



## #26 | A New Epoch in Automotive Quality: How ASQMS Transforms the “Quality Snail” into a WARP-Speed Catalyst

“ASQMS Expert Commentary” is an article series on ASQMS written by automotive software quality experts around the world, based on their own insights, practices, implementation, or evaluation of ASQMS.



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Anyone who has ever served in a quality management capacity within the automotive sector will inevitably have encountered a rather uncharitable, yet regrettably pervasive, misconception. ISO 9001, IATF 16949, VDA 6.3, and ISO 26262 are frequently maligned by engineering teams and project managers as bureaucratic “quality snails”, a cumbersome, paper-pushing burdens that impede the execution of every project, delay market launches, and generate reams of documentation destined to remain utterly unread.

For a long time, the industry operated under the tacit assumption that uncompromising quality and swift execution were fundamentally antithetical. One was obliged to choose between delivering a meticulously compliant product at a painfully languid pace, or rapidly deploying innovations to market whilst incurring substantial risk regarding reliability and product recalls.

In the contemporary automotive landscape, however, such a compromise is no longer tenable. The vehicle has ceased to be a predominantly mechanical assembly; it has evolved into a

sophisticated Software-Defined Vehicle (SDV). Within this altered paradigm, conventional quality assurance methodologies are proving demonstrably inadequate.

For many years, the industry awaited an overarching framework capable of synthesising hitherto disparate disciplines: software engineering, systems architecture, cloud infrastructure, and rigorous automotive compliance. That framework has materialised and has been called Automotive Software Quality Management System (ASQMS). This is a standard that equips the quality snail with high-grade propulsion, enabling organisations to navigate at WARP speed whilst compromising neither safety nor methodological rigor.

## 1. The SDV Dilemma: Why Legacy Standards Fall Short

To appreciate the paradigm shift represented by ASQMS, one must first examine the fragmented landscape of legacy automotive standards.

IATF 16949 served as the bedrock of quality management across the sector. It remains an exemplary framework for overseeing the serial production of physical hardware components. It offers precise governance for manufacturing processes, supplier evaluation, and non-conformance management. Crucially, however, IATF was conceived in an era when software accounted for a negligible fraction of a vehicle's value and was confined to rudimentary Electronic Control Units (ECUs).

Conversely, Automotive SPICE emerged as the domain-specific process assessment model for software development. ASPICE introduced immense discipline to software and systems engineering by establishing the V-Model, mandating bi-directional traceability from requirements through to verification, and codifying process capability assessments.

In operational practice, however, a critical structural weakness emerged: a profound lack of cohesion.

- Plant Quality Divisions (Hardware/Production): Operating strictly within the lexicon of IATF 16949, focusing on layered process audits, FMEA, and process capability indices ( $C_{pk}$ ).
- Software Engineering Divisions: Residing within their bespoke ASPICE ecosystem, adopting Agile frameworks and CI/CD pipelines, frequently regarding plant quality requisites as superfluous administrative overhead.
- Functional Safety and Cybersecurity Divisions: Implementing ISO 26262 and ISO/SAE 21434 in isolation, thereby creating yet another silo of governance documentation.

The consequence was the formation of highly compartmentalised quality islands. Information flow became fractured, requirements were unnecessarily duplicated, and audits proliferated without strategic alignment. Rather than accelerating development, projects stumbled at every interface between systems, hardware, and software engineering.

The Automotive Software Quality Management System is emphatically not merely another volume to be added to an already bloated compliance library. Rather, it represents an integrated management framework designed to unite quality imperatives into a singular, dynamic ecosystem.

## **2. The Four Pillar Breakthroughs of ASQMS**

### **Pillar I: Extending ASPICE Across the Entire Enterprise**

Historically, Automotive SPICE was largely sequestered within the confines of R&D departments or specialised software vendors. Whilst software engineering teams adhered to ASPICE guidelines internally, process continuity faltered the moment a project was handed over to manufacturing operations, integrated with upper-tier suppliers, or submitted for post-market warranty analysis.

ASQMS dismantles these institutional silos. It projects the underlying logic of software quality management across the entirety of the corporate structure.

- **Procurement Integration:** Procurement departments move beyond treating software as an opaque "black box" acquired purely on price. ASQMS provides robust frameworks to assess vendor code quality using the self-same standards applied internally.
- **Operational Quality:** Maintenance and operational support teams adopt identical traceability and change-management metrics as core development units.
- **Corporate Culture:** Systems engineers, verification specialists, product managers, and internal auditors converge upon a unified process language, rendering the tedious translation between IATF terminology and ASPICE terminology entirely redundant.

### **Pillar II: Comprehensive Lifecycle Governance. From Inception to Deprecation.**

Under traditional quality assurance paradigms, primary emphasis was placed upon the development phase leading up to Start of Production, alongside flawless physical manufacturing. The post-launch state of the software was largely treated as immutable.



In the era of the SDV, however, a vehicle rolling off the assembly line marks merely the commencement of the software lifecycle. Over-The-Air updates necessitate that the vehicle continue to evolve dynamically throughout an operational lifespan spanning a decade or more.

ASQMS encapsulates the true End-to-End Lifecycle:

- Concept and Architectural Governance: Embedding quality engineering at the inception of software strategy formulation.
- Development and Continuous Integration: Merging Continuous Integration/Continuous Deployment practices with Functional Safety and Cybersecurity requirements.
- Deployment and OTA Distribution: Regulating release management for software deployed directly into active vehicle fleets.
- Post-SOP Maintenance and Monitoring: Managing defects, telemetry, and emerging vulnerabilities throughout field operations.
- Decommissioning and End-of-Life: Overseeing the structured deprecation of legacy software versions, cryptographic key lifecycles, and data migration. Nothing is overlooked; no codebase is left unmonitored.

### **Pillar III: Standardising the Off-Vehicle Ecosystem**

The most forward-thinking dimension (and personally my favourite) of ASQMS is its explicit recognition of the off-vehicle domain. Historical automotive standards suffered from a form of "on-board myopia," concerning themselves exclusively with components physically housed within the chassis.

In modern architectures, a vehicle cannot function as intended without an extensive off-board digital ecosystem:

- Mobile Applications: Facilitating remote access, thermal pre-conditioning, charging management, and digital key provisioning.
- Cloud Backends: Processing telemetry data, performing real-time route calculations, and managing fleet operations.
- V2X Infrastructure: Communicating with traffic infrastructure, charging stations, and surrounding vehicles.



ASQMS applies automotive-grade quality discipline to off-vehicle components, recognizing that cloud infrastructure and mobile software are vital, safety-critical extensions of the modern automobile.

#### **Pillar IV: Extending Governance to Data Centres**

This represents a profound blind spot in traditional quality governance. If cloud-hosted algorithms execute calculations for safety-critical functions, such as autonomous parking routines, predictive braking models, or battery management in electric vehicles, then the data centre effectively functions as an operational extension of the vehicle's assembly and operational architecture.

ASQMS integrates structured quality criteria directly into server and cloud environments:

- **High Availability & Reliability (SLA/SLO Alignment):** Standardising high-availability protocols within the context of automotive safety requirements.
- **Business Continuity & Disaster Recovery:** Ensuring full auditability of failover procedures for host facilities.
- **SaaS/PaaS Supply Chain Governance:** Establishing rigorous control over external cloud providers.
- **Server Configuration & Compliance Governance:** Guaranteeing that cloud production environments rigorously conform to verified, tested specifications.

Server infrastructure demands the same precision, standardization, and process discipline as physical manufacturing lines. ASQMS provides the blueprint to achieve precisely that.

### **3. Audit Reality: The Industry Disconnect**

When engaging with senior third-party auditors, one may pose a rather straightforward, albeit incisive, question:

“Are you currently conducting third-party audits of the data centres supporting vehicle software operations? Are you verifying CI/CD pipelines and cloud redundancy against safety-critical automotive criteria?”

The response is almost universally characterized by a telling silence. At present, the certification sector remains largely anchored in the mechanical era. Auditors meticulously verify the calibration of vernier callipers on the factory floor whilst remaining oblivious to the fact that mission-critical code is deployed automatically from cloud servers located halfway across the globe, often absent the rigorous quality gates customary in physical manufacturing.

It is precisely within this regulatory vacuum that the necessity of ASQMS becomes undeniable. By adopting ASQMS, forward-thinking organisations establish a comprehensive quality framework well ahead of regulatory mandates, insulating themselves against systemic risk before OEMs and statutory authorities inevitably enforce compliance.

#### **4. Speed versus Methodological Discipline: Achieving WARP Velocity**

To revisit my central metaphor: does implementing a comprehensive software quality management system not risk introducing further operational drag? Is ASQMS not merely a more elaborate snail?

Emphatically not. Herein lies the fundamental paradox of modern quality management.

Legacy quality processes slowed projects down not because they demanded excellence, but because they were fragmented, redundant, and manually driven. Teams squandered uncountable hours navigating jurisdictional disputes, manually translating requirements between incompatible toolchains, re-testing components unnecessarily, and generating static documentation purely for audit compliance.

ASQMS functions as a streamlined engineering catalyst: it installs the requisite methodological rigor to eliminate costly downstream rework. As a fundamental tenet of systems engineering dictates, resolving a defect during the conceptual phase incurs a nominal cost; resolving the same defect post-launch incurs exponential financial and reputational damage.

By embedding quality early and encompassing cloud backends alongside data centre infrastructure, ASQMS enables organisations to move at WARP speed with confidence.

#### **Conclusion: The Strategic Imperative and the Path Ahead**

The Automotive Software Quality Management System represents a definitive evolution in automotive quality assurance. It transforms what was historically perceived as an onerous, bureaucratic impediment into a dynamic, automated engine of organizational performance.

What Is Still Missing on the Horizon?

Whilst ASQMS represents a monumental leap forward, the ecosystem must continue to mature. To achieve true end-to-end synergy across the entire vehicle architecture, three critical elements remain to be fully realized:

- A Harmonised Framework for Hardware and Mechanical Disciplines: Just as ASPICE provided the blueprint as Hardware ASPICE and Mechanical ASPICE, we desperately require a unified, ASQMS-aligned equivalent for physical engineering, that

seamlessly interface with the software ecosystem without reverting to archaic manufacturing silos.

- **A Dedicated Professional Community:** We need a specialized knowledge-sharing ecosystem analogous to *Gate4SPICE*, a dedicated ASQMS community where auditors, practitioners, and quality leaders can exchange best practices, calibrate assessment perspectives, and refine the standard collaboratively.
- **Heightened Awareness Across European Industry:** There remains a pressing need for broader education and executive awareness within the European automotive landscape. European OEMs and tier-1 suppliers must proactively embrace these off-vehicle and cloud quality paradigms rather than waiting for regulatory mandates to force their hand.

One ought not wait for third-party registrars to inspect your data centre facilities with questions you are ill-prepared to answer. The era of the bureaucratic quality snail has drawn to a close; the era of high-velocity, integrated quality management has arrived.



„I feel like ASQMS is that snail with a rocket:  
seemingly slow and methodical,  
but riding a speeding rocket!“

Katarzyna Czerwiec