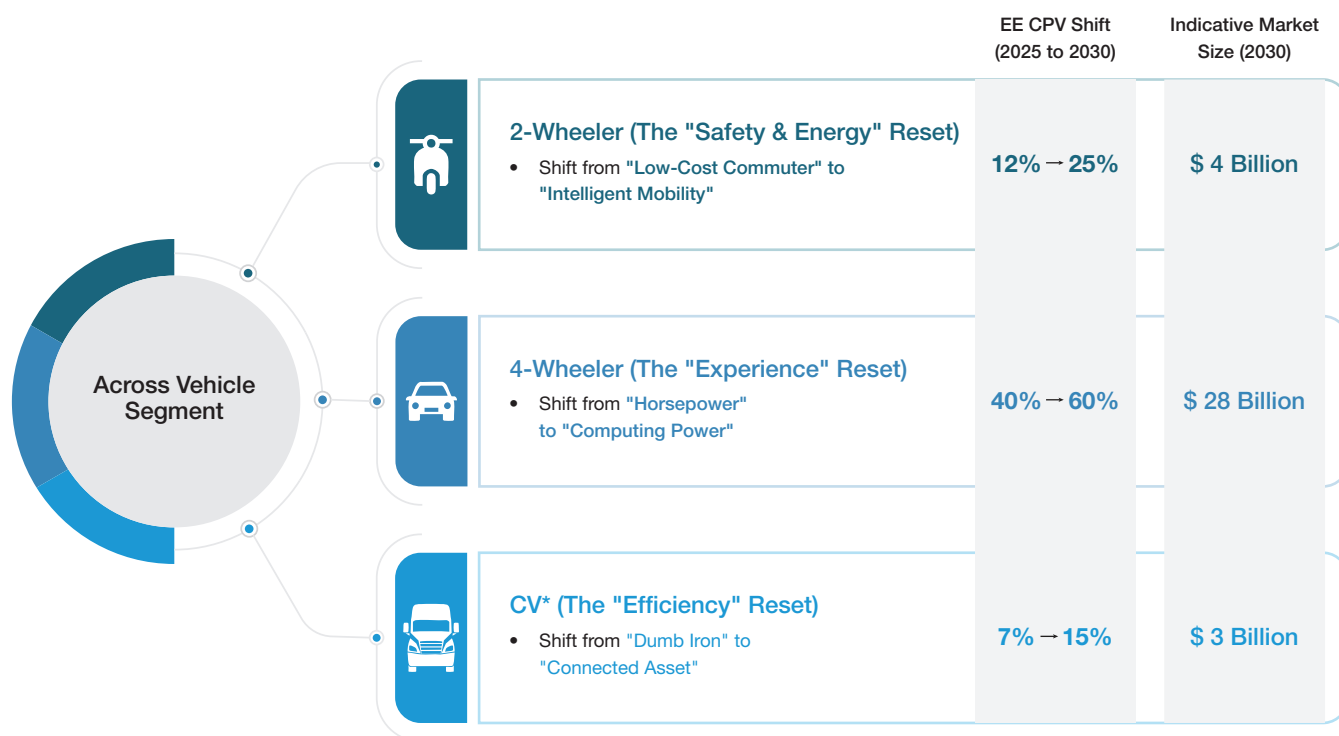
Passenger vehicles are evolving into software-defined platforms. Advanced driver assistance systems (ADAS) sensors, large infotainment screens, digital cockpits, zonal E/E architectures, and high-speed networks are expanding electronic content, while EV powertrains add inverters, battery management systems, and power electronics.



Commercial Vehicles: From "Dumb Iron" to Connected Assets

Electronics in commercial vehicles are rising through telematics, fleet management systems, predictive maintenance sensors, electronic braking systems, and emission control electronics-enabling fleet operators to monitor uptime, safety, and efficiency in real time.

\$35B+ Opportunity by 2030 as E/E Content Grows Across Vehicles in India



Source: A&M analysis, CPV: Content per value shift models

Note: CV Includes both on road & off road vehicles

Current E/E Paradigm: Limited Value Capture with Passive E/E Content Strategies

Our analysis shows that most Indian suppliers have historically adopted a reactive posture, responding to regulatory and original equipment manufacturer (OEM)-led shifts rather than shaping E/E-led system strategies.

Indian E/E Suppliers' Current Play



Reactive Actions Based on Market Dynamics

Example: OEM driven developments, BS6 regulated sensors (NOx & O₂)



Policy Linked Initiatives

Example: Advanced Automotive Technology PLI (multiple electronic systems)



Going forward, Indian suppliers must adopt a more proactive strategy to capture the emerging \$35 billion E/E opportunity.

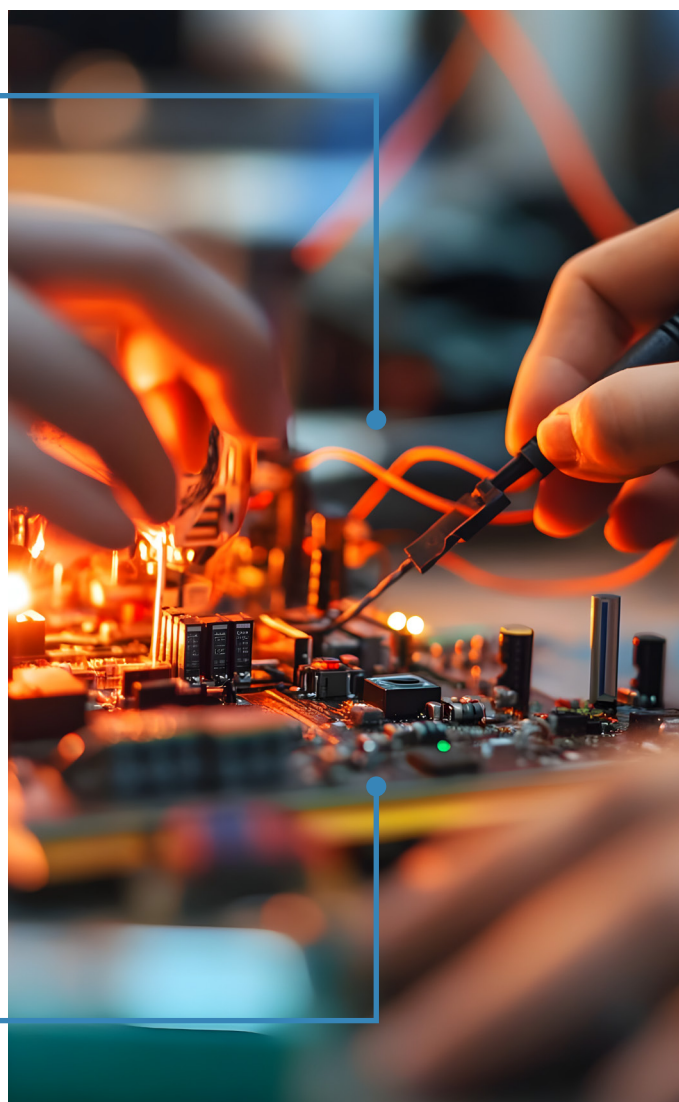
Source: A&M analysis

While India has built formidable scale and competitiveness across mechanical and commodity electronics, the next phase of value creation would be defined by E/E content growth, system integration capabilities, and software-led differentiation.

The material distinction emerging in the supplier ecosystem is not size, but posture.

Most of the suppliers have responded in past to OEM's requirements incrementally adding capacity, localizing production, or following platform mandates.

Without sustained investment in R&D to build long-term capabilities, suppliers may lose the opportunity to capture long-term value and could be confined to transactional roles as the E/E value chain evolves. The suppliers who fail to reposition, risk being confined to low-margin execution roles, even as E/E content expands.



Key Drivers Re-Shaping the E/E Content Growth

Across Vehicle Segments

Time has come for Indian suppliers to proactively reset their strategies to grow content in E/E space. Suppliers must adopt a 360° view to identify and focus on the most value creating opportunities. In our analysis, there are three key drivers that requires a thorough assessment and alignment with the internal capabilities and investment roadmap to develop a comprehensive E/E reset.



Driver 1 The Regulatory Landscape

Indian regulations are converging rapidly with global standards, mandating increased electronic content across safety, emissions, and cybersecurity. Upcoming Bharat Stage VII (BS-VII) emission norms¹, Corporate Average Fuel Efficiency (CAFE) Phase 3 regulations², Autonomous Emergency Braking (AEB) requirements³, and cybersecurity guidelines⁴ are pushing electronics deeper into vehicle subsystems, making over-the-air (OTA)-ready, secure, and sensor-rich architectures mandatory.

Driver 2 E/E Architecture & Technology Roadmap Evolution

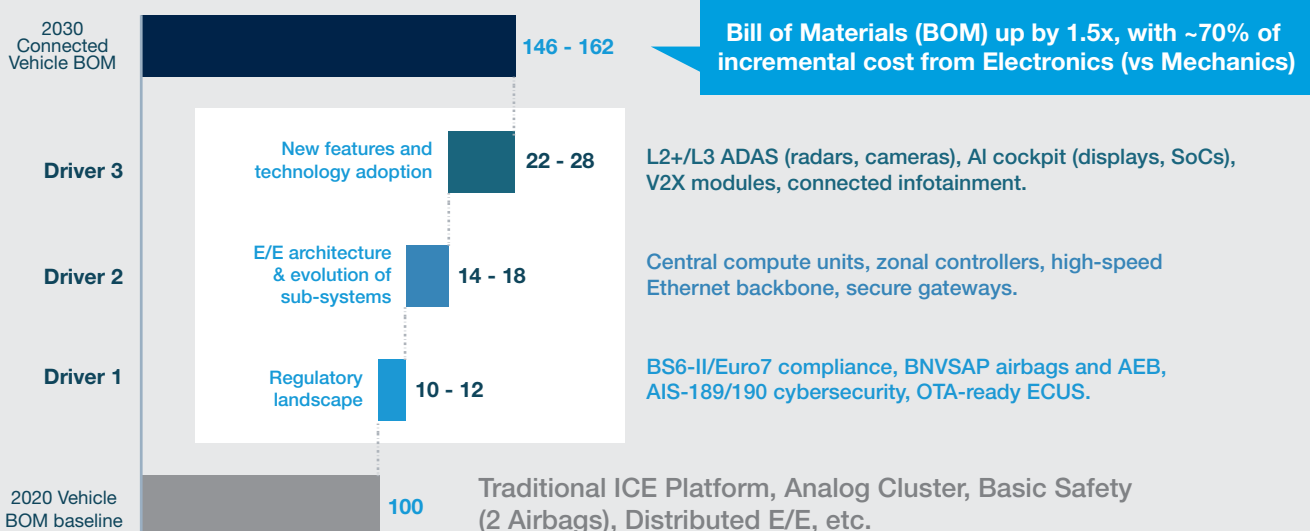
OEMs are transitioning from distributed electronic control unit (ECU) architectures to domain and zonal architectures, driven by software driven vehicles (SDV) requirements, higher compute needs, and communication backbone upgrades. This architectural shift is structurally increasing demand for central compute units, zonal controllers, secure gateways, and high-speed networking electronics.

Driver 3 New Features and Technology Adoption

Premiumization and feature-led differentiation are accelerating adoption of ADAS, digital cockpits, connected car solutions, and in-cabin intelligence. These features are compute- and sensor-intensive, directly translating into higher E/E content per vehicle.

Our analysis reveals that the combined effect of the three drivers has a potential to push the E/E content by approximately 45%-60% in passenger cars, as illustrated in the infographic below.

Illustrative Shift in Passenger Cars E/E Content per Vehicle From 2020 Baseline to 2030



Chassis Systems: A Case Study in E/E-Led Disruption

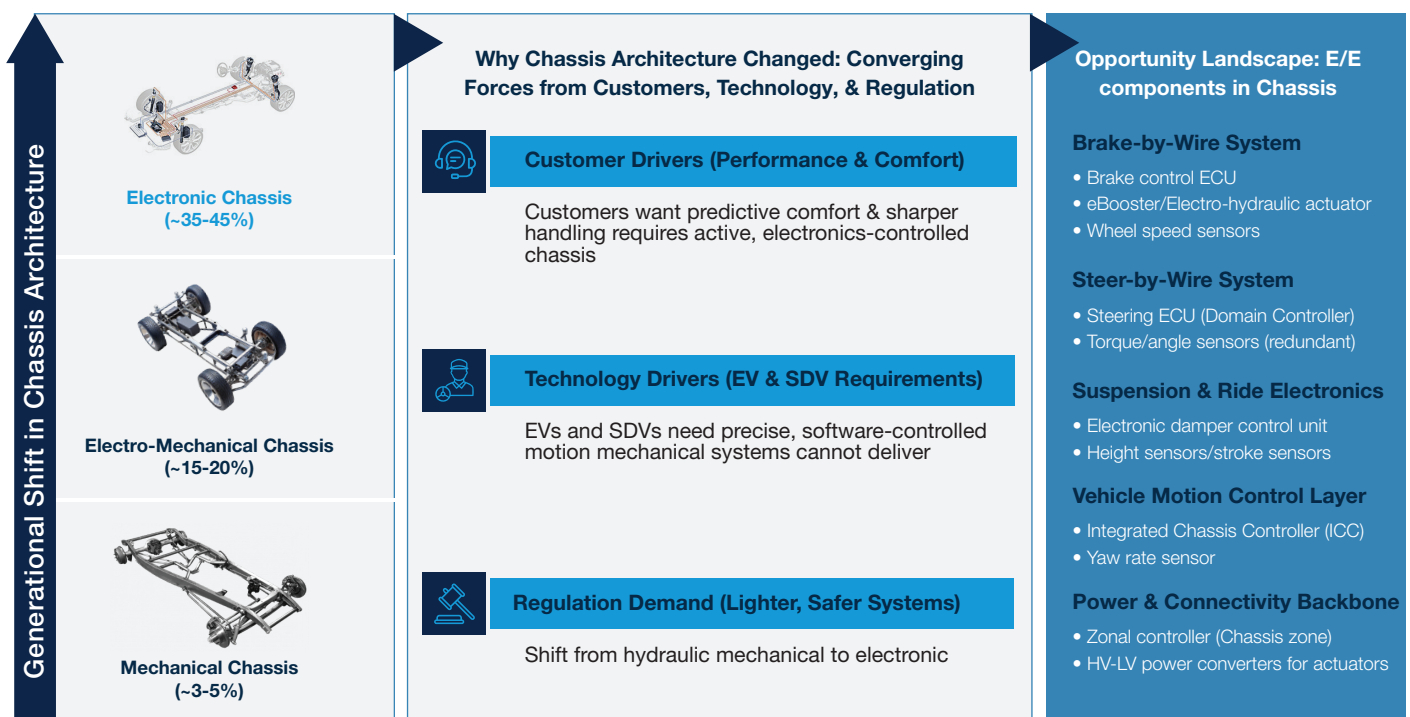
The chassis domain illustrates the broader transformation underway. Traditionally mechanical, chassis systems are now increasingly software-driven, integrating:

- Brake-by-wire,
- Steer-by-wire,
- Active suspension,
- ADAS-linked control logic.

This shift increases E/E content materially while compressing the supplier base toward players with cross-domain integration capabilities.



Case Study: Chassis Is Shifting from Mechanical to Electronic - Driven by Customers, Technology, and Regulation



Source: A&M analysis, CPV shift models

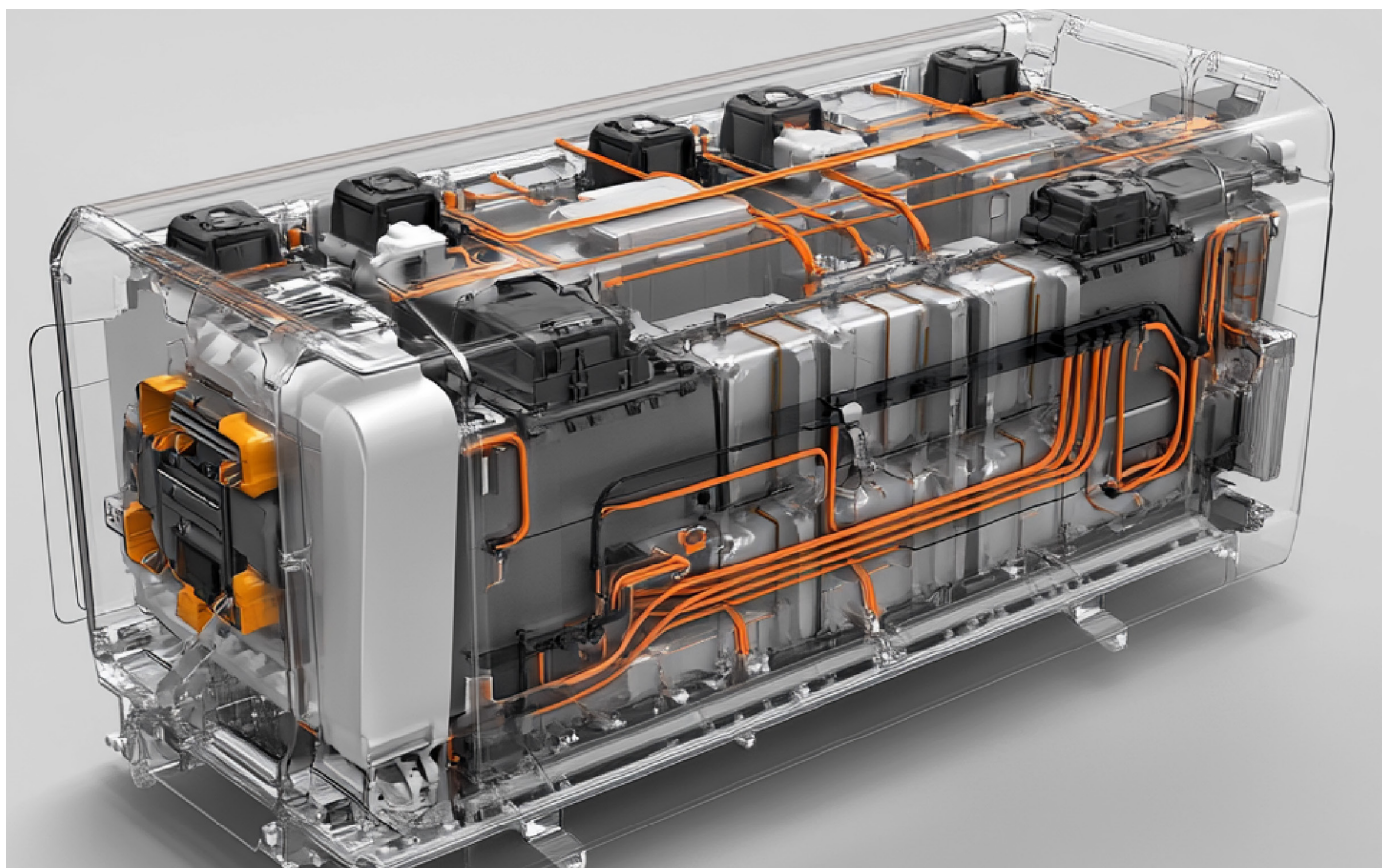
Similar transitions are underway across body, cockpit, powertrain, and connectivity domains; creating multiple but highly differentiated E/E value pools (as illustrated in the figure below).

However, not every emerging technology will create an equally winnable opportunity for Indian suppliers. Disciplined portfolio choices may become as important as technology investments.

Broad-based adoption opportunities				Selective/premium opportunities		ILLUSTRATIVE
Cockpit	S	ADAS	S	Steering	M	
Basic TFT + standalone → Fully digital cockpit, HUD, Display electronics, SoC, cockpit controller,...		Standalone driver assistance (ABS/ESC) → Central ADAS compute, sensor fusion, L2+		Electronic Power steer → Redundant EPS, Steer-by-Wire (premium), zonal integration ,...		Strategic Considerations ○ Capability Adjacency Does this build on our existing focus areas and systems capabilities? ○ Value Pool/Margin Premium Will the E/E content materially improve value capture and improve contribution margins for us? ○ Right to Win Do we already have OEM relationships, manufacturing credibility or IP? Can this be easily replicated? ○ Build, Partner, and Scale How quickly can we make this opportunity meaningful?
Connectivity	S	Braking	S	Suspension	M	
Basic telematics → OTA platform, SDV services, cloud connectivity, 5G modems		Hydraulic brake system → Integrated Brake sys, Brake-by-Wire, Electro-hydraulic brake actuator		Passive dampers → Electronically controlled dampers, Semi or Active suspension,...		
Powertrain - EV	S	Battery Systems	S	HVAC	M	
Separate inverter, MCU, VCU → Integrated e-axis, central power electronics		Conventional BMS → AI-enabled BMS, predictive thermal management,...		Standalone HVAC → Zonal cooling, micro-cooling, solid-state secondary HVACs, ...		
				Lighting	M	
				Relay operated, LEDs → Adaptive / Matrix LED - Lighting ECU, camera interface, ...		
				Powertrain - ICE	L	
				Distributed ECUs → Integrated powertrain control, predictive OTA calibration,...		

Note: S/M/L represent the relative scale of supplier opportunity over the next 5-7 years, considering expected volume adoption, regulatory momentum, and value creation potential (not technology maturity)

Source: A&M analysis, CPV shift models



The Big Reset: Imperatives to Win in the E/E Era for Suppliers

The E/E transition is not a future trend—it is already reshaping competitive dynamics. Indian suppliers that move decisively from investing in only hardware-led growth to building capabilities for harnessing growth from emerging E/E content will define the next phase of industry leadership.

Capturing the emerging E/E opportunity would require OEMs, suppliers, technology partners, and policymakers to work in close alignment, moving beyond compliance-driven localization toward architecture- and roadmap-led collaboration.



Build early visibility into OEM E/E architecture plans

Move upstream from RFQs to actively track OEM platform, zonal, and SDV roadmaps to understand where future E/E value will be created.

Convert regulation, roadmap, and feature signals into focused R&D priorities

Translate regulatory foresight, OEM technology plans, and feature evolution into a small set of clear, investable R&D bets.

Re-anchor portfolios from hardware-led growth to E/E value creation

Shift portfolio thinking from incremental hardware additions to system-level, electronics-led offerings aligned to long-term E/E CPV growth.

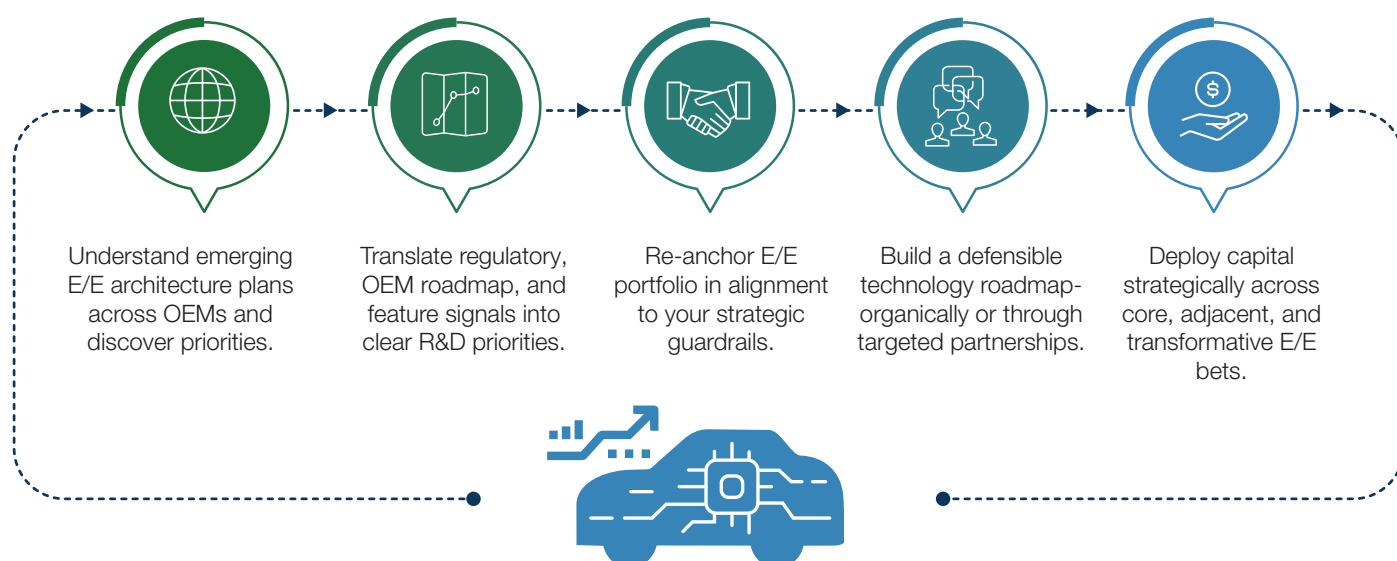
Develop defensible technology and system capabilities

Build or access capabilities in electronics, controls, software, and integration—organically or through targeted partnerships—to move beyond build-to-print roles.

Deploy capital with a long-term E/E value lens

Allocate capital across core, adjacent, and transformative E/E opportunities, prioritizing long-term value capture over short-term volume expansion.

Call for Action: Navigate the Shift to Unlock \$35 B Opportunity



Outlook For the Next Five Years

Success in the E/E era will not be defined by volume growth alone. Instead, to lead, suppliers will need to demonstrate:

- **Ownership of at least one E/E subsystem;**
- **OEM trust as a development partner, not just a vendor;**
- **The ability to scale software alongside hardware; and**
- **Resilience across EV and ICE transitions.**

The next decade will not reward suppliers who simply add electronics to their portfolios. It will reward those who systematically reposition themselves around the E/E value pools they are best equipped to own.

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