

## Seminar

### **Systems Engineering when Humans Matter: Distributed Expertise and Team Coordination**

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1027 Emerging Technologies Building

**Abstract:** A variety of perspectives on systems engineering assign differing contributions to the role of human performance in responding to complex events. Beginning with an overview of systems engineering approaches, this presentation provides a discussion of the functions of expertise, information flow, and task dynamics affecting human performance in time critical, high-consequence environments. Coordination of knowledge and resources in settings such as spaceflight operations and healthcare delivery represents a human-focused approach to real-time situation awareness, sensemaking, and system effectiveness. Past and current research in the author's lab has elaborated quantitative measures of both event dynamics and expertise-driven capabilities for task response in mission control, pandemic response, and oncology treatment contexts. Our work has also explored how multiple dimensions of expertise can be used to model non-rational aspects of team performance and task coordination. These insights help forge a methodological integration of human factors and simulation tools to perform system architecture analyses of alternatives and event-based function allocations. The presentation also outlines a roadmap for additional aspects of quantifying real-world elements of knowledge sharing and task achievement among human experts; this roadmap highlights opportunities to rethink critical IE areas of information engineering, human decision making and performance, and systems of systems engineering.

**Bio:** Barrett S. Caldwell, PhD is a Professor in Industrial Engineering (and Aeronautics & Astronautics) at Purdue. His PhD (Univ. of California, Davis, 1990) is in Social Psychology; his two BS degrees are from MIT (1985). Prof. Caldwell's research team, known as the Group Performance Environments Research (GROUPER) Laboratory, studies *how people get, share, and use information well*. GROUPER research explores team performance in complex systems; this work defines an innovative and possibly revolutionary way of looking at knowledge sharing. Prof. Caldwell has authored over 100 scientific publications and graduated over 12 PhD and over 30 MS thesis students. Projects since 2005 have been funded by sources including Motorola, NASA, and the United Space Alliance. He is a Fellow of the Human Factors and Ergonomics Society (HFES), and a Purdue University Faculty Scholar. In August, 2012, Prof. Caldwell was elected Secretary-Treasurer-Elect of the HFES.