Characteristics of Effective Systems Engineering Leaders

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Presenters

SoS Authority	What are the effective collaboration patterns in SoS?
Leadership	What are the roles and characteristics, including skills, of effective SoS leaders?
Capabilities and Requirements	How can SE address SoS capabilities and requirements
Testing, Validation, and Learning	How can SE approach SoS validation, testing, and continuous learning in SoS?
SoS Principles	What are the key SoS thinking principles
Constituent Systems	What are effective approaches to integrating constituent systems?
Autonomy, Interdependencies, and Emergence	How can SE address the complexities of interdependencies and emergent behaviors?

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)

Cruelty vs. Mercy
Great Man Theory (1840’s)
Traits (1930’s-1940’s) and Behaviors (1940’s-1950’s)
Situational Leadership (1960’s)
Transactional Leadership (1970’s)
Transformational Leadership (1970’s)

Leadership Theory

Transactional vs. Transformational

Transactional Leadership	Transformational Leadership
Leadership is responsive	Leadership is proactive
Works within the organizational culture	Work to change the organizational culture by implementing new ideas
Transactional leaders make employees achieve organizational objectives through rewards and punishment	Transformational leaders motivate and empower employees to achieve company's objectives by appealing to higher ideals and moral values
Motivates followers by appealing to their own self-interest	Motivates followers by encouraging them to transcend their own interests for those of the group or unit

Leadership Theory:

"is **what** makes people great leaders"

Leadership Style:

"is the **way** that individual leaders lead"

Leadership Theory vs. Leadership Style

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

Leadership Style

Primal Leadership by Daniel Goleman, Richard Boyatzis, and Annie McKee

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?

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- Most common answer: "the captain"

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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"
- Additional answers:
  - "the navigator, setting the direction"
  - "the helmsman, actually controlling the direction"

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"
- 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

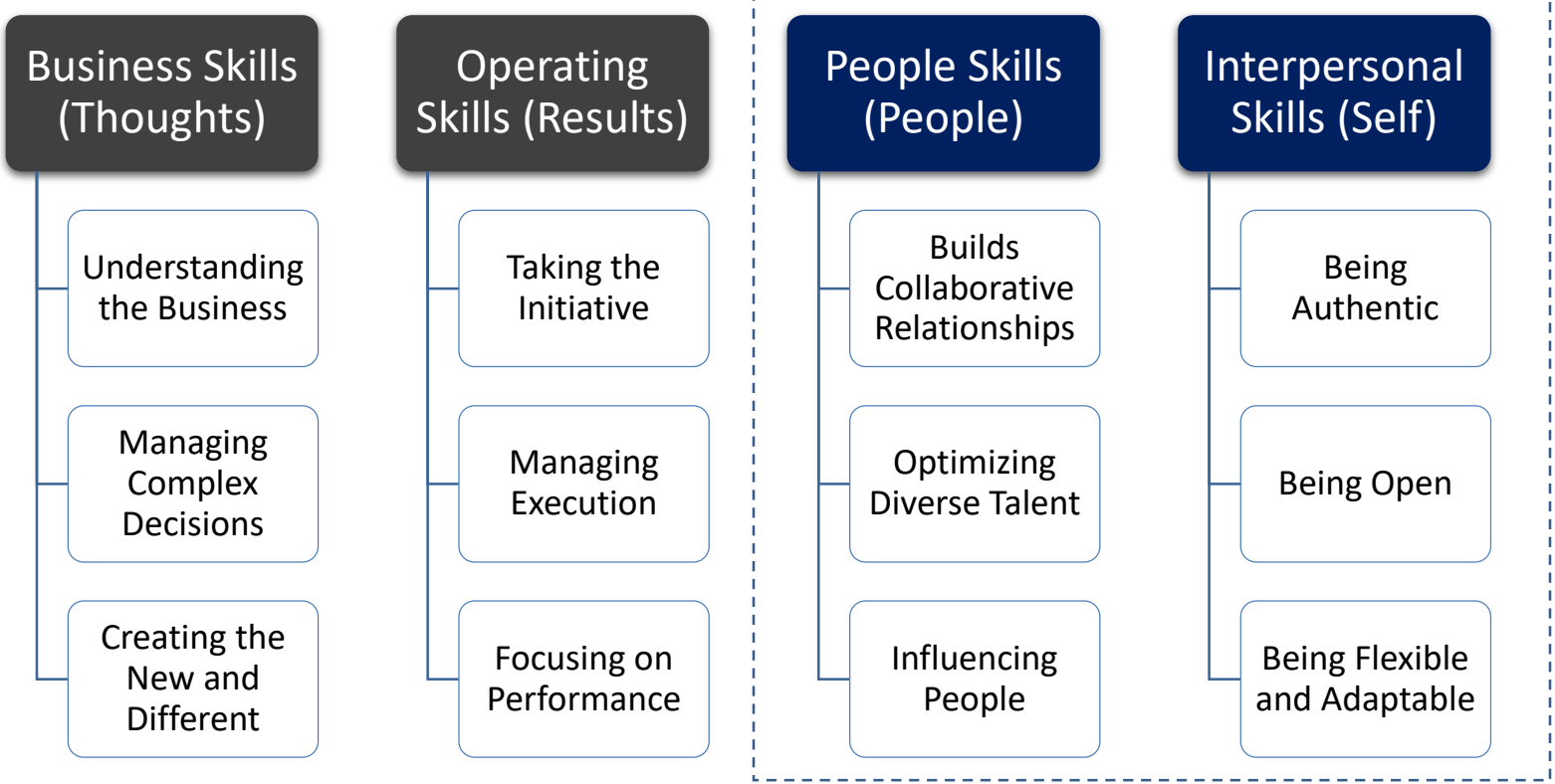
No one has a more sweeping influence on the ship than the designer. Leaders who appreciate organizations as living systems realize that they can create organizational artifacts like new metrics, or formal roles and processes, or intranet Web sites, or innovative meetings - but it is what happens when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

Systems Engineering Research Center Atlas Model	NASA Engineering Leadership Program
1. Math / Science / General Engineering	1. Leadership
2. Systems Domain & Operational Context	2. Attitudes and Attributes
3. Systems Engineering Discipline	3. Communication
4. Systems Engineering Mindset	4. Problem Solving and Systems Thinking
5. Interpersonal Skills	5. Technical Acumen
6. Technical Leadership	



Leadership Proficiencies

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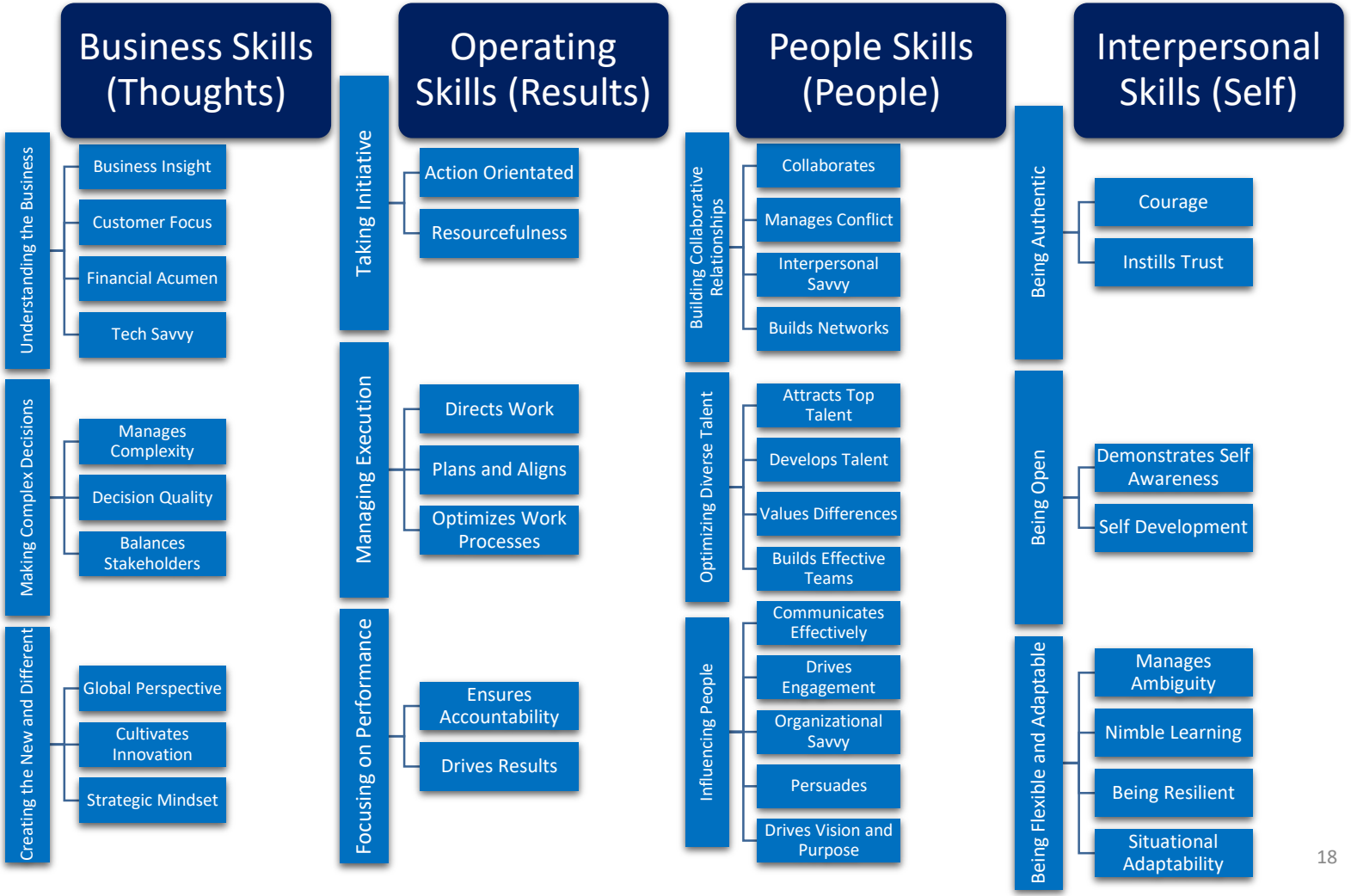
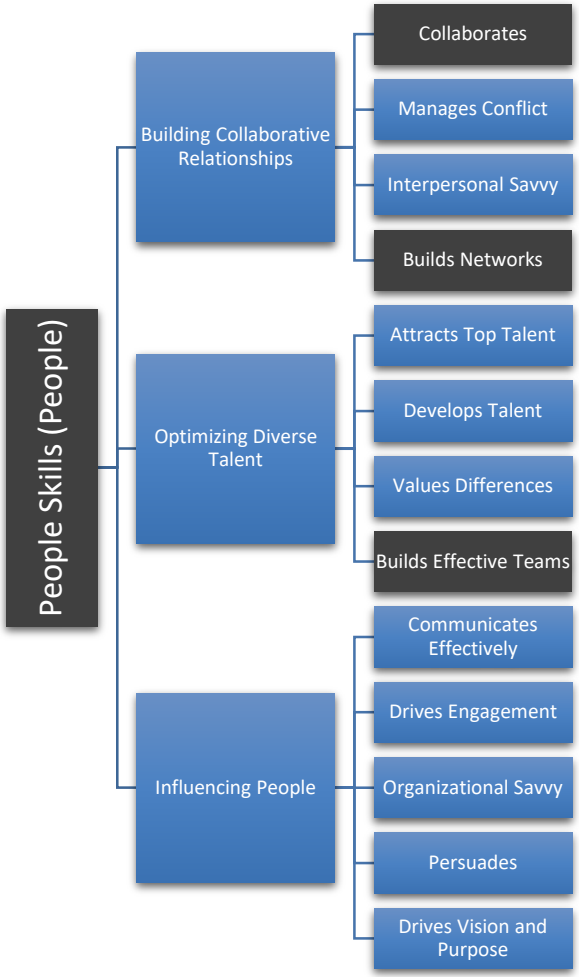
Leadership Architect

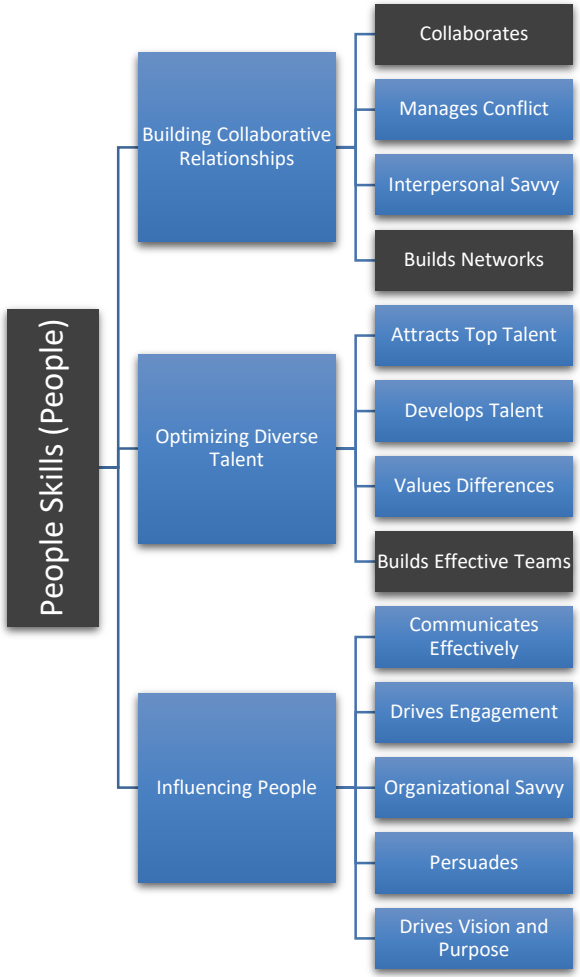

Business Skills (Thoughts)
Understanding the Business
Business Insight
Customer Focus
Financial Acumen
Tech Savvy
Making Complex Decisions
Manages Complexity
Decision Quality
Balances Stakeholders
Creating the New and Different
Global Perspective
Cultivates Innovation
Strategic Mindset
Operating Skills (Results)
Taking Initiative
Action Orientated
Resourcefulness
Managing Execution
Directs Work
Plans and Aligns
Optimizes Work Processes
Focusing on Performance
Ensures Accountability
Drives Results
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
Interpersonal Skills (Self)
Being Authentic
Courage
Instills Trust
Being Open
Demonstrates Self Awareness
Self Development
Being Flexible and Adaptable
Manages Ambiguity
Nimble Learning
Being Resilient
Situational Adaptability



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 sills and leverages the strengths of individual members
- Rewards team efforts and accomplishments

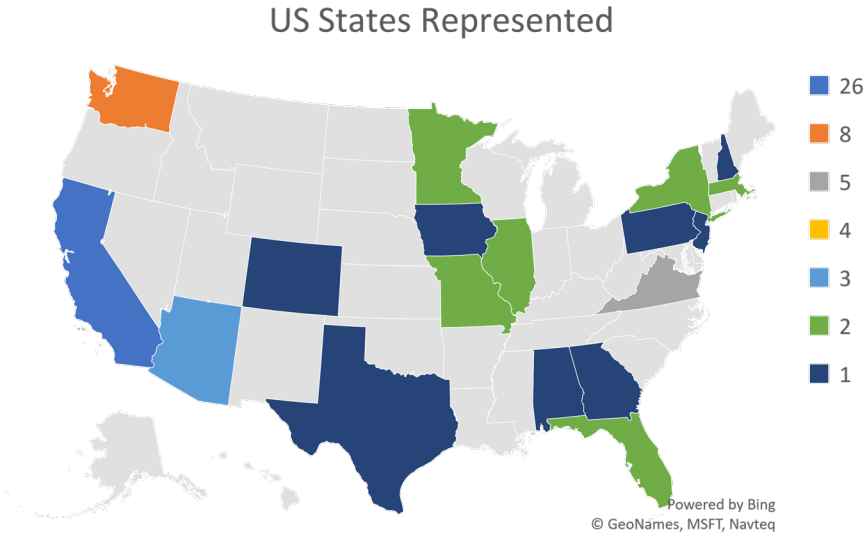
Systems Engineering Leadership Survey

- 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



Survey Questions

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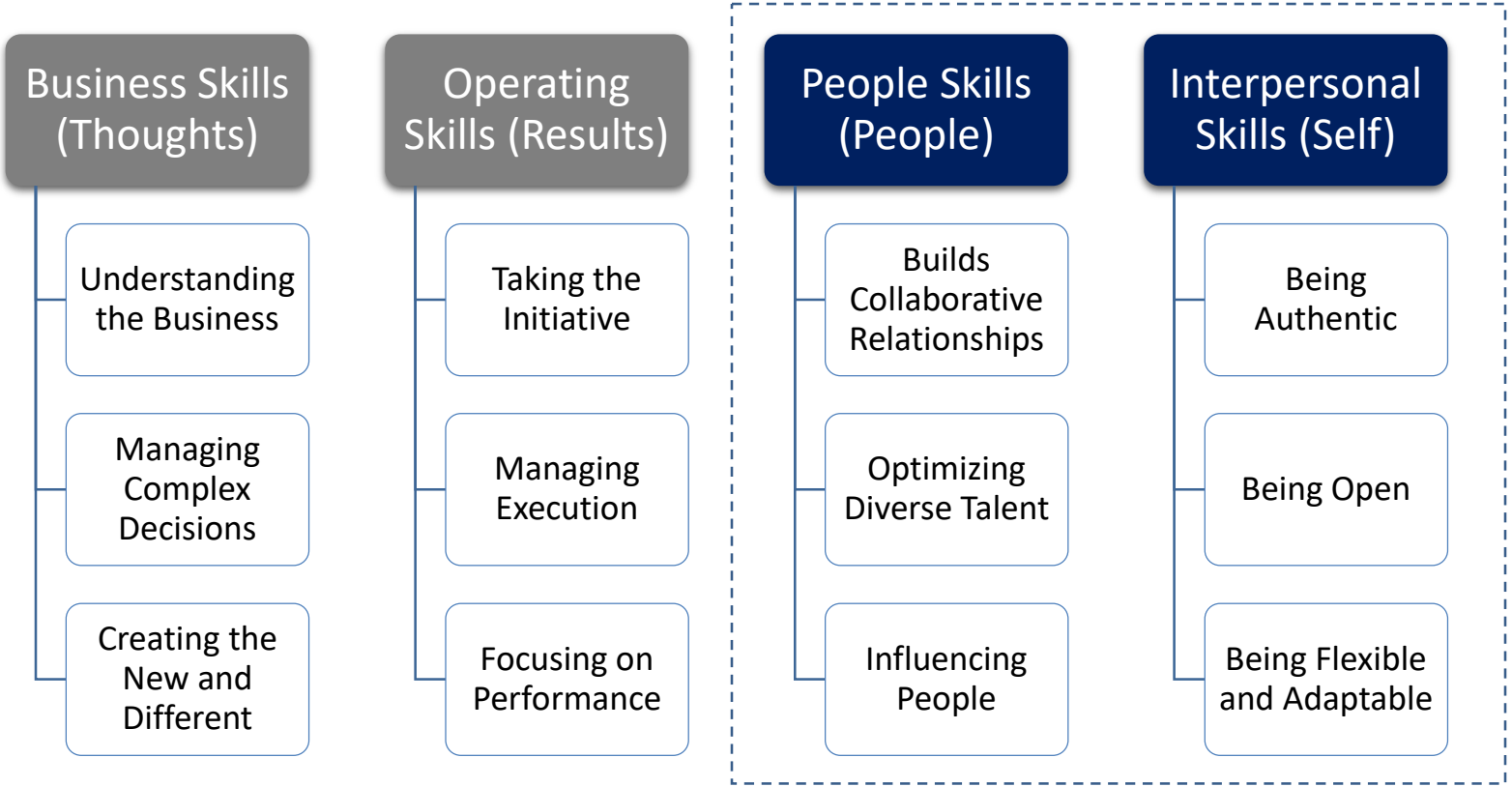
Leadership Proficiencies



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

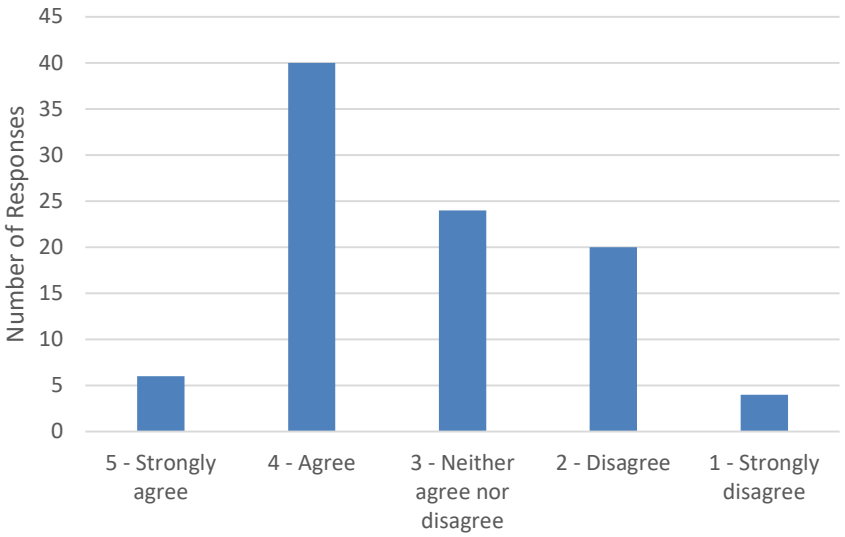
- 99% Communication
- 97% Problem Solving
- 97% Collaboration
- 95% Adapting to Change
- 75% Self Confidence
- 77% Authenticity
- 94% Dealing with Ambiguity
- 96% Open Mindedness

1-Not Important| 2-Slightly Important | 3-Moderately| 4-Very Important | 5-Extremely Important

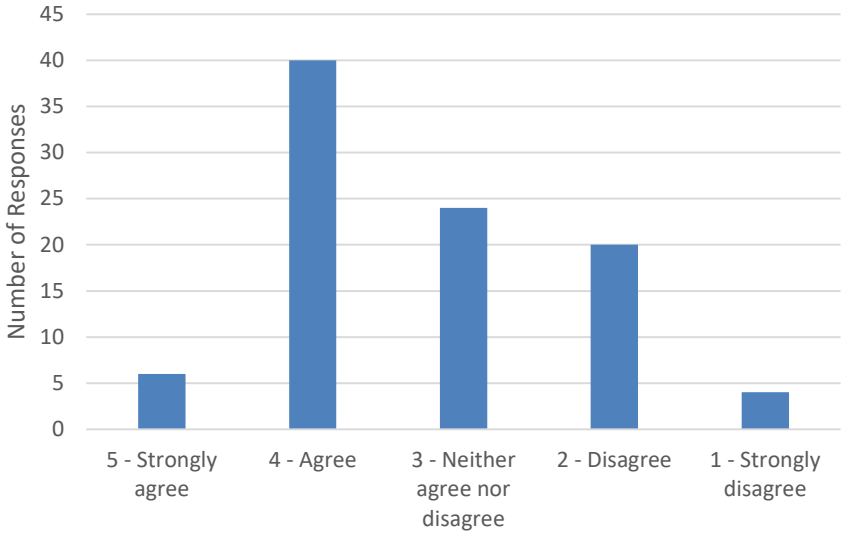
…but most Systems Engineers do not possess them.*

(*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

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

Develop strategies to increase leadership competencies

Recommendations for Further Research

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