The Problem with Problem Management

Evaluating the Systems Engineering Problem Management Process for Heavy Industrial Manufacturing Problems

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Introduction

- Problem Management is not covered in INCOSE SE Handbook
  - Yet problems exist in any project
- Systems Engineering Problem Management Process (SEPMP)
  - Modeled after Risk and Opportunity Management methods
  - Shall be included in the Project Systems Engineering Management Plan (SEMP)

Risk, Project, & Problem Management

SEPMP - Components

- Identification
- Assessment
- Investigation
- Action Planning
- Reporting
- Closure
- Knowledge Management

Problem Management Models

Factors	Subfactors	Variables	SE Problem Management Model	Porter's Five Forces Model	Taylor's IT Problems Model	Weber & Konsynski's DSS Model
Problem Management	Planning	Resources	✓		✓	
		Tools	✓	✓	✓	✓
	Identification	Risks	✓	✓		
		Emergent	✓		✓	✓
	Analysis	Impact	✓	✓		✓
		Timeliness	✓			
	Handling	Design	✓		✓	
		Implement	✓			✓
	Monitoring	Reporting	✓	✓	✓	✓
		Validation	✓		✓	✓
	Closure	Close Problem	✓		✓	
		Lessons Learned/KM	✓			

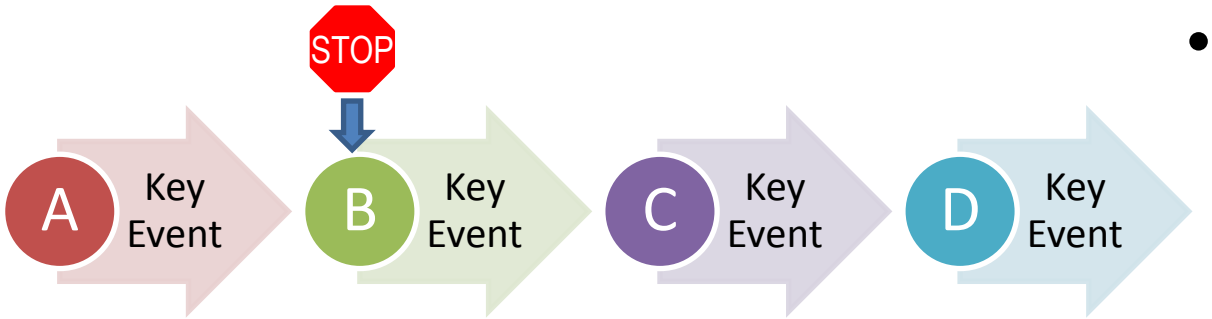
Problem Management Models

Factors	Subfactors	Variables	SE Problem Management Model	Porter's Five Forces Model	Taylor's IT Problems Model	Weber & Konsynski's DSS Model
Project Success	Technical	Validation	✓			
		Verification	✓			
	Schedule	Key Events	✓		✓	
		Completion	✓	✓	✓	✓
	Cost	Budget	✓	✓	✓	✓
	Safety	Project	✓			
		Product	✓			
	Environmental	Regulation	✓			
		Community	✓			
	Programmatic	Events	✓			
		People	✓		✓	

SEPMP – Problem Identification

- Planning for Problems
  - Thresholds
- Process Failures
  - Accidents
- Risk
  - Likelihood 100%
- Communication
- Customer Feedback

Problem, Risk, or Crisis?



Problem Identified for Key Event B?

OR

Risk Identified to Key Event C?

- Is a Problem just a Risk to a future step in the value stream?
- What is a Crisis?

SEPMP Analysis – Impact

- Impact of the problem if not addressed
- Categories of Problem Impacts
  - Technical
  - Cost
  - Schedule
  - Safety/Environmental
  - Programmatic

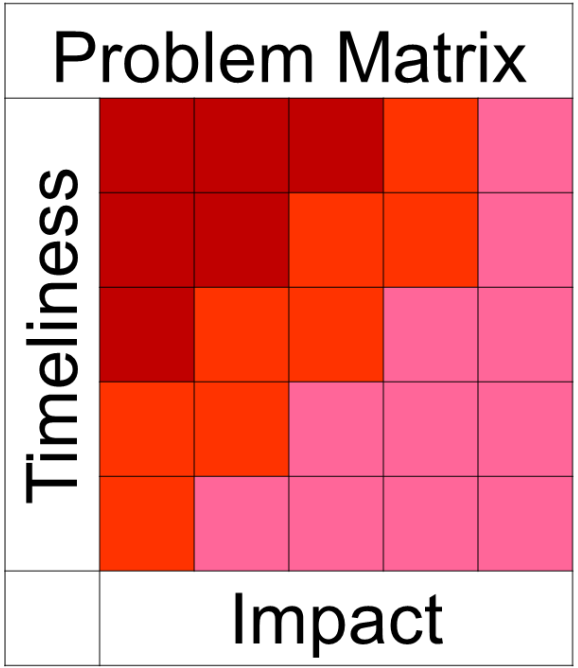
Is this a comprehensive list?

SEPMP Analysis – Timeliness

- For any given deadline, the later a problem is identified, there is less time to:
  - React
  - Plan
  - Analyze
  - Resolve
  - Avert Disaster!

Is this Self-Evident?

SEPMP – Problem Assessment



SEPMP – Problem Handling

Methods or Tools

- Acceptance
- Avoidance
- Transference
- Resolution

How do these relate to the INCOSE SE process?

- Requirements
- Validation
- Risk
- KM

SEPMP – Monitoring and Closure

- Monitoring
  - Maintain awareness of problems
  - Consider established thresholds
  - Problems as liabilities
- Closure
  - Decision support criteria
  - Cost effective to manage
  - Departure from specification
  - Absorb impact

SEPMP – Knowledge Management

- Cross Program Liabilities
- Lessons Learned
- Hotwash for Significant Problems
- SEPMP feeds KM tool
- SEPMP considers KM
  - During identification, analysis, and assessment

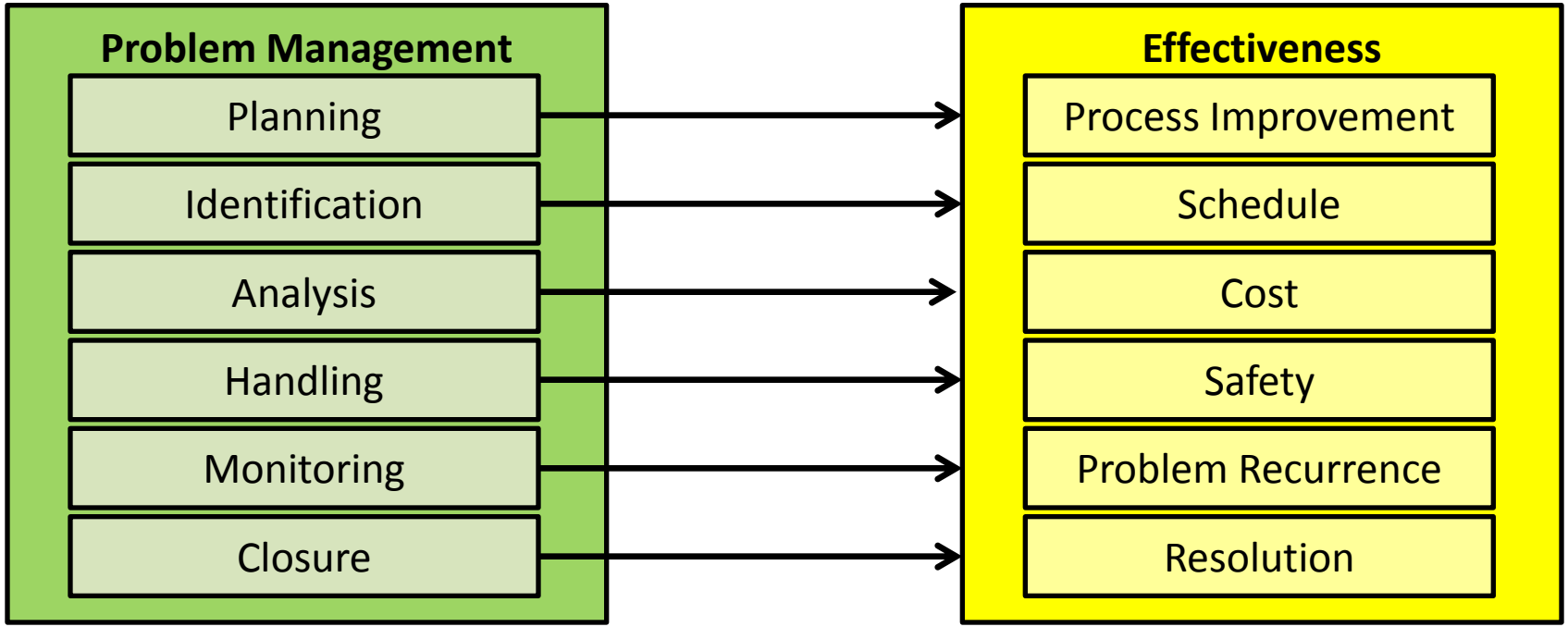
How helpful is it as a tool for identifying systemic issues?

Research Model

- Mixed Method approach
  - Empirical analysis of existing problem and risk data
- Data from multiple programs
  - Impacts project success at completion and milestones
- Data from a 3 year period
- Differing impact magnitudes
  - Effort required to manage the problem

Can the SEPMP allow for Scalability?

Research Model



Data Collection

- Full Study
  - Sample of approximately 300 problems
  - Multiple programs
  - Includes customer- and self-identified problems
- Significant data mining required
- SME interpretation for some variables

Independent Variables

- Impact – Harmful results of problem
- Impact communicated – how well the impact was characterized
- Timeliness – time to next milestone
- Timeliness communicated – how well the urgency was communicated
- Problem complexity – number of problem components and causes identified
- Actions – number of short and long term corrective actions
- EH&S – environmental, health, and safety impacts identified
- Impact Category – Technical, Programmatic, Safety, Cost, Schedule
- Similar Problems – Identified related problems

Dependent Variables

- Recurrence – Recurring problems of a similar nature
- Delay to Milestone – Every lost day can be costly
- Process Improvements – Resulting improvements from problem management
- DFS – Number of Departures from Specifications required to meet milestones
- Problem Management Cost – Time and Effort required to investigate and manage the problem

Hypotheses

- Increased attention to impact and timeliness will contribute to more effective problem resolutions
- Timeliness will be the primary driver to the quickness of the resolution
- The impact categories will adequately capture all problem impacts observed
- Existing KM will not support effective identification of Systemic issues
- Integration with Risk Management will be inconsistent

Recommendations

- Scalability
- Identification of systemic issues
  - Across programs
- Strengthen problem identification and characterization
  - Risk/Problem/Crisis relationships
- Problem Planning
  - Organizational decisions vs. project decisions

Recommendations for Problem Research

- Complete Study
  - Recommend improvements to SEPMP for heavy industrial manufacturing problems (6 months)
- Implement optimized SEPMP at Heavy Industrial Manufacturing Company (+1 years)
  - Case study after implementation (+2 years)
- More empirical research and case studies on SEPMP in other applications (+1-4 years)
- Establish confidence in SEPMP and include in INCOSE handbook as a standard SE tool (+5 years)

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Dennis Perry graduated from Virginia Commonwealth University in 1996 with a Bachelor of Science in Psychology, and again in 2000 with a Bachelor of Science in Mechanical Engineering while working as a retail sales manager in a furniture store. After 3 years as a sales engineer, Dennis joined Northrop Grumman Shipbuilding (now Newport News Shipbuilding, a division of Huntington Ingalls Industries) as a Systems Test Engineer. Dennis completed a Masters in Engineering Management at Old Dominion University in 2007. In 2010, Dennis transferred to Systems Engineering, and later assumed the CVN78 Configuration Management Lead position. In 2013, Dennis transferred to Program Quality Assurance as a senior quality engineer. Dennis lives in Williamsburg, VA, with his wife, son, and daughter.

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