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Mobility Minds Blog

By PwC Deutschland | 22 January 2026

From Waterfall to Freefall

Why traditional R&D models are doomed in the age of Software-Defined Vehicles

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The clock is ticking for Europe's automotive R&D. As electric mobility surges, software eats the car, and customers demand constant innovation, the traditional R&D playbook is collapsing. What once worked – long cycles, rigid silos, hardware-first thinking – is now a liability. To stay in the race, automakers must reinvent how they work. Fast.

From V-Model to Dead-End: Legacy R&D need to evolve

Legacy automotive R&D processes – typically structured around sequential, siloed development phases like the V-model – have historically resulted in long development cycles. The average time from concept design to start of production was approximately 48 months (four years), underscoring the rigidity and slow pace of traditional methods.[1] This worked in the past when product change was slow, but it's too sluggish now.

Traditional automotive R&D models are increasingly inadequate due to several converging forces:

- **Electrification & Software Complexity:** Modern electric and autonomous vehicles can contain over 100 million lines of code and 100+ interconnected ECUs, effectively making cars software-driven platforms.[2]
- **Dual Platform Burden:** Incumbent automakers must maintain both ICE and EV programs, doubling complexity and straining resources.[3]
- **Customer-Centric Innovation:** Consumers now expect continuous feature upgrades, personalized digital services, and shorter model refresh cycles.[4]
- **Organizational Inflexibility:** Decades of siloed, hierarchical R&D structures hinder cross-functional collaboration and slow decision-making.[5]

How Tech Titans Are Rewriting Automotive R&D

Innovative EV entrants like Tesla, Nio, and BYD have reset industry standards by slashing development time to ~24–30 months – roughly half that of incumbents.[6] Their approaches emphasize agility, integration, and breaking old silos, offering a blueprint for legacy OEMs.

- **Agile, Software-First Culture:** Small, empowered teams iterate rapidly on software, aiming to deliver a minimum viable product fast and then continuously improve it. For example, Xpeng attributes its edge to an agile, customer-led R&D philosophy.[7] Nio is even known to push weekly over-the-air software updates for its driver-assistance features.[8]
- **Full-Stack Development & Technological Autonomy:** New EV companies prioritize building in-house tech across the full stack, from custom chips to cloud services, for faster innovation. Nio, for example, developed both its own superchip and operating system ("SkyOS"), with about 70% of its engineers focused on software.[9]
- **Ecosystem Partnerships:** Tech giants like Huawei are injecting new collaboration models into automotive R&D. Huawei's Harmony Intelligent Mobility Alliance (HIMA) offers automakers a

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turnkey platform, allowing partners to focus on vehicle manufacturing. This model speeds up development, enabling car brands to quickly launch new vehicles using Huawei's digital chassis.[10]

- **Lean, Decentralized Organizations:** In these next-gen companies, R&D organization itself is reimagined to be flatter and faster. Decision-making is pushed down to small, cross-functional teams, cutting out layers of middle management.

Interestingly, automakers are also learning from other high-tech industries that have embraced agility. Even in regulated fields like medical devices, companies have shown that you can blend agile methods with compliance. Leading MedTech firms now use short development sprints with interdisciplinary teams (engineers, regulatory experts, designers working together) instead of pure V-model cycles. Similarly, aerospace and semiconductor sectors rely on digital twins and simulations to rapidly test ideas, a practice now adopted by EV startups to speed up autonomous driving development (e.g., training AI on countless virtual driving scenarios).

The message is clear: legacy R&D models are no match for the speed, agility, and integration now defining the automotive frontier. As software becomes the soul of the car, European automakers must rewrite their R&D playbooks. That means:

- **Embedding agile, cross-functional teams** at the core of product development, which means to run key R&D phases in parallel where possible (for example, developing software and hardware concurrently) and using iterative sprints to drive progress.
- **Building or partnering for full-stack capabilities**, as the development of EV requires new skills. New in-house expertise in areas like battery chemistry and management systems, automotive software development (ADAS, connectivity, UI/UX), and systems integration, needs to be built up – a workforce transformation at scale.
- **Embracing ecosystem collaboration**, for example, the Catena-X initiative in Europe brings OEMs and suppliers together to share data and software developments, aiming to avoid redundant work across the industry.
- **Flattening hierarchies and empowering teams** to move fast and own outcomes, requiring leadership to drive a cultural shift towards dedicated cross-functional product teams or "value streams."

The future of R&D isn't linear.Iit's iterative, integrated, and insanely fast. Europe's OEMs still have the engineering muscle and brand equity to lead – but only if they're willing to unlearn the past and build like the disruptors they once feared.

[1] Sabadka, D., Molnár, V., & Fedorko, G. (2019). Shortening of life cycle and complexity impact on the automotive industry. TEM Journal, 8(4), 1295–1301. **https://doi.org/10.18421/TEM84-27**

[2] Robert N. Charette, "How Software Is Eating the Car," IEEE Spectrum, June 2021.

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[3] EV-Global Team, “Automotive Product Development: From a Sketch to Production,” EV-Global (blog), Aug. 8, 2024.

[4] Purnendu, “Over-the-Air Everything: Why Today’s Cars Keep Getting New Features Long After You Buy Them,” Autoraiders, Nov. 22, 2025.

[5] Franziska Scharold & Kristin Paetzold-Byhain, “Towards agile automotive development: benefits, challenges and organizational changes,” in Proceedings of the International Design Conference 2024 (Design Society, 2024).

[6] EV-Global (2024) – “Automotive Product Development: From a Sketch to Production.” **https://www.ev-global.org/blogs/articles/Article14_ProductLifeCycles**

[7] Will Girling, “Xpeng’s R&D philosophy emphasises customer needs and agility,” Automotive World, July 10, 2023. (Xpeng execs discuss how an agile, customer-centric R&D approach gives them an edge.)

[8] Zhineng Technology, “NIO’s Transformational Moment: Shifting from Full-Stack Technology to Agile Organization,” AsiaICT, June 4, 2025. (Describes NIO’s weekly software updates and other agile practices.)

[9] Frank Markus, “The Era of Cars Running a Single Computer and Operating System Is Here,” MotorTrend, May 30, 2025. (Notes that Nio developed its own 5 nm chip and vehicle OS in-house, with ~70% of engineers in software roles, versus legacy OEMs’ opposite ratio.)

[10] “Beyond the Hype: A Tier 1 Insider’s Deep Dive into Huawei’s Automotive Strategy at Auto Shanghai 2025,” TheSinoReport, June 28, 2025. (Industry insider explains Huawei’s HIMA alliance, which lets partner brands launch smart EVs “incredibly quickly, bypassing years of R&D” by using Huawei’s turn-key technology platform.)

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