SE:PM
Two sides of the same coin!

SE-Training GmbH

Delivered by Mike Johnson.

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Agenda

Technical Governance | SE & PM Roles | Managing Uncertainty | Perspectives | Leadership

- Context of the problem

- Balancing **technical governance** with PM

- Optimising the **roles** of the PM and SE

- Managing project **uncertainty** & decision making

- Understanding each other's unique **perspectives**

- Strong and united project **leadership**

- Tips & Tricks

- Wrap up / Summary Q&A

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SE-Training Co-Founder

Mr. Mike Johnson (CSEP, CEng)

Mike is a Systems Engineering Manager, Consultant, Trainer and Coach with extensive experience in delivering complex systems and establishing Systems Engineering in the Defence, Space and Medical sectors.

Experience:

- Established Systems Engineering in the Molecular Division of Roche Diagnostics and led many Organisational Systems Engineering initiatives
- Head of Systems Engineering, RUAG Space
- Systems Engineer for the CaSSIS Telescope, orbiting Mars since 2017
- Systems Engineer for Thales Optronics, UK
- MSc in Optics and Optoelectronics, The University of St Andrews

Problem Statement

Project Management (PM) and Systems Engineering (SE) are two different disciplines yet so important to successful project delivery.

- Their needs are entangled

- Technical solutions have an impact on pillars of PM

- They share the project risks

- They need to build synergy for a successful technical project

They are very much "two sides of the same coin". There are many critical obstacles to overcome to make a successful relationship, including:

- Balancing technical governance with PM

- Optimising the roles of the PM and SE

- Managing project uncertainty & decision making

- Understanding each other's unique perspectives

- Strong and united project leadership
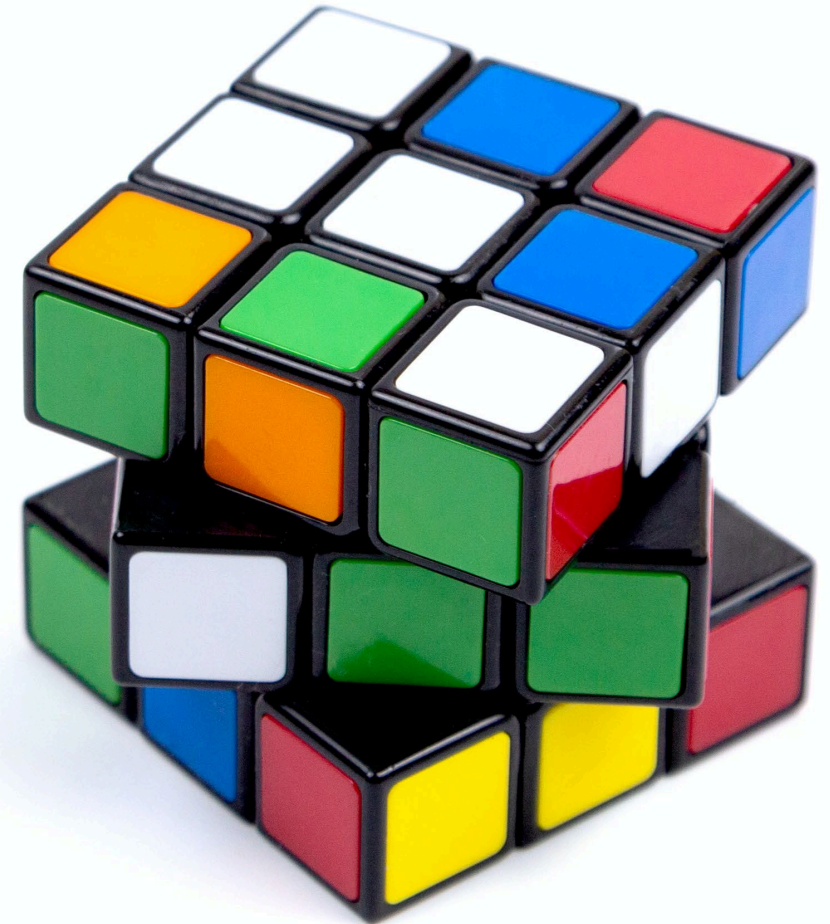
Definitions

Technical Governance

Project Governance

- <u>INCOSE</u>: Systems Engineering is a transdisciplinary and integrative approach to enable the successful realization, use, and retirement of engineered systems, using systems principles and concepts, and scientific, technological, and management methods.

- <u>PMI:</u> Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. It's the practice of planning, organizing, and executing the tasks needed to turn a brilliant idea into a tangible product, service, or deliverable.

  Key aspects of project management include:
  - Defining project scope
  - Identifying deliverables
  - Managing risks
  - Effective communication across teams

System Lifecycle Processes

ISO 15288; Derived into the INCOSE Systems Engineering Handbook

Technical

- Business or Mission Analysis
- Stakeholder Needs and Requirements Definition
- System Requirements Definition
- Architecture Definition
- Design Definition
- System Analysis
- Implementation
- Integration
- Verification
- Transition
- Validation
- Operation
- Maintenance
- Disposal

Technical Management

- Project Planning
- Project Assessment and Control
- Decision Management
- Risk Management
- Configuration Management
- Information Management
- Measurement
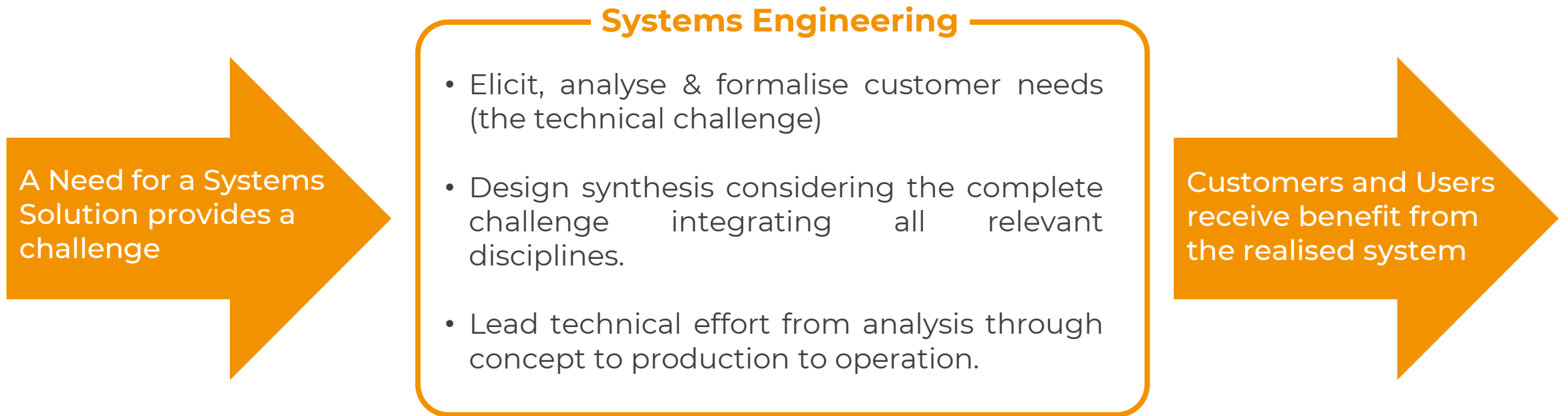- Quality Assurance

Agreement

- Acquisition
- Supply

Organisational Project-Enabling

- Life- Cycle Model Management
- Infrastructure Management
- Portfolio Management
- Human Resource Management
- Quality Management
- Knowledge Management

Systems Engineering

Process View

Systems Engineering

A Need for a Systems Solution provides a challenge

- Elicit, analyse & formalise customer needs (the technical challenge)

- Design synthesis considering the complete challenge integrating all relevant disciplines.

- Lead technical effort from analysis through concept to production to operation.

Customers and Users receive benefit from the realised system

Balancing technical governance

How to effectively counter a multi-faceted problem?

LifeCycle Approach

- The Systems LifeCycle is not just a copy and paste from the last project.

- The LifeCycle must be optimised for the development, of which the technical objectives and constraints are highly significant inputs.

- Many opportunities can be realised from an optimised LifeCycle.

Project Artifacts

- Many projects only have a Project Management Plan (PMP) as the overall governance artifact.

- Only having a PMP can be okay, depending on the complexity of the development and the scope of the PMP.

- Having a dedicated SEMP is often used as a vehicle for providing technical governance.

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Balancing technical governance

BUSINESS CASE

FUNDING

PRODUCT
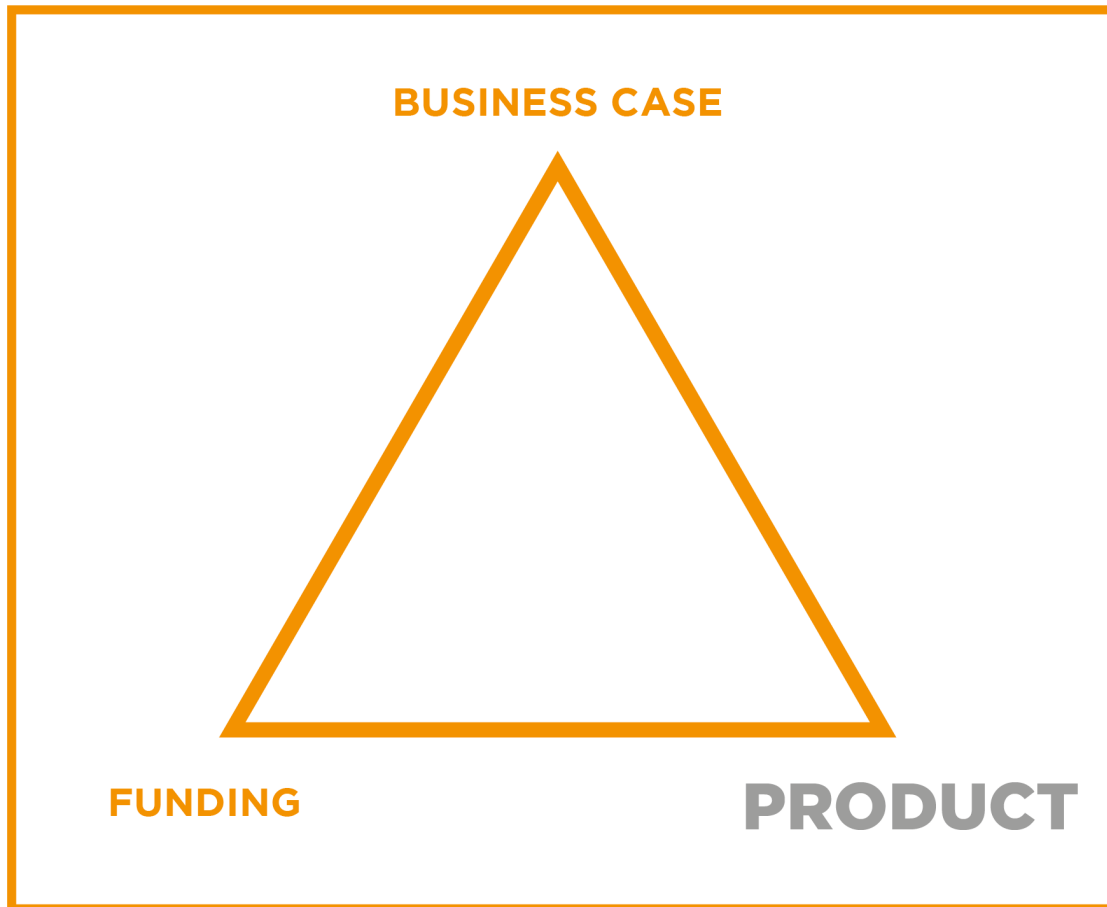
- When critical decisions are made by the same person, they often have the same bias.

- Over the course of the development, this can lead to unbalanced decision making.

- Opportunities to improve the business case, through innovation within the product can be missed.

- Funding to improve LifeCycle aspects such as Reliability and Maintainability can be addressed too late, causing high costs, delays and poor Customer satisfaction.

Balancing technical governance

Project Artifacts: The SEMP interfaces to many other engineering plans

Programme Management Plan (PMP)

Systems Engineering Management Plan (SEMP)

Reliability Programme Plan

Human Factors Engineering Plan

Logistics Engineering

Quality Engineering Plan

Manufacturing Programme Plan

Environmental Plan

Maintainability Programme Plan

Safety Engineering Programme Plan

Value/Cost Engineering Plan

Software Engineering Plan

Disposability Plan

Security Plan

Managing uncertainty

Managing project uncertainty & decision making

SE / PM Business Case
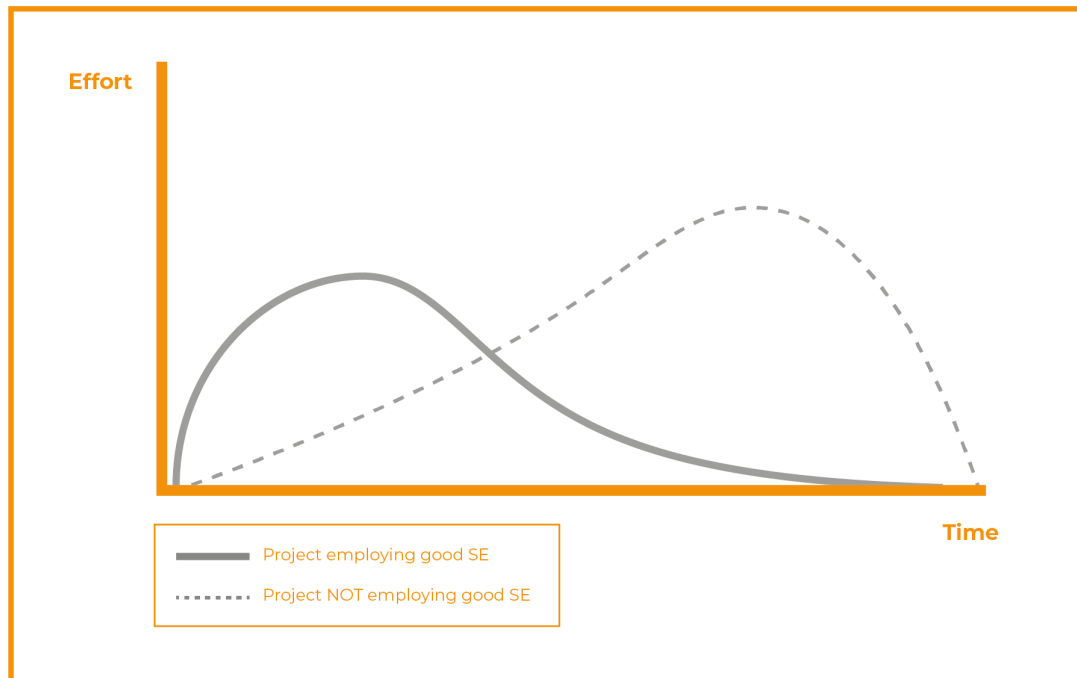
Problem

- Cost/effort that is due next week is certain.

- Cost/effort that is due next year can be perceived as as a minor problem.

- SE risks are not mitigated => High cost/effort in the second half of the project.

Managing uncertainty

Cost/effort in the next week weighs heavier than cost/effort next year

SE / PM Business Case

Legend:
— Project employing good SE
- - - Project NOT employing good SE

(Graph axes: Effort (vertical), Time (horizontal))
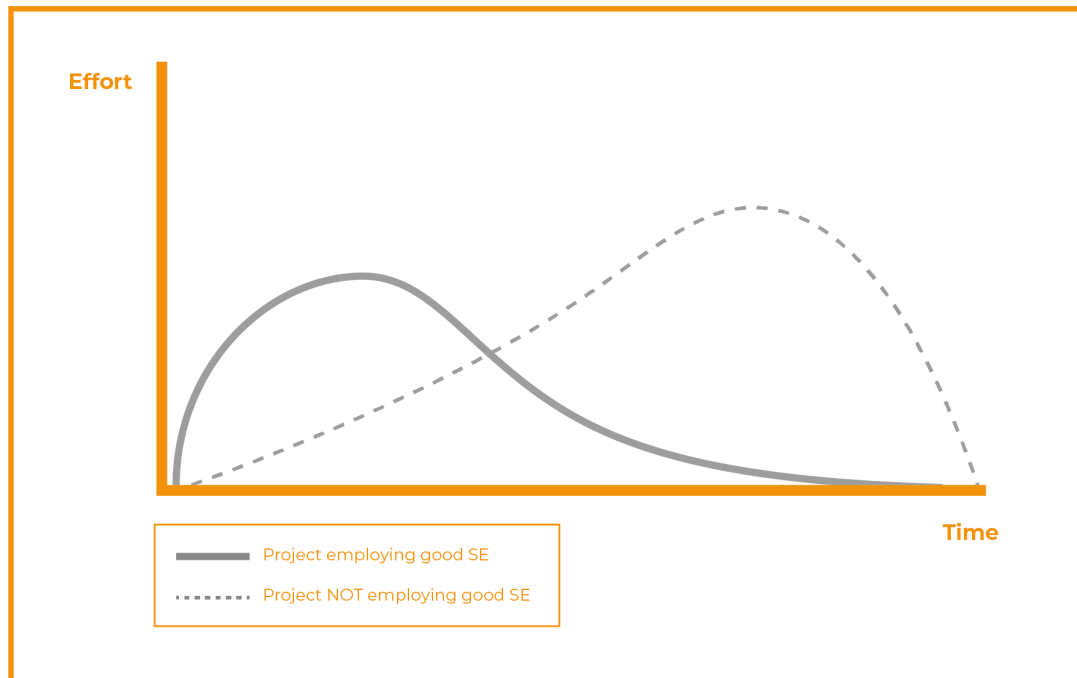
Solution

- Effective risk management prevents to overlook/discard future costs and forces you to act mitigate

- Effective risk management motivates the organisation to «shift left» (apply SE through a strong PM interface)

- Strong SE:PM collaboration required to realise the «shift left» strategy

Managing uncertainty

Forming confidence and good judgements with the planning of complex systems development

Project Schedule

Risk register

PM & SE Roles

Optimising the roles of the PM and SE

Critical Interface

- This is the most critical interface for the SE to realise the success of the project/programme.

- It's critical for the SE and PM to have complimentary skills and experience.

- Both SE and PM must 'give up their pasts' to ensure they focus on the key tasks.
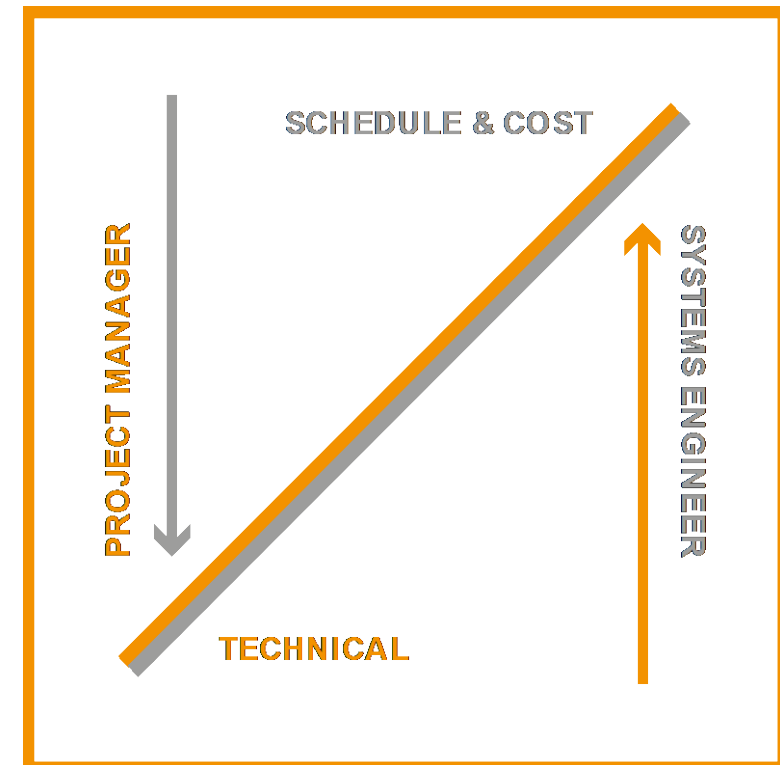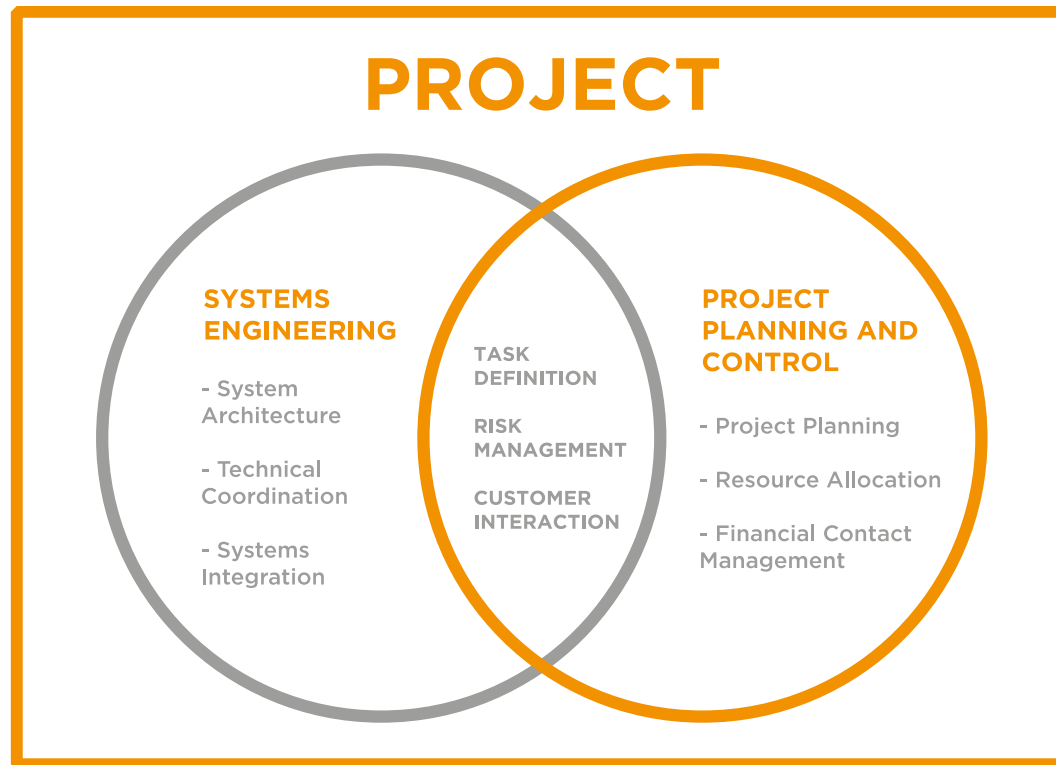

Backgrounds

- Often the PM has started a technical background in one of the core engineering/science disciplines and has progress from delivering smaller-sized projects.

- Career PMs are becoming more common in certain industries.

- There are many "flavours" of Systems Engineers. Many with very different strengths and weaknesses.

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PM & SE Roles

Overlap of SE and PM Roles

PROJECT

SYSTEMS ENGINEERING

- System Architecture

- Technical Coordination

- Systems Integration

TASK DEFINITION

RISK MANAGEMENT

CUSTOMER INTERACTION

PROJECT PLANNING AND CONTROL

- Project Planning

- Resource Allocation

- Financial Contact Management

SCHEDULE & COST

PROJECT MANAGER

SYSTEMS ENGINEER

TECHNICAL

PM & SE Roles

Overlap of SE and PM Roles

See: https://www.sebokwiki.org/wiki/Relationships_between_Systems_Engineering_and_Project_Management

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PM:SE Perspectives

Understanding each other's perspectives

Keep focussed on the destination!

- If you're not moving forwards, you are traveling backwards!

- Together objectively assess the Technical complexity in the pre-conception phase.

- Regularly check each other's unique perspective on key decisions, enabling as much delegation as feasible to the technical team.

- Prepare together for key meetings, especially hold pre-alignments on the Milestones.

- Be courageous to introduce new methods and approaches to complex product development.

YOU'RE GOING THE WRONG WAY!

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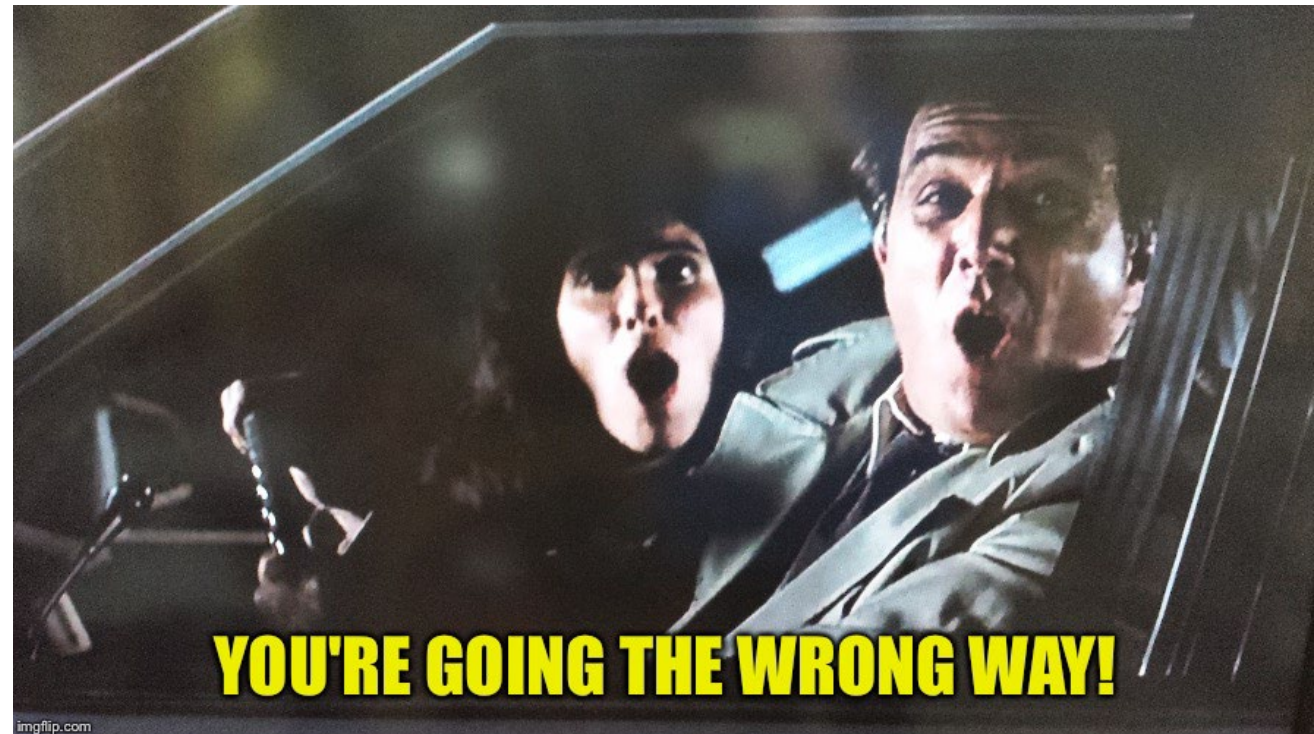
Leadership

Strong and united leadership

Key aspects

- Leaders need to show the team how to progress through obstacles and uncertainties in the future.

- Effective leadership skills and behaviors are key to the success of large multidisciplinary teams.

- An effective Leader:
  - ...defends their team.
  - ...empowers their team.
  - ...takes accountability of the team performance.
 - ...empathises with the team members unique perspectives.

Tips & Tricks

Tips and tricks for integrating the two key disciplines for leading complex projects

SE:PM Integration!

- The SE needs to have a good understanding of PM Skills and Vice-Versa

- Together, their trade-space is project risk; commonly they must focus on the schedule

- **PM challenge:** Propose to deliver the project schedule as a function of cost.

- **SE Challenge:** how to deliver the project schedule as a function of realizing the technical performance
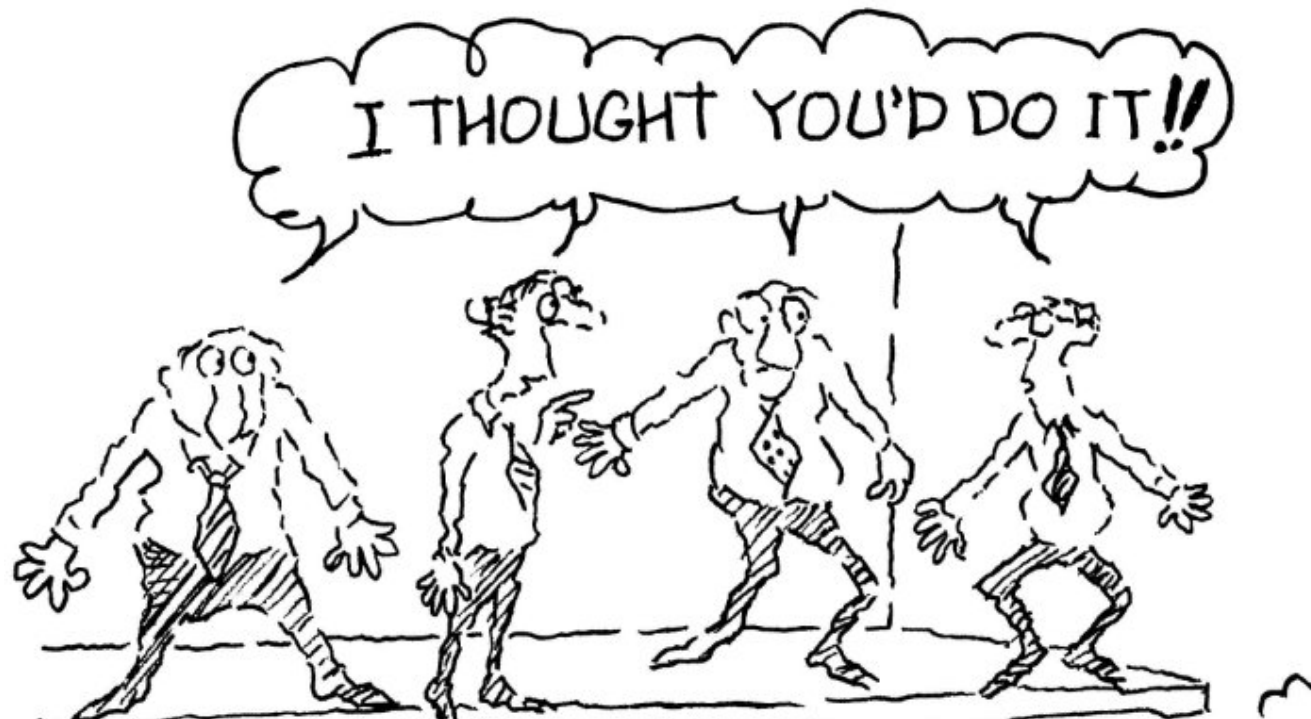
Summary

Technical Governance | SE & PM Roles | Managing Uncertainty | Perspectives | Leadership

- Project Management (PM) and Systems Engineering (SE) are two different disciplines yet so important to successful project delivery.

- They are very much "two sides of the same coin".

- Make a successful relationship by focusing on:
  - Balancing technical governance with PM
    - Consider SEMPs and LifeCycle Approach
  - Optimising the roles of the PM and SE
    - Consider the overlap in the roles
  - Managing project uncertainty & decision making
    - Implementing a strong risk management process
  - Understanding each other's unique perspectives
    - Regularly discussing each other's perspective on key decisions
  - Strong and united project leadership
    - Unified approach to leading the project through uncertainties

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Thank you for listening!

Q&A