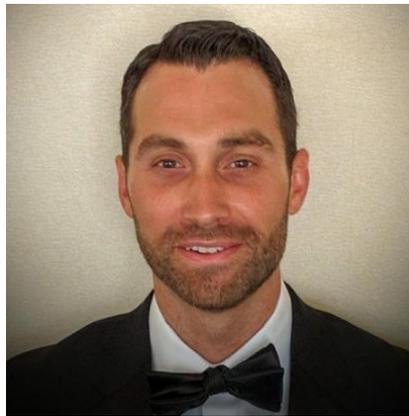




Operations Research and Engineering Management Dissertation Defense

A Methodology for Reliability-Based Selection of System of Systems



**Ph.D. Dissertation
Presented by
Justin Brown
Advisor: Eli Olinick**

**Tuesday, December 7, 2021
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Caruth 384**

Abstract

Currently, Department of Defense (DoD) systems underperform and have inadequate reliability compared to acquisition expectations. Additionally, System of Systems (SoS) complexity and non-quantifiable approaches to selecting systems to perform a mission cause challenges for the decision-maker. Beyond DoD, mission-critical scenarios exist where responses are not data-driven, such as hurricane response, wildfire response, and littoral search and research missions. Optimization of these missions within a short amount of time can not only increase the probability of success and reduce the cost of performing the mission but allow systems to be used for additional missions.

This dissertation presents solution methodologies to address the complexity of meeting a large-scale mission reliability with the constraints of cost and limited systems. The objective is to develop a methodology to (1) minimize the total cost of the SoS and constraint set (2) ensure that all capabilities required for the mission are provided by the SoS.

In this study, a comprehensive modeling approach is taken, considering system reliability, system cost, mission reliability, and system capability. A mixed-integer programming model is proposed for selecting systems to comprise a system of systems with given capability and reliability requirements at minimum cost. An experimental design is set up to provide a deterministic solution set to realistic scenarios and explore the feasibility of using the methodology in large-scale SoS problems.

Biography

Justin Brown is a doctoral candidate in Systems Engineering at the Operations Research and Engineering Management Department. His research interests are System of Systems, reliability, and optimization. He received his Master's Degree in Systems Engineering from Southern Methodist University in 2010, an MBA from Indiana University in 2006, a Master's of Science in Management from Indiana Wesleyan University in 2006, and a Bachelor's Degree in Electrical Engineering from Louisiana Tech University in 2004. He is currently working for Bell Textron.