

Center for e-Design

A CISE-funded Center

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Complexity Management Methodology: A Tool for Developing Product Families



A tire is a very complex product, with dozens of components and hundreds of raw materials.

Industry is continually challenged by the need to balance customer demands for increased product variety and the associated increased costs of meeting the demands; all while staying competitive. While great from customers' perspectives, increasing variety in products can quickly lead to complexity that impacts time, processes, and costs associated with the supply chain, inventory, manufacturing, service in the field, training, throughout the life of the product (from initial inception through product retirement, recycle, reuse, or disposal). One strategy for satisfying customer demand while managing costs is to design products using product families and platforms, wherein common components and subsystems are shared across a variety of products. The objective is to give customers variety and choices that are apparent to them, but to also incorporate commonality and reuse across products to save the company time and costs.

Researchers at the Center for e-Design have developed a collaborative Complexity Management Tool (CMT) that was lacking in previous complexity research. CMT is a comprehensive quantitative methodology that provides comprehensive evaluation and

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analysis of complexity for manufacturing integrative product lines and supports design decisions that links complexity with costs. It identifies and incorporates multiple measures and indicators of product complexity, including product design, development, manufacturing, assembly and supply chain. These metrics are then used to compute the costs that would be associated with increased product complexity. CMT has been tested on three product lines at The Goodyear Tire & Rubber Company (Goodyear) where tire production includes a variety of manual and automated assembly and integrative processes.

Economic Impact: CMT Test results indicate that significant cost saving can be achieved with product family redesign. In the analysis of one specific product line, results demonstrated feasible changes that would help reduce production costs for two critical components by approximately 10% and 40% respectively. For high volume products, this can quickly result in hundreds of thousands of dollars of savings. Sponsors indicate that CMT has significant value. A patent in collaboration with Center for e-Design industry members is being sought.

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