



APTA SE + INCOSE TWG + INCOSE UK RIG 2021 Joint Monthly Membership Meeting & Webinar Series

Thursday, October 21, 2021

2:30pm – 3:30pm ET, 7:30pm – 8:30pm UK Time, 8:30pm – 9:30pm European Time

Demonstrating the Value of Systems Engineering as the Professional Standard of Care

Abstract: One of the most difficult challenges systems engineers face when attempting to introduce or expand the application of systems engineering (SE) is the demonstration of the systems engineering value. As SE is an upfront investment that may not pay dividends before sometime in the possibly distant future, business leaders unfamiliar with the process can be skeptical about the value of SE, especially in industries where SE is still an emerging discipline without a proven track record. Sometimes, however, the value of systems engineering can be demonstrated by the increased risk of **NOT** applying systems engineering,

Example: The Central Artery/Tunnel Project (CA/T), commonly known as the Big-Dig. Designed and built between 1982 and 2007, it was the most expensive highway project in the US at the time (approx. \$21 billion in 2020 dollars), and was plagued by thousands of water leaks, design flaws, charges of poor execution, use of substandard materials and other issues, which eventually led to the death of a motorist and criminal arrests (Wiki, 2020, NTSB, 2006). The project managing consortium agreed to pay \$407 million in restitution and several smaller companies agreed to pay a combined sum of approximately \$51 million (AP, 2008). The settlement agreement included a statement of facts as the basis for liability, specifically addressing several areas of construction management oversight failures, including the use of non-specified material, the use of substandard materials, as well as ignored observations of failing epoxy bolt load tests (AP, 2008). The consortium was paid more than \$2 billion in fees (AP, 2008) that would have resulted in approximately \$160M in profit (applying an 8% profit target). Looking at this project purely from an ROI perspective, however, the consortium not only lost all profit, but faced an additional \$247M (\$407M - \$160M) in losses.

The issues identified above are typically addressed in **construction specifications** describing in detail the scope of work, materials, installation, and quality of workmanship. The Big Dig example should provide a cautionary tale of the risks associated with managing and overseeing construction projects, such as infrastructure, transportation, water, energy, or other projects.

This presentation presents the application of systems engineering principles to construction specifications in a large infrastructure project using a case study approach. The presentation demonstrates the systematic *exercise of a reasonable level of care, diligence, and skill*, commonly described as the **professional standard of care**, thereby demonstrating the **value of systems engineering** as a successful **liability protection** and **risk mitigation strategy**.

Presenters:

Oliver Hoehne

Oliver is a passionate Systems Engineering Practitioner, Technical Fellow, Project Manager, and the U.S. Global Technical Excellence Sector and Practice Lead on Systems Engineering, Communications and Control Systems for WSP USA, an architectural and engineering (A&E) firm with approximately 50,000 employees in 500 offices across 40 countries. Mr. Hoehne is a Project Management (PMP) and Systems Engineering Professional (CSEP) with over 20 years of extensive international and domestic experience in Software and Systems Engineering across industries, and has worked in leading Systems Engineering, Integration & Testing (SEIT) roles on large system of systems (SoS) like transportation and infrastructure programs.



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