



## **PREPARING RISK-CERTIFICATES FOR COMPLEX PRODUCT STRUCTURES**

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### **GENERAL MOTORS**

During product design (conception), development (engineering & manufacturing) and usage (handling), there are risks inherent, in a multitude of forms, which drive the warranty cost high. While we design for maintenance, the procedures that we employ to evaluate the warranty-risk in different failure-modes, play a major role in the decisions related to product quality and future warranty-cost savings.

We have developed a decision-support system to perform risk-analysis that aid design and developmental reviews. To suit a practical industrial case, we assess the risk under the considerations of quantitative data, qualitative criteria, contextual information and expert-knowledge. Specifically, while modeling warranty risk of a complex product, which is comprised of assemblies and subassemblies, with a multitude of possible failure modes, we adopt hierarchical decomposition and aggregation principles that model risk appropriately.

We have developed and tested mathematical models that provide a risk certificate for future expected warranty on a complicated product such as an automobile. The use of analytic hierarchy process to model and analyze the associated warranty risks is provided with a case-study on an automotive brake system. The learnings from the successful application of this model would be discussed with key-insights and recommendations.

Participants will learn the following:

- How to model warranty-risk on a product that has an interdependent hybrid (series & parallel) failure structure.
- How to introduce and negotiate the expert opinions while certifying warranty-risk
- How to formulate a risk-based decision tree to include qualitative criteria of evaluation
- How to formally anticipate the expected future warranty based on risk-analysis