

Stephen Adams · Peter A. Beling
James H. Lambert · William T. Scherer
Cody H. Fleming *Editors*

Systems Engineering in Context

Proceedings of the 16th Annual
Conference on Systems Engineering
Research

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Preface

The papers that comprise this volume were presented at the 16th Annual Conference on Systems Engineering Research (CSER 2018). The conference was held on May 8–9, 2018, at the University of Virginia (UVA) in Charlottesville, Virginia, USA. The co-chairs of the conference were Peter A. Beling (UVA) and William T. Scherer (UVA). The honorary chair of the conference was Yacov Y. Haimes (UVA). The program chair was Stephen Adams (UVA), and the panel chair was Cody Fleming (UVA). The publication chairs were James H. Lambert (UVA) and Brian Park (UVA).

The CSER 2018 Program Committee had participation of a wide range of universities and companies, including Carl Elks (Virginia Commonwealth University), Cody Fleming (UVA), Yacov Y. Haimes (UVA), James H. Lambert (UVA), Brian Park (UVA), Michael Farnsworth (UVA), David Long (Vitech Corp.), Tom McDermott (Georgia Tech), Chris Paredis (Clemson University), Alejandro Salado (Virginia Tech), Lu Xiao (Stevens Institute of Technology), Ye Yang (Stevens Institute of Technology), Steve Y. Yang (Stevens Institute of Technology), Roger Georges Ghanem (University of Southern California), and N. Peter Whitehead (The MITRE Corporation).

The 2018 theme “Systems in Context” is inclusive of topics across systems engineering, industrial engineering, systems acquisition, engineering management, operations research, engineering systems, and related fields. Few systems operate independently of other systems and stakeholders. Understanding the interactions with other entities and the context in which a system will be used is paramount to the design process. The conference featured papers from a wide range of domains and topics including:

- Systems in context and applications of systems engineering concepts
- Theoretical foundations of systems engineering
- Systems-of-systems design
- Integration of systems
- Complex and large-scale systems

- Human factors, human-machine interaction, and cyber-human systems
- Simulation integration into systems engineering
- Optimization and multi-criteria decision-making
- Risk and resilience
- Distributed decision-making and control
- Model-based systems, stochastic modeling, and state estimation
- Data-driven decision-making in large-scale systems
- Data collection, storing, and handling for large-scale systems
- Sensor and data fusion in large-scale systems
- Autonomous systems
- Safety and security systems
- Transportation systems
- Cyber-physical systems and the Internet of Things

We would like to thank all of the authors and presenters for participating in CSER 2018 and contributing to a positive learning experience in Charlottesville. We would also like to thank all that contributed to organizing the conference.

Charlottesville, VA, USA
May 2018

Stephen Adams
Peter A. Beling
James H. Lambert
William T. Scherer
Cody H. Fleming

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Chapter 1

Toward Achieving Architecture Alignment of Business and IT: A Portfolio Decision Analysis Approach



Mengmeng Zhang, Honghui Chen, and Kalle Lyytinen

1.1 Introduction

The fit between the business domain and IT domain of a firm contributes to “maximizing the return value of IT investments,” [1, 2] “helping to improve IT usage,” [3, 4] and “improving overall company performance” [5, 6]. However, there are currently different ways of aligning the business domain and IT domain; for example, strategic alignment [7–9], architecture alignment [10, 11], and business alignment [12, 13] are some of the many types of alignment problems discussed and investigated in the literature. While most research and practice have focused on strategic alignment to synchronize IT and business plans, our research suggests that architecture alignment is equally important. Architecture alignment brings strategic alignment to the practical level and creates value from architecture design and management.

Several alignment dimensions, such as social [14, 15], cultural [14, 16], and structural [17, 18], were often considered in the various types of alignment problems. This study focuses on the structural dimension of architecture alignment without regard for the other dimensions. In this paper, architecture alignment will refer to a structural fit between business elements (e.g., business processes, activities, and business structures) in business architecture and IT elements (e.g., applications, services, and software components) in IT architecture.

Two research questions (RQ) will be addressed in this paper:

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