Preface

Innovation growth in the twenty-first century is continuing to fuel the way we live, work, learn, and entertain. This era augurs well for societal well-being so long as we make the understanding and management of complexity a top priority. Specifically, the impact of innovation needs to be studied with regard to unintended consequences. The latter is a challenge for complex systems engineering and a fertile ground for conducting systems engineering research.

According to the World Economic Forum, we are in the early stages of the Fourth Industrial Revolution. Coming on the heels of the Third Industrial Revolution, which produced dramatic advances in electronics, computers, communications, and information technology, the Fourth Industrial Revolution is going to be an era of convergence. Increasingly, we are beginning to see the convergence of engineering with behavioral and social sciences, entertainment and cinematic arts, biology, and the physical sciences.

At the same time, systems in the twenty-first century are becoming increasingly hyper-connected and more complex. Recognizing that traditional systems engineering methods, processes, and tools no longer suffice, the research community supported by government, academia, and industry has begun working together to transform systems engineering. Central to this transformation is exploiting innovation and capitalizing on convergence to develop new approaches, methods, and tools. The emphasis is on reaching beyond traditional engineering to address problems that appear intractable when viewed solely through an engineering lens. Today disciplinary convergence is beginning to play a key role in this transformation.

"…..The central idea of disciplinary convergence is that of bringing concepts, thinking, and approaches from different disciplines in conjunction with technologies to solve problems that appear intractable when viewed through the lens of a single discipline." (Madni, A.M. Transdisciplinary Systems Engineering: Exploiting Convergence in a Hyper-Connected World," Springer, 2017)

This vision inspired the central theme of 2017 Conference on Systems Engineering Research (CSER): *Disciplinary Convergence: Implications for Systems Engineering Research*. This volume is a collection of peer-reviewed research papers from university, government, and industry researchers who participated in 2017 CSER. To help the reader conveniently navigate this volume, the papers are organized into ten sections. Each section represents a key research area in systems engineering research today.

It is our hope that this volume will get you interested in systems engineering research that exploits disciplinary convergence and pursues cross-disciplinary approaches to solve complex scientific and societal problems.

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