Mapping Systems Engineering Tools with Effective Leadership Behaviors

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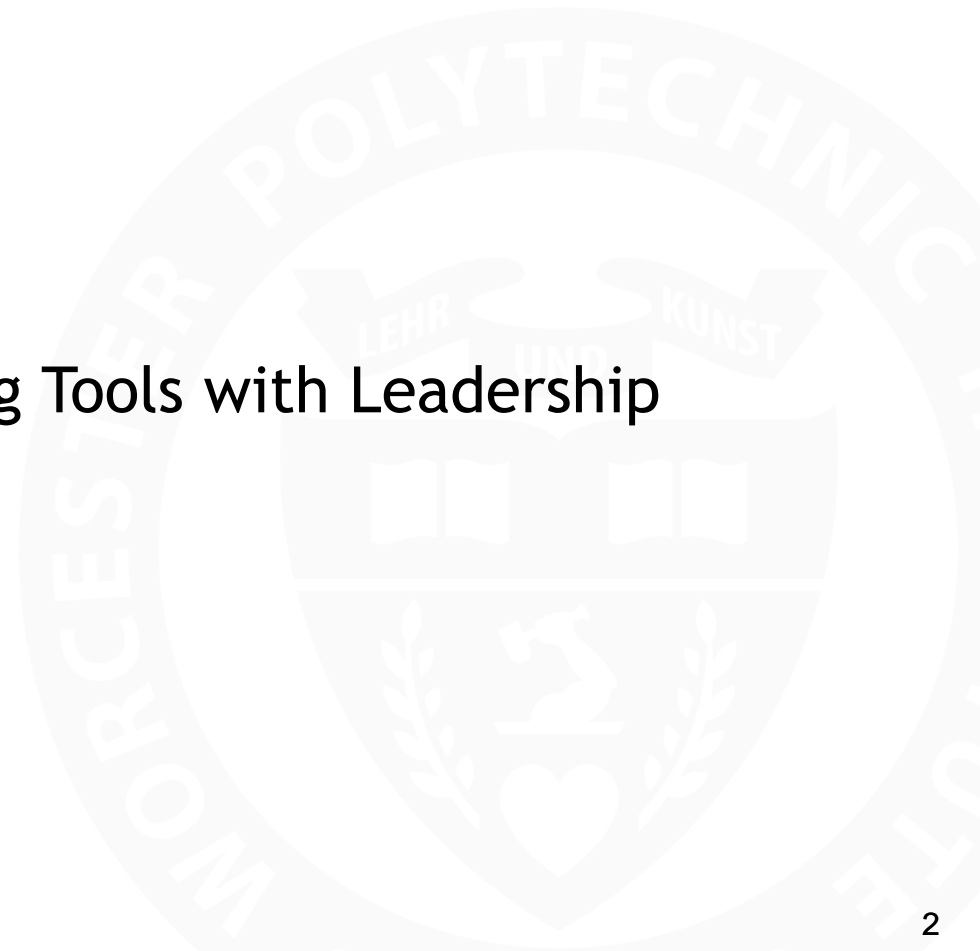Worcester Polytechnic Institute

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Agenda

- Systems Engineering and Leadership

- Leadership
  - Theme
  - Competencies
  - Behaviors

- Mapping Systems Engineering Tools with Leadership Behaviors

Expectations and Facts

- Growing expectations that effective Systems Engineers must be able to lead, starting on Day 1, without necessarily holding a position of authority

- Younger engineers without much experience are being put into leadership positions sooner due to Baby-Boomer retirements and other attrition

- Corporations and government agencies who can afford it have developed their own engineering leadership programs – shows their need and value

- Need for better technical leadership discussed at professional societies – International Council on SE, National Defense Industrial Association, etc.

- Leadership should be learned and appreciated early in one's career – too late to first learn leadership as an executive

- Leadership should be practiced and improved in the context of and throughout one's career – value-added life-long learning is key

You cannot manage men into battle. You manage things; you lead people.

Grace Hopper

NASA Systems Engineering Behavior Study (2008)

- Accelerate Critical Behaviors

- Assure Mission Success

- Guide Coaching and Mentoring Program

- Human Capital Development

Major Theme: Leadership

- Appreciate / Recognize Others
- Builds Team Cohesion
- Understands the Human Dynamics of a Team
- Creates Vision and Direction
- Ensures System Integrity
- Possesses Influencing Skills
- Sees Situations Objectively
- Coaches and Mentors
- Delegates
- Ensures Resources are Available

Appreciate/ Recognizes Others

- Articulates Team Work
- Recognizes Individual and Team Contribution

SE Tool Mapping

- Integrated Product and Process Design
- Integrated Product Teams

Builds Team Cohesion

- Resolving Differing Opinions
- Foster Team Cohesions
- Open, Non- Defensive Behaviors with Others
- Relaxed Inquiry by Positive Encouraging Comments

SE Tool Mapping

- Nominal Group Technic
- Ishikawa Diagrams
- Affinity Diagrams
- Context Diagrams
- Benchmarking

Understands the Human Dynamics of a Team

- Motivating Teams by Communicating Progress and Understanding Challenges
- Supporting Teams with Resources
- Interdisciplinary Team Interactions

SE Tool Mapping

- N2 Analysis
- Value Stream Mapping
- View Point Analysis

Creates Vision and Direction

- Big Picture View of Mission Requirements
- Understands and Interpret Different Opinion, Concerns
- Articulates the System, Mission Success and Team Roles and Responsibilities

SE Tool Mapping

- Holistic Requirements Model
- Failure Modes and Effects Analysis
- Systemigram

Ensures System Integrity

- Planning, Reporting and Managing System Risk

- Accepts Responsibility for System Performance << Character Trait>>

SE Tool Mapping

- Risk Cubes

- Cost-Risk-Benefit Analysis

- Pugh Matrix

Possesses Influencing Skills

- Understand the Affect of Political Forces and its affects on Projects

- Creates Synergy Among and with People

- Builds a Resource Network

SE Tool Mapping

- Positive Interdependence

- Teaming

Sees Situations Objectively

- Takes Responsibility for Own Actions
- Understands Wisdom of Teams
- Understands Biases and Outside Influences

SE Tool Mapping

- Concept Mapping
- Teaming

Coaches and Mentors

- Develops Breath and Depth of Team Competencies

- Recognizes High Potential Individuals

- Challenges Individuals to do their Best Work

SE Tool Mapping

- Empowering Teams and Individuals

Delegates and Ensures Resources are Available

- Builds Confidence Among Teams by Delegating Responsibility
- Keeps Abreast with Analytical Tools and Models
- Organize, Simplify and Distribute Information Effectively

SE Tool Mapping

- Multi-Criteria Decision Making Tools
- PERT/CPM
- Gantt Chart
- Data Driven Decision Making

How Can a Systems Engineer Lead?

- Start leading on day one, don't wait for a position of authority to come your way, you have the tools use them

- Be proactive, help the person in charge, relieve some of their burden

- Be a team player, help facilitate meetings and working sessions, encourage others to excel, share the credit, help others learn how to lead

- Try to understand the problem before you try to solve it, help others to understand

- Try to understand the issues before you speak

- Sometimes, all you have to do is "Show Up!"

The Final Word...

- Systems Engineering Leadership Institute at WPI Incorporates Systems Engineering Leadership Tools and Behaviors Across Entire SE Curriculum

- The SE community is beginning to understand the importance of systems engineers who can lead and influence others from Day 1, without being in a position of authority

- Traditionally, SE and Leadership have been treated as separate capabilities to be learned only through separate stove-piped development programs with no collaboration or cross-pollination

- Future Research to develop Empirical Evidence

Thank You!