2024
Annual INCOSE
international workshop
HYBRID EVENT
Torrance, CA, USA
January 27 - 30, 2024

FuSE Initiative

How to Innovate in MBSE within the Context of Technical & Knowledge Debt

www.incose.org/IW2024

Agenda

- Intro to Aureus Innovation
- Background on Technical & Knowledge Debt
- Facilitated Discussion - Innovating in this Context
- Next Steps

Aureus Innovation Team

Matthew Sease, Co-Founder

- 19+ years in industry (automotive, industrial, consumer appliances, motorsports)
- Purdue University, BS Mechanical Engineering
- Cornell University, MEng Systems Engineering
- Former Design Team Leader, Assistant Chief Engineer & Global MBSE Leader at Fortune 150 Company

Brian Smith, Co-Founder

- 12+ years in industry (automotive)
- Michigan State University, BS Mechanical Engineering
- Cornell University, MEng Systems Engineering
- Virtual Propulsion Calibration Analysis Engineer at Automotive OEM

Aureus Innovation

ORIGINS

- 2018 - Founded
- 2021 - 1st NASA SBIR Phase I Award
- 2021 - 1st Fortune 125 client
- 2022 - 2nd NASA SBIR Phase I Award

CURRENT FOCUS

- Model Based Systems Engineering & Portfolio Architecture Consulting

INTERESTS & EXPANSIONS

- Descriptive Modeling (eg MBSE) Tool Development
- System Architecture Decision Modeling & Analysis
- Sustainable Systems Modeling & Analysis

Background

Technical & Knowledge Debt

What is Technical Debt?

- Well known in software development
- Simply defined as making a trade-off to improve short-term benefits at some cost to future efforts
  [Kleinwaks, Batchelor and Bradley]
- In software, technical debt can be:
  - Not following best coding practices,
  - Poor documentation
  - Using outdated libraries, etc.

What is Knowledge Debt?

- A more general form of Technical Debt
- Can be thought of as the disparity between the knowledge you have and the knowledge you need (now or future) to do your job.
- Also known as:
  - Information Debt [Dove, Schindel and Garlington]
  - Solution Debt [Taylor, Davidz and Schriner]

Why do we care?

- Debt we're dealing with:
  - Nearly **58%** of a worker's day is spent on "**work about work**," with only 33% spent on the work they were hired to perform [CNBC & Asana]

- Debt we're creating:
  - **Nearly half** (47% for the Tech industry) of workers are **looking for a new job** in 2024 [LinkedIn]

Facilitated Discussion

Innovating MBSE within this Context

Discussion

Setup

- We will use miro to capture our thoughts
- We have 2 exercises
  - We will introduce the topic
  - You will have ~5 minutes to capture your own thoughts
  - We will take ~15 minutes to discuss as a group

Discussion

Exercise 1: Positives, Negatives & Insights

When considering Technical, Knowledge, Information or Solution Debts, what comes to mind?

- Give examples of a positive experience.
- Give examples of a negative experience.
- List any Insights or Goals that you may have or are aware of.

Discussion

Exercise 2: Impact & Difficulty

When considering Technical, Knowledge, Information or Solution Debts, what solutions are most important and most feasible?

- Fist, list known & future solutions, good or bad.
  - What current solutions are being / have been deployed? Were they helpful or not?
  - What future, promising solutions are being considered?
  - What historical patterns are currently missed and should be considered?
- Next, prioritize based on Impact and Difficulty.
  - For a given solution, what is the actual or expected impact?
  - For a given solution, how difficult was it, or is expected, to deploy?

Next Steps

How do we keep the momentum?

Next Steps

- How shall we, as a group sharing similar interests and challenges, keep this collaboration going?

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Thank you!!

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Further Study

- H. Kleinwaks, A. Batchelor, and T. H. Bradley, “Technical debt in systems engineering—A systematic literature review,” Syst. Eng. Electr., Apr. 2023, doi: 10.1002/sys.21681
- R. Dove, W. B. Schindel, and K. Garlington, “Case study: Agile systems engineering at Lockheed Martin aeronautics integrated fighter group,” INCOSE Int. Symp., vol. 28, no. 1, pp. 303–320, Jul. 2018
- D. Sturtevant, A. Maccormack, S. Eppinger, C. Magee, D. Jackson, and C. Baldwin, “Technical Debt in Large Systems: Understanding the cost of software complexity.” https://dsmsuite.github.io/external/CostOfComplexityPresentation.pdf