Characteristics of Effective Systems Engineering Leaders

Victoria Schaefer, Ed.D., Glenn Tolentino, Ph.D., and John Wood, Ph.D.
Presenters

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Victoria Schaefer, Ed.D.
<table>
<thead>
<tr>
<th>Category</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>SoS Authority</td>
<td>What are the effective collaboration patterns in SoS?</td>
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<tr>
<td>Leadership</td>
<td>What are the roles and characteristics, including skills, of effective SoS leaders?</td>
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<tr>
<td>Capabilities and Requirements</td>
<td>How can SE address SoS capabilities and requirements</td>
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<tr>
<td>Testing, Validation, and Learning</td>
<td>How can SE approach SoS validation, testing, and continuous learning in SoS?</td>
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<tr>
<td>SoS Principles</td>
<td>What are the key SoS thinking principles</td>
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<tr>
<td>Constituent Systems</td>
<td>What are effective approaches to integrating constituent systems?</td>
</tr>
<tr>
<td>Autonomy, Interdependencies, and Emergence</td>
<td>How can SE address the complexities of interdependencies and emergent behaviors?</td>
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</tbody>
</table>

System of System - Pain Points

(Dahmann, 2013)
Agenda

- Leadership: A Major Challenge Area
- Leadership Theory and Leadership Style
- Systems Engineering Leadership
- Leadership Proficiencies
- Leadership Survey
Leadership: A Major Challenge Area

“...most of the problems faced by human kind, concerns our inability to grasp and manage the increasingly complex systems of our world” – Peter M. Senge

Leadership

• “Capacity to lead; the act or an instance of leading” (Merriam-Webster)
• “Leadership defines what the future should look like, aligns people with that vision, and inspires them to make it happen despite the obstacles” (Kotter, 1996)

Management

• “Conducting or supervising of something” (Merriam-Webster)
• “Organizations provide its managers with legitimate authority to lead, but there is no assurance that they will be able to lead effectively” (Lunenburg, 2011)
• “Management is doing things right, leadership is doing the right things” (Drucker, 1999)
<table>
<thead>
<tr>
<th>Theory</th>
<th>Time Period</th>
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<tbody>
<tr>
<td>Cruelty vs. Mercy</td>
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<tr>
<td>Great Man Theory (1840’s)</td>
<td></td>
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<tr>
<td>Traits (1930’s-1940’s) and Behaviors (1940’s-1950’s)</td>
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<tr>
<td>Situational Leadership (1960’s)</td>
<td></td>
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<tr>
<td>Transactional Leadership (1970’s)</td>
<td></td>
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<tr>
<td>Transformational Leadership (1970’s)</td>
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</table>
## Transactional vs. Transformational Leadership

<table>
<thead>
<tr>
<th>Transactional Leadership</th>
<th>Transformational Leadership</th>
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</thead>
<tbody>
<tr>
<td>Leadership is responsive</td>
<td>Leadership is proactive</td>
</tr>
<tr>
<td>Works within the organizational culture</td>
<td>Work to change the organizational culture by implementing new ideas</td>
</tr>
<tr>
<td>Transactional leaders make employees achieve organizational objectives through rewards and punishment</td>
<td>Transformational leaders motivate and empower employees to achieve company’s objectives by appealing to higher ideals and moral values</td>
</tr>
<tr>
<td>Motivates followers by appealing to their own self-interest</td>
<td>Motivates followers by encouraging them to transcend their own interests for those of the group or unit</td>
</tr>
</tbody>
</table>
Leadership Theory:
“is **what** makes people great leaders”

Leadership Style:
“is the **way** that individual leaders lead”
<table>
<thead>
<tr>
<th></th>
<th>Visionary</th>
<th>Coaching</th>
<th>Affiliative</th>
<th>Democratic</th>
<th>Pacesetting</th>
<th>Commanding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impact</strong></td>
<td>Most strongly positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td><strong>Style</strong></td>
<td>Motivates people towards a vision</td>
<td>Developing People for the future</td>
<td>Creates Harmony and Builds Emotional Bonds</td>
<td>Forges Consensus through Participation</td>
<td>Set’s high standards for Performance</td>
<td>Demands Immediate Compliance</td>
</tr>
<tr>
<td><strong>Leaders Motto</strong></td>
<td>“Come with Me”</td>
<td>“Try This”</td>
<td>“People Come First”</td>
<td>“What do you think?”</td>
<td>“Do as I do now”</td>
<td>“Do what I tell you”</td>
</tr>
<tr>
<td><strong>When style works best</strong></td>
<td>When changes require a new vision, or when a clear direction is needed</td>
<td>To help an employee improve performance or develop LT strengths</td>
<td>To heal rifts in a team or to motivate people during stressful circumstances</td>
<td>To build buy-in or consensus, or to get input from valuable employees</td>
<td>To get quick results from a highly motivated and competent team</td>
<td>In a crisis, to kick start a turnaround, or with a problem employee</td>
</tr>
<tr>
<td><strong>Limitations</strong></td>
<td>Although powerful, does not work in every situation</td>
<td>Less effective when employees are resistant to learning or changing</td>
<td>Exclusive use may encourage poor performance and lead to group failure</td>
<td>Leaders may use style to put off making decisions and create confusion and conflict</td>
<td>May destroy “climate” and loss of initiative and commitment</td>
<td>Use with caution. Long-term use damages moral</td>
</tr>
</tbody>
</table>
If you imagine your organization as an ocean liner and you as the leader, what is your role?

Case Study: The Leader’s New Work
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If you imagine your organization as an ocean liner and you as the leader, what is your role?

- Most common answer: “the captain”
Case Study: The Leader’s New Work

If you imagine your organization as an ocean liner and you as the leader, what is your role?

• Most common answer: “the captain”
• Additional answers:
  • “the navigator, setting the direction”
  • “the helmsman, actually controlling the direction”
If you imagine your organization as an ocean liner and you as the leader, what is your role?

- Most common answer: “the captain”
- Additional answers:
  - “the navigator, setting the direction”
  - “the helmsman, actually controlling the direction”
- While these are legitimate leadership roles, there is another role that, in many ways, eclipses them all in importance
Case Study: The Leader’s New Work

The neglected leadership role: Designer of the Ship

No one has a more sweeping influence on the ship than the designer. Leaders who appreciate organizations as living systems realize that they can create organizational artifacts like new metrics, or formal roles and processes, or intranet Web sites, or innovative meetings - but it is what happens when people use the artifacts or processes or participate in the meetings that matters.
Importance of Leadership in Systems Engineering

- Leadership has been identified as a ‘Pain Point’
- Systems Engineering Research Center has identified Leadership as an area of proficiency
- NASA Systems Engineering Leadership Development Program (SELDP)
## Leadership Proficiencies

<table>
<thead>
<tr>
<th>Systems Engineering Research Center Atlas Model</th>
<th>NASA Engineering Leadership Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Math / Science / General Engineering</td>
<td>1. Leadership</td>
</tr>
<tr>
<td>2. Systems Domain &amp; Operational Context</td>
<td>2. Attitudes and Attributes</td>
</tr>
<tr>
<td>5. Interpersonal Skills</td>
<td>5. Technical Acumen</td>
</tr>
<tr>
<td>6. Technical Leadership</td>
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</tbody>
</table>
Leadership Proficiencies

Business Skills (Thoughts)
- Understanding the Business
- Managing Complex Decisions
- Creating the New and Different

Operating Skills (Results)
- Taking the Initiative
- Managing Execution
- Focusing on Performance

People Skills (People)
- Builds Collaborative Relationships
- Optimizing Diverse Talent
- Influencing People

Interpersonal Skills (Self)
- Being Authentic
- Being Open
- Being Flexible and Adaptable

© Korn Ferry Leadership Architect
Collaborates

- NASA’s SE Leadership Development Program
  - Builds Team Cohesion
  - Understands the Human Dynamics of Team
- Systems Engineering Research Center
  - Building and Orchestrating a Diverse Team
  - Working in a Team
  - Building a Social Network

“Collaboration is vital to sustain what we call profound or really deep change, because without it, organizations are just overwhelmed by the forces of status quo” – Peter M. Senge
Builds Effective Teams

Individual Contributor
- Contributes to positive morale and a sense of team spirit
- Offers to help others complete work to ensure the team’s success
- Shares credit with others for team accomplishments

Supervisor
- Participates in constructive dialogue with the team, ensuring multiple perspectives
- Places the team’s priorities above personal objectives
- Supports team decisions and promotes team spirit
- Involves others appropriately when working on team projects

Manager
- Coaches others on how to build effective teams
- Communicates clear goals and roles to team members
- Ensures that the team has the right mix of skills and leverages the strengths of individual members
- Rewards team efforts and accomplishments

People Skills (People)

Building Collaborative Relationships
- Collaborates
- Manages Conflict
- Interpersonal Savvy
- Builds Networks

Optimizing Diverse Talent
- Attracts Top Talent
- Develops Talent
- Values Differences
- Builds Effective Teams

Influencing People
- Communicates Effectively
- Drives Engagement
- Organizational Savvy
- Persuades
- Drives Vision and Purpose
Systems Engineering Leadership Survey

- **Survey Goal**
  - Identify leadership proficiencies vital to Systems Engineering
  - Assess current state of leadership proficiencies among Systems Engineers

- **Research Approach**
  - Google Forms
  - Posted to social media
  - INCOSE chapter distribution list
  - Within authors’ organizations
  - Available for 2 weeks
Participants

• 95 Participants
• 79% Practicing
• Top Industries
  • 41% Military and Defense
  • 27% Aerospace
  • 8% Health Care
  • 6% Government Services
• Top Roles Performed
  • 28% Technical Manager
  • 16% System Designer
  • 11% System Analyst
  • 11% Verification Engineer
• 15 Countries, 20 US states
  • 74% within the United States

US States Represented
Survey Questions
Leadership Proficiencies

### Business Skills (Thoughts)
- Understanding the Business
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### Operating Skills (Results)
- Taking the Initiative
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### People Skills (People)
- Builds Collaborative Relationships
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### Interpersonal Skills (Self)
- Being Authentic
- Being Open
- Being Flexible and Adaptable
These skills are very or extremely important...

**Leadership (People) Skills**
- 88% Team Cohesion
- 93% Balanced Decision Making
- 87% Conflict Resolution
- 84% Appreciation and Recognition
- 92% Creating a Vision and Direction
- 82% Coaching and Mentoring
- 83% Delegating
- 84% Influencing

**Interpersonal Skills**
- 99% Communication
- 97% Problem Solving
- 97% Collaboration
- 95% Adapting to Change
- 75% Self Confidence
- 77% Authenticity
- 94% Dealing with Ambiguity
- 96% Open Mindedness

1-Not Important | 2-Slightly Important | 3-Moderately | 4-Very Important | 5-Extremely Important
...but most Systems Engineers do not possess them.*
(*According to other Systems Engineers)

**42% Possess Leadership Skills**

**48% Possess Interpersonal Skills**
Findings

• Attitudes towards Leadership (people) and Interpersonal Skills in Systems Engineers
  • Near unanimous sense of importance (very and extremely)

• Possession of Leadership (people) and Interpersonal Skills by Systems Engineers
  • Less than half respondents agree or strongly agree SEs possess
What do we do about it?

Risk Response

- **Acceptance**: Risk falls within risk tolerance levels or has been appropriately mitigated due to other risk response activities
- **Avoidance**: Action is taken to exit the activities giving rise to risk
- **Reduction**: Action is taken to reduce the risk likelihood or impact, or both. This may involve a variety of strategies
- **Sharing**: Action taken to reduce the risk likelihood or impact by transferring or otherwise sharing a portion of the risk
Recommendations for Further Research

Identification / ranking of specific leadership competencies vital to a System Engineer’s growth and effectiveness

Develop strategies to increase leadership competencies
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