

B.8. Tailoring: frameworks and applications

Tailoring: effective frameworks and applications. This stream will explore tailoring Systems Engineering processes and case studies for tailoring on projects. Submissions are invited to explore frameworks, key criteria, decision points and software tools that enable good tailoring decisions in early projects phases, and case studies from various domains where tailoring has worked in practice.

Lead: Aaron Miles, Lauren Fraser, Tilo Franz, Alexandra Morey, Erica Barrett

Domains: All domains welcome

Submissions Summary:

1. Aligning Strategy, Research, and System Development, Leveraging Model-Based Systems Engineering Techniques (Full Paper)
2. Integrating Model and Simulation Based Testing with Virtualisation for Humanitarian Assistance and Disaster Relief (Full Paper)
3. The Case for Employing MBSE in Early-Stage R&D Projects using Agile Development Approaches (Full Paper)
4. Operational Readiness Roadmaps: A Cross-Industry Approach (Full Paper)
5. Cost-Effective Systems Engineering: Exploration of tools for Systems Engineers on a budget. (Full Paper)
6. Fearless Tailoring: The Art of Knowing When Good Enough is Good Enough (Panels and Workshops)
7. One drop at a time (Paperless Presentations)

20808 Aligning Strategy, Research, and System Development, Leveraging Model-Based Systems Engineering Techniques

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Keywords: MBSE,Tailoring,Research,Prototype

Type: Full Paper

Stream submitted: B.8. Tailoring: frameworks and applications

Research groups are challenged with ensuring that their activities are appropriately aligned to evolving strategic intent. This paper aims to address that challenge by describing a systematic approach, using Model-Based System Engineering (MBSE) techniques, to bridge the gap between strategic intent and exploratory research activities such as Modelling and Simulation, and experimental prototyping. As strategic intent evolves, so too should the research activities. However, it is often the case that as strategic intent evolves, areas of research become unaligned. Further, there exists updated strategic intent that is not supported by research or technology development activities. To maintain alignment with strategic intent, this paper proposes an approach leveraging model-based systems engineering (MBSE) techniques. To demonstrate the approach, this paper presents a case study where a descriptive model was developed within CATIA Magic to: capture the structure and activities of a research group; link the elements of that groups research program with strategic intent; and, trace the strategic intent to exploratory prototyping conducted by the research group. The model was then used to capture operational-level analysis and subsequent system need derivation. The intent of this was to provide a more robust trace from strategic intent through to technology development by allowing development efforts, such as producing prototype systems, to be driven by operational analysis. The results from gathered from experimentation could then be used to further refine system needs and inform future prototyping/development activities. In doing so, experimental prototyping was more aligned to operational analysis and hence strategic intent throughout the entire research program duration.

20895 Integrating Model and Simulation Based Testing with Virtualisation for Humanitarian Assistance and Disaster Relief

Ryan Messina 1, CASG, LC4S, Melbourne, Victoria, Australia

Keywords: modelling and simulation advances, future of systems engineering, cyber-physical systems, Systems of Systems Engineering Applications, digital twins

Type: Full Paper

Stream submitted: B.8. Tailoring: frameworks and applications

This paper explores innovative testing methodologies tailored for complex software and cyber-physical systems in Humanitarian Assistance and Disaster Relief (HADR) environments for search and rescue operations. By integrating model and simulation based testing with virtualisation, we develop scalable testing frameworks customised to HADR application requirements. Virtualisation enables simulation of scenarios, facilitating thorough testing without operational disruptions. A key focus is on the comprehensive evaluation of Systems of Systems (SoS) behavior to identify integration issues and performance bottlenecks early in the development lifecycle. Simulated interactions between system components reveal vulnerabilities, consequently enhancing system reliability and resilience. Our approach emphasises continuous testing and validation throughout the system lifecycle. Leveraging digital twins and cyber-physical models, we ensure adaptability to evolving requirements and operational conditions. This iterative process enhances system robustness and responsiveness to dynamic HADR environments for search and rescue operations. This approach, employed in testing the lifecycle of complex software and cyber-physical systems, aims to generate reliable test cases, ensure systems adapt to changes observed in prior tests and uphold mission resilience by prioritising performance. It involves creating a surrogate model of a search and rescue mission, identifying failure modes to use as test cases and evaluating them through sensitivity analysis. The final sequence of test cases, relying on more expensive testing, is prioritised based on its impact on the search and rescue mission surrogate model. This paper provides insights into innovative advancements shaping the future of testing methodologies for systems used in HADR and search and rescue operations. The focus is on enhancing the reliability, resilience, and responsiveness of testing complex software and cyber-physical systems.

21164 The Case for Employing MBSE in Early-Stage R&D Projects using Agile Development Approaches

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Keywords: MBSE, Early-Stage R&D, Agile

Type: Full Paper

Stream submitted: B.8. Tailoring: frameworks and applications

The case for using Model-Based Systems Engineering (MBSE) in large, complex projects is now well established and many sources are available from which a system engineer can make a case to project stakeholders for its inclusion. In contrast, there is much less available material to justify the use of MBSE in Early-Stage Research and Development (ESR&D) projects that are intending to use agile development methodologies. This paper addresses this deficiency by reviewing information from standards, handbooks, and research papers and tempering this with experience to assemble a compelling case targeted at audiences unfamiliar with contemporary industry systems engineering practices, such as those in small start-up companies, research laboratories, and universities. The review is followed by a discussion on the relevant nuances from contemporary thinking on systems engineering, digital engineering, and agile approaches for product development that further reinforces the business case developed from the review material.

21230 Operational Readiness Roadmaps: A Cross-Industry Approach

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Keywords: Operational Readiness, operations, Rail, Bus

Type: Full Paper

Stream submitted: B.8. Tailoring: frameworks and applications

Operational readiness is term familiar in transport projects what are the things that need to be in place to ensure an organisations preparedness prior to accepting finished projects and transitioning operations. It often constitutes a significant yet underestimated aspect of project delivery. While the focus typically centres on the delivery of physical infrastructure and systems, a critical gap emerges during the transition from the completion of project delivery to placing the system into service. This challenge is further compounded when projects introduce new, novel, and/or complex systems into service and into their scope such as novel technologies, new operating environments and/or complex organisational change. This paper explores techniques and processes that can be adopted to facilitate a more efficient and effective journey to operational readiness. Drawing from case studies across various transport modes, it is discussed how these practices can be adapted and scaled to meet diverse operational requirements, irrespective of industry. By providing a detailed understanding of the necessary activities, this paper aims to bridge the gap in project preparedness during early delivery phases. Additionally, it presents examples of operational readiness delivery processes, highlighting their application in rail and bus projects within Australia and how these can also be adopted in other industries like Defence and Health.

21241 Cost-Effective Systems Engineering: Exploration of tools for Systems Engineers on a budget.

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Keywords: practical systems engineering, cost effective tool, Small scale systems engineering

Type: Full Paper

Stream submitted: B.8. Tailoring: frameworks and applications

Overview This paper explores the feasibility of using cost-effective tools like DevOps and Jira for systems engineering tasks traditionally done on expensive tools such as DOORS or Relatics. This presentation would be of interest to people/businesses that work on small-medium size projects looking for a cost-efficient way to manage system lifecycle. **Context** Life cycle model approach is a Systems engineering framework that can help successful realisation of a system. Tools like DOORS and Relatics help engineers develop a system using the life cycle (V) model approach. However, the costliness of tools can pose as a potential barrier to effective systems engineering practices. In contrast, DevOps and Jira, tools widely used in the software development and IT industries, offer cost-effective alternatives with features comparable to DOORS or Relatics for certain situations. We know that DOORS and Relatics is not cost-effective for small-medium projects. **Purpose** The purpose of this paper is to provide insight on how inexpensive tools can provide a viable alternative and prevent cost from being a barrier to performing good systems engineering practices. The paper will provide potential processes, templates and use cases that can be used to maximise the benefit of the cost-effective tools. We are trying to show that tools like DevOps and Jira can help make systems engineering more prominent by removing the cost barrier as well as how to best use these tools. **Approach** The paper will simulate a project and showcase how the v-model approach can be achieved using one of the cost-effective tools. The presentation will go through a project life cycle and show how to best use the cost-effective tool. **Insights** This paper aims to inform readers that there are alternative options available to DOORS and Relatics that may be more cost-effective, that are not Excel and Word.

21233 Fearless Tailoring: The Art of Knowing When Good Enough is Good Enough

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Keywords: Tailoring, Digital Transformation, Over-Engineering, Engineering Perfection, Good Enough

Type: Panels and Workshops

Stream submitted: B.8. Tailoring: frameworks and applications

Format Facilitated group discussion exploring the "good enough" engineering principle. Overview In an era of rapid digital transformation, Systems Engineering grapples with a critical challenge: leveraging the potential of modern tools and processes while side-stepping the crippling effects of over-engineering. Addressing this challenge is becoming urgent. Despite the availability of modern innovations designed to streamline the engineering process like Model-Based Systems Engineering (MBSE) and AI-driven requirements generation projects are still grinding to a halt under the burden of excessive, inflexible and poorly tailored engineering approaches. Tackling this challenge demands a shift in mindset a departure from the relentless pursuit of engineering perfection, the inability to accept appropriate levels of risk, and the often-unyielding adherence to arbitrary engineering standards. It requires the uncomfortable acceptance that good enough is good enough. This workshop will explore how the good enough concept, when embedded as a core principle within our engineering approaches, can lead us out of the over-engineering trap, and unlock the full potential of our existing, and future, digital toolsets. Opportunity for interaction Participants will engage in a facilitated discussion exploring their experiences with over-engineering and the good-enough engineering approach. Line-up Brayden Donohue Sanjev Naidu Length 60

21081 One drop at a time

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Keywords: water,utilities,tailoring,process improvement,project delivery

Type: Paperless Presentations

Stream submitted: B.8. Tailoring: frameworks and applications

Overview - SA Water identified the implementation of Systems Engineering (SE) as a key opportunity for process improvement, and engaged Aurecon to create a tailored methodology for the delivery of capital projects. Context - SA Water began reviewing the feasibility of implementing SE in 2021. This review identified that project delivery was siloed, with limited information flows and reliant on the knowledge of senior personnel to progress. As a result, projects suffered from scope creep or late changes, subsequent cost variations, and a lack of traceability to the original project aims and needs. Purpose - SA Water asked Aurecon to apply their SE knowledge to review existing processes for investigating high-level concept solutions; ensure that project selection is evidence-based; investigate options that consider and address all stakeholder needs; respect inputs from all stages of the project lifecycle; and enable data-driven decision-making. Approach - Aurecon conducted interviews and workshops with representatives from all teams and levels throughout SA Water to consolidate a list of issues experienced when delivering projects. From this, a bespoke SE approach was tailored to the organisational level of understanding to meet people where they are - introducing concepts that would deliver maximum value for limited effort, rather than just directing people to the SE body of knowledge. It started small, with a reduced set of activities to help the realisation of project needs, developing these into verifiable requirements for the project to meet, and managing interfaces and stakeholder expectations across the developing network. This has grown over the course of the engagement into a fully-fledged V-model, providing customised guidance and tailored approaches for SA Water. Insights - This work provided insights in how to collaborate with an organisation that was relatively new to the concept but welcomed engagement and change in the space.
