Case Study

System Requirement Development for Model Year 2019 for a leading OEM

About the Client
The client is a multinational manufacturer of passenger cars, light commercial vehicles, components and production systems.

Business & Technology Context
With development cycles becoming shorter, architectures becoming complex and safety being paramount, it is important to detect factors causing software failure and ensuring a robust product. System requirements form the basis of development of software requirements and further development. It is important to ensure that the requirements are validated thoroughly before starting the design and development activities. Rigorous analysis of requirements involves looking for issues such as ambiguities, inconsistencies and missing requirements. The correctness of functional requirements is validated through analysis using expert domain knowledge and simulation based techniques. Often along with the functional requirements, safety requirements for the system are specified in detail.

A robust failure mode and effects analysis (FMEA) helps in avoiding rework in software by anticipating and preventing failures in both design and process. Design Verification Plan and Report (DVP&R) tests if the design is fit for use in its intended environment. A traceability of requirements throughout the entire development cycle including the testing stages needs to be maintained to ensure high quality of design and end products.

The client wanted to develop a control software for its Model year 2019 architecture. The OEM lacked failure mode analysis of requirements developed for different functionalities within the architecture. The OEM wanted to perform Design Failure Mode and Effect Analysis (DFMEA) and DVP&R as a part of the system engineering.

KPIT with its cross-functional team of experienced system engineers, quality and testing resources, aptly met client’s product development and validation needs and hence, was the partner of first choice to them. KPIT, being one of the few niche automotive technology companies with Automotive SPICE certification, proved to be a huge advantage for the client.

KPIT’s Solution
KPIT developed a complete framework and process for System & Function Requirement development and ensured that the framework was developed keeping in mind HIL and Vehicle Level Testing. In addition to the framework, KPIT provided insights to mitigate design failures and enhance performance.
KPIT performed the following key activities for system engineering:

1. **Performed Vehicle Function Development** that included
   - Studying the requirement document, understanding the function behavior
   - Preparing function block diagram & defining working conditions and functional requirements
   - Defining/Updating diagnostic and recovery requirements
   - Feeding the Output as Vehicle function requirement document in DOORS

2. **Conducted System DFMEA** that included
   - Creating a DFMEA document, with RPN number calculated for all the malfunction
   - Providing recommendation for design changes

3. **System DVP&R Development** that included
   - Detail study of the calibrated parameters and threshold affecting the function behavior.
   - Identifying test objective for each requirement (to be tested) and preparing test cases
   - Clearly specifying the acceptance criteria for each test cases

4. **System Architecture Diagram** included
   - Architecture System Boundary & EE requirements
   - Architecture Diagram for Mule Build, VP-A Build, VP-B Build and PS Build

**Key Success Factors**

- KPIT worked on 40+ complex functionalities simultaneously ranging from body, transmission to EVs
- KPIT took complete ownership of the system requirement development from offshore, and provided consultation to bring performance enhancements in the design
- Systematic reviews and collaboration with multi-functional teams at every step of the system engineering process ensured transparency and robustness
- Huge resource pool of INCOSE* certified system engineers ensured superior quality delivery
- Achieved high level customer satisfaction in the deliverables with delivered defect density of zero

* INCOSE: The International Council on Systems Engineering is a membership organization with a mission to share, promote and advance the best of the systems engineering from across the globe for the benefit of humanity and the planet.

"DFMEA is a key activity in the System Requirement Development. Main challenge is to have a resource pool with experience from embedded to quality processes. KPIT arranged for DFMEA brain storming sessions with the Cross functional team including System Engineers and other stake holders i.e. control engineer, Quality engineers etc. for finalizing the Cause & Effect analysis, Failure detection strategy, Control decision for mitigation, Severity rating, Occurrence rating, and Detection rating etc."

About KPIT

KPIT Technologies (BSE: 532400; NSE: KPIT) is a fast growing Product Engineering and IT consulting partner to Automotive, Manufacturing and Energy & Utilities companies. A leader in technology solutions and services, KPIT partners with 200+ global corporations enabling them to become more efficient, integrated and innovative enterprises.