

# Preface

The current global “*content revolution*” is characterized by information creation overload and mired in a vast swamp of ambiguous complexity and insecurity which we currently call “The Big Data” problem. Analogously, the Industrial Revolution spanned 50–100 years and was characterized by massive transition from hand production to machines. Each technology revolution has evolved from years of pooling knowledge until a critical mass of technology allowed for a major leap forward. We are swimming in oceans of data collectors and creators and drowning in the data. Simultaneously, we are trying to keep our head above water by spending billions of dollars to develop analytics to provide intelligence and knowledge from the massive data stores, as we try to automate the analysis, reasoning, and decision-making to handle our data problems. What is emerging is yet another great migration to handle the architecture and design of ever more complex System of Systems. The content revolution driven by seven billion people, five billion phones, one billion PCs, and ~90 PB of Facebook data holdings (2011) has resulted in current system designs that must fuse dozens of overlapping disciplines.

To further complicate current Systems Engineering efforts, there is growing interest in autonomous systems with cognitive skills to monitor, analyze, diagnose, and predict behaviors in real time makes this problem even more challenging [139]. Systems today continue to struggle with satisfying the need to obtain actionable knowledge from an ever increasing and inherently duplicative store of non-context-specific, multidisciplinary information content. Hence, increased automation and complex System of Systems is the norm for current Systems Engineers and truly autonomous systems are the growing future. Additionally, the size, speed, and increased functionality of systems continue to increase rapidly, significantly challenging current Systems Engineering methods. Simultaneously however, development of valuable readily consumable knowledge and context quality continues to improve more slowly and incrementally.

Lastly, the complexity of systems and information today requires expertise in many disciplines and domains leaving engineering, just like during the industrial revolution, without the tools and level of understanding required to engineer across

disciplines, much less obtain knowledge outside of their silos of expertise. Therefore, new Systems Engineering concepts, mechanisms, and implements are required to facilitate the development and competency of the Systems Engineering discipline and complex systems themselves, in order to simply be capable of proper operation, much less autonomous operation, self-healing, and critical self-management of knowledge and real-time operational self-awareness. Presented in this first of a series of books are new Multidisciplinary Systems Engineering concepts, processes, methodologies, notional architectures, and tools to support the engineering discipline in understanding and evolving engineering of systems across the full spectrum of disciplines required today. The materials include the rationale for Multidisciplinary System Engineering (MDSE) as the standard for systems engineering and development; ensuring new System of Systems (SoS) designs are successful and avoid the failures introduced by complexities of the information overloads facing our customer and management teams.

E. Nichols Place, CO  
Garland, TX  
Aurora, CO

James A. Crowder  
John N. Carbone  
Russell P. Demijohn

<http://www.springer.com/978-3-319-22397-1>

Multidisciplinary Systems Engineering

Architecting the Design Process

Crowder, J.A.; Carbone, J.N.; Demijohn, R.

2016, XXIII, 297 p. 105 illus., 22 illus. in color.,

Hardcover

ISBN: 978-3-319-22397-1