

## Summary

*Modern vehicle systems are containing more advanced intelligent features than a decade before. Complexity reached a level, where one feature might requires cooperation of multiple domains and suppliers. Vehicle manufacturers and developers used to design mechanical components rather than highly computed electrical devices including extreme long lines of software codes. Likewise not only traditional car manufacturers are presenting in the automotive market, but also IT 'high tech' companies are entering in that market. Although, the technology has started to revolutionize the Automotive Industry, the constraints of process background is remained. New process or analytical method usually result high opposition, but optimizing existing solution can be found open mind easier. Quality of the product must be ensured and guaranteed even in that extended supplier background. Technical reliability and product safety are key aspect for both customer and authority. Thus, participants in automotive industry are obligated to estimate and reduce the risk arising from the use of their product. The use of preliminary risk estimation analysis is the Failure Mode and Effects Analysis (FMEA), but higher level of automotive safety integrity level (ASIL) requires Fault Tree Analysis as well.*

*Therefore, I have started to examine the existing methods and processes to find weak points of preliminary risk estimation in FMEA. Both academic and industry resources are improving this method, but not the hot problems. Therefore, I have started to research solutions for common modeling of multidisciplinary engineering fields (Hardware, Software and Mechanics). Modeling complex systems and highly computed software modules are made conclusion to divide software functions in three levels instead of two levels as Haapannen did. Due to interfacing and communication makes more relevance today.*

*I have improved process development and optimization with fault tree analysis, using Linear Fault Tree Sensitivity Analysis (LFTSM). Optimizing risk estimation is essential, to have deeper understanding existing risks, thus I have to introduce sensitivity analyses of FMEA to refine risk estimation and prioritizing together with graphical representation of it.*