

Auto Tech Insights

Latest trends in technologies that are likely to reshape the industry's landscape



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Automobiles

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Image source: Google

Automobiles

India | Sector Update



3 December 2025

Era of zonal architecture in advanced SDVs

Given the rapid adoption of software defined vehicles (SDV) globally, an emerging trend in electrical/electronic (E/E) system is the adoption of zonal architecture over domain. Zonal architecture effectively reduces wiring harness content in a vehicle. Globally, while this architecture was adopted by Tesla and Chinese OEMs, currently several legacy OEM have adopted zonal architecture in their recently launched/upcoming platforms. We see more OEMs adopting it, both in EV and ICE vehicles (as stated by GM) for next-gen more advanced SDVs, which helps with efficient software updates and saves cost by reducing development time, fewer control units, and reducing wiring harness content. While we believe Indian OEMs are some years away from shifting to advanced zonal architecture, we believe it is imminent and structurally negative for wiring harness suppliers like Motherson Sumi Wiring India (MSWIL). We retain Sell.

Cracking the SDV code – not a cakewalk; legacy OEMs are struggling: While there are many definitions of advanced SDV, we find Nio's definition as the most simplistic. To quote, Benjamin Steinmertz, Production Experience Director, Nio Europe, "...SDV is a vehicle that can be shaped or changed via software than hardware. So, the characteristics of a vehicle can be changed via software. While the term SDV today is used for almost all vehicles, there are different levels, and as the SDV level moves higher, vehicle architecture becomes critical. For L3 and above, the adoption of zonal architecture becomes critical to its functionality and efficient "over the air" (OTA) updates. Tesla was the pioneer of SDV, but today Chinese OEMs are catching up fast, as per S&P Mobility. However, legacy OEMs continue to struggle, especially in the software piece (e.g., Volkswagen) albeit catching up at a slower pace.

Zonal vs domain architecture advantages: In domain architecture, electronic control units (ECU) are categorized into domains based on functions while zonal classifies ECU by their physical location inside the vehicle, leveraging a central gateway to manage communications; adds a vehicular compute module. This module is a computer with a large processing capacity to perform computations regardless of function. Some advantages of adopting zonal are: 1) reduction in wiring and hence cut in weight of vehicles, 2) scalability and modularity, 3) higher levels of SDV and OTA updates, and 4) improved reliability & maintenance. For e.g., Tesla's Model 3 was able to reduce wiring content by 50% while BMW is talking about cutting ~600m wiring and ~30% of vehicle weight after adopting zonal architecture.

Implications on our coverage universe: India's EV ecosystem is still a few years away from adoption of advanced SDV-related zonal architecture; however, this trend is catching up fast globally, now even with legacy OEM. This may be negative for wiring harness suppliers like MSWIL as adoption of zonal architecture in EV would reduce wiring harness content (mainly low voltage wiring harness), and wiring harness would become a mere part of electrical distribution system (EDU), thereby increasing competition in this space. It also becomes critical for EV in terms of reducing the vehicle's weight. Our interactions with global auto experts suggest that any vehicle designer, while designing EV architectures, wants to reduce weight and wiring harness is one of the key components they target. We reiterate our **Sell** rating on MSUMI as we believe increasing content per vehicle in EV may benefit MSUMI in the initial years, but risks associated with technology & platform changes remain, as OEM globally are trying to reduce wiring harness content in a vehicle to trim overall weight, which would remain an overhang on multiples.

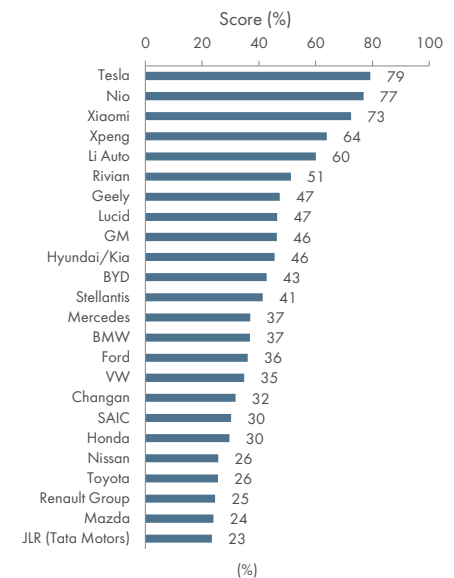
Increasing zonal architecture adoption a negative for wiring harness players

OEM Benefits from zonal architecture

Tesla	Reduced Model 3's wiring content by ~50%
Rivian	Helped it shave ~2.6km of wiring and ~20kg of weight in EV
BMW	Cabling lower by 600m, ~30% weight reduction
JLR	New and Next Gen EV architecture to reduce wiring content by ~40% and ~60%. However no specific mention of zonal
VW	China based platform on zonal E/E architecture. ~40% less cost. Rivian JV will help scale this
GM	Powertrain neutral, designed for both EV and ICE
Ford	UEV architecture to reduce complexity by cutting parts by 20%, fasteners by 25%, and workstations in the assembly plant by 40%, along with a significantly lighter and shorter wiring harness

Source: Company, Elara Securities Research

Digital Automaker Index 2025: Tesla and China OEM lead



Source: Gartner, Elara Securities Research

Our series on Elara Auto Tech Insights highlights the latest trends in automotive technologies that are likely to reshape the industry's global landscape

Previous released

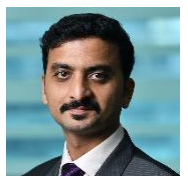
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Elara Auto – Coverage matrix

Etara Auto – Coverage matrix																		
Company	Ticker	Rating	Mcap	CMP	TP Upside		P/E				EV/EBITDA				ROE			
			(USD mn)	(INR)	(INR)	(%)	FY25	FY26E	FY27E	FY28E	FY25	FY26E	FY27E	FY28E	FY25	FY26E	FY27E	FY28E
Motherson Sumi Wiring India	MSUMI IN	Sell	3,416	46	38	(18)	50.3	45.1	33.9	29.6	30.8	27.6	21.5	19.0	35.9	36.9	41.8	40.7

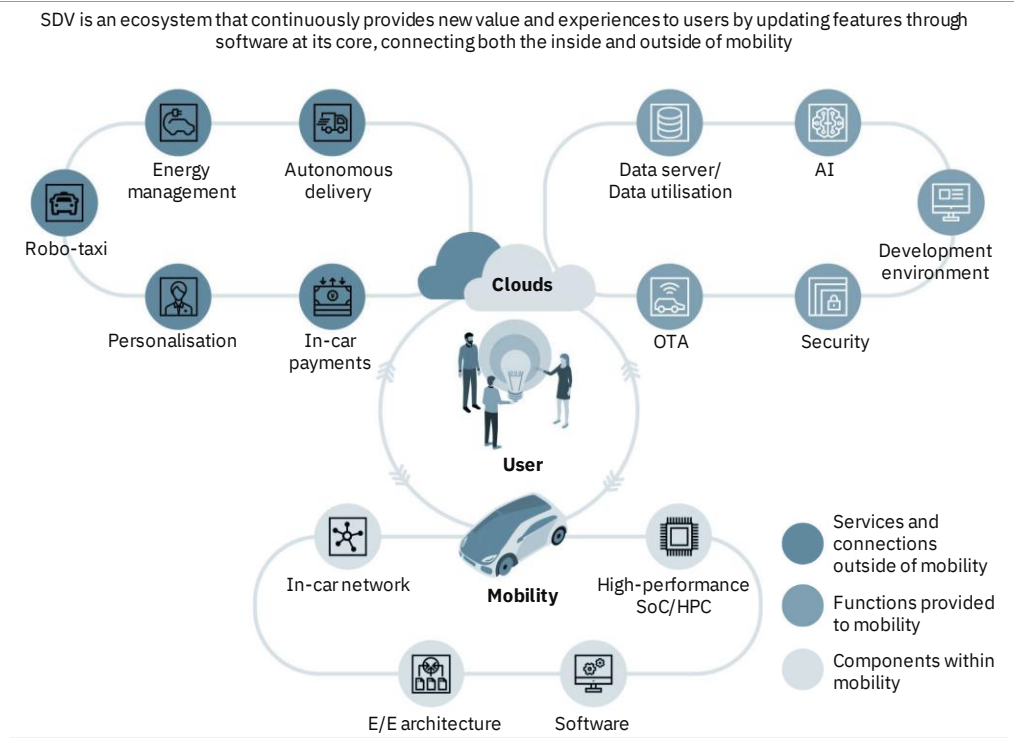
Note: Pricing as on 2 December 2025; Source: Company, Elara Securities Estimate

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Cracking the SDV code, no cakewalk; legacy OEM continue to struggle

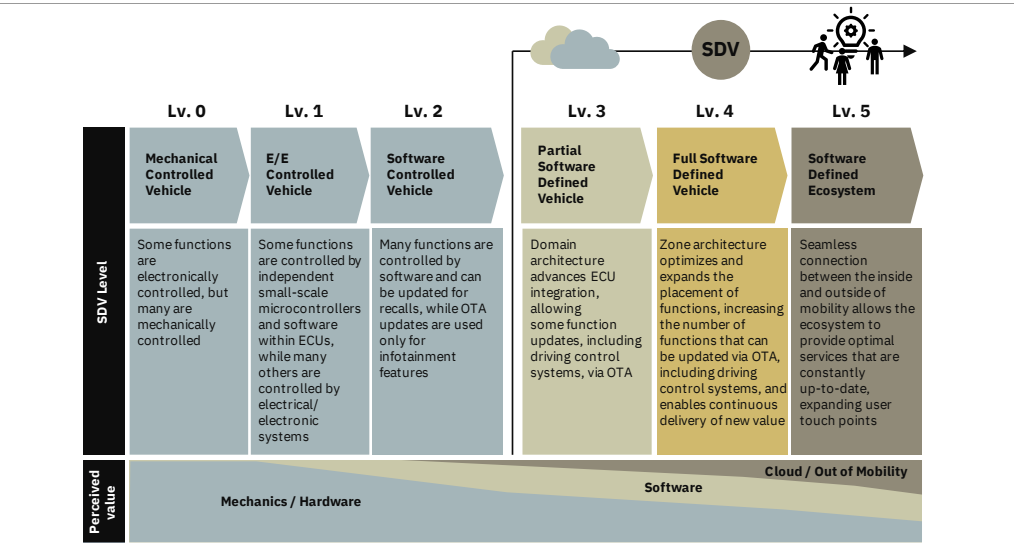
As OEM continue to focus on development of more technologically advanced EV, SDV become a critical aspect. While definitions for SDV are varied, as per PWC, is "a SDV is an ecosystem that continuously offers new value and experiences by updating features through software at its core, connecting both the inside and outside of mobility". To quote, Benjamin Steinmertz, Production Experience Director, Nio Europe, "...SDV is a vehicle that can be shaped or changed via software than hardware. So, the characteristics of a vehicle can be changed via software. So, perhaps, in the past you went to a tuner, to put in a new suspension in the car. But in the future and already today, you simply change the software code, or you change a software setting and the whole suspension experience changes."

Exhibit 1: Definition of a SDV



Source: PWC, Elara Securities Research

Exhibit 2: Different SDV levels



Source: S&P Mobility, Elara Securities Research

Although Tesla was the pioneer in SDV, new-age OEM from China are gaining traction, largely attracting the youth who want cars to be connected and act as smart vehicles, akin to smart phones, especially in China. This transition can be explained by a similar transition arc in mobile phones (to Android or iOS). This opens up avenue to spike the revenue pool, from a mere one-time revenue transaction of selling cars to recurring revenue from software updates and premium services (post-sales revenue). As per Huawei, a leading company in SDV, "human-machine interaction technologies will continue to advance and the intelligent cockpit application ecosystem will continue to improve, making vehicles an intelligent mobile 'third space', outside of home and workplace."

SDV also help in managing better product timelines. For e.g., leveraging SDV, new-age OEM from China have **reduced the time to market** a new vehicle to within a year vs legacy OEM's 2-3 years (to develop a new platform and launch a new vehicle).

SDV help OEM update the core of the vehicle, including features and infotainment systems through over-the-air (OTA) updates, without the need to take vehicles to service centers, saving both cost and time for OEM and consumers. Legacy OEM, such as VW, have struggled in the area of software, especially in China. This explains their weak performance in the China's NEV market. While today, SDV are used generally to define advanced vehicles, and there are different levels, which are based on their hardware, software and OTA update capabilities. As SDV move on to higher levels (Level 3 and beyond), adoption of zonal architecture becomes critical.

Exhibit 3: Different SDV levels, with higher (Level 3 and above) requiring adoption of advanced zonal E/E architecture for efficient OTA and functioning

	Vehicle SDV readiness level	Level 0 - Not connected	Level 1 - Connected	Level 2 - Basic upgrades	Level 3 - Efficient upgrades	Level 4 - Dynamic upgrades	Level 5 - Full SDV
	Vehicle capabilities	Static features	Can update maps over the air	Can update, debug, and upgrade infotainment and ADAS or powertrain	Can upgrade efficiently across 3+ domains in same OTA update	OTA updates across 3+ domains, dynamic compute power and memory allocation, and 24/7 cybersecurity updates	Real-time updates and dynamic resource allocation across 4+ domains, ensuring future-proof adaptability to new hardware configurations
	Foundation technology						
OTA	Over the air (OTA)	No OTA	Basic OTA	Intermediate OTA		Full OTA	
Software	Software architecture type	Signal type		Mix signal service			Full service oriented
	Cybersecurity	Basic cybersecurity		Full embedded cybersecurity		Full embedded + cloud cybersecurity	
	Unified Auto OS	Individual operating systems			Partially unified OS		Fully unified OS
Hardware	E/E architecture	Distributed or Domain			Basic Zonal		Advanced Zonal
	Backbone BUS	CAN					Ethernet

Source: S&P Mobility, Elara Securities Research

Domian vs Zonal Architecture

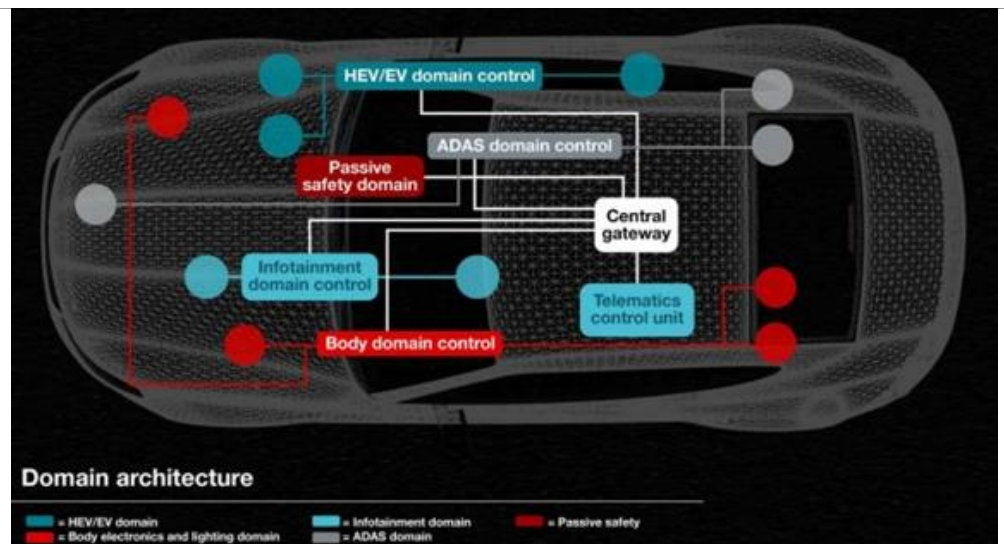
In domain architecture, ECU are categorized into domains based on functions while zonal classifies ECU by their physical location inside the vehicle, leveraging a central gateway to manage communications.

In a domain architecture, the functions are generally classified into five domains where ECU are normally categorized based on function. For e.g.,:

- ▶ **Powertrain domain:** manages the function of driving a car, including electric motor control and battery management, engine control, transmission and steering control
- ▶ **Advanced driver assistance domain:** processes sensor information and takes decisions to assist the driver, including the camera, radar & ultrasonic module and sensor fusion

- ▶ **Infotainment domain:** manages entertainment within the vehicle and exchanges information between the vehicle and the outside world, including the head unit, digital cockpit and telematics control module
- ▶ **Body electronic and lighting domain:** manages comfort, convenience, and lighting functions in the car, including the body control, door, and headlight control module
- ▶ **Passive safety domain:** controls safety-related functions, such as the airbag control, braking control, and chassis control module

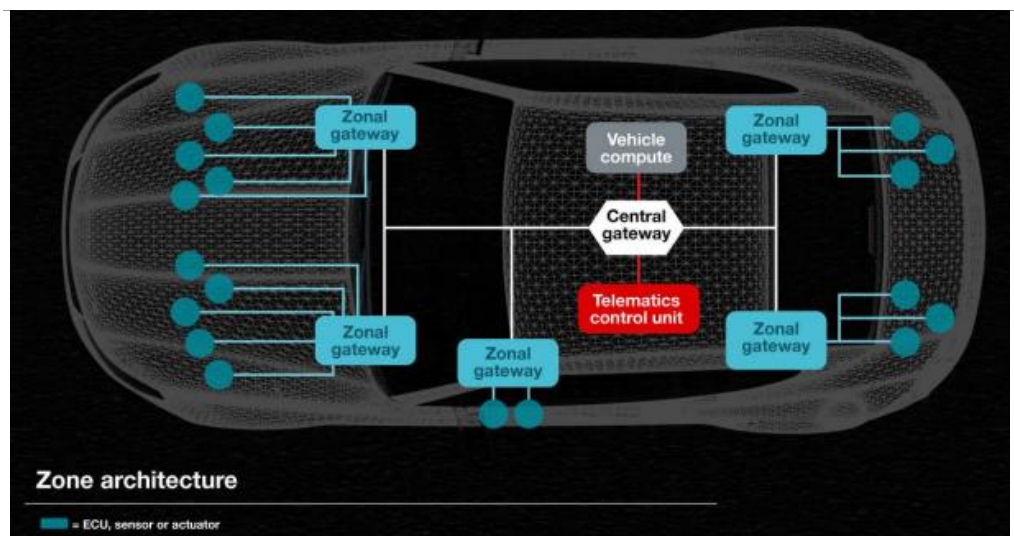
Exhibit 4: Visual representation of a domain architecture



Source: Texas Instruments, Elara Securities Research

A zonal architecture organizes the ECU based on their location inside the car and adds a vehicle compute module. The vehicle compute module is a computer with a large processing capacity to perform all computations regardless of function. This architecture could include a gateway module to manage network traffic.

Exhibit 5: Visual representation of a zonal architecture



Source: Texas Instruments, Elara Securities Research

Advantages of zonal vs domain architecture

In the past era of vehicular development, with the increase in number of ECU and software, the vehicle had evolved into domain architecture where ECU were grouped based on a related function that each was performing. This has increased network complexity, and, hence, as the world has moved toward more advanced SDV, and vehicle designers are shifting away from domain to zonal architecture. Following are some advantages of zonal vs domain architecture:

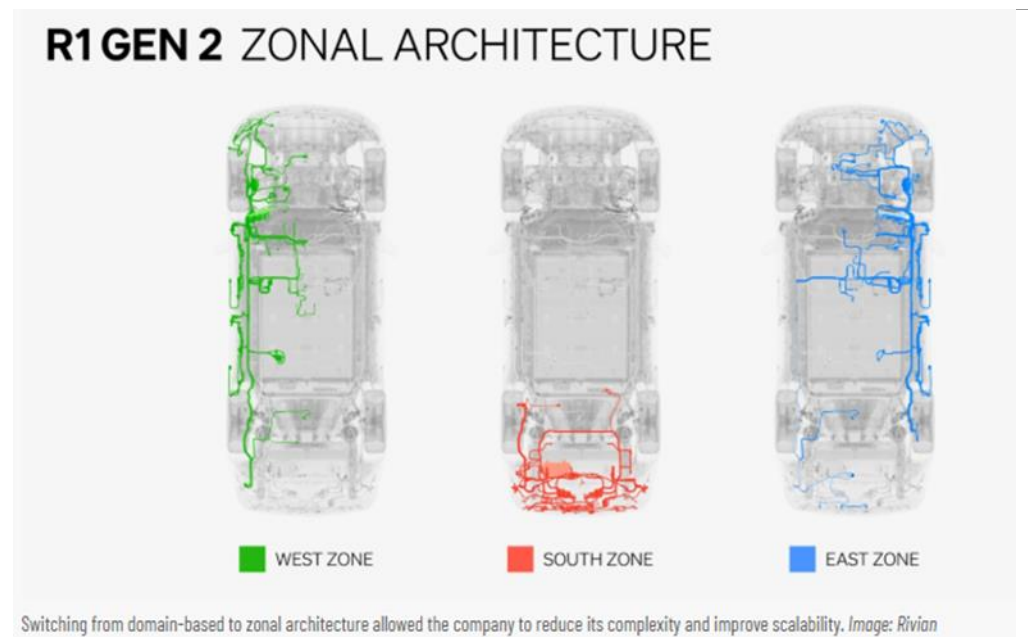
- ▶ **Reduction in wiring harness, thereby cutting weight:** As the world moves toward EV, weight reduction becomes a critical aspect to increase range and efficiency. Zonal architecture significantly reduces wiring complexity and vehicle weight compared to domain. Traditional domain system can require up to 5km of wiring and add more than 50kg to a vehicle. Zonal architecture can cut cable requirement by up to 40% and reduce wiring harness weight by 20-30% (Source: [Molex](#)). This helps OEM save manufacturing cost. Tesla was the first to market the tech. Due to adoption of zonal architecture, the *Model 3*'s wiring was reduced by 50% years ago and this is the reason why it can be produced in less than half the time compared to its rivals
- ▶ **Scalability and modularity:** Zonal architecture is inherently more scalable and modular compared to domain. By grouping components by physical location (zone) rather than by function (domain), manufacturers can more easily adapt to new technologies and features without major rewiring or redesign. This modularity supports rapid integration of new functions and enables easier upgrades over the vehicle's lifecycle
- ▶ **Higher levels of SDV and OTA updates:** Zonal architecture supports the concept of the software-defined vehicle, where software is abstracted from hardware. This allows for independent, OTA software updates, faster deployment of new features, and improved cybersecurity. As per S&P Mobility for advanced SDV (Level 3 and above) zonal E/E architecture becomes critical for efficient OTA and functioning
- ▶ **Improved reliability and maintenance:** Zonal architecture offers greater fault tolerance by isolating each zone. A failure in one zone usually remains contained, preventing it from affecting the entire vehicle's electrical system – unlike centralized domain architecture where a single fault can have wider system impact. With this, maintenance becomes more efficient, as technicians can isolate and address issues within a specific zone, minimizing downtime and preventing failures from spreading to unrelated systems
- ▶ **Cost savings and manufacturing efficiency:** Zonal architecture's modular and standardized design simplifies manufacturing by enabling the use of pre-assembled wiring harnesses and plug-and-play components. This approach reduces assembly errors, enhances production flexibility, and lowers overall manufacturing cost. Apart from that, fewer ECU and reduced wiring content can add to cost savings.

However, there are some disadvantages. Most prominent is data routing and latency issues, processing distribution complexity, higher initial development cost, more robust testing and data validation. But with the advancement of R&D and engineering, OEM are increasingly adopting zonal E/E architecture for developing new-age advanced SDV. Some example of OEM adopting zonal E/E architecture are as follows:

Tesla: Tesla was the first to market the tech. Due to adoption of zonal architecture, the *Model 3*'s wiring was reduced by 50% years ago and it is the reason why it can be produced in less than half the time compared to rivals.

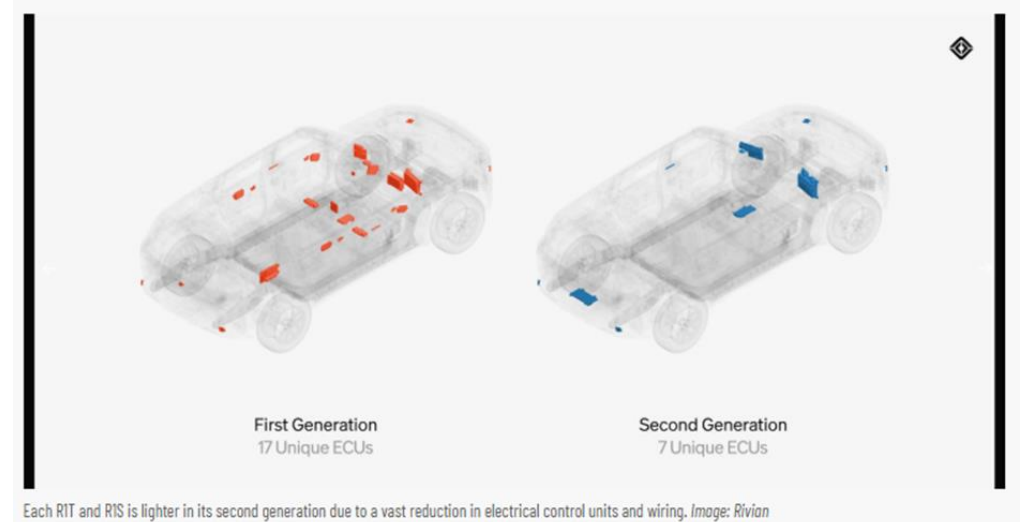
Rivian: The company has shifted to zonal architecture between its Gen 1 and Gen 2 R1 vehicles. Rivian's zonal architecture reduces the number of ECU from 17 to seven highly powerful ones. This move has enabled it to remove 1.6 miles (~2.6km) of internal wiring. Consequently, it shaved off 44 pounds (~20kg) of weight from its EV

Exhibit 6: Visual representation of Rivian R1 Gen 2 Zonal architecture



Source: Inside EVs, Rivian, Elara Securities Research

Exhibit 7: Rivian Gen 1 vs Gen 2 ECU count

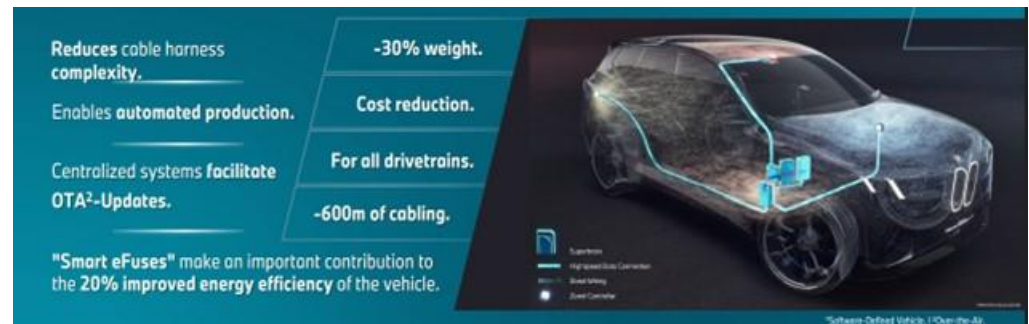


Source: Rivian, Inside EVs, Elara Securities Research

Separately, Rivian and Volkswagen have established a joint venture to develop an advanced software-defined vehicle (SDV) platform that blends Rivian's software strengths with Volkswagen's manufacturing capabilities. The platform uses a modular zonal electronics architecture with centralized computing, allowing seamless OTA updates that enhance driving experience, ADAS features, and infotainment systems. It is designed to anchor Volkswagen's forthcoming SSP platform – scalable to as many as 30mn vehicles – and will also support Rivian's next-generation products. The JV intends to license this technology to other automakers, positioning the partnership as a significant step toward setting new global standards for software-driven electric vehicles, which means a further wide adoption of zonal architecture.

BMW: BMW introduced a zonal architecture recently, thereby reducing cable harness complexity and almost resulting in 600m of less cabling. This will help in ~30% cost reduction.

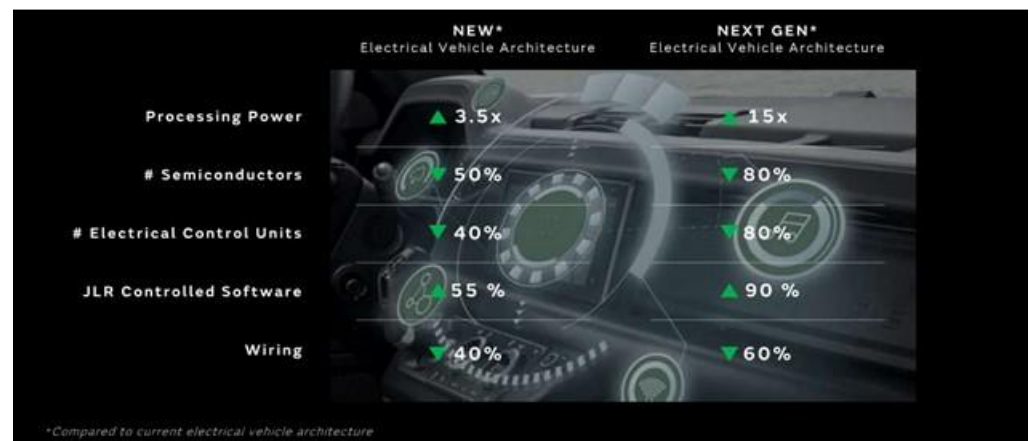
Exhibit 8: BMW introduces zonal architecture for SDV, which is expected to reduce weight by ~30%



Source: BMW, Elara Securities Research

JLR: On its Investor Day 2025, JLR talked about its new and next-gen EV architecture, which is a significant step toward its SDV vision. The Group said the new and next-gen EV architecture will reduce wiring content by ~40% and ~60% vs current levels, which would help in cost savings.

Exhibit 9: JLR new EV architecture details



Source: JLR, Elara Securities Research

"We did not know our wiring harness for Mach-E was 1.6km longer than it needed to be. We did not know its 70-pounds heavier and that is costs an extra USD 300 a battery" – Ford CEO in an investor call on Feb 2, 2023, when asked about difficulties and prospects to catch up with Tesla

Volkswagen: The VW Group recently introduced its main platform for China, which plans to develop and launch NEV in China based on zonal E/E architecture by CY26. Together with localization, lower battery prices (LFP) and zonal E/E architecture, it expects to reduce cost by ~40%.

GM: General Motors is moving toward full SDV with a new centralized computing architecture built on Nvidia's Drive AGX Thor platform, set to roll out from CY28. By consolidating propulsion, body, lighting, and chassis controls into a central system, GM reduces the number of vehicle computers and wiring, enabling faster updates, greater reliability, and more advanced autonomous capabilities. The Cadillac Escalade IQ will be the first model to adopt this architecture, gaining upgraded driver-assistance features, including eyes-off and off-highway functionality, supported by LIDAR. Unlike some competitors, GM's system is powertrain-neutral, designed for EV as well as ICE, allowing wider software reuse and continued OTA upgrades. Overall, the architecture is likely to deliver tenfold increases in software updates, real-time safety enhancements, and scalable intelligence across future GM vehicles – marking a major step toward the industry's "smartphone on wheels" future.

Exhibit 10: GM is moving toward centralized architecture which reduces the number of on-board computers and shortens wiring

Current
Launched 2020



Next-Gen
Launching 2028



Source: GM, Elara Securities Research

Ford: Ford has recently launched its Universal EV (UEV) architecture. The UEV platform is a scalable, cost-efficient electric vehicle architecture designed to underpin a family of affordable electric vehicles, including SUV, trucks, and small commercial vans. It features a 400V architecture and uses lithium iron phosphate (LFP) prismatic batteries, prioritizing durability, lower cost, and space savings over more expensive chemistries, such as nickel-manganese-cobalt. The UEV reduces vehicle complexity by cutting parts by 20%, fasteners by 25%, and workstations in the assembly plant by 40%, along with a significantly lighter and shorter wiring harness.

Battery production for UEV is localized at Ford's BlueOval Battery Park in Michigan, using technology licensed from China's battery maker, CATL. The base LFP battery pack is set to be about 15% smaller than comparable models, offering a balance between cost and range. This approach aligns with Ford's strategy to deliver affordable, high volume EV made by US workers, targeting a base price of around USD 30,000 for the entry-level electric pickup, making it competitive for the market.

Tesla – first-mover in zonal architecture, but Chinese OEM fast gaining ground

Tesla was the first mover in zonal architecture, as per S&P mobility and it is at least five years ahead of legacy OEM. However, new-age OEM from China (especially NEV) are adopting this rapidly and even closing gap with Tesla. As per S&P, the rapid adoption was due to lack of burdensome legacy architecture and brands are dedicated to fewer nameplates. The established legacy North American, Japanese, South Korean and European OEM need to consider investments into several powertrains, market and a large portfolio, which makes the shift difficult to the zonal E/E architecture and other innovative manufacturing tech. Tesla can manufacture vehicles like the *Model 3* in 10 hours vs peers, which need ~20 hours or more, as per S&P Mobility.

Exhibit 11: Chinese OEM closing in fast on Tesla in adoption of zonal E/E platforms and SDV

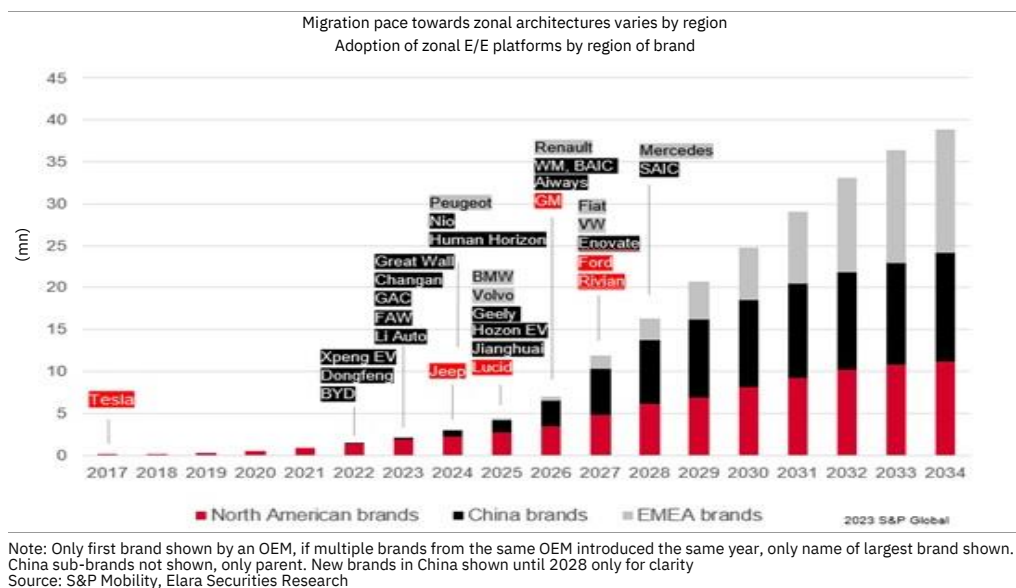
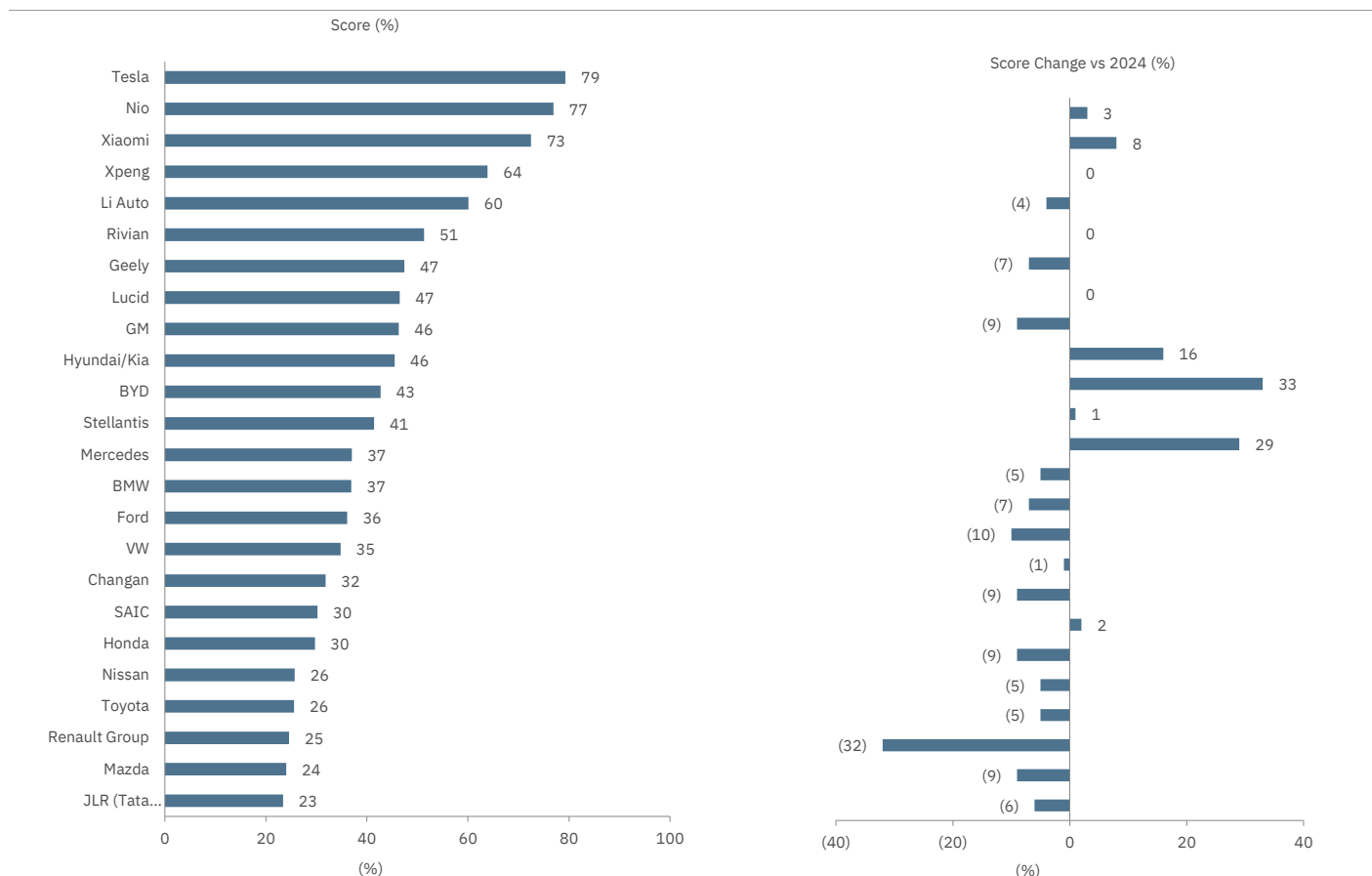
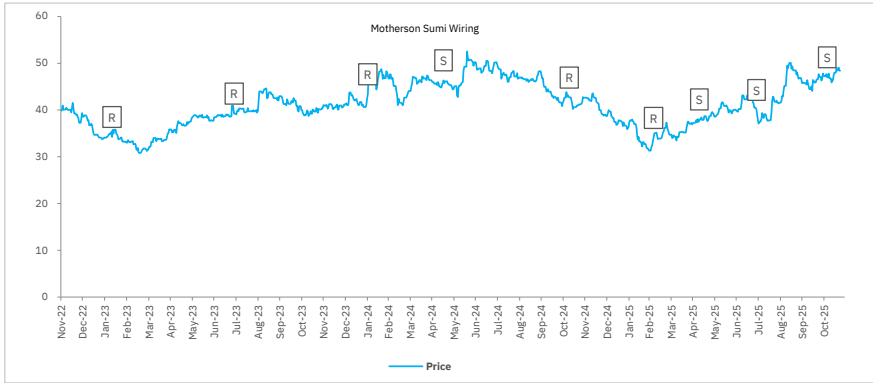


Exhibit 12: Digital Automaker Index 2025 – Tesla and Chinese OEM lead; Zonal architecture aids digital capabilities of OEMs



Source: Gartner, Elara Securities Research

Coverage History



Date	Rating	Target Price (INR)	Closing Price (INR)
16-Nov-2022	Sell	58	60
07-Feb-2023	Reduce	55	52
28-Jul-2023	Reduce	57	59
31-Jan-2024	Reduce	62	65
16-May-2024	Sell	62	70
08-Nov-2024	Reduce	62	64
06-Mar-2025	Reduce	50	51
09-May-2025	Sell	50	57
28-Jul-2025	Sell	34	40
04-Nov-2025	Sell	38	47

Guide to Research Rating

BUY (B)	Absolute Return >+20%
ACCUMULATE (A)	Absolute Return +5% to +20%
REDUCE (R)	Absolute Return -5% to +5%
SELL (S)	Absolute Return < -5%

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