Statement of Professional Interests, Teaching Interests, and Potential Enhancements to Baylor's Engineering Program – Joseph Donndelinger

I have accrued 22 years of combined professional experience with General Motors Company and Ford Motor Company. My technical specialty is coordination of vehicle-level design feasibility assessments across the engineering, marketing and manufacturing domains during the conceptual phase of vehicle development. However, I have broad experience within the product development organizations at both GM and Ford. My engineering experience includes positions in systems engineering, chassis system design, computer-aided engineering, quality analytics and safety analytics. Additionally, I have cross-functional experience in marketing research, technology planning, business process analysis, and material control for vehicle production. My global business experience includes 11 years of remote collaboration with colleagues in China, India, Germany, Russia, Singapore and Brazil and 14 weeks of on-site interaction in China, India and Germany.

At the General Motors Global Research & Development Center, I have served as Principal Investigator on a total of 17 projects. The overarching vision for my program has been to automate and synchronize the processes of designing, producing, and selling portfolios of products. The work has been focused primarily in the following two areas:

Market-Focused Conceptual Design

- Developing market simulation models to inform design decisions, accounting for varying degrees of market segmentation and product line complexity with model specifications ranging from aggregate linear demand models[1] through multinomial logit and nested logit to latent class and hierarchical Bayes[2]
- Exploring the sensitivity of design decisions to market simulation model specifications[3] as well as to market research data collection methods including choice-based conjoint, pairwise comparison, and self-explicated willingness to pay
- Incorporating game theory in market simulations to account for competitive effects
- Advancing optimization techniques, particularly genetic algorithms[4] and multi-objective problem formulations[5], to facilitate trade space exploration for product development decisions with market-facing objectives
- Applying decision-analytic methods to identify and include relevant uncertainties in product development[6] and production decisions and to account for differences in values and risk tolerances between decision-makers[7]

Product Complexity Management

- Decomposing products both functionally[8] (for requirements allocation and performance assessment) and physically (for bill of material definition and manufacturing feasibility assessment) using functional models and design structure matrices
- Applying requirements management systems (IBM Rational DOORS, Siemens TeamCenter Systems Engineering) to implement structures for requirements and product configuration data used for merging results from engineering and manufacturing analyses at varying levels of abstraction
- Developing, adapting, and applying process-based cost models to assess the financial impacts of changes in product configurations, manufacturing processes, and material specifications[9]
- Modeling and simulating distribution networks to assess the impacts of changes in product portfolio structure on operating margins and inventory patterns

Over the course of my career, I have mentored a total of 27 students on industry-university collaborative projects, including a team of four Capstone Design students. I have also recently collaborated with three other instructors to develop and deliver content for an eight-hour GM-internal course on Systems Engineering Fundamentals. I have found providing these educational experiences to be among the most fulfilling accomplishments of my career. I am now seeking opportunities to apply my talents exclusively in these areas, coaching students through the solution of practical engineering problems and refining my classroom instruction and course development skills.

Within the General Engineering curriculum, I am most interested in contributing to the Engineering Design and Technology Entrepreneurship course sequences. The Engineering Design sequence (EGR 3380 and EGR 4390) is an ideal environment for applying my student mentoring skills and for imparting the design process knowledge and experience I have gained through engagement in General Motors' Vehicle Development Process, Ford's Global Product Development System, and research collaboration within ASME's Design Engineering Division. I would seek opportunities to create joint Capstone projects between the Engineering and Marketing departments to allow students to discover the strong interdependencies between these two functions throughout the product development process and to foster growth of cross-functional collaboration skills.

Within the Technology Entrepreneurship sequence, I would bring practical perspectives from more than a decade of global business experience to Global Business Economics and Communication (EGR 4301) and I would also stress the application of rhetorical skills in technical communication. I have found this to be a paramount need among new hires; rather than chronologically reviewing an entire body of work and counting on the audience to recognize its value, students must be trained to introduce technical needs in a clear and engaging manner and then systematically support the conclusion that their work meets these needs. Although Technology Entrepreneurship (ENT 4340) is listed outside the School of Engineering and Computer Science, I would seek opportunities to contribute my practical knowledge of marketing research, market modeling, conceptual design, and business case development to this course. I see similar opportunities for contributing to the parallel course sequence of Technical and Professional Writing (ENG 3300) and Engineering Economic Analysis (ECO 3308) and I would welcome opportunities to collaborate with faculty in the English and Economics departments to teach and further develop these courses.

Within Baylor's Mechanical Engineering Curriculum, I am interested in teaching Numerical Methods for Engineers (ME 4327). In this course I would draw on my previous experience with design optimization, product configuration optimization and response surface methodology. I see opportunities to complement the existing course content with introductions to genetic algorithms and multiobjective optimization methods. I am also interested in contributing to Failure Analysis and Product Liability (ME 4385). From three years of recent experience in systems engineering and quality analytics, I am experienced in implementing the ISO 26262 systems safety standard, conducting hazard and operability analyses, performing Failure Mode and Effect Analysis for designs and processes, and applying analytical methods to product usage and repair data to detect and investigate emergent safety issues. To the extent this content supports the learning objectives of ME 4385, I would gladly include it in the course.

An additional course I could develop and add to Baylor's Engineering curriculum is Quality Engineering. This course would broadly survey quality engineering methods, from tolerance stack-up and statistical process control through Taguchi's methods for experimental engineering and robust design to contemporary approaches of Total Quality Management (emphasizing systematic development of requirements and validation procedures) and applying data mining to identify design and process improvement opportunities. This would be a valuable elective particularly for students with strong interests in manufacturing and for entrepreneurship students seeking to develop interdisciplinary breadth.

As I have reviewed Baylor's engineering curriculum, I have recognized a wide variety of opportunities to share my product realization experience. I am energized by the prospects for applying my talents to serve God's kingdom by developing future generations of Christian technical leaders and I sincerely hope for an opportunity to pursue them.

References

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