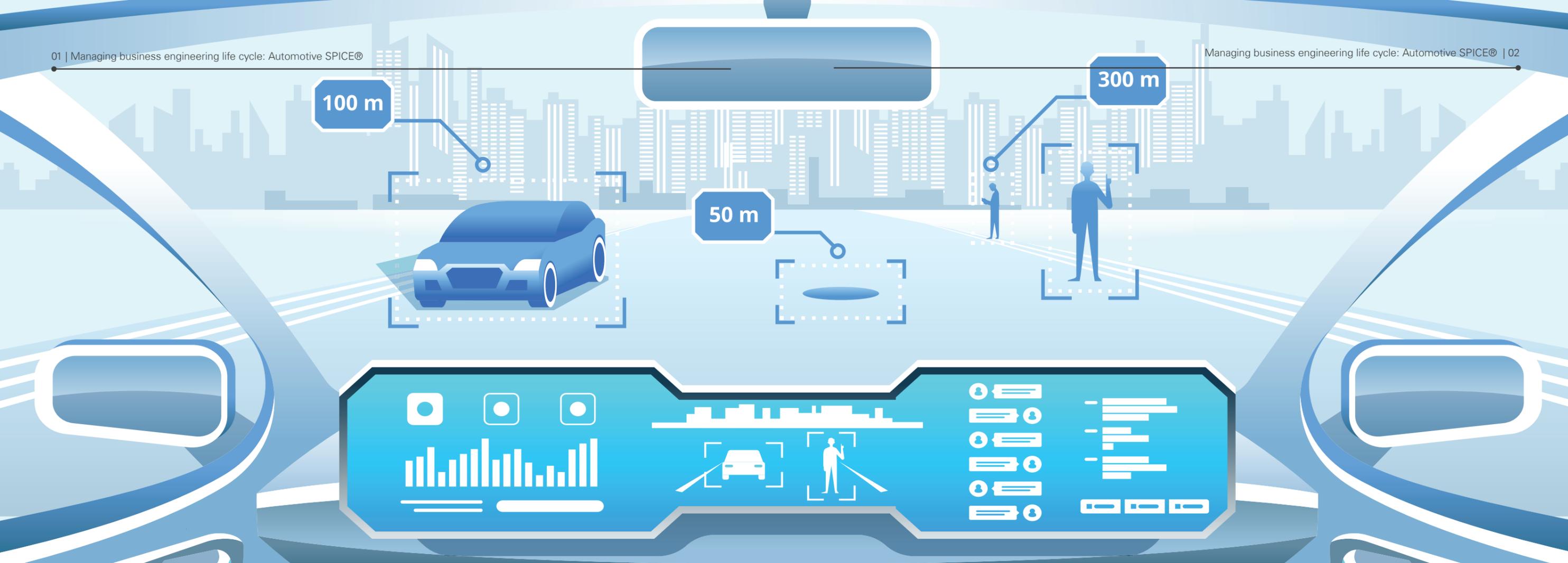




# Managing business engineering life cycle: Automotive SPICE®



# Foreword

The global automotive motors market size is projected to grow from USD 20,321 million in 2020 to USD 25,719 million by 2025, at a CAGR of 4.8%<sup>1</sup>. The Automotive industry is one of the key pillar of the Indian economy and has a strong correlation to the overall economic growth. It is in the forefront of innovation and caters to a wide variety of customer segments. It is also one of the most globally integrated industries in terms of supply chain and markets. It is one of the industries which is driven by continuous innovation with high quality research in multiple areas of travel and transport. It caters to consumers from a small rural area to most advanced cities across the globe. Overall automotive eco system support people across geographies with jobs, infrastructure, convenience, and competency building.

The process of designing, manufacturing and servicing automotive is governed by industry models and frameworks such as ISO 9001, ISO 45001, IATF 16949, ISO 26262, etc. Such international frameworks help

organisations to address the challenges associated with VUCA (Volatility, Uncertainty, Complexity, Ambiguity) times and can be the key drivers for business success. These models are built on the fundamental pillars of people, process and technology. For any industry, these are the three pillars for the business success, and this is even more critical in case of the automotive industry, for both OEMs and auto component suppliers.

Automotive industry is facing several challenges globally from availability of competent human resources, COVID-19 pandemic, overall state of economy, stringent government policies, globalisation, heightened expectations from customers, etc. Process implementation, disciplined culture with innovation are the key differentiators for better growth. They support to control the production and delivery cost to continuously increase the bottom line and ensuring 100% right first time without any market recall, which the basic 'ask' from the investors and management.



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<sup>1</sup> The global automotive motors market size is projected to grow from USD 20,321 million in 2020 to USD 25,719 million by 2025, at a CAGR of 4.8%, PR news wire, 17 August 2020

# Automotive Industry

The automotive world is experiencing the one of the most substantial change since Henry Ford industrialised manufacturing a century ago, with lots of automation and smart connections. Digitisation, increasing automation, and new business models have revolutionised other industries, and automotive is no exception.

Technology-driven trends have and will revolutionise how industry players respond to the changing consumer behavior and drive transformational change. These forces are giving rise to disruptive technology-driven trends in the automotive sector such as diverse mobility, autonomous driving, electrification, and connectivity.

Electric vehicle and charging stations, driver-less cars, communication between cars, connected cars having office and home features etc. are going to be must-have features very soon in mid-segment and premium cars. Frequent updates of hardware and software by the OEMs and suppliers would play a crucial role for the end consumer requirements. OEMs are using various components and software from their suppliers. Suppliers are also modernising their manufacturing facility with state of the art in process and finished product testing to instill confidence to OEMs. Software is a crucial component in the overall product which,

plays a significant role in providing ultimate customer experience. Therefore, suppliers have a critical role as they ensure quality and timely delivery. To meet these expectations, strong processes to drive innovation, continuous improvement, productivity improvement, reusability, skill upgradation, automation are required using the latest possible technology [AI and ML]. These processes also manage the technology disruption in a strategic and methodical way which may support to strengthen increase in customer satisfaction and strong position against competitors.

For the automotive sector, Automotive SPICE® [Automotive Software Process Improvement and Capability dEtermination], a process improvement framework is an integrated framework which helps to strengthen the organisation' processes for the OEMs and also for their suppliers. Automotive SPICE® helps to benchmark organisation working model with international best practices in automotive domain for software development. This supports overall project management and engineering activities including deliverable quality with strong emphasis on measurement with focus to action on the leading parameters for business performance improvement linked with EBITDA and CAGR.



Automotive industry has experienced growth. Based on the recent economic developments, beyond demand levels, basic structure of the aftermarket industry may change. Businesses will have to revise their strategy, plans, geographic location based plans and manufacturing and software development strategies. Strong process adherence plays a very vital role in this situation for support and maximum possible business growth. Processes bring a disciplined culture in the organisation which adds to the business value. Metrics provides data for business performance for actions to control and improve business performance.



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Automotive industry will soon have fast growth. Country has business savvy policies to support this growth to improve the GDP. CXOs' continued commitment for process implementation would add lot of value to improve cost and quality and workforce competency. Automotive SPICE® details best practices from multiple organisations to benchmark process implementation to achieve business benefits.



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LEADERS' SPEAK



Globally and in India, automotive industry has always been innovative in terms of meeting consumer needs across segments. Innovation needs enhanced employee competency using tools and models such as ASPICE, which covers distilled best practices for process implementation and performance improvement for this sector. This model enables organisations to drive continuous technology disruptions and proactively handle rapid requirement changes.

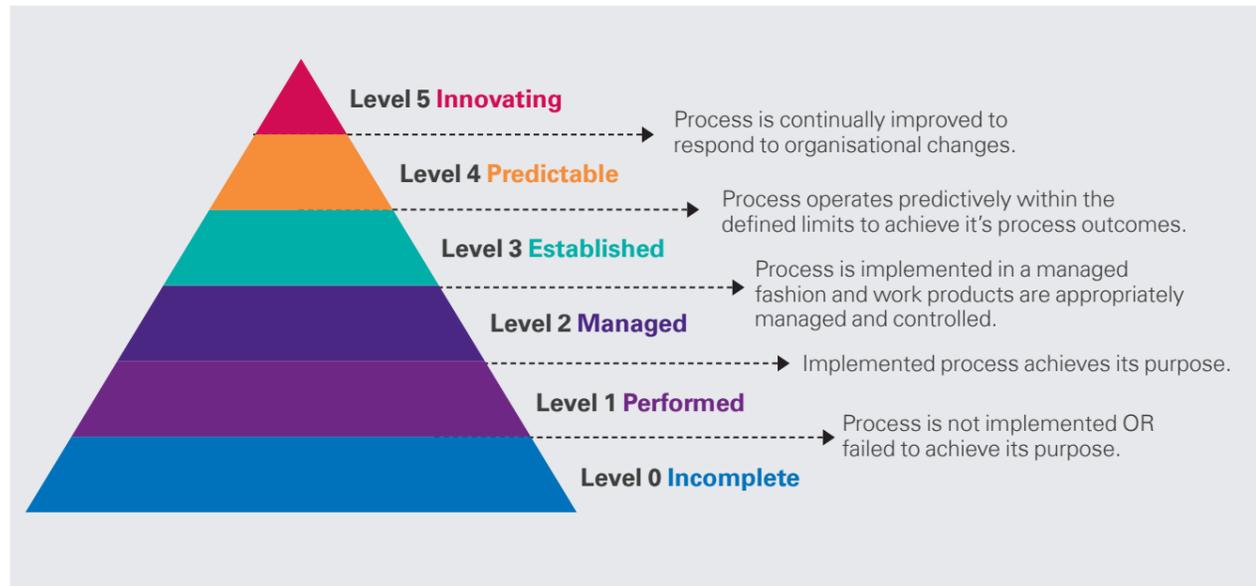


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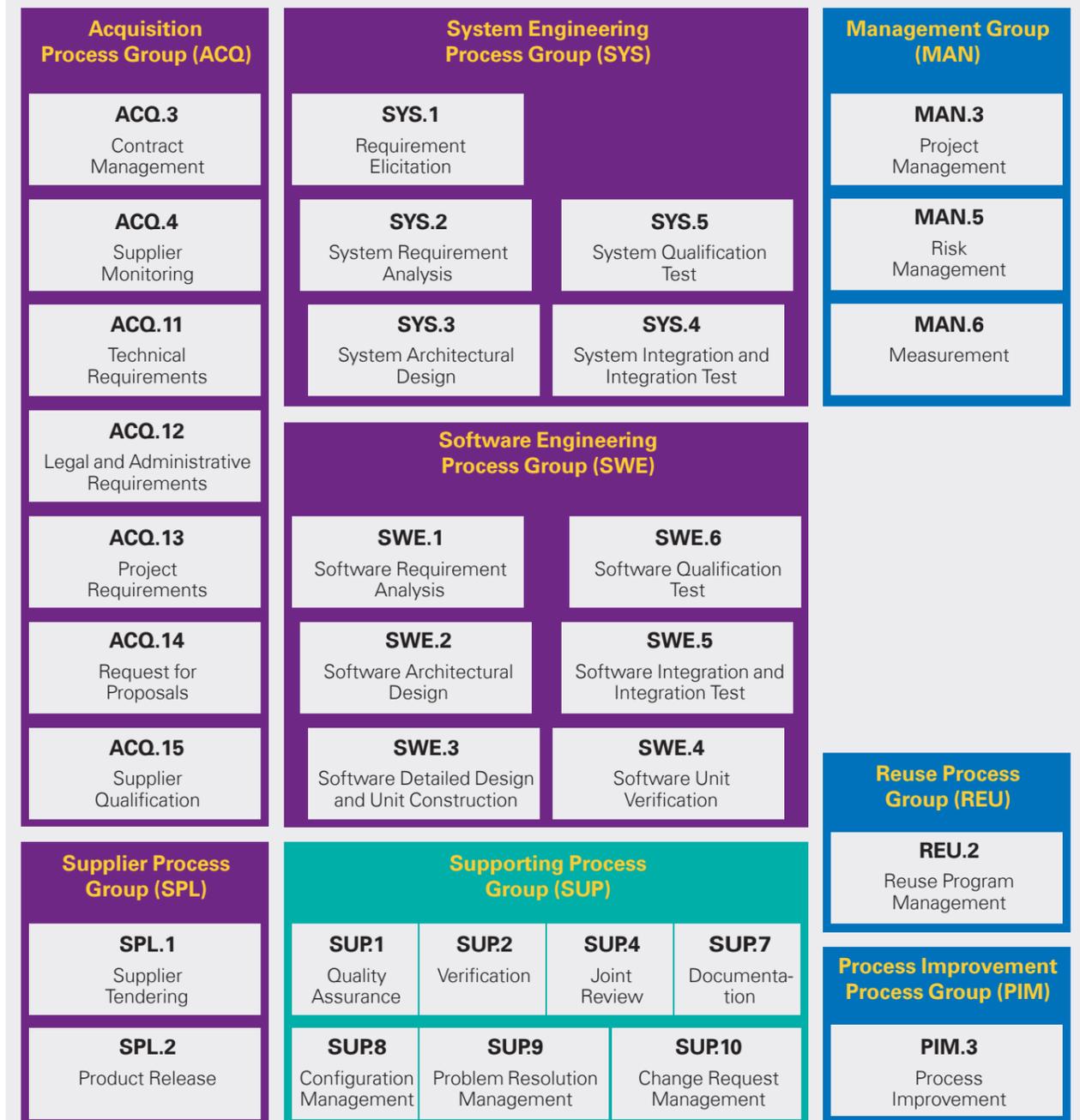
Following are the characteristics of Automotive SPICE® which – might help organisations to achieve process excellence.

- Supports multiple different life cycle activities including software engineering interfacing with system engineering.
- Team members able to learn more about process implementation and their involvement
- Addresses both business and project level risk. Based on the risk management experience, Organisation and Business Unit level risk repository helps to proactively plan activities based on the past experience.



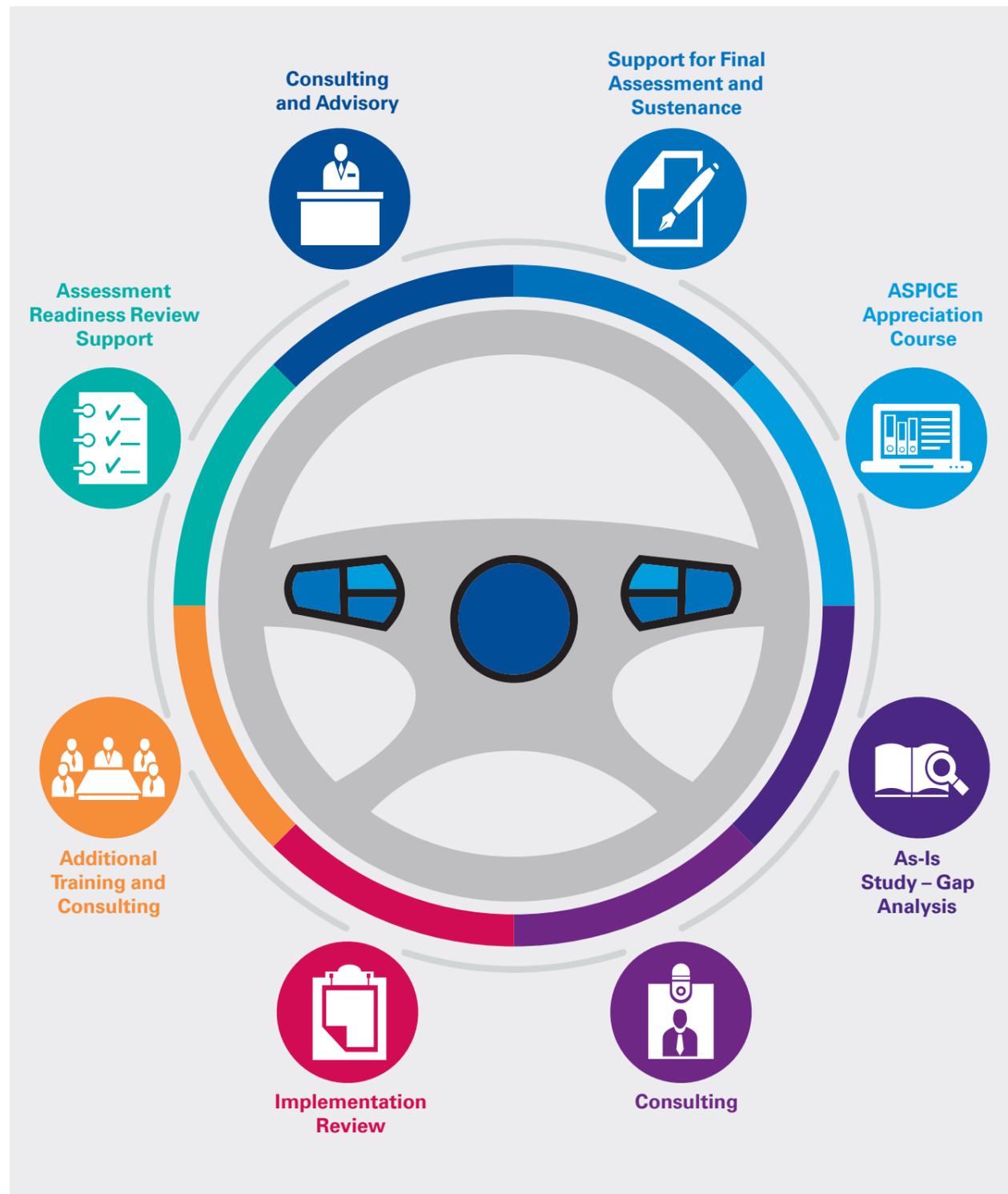
- Better monitoring of the project life cycle activities, visibility into each stage including for engineering activities
- Continuous monitoring of customer requirements and traceability from requirements to the release. Strong change management mechanism interfacing with project scope and acceptance criteria.
- Improvement in Quality Cost – For engineering application, the safety is very important for hardware and software. This is one of the unique characteristics of Automotive SPICE®. Review and testing throughout various phases of the engineering life cycle. This ensures that defects are not missed from any stage and prevents leakage to the next stage. From the analysis of defects, one can learn how to control defects for future activities. Work products are verified and validated based on the provided effort, schedule and organisational learning. Continuous process improvement for quality, effort, cost, schedule are linked with business needs.
- Allows the organisation to have responsibilities for each stage of the process resulting in fewer discussions. For all the stages of life cycle the organisation implementing the processes has an in-depth control on each phase of the project life cycle and organisational activities for improvement, data analysis, skill and efficiency.
- High customer satisfaction – Over a period of time, customer processes are institutionalised. Customer requirements are considered for implementation and improvement.
- Supports to manage and increase capability to manage increasing project complexity. Process to be defined and implemented as per the organisation business requirements, organisation objectives, usage of measurement data and learning from past experience.
- Productivity and Cost – Automotive SPICE® process repeat implementation and usage of the past experience results, reusability, learning from testing and manufacturing errors, in cost improvement with increase in competency and capability. Usage of history data/organisation knowledge repository helps to learn from the past experience [e.g. reusable component, reusable test cases, reusable artifacts, etc.]. It advocates for priority hopping, clear responsibilities, pride in one's own work, less discussions, and elimination of double work.

### Automotive SPICE (R) Reference Model



- Primary Life Cycle Process
- Operational Life Cycle Processes
- Primary Life Cycle Process

# ASPICE Approach: KPMG in India Approach for Automotive SPICE®



## Gap Analysis

During this phase, our team would first understand the client's business life cycle, project type and project domain. Explain each practice of Automotive SPICE® in detail with interpretation in line with the organisation's business requirements. The definition of current processes in the client organisations in line with this explanation would be discussed and a detailed gap analysis report based on this as-is study would be provided. This report would be discussed in detail to provide to-the point actions.

and metrics during the project life cycle, metrics analysis using various computation techniques [e.g. statistical techniques], interpreting metrics analysis, using the analysis outcome, and creation of the measurement repository.

## Process Advisory

Based on the gap analysis report, modified processes would be reviewed. Detailed hand-holding support would be provided for process modification, interpretation for implementation in each project and how to analyse metrics data using statistical techniques. Based on the engagement scope, process writing, training and internal audit would be included in the Process Advisory step.

## KPMG in India Automotive SPICE® Appreciation Course

The KPMG in India Automotive SPICE® appreciation course would be conducted with detailed discussion on each requirement of Automotive SPICE® with examples from gap analysis. This will be done in an interactive manner with quizzes and other learning aids.

## Implementation Reviews and Support for Readiness Review

Process implementation review in line with the processes defined at a defined periodicity and inputs for process improvement, close handholding for closure of the readiness review findings and support during final Automotive SPICE® assessment would be provided.

## Management by metrics

For Automotive SPICE® implementation, a detailed discussion would take place on collecting measures



# KPMG in India Experience

KPMG in India has provided advisory to multiple client organisations.

## Clients' organisation background –

They have a software development unit in automotive domain for their customers located in the Europe and Asia Pacific.

Challenges experienced by the customer organisation	KPMG in India Recommendations and benefits experienced
<ul style="list-style-type: none"> <li>• More effort and in-turn cost for day-today business activities,</li> <li>• Life cycle performance and status not visible</li> <li>• Unable to utilise their past experience</li> <li>• Component integration and defects reported from customer</li> </ul>	<ul style="list-style-type: none"> <li>• Streamlined technical requirements, established various technical requirements' analysis techniques, taking the customer/end user in confidence on the requirement understanding and what they would be receiving as the final output software [customer expectation and functional and non-functional requirements], requirements elicitation and team members involvement</li> <li>• Customer involvement during the development and to avoid any surprise at a later point in time.</li> <li>• Measurement System – Established measurement system linking with the business objectives to support measurement of the process implementation using metrics [e.g. defects, effort, schedule, defect density, etc], understand process variation and usage of statistical techniques for data analysis, focus on leading parameters and improvement in metrics linked with business and customer specific objective</li> <li>• Measurement data availability with status to the Senior Management for their inputs for the corrective actions and any impact on the deliverables delay, analysis of current data for better performance in the future to avoid any delivery and quality impact, availability of the measurement data for future usage as a knowledge bank.</li> <li>• Advisory for Integration Testing – Detailed integration testing process, reusability of the test cases from past and for future activities, root cause analysis and how to avoid the same defects in future, stakeholder involvement, recommendation to automate the testing process and training to team members to automate the testing activities.</li> <li>• Detailed test cases for before and after integration testing and integration review, integration strategy, tool usage for integration and may be tool usage for continuous integration activities.</li> <li>• Trained team members on KPMG in India Automotive SPICE® Training implementation.</li> <li>• Internal team members' audit to ensure Automotive SPICE® compliant activities as per the process compliance requirements</li> </ul>

<ul style="list-style-type: none"> <li>• Project level risk monitoring not done</li> <li>• managing continuous requirement changes – internal and external with impact analysis not being done</li> <li>• challenges in supplier understanding and stakeholder management, internal reviews and testing stages unable to capture defects which was leaking to the next stage</li> <li>• unorganised and team member centric organisation past work experience, past measurement data analysis and misinformation in the data interpretation</li> <li>• Varying customer satisfaction and overall cycle time</li> </ul>	<ul style="list-style-type: none"> <li>• Successful implementation of Automotive SPICE® for the various business units</li> <li>• Quality process review and detailed discussion regarding Automotive SPICE® interpretation with the client Quality Team</li> <li>• Risk Management – Established risk management strategy with guidelines, checkpoints/lists, detailed discussion on how to establish, maintain and use the risk repository for future activities, risk reporting.</li> <li>• Supplier Involvement – Agreement with the supplier, monitoring and providing inputs to suppliers, integration strategy, technical acceptance of the supplier output, supplier measurement data analysis for the work performed, inputs for improvement opportunities.</li> <li>• Configuration and Change Management – Agreeing to requirement changes, approval, impact analysis, business impact to receive the changes, stakeholders', Change Control Board approval, impact on the project objectives, achieving the delivery timelines, impact on the metric and re-planning, tracking and controlling the change requests, change management database availability and updation</li> <li>• Problems affecting day-today work to be resolved, analysed to avoid recurrence and then inputs for process improvement, inputs for organisation level system to record and track problems to closure.</li> <li>• Reusable component repository – Reusable component repository, usage of the same, access rights, updating the component library, providing required inputs such as software code, test cases, sample documents, best practices, lessons learned, best practices, mistakes made from internal activities, external reference material for automotive software and industry trends</li> <li>• Design and Reviews – guidelines, checklists, etc. for a very robust system architecture, review at a defined periodicity, external and internal interfaces, whether any interface with hardware, scalability for future, non-functional requirements, how to handle design during a complex situation, internal integration with other components, etc., technical reviews to ensure all technical specifications are met, joint review with the team and also as required process for customer involvement.</li> <li>• Project Management – project planning, monitoring activities, inputs for re-planning and how to take the same further, assumptions, constraints to ensure timely delivery to achieve customer objectives and timelines, inputs to the project life cycle based on the progress and project commitment monitoring</li> <li>• Streamlining external stakeholder requirements [e.g. timely project status, requirement changes, delivery impact due to risk/other challenges.</li> <li>• Focused process implementation review by KPMG in India to ensure continuous improvement with respect to the Automotive SPICE® requirements</li> <li>• Overall improvement in the cycle time, effort, improved the customer satisfaction rating and process improvement</li> <li>• Formalising the customer satisfaction process steps, analysis based on the feedback, Causal Analysis and Resolution [e.g. Five WHY, Fishbone analysis, etc.], inputs may be considered to repository at a defined periodicity.</li> </ul>
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# Way Forward and Conclusion

***“In God we trust, all others bring data”***

***– W. Edwards Deming.***

Automotive SPICE® is a very well-established international framework to benchmark process implementation. It strongly supports achieving the organisation’s business objectives based on process implementation for automotive domain for engineering and management activities to optimise the cost of delivery, error/defect rate, scrap rate, cycle time, return on investment, cost improvement.

Suppliers and Global Capability Centre (GCC) supporting their organisation’s innovation, production cost reduction and robust design in automotive sector could achieve the quantitative benefit based on continuous implementation of Automotive SPICE®:

- Complete life cycle is covered in the Automotive SPICE® implementation which helps to manage projects and over a period, strengthens project management activities
- Process implementation strongly establishes the strategy how to handle the business in uncertain times [e.g. COVID-19, etc.]
- Based on data captured and analysis, improvement in efficiency and overall capability
- Learning for the work force and continuous competency improvement process implementation and disciplined culture is a must for every organisation for their business benefits
- Continuous process improvement framework and person independence with required stakeholders’ involvement
- Automotive SPICE® helps to establish and maintain organisation repository to learn and implement based on the past experience and no need to further re-do activities.
- Benchmark process implementation with internationally acclaimed framework
- Different types of life cycles are supported by Automotive SPICE® and compatible with other process improvement frameworks also [e.g. ISO, CMMI, etc.].

## Acknowledgements

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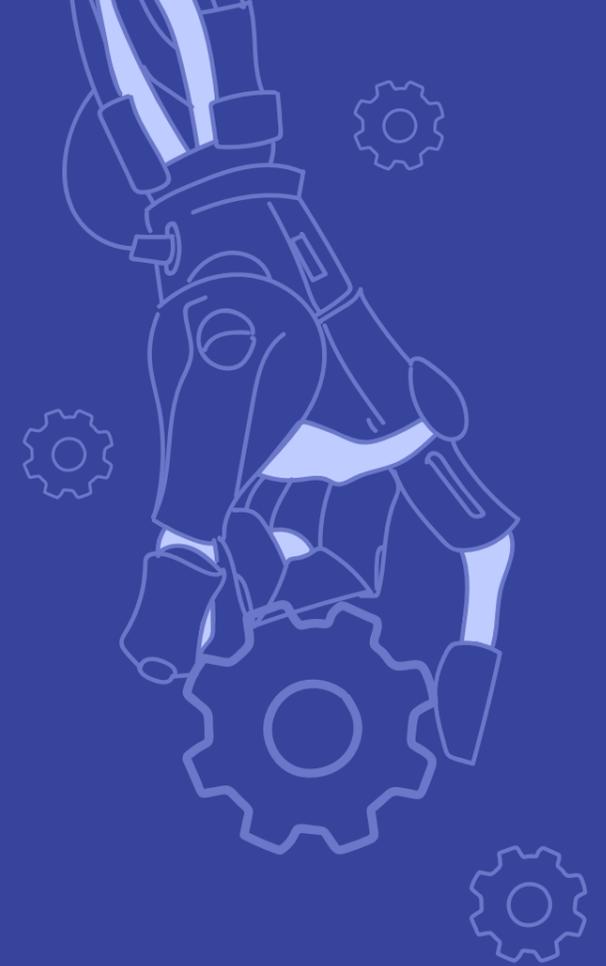
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