RT-198: Helix: Developing an Understanding of Organizational Systems Engineering Effectiveness

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Research Task / Overview

- Since 2012, the Helix project has investigated what makes systems engineers effective; this work culminated in ***Atlas: The Theory of Effective Systems Engineers*** and other products as shown in Figure 1.

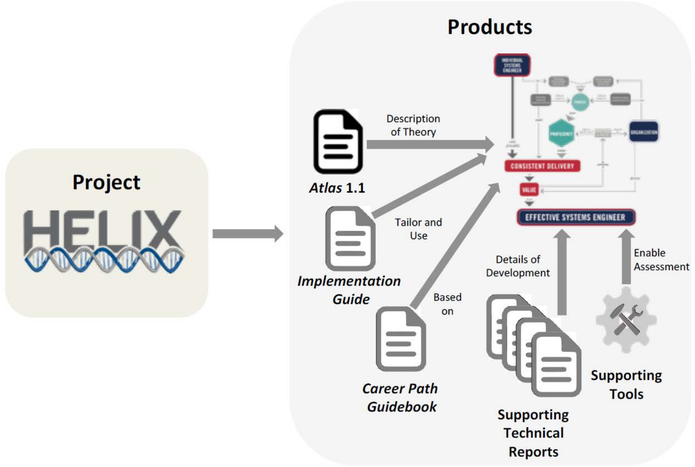


Figure 1: Overview of the Helix Project

- This year, the Helix team transitioned from an exclusively workforce focus to include how organizations can become more effective at systems engineering and how they can better enable their workforce.

Data & Analysis

- Current work incorporates the understanding of individual systems engineers defined in *Atlas* (Figure 2), and also incorporates more depth on organizational culture, governance, structure, and workforce composition on the systems engineering workforce effectiveness.

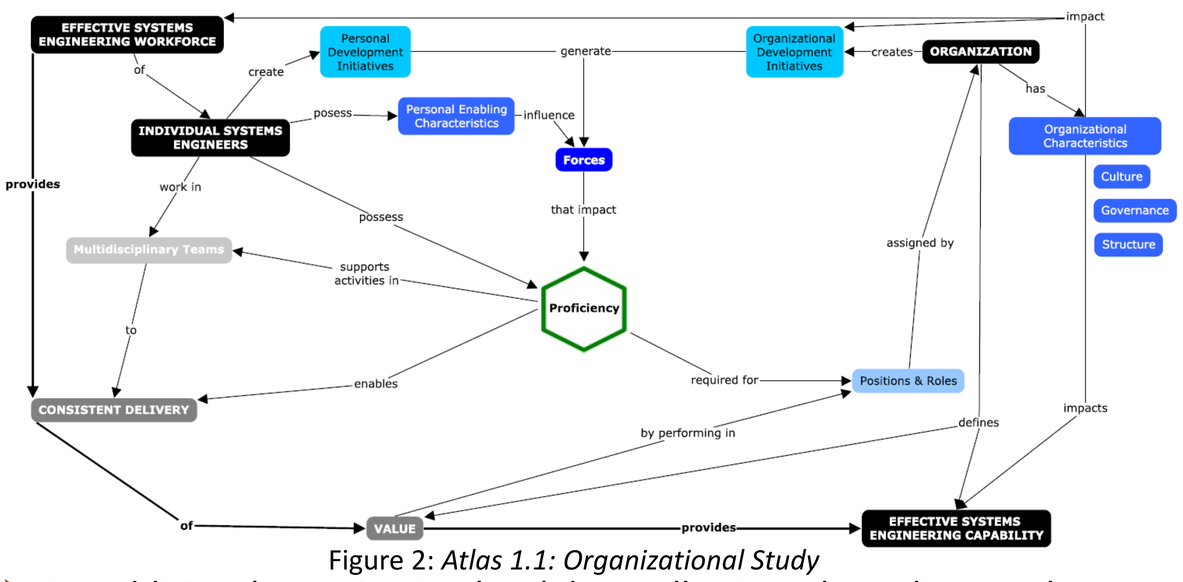
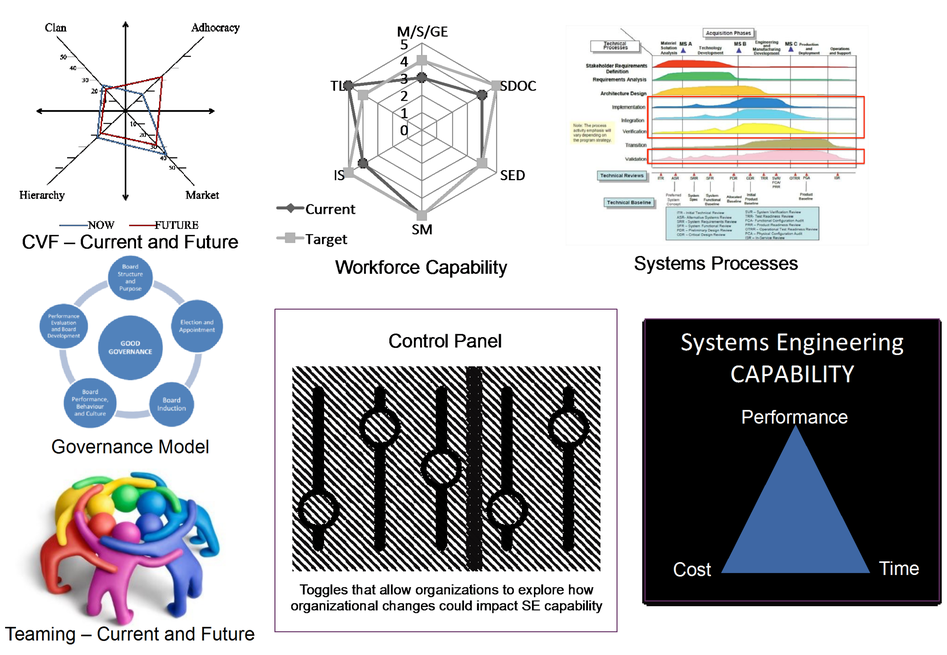


Figure 2: *Atlas 1.1: Organizational Study*

- For additional organization-level data collection, the Helix team has developed a web-based survey by integrating *Atlas,* the Competing Values Framework (CVF), and the Quality of Interaction Index (Qi Index) to understand the organization alignment.
- The Qi Index assessment helps organizations identify specific team behaviors that may impact the overall team performance.
- Using the CVF, the team can analyze to see how the organizational cultures impact the organization's ability to deliver systems engineering capabilities.
- Team is analyzing interview data, survey responses, organizational profiles, and systems engineers' self assessments to identify the patterns and relationships between these variables.



Conceptualization of the Organizational Simulator for SE Capability (estimated completion December 2019)

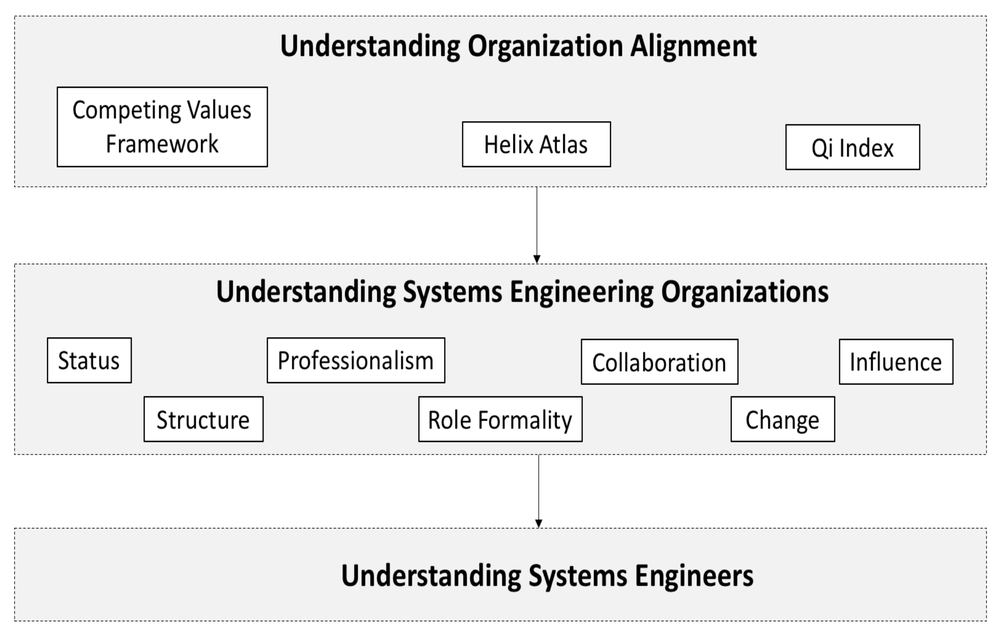
Goals & Objectives

- In 2017, the Helix team expanded the research to look more closely at the organizational factors that influence systems engineering as a discipline and the delivery of effective systems engineering capability.
- This research task is investigating the following research questions:
  - **How can organizations improve the effectiveness of their systems engineering workforce?**
  - **How does the effectiveness of the systems engineering workforce impact the overall ability of an organization to successfully deploy increasingly complex systems and solutions (i.e., to have an effective systems engineering capability)?**
  - **What critical factors, in addition to workforce effectiveness, are required to enable systems engineering capability?**
- The goal is to have a theory (similar to *Atlas)* that describes the main variables that define organizational systems engineering effectiveness.

Methodology

The Helix team has created a new methodology and process which:

- Builds off the learning for individual systems engineers, including improving data collection for proficiency and career path self assessments
- Delves into the culture, governance, and structure of the organizations, including:
  - **How are these intended to function?**
  - **How do they function in practice?**
  - **What is the alignment between these elements?**
  - **How do these aspects of the organization foster or inhibit systems engineering capability?**



Future Research

- Additional data collection with the web-based survey, site interviews, self assessments, and follow-up interviews with Helix participants.
- Continue data analysis to find organizational patterns from the organizational profiles, CVF analysis, Qi Index analysis, and the self assessments.
- Expand the modeling and simulation efforts to include natural language processing, text mining, agent-based, and system dynamics.
- Enhance the user interface of the self assessment tool.

Call for Participation

- Scan the QR code below to explore ways to participate:
- To participate in the Helix project, please contact Dr. Nicole Hutchison at Nicole.Hutchison@stevens.edu.