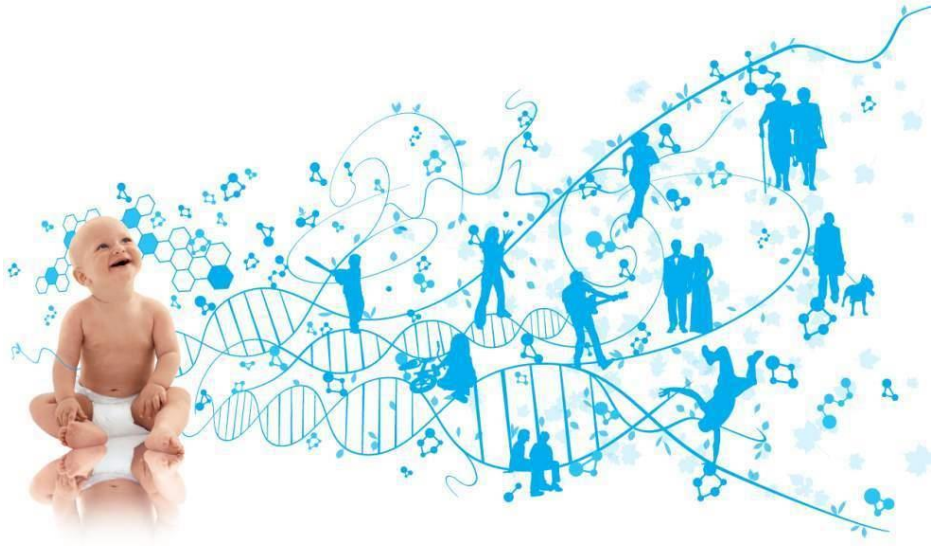
Assessment and Development of Leadership for Systems Engineers at GE Healthcare



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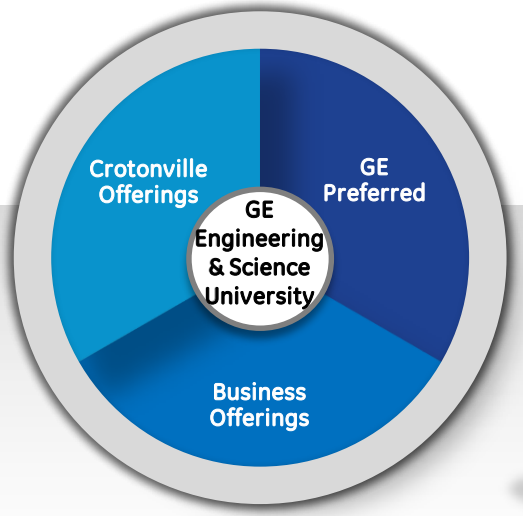
GE Engineering & Science University Vision

To Transform the Capabilities of GE's Engineering/Technology Function to Enable Digital-Industrial Excellence



Foundation (ITM Learning Architecture)

Engineering & Science University

Maximize Learning Margins (Digital Learning)

Deliver Extraordinary Pipeline Development Programs

GE Healthcare Systems Engineering
Skills Assessment - Competency Model

Technical Excellence Competencies
SE 1.0 System Design
SE 1.1 Scope and Requirements Management
SE 1.2 Architecture and Design Optimization
SE 2.0 Product Realization
SE 2.1 Application, Product, and Technology Knowledge
SE 2.2 Product Integration, Verification , and Validation
SE 2.3 Product Lifecycle/ DFx Management
SE 3.0 Technical Management
SE 3.1 Systems Engineering Management
SE 3.1.1 Technical Design Reviews
SE 3.2 Technical Risk Management (and Safety)
SE 4.0 Critical Thinking

SE 5.0 Technical Leadership Competencies
SE 5.1 Communication and Conflict Resolution
SE 5.2 Takes Risks Courageously
SE 5.3 Adapts and Leads Change
SE 6.0 Business Acumen
SE 6.1 Customer, Clinical and External Acumen
SE 7.0 Personal Attributes
SE 7.1 Execution and Accountability
SE 7.2 Teamwork and Collaboration

Balancing simplicity with effectiveness

- ✓ 4 Technical, 3 Leadership Competency Areas
- ✓ 15 Competency sub-areas
- ✓ 51 Behavioral anchors

Behavioral Anchors

SE 4.0 Critical Thinking: Competencies and Behaviors

4.1 Frames Problems and Decision Making – Accurately frames complex and ambiguous problems, including key issues and critical stakeholder input. Uses creative approaches to synthesize separate pieces of data from multiple sources, to make sound and rational decisions in complex situations.

	Aware	Skilled	Expert	Strategist
Frames Problem	• Identifies and relates key issues to customer, market and business value.	• Identifies key issues, utilizing a systematic and methodical approach to prioritize problems.	• Accurately frames a complex problem, using foresight to sort out essential from detail.	• Accurately and confidently frames a complex system problem, appropriately engaging and challenging experts and advocates.
Trade Offs	• Recognizes that a problem exists tradeoffs between similar design criteria.	• Avoids jumping into problem solving before actually framing the problem and brainstorming scenarios and solutions.	• Balances traditional project management concerns of cost and schedules, with technical requirements, sound evidence and sources.	• Utilizes innovative approaches and relevant evidence to remove bias and identify predispositions.
Decisions	• Identifies correct data needed to make a decisions.	• Collaborates to logically examine facts and situations to arrive at a decision.	• Accepts decision making responsibility, balancing analysis and intuition, while considering program implications.	• Comfortable with uncertainty; experiments with innovative solutions, using logic , intuition and past experience to make system life-cycle decisions.

SYSTEMS ENGINEERING Research Center

Project Helix

HELIX

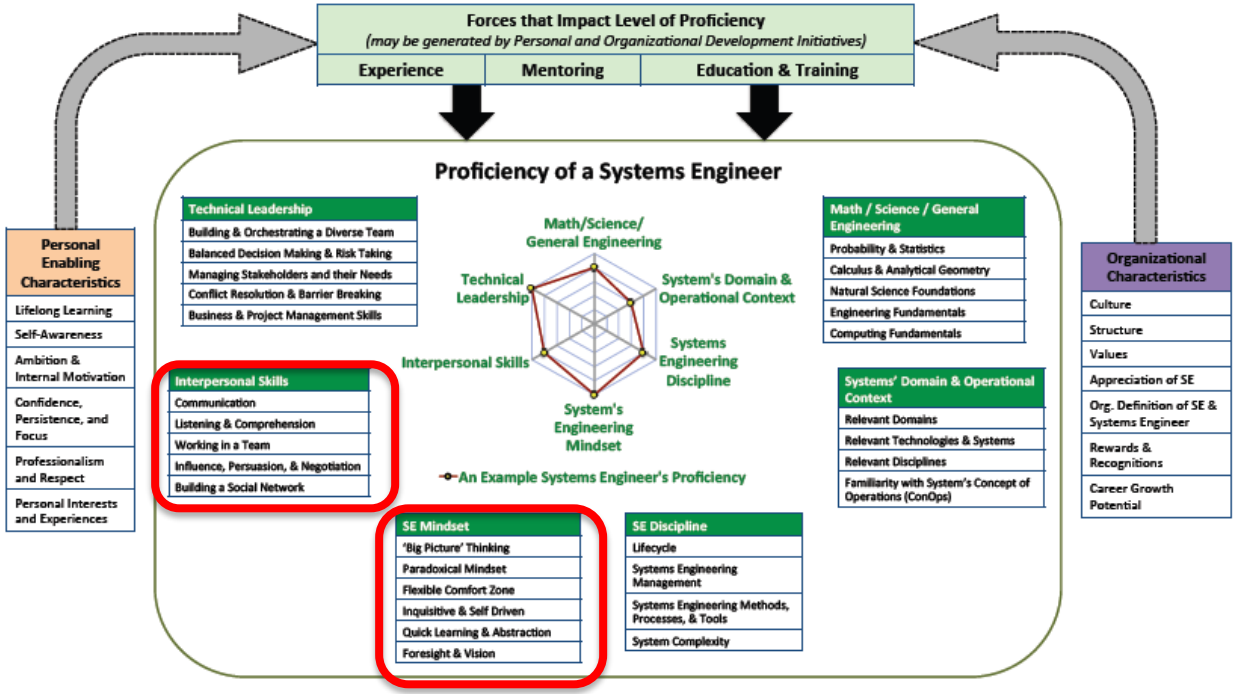
Helix is a research project that is attempting to answer three questions:

1. What are the characteristics of systems engineers?
2. How effective are systems engineers and why?
3. What are employers doing to improve the effectiveness of their systems engineers?

- Helix follows a grounded-theory based research approach and uses qualitative and quantitative research methods to develop *Atlas: The Theory of Effective Systems Engineers*.
- Data has been collected through in-depth interviews with nearly 300 systems engineers and others from 21 organizations in the defense, aerospace, transportation, IT, and healthcare business sectors (May 2016)

N. Hutchison, et al. "*Atlas: The Theory of Effective Systems Engineers, version 1.0, December 16, 2016.*" Systems Engineering Research Center (SERC), Stevens Institute of Technology: Hoboken, NJ.

Helix Model of Competencies



How to assess some of the softer skills on the left?

- "Paradoxical mindset"
- "Flexible comfort zone"
- …

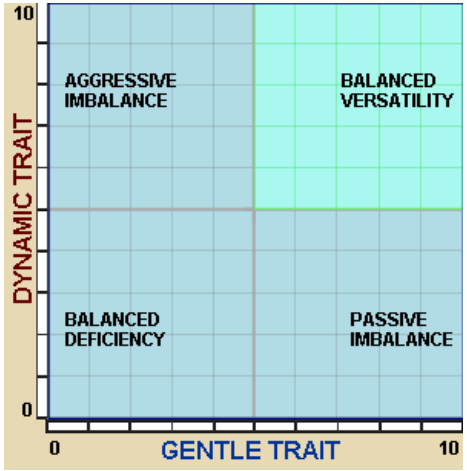
Harrison Assessment

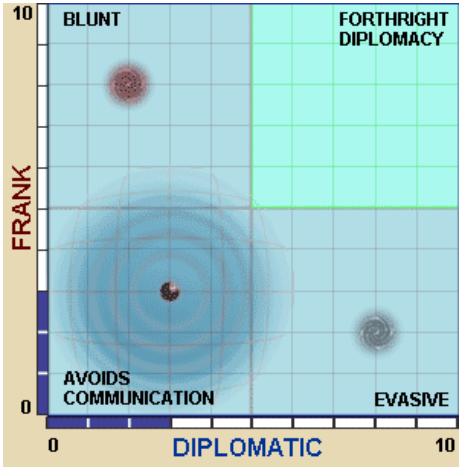
We used the managers assessment of the employee's technical skills (mixed with senior technical people's inputs)

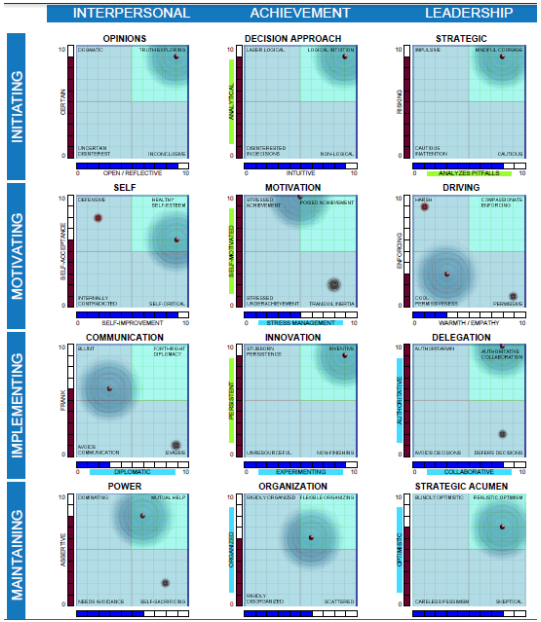
For leadership skills we complemented that with a 'work preference tool' (Harrison Assessment)

- Measures 175 independent critical traits
- Summarizes 12 "Paradoxes"…well mapped to the Helix study critical skills

Example “Paradox” - Communication



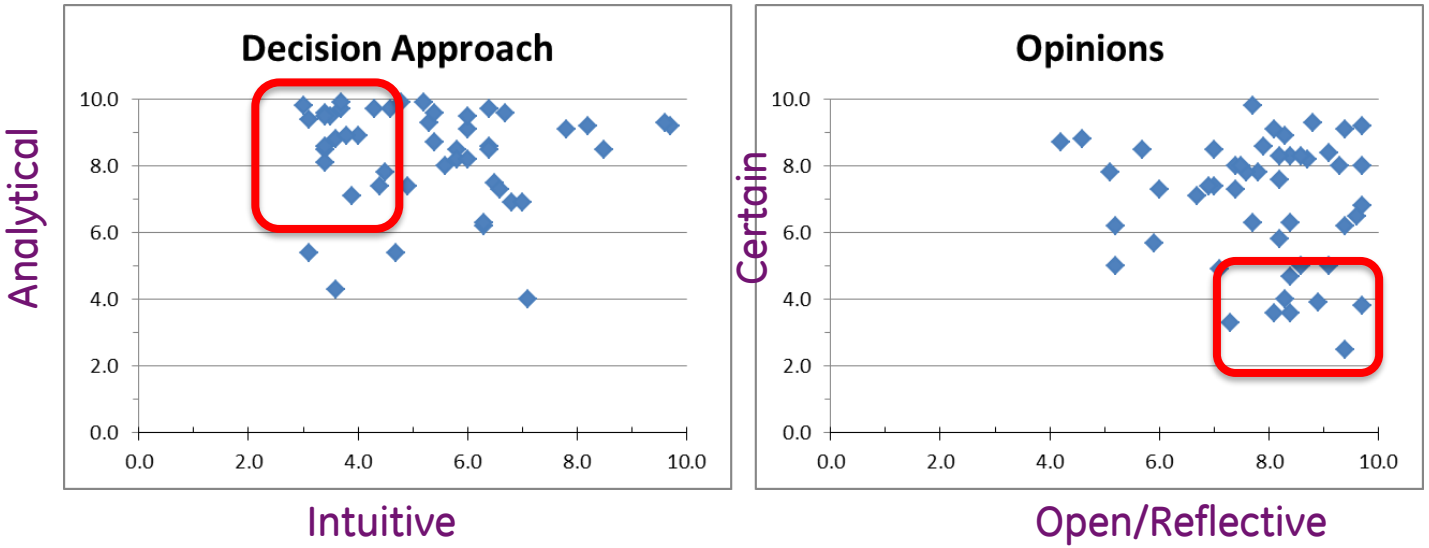




Paradoxical traits are complementary, not contradictory

Possible to be strong in both…and both are useful

Example GE Healthcare Skill Portfolio



Employees are individuals, but as a trend…

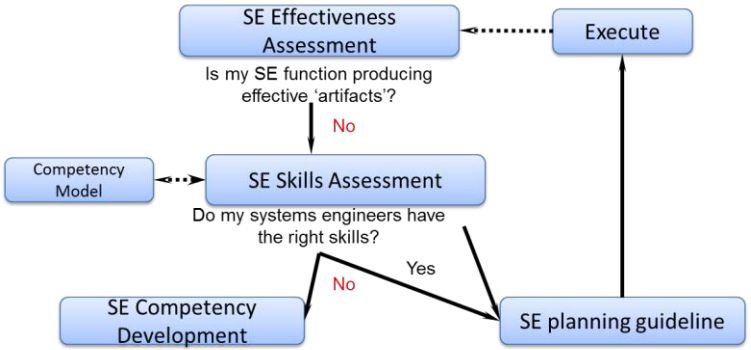
Our SE leaders **tend** to be “laser logical” and “inconclusive”

Conclusion

We implemented SE Professional Development as a 'system'

Focused on the competency model

- Forms the basis for the 'terminology' of the system
- Leadership skills (including critical thinking) are a key component of the model
- Used "Harrison Assessment" to measure some **paradoxical thinking** identified as critical in the Helix/Atlas model of Systems Engineering professional development and effectiveness



INCOSE SE Handbook v4 (Fig 2.9)

Working on the right mix of assessments, coaching, and training to develop the proper leadership skills.