Balancing Quality and Functional Safety

Detects

Improves

Systematic Errors
• Design FMEA

Random Faults
• FMEDA
• FTA

• Design-for-Manufacturability (DFM)
• Process Integration

Design-for-Reliability (DFR)

Pillar 1: ISO 9001

Our organization has implemented a quality management system (QMS) based on the ISO 9001:2015 standard, and includes processes for product development, customer delivery, and supplier selection.

Synopsys' QMS is designed to ensure that all products and projects meet the highest quality standards, from conception to delivery. The key elements of the QMS are derived as per requirements of the ISO 9001:2015 standard:

- Management, Organization and Systems
- Product and project processes
- Product development processes
- Delivery of products to customers
- Supplier selection processes
- Support systems for the development and customer delivery processes

Pillar 2: ISO 26262

ISO 26262 helps us implement a functional safety development process to follow and document (for compliance) to have our IPs qualified to integrate with the customer's automotive application. We have integrated pillar 2 coherently throughout the product development lifecycle such that nominal and safety milestones are aligned effectively.

- Planning Phase: The safety requirements for the system are defined, and a safety plan is developed.
- Analysis Phase: The system is analyzed to identify hazards and potential failure modes.
- Design and Implementation Phase: The system is designed and implemented to meet the safety requirements defined in the planning phase and to eliminate or mitigate the hazards identified in the analysis phase.
- Verification Phase: The system is tested to ensure that it meets the safety requirements and that any hazards have been eliminated or mitigated.
- Validation Phase: The system is tested in its intended environment to ensure that it behaves as expected.
- Production, Operation and Decommissioning Phase: The safety requirements are maintained, and the system is decommissioned.

The validation and production, operation and decommissioning phases are tailored to the Synopsys IP development process due to its nature of being a soft IP and are replaced by the release phase.

Pillar 3: R&D Product Development Methodology

The Synopsys ARC IP R&D Product Development Methodology outlines and integrates the entire product lifecycle involving nominal and safety development. It ensures the efficient and effective development of automotive systems and components. Our methodology is based on the principles of quality and functional safety standards and is designed to support the entire product development process, from the early stages of planning, requirements capture and design to the final stages of testing, verification and release.
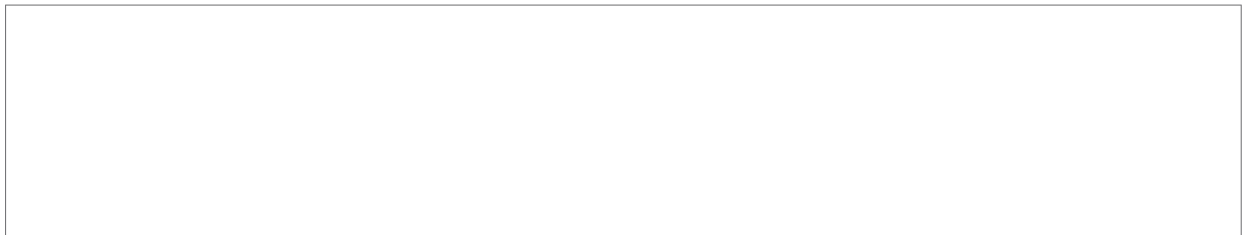
As depicted in Figure 3, The R&D methodology consists of the following phases:

Investigation Phase: The stakeholders define the requirements for the subsystem or component to be developed. These requirements in the form of KPIs, marketing and product requirements are captured using a model-based approach, which allows for a clear and

Key Supporting QMS Processes Implemented

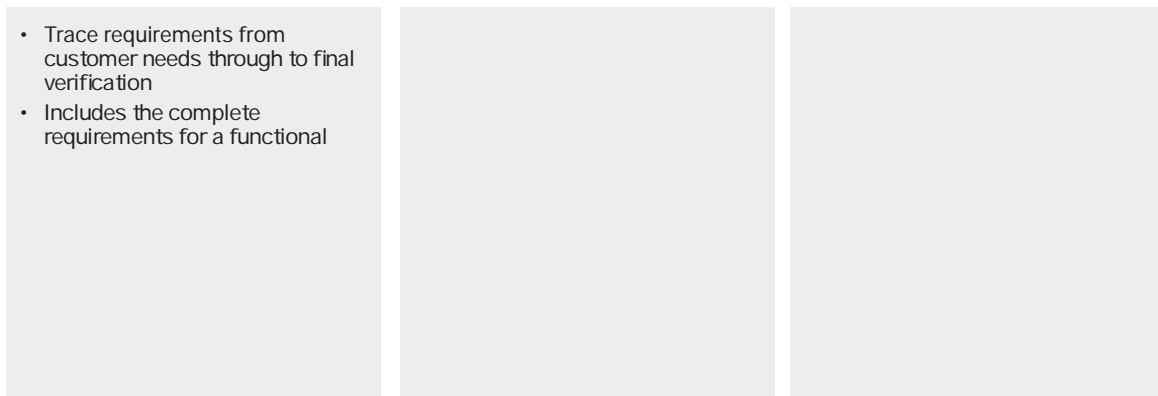|		5		
A project's Configuration Management Plan is developed	To control each change introduced throughout a product's lifecycle			
Configuration items are documented, evaluated and approved	Manage each change request (ú c%			
Configuration Status Reports are generated throughout the lifecycle of the product				

Issue Tracking and Project Management Platform

A robust project management tool is used when developing Synopsys ARC processors that helps our key stakeholders efficiently drive throughout the entire product development lifecycle. Issue tracking is an essential part of the QMS in the automotive industry. Here are some key considerations for implementing issue tracking as part of our product lifecycle:

- **Define the issue** clearly and specifically, including the root cause and potential impact to ensure that the issue is properly addressed and resolved.
- **Assign responsibility** for addressing the issue to specific individuals or teams or establishing a cross-functional team to address the issue.
- **Set priorities** for addressing issues based on their potential impact on safety, quality, and customer satisfaction. This may involve establishing a system for categorizing issues by severity and allocating resources accordingly.
- **Track progress** on addressing the issue, including key milestones, timelines, and outcomes to ensure that the issue is properly addressed and resolved in a timely and effective manner.
- **Conduct root cause analysis** to identify the underlying causes of the issue using tools such as the 5 Whys, fishbone diagrams, or Pareto analysis.
- **Implement corrective and preventive actions** to address the issue and prevent it from recurring in the future by making changes to processes, procedures, or systems to address the underlying causes of the issue.

Overall, effective issue tracking is essential to the success of the QMS in the automotive industry. By following these key considerations, automotive organizations can ensure that issues are properly addressed and resolved, and that corrective and preventive actions are implemented to prevent similar issues from occurring in the future.

Quality Checklist Tool

The Quality Checklist Tool is a natively designed and developed browser-based system for housing and smoothing the way of performing the checks and balances for managing all project releases. All SG R&D teams are required to complete the applicable checklists in the tool for their specific product family. Upon completion it is shared with key stakeholders that are authorized to validate and approve the product for release (Figure 7).

- Trace requirements from customer needs through to final verification
- Includes the complete requirements for a functional

Conclusion

The perfect blend to automotive quality and functional safety implemented in our product development lifecycle that qualifies our automotive products to release has proven benefits to our customers, as shown in Figure 8.