

**ENGINEERING & PUBLIC POLICY
CARNEGIE MELLON UNIVERSITY**

EPP Graduate Studies: Global Project Design

**GOAL: Think Globally - Act Locally:
Rethinking Commonality vs. Differentiation in Global Product Design**

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In recent years there has been a dramatic shift in the location of demand and production from developed to industrializing countries. To remain competitive, U.S. designers and engineers must understand the significance these shifts for the economic viability of their design choices.

We propose to develop a methodology to incorporate location-specific market and production characteristics into global product design. We will focus on case studies examining the economic competitiveness of energy-saving technologies in automotive body and powertrain design in the United States and in China. These cases are timely, and they span a range of global market characteristics influencing the tension between design for manufacturing and design for market location.

Our **expected outcomes** include 1) a general modeling approach for constructing and integrating market and operational models to determine the most competitive design in local contexts, 2) an approach for quantifying the cost benefits of commonality in global platforms against the cost and revenue benefits of differentiation for local production and markets, 3) identification of a set of critical factors affecting technology selection in developed versus industrializing nations, and a theory for how different products or industries need to differentiate their design-for-location strategies, and 4) implications of global shifts in the location of production and demand for the economic viability of energysaving automotive technologies.

To achieve these outcomes, our primary **research tasks** are to 1) model market preferences for vehicle attributes in the U.S. versus China, 2) model vehicle production and associated costs in the U.S. versus China, 3) determine the most economically competitive designs in each location and identify critical location-specific factors affecting this choice, and 4) quantify cost and revenue benefits of global platform vs. location-specific designs to determine the optimal balance.

Our primary **educational tasks** are 1) to bring research and industry into the classroom, and 2) to send students to Detroit and Shanghai on internships to study the real-world implications of location differences for operations and markets.

Intellectual Merit: Today only 15% of manufacturing value-added occurs in the U.S., and the U.S. share of global manufacturing and global demand continue to decline. Despite these trends and despite recent research demonstrating the significance of local context for technology competitiveness, product design methods today offer little consideration for how local contexts fit into a global design strategy. We aim to establish a methodology to quantify economic tensions between global commonality and local differentiation and to identify key differentiating product and industry characteristics that determine the most appropriate global design strategy. In doing so, we propose to deliver a new theory for global product design.

Broader Impact: Energy-saving automobile technologies are critical to global economic and environmental sustainability. This project's case-specific findings will provide critical insights into the impact of recent shifts in the location of automobile demand and production on economic incentives for energy-saving designs. We will use our results to quantify the technical and economic targets necessary for the global expansion of energy-saving designs and the implications of national and global policies. We will incorporate our research findings into a new Design for Location module in our course, Decision Tools for Engineering Design and Entrepreneurship, which will be shared publicly via our wiki. We will work Sue Markland Day of our department's D.C. office to disseminate findings within the U.S. government, and with Xue Lan, Dean of Tsinghua's School of Public Policy and Management to disseminate the results within the Chinese government.

http://www.epp.cmu.edu/graduate/global_product_dev.html