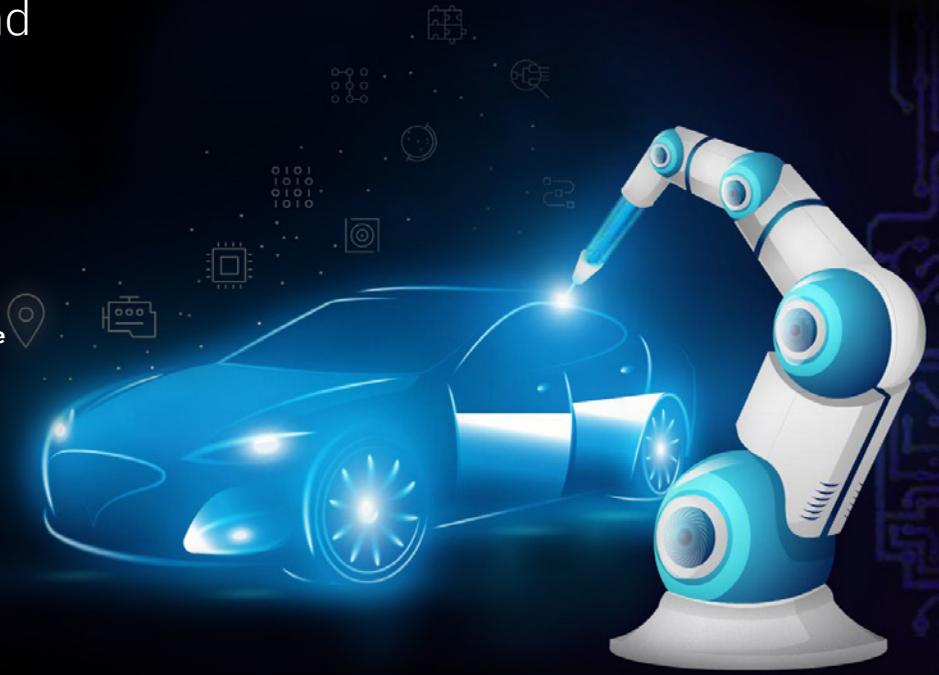


Addressing complexity for automotive software and systems engineers

- Today's cars have about 30,000 parts and more than **100 million lines of code**¹
- To cope with rising product complexity and crushing amounts of data, **teams must embrace the cloud** to maintain a competitive edge
- **47%** of failed projects are due to poor requirements²



Three key areas are driving the digital transformation in automotive engineering

Product complexity



Data, data, data

A connected, smart car is generating large amounts of data, while processing data from external sources such as weather and traffic. It's not just interacting with other drivers, but also exchanging data with other connected devices such as smart phones, watches, connected homes, workplaces and other connected spaces.

Today's cars are required to have built-in data intake and processing capabilities, along with on-board analytics. Such data capabilities require advanced electronics and software, which in turn drives up product development complexity.



More software than hardware

Computerization of vehicles has been long underway, but the requirements for smart cars are a paradigm shift in how the products are designed and engineered. Today's smart cars are packed with processing power which requires millions of lines of code to function properly.

The situation is getting more complex as we head towards autonomous driving. A myriad of systems are being controlled by software, that have to perform flawlessly while delivering a pleasurable occupant experience. As the complexity of product design increases, the reliance on modern engineering and development processes becomes increasingly crucial.



Digitally managing requirements

For an organization to be successful, it needs to deliver results. Projects fail because requirements are incomplete, incorrect, ambiguous or lack the necessary details. By digitally managing requirements, organizations can improve visibility, traceability and re-use, thereby reducing risk of downstream errors.

Documentation, traceability, prioritization and convergence on requirements can be accomplished by utilizing a robust digital framework, where controlling change is straightforward and communicating information to relevant stakeholders, seamless.

Globalization



Globally distributed teams and systems

In the automotive industry, globalization is the rule, resulting in distributed teams working across systems of systems. Managing requirements changes becomes critical for successful product delivery in such environments.

In order to avoid additional rework, lack of first time quality, unpredictable schedules deviations and cost issues, organizations must follow a process that makes requirement changes very easy to deal with. The ability to propose, analyze, approve, and implement changes within any system, across any team becomes essential.



Cross-industry partnerships

Connected, smart cars are genuine IoT constructs. This means that multiple industries are involved in their creation and subsequent operations. With increased computerization, cross-industry partnerships are commonplace in automotive organizations. Electronics, insurance, entertainment, telecommunications and security providers are some of the main industries integrating with vehicles.

This means that manufacturers and suppliers must work together across industries and successfully make the desired product integrations happen.



Single source of truth

The global aspect of automotive design and development also means that different languages and tools are being used across the various locations. This increases the importance of a unified framework where project requirements can be relied upon as a single version of the truth.

Analysis and agreements, along with traceability and validation, all have to comply with a unified set of rules that are not dependent on geographic location, languages or tools.



Engineering across global teams

Requirements management enables the ability to re-purpose, track and manage reusable components, parts and systems for localization of the vehicle for a particular geography. Poor requirements management results in the inability to reuse systems requirements, driving the creation of specific requirements for each country or market, which is time and cost prohibitive.

A successful framework for requirements management allows automotive organizations to achieve a high degree of modularity in their processes and products, along with simpler supply chains.

Compliance



A consistent set of processes

ASPICE or Automotive Software Process Improvement and Capability dEtermination is an extendable process assessment model for the automotive industry, focused on developing to achieve compliance.

It is a methodology for ensuring a consistent set of processes are followed in the creation of the requirements and well as the entire creation process for the vehicle. ASPICE is maintained by automotive companies and required by automotive OEMs.



A common model

The ASPICE standard prescriptively defines and utilizes a common process model to assess how a vehicle and its sub-systems are created, tested and produced. It is the accepted standard for automotive OEMs worldwide.

As the complexity of software utilized in a car increases, a robust requirements management product is needed to deliver the ASPICE components necessary to satisfy any level of the ASPICE standard.



Compliance in the supply chain

Traceability and consistency, along with communication of the relevant information, agreement on the validation criteria and successful validation of the change are responsibilities that affect the entire supply chain.

Auto manufacturers and suppliers are looking towards requirements management and the ASPICE reference model to provide a common set of process assessment capabilities in the creation and reporting of auto products.

75%

of auto industry executives expect non-traditional participants to have a key role in the automotive ecosystem by 2025³

The path forward for automotive organizations

Digitization

Improve efficiency by applying technology to individual resources or processes

Digital transformation

Produce consumer experiences that support individuals' needs or wants

Digital reinvention

Create revenues and results via innovative strategies, products

Auto makers and suppliers have already adopted cloud-based engineering tools into their operations



Yet many are still lacking deployment in critical areas, including security³

87%

are deploying without risk evaluation

86%

do not perform regular security assessments

87%

do not have a formally established security program

To seize the digital transformation in auto engineering, you need the right mix of tools and practices, both human and machine

- Cloud-based
- Analytics
- Traceability
- Modeling
- Security
- Agile

Teams who embrace these methods will find:



New focus

Systems approach to build in efficiency



New ways to work

Collaborating in real time across globally distributed teams



New expertise

Leveraging models and AI for continuous improvement

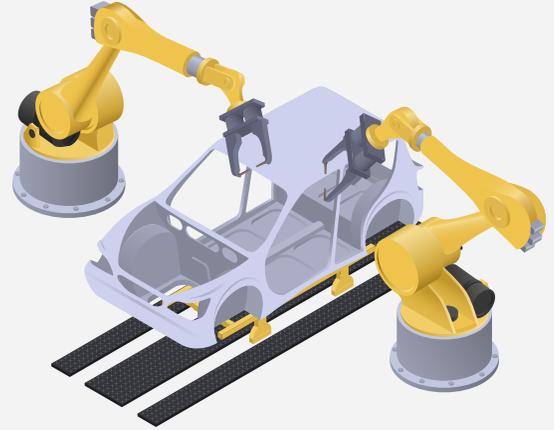
Putting it all into motion

Client study:

Daimler is shifting from traditional truck manufacturing to building digitally connected smart commercial vehicles designed to make trucking more efficient and cost effective.

Building new expertise around IoT, AI, cognitive automation, big data, telematics and hybrid systems, Daimler is creating new services and digital solutions.

It is also rapidly evolving its manufacturing processes, as it reinvents the end-user experience across the commercial vehicle segment.



Features of the reinvented vehicle

Self-integrating

- Digital integration
- Seamless
- Secure

Self-configuring

- Digital personas
- Personalization
- Environmental

Self-socializing

- Social networks
- Assisting others
- Using vehicles to do other things

Self-driving

- Automated
- Autonomous

Self-learning

- Occupants
- Performance
- Behavior
- Cognitive

Self-healing

- Analytics
- Prognostics
- Servicing

Design smarter cars, deliver new capabilities and enhance customer experiences

For more information, contact your IBM Business Partner

Footnotes

1. <https://futuremonger.com/100-million-lines-of-code-4-tb-data-per-day-is-that-your-next-car-a2724e9bd3fa>
2. Project Management Institute
3. IBM Institute for Business Value

© Copyright IBM Corporation 2019. IBM, the IBM logo and ibm.com are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at "Copyright and trademark information" at www.ibm.com/legal/copytrade.shtml.

