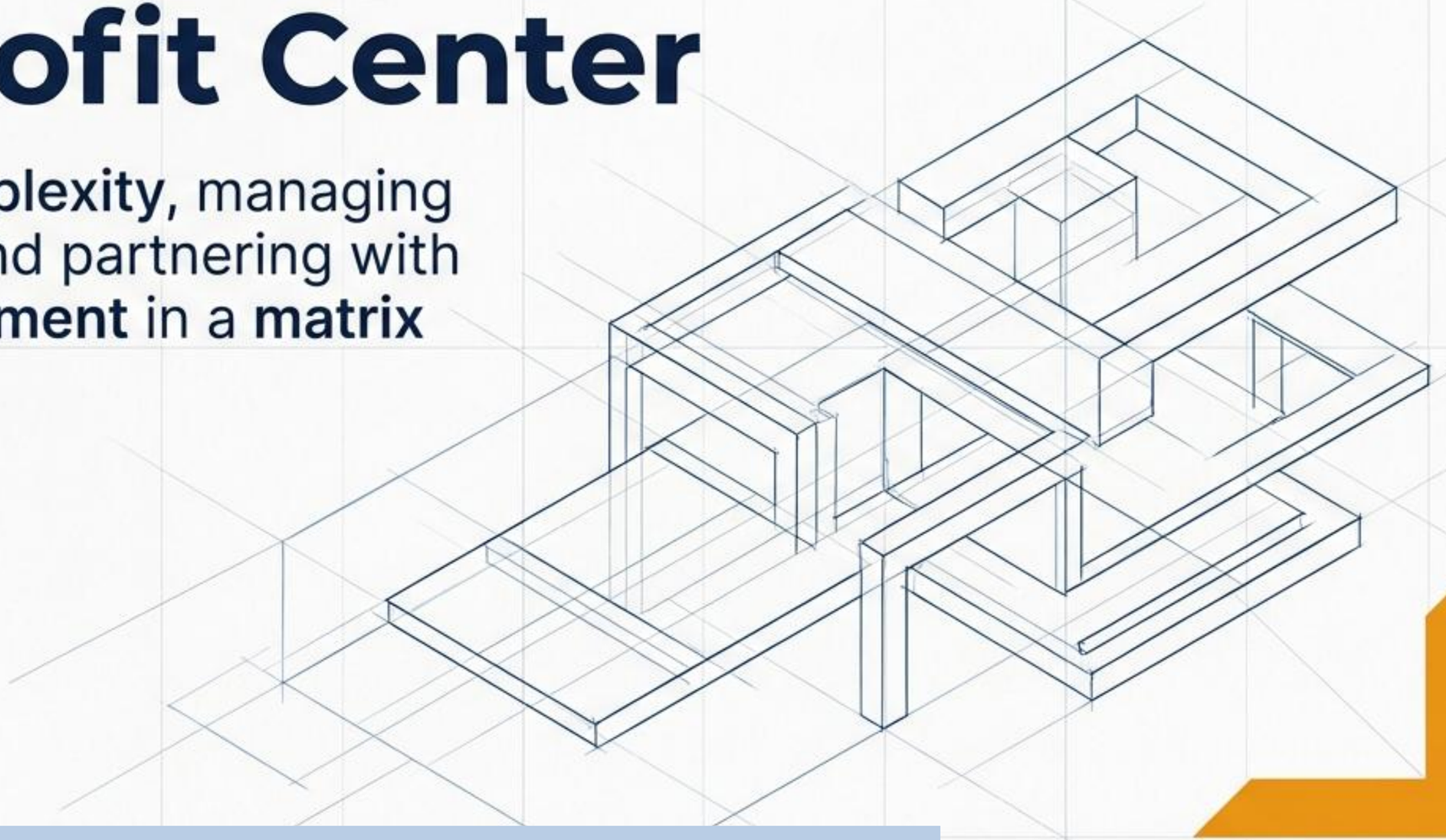
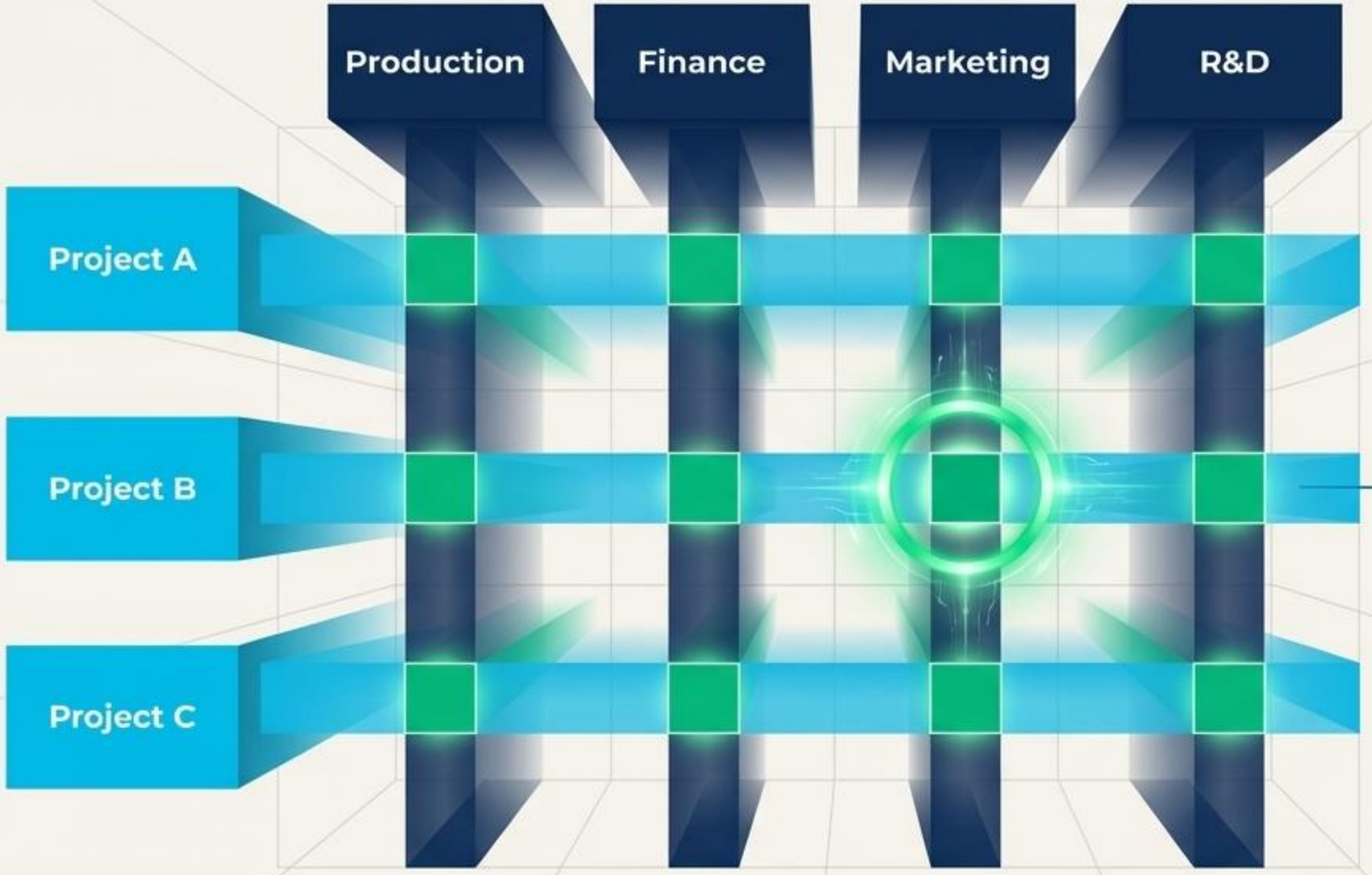
Systems Engineering in a Profit Center

Noti Haim

Navigating complexity, managing requirements, and partnering with **project management** in a **matrix organization.**



Navigating the Complexities of the Matrix Organization



Dual Reporting Lines

Project personnel must balance the immediate demands of project deliverables with the long-term standards of their functional disciplines.

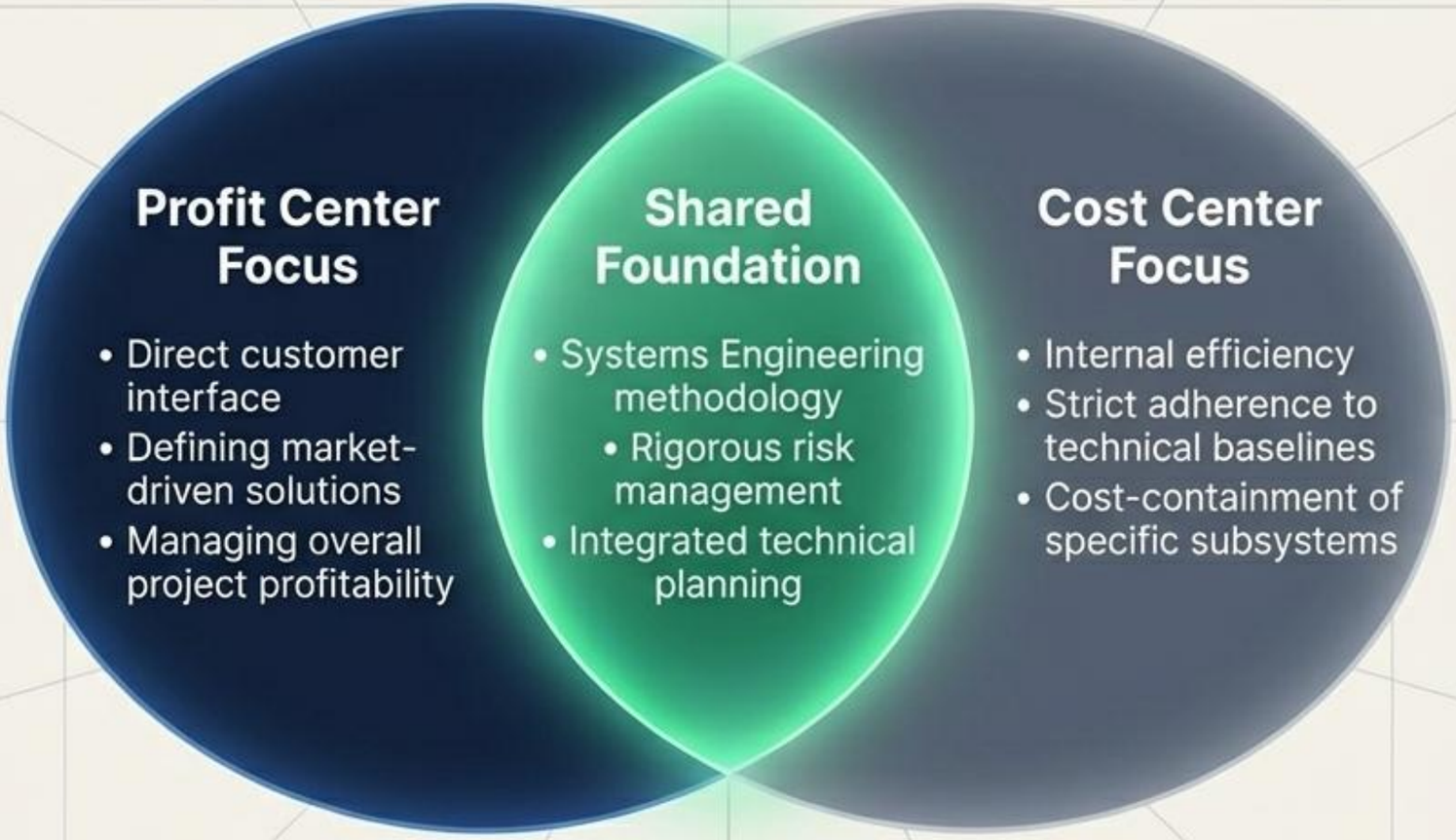
The SE's Position

The Systems Engineer operates at the most complex intersections of this grid, forced to harmonize conflicting priorities from cross-functional stakeholders.

The Business Environment: Profit Centers vs. Cost Centers

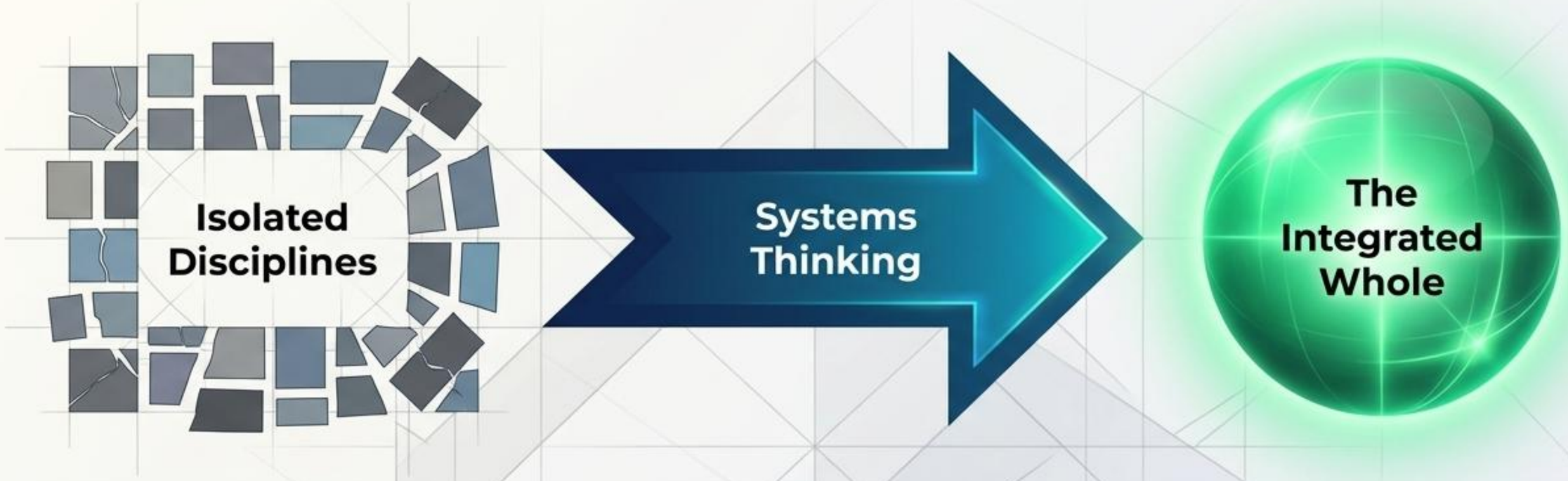
Profit Center (PC)	Cost Center (CC)
Core Objective: Maximize sales and corporate profit.	**Core Objective:** Provide competitive costs, maintain product quality, and meet initial estimates.
Primary Measurement: Measured directly on profit margins and revenue growth.	**Primary Measurement:** Measured on budget adherence and internal efficiency.
Investment Focus: Customer satisfaction, product quality, risk management, and systems engineering optimization.	**Investment Focus:** Process improvement, operational efficiency, and professionalization.
Structural Role: The primary business unit driving external revenue.	**Structural Role:** The supporting unit enabling the Profit Center to succeed.

The SE’s Dual Mandate Adapts to the Organizational Center



Key Takeaway: While the SE methodology remains constant, the most significant shift occurs in the SE's managerial responsibilities and their proximity to the end customer.

Systems Thinking is the Foundation of Systems Engineering



1. The Holistic View

The ability to understand the entire picture and the complete system, even without knowing every granular detail (the 'Black Box' concept).

2. Multi-Dimensional Scope

Thinking that simultaneously integrates Technical, Managerial, Economic, and Marketing perspectives.

3. Disciplinary Synthesis

Connecting subsystems from vastly different engineering disciplines into a single entity that fulfills stakeholder needs.

⚠ Caution: Isolated thinking destroys systems. (e.g., Spraying for malaria without considering broader environme

Defining the Discipline

NASA Definition

A methodical, multidisciplinary approach to design, realization, and technical management.

INCOSE Definition

An interdisciplinary approach to enable the successful realization of systems.

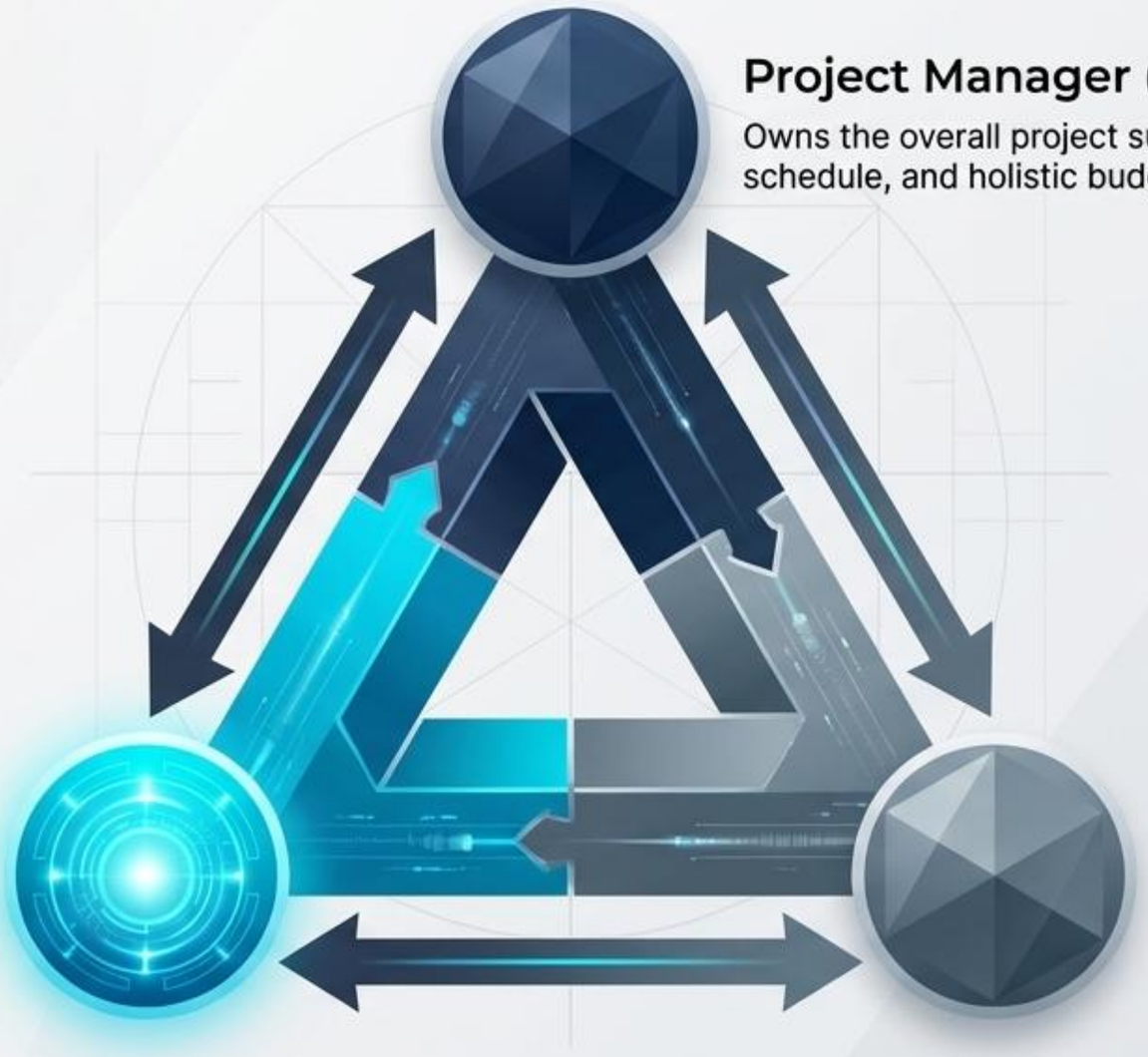
Project Success

Technical: Architecture, Integration, Validation.

Economic: Life Cycle Cost (LCC), Value Engineering.

Managerial: Cross-functional Team Integration.

The Project Triad: The Core Leadership Team



Project Manager (PM)

Owns the overall project success, schedule, and holistic budget.

Systems Engineer (SE)

Owns all technical aspects, ensuring the delivered system validates stakeholder expectations while continuously aligning with the PM's economic constraints.

Contract Manager

Owns the legal, financial, and regulatory compliance of the program.

The exact division of labor within this triad often adapts dynamically based on the personalities and specific strengths of the individuals involved.

The Threefold Sphere of the Systems Engineer

Technical

- Defining stakeholder needs
- Mapping required capabilities
- Architecting technological solutions
- Verifying requirements
- Validating that the final system meets actual operational expectations

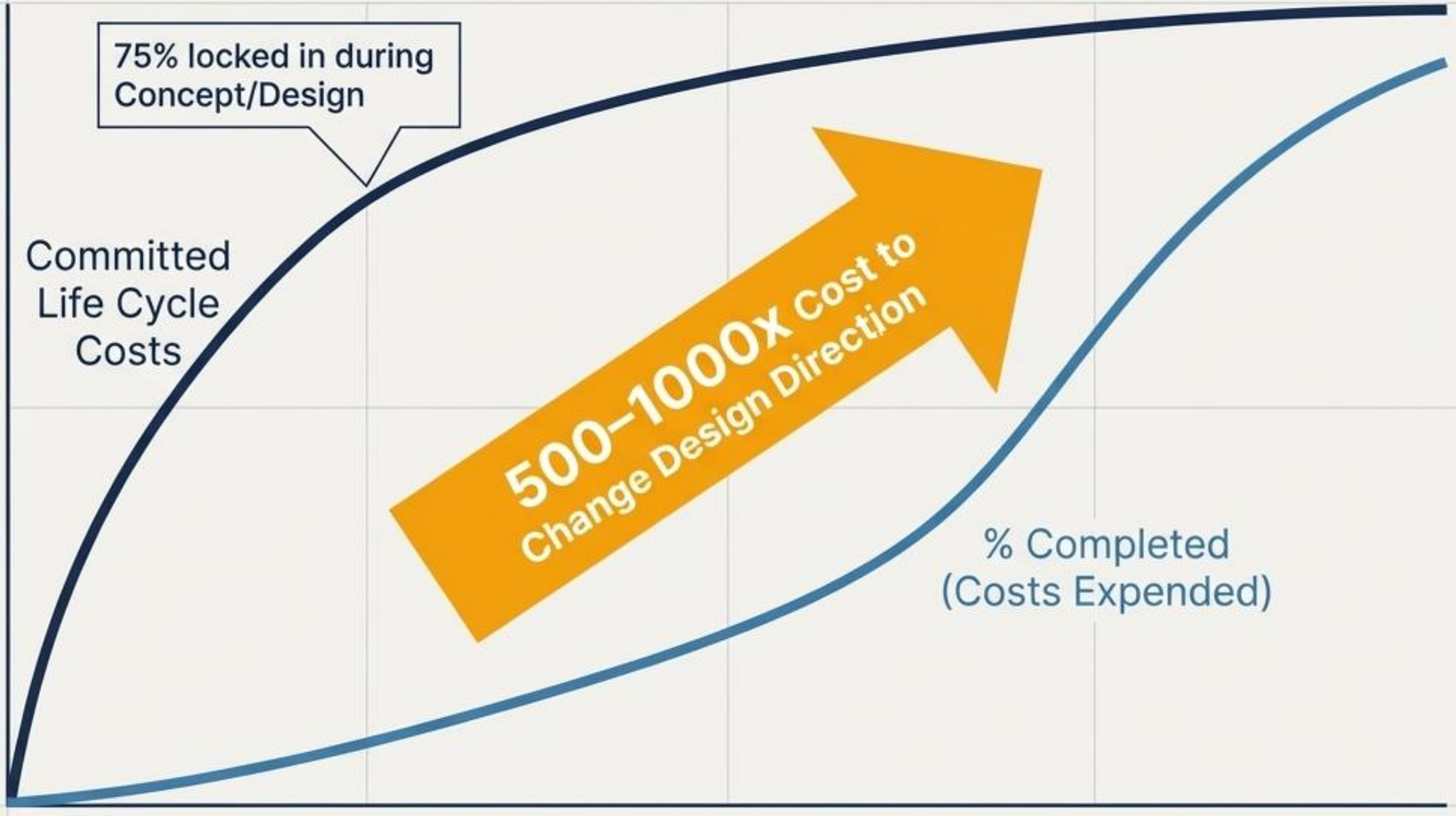
Managerial

- Integrating disparate engineering disciplines into cohesive teamwork
- Orchestrating a structured development process from initial concept through production to ongoing operational use

Economic & Contractual

- Continuous alignment of technical decisions with the project's financial reality
- Ensuring adherence to binding contractual obligations

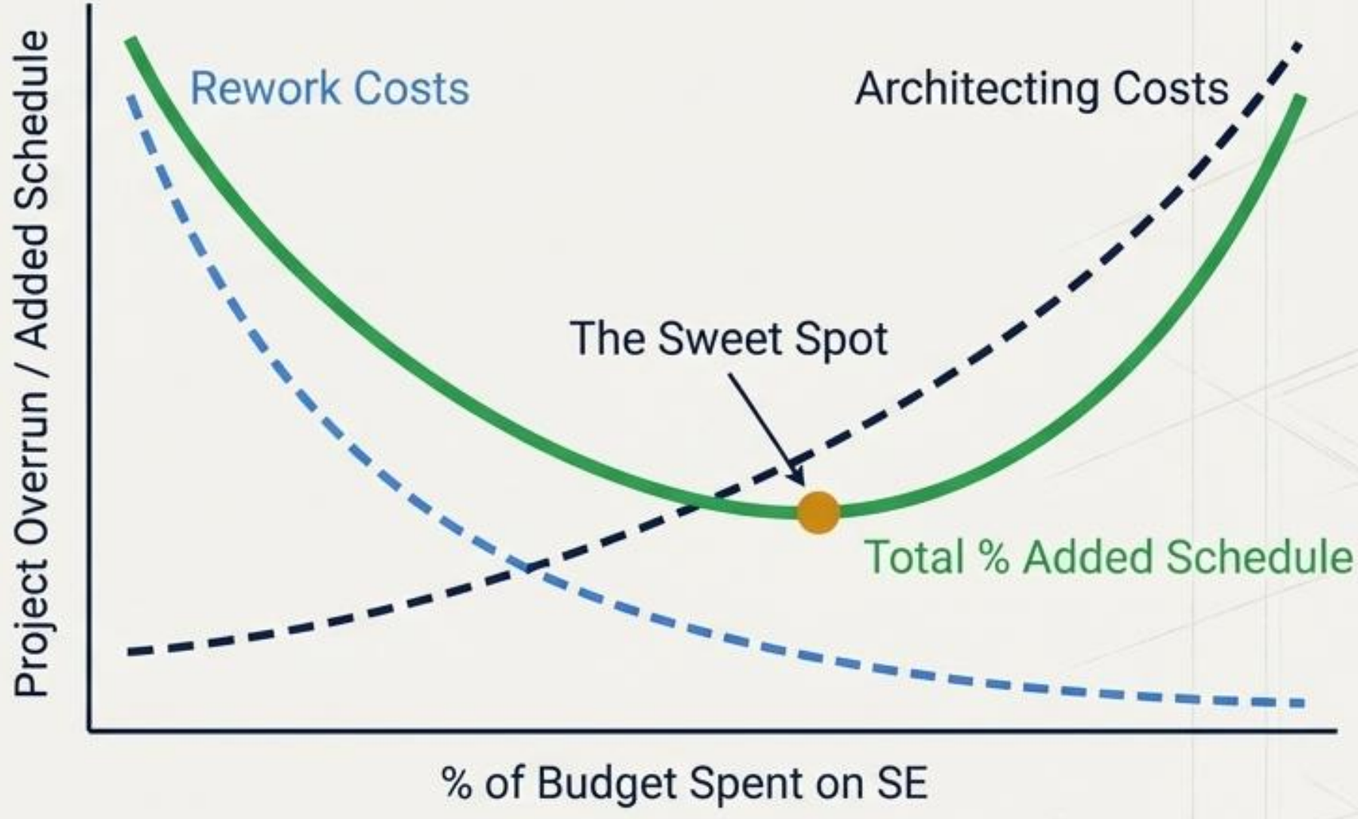
The Systems Engineering Challenge



The Paradox:

Decisions finalizing the vast majority of future lifecycle costs are made when project uncertainty is at its absolute highest.

Finding the Sweet Spot of SE Investment



Data from **161 projects demonstrates that hitting the optimal zone** of initial architecture **minimizes crippling schedule overruns** caused by late-stage rework. **Under-investing leads to failure**; **over-investing leads to paralysis**.

The Core Methodology

Systems Engineering is a continuous telemetry loop, not an upfront task.

The Requirements Trap: Why Projects Actually Fail

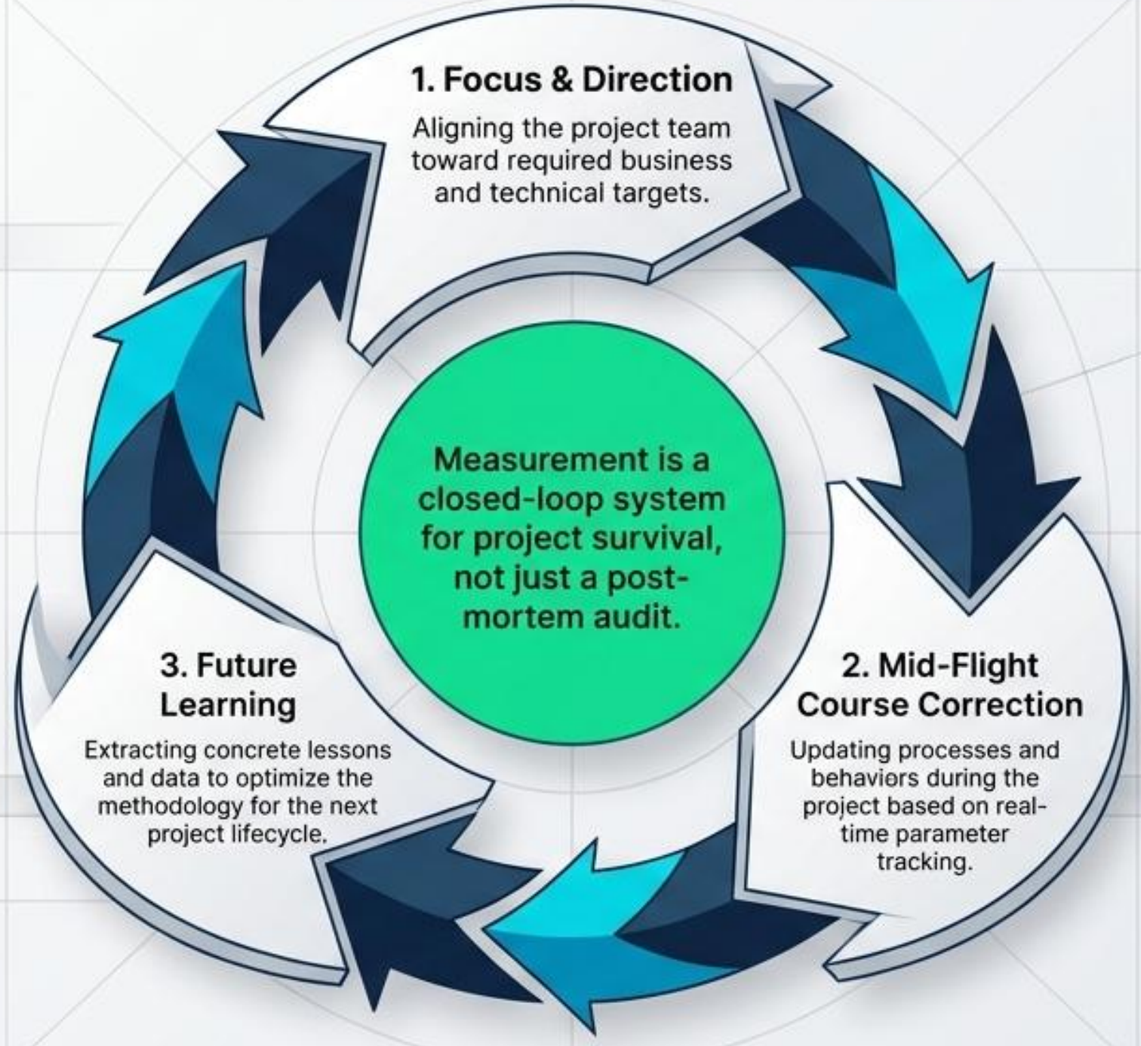
The Paradox of Requirements

1. **51%** of project dollars are wasted specifically due to poor requirements management.

2. Only **49%** of organizations have the resources to manage requirements properly.

3. Most leaders do not value it as a critical competency, creating an urgent mandate ↗ for the Systems Engineer.

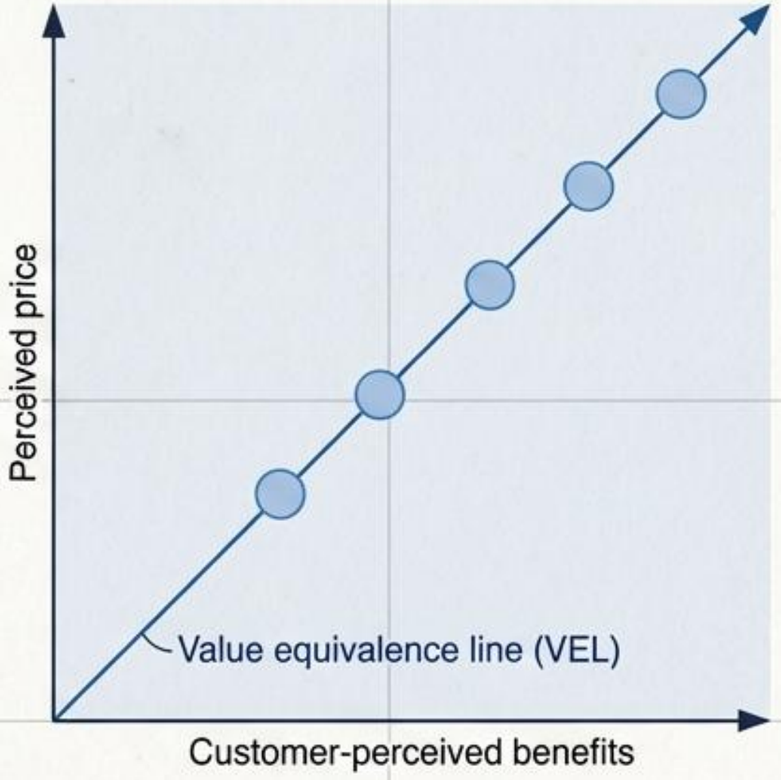
The ‘Why’ of Measurement: Navigational Feedback



Defining & Measuring SE Success

Project/Business Metrics

- ROI
- Profitability
- Schedule
- Resource Efficiency.



Product/Customer Metrics

- Performance
- Reliability
- Safety
- Follow-on Orders.

The Ultimate Criterion: A balanced system that meets customer expectations and project profitability goals across its entire lifecycle.
Customer Expectations ≠ Simply meeting Contract Requirements.

The Dual Axes of Measurement

Process Metrics (Leading Indicators)

Evaluating the rigor of SE execution.

- ☑ Requirements management effectiveness
- ☑ Risk mitigation status
- ☑ Outcomes of critical design reviews

Results Metrics (Lagging Indicators)

Measuring the ultimate impact on the Profit Center.

- ☑ Return on Investment (ROI) & Profitability
- ☑ Schedule adherence
- ☑ Lifecycle Cost control
- ☑ Stakeholder satisfaction

The Danger of Isolated Metrics (The Cobra Effect)

Improving one metric in a vacuum can destroy another. For example, pursuing infinite technical product improvements will boost immediate customer satisfaction but fundamentally destroy project profitability. **Optimization must be holistic.**

The Ultimate Success Criterion

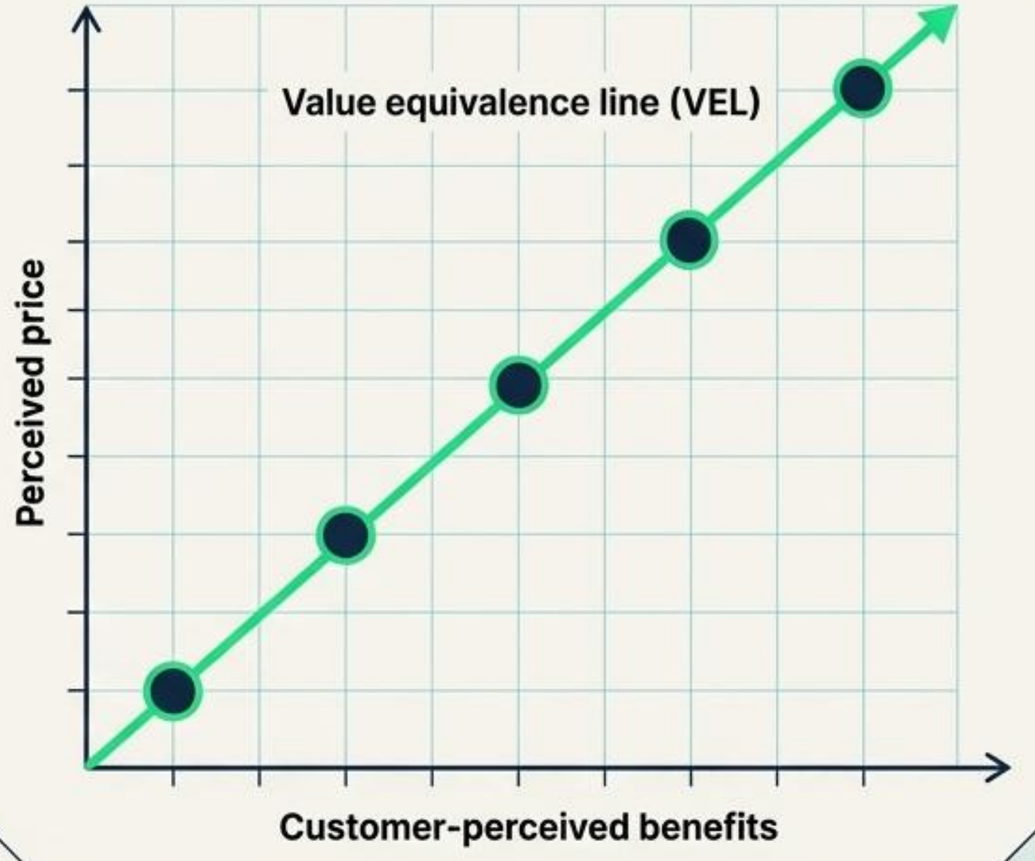
The Holistic Definition of SE Success:

The design and realization of a balanced, safe system that meets customer expectations AND project profitability targets across the entire lifecycle.

- 'Balanced' means optimizing the exact point of work between technical performance and financial cost.

⚠ **Crucial Rule:** Fulfilling contract requirements ≠ Fulfilling customer expectations. (True expectations include reliability, safety, and operational simplicity, which may not be explicitly contractual).

The Goal: Maintaining balance on the Value Equivalence Line.



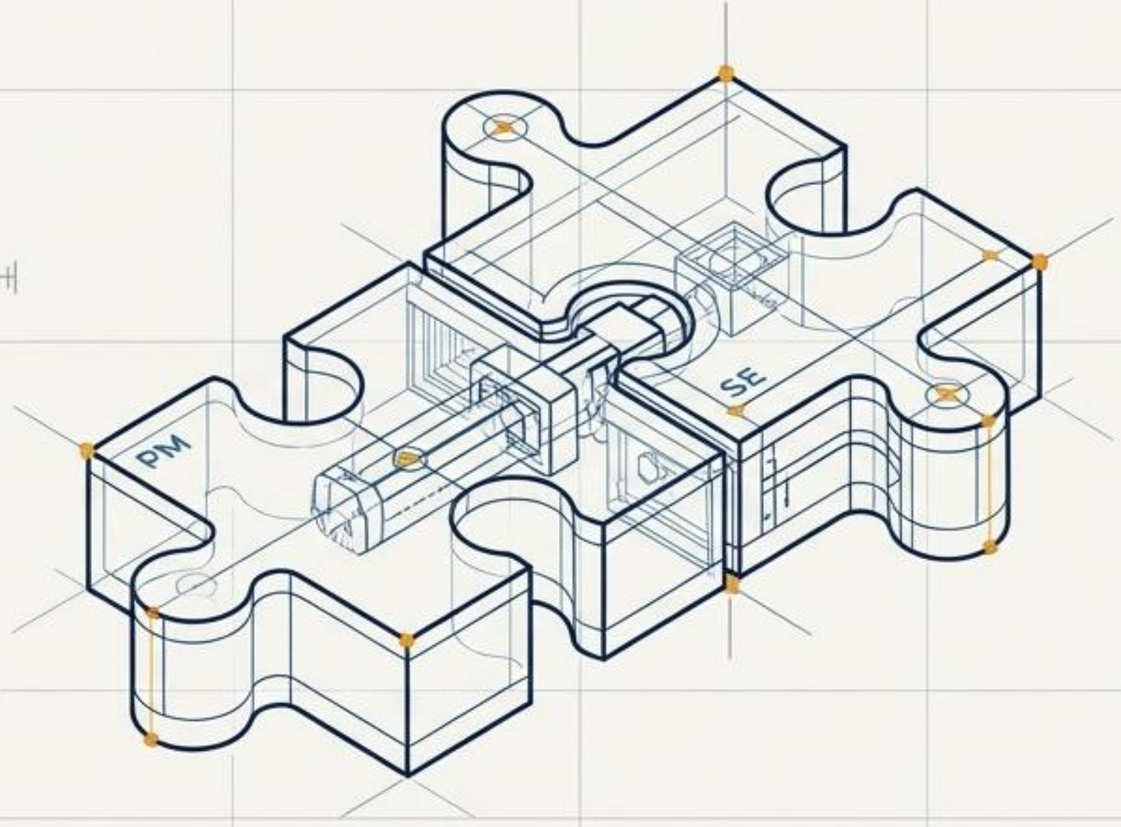
The Critical Interface: SE vs. PM

Two distinct perspectives examining the exact same project

Project Manager (PMI / PMBOK)

Focuses on overarching project goals, budget constraints, schedule, and human resources.

Undergoes distinct management training.



Systems Engineer (INCOSE / SE Handbook)

Focuses on technical activities, system architecture, capability, and technical validation.

Operates from an engineering perspective.

The PM and the SE: Two Sides of the Same Coin

Project Manager (PM)

Core Drive:
Overall project targets (Budget, Schedule, Scope).

Training:
Business Administration or Engineering Management.

Guiding Authority:
PMI (Project Management Institute) and the PMBOK.

Systems Engineer (SE)

Core Drive:
Technical execution and holistic system performance.

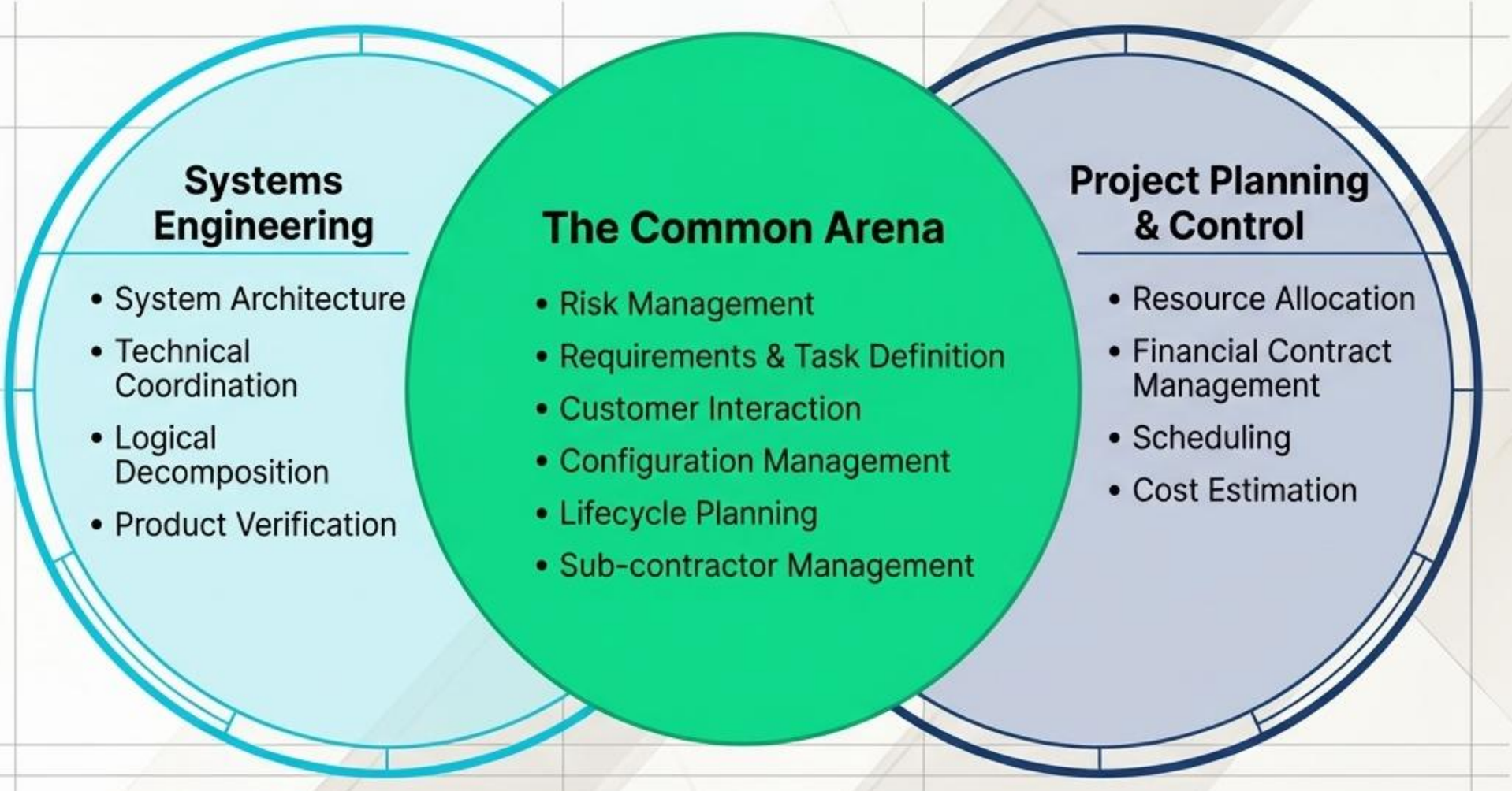
Training:
Deep, specialized engineering disciplines.

Guiding Authority:
INCOSE (Int. Council on Systems Engineering) and the SE Handbook.

The Structural Conflict:

Each professional undergoes entirely different training and certification processes, utilizing separate methodologies that often lack an integrative, shared perspective.

The Shared Battleground: Overlapping Responsibilities



Takeaway: The overlap is not minor. It encompasses the absolute most critical drivers of project success.

The Friction Points: Diagnosing Organizational Tension

30% In a joint PMI & INCOSE survey of 680 professionals, 30% reported an undesirable level of tension between Project Managers and Systems Engineers.

Siloed Planning

A fundamental lack of integrated planning for PM and SE activities.

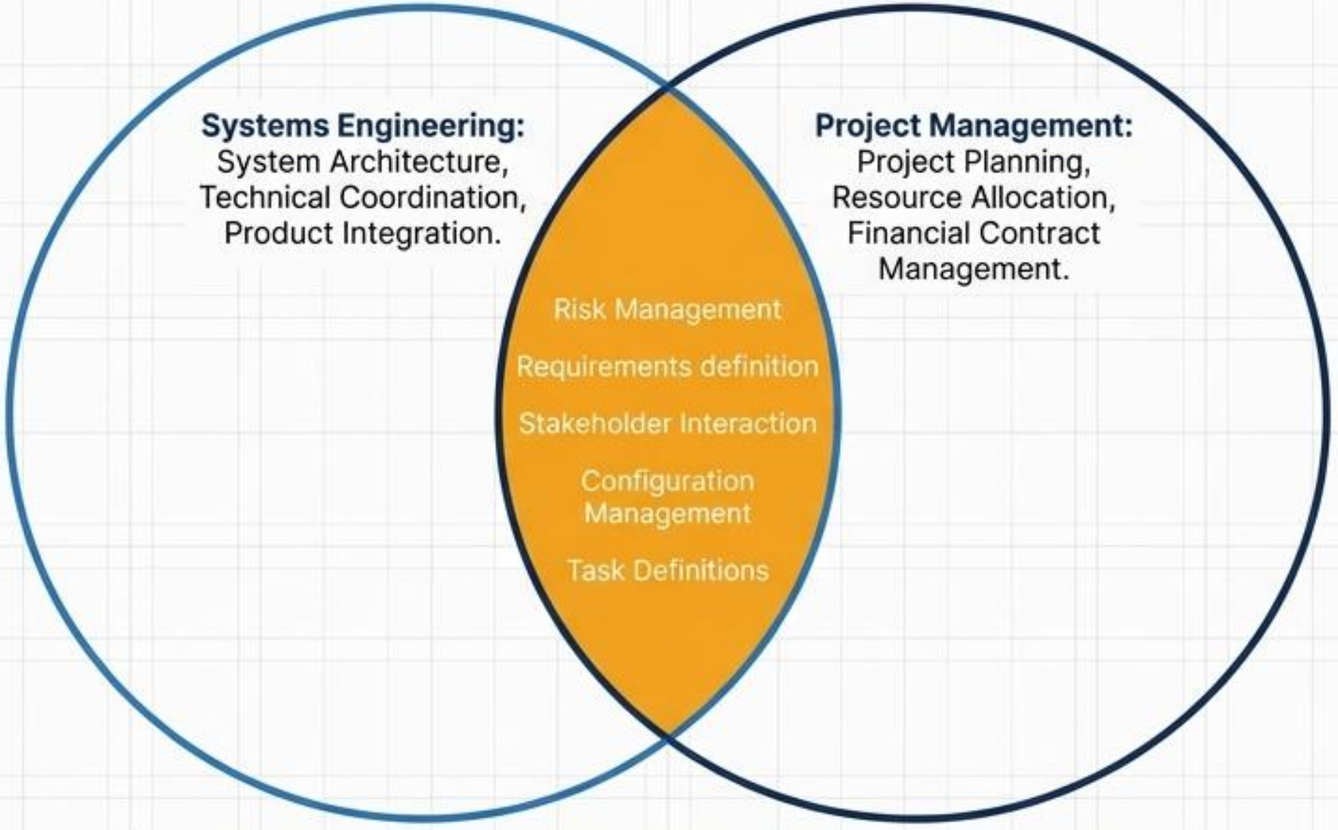
Ambiguous Authority

Failure to formally define decision-making authority in the massive overlapping areas (e.g., who holds final say on a risk mitigation impacting both budget and technical baseline).

Conflicting Practices

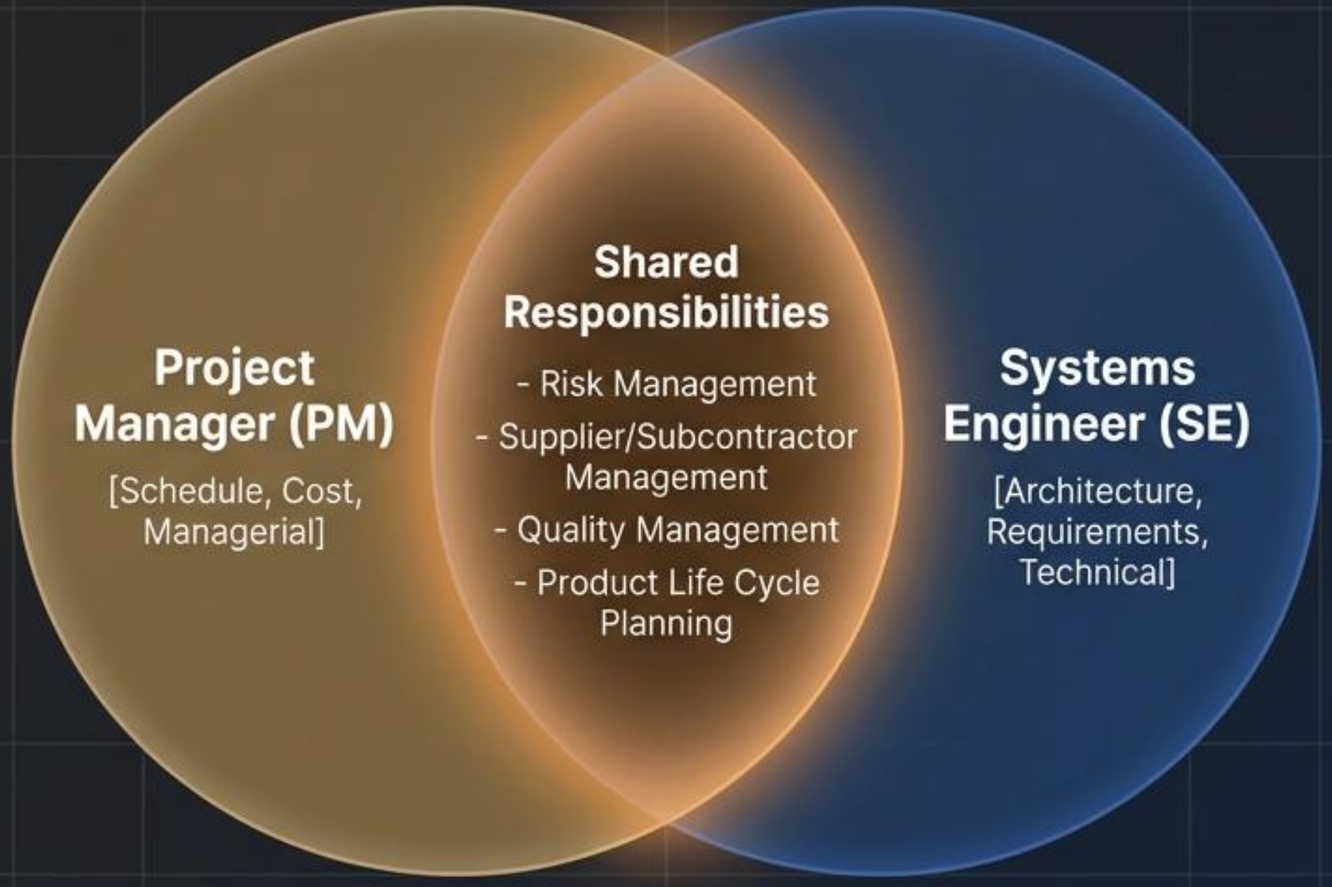
Applying separate, sometimes contradictory methodologies derived from completely separate PM and SE training manuals.

The Zone of Overlap (The Friction Point)



Diagnostic:
Industry surveys reveal 30% of professionals report undesirable tension. Friction occurs in the overlap due to a lack of integrated planning, unclear authority boundaries, and conflicting methodologies.

Partnership for Success: Project Management & Systems Engineering



Key Recommendations for Success

Clear Division of Authority: Define responsibilities upfront (PMP/SEMP) to eliminate friction in overlapping "gray areas."

Engineering Background: A distinct advantage is gained by appointing a PM with prior Systems Engineering experience or deep technical knowledge.

Ongoing Dialogue: Establish continuous communication to resolve conflicts through mutual understanding, persuasion, and shared goals.

Based on the article: "The partnership between the PM and the SE.pdf"

NotebookLM

Executive Summary: The Blueprint

Beyond Engineering

In a Profit Center, SEs exist to drive business value, customer satisfaction, and profitability—not just technical specifications.

Early Leverage

Hitting the “sweet spot” of early architectural investment prevents catastrophic life-cycle cost overruns.

Requirements are King

With poor requirements causing 50% of failures, rigorous requirement management is a non-negotiable survival skill.

The PM Partnership

Defining shared domains and maintaining continuous dialogue between PMs and SEs is the definitive organizational key to project success.

Executive Summary & Key Takeaways

1. The Elevated Business Role

In a matrix structure, the Systems Engineer's responsibilities extend far beyond technical design. They are the **critical bridge ensuring the technical baseline serves the Profit Center's business reality.**

2. The Necessity of Alignment

Project success hinges on the active integration of the PM and the SE. Understanding each other's methodologies, sharing authority over overlapping domains, and maintaining continuous dialogue are non-negotiable.

3. The Power of Early Investment

The ultimate challenge of SE is locking in Life Cycle Costs during the high-uncertainty concept phase. Defining success criteria early, and investing heavily in robust initial architecture, is the only way to prevent massive late-stage failure.