Any product sold is expected to be reliable and available when the customer wants to operate it. Companies that produce large capital products (LCP), such as rockets, satellites, or large gas turbines to generate electrical energy, tend to shy away from extending their testing and validation method above the requirements by law, mainly due to the very high costs of each additional test and the uncertain return on investment.

This research shows that today’s state of the art validation methods for LCP, required by law, or suggested in literature, and adapted by these industries, are not capable of capturing all significant failure modes (or even enough failure modes), with the consequence that the subsequently sold commercial product will still experience failures with significant effects on product reliability, and subsequently on the companies’ bottom line earnings projections.

The research determines the type of data (significant variables) necessary to correlate a company’s validation policy to product failures after commercialization, and predicts the financial impact of the current validation policy on the company’s profitability. An optimized validation plan and testing policy is suggested, and its impact on a company’s profitability is demonstrated through simulation.

A generic methodology is derived and its viability is illustrated using a specific product and a dynamic model developed with data available to the researcher. The generic method can be applied by any company to develop its own model for optimizing product reliability prior to market introduction.

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Approved for distribution by Linda Malone, Committee Chair, on September 2, 2010.

The public is welcome to attend.