Guide to *Atlas 1.0* Self-Assessment Tools

Overview

This document provides user instructions for the Excel-based tools that support analysis using the *Atlas 1.0* theory of effective systems engineers. (Hutchison et al. 2016) The table of contents is as follows:

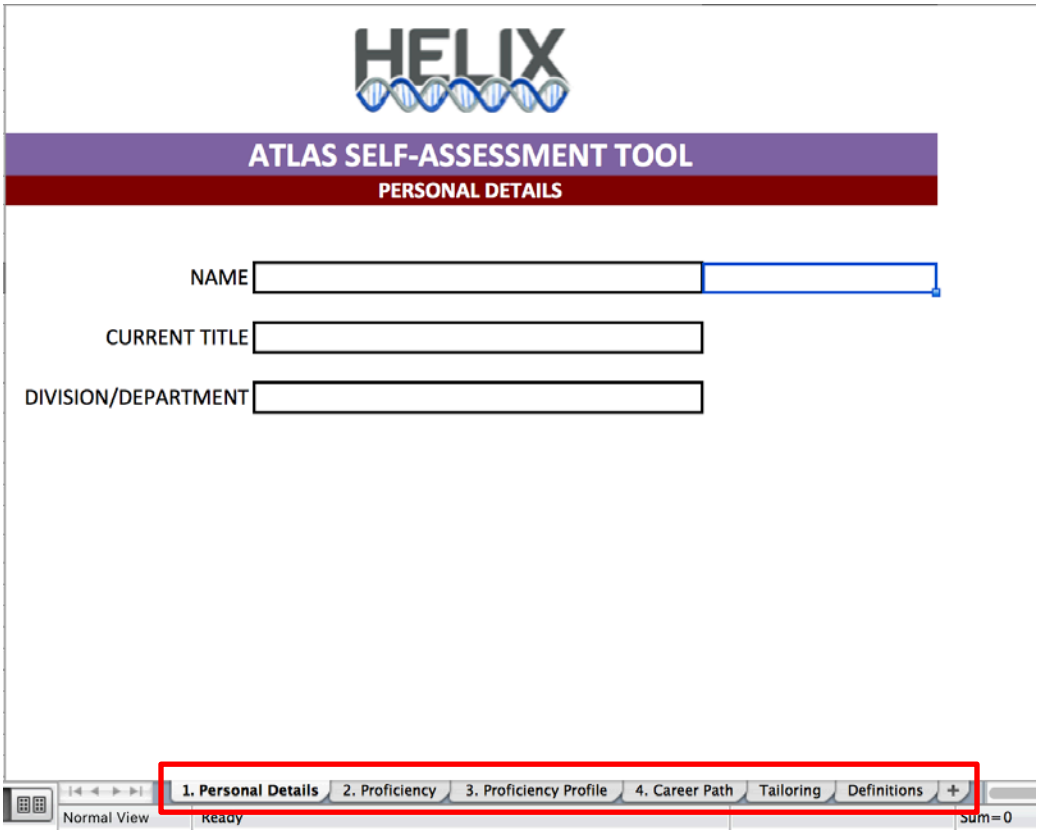
These tools are available for download on the Helix website (http://www.sercuarc.org/projects/helix/). If you have any questions about this tool, please contact the Helix team at helix@stevens.edu.

OVERVIEW OF THE TOOL

The Excel tool consists of six tabs:

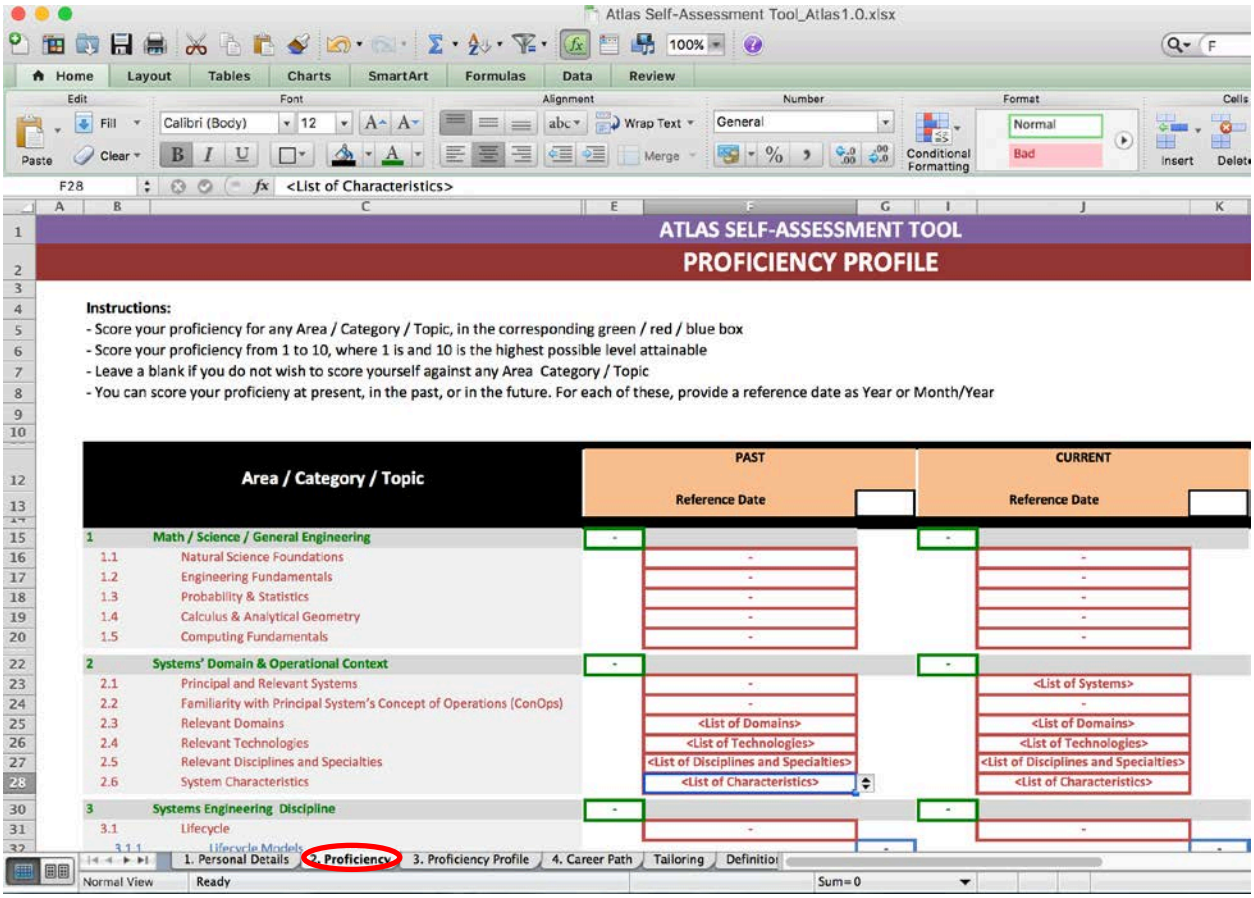
- 1. **Personal Details** – These capture the key data for an individual performing the assessment. If using the tool for only your own personal analysis, this does not need to be completed. However, if an organization has requested that you provide a profile, it will be important to capture this information.
- 2. **Proficiency** – This is the tab in which you will record all of your proficiency profile information.
- 3. **Proficiency Profile** – This tab should *not* be edited. It automatically generates a proficiency profile (radar chart) based on the data you enter in the Proficiency tab.
- 4. **Career Path** – This is the tab in which you will record all of your career path information.
- **Tailoring** – This tab allows editing of the drop-down lists used to complete the proficiency profile. In general, individual users should not expect to edit this tab but organizations may wish to use this to tailor the tools specifically to their employees.
- **Definitions** – Definitions for all critical elements captured in *Atlas 1.0* are provided.

Screenshots of the tool are provided throughout this guide as appropriate.



PROFICIENCY SELF-ASSESSMENT

Proficiency self-assessment data will be recorded in the "2. **Proficiency**" tab of the tool, as shown below.



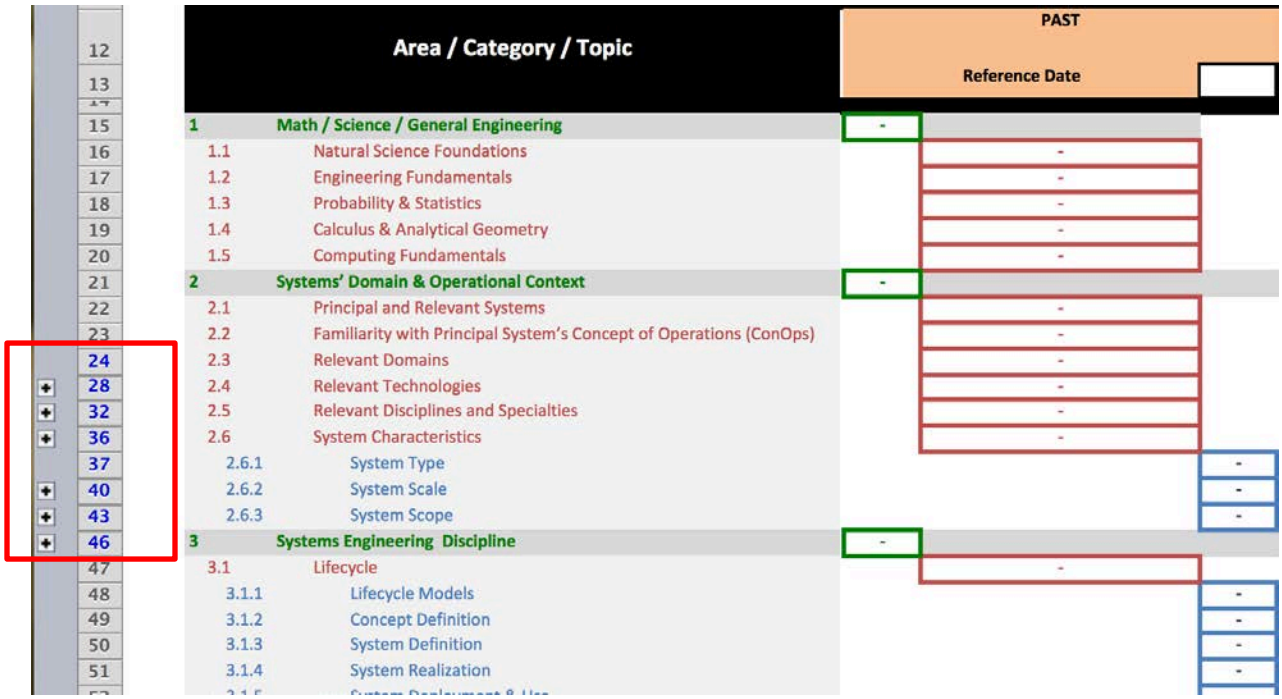
Proficiency defines the knowledge, skills, abilities, behaviors, patterns of thinking, and abilities that are critical to the effectiveness of systems engineers. The *Atlas* proficiency model consists of six difference proficiency areas:

- **Math/Science/General Engineering**: Foundational concepts from mathematics, physical sciences, and general engineering;
- **System's Domain & Operational Context**: Relevant domains, disciplines, and technologies for a given system and its operation;
- **Systems Engineering Discipline**: Foundation of systems science and systems engineering knowledge;
- **Systems Engineering Mindset**: Skills, behaviors, and cognition associated with being a systems engineer;
- **Interpersonal Skills**: Skills and behaviors associated with the ability to work effectively in a team environment and to coordinate across the problem domain and solution domain; and
- **Technical Leadership**: Skills and behaviors associated with the ability to guide a diverse team of experts toward a specific technical goal.

Each of these areas contains several categories, or groupings of related knowledge, skills, abilities, behaviors, or cognitions, as illustrated in Table 1.

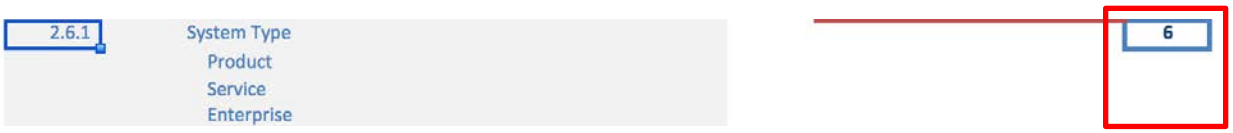
Tailoring

There is some tailoring expected for the proficiency self-assessment. Where tailoring is expected, the related fields are grouped together to make the spreadsheet easier to navigate. Simply click on the "+" button beside a group to expand it. This is illustrated below.



For example, under "System's Domain and Operational Context", there are many drop-down fields. These fields are where you can tailor the model appropriately for your work and experiences. Under "System Type", you can select the type of system (product, service, or enterprise) that is most relevant. This is illustrated below.

If you would like to make more than one selection, simply select the *entire row* for item, right click, and select, "INSERT ROW". Then you can select the field you would like to add drag it up to copy the exact contents into this row. You can also copy/paste the field. Repeat this until you have captured everything you feel is appropriate. Note that do not have to score each one of these areas, but you will instead score only the Category or Topic, as shown below.

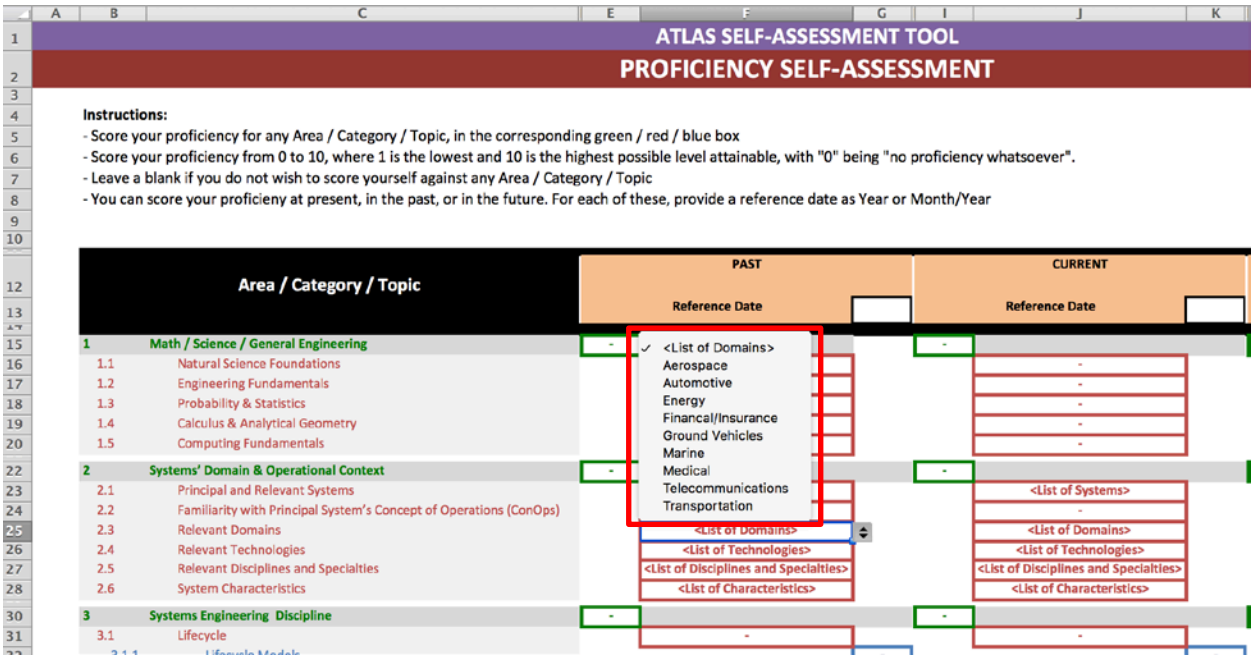


Self-Assessment

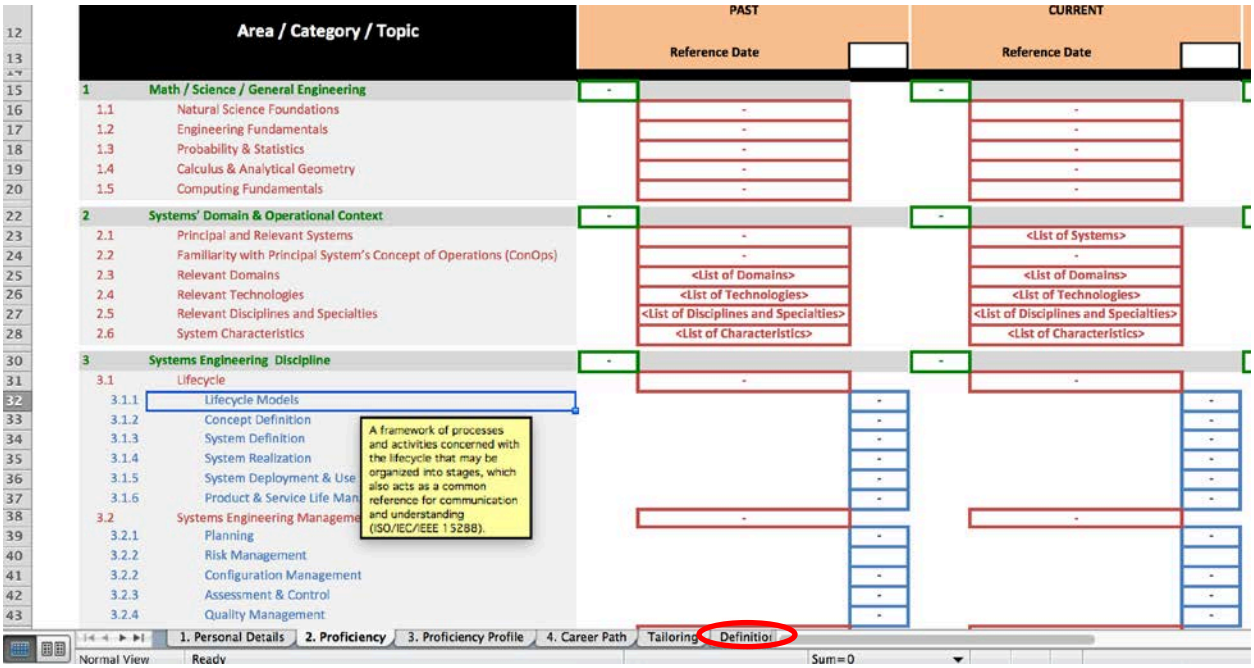
In order to perform a self-assessment, individuals are asked to review the definitions of the proficiency areas above and the categories in Table 1. Additional detail can be found in the full report on *Atlas* 1.0, found at the Helix website: http://www.sercuarc.org/projects/helix/.

Then Excel template can then be used to capture your "0 to 10" assessment of based on your current proficiency in each Area, with "0" meaning you have no skill in the area and 10 meaning your skills are the top within your experiences. Consider the following guidelines:

- For each Proficiency Area, think about proficiency across *all categories*, not just one. For example, if you are a "10" in a single category, but a "5" in all others, you would not be a "10" for the entire Area.
- For each Area, think about what is most critical for your current position. This may not change your assessment, but may mean that a lower number not an issue.
- Consider your past experiences in the Area, any training or education that might be relevant, and where you might have received guidance from a mentor or leader. These things together will have shaped your proficiency, and thinking about them may help you to assess yourself more realistically.
- You know your strengths and areas for growth – be honest in your responses.



Each field of the proficiency model has a definition embedded as roll over text. When you select a cell, the definition will appear, as shown below. These definitions are abbreviated. The complete definitions can be found in the "Definitions" tab (circled below).



Once you have completed your initial assessment for your *current* proficiency, you can choose to retroactively assess what your proficiency was at different points in your career. For example, when you completed your undergraduate education or joined your current organization. This may help you to better reflect on changes over time. If you do this, revisit your current proficiency assessment afterwards and determine whether any adjustments are required.

Finally, if desired, you can use the tool to capture a *target* proficiency profile. This may be based on your own desires ("I would like to be better in . . ."), recommendations from your mentor, leadership, or manager ("I think you would do well in . . ."), or based on organizational data (such as a published proficiency profile for a position in which you are interested).

The following pages provide the structure of the proficiency model as well as a rubric to provide guidance for your self-assessment.

N.B. Filling in an assessment for the Topics and Categories is very helpful, and will enable you to think critically about your overall proficiency in each area. However, your score for each area is self-selected; there is no algorithm to auto-generate your scores based on the underlying data.

Table 1. *Atlas 1.0* Proficiency Model

Area	Category	Topic
1. Math / Science / General Engineering	1.1. Natural Science Foundations	
	1.2. Engineering Fundamentals	
	1.3. Probability and Statistics	
	1.4. Calculus and Analytical Geometry	
	1.5. Computing Fundamentals	
2. Systems' Domain & Operational Context	2.1. Principal and Relevant Systems	< List of Principal and Relevant Systems >
	2.2. Familiarity with Principal System's Concept of Operations (ConOps)	
	2.3. Relevant Domains	< List of relevant Domains >
	2.4. Relevant Technologies	< List of relevant Technologies >
	2.5. Relevant Disciplines and Specialties	< List of relevant Disciplines and Specialties >
	2.6. System Characteristics	< List of applicable System Types, Scales, and Levels >
3. Systems Engineering Discipline	3.1. Lifecycle	3.1.1 Lifecycle Models 3.1.2 Concept Definition 3.1.3 System Definition 3.1.4 System Realization 3.1.5 System Deployment and Use 3.1.6 Product and Service Life Management
	3.2. Systems Engineering Management	3.2.1 Planning 3.2.2 Risk Management 3.2.3 Configuration Management 3.2.4 Assessment and Control 3.2.5 Quality Management
	3.3. SE Methods, Processes, and Tools	3.3.1 Balance and Optimization 3.3.2 Modeling and Simulation 3.3.3 Development Process 3.3.4 Systems Engineering Tools
	3.4. Systems Engineering Trends	3.4.1 Complexity 3.4.2 Model Oriented Systems Engineering 3.4.3 Systems Engineering Analytics 3.4.4 Agile Systems Engineering
4. Systems Engineering Mindset	4.1. Big-Picture Thinking	
	4.2. Paradoxical Mindset	4.2.1 Big-Picture Thinking and Attention to Detail 4.2.2 Strategic and Tactical 4.2.3 Analytic and Synthetic 4.2.4 Courageous and Humble 4.2.5 Methodical and Creative
	4.3. Flexible Comfort Zone	
	4.4. Abstraction	
	4.5. Foresight and Vision	
5. Interpersonal Skills	5.1. Communication	5.1.1 Audience 5.1.2 Content 5.1.3 Mode
	5.2. Listening and Comprehension	
	5.3. Working in a Team	
	5.4. Influence, Persuasion and Negotiation	

Area	Category	Topic
	5.5. Building a Social Network	
6. Technical Leadership	6.1. Building and Orchestrating a Diverse Team	
	6.2. Balanced Decision Making & Rational Risk Taking	
	6.3. Guiding Stakeholders with Diverse/Conflicting Needs	
	6.4. Conflict Resolution & Barrier Breaking	
	6.5. Business and Project Management Skills	
	6.6. Establishing Technical Strategies	
	6.7. Enabling Broad Portfolio-Level Outcomes	

Table 2. Rubric for Self-Assessment

Atlas Proficiency Area / Category	Proficiency Level "1"	Proficiency Level "3"	Proficiency Level "5"
1. Math / Science / General Engineering			
1.1. Natural Science Foundations	Minimal awareness of the basic concepts of physics, chemistry, and biology		Expert in the principles and concepts of physics, chemistry and biology including practical experience, and ability to apply these in the system's context
1.2. Engineering Fundamentals	Minimal awareness of the basic engineering concepts, processes, and techniques.		Expert in basic engineering concepts, processes, and techniques including practical experience, and ability to apply these in the system's context
1.3. Probability & Statistics	Minimal awareness of the basics of probability and statistics		Expert in probability theory, probability distributions, statistical measures and other related topics, and ability to readily apply them where required
1.4. Calculus & Analytical Geometry	Minimal awareness of differential calculus, integral calculus, coordinate systems, and geometric equations		Expert in differential and integral calculus methods, coordinate systems, transformations, describing and analyzing geometric objects and ability to readily apply them where required

Atlas Proficiency Area / Category	Proficiency Level "1"	Proficiency Level "3"	Proficiency Level "5"
1.5. Computing Fundamentals	Minimal awareness of computer organization, operating systems, and programming languages		Expert in computer architectures, networking, operating systems, programming languages and ability to readily apply them where required
2. Systems' Domain & Operational Context			
2.1. Principal and Relevant Systems	Minimal knowledge about the specific systems		Expert in the specific systems, their development and operation
2.2. Familiarity with System's Concept of Operations (ConOps)	Minimal awareness of the ConOps of the principal system		Expert in the ConOps of the system, and the ability to comprehensively develop ConOps
2.3. Relevant Domains	Minimal familiarity with the terminology and basic concepts of the specific domains		Expert in the domain and the development and operation of systems in that domain.
2.4. Relevant Technologies	Minimal familiarity with the terminology and basic concepts of the specific technologies		Expert in the technology and its current development, and the ability to easily apply it to system development
2.5. Relevant Disciplines and Specialties	Minimal familiarity with the terminology and basic concepts of the specific disciplines		Expert in the discipline and latest advancements
2.6. System Characteristics	Minimal familiarity with the specific Types, Scales, and Levels of systems		Expert in the specific Types, Scales, and Levels of systems
3. Systems Engineering Discipline			
3.1. Lifecycle	Minimal awareness of lifecycle models and lifecycle stages		Expert in the understanding of lifecycle models and how systems are developed in them. A deep understanding of specific lifecycle stages of system development and ability to carry out the required technical activities at those stages
3.2. Systems Engineering Management	Minimal awareness of systems engineering management activities		Expert in specific topics of systems engineering management and ability to perform the required management activities

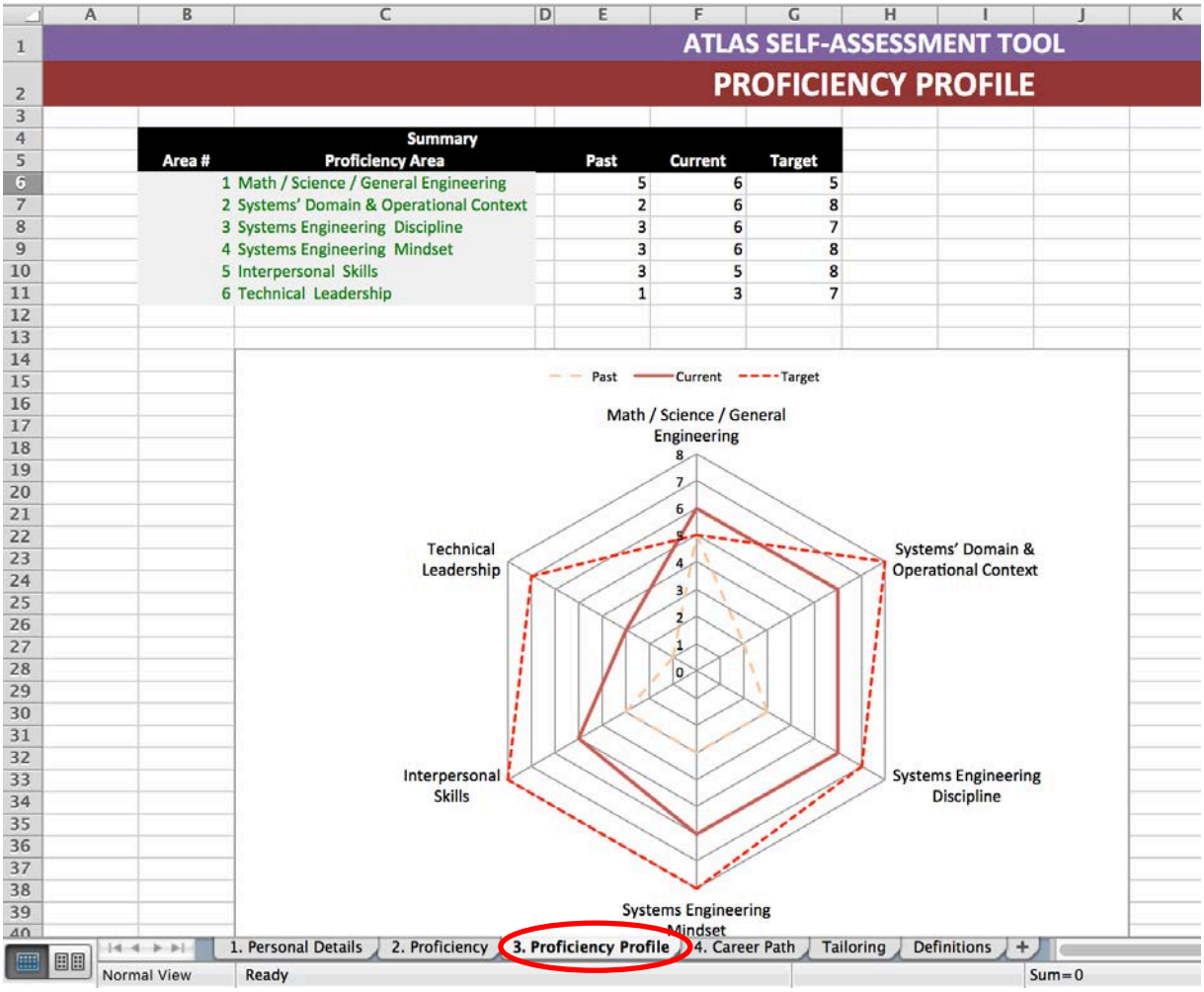
Atlas Proficiency Area / Category	Proficiency Level "1"	Proficiency Level "3"	Proficiency Level "5"
3.3. SE Methods, Processes, & Tools	Minimal awareness of SE methods, processes and tool in an isolated manner		Expert in specific SE methods, processes, and tools, and in the application of these.
3.4. Systems Engineering trends	Minimal awareness of the specific trends and their application to systems development		Expert in the specific trends and their application to systems development
4. Systems Engineering Mindset			
4.1. Big-Picture Thinking	Minimal ability to think beyond a narrow scope of the problem at hand	Able to think in a limited manner outside a narrow scope with some guidance	Expert in thinking broadly along various dimensions (e.g., regarding broader domain or enterprise-level considerations, and linking across apparent disparate domains such as incorporating "soft" science with "hard" science)
4.2. Paradoxical Mindset	Minimal ability to handle seemingly opposed views	Able to understand the one of the opposed views separately but not both	Expert in the understanding of two opposed views and perspectives, ability to successfully handle them both separately and together, and the ability to successfully move from one perspective to another
4.3. Flexible Comfort Zone	Comfortable only strictly within one's comfort zone and area of technical expertise	Able to permeate beyond one's comfort zone in a limited manner, but hesitates to explore the unknown	Willing and able to permeate the boundaries of one's comfort zone with ease, and able to comfortably explore the unknown and readily seek interdisciplinary SME
4.4. Multi Scale Abstraction	Minimal ability to abstract or infer from individual pieces of information and relate to environmental context	Able to abstract insights with some guidance and prior experience and understand system in larger operational context	Expert in quickly and effectively abstracting (from highly detailed level to highly conceptual level) new and significant insights from seemingly disparate pieces of information across system and environmental scales
4.5. Foresight & Vision	Minimal ability to comprehend future impacts of current decisions and situations	Able to comprehend impacts in the near future, in a limited manner	Expert in seeing future impacts of current decisions, and to clearly visualize future stages of a system's lifecycle

Atlas Proficiency Area / Category	Proficiency Level "1"	Proficiency Level "3"	Proficiency Level "5"
5. Interpersonal Skills			
5.1. Communication	Minimal ability to successfully communicate any information to any audience in any mode	Able to communicate well in one predominant mode with limited familiar audience	Expert in being able to successfully and unambiguously communicate to a variety of audience and a wide range of technical and non-technical content, in various written and oral modes.
5.2. Listening & Comprehension	Minimal ability to listen to and understand others' points and perspectives	Able to listen to other's points, but limited ability to comprehend	Expert in listening and successfully comprehending others' points and perspectives
5.3. Working in a Team	Minimal ability to work with anyone else, preferring to work alone	Able to work in familiar teams, but limited ability to work on new teams	Very comfortable to work with others, and being able to quickly and successfully become part of any team exhibiting positive team dynamics
5.4. Influence, Persuasion & Negotiation	Minimal ability to modify another person's viewpoint or perspective, even when that is detrimental	Able to influence others in a limited manner, only with familiar individuals or when they are not experts in their own fields	Expert in positively influencing others, particularly experts in their own fields, to see beyond their viewpoints and to come to agreements for the good of the overall system
5.5. Building a Social Network	Minimal ability to form any social relationship with a professional acquaintance	Able to form a limited social network among those with frequent interactions	Expert in establishing strong social relationships with professional acquaintances both within and outside the organization
6. Technical Leadership			
6.1. Building & Orchestrating a Diverse Team	Minimal ability to form or lead a team with any success	Able to build a team with guidance but has difficulty in handling or delegating to a diverse team	Expert in bringing together the right team for the task, being able to synergistically draw individual strengths of team members, successfully leading the team to achieve end goal

Atlas Proficiency Area / Category	Proficiency Level "1"	Proficiency Level "3"	Proficiency Level "5"
6.2. Balanced Decision Making & Rational Risk Taking	Minimal ability to take balanced decisions or to take any rational risks	Able to take some balanced decisions with some guidance, but limited ability to take rational risks	Expert in taking successful decision considering all relevant factors and constraints, and being able to rationally calculate risks when required
6.3. Guiding Stakeholders with Diverse/ Conflicting Needs	Minimal ability to guide internal and external stakeholders and their needs	Able to guide familiar stakeholders, who have well established needs, in a limited manner	Expert in leveraging good relationships with internal and external stakeholder, and successfully meeting their needs
6.4. Conflict Resolution & Barrier Breaking	Minimal ability to resolve any conflict that negatively affects the system, and unable to break barriers of opinions and perspectives that prevent any progress	Able to resolve minor conflict mostly among familiar individuals	Expert in successfully resolving conflict between individuals or teams for the sake of the overall system, and able to break down various technical or cultural barriers
6.5. Business & Project Management Skills	Minimal ability to perform business and project management activities	Able to perform business and project management activities with some guidance and reference	Expert in the knowledge, understanding, and application of various business and project management skills.
6.6. Establishing Technical Strategies	Tactical approach to technology on a project-by-project basis		Develops technical strategies that impact multiple projects (e.g. investment decisions, prioritization of technology roadmaps, etc.)
6.7. Enabling Broad Portfolio-Level Outcomes	Focuses only on outcomes for individual projects		Identifies issues and opportunities that impact an entire portfolio of systems Communicates these issues to leadership and engineers

PROFICIENCY PROFILE

Once you have completed your self-assessment, a profile will be auto-generated in the "3. Proficiency Profile" tab, as shown below. Please do *not* make any edits to this tab. Instructions for exporting the graphic proficiency profile are embedded in this tab as well.

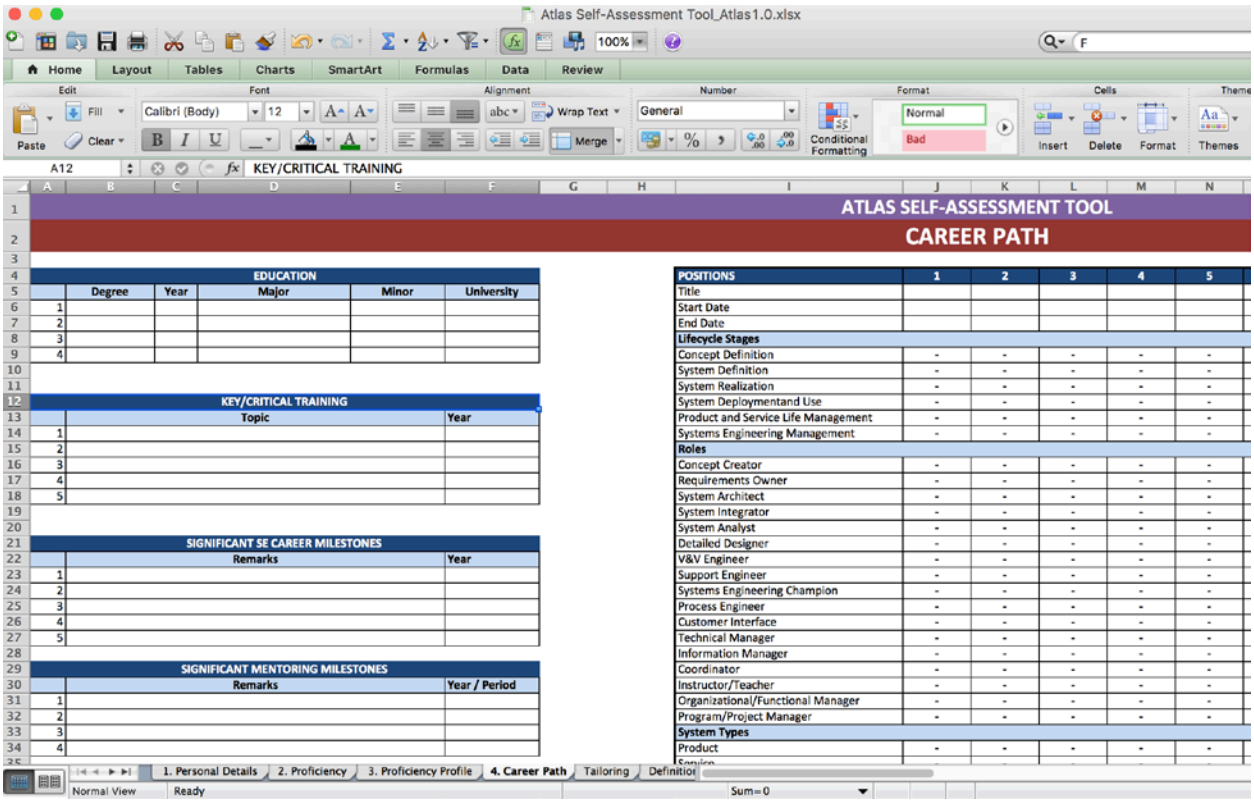


CAREER PATH SELF- ASSESSMENT

Overview

An individual's career path is the precise combination of experiences, mentoring, education, and training that an individual goes, particularly their characteristics, timing, and order. In order to complete a career assessment, an individual should work through the steps outlined here while filling out the career path template.

Career Path data will be documented in the "4. Career Path" tab, as shown below.



The tool is set up to capture the data for 15 positions. If you require more, simply highlight all of the positions table (P1-P15) and using the box in the lower-right corner of the last cell, drag the contents to the right. This will create P16-P30. If you require more fields, simply repeat this step.

The next several pages provide specific information on the factors included in the career path self-assessment and detailed definitions. These can also be found in the definitions tab. As with the "2. Proficiency" tab, abbreviated definitions have been incorporated as roll over text.

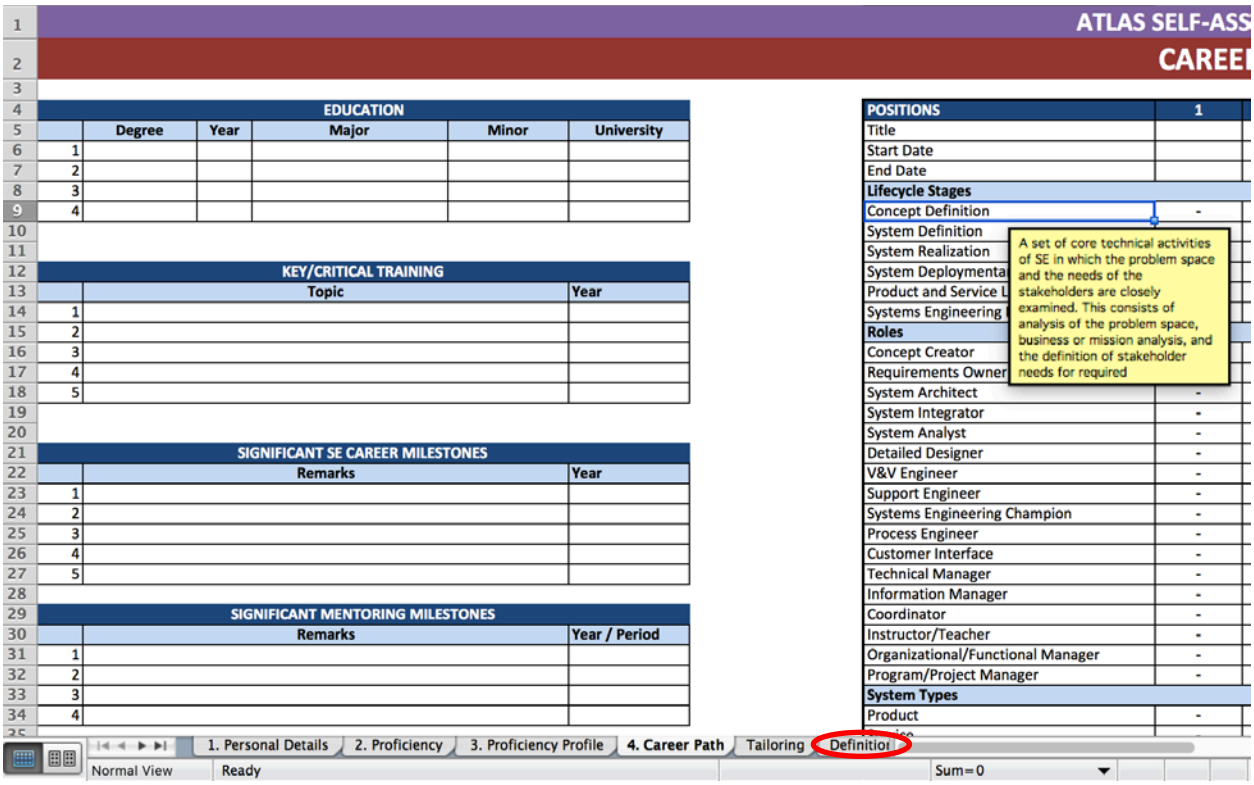
Experiences

The Helix team chose to use a **position** as the unit of measure for experiences; a position is established by the organization and defines the roles and responsibilities to be performed. The tool is set up to capture up to 15 positions.

Based on both the literature and the Helix data itself, each position has several characteristics:

- **Relevance:** A 'relevant' position is one that enables a systems engineer to develop the proficiencies critical to systems engineering. Determine a starting point for relevant experiences; this will become the first position (P1) of the career path. Fill in the title and the year(s) for the position(s).
- **Organizations:** Fill out the name of the organization for each position. This will help to show any transition or variation between organizations.
- **Roles:** A role is a collection of related systems engineering activities. Roles were identified based on the activities consistently performed by systems engineers. There are 16 roles identified in *Atlas*, as described in Table 1, below. For each position, review your activities and responsibilities and write down *all* roles played during that position.
- **Lifecycle Phases:** Generic systems engineering lifecycle phases considered in *Atlas* are based on the lifecycle phases in the *Guide to the Systems Engineering Body of Knowledge (SEBoK*), as explained on page 5. (BKCASE Authors 2015) For each position, fill in the area(s) of the lifecycle you worked on.
- **System Characteristics:**
    - **System Type:** Types of systems include technical systems, social systems, human systems, physical systems, cyber systems, and any combination of these. Another classification of system types includes product systems, service systems, and enterprise systems.
    - **System Scale:** Systems can be anywhere from a Nano level to a distributed global or enterprise level. A generic systems engineering development process may be applicable to systems at any scale.
    - **System Scope:** What can be seen as a system from one perspective, could be a subsystem from another perspective. The levels of a system could range from component/element, subsystem, system, and platform or system of systems.

As with the proficiencies, key definitions are included as roll-over text in the tab and full definitions are available in the "Definitions" tab, as shown below.



Key Milestones

Note any key milestones in your career. For example, some positions may be milestones, such as your first systems engineering role, first chief systems engineer role, first supervisory position, etc. Any key or critical training that was particularly impactful or useful for your career; mentoring experiences can also be noted.

Education

Note any educational milestones with the position/timeline in which they occurred. Education milestones may include the completion of a degree or participation in a course that was particularly relevant or impactful for your career. Key training is training that was particularly impactful or useful for your career. You do not need to include training that did not have an impact.

Role Name	Role Description
Roles Focused on Systems	
Concept Creator	Individual who holistically explores the problem or opportunity space and develops the overarching vision for a system(s) that can address this space. A major gap pointed out to the Helix team – particularly when working to implement the findings of Helix – has been that of the development of an overarching system vision. This is a critical first step in the systems lifecycle, and several organizations stated that they believed it needed to be separated out. In addition, when looking to the future of what systems engineers need to do (e.g. INCOSE Vision 2025 (2015)), the focus on early engagement and setting the vision was deemed critical.
Requirements Owner	Individual who is responsible for translating customer requirements to system or sub-system requirements; or for developing the *functional* architecture. This is unchanged from (Sheard 1996).
System Architect	Individual who owns or is responsible for the architecture of the system. This is an update of Sheard's "System Designer" role (1996). There was concern both at community events and during later interviews that nowhere in the presented framework did the critical role of systems engineers in architecture come out clearly. Some also argued that "Design" gave the impression that this roles focuses specifically on the details of systems design over architecture.
System Integrator	Individual who provides a holistic perspective of the system; this may be the 'technical conscience' or 'seeker of issues that fall in the cracks' – particularly, someone who is concerned with interfaces. Likewise, there was concern over the word "Glue", which many expressed was not clearly descriptive enough.
System Analyst	Individual who provides modeling or analysis support to system development activities, and helps to ensure that the system as designed meets he specification. This is unchanged from Sheard's roles (1996).
Detailed Designer	Individual who provides technical designs that match the system architecture; an individual contributor in any engineering discipline who provides part of the design for the overall system. This is an addition based on the Helix data. While systems engineers do not always get involved with detailed design, in smaller organizations or on smaller projects it is more common. Likewise, systems engineers who had played this role explained that it was critical in developing their own technical and domain expertise as well as in understanding the design approaches of classic engineers.
V&V Engineer	Individual who plans, conducts, or oversees verification and validation activities such as testing, demonstration, and simulation. This is unchanged from Sheard's roles (1996).
Support Engineer	Individual who performs the 'back end' of the systems lifecycle, who may operate the system, provide support during operation, provide guidance on maintenance, or help with disposal. This was previously titled "Logistics and Operations Engineer" in Sheard (1996). However, in interviews and at community events, the Helix team received feedback that using this title gave the impression that this role was limited and did not encompass the full spectrum of systems engineers' activities at system deployment or post-deployment. Likewise, in several organizations, "logistics" and "operations" were seen as separate disciplines from systems engineering, which caused some contention in discussions. The renaming of this category is intended to address these issues.

Roles Focused on SE Process and Organization	
Systems Engineering Champion	Individual who promotes the value of systems engineering to individuals outside of the SE community - to project managers, other engineers, or management. This may happen at the strategic level or could involve looking for areas where systems activities can provide a direct or immediate benefit on existing projects. Sheard recommended that a role such as this, labeled in her work, as "Systems Engineering Evangelist", be added in (2000).
Process Engineer	Individual who defines and maintains the systems engineering processes as a whole and who also likely has direct ties into the business. This individual provides critical guidance on how systems engineering should be conducted within an organization context. This is unchanged from Sheard's roles (1996).
Roles Focused on Teams	
Customer Interface	Individual who coordinates with the customer, particularly for ensuring that the customer understands critical technical detail and that a customer's desires are, in turn, communicated to the technical team. This is unchanged from Sheard's roles (1996).
Technical Manager	Individual who controls cost, schedule, and resources for the *technical* aspects of a system; often someone who works in coordination with an overall project or program manager. This is unchanged from Sheard's roles (1996).
Information Manager	Individual who is responsible for the flow of information during system development activities. This includes the systems management activities of configuration management, data management, or metrics. This is unchanged from Sheard's roles (1996).
Coordinator	Individual who brings together and brings to agreement a broad set of individuals or groups who help to resolve systems related issues. This is a critical aspect of the management of teams. This is unchanged from Sheard's roles (1996).
Instructor/Teacher	Individual who is provides or oversees critical instruction on the systems engineering discipline, practices, processes, etc. This can include the development or delivery of training curriculum as well as academic instruction of formal university courses related to systems engineering. While any discipline could conceivably have an instructor role, this denotes a focus on systems and is a critical component in the development of an effective systems engineering workforce. This is an addition to the Sheard roles (1996)

Systems Engineering Lifecycle

- **Concept Definition** - A set of core technical activities of SE in which the problem space and the needs of the stakeholders are closely examined. This consists of analysis of the problem space, business or mission analysis, and the definition of stakeholder needs for required services within it.
- **System Definition** - A set of core technical activities of SE, including the activities that are completed primarily in the front-end portion of the system design. This consists of the definition of system requirements, the design of one or more logical and physical architectures, and analysis and selection between possible solution options.
- **System Realization** - The activities required to build a system, integrate disparate system elements, and ensure that a system both meets the needs of stakeholders and aligns with the

requirements identified in the system definition stage. This includes integration, verification, and validation (IV&V).

- **System Deployment and Use** - A set of core technical activities of SE to ensure that the developed system is operationally acceptable and that the responsibility for the effective, efficient, and safe operations of the system is transferred to the owner. Considerations for deployment and use must be included throughout the system life cycle. Activities within this stage include deployment, operation, maintenance, and logistics.
- **Product and Service Life Management** - Deals with the overall life cycle planning and support of a system. The life of a product or service spans a considerably longer period of time than the time required to design and develop the system. This stage includes service life extension, updates, upgrades, and modernization, and disposal and retirement. The organizations in the current sample are primarily concentrated on new development, so this is a very under-represented aspect of the life cycle.
- In addition to these life cycle phases, the SEBoK includes orthogonal activities of systems engineers, **Systems Engineering Management**, defined as managing the resources and assets allocated to perform SE activities. Activities include planning, assessment and control, risk management, measurement, decision management, configuration management, information management, and quality management. These activities can occur at any point in the systems engineering lifecycle.