



EBOOK

ASPICE 101: An introduction to ASPICE Model for Automotive Development

A comprehensive look at ASPICE goals, requirements, and achieving compliance

Table of Contents

Introduction	3
What is ASPICE?	6
ASPICE and ISO 26262	8
Goals, Requirements, and Levels	11
How ASPICE Affects Automotive Development	16
How to Ensure Compliance	18
How Jama Software® Can Help	21



1

Introduction

Introduction

Few consumers could have predicted there would come a time when their automobiles would be controlled by computer chips, much less have integrated technologies to manage everything from cell phone calls to satellite radio to entertainment features, GPS mapping, and even drive controls.

According to an IEEE Spectrum article by Robert Charette entitled: “This Car Runs on Code,” the first production car to incorporate embedded software was the 1977 General Motors Oldsmobile Toronado which had an electronic control unit (ECU) that managed electronic spark timing.

The automobile of the 2020s hasn’t just transcended crank starters and wood paneling. Today’s automobiles integrate multiple technologies developed by teams across industries all over the globe. The automobile market has evolved to include everything from self- or assisted-driving technology, automated safety features, and various green technologies, including electric and hybrid options.

Market Forces Create Challenges



SURGE IN CONNECTED CARS



AUTONOMOUS VEHICLES (AVS) DISRUPT REGULATIONS



PUSH TO ELECTRIFICATION OF VEHICLES (EVS) BALANCED WITH HIGH TECHNOLOGY COST



PRODUCT QUALITY THAT MEETS SAFETY-CRITICAL STANDARDS



INCREASED MOBILITY SERVICES

With all of these new market demands, it's not uncommon for automobiles to require over 100 million lines of code. By 2030, a late model auto could require as many as **300 million lines of code**. Connected cars can process **25 gigabytes of data per hour** and generate over **4 terabytes of data per day**.

All of this data means that today's cars can fall prey to software malfunctions, connection interference, or even hacking. And because lives are in the balance, development teams have more incentive — and responsibility — than ever to get it right from beginning to end.

In this complex world of modern automotive development, many companies are adopting the ASPICE process model for automotive product development to meet the challenges.

MARKET DRIVERS

12+
YEARS

12+ years is the average life of vehicles on the road. Functional safety considerations are now center stage.

30
STATES

29 states and the District of Columbia have enacted AV legislation.

48%

48% consider giving up car ownership to autonomous mobility services solutions.

83%

83% of consumers are concerned about vehicle security.

\$1000+

It costs over \$1000 in semiconductor parts for a single car due to electronic system requirements.



2

What is ASPICE?

What is ASPICE?

ASPICE started as a variation of the ISO/IEC 15504, or SPICE, standard. SPICE stands for “Software Process Improvement and Capability determination.” The SPICE standard began as a way to provide a framework for independent assessors to evaluate an organization’s capability for software development. As other teams and manufacturers looked for software suppliers, this SPICE score could serve as one way to evaluate whether the developer could meet certain standards for performance, safety, and quality.

Though the SPICE standard didn’t gain much traction in other development fields, it did start to take hold in automotive as German auto manufacturers began using it. As the standard became focused more toward automotive, the moniker “AutomotiveSPICE” or “ASPICE” took hold.

As it stands now, ASPICE is a process assessment model and a process reference model for system, software, hardware, mechanical, and cybersecurity development in the automotive industry. Teams who design and develop products for the automotive industry increasingly use the ASPICE model to improve and optimize development processes and measure organizational process maturity.

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3

ASPICE and ISO 26262

ASPICE and ISO 26262

Of course, automotive companies already use ISO 26262, and introducing yet another compliance piece into a very full process may feel overwhelming. It's understandable why companies would be asking if they need to adhere to both ASPICE and ISO 26262 when they are already focused on ISO 26262 compliance.

Keys Points from ASPICE and ISO 26262

ASPICE services as an important foundation for process dimension of ISO 26262 development.

ISO 26262 has process requirements which need to be audited. This is because safety faults can happen because of inadequate development processes. In fact, according to the Project Management Institute, 47% of defects are a result of poor requirements.

Development processes can be improved to support ISO 26262 by using the ASPICE process model. A successful ASPICE assessment against capability level is an important step in preparing for an ISO 26262 Audit.

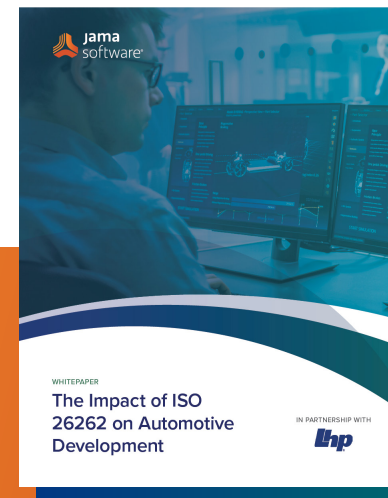
ISO 26262 requires a quality management system that adheres to a recognized industry standard in order to support quality management, requirement management, configuration management, project management, software development, and more.

ASPICE is the automotive industry standard for system and software development, but also for hardware, mechanical, and cybersecurity.

Many OEMs and Tier 1s require ASPICE as a foundation for both ISO 26262 functional safety development and ISO 21434 cybersecurity development.

Specific areas of the ISO 26262 standard addressed by ASPICE process areas: Project Management (Part 2), Safety Requirement Management (Part 8), Configuration Management (Part 8), Change Management (Part 8), Verification (Part 8), Documentation (Part 8), System Development Lifecycle (Part 4), Software Development Lifecycle (Part 5), Hardware Development Lifecycle (Part 6), and Supplier Management for Distributed Development (Part 8).

The best approach for automotive development teams is to consider both ASPICE and ISO 26262 guidelines.



The Impact of ISO 26262 on Automotive Development

[Download the whitepaper »](#)



4

Goals, Requirements, and Levels

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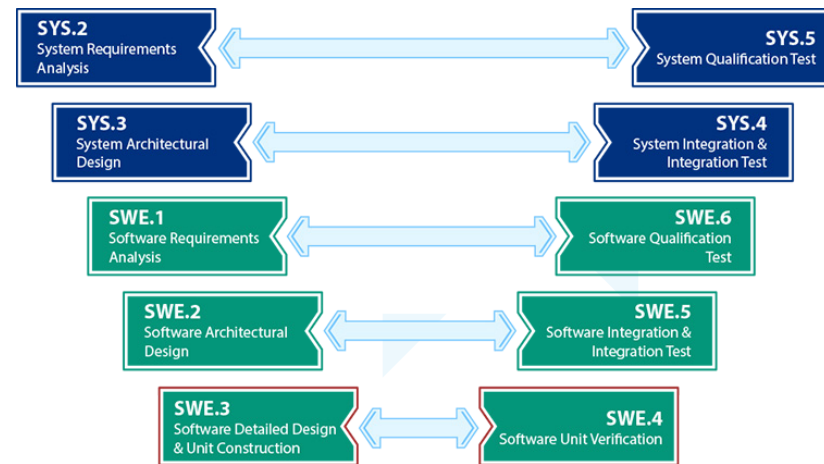
Fundamentally, the goal of ASPICE is to ensure quality at each step of the V-Model and in the supporting processes.

ASPICE does not contain best practices, in fact it doesn't tell you how to do systems or software engineering. It's a process model or framework that serves as a reference model for improving processes based on the V-Model. When process improvement is done according to ASPICE, the result is an increase in quality at each step of the V-Model and in the supporting processes.

ASPICE is based on the V-Model — a model that requires logical decomposition of requirements and rigorous evaluation through testing at each stage of development. This model benefits both suppliers and system integrators by giving opportunity to eliminate problems in early development stages.

ASPICE helps ensure quality at each step of the V-Model and provides a maturity model for companies to objectively assess their own process maturity and the process mature of their suppliers

On the left side of the V-Model are initial phases of product development



- **System Requirement Analysis:** Transform stakeholder requirements into system requirement
- **System Architectural Design:** Define the system design, allocate requirements to it, and verify it against established criteria
- **Software Requirements Analysis:** Transform the software related parts of the system requirements into software requirements
- **Software Architecture Design:** Define the software architecture, allocate requirements to it, and verify it against established criteria
- **Software Design and Construction:** Design and implement the software units

On the right side of the V-Model are the secondary phases of product development:

- **Software unit verification:** Verify the software units according to their design and requirements
- **Software integration and verification:** Integrate the software and verify it according to architecture design including interfaces
- **Software qualification test:** Verify the integrated software according to the software requirements
- **System integration and integration test:** Integrate the system components and verify the system according to system design including interfaces
- **System qualification test:** Verify the integrated system according to the system requirements

The advantage of the V-Model is that it promotes testing and improvement throughout the development cycle. For each point along the V, there is a corresponding verification phase and additional traceability and management processes. Suppliers who follow this ASPICE model can earn certifications according to standardized achievement phases; the ASPICE standard is scored in levels from zero to five, which clients can use to evaluate the proficiency of the development team.



The ASPICE model includes additional process areas that provide critical support for V-Model development:

- **Quality Management (SUP.1):** Independently ensure the quality of work products and process compliance, manage quality related issues
- **Configuration Management (SUP.8):** Establish and maintain the integrity of all work products, ensuring the correct versions of items are available
- **Project Management (MAN.3):** Plan, establish, and control the project activities and resources
- **Change Management (SUP.10):** Ensure change requests are managed, tracked, and implemented
- **Problem Management (SUP.9):** Ensure that problems (issues, defects) are identified, analyzed, managed, and controlled to resolution
- **Supplier Management (ACQ.4):** Track and assess the performance of suppliers against agreed requirements

ASPICE levels are as follows:

LEVEL 0 | Basic

Teams at Level 0 are still developing processes or systems. They can, at most, “partially” achieve ASPICE requirements. These teams should focus most of their efforts on managing basic tasks.

LEVEL 1 | Performed

Teams achieving Level 1 either nearly or completely deliver standard ASPICE requirements, but likely have gaps in their processes.

LEVEL 2 | Managed

Level 2 teams can reliably deliver work products and almost or completely achieve ASPICE standards.

LEVEL 3 | Established

At Level 3, teams have established and set performance standards and are engaged in continuous improvement to constantly evaluate and learn.

LEVEL 4 | Predictable

Level 4 teams measure, record, and analyze outcomes; evaluate outcomes and processes objectively; and consistently meet performance standards.

LEVEL 5 | Innovating

Level 5 teams have reached a stage where they are not only consistently delivering high performance and quality products, but also engaging and investing in continuous improvement. These teams also analyze performance standards for quantitative feedback and causal analysis resolution.



ASPICE standard does not describe how to engineer products, other than use the V-Model, or what tools to use. Because every team is different, this generic approach can help bring order and improvement to any team operating in any automotive system or space.

ASPICE compliance is a journey that requires requirements management support, resources, and proper tooling

The biggest step in capability levels is from 0 to 1. Teams that achieve level 1 are recognized in the industry as capable of high-quality product engineering and have established a QMS required for engineering safety-related and cyber-secure systems.





5

How ASPICE Affects Automotive Development

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The world of automotive development is only becoming more complex.

Some factors that are increasing complexity:

Consumer demand:

A connected world means that consumers want seamless connectivity across their entire lives. The lines between work, home, and leisure are increasingly blurry, and consumers who still need vehicles to get from point A to point B will want all of those pieces of their lives to be integrated — even behind the wheel.

Increasing regulation:

With the increasing of complexity of automotive systems, powered by an exponential growth in the amount of vehicle software, regulations for functional safety and cybersecurity play an important role to ensure the safety and security of the road users.

Rapid innovation:

Vehicle manufactures are fully embracing new technologies including automated drive, connected car services, cloud-based services, electrification, and over-the-air updates. Vehicle innovation drives suppliers to support these features resulting in an exponential increase in software. Software fuels innovation and now more than ever software is at the forefront of automotive development.

Fortunately, ASPICE can help auto suppliers and original equipment manufacturers (OEMs) respond to this increasing complexity in multiple ways:

Control the process:

ASPICE gives teams clear guidance for evaluating and controlling their development processes, which can help ensure product quality, shorten time to market, and reduce costs.

Streamline supplier selection:

ASPICE is an important tool for OEMs, Tier 1s, and Tier 2s to assess and evaluate suppliers. Suppliers who achieve ASPICE compliance are capable of delivering consistent quality products, a critical measure in today's rapid pace of automotive innovation.

Reduce costs and improve time to market:

Because ASPICE is more concerned with process than with specific regulations or safety guidelines, using the standard can help teams reduce costs and improve efficiency, thereby improving overall market competitiveness.



6

How to Ensure Compliance

How to Ensure Compliance

Why should we start our ASPICE initiative now? Why not wait until our customers require it?

01

ASPICE compliance is a journey that will require significant resources, management commitment, and iterations. The payoff in terms of quality, cost savings, team capability, and innovation is significant. Smart teams start yesterday.

02

ASPICE provides the necessary support for development according to ISO 26262 Functional Safety and ISO 21434 Cybersecurity. If you are working with those standards or aspire to, start your ASPICE initiative now to ensure success across compliance standards.

03

ASPICE compliance gives companies a competitive edge over companies that don't support it. Many OEMs require ASPICE throughout their supply chain and will give preference to those who are committed to it.



But knowing that compliance is desired and actually achieving it are two different things. How can teams ensure compliance with the ASPICE standard?

Start with an honest assessment.

Teams can't know where to go until they know where they are. A good place to start is to draft current processes and compare them to the ASPICE V-Model. This effort can provide good insights into current levels compliance and where improvements can be made.

Confront the gaps and missing pieces.

Most teams will have gaps between their processes and the requirements of the ASPICE model. Assess the current process to identify these gaps and then develop process improvement plans to close them. Be sure to allocate the resources needed to do the process improvement work!

Include stakeholders.

Be sure that all stakeholders have complete visibility into the ASPICE compliance efforts, and clearly define the resources those stakeholders can provide where necessary.

Initially focus on the three pillars of ASPICE

Place a priority on improving processes in the areas of quality management (SUP.1), configuration management (SUP.8), and project management (MAN.3). These three process areas provide critical support to all other process areas and also are vital for level 2 and level 3 compliance.

Pilot the new processes.

Select a pilot project once a critical mass of ASPICE process areas are supported and start using the new processes.

Reassess and improve.

After completing a new product under the new ASPICE-compliant processes, reassess, evaluate, and look for ways to improve. This constant focus on improvement is what allows teams to achieve higher levels of ASPICE compliance.



7

How Jama Software® Can Help

How Jama Software Can Help

Jama Connect® for Automotive is designed to give automotive development teams the framework they need to meet market demands quickly and efficiently without breaking the bank. Our automotive solution can help even a brand-new automotive manufacturer achieve compliance with ASPICE and ISO 26262.

Jama Connect:

- Provides known processes and practices to those companies that may not have the time to start from scratch and would prefer to leverage something with a proven track record.
- Produces documentation necessary to prove compliance with ASPICE and ISO 26262.
- Gives a central source of information to help break down siloes and improve communication and collaboration between teams.
- Includes consulting services to help you customize your documentation to your company's needs and preferences.



Jama Connect for Automotive

Whether your team is young or seasoned, small or large, all together or scattered across geographies, Jama Connect for Automotive can help improve processes, reduce costs, speed time to market, and help achieve ASPICE compliance.

To learn more about Jama Connect for Automotive, [download our datasheet](#).



Jama Software® is focused on maximizing innovation success in multidisciplinary engineering organizations. Numerous firsts for humanity in fields such as fuel cells, electrification, space, software-defined vehicles, surgical robotics, and more all rely on Jama Connect® requirements management software to minimize the risk of defects, rework, cost overruns, and recalls. Using Jama Connect, engineering organizations can now intelligently manage the development process by leveraging Live Traceability™ across best-of-breed tools to measurably improve outcomes. Our rapidly growing customer base spans the automotive, medical device, life sciences, semiconductor, aerospace & defense, industrial manufacturing, consumer electronics, financial services, and insurance industries. To learn more, please visit us at jamasoftware.com.