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TECHNICAL LEADERSHIP DEVELOPMENT

GUIDEBOOK

THE TECHNICAL LEADERSHIP DEVELOPMENT GUIDEBOOK OUTLINES A PROCESS USED TO DEVELOP TECHNICAL LEADERS WITHIN THE UNITED STATES DEPARTMENT OF DEFENSE. THIS GUIDEBOOK EXPLAINS HOW TO ADDRESS A LEADER'S COMPETENCY DEFICIENCIES AND IMPROVE THEM IN PREPARATION FOR ADVANCEMENT AND INCREASING RESPONSIBILITY.

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SECTION 1

Introduction

This section presents the background of the Technical Leadership Development Framework and the motivation behind its inception. In this section, several key topics and phrases are introduced as well as an explanation of how this Guidebook is structured.

1.1. THE NEED FOR TECHNICAL LEADERSHIP DEVELOPMENT

The Technical Leadership Development Framework seeks to address the following risks the Department of Defense (DoD) is facing regarding the civilian technical workforce.

- Aging workforce demographic: The DoD civilian technical workforce is an aging demographic, resulting in senior technical talent retiring.
- Threat to technological supremacy: Capable technical leaders are needed for the U.S. to maintain its lead in global technical advancement.
- Lack of career development "roadmap": There is no process in place to improve the leadership competencies of developing technical leaders, competencies that would allow them to move into senior technical positions.

These issues compound one another and their consequences are severe. The Technical Leadership Development Framework offers a solution.

1.1.1. Motivation

Technical leadership is honed over a career of increasingly challenging assignments. Leaders of large and complex undertakings—sophisticated weapon systems, major programs of national importance, and the like—must have a strong technical background and a special ability to lead people of varying backgrounds and disciplines.

The highest performing technical organizations do not simply have brilliant technical leaders at the top. They have a culture and an environment that:

Why Use the Technical Leadership Development Framework?

The key benefit is that it provides a roadmap through career stages, from junior through mid-level, and ultimately through the senior level.

- Inspires technical leadership throughout the organization
- Encourages high performing technical employees at every level to build and hone their leadership skills
- Provides developing technical leaders a chance to exercise those skills both in formal and informal positions of authority
- Provides the opportunity to build their technical skills over the course of a career

Therefore, when the time comes to select the next top leader, there is a pool of qualified candidates, and all are outstanding in both the technical and leadership dimensions.

1.1.2. What is Technical Leadership Development?

The **Technical Leadership Development** effort was inspired by the need to guide developing technical leaders through the training, assessments, and situations required to hone their technical leadership skills. The result is the **Technical Leadership Development Framework** (hereafter referred to as "the Framework"), which presents a series of elements for the developing technical leader to follow and complete throughout their career. The key point of the Framework is that it focuses on what a successful technical leadership career should be; it provides the developing technical leader with guidelines and goals to focus their efforts to achieve the required skills and ultimately, a successful career.

Technical leadership development enables employees to become proficient and accomplished technical leaders within their organization, focusing on the capabilities a developing technical leader must have, called **competencies**, and how the developing technical leader can progressively develop those competencies. Technical leadership development is a process that spans an employee's entire career through three **career stages**: junior, mid-level, and senior. As employees move through the ranks within their organization, competencies continue to be honed and refined to fit their responsibilities.

Key Difference

"Technical leadership" is not synonymous with "traditional leadership" or even "management" within the context of this Guidebook as technical leaders are responsible for more than leading and managing subordinates on highly technical programs.

Critical Roles in Technical Leadership Development

There are three critical positions, called **roles**, within technical leadership development.

- Developing technical leader: The person seeking to attain competency the technical leadership competencies.
- Supervisor: The first level superior to the developing technical leader. In this context, the supervisor has two main responsibilities:
    - Provide direction and support to the developing technical leader on the leadership development methods
    - Provide input and feedback on the developing leader's competency attainment
- Executive sponsor: The executive of the organization where the Framework is implemented. The executive sponsor has two key responsibilities:
    - Oversee and govern the implementation of the Framework
    - Model technical leadership by mastering the competencies

These roles are not to be confused with the three career stages. Career stages relate to the developing technical leader's place within the organizational hierarchy, with regard to leadership responsibilities. Roles are filled by those "players" within technical leadership development that shepherd the developing technical leader through the Framework. Each role has a different part to play in ensuring the Framework is implemented and leadership development within the organization is successful.

1.1.3. How Competencies were Determined

Within the context of the Framework, there are 24 technical leadership competencies:

- 12 technical competencies critical for leaders within a technical environment
- 12 key enabling competencies required to successfully execute those technical competencies

The 24 competencies selected for inclusion in the Framework were developed through a review of leadership development literature, use of existing Office of Personnel Management (OPM) and other government competency models, and discussions with colleagues and subject matter experts.

All Competencies Are Important

While this Guidebook focuses on the 24 technical leadership competencies, it is important to remember that technical leaders are required to be fully competent technically, and fully competent as leaders, rendering all three competency sets important (purely technical, purely leadership, and their intersection).

1.1.4. Applying the Framework

For the individual, the Framework provides a tool to manage, and take ownership of, their professional development. Through regular application of the Framework over time, technical leaders can guide their leadership development throughout their careers. Using the Framework, emerging technical leaders across DoD will be able to:

- Assess their mastery of key competencies
- Identify opportunities for improvement
- Seek guidance on methods to improve their technical leadership skills

1.1.5. Goal and Benefit

The goal of the Framework is to provide a progressive, developmental path to technical leadership that is flexible, affordable, and achievable over the course of one's career.

The Framework is **flexible** in several different ways.

- First, narrative descriptions of the key competency indicators (KCIs) define competencies at each career stage, allowing different Components and supervisors to adapt the KCIs to their particular situation (see Appendix 1).
- Second, the definition of the career stages on which the Framework is based permits a wide number of different constructs without compromising the essential character of the career structure envisioned.
- Third, seven different leadership development methods (see Section 4) are described, which can be used in various combinations to help emerging and developing leaders acquire the full set of competencies required to progress their career.

Different Avenues for Development

Individuals and their supervisors can take advantage of the wide variety of leadership development methods to develop the required skill sets. Some are part of the formal workplace structure, but others are available outside the workplace at an individual's own discretion.

These adaptive features make the Framework **affordable**, in that it does not require new leadership development programs, expansion of existing leadership development programs, or new funding initiatives. The best way to ensure the success of the Technical Leadership Development initiative is to provide emerging and developing leaders with a structure that enables them to take responsibility for their own development and provide their supervisors with a complementary structure to guide the technical leadership growth of their employees.

In addition to being flexible and affordable, the Framework is **achievable** because the basis for a DoD-wide culture of

technical leadership excellence is already in place:

- Component supervisors are primed to support this initiative
- Individual technical personnel are highly motivated to embrace their own career development
- The developmental processes to achieve the needed training are already in place and available

1.1.6. Technical Leadership Development Principles

The Technical Leadership Development Framework is just that, a framework. It is not meant to be prescriptive or a detailed algorithm to be followed. That said, there are four basic principles for the implementation of the Technical Leadership Development Framework and Career Model.

Principle 1: Conscious and Systematic Application of Development Methods

The conscious and systematic application of development methods refers to a deliberate, intentional, purposeful, coordinated, and methodical use of the leadership development techniques to grow technical leadership competencies.

Illustrating Conscious and Systematic Application

If a developing leader needs to improve their communication skills, it's not enough to simply take a training course on effective communication. Coordinating training, practicing the skills gained through training, and using a mentor for help in future efforts illustrate the thoughtful way the developing leader can use these three leadership development methods to improve in the communication competency.

In another situation, a technical leader seeks to improve their competency in developing people. After considering each leadership development method, they decided to use training, a job rotation, and a mentor to improve. The developing technical leader chooses training courses focused on developing people, a mentor to provide advice and guidance on the topic, and ultimately a teaching job assignment requiring the development of people.

Both of these examples illustrate how multiple development methods support one another. The key point is that gaining knowledge isn't as effective as being able to apply that knowledge through practical application. When multiple development approaches are present and working together, growth in a given competency will be expedited.

Another aspect of the conscious and systematic application of development methods is to incorporate them into the existing culture and standard operating procedures. To achieve conscious and systematic application, superiors should ask subordinates questions about how a leadership development method is growing a particular competency during existing meetings.

Culture changes, in part, through informal conversations; turning the topic of these conversations to leadership development rather than sports topics is a conscious choice. In short, conscious and systematic application includes coordination among the Framework elements to encourage competency growth, as well as incorporating a focus on learning in the existing culture and standard operating procedures.

Something To Talk About

One way to make technical leadership development important is by making it important in conversations; if the topic never comes up in conversation, it is not really important.

Principle 2: Systematic Evaluation of Capability Attainment through the Evaluation of Individual Accomplishments

The systematic evaluation of capability attainment through the evaluation of individual accomplishments focuses on outcome-based evaluation rather than activity-based or assessment-based evaluation, or focusing solely on capabilities. While evaluating capability attainment is typically done through self-assessment, and sometimes through

a 360-degree assessment, advancing beyond a subjective rating to the evaluation of individual accomplishments is a stronger measurement and ought to connect more closely with performance objectives.

Illustrating Different Ratings

If the competency to be evaluated is Abstraction, instead of asking how good a person's abstraction skills are (assessment-based evaluation), or documenting the number and type of patterns and structures in the relationships among multiple diverse systems (activity-based evaluation), the goal rather is to identify what that abstraction allowed a person to achieve in terms of problem solving or generating solutions (outcome-based evaluation). In addition, outcome-based evaluation of individual accomplishments aligns more closely with annual performance objectives.

However, it may not always be possible to directly measure a competency. Sometimes, it's the outcomes of one's work that proves competency attainment. If the competency in question is Developing People, an objective way to assess the competency would be to determine the number of subordinates that were promoted. (Conversely, a subjective way to assess the Developing People competency would be to ask the developing leader how they think their skills in developing people improved, or asking superiors, subordinates, and peers how they think that person's skills developing people improved.)

Principle 3: Flexible Application of the Framework

The flexible application of the Technical Leadership Development Framework allows for the tailoring and adaptation of the Framework to meet the needs of individuals, commands, and career fields. Given the size, structure, and diversity of organizations and agencies in the DoD, there may be differing views on what level and type of degree should be achieved in what career stage, which DAU courses (Core only, or Core Plus?) should be taken, which other technical leadership training courses should be taken, what job rotations are best for individuals at a particular career stage, when should a person receiving coaching, and who should mentor whom.

In addition, individuals may differ: some may learn best in a learning-by-doing mode, others by being taught, while still others learn best through an individual relationship in which they are held accountable. Finally, the differences among career fields may also require different education and training because the fields have different contexts. Because of all this diversity, it is recommended that the Framework be applied in a flexible manner.

Principle 4: Personal Ownership of Each Individual's Career Development

Individual Responsibility

Even though all the Framework elements may be in place, ultimately it is the individual who is responsible for their growth and development, including the growth and development of competencies.

The personal ownership of each individual's career development emphasizes that it is the person's responsibility to actively manage their career. If the person is not engaged, then education and training simply become book-learning, experience becomes something one has to do, and mentoring is an alternative which is not exercised. If the person is engaged, then education and training enable one to perform better on the job, experience becomes an opportunity to learn and grow, and mentoring becomes a tool to ask the questions that it is difficult to ask in the other Framework elements.

1.1.7. How is this Guidebook Organized?

This Guidebook outlines the Framework elements and their application by developing technical leaders, their supervisors, and executive sponsors.

After explaining the key terms and concepts in Section 1: Introduction, Section 2: The Technical Leadership Development Framework and its Elements, describes the four key elements of the Framework in detail, taking care to explain how each element interacts with the one before or after and within the context of technical leadership

development.

Section 3: Technical Leadership Competencies, and Section 4: Leadership Development Methods, provide thorough discussions on the technical leadership competencies and their various methods of attainment. It is important to note that which competencies to pursue and their methods of attainment are dictated by the developing technical leader's career stage.

With the discussion of the four elements of the Framework complete, Section 5: Assessing Competency Proficiencies, explains how the developing technical leader can determine whether their application of the Framework was successful.

Section 6: Application of the Framework (with Scenario), illustrates the Framework in action, complete with sub-processes and supporting information that developing technical leaders and their supervisors should use.

A glossary and acronym list is included, followed by a series of appendices. The appendices breakdown various elements of the Guidebook by career stage, as well as describe how supervisors and executive sponsors can implement the Technical Leadership Development Framework within their organization.

Lastly, a series of workbooks, separated by career stage, are included. The workbooks provide an overall summary of the Guidebook as well as direction for completing an assessment.

1.2. Developing Your Technical Leadership Capabilities

A highly capable technical leader—a leader with a strong technical background and the ability to lead people—needs to be proficient in the 24 competencies. Within the context of the Technical Leadership Development Framework, these 24 competencies focus on:

- 12 technical competencies critical for leaders within a technical environment
- 12 key enabling competencies required to successfully execute those technical competencies

1.2.1. The Technical and Enabling Competencies

The 24 technical leadership competencies are at the conjunction of the much longer list of purely technical competencies on one hand (i.e., the blue circle on the left), and the much longer list of purely leadership competencies (i.e., the red circle on the right) on the other. This overlap is shown in Figure 1.

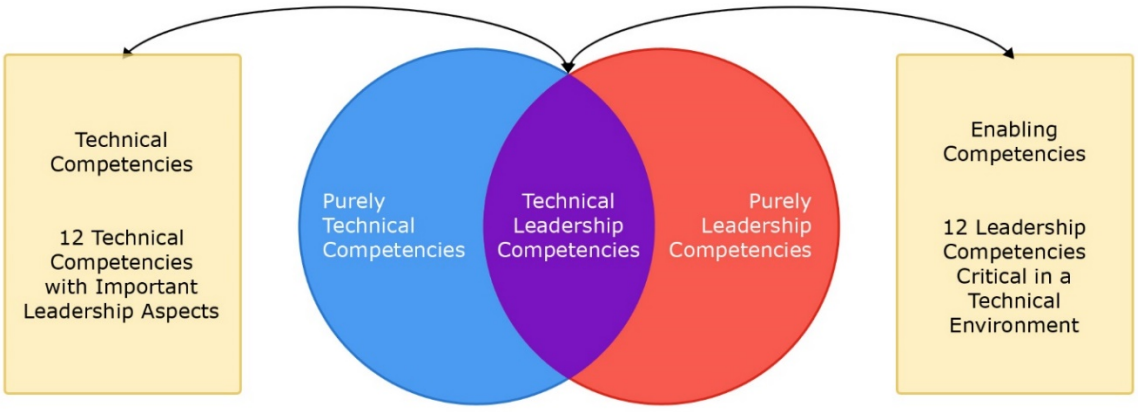

Figure 1: Technical Leadership Competency Diagram

1.2.2. Technical versus Traditional Leadership

Definition and Differences

Technical Leadership

A technical leader must not only be highly proficient technically, but also possess the skills to competently lead a diverse team of technical employees in executing highly technical programs.

Technical leadership is different than traditional leadership. Technical leadership is defined as motivating, guiding, and influencing the direction, courses of action, and opinions of teams or organizations of professionals who use principles from the natural sciences or mathematics as an integral part of their work. A technical leader typically has a bachelor's or advanced degree in engineering, natural science, technology, or mathematics. Conversely, traditional leadership focuses more broadly on motivating, guiding, and influencing teams or organizations of professionals.

Technical leadership is demonstrated through a combination of performing the technical work, showing others how to do it, and/or conducting a quality check once the work is done. Traditional leadership is agnostic of the nature of the work being performed.

Application to Successful Acquisition Programs

Capable technical leaders have a recognized impact on program success. Most successful programs have a single lead engineer responsible for driving the program toward meeting its technical objectives while ensuring that strong technically viable and financially sound decisions are made with confidence. Through effective application of the technical leadership competencies, the technical leader creates the environmental conditions conducive to good performance, supporting shared understanding, innovation, problem solving, resilience, and learning across the program team.

A well-known phrase is very appropriate in this discussion: Managers are people who do things right while leaders are people who do the right thing. Doing the right thing is not only about identifying the right approach in the first place; it is also about taking responsibility for understanding and challenging the program team. By applying the enabling competencies, the effective technical leader will act less as a manager, focusing instead on coaching the team to do their best work on the program.

Relationship Between Technical Leadership Capabilities and Technical and Enabling Competencies

The 24 technical leadership competencies guide, direct, and motivate developing leaders possessing engineering, scientific, technological, or mathematical skills and knowledge. The 12 technical competencies list what needs to be accomplished while the remaining 12 enabling competencies focus on how to accomplish what needs to be done.

Being highly proficient in both the technical and enabling competencies makes the developing leader a more confident and capable technical leader.

Building Competencies

Competencies are mastered during a career by learning, applying, and assessing one's abilities over time. At the junior career stage, the developing technical leader learns a new skill at a low level of complexity. As the developing techincal leader moves through the junior stage and approaches the mid-level career stage, the quality of work and complexity of tasks increases. When they are fully capable of demonstrating that competency, they are able to begin teaching others.

SECTION 2

The Technical Leadership Development Framework and its Elements

In this section, we will discuss the elements within the Technical Leadership Development Framework. For each element, the developing technical leader will analyze the competencies they need to attain, where they are in their career path, and the best methods of obtainment.

While this section provides an overview of the Framework and its elements, those elements will be discussed in detail in Sections 3 through 6.

2.1. INTRODUCTION TO THE FRAMEWORK

The Technical Leadership Development Framework is a flexible process developing technical leaders can use to attain competencies. It guides the developing leader though a series of steps to identify and realize the capabilities required to become a more effective technical leader. The Technical Leadership Development Framework is illustrated as follows.

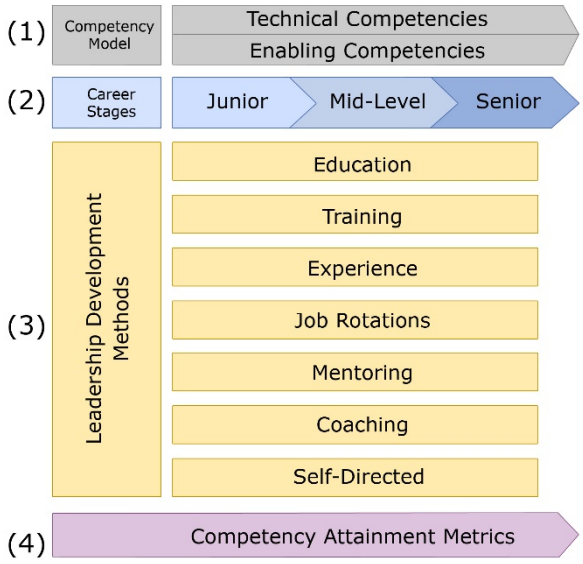

Figure 2: Technical Leadership Development Framework

The four elements of the Technical Leadership Development Framework are explained in this section.

2.1.1. Framework Element 1: Technical Leadership Competencies

The foundation for the Framework is the list of 24 technical leadership competencies that occur at the combination of two competency domains: purely technical competencies and purely leadership competencies. These competencies are characterized by guiding, directing, motivating, and developing a team of professionals possessing engineering, scientific, technological, or mathematical skills and knowledge.

The resulting technical and enabling competencies are defined and described in Section 3.

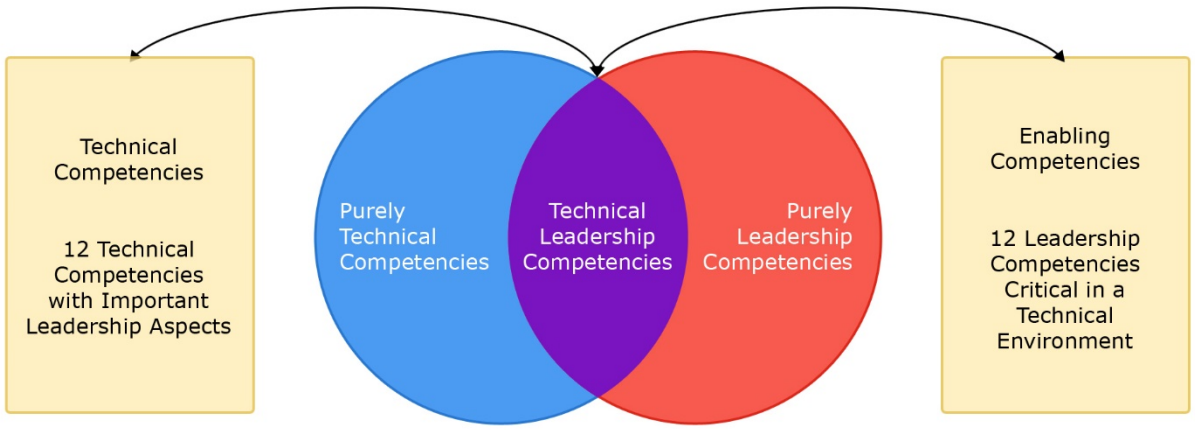

Figure 3: Technical Leadership Competencies

List of Competencies

The 24 technical leadership competencies are defined in Tables 1 and 2. These are general definitions that can be updated to fit the needs of a specific organization using the Framework.

TECHNICAL COMPETENCY	DEFINITION
Technical Planning	Organizing and scoping the technical work across all the technical phases (from analysis and design, through to development, deployment, and operation).
Technical Requirements Definition and Analysis	Translating the stakeholder's behavioral and functional needs and expectations into technical statements (including technical problem scope, technical product constraints, and technical requirements).
Logical Decomposition	Separating or disintegrating a problem, function, or system into its constituent parts, often into a hierarchical structure.
Product Verification and Validation	Comparing and evaluating the final technical product or system with the initial requirements, specifications, and stakeholders' expectations.
Product Transition	Deploying the technical product into production, test, operations and sustainment.
Lifecycle View	Managing the product movement through the lifecycle, including setting the criteria by which the technical product may be evaluated as it passes from one stage to another.
Technical Risk Management	Identifying, quantifying, and mitigating technical risk, and accepting any residual technical risk.
Systems Thinking	Seeking holistic explanations and relationships when examining technical problems, and focusing on connections and interfaces among the subsystems in a system.
Systems Complexity	Understanding the interfaces within and between systems, and recognizing the potential for emergent behavior because of differences in system components and interfaces.
Big Picture Thinking	Managing the technical aspects external to the system.
Abstraction	Identifying and translating a pattern in one domain to a different domain.
Paradoxical Mindset	Holding opposite views simultaneously to make better decisions.

Table 1: Technical Leadership Competencies and Definitions

ENABLING COMPETENCY	DEFINITION
Developing People	Expanding people's ability to do technical work effectively, expanding their ability to lead others effectively, increasing their decision-making capability (with associated trade-offs and judgment calls), helping people understand their career paths and career growth, encouraging people to be good citizens in the workplace, and fostering people's fulfillment from doing their work.
Leading People	Guiding, directing, or motivating others in a dignifying and empowering way to further the goals and priorities of the organization.
Thinking Critically	Using logic and analysis to identify and evaluate the strengths, weaknesses, and implications of different courses of action, as well as analyzing a situation objectively.
Building Trust and Credibility	Relating to others in a way that fosters a legitimate belief in the leader's intentions and those of the organization.
Communicating Effectively	Expressing information, meaning, and ideas clearly to individuals or groups using verbal, written, and nonverbal skills that help the receiver(s) to understand and retain the message.
Establishing and Maintaining Stakeholder Relationships	Building and sustaining partnerships with other internal or external groups who can affect or are affected by the technical leader's area.
Influencing Others	Persuading others to accept a particular view as expressed in an idea, proposal, initiative, or decision.
Developing Strategy and Vision	Setting the long-term goals, aligned with organizational goals, and evaluating and adopting the courses of action and allocating resources to achieve those goals.
Fostering Agility	Adapting quickly, learning, responding, and thriving when work tasks, the environment, context, or conditions change; encouraging others to see change as an opportunity and seek better ways of doing their work.
Promoting Innovation	Creating, or seeking from others, new or significantly improved products or processes, as well as developing original approaches to handle challenges and opportunities.
Possessing Government Acumen	Making good judgments and managing human, financial, technological, and information resources in a federal, state, or local context, which consists of both federal, state, or local employees and external contractors.
Possessing a Macro Perspective	Delivering solutions within the political, economic, and social aspects, context or landscape.

Table 2: Enabling Competencies and Definitions

2.1.2. Framework Element 2: Career Stages

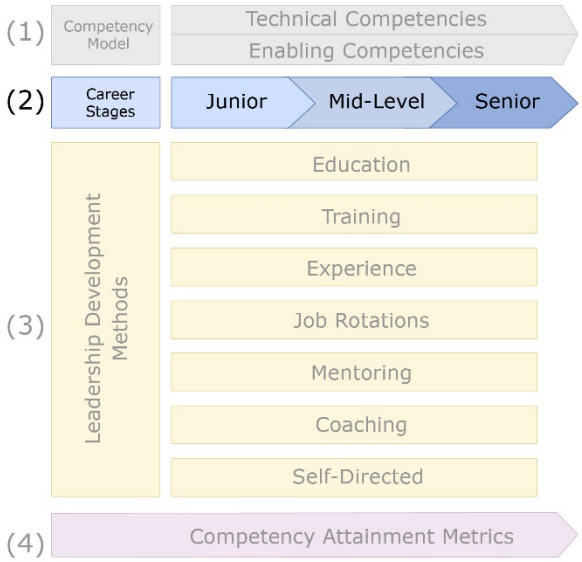

Figure 4: Career Stages of the Technical Leadership Development Framework

Each developing technical leaders' career will progress at different rates and any career development framework needs to accept and accommodate that fact. In these terms, career stages are defined by milestone rather than duration. A framework intended to guide and oversee the development of a particular set of professionals needs some structure and a definition—however flexible it may be—of each career stage accounting for the transition and career progression.

The second Framework Element involves the definition of the junior, mid-level, and senior career stages. The separation among career stages is based on common practices across many fields, is highly flexible, reflects the wide variety of situations within the target workforce, and is intentionally vague, in order to avoid forcing individuals into an excessively rigid structure. There are multiple pathways that an individual might follow in building technical leadership competency, including ones that involve program responsibility or technical expertise, so the way in which the three career stage definitions will be applied in an individual case will (and should) vary widely.

There are three criteria to identify which career stage a person is in:

- The number of people for which the developing technical leader is responsible
- The level of decision-making authority (which is frequently demonstrated in the level of program that an developing technical leader has responsibility)
- The level of expertise typified by years of experience and variety of programs worked

The three criteria are used to define the three career stages as described below.

Career Progression

The definitions of career stages are intended as broad guidelines, and it's important to remember that the DoD is an exceptionally diverse enterprise. As such, the exact grade level at which a particular individual might reach a particular career stage varies widely depending on the organization.

Definitions

As a useful rule of thumb, the three career stages are defined as follows:

Career Stage	People Responsibility	Program Responsibility	Knowledge Responsibility
Junior	Managing one's self	Not responsible for any programs	Introductory level of professional knowledge
Mid-level	Managing the team	Decision-making authority over programs having a limited to moderate level of size, scope, and complexity	Intermediate level of professional knowledge and expertise
Senior	Managing managers	Decision-making authority over programs having a large level of size, scope, and complexity	Subject matter expert, expanding breadth and depth

Table 3: Career Stages

Junior

The first career stage is the **junior career stage**. The characteristics of a junior developing technical leader are as follows.

- A junior developing leader functions as an individual practitioner or contributor to the team. The junior career stage includes non-supervisory, university-educated professionals, and is frequently the first category that an employee belongs to if they join a large, established organization upon university graduation.
- Developing technical leaders in the junior career stage have no people reporting to them and have minimal decision-making authority since they are not responsible for programs. As a result, leadership potential at the junior career stage is observed through the employees' ability to express their ideas and to work collaboratively with others around them and those responsible for the program.
- Finally, people in the junior career stage have an introductory level of expertise. While they may possess significant academic knowledge (indicated by a bachelor's or master's degree), they are just in the beginning stage of applying that academic knowledge to problems external to the academic world.

Mid-level

The next career stage in this upward progression is the **mid-level career stage**. The characteristics of a mid-level developing technical leader are as follows.

Keep In Mind…

There may be varying combinations of these three criteria resulting in a designation of mid-level across different organizations.

- The developing technical leader has supervisory duties and is now responsible for people. This includes at least two types of positions:
  - Supervisory positions: consisting of monitoring and administrative tasks
  - Team lead positions: consisting primarily of coordinating and supportive duties; this position is typically temporary
- The level of decision-making authority is elevated. At the mid-level career stage, the employee has decision-making authority over programs having a limited to moderate level of size, scope, and complexity.
- The employee possesses an intermediate level of expertise. Within scientific work in government, it is acknowledged that expertise is a second way to progress: "While supervision is one ladder to high-level responsibility in scientific work, another ladder is personal creativity and scientific contribution."

Senior

The last career stage is the **senior career stage**. The characteristics of a senior developing leader are as follows.

- Technical leaders at the senior level have second-level supervision; they are managing managers.
- In terms of the level of decision-making authority, a senior employee may have responsibility for programs

having a large level of size, scope, and complexity.

- An employee may be categorized at the senior level if they have demonstrated an expert level knowledge of the subject matter. Similar to the mid-level, there may be varying combinations of these three criteria resulting in a designation of senior level across different professions and industries.

Competencies Throughout Careers

Key competency indicators (KCIs) address specific knowledge, skills, and abilities (KSAs) that a technical leader must possess to be successful. Knowledge is defined as the recollection of specifics and universals, methods and processes, or a pattern, structure, or setting. Knowledge is typically acquired through education and training and is the foundation for building competencies—the "K" in KSA. KSAs represent different factors of competency building. While knowledge is the foundation, it is the application of the knowledge through work experiences that builds skills and abilities.

Bloom's Taxonomy

The basis of adult learning follows a predictable path over an individual's career. Initially developed in 1956 by Benjamin Bloom and updated in 2001, the Bloom's Taxonomy is a framework that demonstrates how learning takes place, from the novice-level to that of an expert. The framework's foundation is based on building one's basic knowledge of the subject matter.

Skills and abilities are developed and refined as an individual applies their knowledge to solving problems and finding creative solutions that expand their comprehension, increasing proficiency across multiple competencies. As tasks become more challenging, the individual begins extrapolating from past experiences and knowledge while seeking the knowledge and experiences of others.

This is why competency building traditionally changes across the different career stages. At the junior career stage, education and training play a greater role in establishing the basic knowledge but it is the application of this knowledge to solve different challenges, as well as learning from others, which builds the needed skills and abilities.

Example of Building Technical Competencies Over a Career

The idea of knowledge being the first step in developing one's competency is uniquely specific to technical competencies, often referred to as "hard skills." As illustrated in Table 1, technical competencies follow a consistent pattern outlining how best to develop each. The following paragraphs outline how the Technical Planning competency can be honed through each career stage.

The methods and processes of organizing and scoping technical work across all the technical phases (from analysis and design, through to development, deployment, and operation) are taught as part of all college engineering programs. Therefore, education and training leadership development methods rate highest for the junior career stage (recognizing that junior level college experience will typically predate actual employment) where developing technical leaders learn the basics behind technical planning, and each of the other technical competencies.

With a solid foundation in technical planning, a developing leader entering the mid-level career stage can expand upon the Technical Planning competency through different and progressive experiences and job rotations. By applying their technical planning knowledge, as well as the other technical competencies, toward solving real problems and finding creative solutions, developing technical leaders are able to expand their skills and abilities thereby increasing proficiency across multiple competencies.

As a senior leader, competencies continue to grow and are best achieved through mentoring and coaching. Supporting junior and mid-level employees in the application of technical planning skills to solve real situations helps hone the senior leader's own understanding of the competency as well. Through the articulation of technical planning knowledge to the employee, the senior leader stays current with changes and improvements to technical planning processes and all the other technical competencies.

Threshold for Senior Leadership

As tasks become more challenging, the developing technical leader begins extrapolating from past experiences and knowledge, as well as tapping into the knowledge and experiences of other, to draw connections between what may appear to be unrelated information. This is the threshold to senior-level leadership.

Example of Building Enabling Competencies Over a Career

Enabling competencies are developed and reinforced by individualistic practices. Commonly referred to as "soft skills," enabling competencies follow a less consistent pattern how each is best developed. As illustrated in Table 2, development is primarily biased toward experience and job rotation followed by mentoring and coaching.

As an example, the ability to communicate effectively isn't a skill that can be learned from a book. While there are basic methods and processes of organizing and targeting communication (knowledge) related to the Communicating Effectively competency that can be taught via education and training, the ability to truly communicate effectively tends to be more innate or developed through experience with feedback typically from mentoring and coaching by peers and leaders.

Junior level developing technical leaders probably did not have any instruction specific to communicating effectively, as the focus of their curriculum was on the technical knowledge. Ideally, once on the job, an employer would either require attendance in an effective communication skills training course—among other enabling competency programs—or short of that, the junior developing technical leader would seek out effective communication skills programs using their own initiative.

As with Technical Planning, improving one's Communicating Effectively competency, as well as the other enabling competencies, is best achieved through applying knowledge. By preparing briefings and making presentations, especially to non-technical audiences, mid-level developing technical leaders are able to expand their skills and abilities in effective communication, thereby increasing proficiency across multiple competencies.

Again, similar to Technical Planning, a senior leader's ability to communicate effectively continue to grow through mentoring and coaching. Supporting junior and mid-level employees in applying communicating effectively knowledge and skills, through the preparation of briefings and the providing of feedback on their presentation skills, helps hone not only the employee's abilities but also the leader's own understanding of the competency.

2.1.3. Framework Element 3: Leadership Development Methods

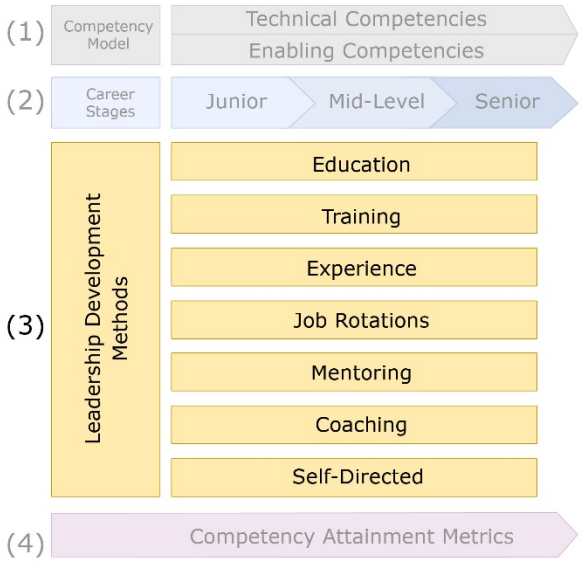

Figure 5: Leadership Development Methods of the Technical Leadership Development Framework

The third element in the Technical Leadership Development Framework is the application of the most effective leadership development method or methods to improve competencies which are weakest or are most desired for the current job position and desired future job positions. There are seven primary approaches to developing the technical leadership competencies: education, training, experience, rotational assignments, mentoring, coaching, and self-directed development.

Descriptions

Leadership Development Method	Definition
Education	The formal instruction received from academic or government institutions, typically resulting in a bachelor's, master's, or doctoral degree
Training	The formal instruction received from government, corporate, or academic institutions, spanning multiple weeks to multiple years, such as Defense Acquisition Workforce Improvement Act (DAWIA) Levels I-III, focusing on technical and/or leadership instruction
Experience	The process of gaining work knowledge and skills from performing in a specific role directly
Rotational Assignments	Allows the leader to broaden their skills by providing different experience in terms of function, role, or geographic location
Mentoring	Mentoring consists of formal or informal advising or developmental relationship with a more senior leader, in a one-on-one context
Coaching	Coaching is distinguished by a focus on applied, goal-oriented learning and behavioral change, also in a one-on-one context
Self-directed Development	Self-directed leadership development refers to the leaders themselves taking the initiative to learn without direction from someone else, such as through reading books, or observing other leaders

Table 4: Leadership Development Method

Growing Competencies

It is possible to use multiple developmental methods while simultaneously developing multiple competencies. Referring to Table 4, the developing technical leader uses the most effective leadership development methods to hone the necessary competencies. A rotational assignment, for instance, would help develop the Systems Complexity technical competency as well as the Thinking Critically and Communicating Effectively enabling competencies. Working as part of a contracting team provides basic training on contracting and the types of business arrangements and procurement alternatives commonly used to support various aspects of the technical and enabling competencies needed.

Learning Styles Impact on Leadership Development Methods

Another aspect that relates to leadership development is a person's learning style. Learning styles are different from the developmental methods; the former addresses how a person understands new information while the latter speaks to how best to instruct the different competencies. Understanding one's preferred learning style can help identify the best developmental method.

Developing a Preference

One's learning style(s) is typically innate and ingrained at a very young age, influenced by environment and cognitive and emotional factors.

Learning styles, by percentage, include:

- Reading/Writing Preference (20%)
    - Individuals who have a reading/writing preference prefer information to be presented using words. They appreciate reading and perform well on written assignments such as writing reports and other business documentation. A great way to help these individuals learn is by having them describe diagrams or charts using written statements. Then, they can study their notes later to better retain the information.
    - Developmental methods best suited for this learning style include education and training, but also self-directed, using written materials.
- Visual (20%)
    - Visual learners prefer to take in information using charts, maps, graphs, diagrams, and more. Using images to explain concepts and ideas is the best way to reach a visual learner as they learn best when information is presented using patterns, shapes, and other visual aids in place of written or spoken words. A flow chart might be used to explain a scientific process rather than listing the steps, for example. However, this type of learning style does not include photographs or videos.
    - Developmental methods best suited for this learning style include education and training, but also self-directed, using appropriate visual materials.
- Tactile/Kinesthetic (30%)
    - Kinesthetic learners learn best when they can use tactile experiences and carry out a physical activity to practice applying new information. Individuals preferring this mode are connected to reality, either through concrete personal experiences, examples, practice, or simulation. These learners enjoy working through examples of an idea or process, or being tasked with recreating experiments to illustrate concepts.
    - Developmental methods best suited for this learning style include direct experience and job rotations, but also self-directed hands-on activities.

Not "One Size Fits All"

An individual's learning style and the desired competency to be developed dictate the most beneficial methods to use. Training is not necessarily the go-to approach in all cases.

- Auditory (30%)
    - This learning style describes individuals who learn best when information is heard or spoken. They benefit from lectures, group discussion, and other strategies that involve talking things through. These learners prefer to sort things out by speaking first, rather than mentally sorting out their ideas before speaking, and benefit from audio recordings of subject matter. Activities that require learners to explain concepts is a good learning tool for these individuals.
    - Developmental methods best suited for this learning style include mentoring and coaching, but also self-directed that require them to verbally work through activities.

Developers of learning material take into consideration the different learning styles' preferences and strive to create inclusive instruction, whether via formal college programs, professional training, structuring rotational assignments, coaching and mentoring programs. Even direct on-the-job experience can be adapted to one's preferred learning style(s).

Value by Career Stage

The table below identifies how effective a particular training method is for each competency by career stage.

The level of effectiveness for each career stage will help guide discussion on which development method to pursue.

COMPETENCY	LEADERSHIP DEVELOPMENT METHOD	EFFECTIVENESS		
		JUNIOR	MID-LEVEL	SENIOR
Technical Planning	Education and Training	High	Medium	Low
	Experience and Job Rotation	Low	High	High
	Mentoring and Coaching	Low	Low	High
Technical Requirements Definition and Analysis	Education and Training	High	High	Low
	Experience and Job Rotation	Low	High	High
	Mentoring and Coaching	Low	Low	High
Logical Decomposition	Education and Training	High	Medium	Low
	Experience and Job Rotation	Medium	High	Medium
	Mentoring and Coaching	Low	Low	High
Product Verification and Validation	Education and Training	High	High	Medium
	Experience and Job Rotation	Low	High	High
	Mentoring and Coaching	Low	Low	Medium
Product Transition	Education and Training	High	Medium	Low
	Experience and Job Rotation	Medium	High	High
	Mentoring and Coaching	Low	Low	High
Lifecycle View	Education and Training	High	Medium	Low
	Experience and Job Rotation	Medium	High	High
	Mentoring and Coaching	Low	Low	High
Technical Risk Management	Education and Training	High	Medium	Low
	Experience and Job Rotation	Medium	High	High
	Mentoring and Coaching	Low	Medium	High
Systems Thinking	Education and Training	High	Medium	Medium
	Experience and Job Rotation	Medium	High	Medium
	Mentoring and Coaching	Medium	Low	Medium
Systems Complexity	Education and Training	High	High	Medium
	Experience and Job Rotation	Medium	High	High
	Mentoring and Coaching	Medium	Low	Medium
Big Picture Thinking	Education and Training	Medium	Low	Low
	Experience and Job Rotation	Medium	High	High
	Mentoring and Coaching	Medium	Medium	High
Abstraction	Education and Training	High	Medium	Medium
	Experience and Job Rotation	Medium	High	High
	Mentoring and Coaching	Low	Low	Medium
Paradoxical Mindset	Education and Training	High	Medium	Low
	Experience and Job Rotation	Medium	Medium	Medium
	Mentoring and Coaching	Low	Medium	High

Table 5: Value of Leadership Development Methods by Career Stage (Technical Competencies)

COMPETENCY	LEADERSHIP DEVELOPMENT METHOD	EFFECTIVENESS		
		JUNIOR	MID-LEVEL	SENIOR
Developing People	Education and Training	Medium	Medium	Low
	Experience and Job Rotation	Medium	Medium	High
	Mentoring and Coaching	High	High	High
Leading People	Education and Training	Medium	Medium	Low
	Experience and Job Rotation	Medium	Medium	Medium
	Mentoring and Coaching	High	High	High
Thinking Critically	Education and Training	High	Medium	Low
	Experience and Job Rotation	Low	Medium	High
	Mentoring and Coaching	High	High	High
Building Trust and Credibility	Education and Training	Medium	Medium	Medium
	Experience and Job Rotation	Low	High	High
	Mentoring and Coaching	High	Medium	Medium
Communicating Effectively	Education and Training	High	Medium	Low
	Experience and Job Rotation	Low	Medium	High
	Mentoring and Coaching	Medium	High	High
Establishing and Maintaining Stakeholder Relationships	Education and Training	High	Medium	Low
	Experience and Job Rotation	Low	Medium	High
	Mentoring and Coaching	High	High	High
Influencing Others	Education and Training	High	High	Medium
	Experience and Job Rotation	Low	Medium	Medium
	Mentoring and Coaching	Medium	Medium	High
Developing Strategy and Vision	Education and Training	High	Medium	Medium
	Experience and Job Rotation	Low	Medium	Medium
	Mentoring and Coaching	Medium	Medium	High
Fostering Agility	Education and Training	Low	Medium	Low
	Experience and Job Rotation	High	High	High
	Mentoring and Coaching	High	Medium	Medium
Promoting Innovation	Education and Training	Medium	Medium	Low
	Experience and Job Rotation	Medium	High	High
	Mentoring and Coaching	Medium	Medium	Medium
Possessing Government Acumen	Education and Training	High	Medium	Medium
	Experience and Job Rotation	Medium	Medium	Medium
	Mentoring and Coaching	Medium	Medium	High
Possessing a Macro Perspective	Education and Training	High	Medium	Low
	Experience and Job Rotation	Low	Medium	High
	Mentoring and Coaching	Medium	Medium	High

Table 6: Value of Leadership Development Methods by Career Stage (Enabling Competencies)

Key Competency Indicators to Determine Competency Proficiency

Both technical and enabling competencies are demonstrated through key competency indicators (KCIs) which are specific demonstrable actions that characterize the proficiency at the junior, mid-level, and senior career stages. Each career stage has a unique and progressive set of KCIs that demonstrate mastery of each technical leadership competency. The hierarchical structure of competency classes, competencies, and KCIs at the junior level is illustrated in Figure 6.

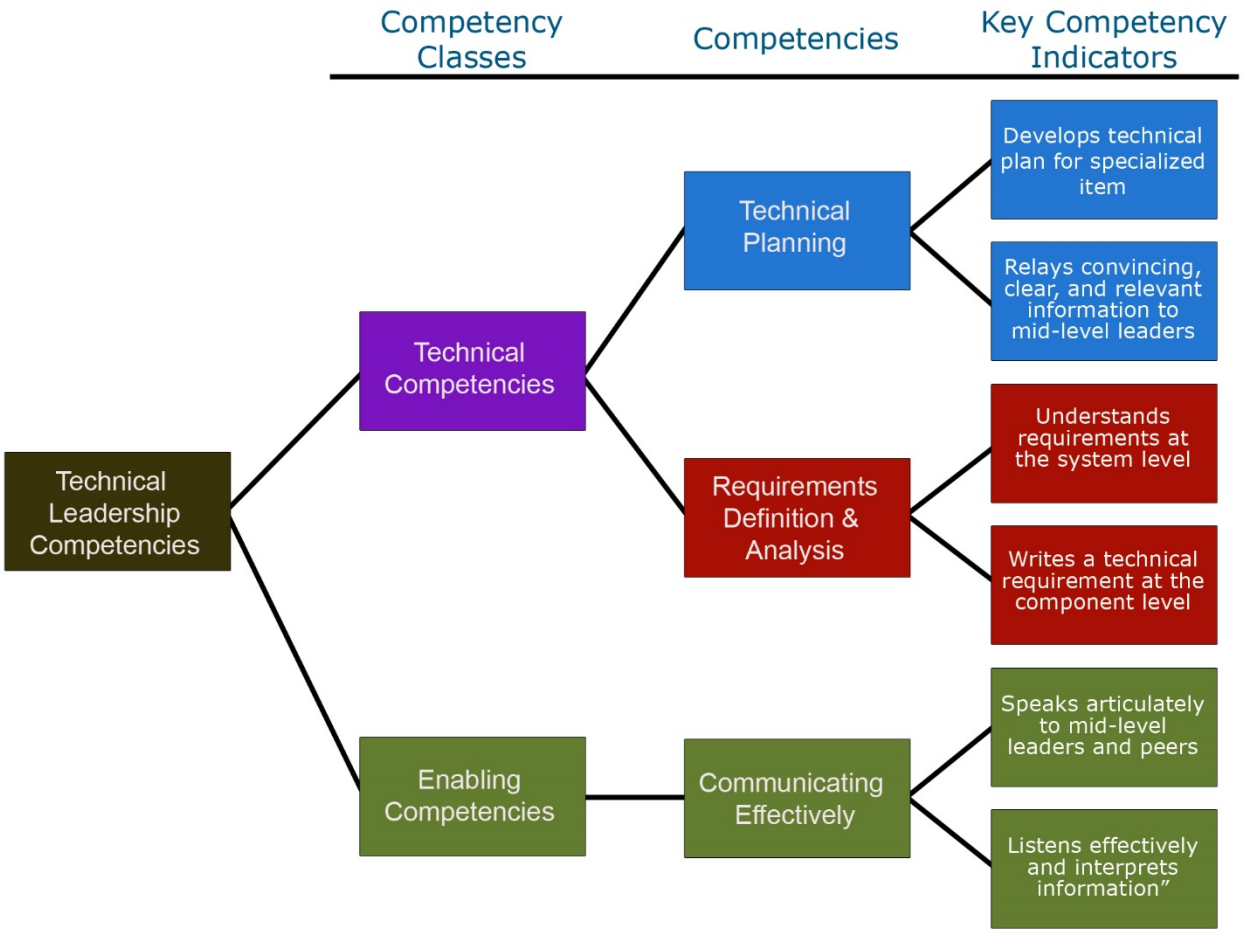

Figure 6: Competency Hierarchy

An example of how KCIs build over career stages for the Communicating Effectively enabling competency is shown in Table 6.

JUNIOR	MID-LEVEL	SENIOR
Listens effectively and interprets information and translates it into work tasks	Actively listens (understands what is meant, in addition to what is said), clarifies what needs to be heard, and conveys genuine interest to senior level leaders, junior level leaders, peers, and stakeholders	Actively listens (understands what is meant, in addition to what is said), clarifies what has been heard, and conveys genuine interest to executive level leaders, mid-level leaders, peers, and stakeholders

Table 7: How Competencies Build Over Career Stages

2.1.4. Framework Element 4: Competency Attainment Metrics

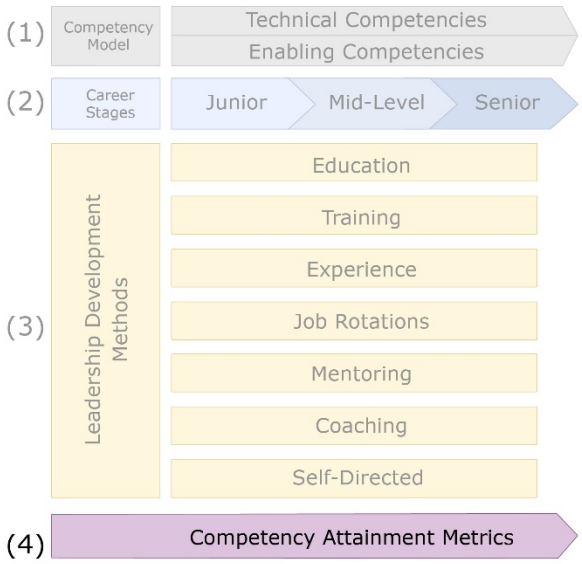

Figure 7: Competency Attainment Metrics of the Technical Leadership Development Framework

The Technical Leadership Development Framework focuses on competency mastery using KCIs. The competency attainment process proposed by the Framework uses these metrics to determine the extent to which the developing technical leader has achieved the targeted competencies.

Definitions

Using KCIs, a **competency attainment metric** is an evidence-based measurement of a person's knowledge, skill, or abilities after that person has used one or more of the leadership development methods to strengthen one or more of their competencies.

Competency attainment metrics measure or gauge the extent to which learning obtained through the leadership development methods has been internalized and manifested in external behavior that has beneficial performance impacts.

As observable actions that characterize the technical leadership competency being performed, KCIs are identified with the developing technical leader's role, not their position within the organization.

Competency Attainment Metrics by Role

Developing Technical Leader

For the developing technical leader, competency attainment metrics provide important feedback regarding the extent to which their internal learning has resulted in external, beneficial performance impacts for themselves and their work. Based on the new information, the developing technical leader can then choose to develop different competencies, enabling them ultimately to advance in career stage.

Measuring Growth

Assessing competency attainment informs the developing technical leader on whether they successfully learned and applied that learning on the job.

Supervisor

Competency attainment metrics provide the supervisor with insight on how well each of their team members is translating the learning received into individual performance impacts, as well as team outcomes. Supervisors then provide customized feedback to their team members on their technical leadership competencies, identifying which competencies have been learned effectively and those competencies requiring additional development.

Supervisors can use competency attainment metrics for other talent management purposes, such as identifying those team members most suited for promotion. A lack of competency attainment metrics prevents supervisors from realizing how well their team members are using the leadership development methods and opportunities.

Executive Sponsor

Finally, competency attainment metrics for technical leadership provide the executive sponsor with the tool for oversight and governance of their technical leadership talent management process. Because data on technical leadership competency attainment is collected for the entire organization, the executive sponsor can conduct analytics to evaluate trends, by team, by leadership development methods, or by competency. Without competency attainment metrics, this is not possible, because even though people are being trained, there is no data captured that reflects the results of that training.

Collecting Evidence

While an executive sponsor is interested in development methods data, statistics, and results, they are even more interested in competency attainment metrics because it connects learning to outcome based performance.

KCIs and Evidence-Based Accomplishment

KCIs are most effective when tailored to a specific technical specialty and organizational mission. Appendix 1 provides generalized KCIs by technical competency and career stage. It is the responsibility of the developing technical leader and their supervisor to adjust the generalized KCIs into actionable goals that, when achieved, provide evidence of competency attainment.

The developing technical leader needs to identify accomplishments that demonstrate how each of the KCIs have been achieved. For instance, an example of evidence-based accomplishment for the first KCI the Technical Planning competency (at the junior career stage) is "Delivered program plan for milestone 1.0 of Program 1234." An outcome-based metric of plan quality or effectiveness is how many of the program's milestones were actually met.

Demonstrating KCIs

Measurement is to be demonstrated by accomplishment rather than capability (something that an individual can lay claim to).

For illustration, one person may deliver plans (for milestones) which are never met, while another person may deliver plans (for milestones) which are met 80% of the time. While plan achievement may have many causes, it is still possible to distinguish plan performance among individuals by examining how many plans are met compared to those that are not met. Therefore, for illustration purposes, a second evidence-based accomplishment measure would be "Milestone 1.0 was achieved on-time."

1. Select competency within the appropriate career stage.
   For example: Technical planning at the junior career stage.
2. Develop KCI based on competency.
   For example: Develop technical design and architecture plans.
3. Develop evidence-based accomplishment(s) based on KCI.
   For example: 1. Delivered program plans for Milestone 1.0 of Program 1234. 2. Milestone 1.0 was achieved on-time.
4. Repeat for each competency that is targeted developmental areas.

Spider Plot Diagram for Assessment

Spider plot diagrams are visual representations of the competency a developing technical leader possess. The 24 technical leadership competencies are separated into two diagrams; one for technical, the other for enabling. Each career level has its own section, forming rings within the diagram. When each of the 24 competencies are assessed and plotted, the developing technical leader "connects the dots" between each point on the two diagrams. The points closer to the outside of the ring mean that the developing leader is capable of performing the duties prescribed by that competency. If the point is closer to the center of the ring, it indicates that the developing leader should work to strengthen their capabilities within that competency.

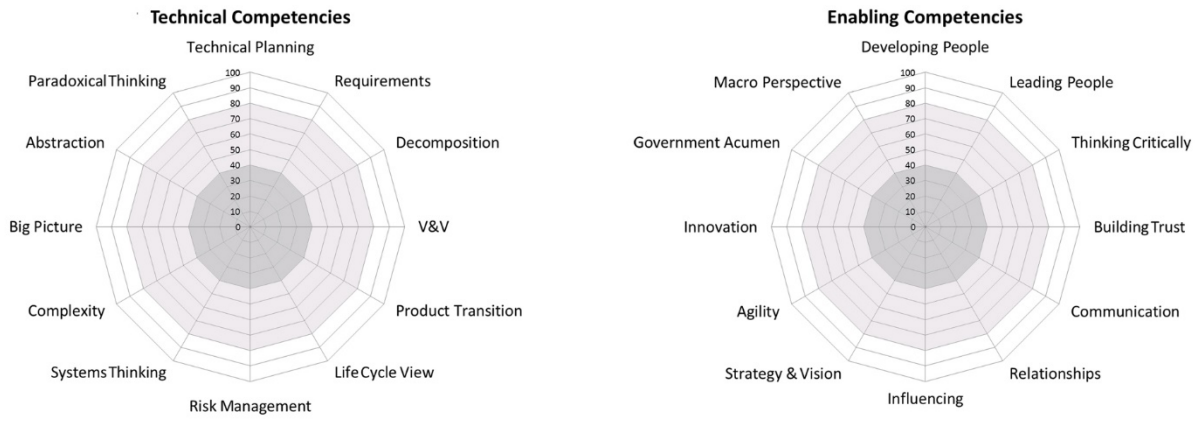

Figure 8: Sample Blank Spider Plot Diagrams

The Competency Attainment Process and how to complete spider plot diagrams are further discussed in Section 5.

2.1.5. Introduction to the Technical Leadership Development Framework Career Model

All the elements of the Technical Leadership Development Framework work together to provide a logical process of recognizing what competencies are lacking, methods to improve those skills, and metrics to assess how successful the technical leader's efforts were. In theory, a developing technical leader could model their career progression using the Technical Leadership Development Framework. The projected path through the Framework is called the Technical Leadership Development Career Model.

The Technical Leadership Development Framework Career Model Defined

The Technical Leadership Development Career Model is defined as movement through the Framework, or how the various elements in the Framework are connected to form a system. In Figure 9, a person in the junior career stage, desiring to strengthen their competencies, takes some training classes, undertakes a job rotation, and obtains a mentor based on which development method is most effective in Tables 5 and 6. After one year of developing their competencies using these three leadership development methods, they measure the level of their competency attainment. This shows how a person moves through the Framework, and how these four elements are connected to form a system.

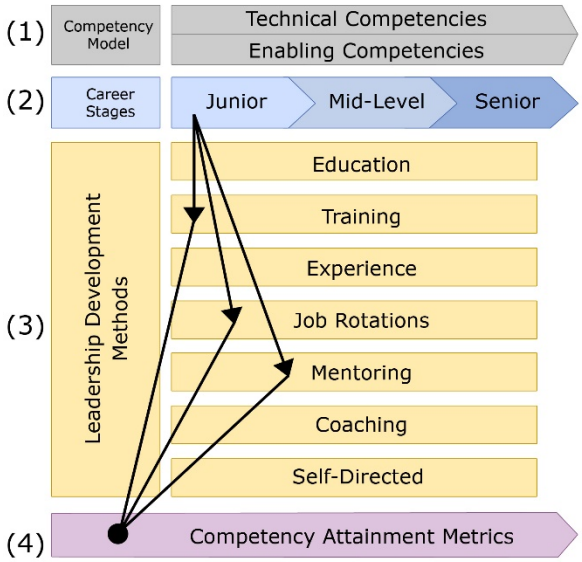

Figure 9: Possible Technical Leadership Development Career Model for a Junior Level Leader

How It Works

The Framework Elements work together to facilitate the achievement of appropriate competencies in the following ways:

- Of the 24 competencies, the developing technical leader identifies which one(s) they are capable of and which one(s) to improve upon.
- With the necessary competencies identified, the developing technical leader's career stage is noted, which dictates the KCIs that provide evidence of competency attainment.
- The sum of all the KCIs for one competency across the career stages results in full achievement of that competency.
- The sum of all the KCIs at one career stage results in full competency across all competencies for a particular career stage.
- Seven classes of development methods are defined in Section 4, and are proven ways to develop the KCIs at each career level. The development methods are not mandatory.
- The attainment of a competency is established through independent assessment metrics in Framework Element 4.

SECTION 3

Technical Leadership Competencies

In this section, we will discuss the 24 technical leadership competencies. The competencies are separated into two groups: technical competencies and enabling competencies.

3.1. TECHNICAL COMPETENCIES IN DETAIL

The technical competencies are the technical leadership competencies with important leadership aspects.

3.1.1. Technical Planning Competency

Definition

Technical planning is the organization and scoping of the technical work across all the technical phases (from analysis and design, through to development, deployment, and operation). Technical planning includes the option to create technical plans that are not typically present in business plans or business project plans, such as:

- Technical design and architecture plans
- Product implementation or development plans
- Verification and validation plans
- Test and evaluation plans (or unit, integration, and user acceptance testing plans)
- Product transition plans (or deployment plans)

Technical planning also includes the ability to identify the control points as the product moves through the lifecycle. In addition to their unique technical characteristics, technical planning incorporates technical task identification, prioritizing, resource assignment, scheduling, and cost control.

Rationale

Technical planning requires an understanding of the technical activities in order to plan them accurately. Additionally, using the direction provided by technical planning, subcomponent organizations are able to integrate into the larger system by keeping each organization informed about the other's actions.

Why this Competency is Important for Technical Leadership?

Keep In Mind…

Because of the technical nature of technical planning content, it cannot be outsourced to a non-technical agent.

The Technical Planning competency provides technical direction and guidance to subordinate suborganizations. Additionally, the role of technical planning in the success of a subordinate suborganization is critically dependent on the technical planner's understanding of the role, relationships, direct and indirect impacts of engineering, science, and technology working across organizational levels and boundaries. This combination of technical understanding, building consensus, and sensitivity to organizational interactions makes this competency foundational to the exercise of technical leadership in an organization.

3.1.2. Technical Requirements Definition and Analysis Competency

Definition

Technical requirements definition and analysis is the translation of the customer's behavioral and functional needs and expectations into technical statements (including technical problem scope, technical product constraints, and technical requirements).

Rationale

The development of technical requirements, and their transformation into specifications that are implemented in a design, is a technical task. Additionally, the technical leader requires technical knowledge to understand which technical requirements are feasible and which are not when in discussions with customers.

The developing technical leader is responsible for negotiating technical requirements with customers, and for explaining to non-technical customers and other stakeholders technical conflicts contained in high level system requirements.

Why this Competency is Important for Technical Leadership?

Failure to properly set and manage technical requirements is a common source of failed technical products, including large unsuccessful information technology (IT) projects, making the Technical Requirements Definition and Analysis competency important in the prevention of this type of failure. Requirements are derived through negotiating with customers and other stakeholders and involve strong communication and influence skills to manage. Without effective requirements, a program will fail to meet expectations.

3.1.3. Logical Decomposition Competency

Definition

Logical decomposition is the ability to separate or disintegrate a problem, function, or system into its constituent parts, often into a hierarchical structure. Logical decomposition occurs through a hierarchical breakdown of a large (or complex) system into a set of functions at multiple levels.

Rationale

The activity of logical decomposition into sub-problems, sub-functions, or subsystems is a method used in science and industry, particularly in science and engineering to design components and systems.

A technical leader's understanding of the close association between decomposing a system and the assignment of resources (in subordinate suborganizations) to the resulting subsystems or segments is crucial in a leadership role. Additionally, the technical leader needs to be confident with discussing systems complexity with multiple levels of stakeholders.

Why this Competency is Important for Technical Leadership?

The appropriate allocation of requirements to a top-level logical architecture is a "make or break" moment in determining success for programs with high technical content. Only technical leaders have the perspective to be able to do this accurately.

3.1.4. Product Verification and Validation Competency

Definition

Product verification and validation is the comparison and evaluation of the final technical product or system with the initial requirements, specifications, and customer and other stakeholders' expectations.

Verification vs. Validation

Technical product verification focuses more on whether the product or system is technically accurate and designed correctly, whereas technical product validation focuses more on whether the product or system meets customer expectations.

Rationale

Verification and validation (such as the design of experiments, statistical analysis, and modeling and simulation) are methods used in science and engineering to verify and validate components and systems.

The essential leadership skills of communication, influence, and coaching are integral to ensuring that this competency is executed successfully, as product verification and validation activities occur across multiple processes and possibly multiple technical program teams.

Why this Competency is Important for Technical Leadership?

Technical leaders need to have the foresight to schedule reviews and test events to verify and validate that the product being developed meets stakeholder expectations. Verification and validation is likely to be the first function deferred when technical programs are delayed. Technical leaders must be prepared to use persuasion and influence to convince both superiors and subordinates not to reduce time and resources allocated to verification and validation because of overruns in other lifecycle phases.

3.1.5. Product Transition Competency

Definition

Product transition is the deployment of the technical product from development into production, test, operations and sustainment. Product transition includes storing and moving the product, preparing the receiving site, and end user training.

Rationale

Product transition is used in science and engineering to deploy technical products into operation. Technical leaders must be able to guide and direct transition to the client.

Why this Competency is Important for Technical Leadership?

Technical leaders must ensure that product transition is a team effort, otherwise excessive organizational friction could lead to cost increases, schedule delays, and inferior quality. If a product is not transitioned effectively, it proceeds no further in the product lifecycle, and becomes failed at that point.

3.1.6. Lifecycle Competency

Definition

The Lifecycle competency is defined as managing the product movement through the lifecycle, including setting the criteria by which the technical product may be evaluated as it passes from one stage to another.

A generic system lifecycle model consists of the following phases:

- Concept and system definitions
- Design
- Build
- Realization/production
- Integration
- Verification and validation
- Support and utilization
- Retirement
- Disposal

Keep In Mind…

The lifecycle is defined as a series of temporal stages through which a technical product is first envisioned and defined, then built, transitioned into production, maintained, and ultimately retired and disposed.

Rationale

Technical leaders set product evaluation criteria and guide and direct the product through the lifecycle. Knowledge of a product's lifecycle enables the technical leader to 1) set the entrance requirements by which the technical product advances from one phase to another, and 2) prepare the technical products and activities (also known as technical work packages) and technical reports by which the technical product advances from one phase to another.

Why this Competency is Important for Technical Leadership?

The significance of the Lifecycle competency for technical leadership stems from the close association between the lifecycle phase transition points and the scheduling and cost of resources. A holistic view of the product lifecycle is critical for technical leaders to exercise influence and persuasion in achieving organizational goals and instilling organizational values with acceptable risk to program achievement.

3.1.7.Technical Risk Management Competency

Definition

The Technical Risk Management competency is the ability to identify, quantify, and mitigate technical risk, and the acceptance of any residual technical risk. Technical risk management consists of the following:

- Identifying the technical risks
- Assessing those risks in terms of the severity of the consequence and the probability that the risk becomes an issue (actually occurs)
- Determining their impact on program/project schedule, cost, and performance
- Developing risk mitigation plans; and acceptance of any residual risk

Rationale

A developing technical leader's ability to identify and qualify (assessing probability and severity) technical risk requires technical understanding and insight. The developing leader is then tasked with accurately representing technical risk knowns and unknowns to superiors and subordinates.

Why this Competency is Important for Technical Leadership?

Technical risk management requires an equal measure of technical and leadership qualities. Misunderstanding the role of technical risk management in a technical program can have disastrous consequences.

3.1.8.Systems Thinking Competency

Definition

The Systems Thinking competency seeks holistic explanations and relationships when examining technical problems, and focuses on connections and interfaces among the subsystems in a system. Systems thinking emphasizes a holistic approach when thinking about a system and the interrelationships that form system behavior.

Systems Thinkers Think Differently

Systems thinkers are those who focus on the whole system rather than the individual parts in the system, and who focus on the connections and interfaces between the components rather than the individual components.

Systems thinking includes the ability to see the big picture, and how the system interacts with the external environment. Systems thinking is differentiated from the Lifecycle competency in that the lifecycle focuses on the "when" (i.e., milestones) of the product while systems thinking focuses on the "how".

Rationale

The technical product/system connections and interfaces and the system explanations, descriptions, and relationships need to be technically understood. To accomplish this, technical leaders need to communicate effectively, to provide direction and guidance to those working on the product or system.

Why this Competency is Important for Technical Leadership?

As in other instances, the importance of this competency is in bringing together of special technical insight and persuasive demonstration of that insight. Only a strong leader with exceptional technical skill, and a particular kind of vision is capable of bringing the special insights of systems thinking into play for the solution of difficult technical challenges.

3.1.9.Systems Complexity Competency

Definition

The Systems Complexity competency is defined as understanding the interfaces within and between systems, and recognizing the potential for emergent behavior due to differences in system components and interfaces. Systems complexity focuses on the volume, types, and diversity of system elements, relationships and interfaces, as well as the lack of system behavior predictability originating from the volume, types and diversity of system elements, relationships and interfaces.

Rationale

As the complexity of systems increases, a technical leader's understanding of systems complexity is required to successfully design, realize, and operate the complex systems. A technical leader needs to be able to communicate effectively and provide direction and guidance regarding a system's complexity.

Why this Competency is Important for Technical Leadership?

As systems become more and more interconnected, only technical leaders can provide the necessary guidance to address systems complexity.

3.1.10. Big Picture Thinking Competency

Definition

The Big Picture Thinking competency is the management of technical aspects external to the system. Big picture thinking is differentiated from systems thinking in that big picture thinking focuses on the technical environment in which the system exists, or a particular system in the context of all other systems.

Big Picture vs. Systems Thinking

Whereas systems thinking is inward-facing, big picture thinking is outward-facing, relating to customers as well as external and internal stakeholder.

Big picture thinking addresses organizational context factors such as business implications and political implications of the system, and how the system fits in the organizational landscape (e.g. relative to finance and human resources).

Rationale

Successful technical solutions can only exist within their larger context, including their technical environment and organizational environment. Technical leaders must understand the big picture context to develop effective solutions. The leaders' capability to provide the big picture for their subordinates enables their subordinates to fully understand where the technical solution fits in its context.

Why this Competency is Important for Technical Leadership?

Without big picture thinking, technical leaders can be easily entangled in the details and lose an overall perspective of the engineering endeavor and the problem to be solved. A clue to its importance lies in the fact that attempting to describe "big picture thinking" from a technical perspective or a leadership perspective results in using the same words.

3.1.11. Abstraction Competency

Definition

Abstraction is the identification and translation of a pattern in one domain to a different domain. More specifically, abstraction is the ability to identify patterns, generic structures or principles in one domain, and translate them to a different domain to solve a problem, generate a solution, or develop a new product, even though there does not appear to be any parity. The larger the difference in the domains' surface details and characteristics, the higher the level of abstraction.

Rationale

Abstraction allows the technical leader to advance beyond their initial specialized training in a single area to handle multiple disciplines and domains. The ability to perform abstraction well builds the trust and confidence level of subordinates, peers, and superiors.

Why this Competency is Important for Technical Leadership?

Technical leaders must be able to leverage ideas, solutions, and lessons learned across multiple domains to lead effectively, maximize investments, and guide mid-level leaders in doing the same.

3.1.12. Paradoxical Mindset Competency

Definition

A paradoxical mindset means the technical leader can hold opposite views simultaneously to make better decisions.

Managing paradoxical or contradictory views, practices, and cultural norms is needed to engage multiple stakeholders, and to ensure that different ideas and courses of action are managed effectively. Paradoxical thinking introduces an uncomfortable level of uncertainty for technical professionals who typically thrive on clarity, certainty, and solutions, and therefore must be handled effectively.

Rationale

Many of the decisions, problems, and courses of actions a technical leader encounters will involve data, interpretations, opinions or theories that are divergent or contradictory and/or require trade-offs to create a solution that balances positives against possible negatives. The ability to hold divergent and contradictory positions simultaneously allows the individual to more fully understand the decision or course of action to be made, and therefore enhances the quality of the decision or course of action.

Why this Competency is Important for Technical Leadership?

This competency keeps technical leaders from being blindsided by too narrow a technical focus. In addition, it is particularly significant since technologies and threats are rapidly changing, and having a paradoxical mindset facilitates a rapid and effective response. Finally, paradoxical thinking also enables leaders to build and lead diverse teams of people who think differently from each other.

Keeping An Open Mind

When dealing with large systems of national importance, it is imperative to have as wide and as agile a perspective as possible on solutions.

3.2. Enabling Competencies in Detail

The competencies described in this section are general leadership competencies critical in a technical environment. They enable competent technical leaders to execute the technical competencies described in the previous section.

3.2.1. Developing People Competency

Definition

The Developing People competency aids in the expansion of people's ability to do technical work effectively, expanding their ability to lead others effectively, increasing their decision-making capability (with associated trade-offs and judgment calls), helping people understand their career paths and career growth, encouraging people to be good citizens in the workplace, and fostering people's fulfilment from doing their work.

Rationale

The ability to develop people counterbalances the technical leader's tendency to focus on the technical task and associated technical processes instead of focusing on the people and associated people development processes.

Developing technical leaders is fundamental to ensuring the depth and breadth of the technical workforce leadership bench and growing technical leadership talent at all levels.

Why this Competency is Important for Technical Leadership?

Developing people helps build and maintain the technical workforce's currency in a rapidly evolving field.

3.2.2. Leading People

Definition

The Leading People competency is the guidance, direction, and motivation of others in a dignifying and empowering way to further the goals and priorities of the organization. Leading people includes delegating to subordinates, and enabling them to act. It is also possible for subordinates to lead others when they provide guidance, direction, or motivation to peers or superiors.

Rationale

Technical work is creative at its core. It is dependent on the creative performance of its practitioners, the technical leader understands how to lead people to obtain maximum performance from a team consisting of diverse members, rather than having the diversity create problems and hinder performance.

Guiding, directing, and motivating technical professionals is synonymous with leading them, making the ability to lead people an essential enabling competency.

Why this Competency is Important for Technical Leadership?

The complexity and speed of change, especially in the technical arena, is such that senior leaders cannot succeed without a strong and motivated team supporting them. Beyond the need to complete day-to-day operations, senior and mid-level leaders need to ensure there is a pipeline of technically competent developing leaders in the organization to assume eventual leadership roles.

Leading People

Being able to effectively lead people cascades down to the mid-level leaders as they must build their own supporting teams and the senior leader is a key role model.

3.2.3. Thinking Critically

Definition

The Thinking Critically competency is the use of logic and analysis to identify and evaluate the strengths, weaknesses, and implications of different courses of action, as well as analyzing a situation dispassionately.

Rationale

Many technical products and processes are neither standard nor routine and require a higher level of critical thinking. Even for those technical products or processes that are standard or routine, something may change, initiated by a client request or changing technology, and the higher the level of critical thinking around the change, the better the resulting decision regarding the changed technical product or process.

The decisions made using critical thinking, such as during technical review meetings, provide guidance and direction to the people with respect to the technical product or system under review.

Why this Competency is Important for Technical Leadership?

Technical leaders must be able to think critically due to the increasingly pervasive, complex, integrated, and unpredictable nature of technology and systems development. The ability to objectively investigate, analyze, and evaluate the strengths, weaknesses, and implications of different courses of action, extrapolate cause and effect, and determine the best solution when presented with imperfect solutions is critical in a technology environment. Imparting this skill to subordinates infuses it into the culture of the organization.

3.2.4. Building Trust and Credibility

Definition

The Building Trust and Credibility competency is being able to relate to others in such a way as to build a legitimate belief in the leader's intentions and those of the organization. To trust or believe a person or organization is to rely on a person or organization's authenticity without possessing knowledge or other assurance of that reliance.

Rationale

Building trust and credibility increases the effectiveness and efficiency of the technical competencies, ultimately resulting in positive individual and organizational reputation and credibility. Many actions that build trust are implicitly embedded in the technical competencies. The action, "keeps promises to mid-level leaders," is implicitly embedded in the competencies in the leaders' technical competency class in which the senior leading is supporting the mid-level leader. Similarly, the action, "delegates responsibility and relies on the ability of the mid-level leaders to achieve their goals and objectives," is implicitly embedded in the competencies in the leaders' technical competency class.

Team performance depends on trust and credibility. Technical team members work well in a climate of trust, and the technical leader is key to establishing this climate.

Why this Competency is Important for Technical Leadership?

Building trust and credibility increases the effectiveness and efficiency of all other technical and enabling competencies, ultimately resulting in a positive individual and organizational reputation and credibility. Whether the competency is technical (such as Technical Planning or Product transition), or whether the competency is enabling (such as Leading People or Critical Thinking), trust enables team members to know they are not being taken advantage of by the system.

3.2.5. Communicating Effectively

Definition

The Communicating Effectively competency is the expression of information and ideas clearly to individuals or groups using verbal, written, nonverbal and listening skills that help the receiver(s) to understand and retain the message. Technical communication can be distinguished as conveying complex information about scientific, technological, or engineering components, products, systems, processes, or programs in a meaningful manner based on the target audience.

Avenues of Communication

In an organization, communication occurs throughout the upward, downward, or lateral information exchange or transmission of meaning, through formal or informal channels and mechanisms, to a particular audience.

Rationale

Effective communication enables many of the leaders' technical competencies. In technical planning, for example, the nature of the job is to provide clear and articulate information to technical staff so technical goals are met on time and budget. In technical requirements definition and analysis, an important action is to coach mid-level leaders in transforming customer inputs into systems requirements and in translating potentially non-technical requirements into technical language. In Technical Risk Management, an important action is to articulate and communicate the technical risk profile to superiors and sometimes nontechnical stakeholders.

Communicating effectively enables many of the enabling competencies, and is embedded in important actions of the enabling competencies. In addition, technical leaders serve as a bridge to non-technical audiences, translating the information to ensure they understand the technical product, issues and challenges, more from a business perspective than a technical perspective.

Why this Competency is Important for Technical Leadership?

Mid- and senior level leaders need to clearly articulate objectives and directions to technical staff so that goals are met within budget and schedule. Additionally, technical leaders frequently need to communicate to clients and stakeholders having a nontechnical background, and it is the technical leader who is responsible for translating technical information into nontechnical, business language.

3.2.6. Establishing and Maintaining Stakeholder Relationships

Definition

The Establishing and Maintaining Stakeholder Relationships competency is defined as building and sustaining partnerships with other internal or external groups who can impact or are impacted by the technical leader. The importance that a particular stakeholder has to an organization is dependent on whether the organization views the stakeholder's claim as legitimate, the extent to which the stakeholder's claim is urgent, and the degree to which the stakeholder has power to influence the organization.

Who are Stakeholders?

A stakeholder is 1) any individual or group who can affect or is affected by an organization's goals, operations, product, policies, or decisions, and 2) any individual or group with whom an organization has interdependencies or interactions. A primary stakeholder has a contractual, official, or formal relationship with an organization, while a secondary stakeholder consists of all others.

Rationale

Technical products are not developed in isolation, but in the context of stakeholder's holders and requirements. The more effective that a technical leader is at moving from the science, technology and engineering perspective to the stakeholder's perspective and back again, the better able that technical leader is to design, develop, and produce a current or future technical product meeting that stakeholder's needs.

Why this Competency is Important for Technical Leadership?

Technical products are developed for stakeholders to meet their needs. Without developing and sustaining stakeholder relationships, it is not possible to lead in those spheres of influence.

3.2.7. Influencing Others

Definition

The Influencing Others competency is the persuasion of others, through non-coercive means, to accept a particular view as expressed in an idea, proposal, initiative, course of action, or decision.

Rationale

The ability to influence others increases the effectiveness and efficiency of the technical competencies. It's not enough for a technical leader to simply develop a technical plan to meet a customer's needs; they also need the ability to influence others, such as subordinates, superiors, or stakeholders, so that they are also persuaded of the benefits of the technical plan.

Influencing others is fundamental to leadership ability, including technical leadership. Some have defined leadership in terms of influence, describing leadership as the extent to which influence changes people's decisions beyond adherence to organizational policy and standard operating procedures. It is also included because it enables other enabling competencies. If a technical leader developed a compelling technical vision that isn't shared by others, such as subordinates, superiors, or various external stakeholders, the ability to sell that approach effectively to a skeptical

audience is not only dependent on communication skills, but is greatly enhanced by the technical leader's ability to influence while communicating that vision. This makes influencing a particularly important enabling skill for technical leaders.

Why this Competency is Important for Technical Leadership?

The ability to influence others increases the effectiveness and efficiency of the other competencies, both technical and enabling. Whether the competency is Technical Planning, Product Transition, Developing People, or Thinking Critically, the greater the leader's ability to influence, the greater the leader's ability to guide, direct and motivate through that influence will be, making it more likely stakeholders and mid- and executive-level leaders will accept the proposed goals, operations, product, policies, or decisions.

3.2.8. Developing Strategy and Vision

Definition

The Developing Strategy and Vision competency is defined as setting the long-term goals aligned with organizational goals, evaluating and adopting courses of action, and allocating resources to achieve those goals.

Rationale

The strategy and vision are the tools that align technical planning, product conceptualization and design to those activities that further the organization's long-term focus. Strategy and vision also allow technical leaders to frame the technical problem and understand which approaches, techniques, and solutions will and will not yield results. In addition, vision enables technical leaders to visualize the technical products and processes before they are designed and built.

The determination of goals and objectives of the suborganization, organization and enterprise and the evaluation of courses of action and allocation of resources to achieve such goals are leadership task. Strategy and vision are also critical to ensure that the technical workforce has the right technical skills in place to make the vision happen.

Why this Competency is Important for Technical Leadership?

Strategy and vision align technical planning, product design and conceptualization with the goals of the suborganization and organization. Determining the goals and objectives of the suborganization, organization, and enterprise and allocating resources to achieve such goals are important tasks for technical leaders.

3.2.9. Fostering Agility

Definition

The Fostering Agility competency is the ability to adapt quickly, learning, responding, and thriving when work tasks, the environment, context, or conditions change; and encouraging others to see change as an opportunity and seek better ways of doing their work. Agility includes the ability to leverage the opportunities and setbacks realized during normal operations, as well as during program development and execution, and turn these into a positive event.

Agility vs. Adaptability

Agility implies a more intentional, proactive position, whereas adaptability and flexibility imply a more passive, reactive position.

Rationale

The ability to foster agility enables technical leaders to adapt to technological change that occurs in the technical

products themselves as well as the supporting toolsets in many of the leaders' technical competencies.

A technical leader's privilege and responsibility is to lead personal and organizational change. Fostering agility throughout the suborganization and organization in terms of structure, culture and processes promotes the ability to keep up with change. Agility is a standard element of leadership practice.

Maintain Flexibility

The inability to respond to change, including technological change, can render a technical leader ineffective.

Why this Competency is Important for Technical Leadership?

Change in the external environment will drive change in the suborganization, organization, and enterprise, and it is the technical leader's responsibility to not only manage the impact of these changes on their organization but also prepare their mid-level leaders to embrace change and identify opportunities to lead change in how their suborganization does its business. Because individuals navigate change differently, it is the technical leader's responsibility to manage resistance and, so, how changes can benefit the individual, team, and organization.

3.2.10. Promoting Innovation

Definition

The Promoting Innovation competency is defined as creating (or seeking from others) new or significantly improved products or processes, as well as developing original approaches to handle challenges and opportunities.

Rationale

Innovation is a hallmark of leadership, including technical leadership. It is the underlying basis for technical advancement, whether that is creating new technologies or supporting deployed technologies requiring new functionality. Innovation is categorized as an enabling competency rather than as a technical leadership competency because innovation occurs in both technical and nontechnical areas.

Why this Competency is Important for Technical Leadership?

In both technical and nontechnical leadership, innovation is the foundation for technical advancement and maintaining a competitive advantage over rivals. Technical leaders must create an environment that supports the generation of new ideas, methods, products, and processes to enable their suborganization, organization, and enterprise to lead.

3.2.11. Possessing Government Acumen

Definition

The Possessing Government Acumen competency is the making of good judgments and managing human, financial, technological, and information resources in a federal, state, or local government context. It consists of both federal, state, or local employees and external contractors. It includes financial management skills (as well as deep contracting skills), and the ability to deliver on a technical vision.

Rationale

Managing the financial, organizational and human resources within a federal, state, or local context is vital to leadership. Possessing government acumen is necessary when there is interruption due to inadequate knowledge of funding, regulation, and political realities, which can be fatal for a technical program or product.

Why this Competency is Important for Technical Leadership?

Possessing government acumen means the technical leader can effectively manage human, financial, technological, and information resources within a federal, state, or local government context. A developing leader must deliver effective solutions while managing the resources available effectively.

3.2.12. Possessing a Macro Perspective

Definition

The Possessing a Macro Perspective competency is delivering solutions within the political, economic, and social aspects, context or landscape. It also incorporates the notion of managing a broader portfolio than one specific program. Possessing a macro perspective includes understanding the impact that a program has on all the functions of an organization or agency.

Taking Responsibility

In business, the macro perspective is characterized by profit and loss responsibility, which translates to budget responsibility in a government context, which is, conducting activities (to meet the mission, vision, and strategy) within an authorized budget.

Rationale

In order for a technical product to be successful, it must be successful in the context of the suborganization, organization, and enterprise and their associated mission and goals. The role of the technical leader is to align the technical leader's mission, objectives and vision so as to contribute to the achievement of the overall mission of the organization and enterprise.

Senior leaders must collaborate with peers in the same organization and enterprise. While it may be possible for a mid-level leader to succeed by playing a zero-sum game with their peers, a senior leader cannot do so.

Why this Competency is Important for Technical Leadership?

Any successful technical solution needs to exist in balance with the political, economic, and social context. The ability to navigate in the macro environment also increases the ability of the technical leader to manage effectively.

SECTION 4

Leadership Development Methods

In this section, we will discuss the seven leadership development methods developing technical leaders can use to obtain a specific competency. It should be noted that there is no one method that works for everyone all the time.

The seven leadership development methods are defined in detail in Appendix 2.

4.1. DEFINITIONS/DESCRIPTIONS

LEADERSHIP DEVELOPMENT METHOD	DEFINITION
Education	The formal instruction received from academic or government institutions, typically resulting in a bachelor's, master's, or doctoral degree.
Training	The formal instruction received from government, corporate, or academic institutions, spanning multiple weeks to multiple years, such as DAWIA Levels I-III, focusing on technical and/or leadership instruction.
Experience	The process of gaining work knowledge and skills from performing in a specific role directly.
Rotational Assignments	Allows the leader to broaden their skills by providing different experience in terms of function, role, or geographic location.
Mentoring	Mentoring consists of formal or informal advising or developmental relationship with a more senior leader, in a one-on-one context.
Coaching	Coaching is distinguished by a focus on applied, goal-oriented learning and behavioral change, also in a one-on-one context.
Self-directed Development	Self-directed leadership development refers to the leaders themselves taking the initiative to learn without direction from someone else, such as through reading books, or observing other leaders.

Table 8: Leadership Development Methods and Definitions

4.1.1. Education

Introduction

"Education" implies a formal degree program, including such courses of study as Engineering certificates or graduate certificates that do not lead directly to a degree (although they may form part of one).

Education by Career Stage

CAREER STAGE	DESCRIPTION
Junior	• Bachelor's degree in a technical field ○ Technical field is defined as science, technology, engineering, or mathematics • Developing technical leader can begin pursuit of a master's degree in a technical or engineering leadership • Focus is on education in a technical field
Mid-level	• Bachelor's degree in a technical field • Master's degree or certificate in a technical or engineering leadership program must be obtained • Refines focus from education in a technical field to technical and engineering leadership
Senior	• Master's degree in technical or engineering leadership • Pursuit of a PhD or other doctoral program in the technical leader's field of science or engineering specialty is highly desirable • A doctoral program is a way to achieve proficiency across a number of key competency indicators • Redirects focus from technical and engineering leadership to the research and advancement of the developing technical leader's mastery of the scientific or engineering specialty

Table 9: Education by Career Stage

4.1.2.Training

Introduction

"Training" is defined as instruction received outside of a formal degree program. Training refers to technical leadership training that is part of the DAU curriculum or offered by other government or corporate organizations or enterprises and includes courses taught by Service Schools, accredited academic institutions when not pursued as part of a certificate or degree program, non-technical accredited degree programs, business training, and organizations such as community colleges, the Federal Executive Institute, and the Graduate School USA. Some of these institutions package this training into programs such as the Graduate School's Executive Leadership Program (ELP) and Executive Potential Program (EPP) programs.

Training by Career Stage

CAREER STAGE	DESCRIPTION
Junior	• Targeted courses focusing on technical and enabling competencies • Designed to deliver content relevant to the KSA at the appropriate level • Focus is on the developing technical leader as an individual
Mid-level	• Training courses associated with building team leadership skills • Focus is on developing the technical leader as a manager of individuals

Senior	• Three training experiences that are vitally important
	  ○ Media training
	  ○ Executive Master's of Business Administration (MBA)

CAREER STAGE	DESCRIPTION
	○ Joint service school program • Focus is on developing the technical leader as a manager of peers and other leaders

Table 10: Training by Career Stage

4.1.3. Experience

Introduction

At each career stage, the developing technical leader should seek aspirational experiences, that is, experiences for the primary purpose of qualification for the next career stage.

The goal of experiential development is to expose the developing technical leader to a series of assignments that provide exposure to a variety of professional challenges of increasing difficulty, culminating in qualification for promotion to the next level.

Experience by Career Stage

CAREER STAGE	DESCRIPTION
Junior	• Application of basic knowledge learned from a bachelor's degree program • Obtains mastery of "management of self" • Introduction to the acquisition workforce and working as part of a team • Prepare for first formal supervisory assignment
Mid-level	• Experience administrative responsibilities associated with supervisory status • Completes assignments in the following sequence ○ Line management of a team ○ Supervisory management of a project team ○ Contracting Officer's Technical Representative with responsibility over some portion of an acquisition program • Prepare for assignment to technical staff position with a second level manager
Senior	• Experience managing suborganizations rather than individuals • Experiences emphasize the application of knowledge and becoming familiar with functions associated with staff management • Opportunity to manage a large, multi-year project with national visibility

Table 11: Experience by Career Stage

4.1.4. Rotational Assignments

Introduction

The series of positions occupied by a technical leader over an entire career should support the entire list of requisite KSAs. However, this is not possible.

Planning and Consideration

As beneficial as rotational assignments can be, they can be equally detrimental if not planned for carefully.

Therefore, there is a close relationship between regular assigned positions and rotational assignments. At each career stage, the technical leader's superiors should arranges for carefully selected rotational assignments for those KSAs that have not been addressed by regular on the job experience.

The following are attributes of a successful rotational assignment.

- First, it must be "for real," meaning that the assignment must not be contrived as a rotational assignment invented for career development purposes, but must instead be in fulfillment of an actual, no-kidding operational need of the organization, a meaningful leadership assignment with important consequences for the organization.
- Second, the assignment needs to involve a real challenge outside the leader's comfort zone, preferably involving multiple elements that go beyond the leader's previous experience. They should have received the appropriate training and education for the role, and may even have had the opportunity to observe others perform that role (up close and personal if possible) but the challenge has to be a significant step in difficulty for the assignee.
- Third, someone should have the leader's back during this process. A trusted advisor is critical to this technique, and in fact, if a rotational assignment can be completed without recourse to such an advisor, it probably wasn't adequate.

"Rotational assignment" can also include both collateral duty and volunteer positions. Thus, a rotational assignment need not involve a complete disengagement from the regular flow of work, but might instead involve longer term, periodic service as part of an ad hoc committee or in a designated ex officio role.

Rotational Assignments by Career Stage

Career Stage	Description
Junior	• Short term; shouldn't drag on or grow into permanent commitment • Involve a different supervisor; should be senior to permanent supervisor • Should target KSAs difficult to experience in regular job
Mid-level	• Overcome KSA shortfalls in regular job assignment • Involve management and supervision as a fundamental component • Should purposefully put leader in a position to lead specialists in other areas • To the extent possible, should extend beyond their home organization
Senior	• Provide experience acting as a leader of interagency peers • Become comfortable contributing to multi-agency interdisciplinary teams in high stakes, high intensity activities

Table 12: Rotational Assignments by Career Stage

Type of Job Rotation

Viewed from a program perspective, the different types of job rotational assignments may be characterized by a number of parameters, which can be used to define a rotation program, as summarized in Table 12.

Job Rotation Program Design Parameter	Job Rotation Program Design Parameter Values		
	Junior	Mid-Level	Senior
Number of rotations	One (1)	Few (2–3)	Several (≥4)
Rotation Duration	Short (4 weeks–9 months)	Typical (1 year)	Long (2–5 years)
Rotation Scope	Narrow (Within technical functional/discipline)	Intermediate (Across technical functions/disciplines)	Broad (Across technical and non-technical functions/disciplines)
Rotation Location	On-site	Off-site (but within the same country)	U.S. or International
Person's Career Stage	Junior	Mid-level	Senior
Rotation Selection	Non-selective (All employees in the population set defined)	Selective (subset of employees in the population set defined)	Selective (subset of employees in the population set defined)
Rotation extent	Partial (part-time)	Full (full-time)	Full (full-time)

Table 13: Job Rotation Attributes

Number of Rotations

The number of rotations in a rotation program may vary, from one rotation, to a few rotations (two to three), to many rotations (four or more). While a rotation program may typically consist of a few rotations, it is important to note that at a single company, there may be multiple rotation programs. This means at the aggregate level, there could be the opportunity for many rotations within the same company.

> **Multiple Rotations within One Company**
>
> At British Petroleum (BP), there are two rotations for the Future Leaders Program, and two rotations in the First Level Leaders Program. Therefore, it is possible for a person to experience a total of four rotations at BP.

A larger number of rotations is more beneficial to developing technical leaders. Multiple job rotations across the system development lifecycle ensures that a person understands the ramifications of decisions throughout the lifecycle phases, such as the implications of a particular requirement, or the design decisions during the build and test phases.

Rotation Duration

The typical length of job rotations at the junior level is a few weeks to months. These rotations are generally used for socialization or orientation where new or junior employees are exposed to various parts of the organization before identifying the department or division they would be assigned to.

The duration of job rotations increase at each level due to the increased complexity that mid-level and senior career stages, which require more time to fully digest. A mid-level employee's job rotation usually lasts a year, and provides a broader view of the business, preparing them for senior technical positions within the organization. A senior employee's job rotation could last anywhere from 2-5 years, providing experience across technical and non-technical functions or disciplines.

Dependencies

The duration of the job rotation depends on the objective of the job rotation program, and the job rotation selected is particularly dependent on a person's career stage.

Rotation Scope

The scope of the rotation may be narrow, intermediate, or broad. For a rotation having a narrow scope, the rotation will occur within the specific technical function or discipline. A rotation with an intermediate scope will occur in a different technical function or discipline, while a rotation with a wide scope will cross from technical to non-technical or vice versa.

The higher the person wants to go in the career stages, the broader the rotations should be.

Broadening Horizons

Suppose someone aspires to be in the senior level career stage. Wide rotations provide the appropriate experience necessary to perform well in this role, allowing the developing leader to gain experience in technical and non-technical areas. Because the senior career stage is responsible for a broad range of functions, gathering non-technical expereince through job rotations is quite valuable.

Rotation Location

The location of the rotation may be on-site at the same location, off-site at a different location but within the same country, or international (a different country). The rotation location may or may not be correlated with rotation scope. It is possible to have an international relocation with a different technical function or discipline, or a rotation which is off-site at a different location (within the same country) combined with a shift from a technical function to a nontechnical function.

Location, Location, Location

The higher a person wants to go in a career stage, the wider the location duration should be. That may translate to different geographic regions within the U.S., or it may translate to an international relocation.

During wide, international rotational assignments, a person learns things unique to international relocations, which is why they are a part of some global companies' leadership development programs.

Developing Technical Leader's Career Stage

Career stage is an integral part of any job rotation program design, and is typically incorporated as a factor with one or more of the other job rotation attributes.

Some job rotation programs are intended for new hires or junior employees to provide them with a quick and broad introduction to the organization. Other job rotation programs are intended for mid-level employees, in preparation for senior technical positions in the organization.

Rotation Selection

The presence or absence of selection criteria affects job rotation opportunities. For some entry-level job rotations, there may be no selection criteria, while for mid-level job rotations, there may be selection criteria that a potential program participant is required to meet prior to entry in the program.

At the junior level, several rotations can be conducted with minimal entrance requirements so that the entire technical workforce gathers both breadth and depth. At the mid-level, if the goal is to build the entire workforce's breadth and depth, there should be moderate entrance requirements.

Rotation Extent

Job rotation are also characterized by the extent of the rotation. In most job rotation assignments, a person assumes full-time responsibility for the job, in lieu of their primary job. In a few cases, a person is partially rotated. This means that individuals take up rotation jobs part-time, while still continuing to work on their primary jobs. This could be implemented by spending a few hours a day on the rotation job, or through spending one day of the week on the rotation job.

Opportunity for All

The program should consist of both partial and full job rotations so that as many people as possible can participate in a rotation.

Rotation Sequence

At the program level, another factor to consider is the sequence or order in which the job rotations occur. The sequence is linked to some of the above parameters, namely, scope, location, and career stage. The sequence of rotations should be structured as first having a narrow scope, then intermediate scope, and then a broad scope. The rationale is to first focus on building depth, and then breadth. Depth is required at the junior level, while the expansion to breadth is required at the senior level.

4.1.5.Mentoring

Introduction

Mentoring involves a relationship between experienced and less experienced team members in which the more experienced person provides an opportunity for:

- Informal discussion
- Observation of the senior's management style and techniques
- Help in networking with the senior's peers
- Removal of barriers through the senior's intercession; and for unstructured advice in an informal (and emotionally comfortable) setting

This relationship between mentor/mentee can occur within and between each career stage. In its best incarnation, mentoring is an unforced, natural friendship across levels of the hierarchy that provides guidance and opportunity to the junior member. Conversely, the more senior mentor benefits from the arrangement by being exposed to the new ideas posed by the junior mentee who hasn't experienced years of doing things the same way.

Mentoring by Career Stage

Career Stage	Description
Junior	• Should receive mentoring from more experienced professionals • Should provide mentoring to newer, less experienced peers • Seek mentoring opportunities if no formal mentoring system is present
Mid-level	• Should have well-established mentoring relationship with a superior • Should have a "tail" of subordinate mentees to continue honing mentoring skills
Senior	• While being mentored is still important, providing mentoring to subordinates is more important • Should maintain a mentoring program for their organization

Table 14: Mentoring by Career Stage

Mentoring Transferrable Attributes

There are three attributes of effective mentoring programs, summarized in Table 14.

Attribute	Specifics
Develop an encouraging and supportive culture and structure	• Foster second-generation mentoring, in which past mentees become mentors, to build a sustainable mentoring program. • As mentoring does require some time commitment from both the mentor and mentee, it is important that top management value and express support for the mentoring program through organizational mechanisms. • Confidentiality protects both the mentor and mentee's interactions and relationship, enhancing their trust. Confidentiality is best ensured through defined policy. • Formally recognize mentoring in the organization, to acknowledge it as one of the organization's values.
Select, match, and train mentors and mentees	• Set criteria to identify mentors to ensure that they have the right competencies (e.g., communication, interpersonal skills). • Match mentors and mentees in respectful ways, allowing for a dual process of informal and formal mentoring. • Train mentors on subjects including developing collaborative relationships, building observational skills, facilitating reflective practice, comprehending professional needs of mentees, and comprehending and assessing mentoring relationships.
Evaluation	• Identify or measure the outcomes of the mentoring relationships and the mentoring program.

Table 15: Attributes of Effective Mentoring Programs

Successful mentoring programs are characterized by organized mentor/mentee profiles, mentoring training, mentoring software, and associated training.

Mentoring may also be characterized by a number of parameters, which can be used to identify transferrable attributes, as summarized in Table 15.

Mentoring Attributes	Mentoring Attribute Values		
	Junior	Mid-Level	Senior
Mentor-to-Mentee ratio	Individual	Group	Individual
Mentor/mentee matching	Mentee has total discretionary choice	Mentee has limited discretionary choice	Mentee has no discretionary choice
Job function distance	Distance is close	Distance is intermediate	Distance is far
Career stage distance	Peer mentoring, where distance is zero or close	Distance is intermediate	Distance is far
Demographic distance	Distance is zero or close	Distance is intermediate	Distance is far

Mentoring Attributes	Mentoring Attribute Values		
	Junior	Mid-Level	Senior
Mentor-mentee duration	Short	Intermediate	Long
Mentoring communication method	In-person	Video-conference	Telephone conference
Meeting frequency	Frequent	Typical	Infrequent
Mentoring Criteria	None	Some	Specific

Table 16: Mentoring Transferrable Attributes

Mentor-to-Mentee Ratio

The mentor-to-mentee ratio may vary. The typical ratio between a mentor and mentee is individual, that is, one-to-one. There are some situations in which it may be beneficial to have mentoring occur in a group situation, with one mentor and two or more mentees at one time. It may be even more beneficial, for a many-to-many mentor-to-mentee ratio, that is, one mentee has multiple mentors, and a mentor has multiple mentees.

The mentoring program should have a one-to-one or many-to-many mentor-to-mentee ratio, because the conversations regarding a person's professional development are better conducted in a one-to-one environment, and both mentors and mentees can benefit from multiple counterparts.

Mentor-Mentee Matching

A key part of any mentoring program is how the mentors and mentees are matched up. There are at least three alternatives.

- One way is to have the mentee select the mentor themselves.
- A second alternative is for a pre-selection to take place, allowing for mentees to have some discretionary choice. In this alternative, a mentee would select a mentor from a subset of the total number of available mentors. The subset could be based on a number of criteria, such as closeness in terms of profile, or matching a mentee's weaknesses to a mentor's strengths.
- In a third alternative, mentees have no choice, but are assigned to a particular mentor.

Mentor Selection

The best alternative is for the mentee to select the mentor, because this corresponds to informal mentoring which is typically associated with more success than formal mentoring programs. However, if certain mentors are popular and oversubscribed, then a pre-selection algorithm may be helpful.

Job Function Distance

The job function distance between the mentor and mentee is simply the logical (not physical or geographic) distance in terms of job function similarity and dissimilarity between the mentor and the mentee. When the distance is close, the degree of closeness spans a range of possibilities, from working in the same function, to different job functions in the same specialty, to different job functions across specialties but in the same field. These three possibilities are all relatively close, with the first option being closest.

Illustrating Job Function Distance

Close: A mentor and mentee are both electrical engineers, but the mentor is working in the requirements phase while the mentee is working in the build phase.

Intermediate: The mentor and mentee work in different technical fields, with the mentor being an engineer and the

mentee is in information technology.

Far: The mentor works in a technical field, like science and technology, while the mentee works in a non-technical field, like finance or human resources.

The job function distance is also dependent upon the career stage of the mentee. With a mentee in the junior career stage, the job function proximal distance should be close or intermediate to the mentor. The rationale for this is that if the job function is far, the mentee may not perceive that the mentor is able to relate to the specific job that they are doing (regardless of the mentor's ability to do so). The option between a close distance and an intermediate distance is partially dependent upon the mentee's individual choice and preference. Some may prefer a mentor who has a close job function, while others may be fine with a mentor whose job function is an intermediate distance away.

With a mentee in the mid-level career stage, it is suggested that the job function distance be intermediate or far. With a mentee at the mid-level career stage, they will either be familiar with other fields, or should be getting familiar with other fields, and consequently a mentor with a broader scope is applicable.

Career Stage Distance

The career stage distance refers to the number of career stages (or hierarchical levels) between the mentor and the mentee. These levels are characterized by close (zero separation), intermediate (one level of separation), or far (two levels of separation) career stage distance.

Illustrating Career Stage Distance

Close: If both the mentor and mentee are in the same career stage, the distance is close, or zero. Peer mentoring is typically within the same career stage.

Intermediate: If the mentor and mentee are one career stage removed, the distance is intermediate, or one. An example would be a mentee at the mid-level career stage with a mentor at the senior level.

Far: A mentee at the junior career stage with mentor at the senior level demonstrates a far career stage difference, where there are two career stages between the mentor and mentee.

The career stage distance should be intermediate or far, if possible. While a mentee can receive insights from a mentor at their same career stage, they can receive greater insights from a mentor who is one or two career stages beyond them, because the mentor one or two career stages beyond the mentee would have greater depth and breadth than a mentor at the same career stage.

Demographic Distance

Demographic distance refers to the distance in demographics between the mentor and mentee, that is, how different the demographics are between the mentor and the mentee, where the primary demographics considered are gender and race.

When the demographic proximal distance is zero or close, it reflects the same demographics (e.g., the same gender and race). When the demographic proximal distance is intermediate, it reflects some similarity and some difference (e.g., the same gender and a different race, or a different gender and the same race). When the demographic proximal distance is far, it reflects a large difference (e.g., a different gender and different race).

Keep in Mind…

It is suggested that the demographic distance between mentor and mentee is partially dependent on the mentee's personal choice, and may be close or intermediate.

Professional and career development is personal; the closer the distance, the easier the conversation between mentor and mentee. However, with respect to women in science, technology, engineering, and mathematics, because there is still a gender imbalance in the senior career stage, women mentees benefit from having both female

and male mentors.

Mentor-Mentee Duration

The duration of the mentor-mentee relationship may be short, which is defined as anything less than one year, may be an intermediate length, which is defined as one year, or it may be long, which is defined as anything greater than one year.

If it is a formal mentoring program, the mentor-mentee duration should start at one year. A one year duration ensures that any and all of the organization's internal career and professional development processes, such as setting performance objectives, and semi-annual or annual reviews, are included; which form natural conversation topics. A one-year time frame also means that there is a need for an active renewal, rather than the potential for an awkward discussion by either the mentor or the mentee who would prefer not to continue the relationships the following year.

No Time Cap on Good Mentoring

While the duration of a mentoring program may be prescriptive within the organization, a good mentor-mentee relationship may last for a number of years beyond what the program requires.

Mentoring Communication Method

With today's communication technologies, there are at least three primary mechanisms for actually conducting the mentor-mentee meetings:

- In-person, face-to-face communication
- Any variation of video-conference: traditional video-conferencing equipment (i.e., large screens and projections) as well as individual video-conferencing such as FaceTime or Skype
- Telephone

The mentoring meetings should be conducted in-person, because much communication is nonverbal. In order for both the mentee and mentor to communicate and be heard effectively, in-person communication provides the greatest bandwidth (allows for verbal and nonverbal). If, however, a mentor is unavailable to meet in-person for a particular meeting, it is better to use video-conferencing than to miss a meeting. The phone is the last technique recommended, because it only supports verbal communication.

Meeting Frequency

The meeting frequency is dependent on the career stage of the mentor and the mentee, and ranges from frequent (biweekly) meetings, to a typical frequency (monthly), to infrequent (bimonthly) meetings.

If the mentee is in the junior career stage and the mentor is in the mid-level career stage, a monthly meeting frequency is recommended, because that is good to progress the professional development of the mentee. If the mentee is in the mid-level career stage and the mentor is in the senior career stage, a bimonthly frequency may be recommended, partially because of the executive's busy schedule, and partially because the action items arising out of such a meeting typically require longer time frames in which to accomplish.

In addition to the regular meetings, the mentor might volunteer to be available in case something urgent arises from the mentee.

Mentor Criteria

Setting criteria for mentor selection helps ensure that they have a good set of competencies prior to any training received. In other organizations, anyone can be a mentor.

Best Practices Transferrable Mentoring Attributes

Mentee Guidelines—Suggestions to Enhance the Mentoring Experience

- Before the initial meeting, have the mentee identify and prioritize three things they would like to gain through the mentoring relationship.
- Some mentees feel anxious because of the power differences between the mentor and mentee. If this is the case, the mentee may want to identify three concerns about meeting with their mentor before their initial meeting. If the issues continue to weigh on the mentee's mind, they may want to discuss this with their mentor.
- The mentee is to identify three things they would like the mentor to provide.
- The mentee is to prepare a short autobiography to share with the mentor, including vision and mission.
- The mentee is suggested to ask the mentor about their background and decision points.
- The mentee is to prepare for each specific meeting by being focused about their needs. This shows respect for the mentor's time.
- Many mentor-mentee relationships use a written agreement. Such an agreement includes information on who will do what by when. It may also include the mentoring purpose as well as career goals. The mentee should determine the mentor's view of such agreements.
- The mentee is to schedule regular meetings with the mentor. It is important to ensure the relationship is active.

Mentor Guidelines

- The mentor is to treat all communication as confidential.
- The mentor is to identify what they can provide to the mentee. They are to discuss expectations and time commitment. Mentors are not expected to meet every mentoring function.
- Mentors are to provide feedback, including both praise for accomplishments as well as constructive criticism.
- In discussions with colleagues, informally promote the mentee.
- Develop an agenda for each meeting.

4.1.6. Coaching

Introduction

Of all the leadership development techniques, coaching is at once the most revered, and the least understood. Coaching in leadership development is less about the type of leadership delivered by the coach of a sports team, and more like the training delivered by a singer's voice coach, namely, targeted instruction in a specific skill delivered by a subject matter expert to a recipient in need of strengthening (or maintenance) of that particular skill.

Coaching, within the context of technical leadership development, is:

- Specifically assigned to the coach to be delivered to the developing technical leader
- Aligned to a particular KSA under this specific career stage (i.e., are the related KCIs for that KSA at the career stage)
- Tracked in terms of progress
- Evaluated as to its success by the responsible supervisor

The coach in this relationship need not be, and frequently is not, senior to the trainee in an organizational sense. It is quite common for senior executives to receive coaching in such skills as public speaking and media relations from consultants or staffers who may be quite junior to the executives concerned, but who are specialists in these areas.

Coaching Strategy

Not all skills are suitable for coaching. In general, it is those skills that have a fairly limited or constrained set of practices that are best learned through guided application.

Coaching, similar to mentoring, involves both the giving and receiving of training, so that at each level leaders can gain valuable leadership skills by coaching others, as well as learning skills by being coached.

Coaching by Career Stage

Career Stage	Description
Junior	• Specifically assigned to a coach and training • Aligned to a particular KSA • Tracked in terms of progress • Evaluated by responsible supervisor
Mid-level	• Efforts shift to coaching rather than being coached • Lower phase of mid-level coaching involves coaching team members on all aspects of the job • Senior phase of mid-level coaching involves coaching the workforce on the subject in which the developing technical leader an expert • Distinction made between leadership and supervision as coaching does not involve formal supervisory authority
Senior	• Coaches tend to be in subject matter experts (SMEs) in junior positions • Coaching for specific KSA in preparation for executive grade

Table 17: Coaching by Career Stage

Coaching Transferrable Attributes

Coaching may be characterized by a number of parameters, which can be used to identify transferrable attributes, as summarized in the following table.

A coaching model or framework should specifically target leadership development. It consists of four phases:

1. Assessment. During the assessment phase, a person's leadership competencies are evaluated to obtain a baseline.
2. Development plan. When developing a plan to strengthen certain competencies, it is the leader who identifies specific areas to target and the associated goals. The coach, in this phase, provides support, particularly regarding feedback the leader disagrees with, and validation.
3. Public announcement. During this phase, the leader makes the goals public. This accomplishes two things:
    a. It increases the person's commitment to the goals as well as the resulting course of action.
    b. Provides the basis for receiving feedback from observers.
4. Implementation. The final phase consists of the leader's developmental action items. The role of the coach in this phase is to provide support and the tools to enable the leader in achieving their goals.

The different types of coaching may be characterized by a number of parameters, similar to the mentoring program design parameters, which can be used to define a coaching program, summarized in Table 17.

Coaching Attributes	Coaching Attribute Values		
	Junior	Mid-Level	Senior
Coach-to-coachee ratio	Individual	Team	Individual
Coach type	External	Internal	External

Coaching Attributes	Coaching Attribute Values		
	Junior	Mid-Level	Senior
Coach criteria	None	Some	Many
Coach selection and coach/coachee matching	Coachee has total discretionary choice	Coachee has limited discretionary choice	Coachee has no discretionary choice
Coaching style	Directive	Nondirective	Non directive
Coach-coachee duration	Short	Intermediate	Long
Coaching communication method	In-person	Video-conferencing	Telephone
Meeting frequency	Frequent	Typical	Infrequent

Table 18: Coaching Attributes

Coach-to-Coachee Ratio

The coach-to-coachee ratio may vary. The typical ratio between a coach and a coachee is individual, that is, one-to-one. There are some situations in which it may be beneficial to have coaching occur in a group situation, such as in a time of organizational transition or change.

At any career stage, the coachee may want to discuss a particular work situation, request particular feedback, or engage in particular role playing exercises in a confidential context. Therefore, the individual approach is suggested.

Coach Type

There are two types of coaches: external and internal. An external coach is one who is outside of the organization or enterprise, while an internal coach is one who is inside of the organization or enterprise. The coach type is dependent upon the coaching purpose.

Coach Types in Action

If the purpose of coaching is to build social media skills, it may be more cost effective to identify an internal coach rather than an external one. One study suggests that internal coaches are more appropriate if either a quick solution or detailed corporate knowledge are required.

External coaches may be more beneficial if the purpose of coaching is to build leadership skills. An external coach may be more effective as an outlet for confidential conversations and issues requiring confidentiality, or if deep, diverse experience is needed.

Coach Criteria

Coach criteria may include their knowledge and experience, as well as their fit with the person and organization.

The coach criteria should be identified prior to selecting and engaging a coach.

Coach Selection and Coach/Coachee Matching

Coach selection is developed based on a person's development needs, as well as any organizational requirements.

The coachee should have some discretionary choice in selecting a coach, such as interviewing a few coaches which

have been preselected. The preselection can occur through matching the coachee with the desired coach profile that best fits both the coachee and organization's requirements.

Coaching Style

There are two styles of coaching:

- Directive: the coach takes the initiative to identify appropriate coaching exercises, feedback, and even teaching
- Nondirective: the coachee takes the initiative and drives the agenda while the role of the coach is to actively listen and ask questions to enable the coachee to identify solutions and action items to various situations

The coaching style is dependent on the career stage of the person being coached. In the junior stage, it may be more effective for the coach to use a directive style, whereas in the mid-level and senior career stage it may be more effective for the coach to use a non-directive style.

Coaching Duration

The coaching duration is typically shorter than the mentoring duration.

- Short: one quarter (i.e., three months)
- Intermediate: two to three quarters (i.e., six to nine months)
- Long: a year or longer

The coaching duration should be dependent on the coaching task. If it is for a specific leadership skill, the duration could be short; if it is for leadership development, including action items, the duration could be intermediate or long.

Coaching Communication Method

The different methods for delivering coaching services are very similar to those for mentoring: in-person, online coaching, and via telephone conference.

Online coaching encompasses a wider variety of mechanisms than electronic video-conferencing through FaceTime or Skype, such as email and chat capability.

In general, if the coaching task is regarding leadership development, meeting in-person is preferred. If the coaching task is less personal and more task-oriented, then it is possible to use video-conferencing or telephone conferencing.

Consider the Task

The coaching communication method should be dependent on the coaching task.

Meeting Frequency

The coaching meeting frequency is dependent on the career stage of the coach and coachee, ranging from frequent (biweekly) meetings, to a typical frequency (monthly), to infrequent (bimonthly) meetings.

If the coachee is in the junior career stage and the coach is in the mid-level career stage, a monthly meeting frequency is recommended to maintain the forward progression of the junior leader's professional development. If the coachee is in the mid-level career stage and the coach is in the senior career stage, a bimonthly frequency may be recommended, in part to accommodate the senior coach's busy schedule.

Best Practices Transferrable Coaching Attributes

Coach Attributes

As best practice, coaches should:

- Generate mutual understanding and trust
- Remain open
- Ask exploratory and deep questions
- Ask reflective questions
- Identify "blind spots" and assumptions
- Provide feedback

Coaching Program Attributes

When designing a coaching program, consider the following:

- Specify the coaching program's goals and purpose
- Set expectations by defining the coach's role and responsibilities
- Ensure that corporate policies are consistent with and support the coaching program
- Identify the attributes of productive coaches
- Develop a coach selection process
- Effectively match coaches and coachees
- Determine a coach champion
- Specify any coach data requirements
- Conduct an evaluation of the coach and the coaching program

4.1.7.Self-directed Development

Self-directed development is the seventh leadership development method in the Technical Leadership Development Framework. In today's technical workplace, a professional must take responsibility for their own professional growth and development throughout their working lives. The developing technical leader should make a personal commitment to keeping their skills fresh, while continually striving for improvement.

Self-directed development may occur at all three career stages, from junior through to the senior stage. It typically consists of the initiative a person takes to learn by reading, which includes books, publications, and web sites, as well as learning by listening, which includes attending conferences, professional community meetings, and networking.

The University of Waterloo proposes a four step process for self-directed learning.

1. Assess the readiness to learn. Key activities include an examination of study habits, evaluating experiences with independent learning and support (employer, family). Key attributes of the successful self-directed learner are the ability to work autonomously with great effectiveness, self-organization, self-discipline and the ability to engage in self-evaluation.
2. Establish learning goals. These goals can be set after discussion with a mentor or coach and should be documented, superimposed on a timeline and matched with the appropriate learning resource. Documenting this in an Individual Development Plan is an effective tool to add visible commitment to the goals.
3. Be fully engaged in the learning process. This includes recognizing resources and training methods which best impact changes in the behaviors the developing leader is seeking. The depth of engagement should reflect what is needed for the developing leader to achieve the goals they identified in step one.
4. Evaluate the learning. The developing leader should objectively assess their development against their goals, not just in terms of accomplishment, but also in terms of what behaviors have been changed. Through self-reflection, the identification of which methods of self-development are most effective should be made.

Volunteer service is an opportunity for the technical leader to take ownership of their own career development. For a technical leader, serving as an officer in their professional society typically permits them to try out techniques of management, build a technical network, and bank goodwill at no career risk. Supervisors of technical leaders are

responsible for making sure that their developing leader subordinates are aware of the value of such opportunities.

4.2. LEADERSHIP DEVELOPMENT METHODS OVER A CAREER

While the development of a technical leader is a constant throughout a career, which development method is employed will evolve. The effectiveness of one method in improving upon a competency area may be very high in the initial stages of a career, yet decrease later. Consequently, the developing leader, supervisor, and mentor should be thoughtful in selecting the most appropriate development methods.

4.2.1. Leadership Development Methods and Competency Development

There are many variables to consider in selecting the most appropriate leadership development method.

- Position within career. The leader's position in his career is of prime consideration. For example, a rotational assignment is more appropriate for someone who has already established themselves in their primary area of expertise while a new employee would benefit more from training as he adjusts to being part of the program.
- Personality. The developing leader's personality should be taken into account. The individual's receptiveness to coaching and mentoring, as an example, should be considered before selecting these methods.
- Resources. Resources factor into the selection of a development method. These considerations include not only funding but also how much time the leader has to devote to the method. The decision to embark on an advanced degree is not trivial.
- Opportunity Cost. The opportunity cost to the organization must be considered. If the leader is engaged in a rotational assignment, who is covering their responsibilities back in the office?
- Commitment. All developing leaders, regardless of their progress in their careers, should commit themselves to employing self-development methods.

The nature of the competency itself will also be a driver of the development method used. While training, education and rotational assignments may be most effective in developing the technical competencies, coaching, mentoring and leadership experience are generally more effective in advancing the enabling competencies. For each of the competencies, Tables 5 and 6 describes the effectiveness of each development method by career stage.

4.2.2. Different Leadership Development Methods Throughout a Career

As a technical leader progresses through each career stage, the most effective leadership development methods change, as do the leadership competencies that require the most focus. A key element of success is pairing the appropriate leadership development method with the competency requiring development.

Education and training are typically the most effective leadership development methods at the junior career stage, and are more effective at developing certain competencies over others. For example, at the junior career stage, a developing technical leader should become proficient at various methods of communication. Training courses offered through a company or agency ensure new and entry-level employees have this foundation before moving beyond the junior career stage.

The mid-level career stage is characterized by leading teams or peers. At this point, developing competencies like Leading People or Promoting Innovation should be the focus of the leader's technical development. In this situation, job rotations will provide the environment and experience necessary to develop these skills; they are not something that can be taught, but rather experienced.

When a developing technical leader reaches the senior career stage, receiving mentoring and coaching are effective

way to develop competencies necessary as a leader of leaders. For example, if the senior technical leader needs to focus on building government acumen, there are no training courses or job rotations to provide that knowledge. But there are other, more senior employees to turn to for advice and insight.

SECTION 5

Assessing Competency Proficiencies

In this section, we will discuss how to measure a developing technical leader's level of attainment of a given competency. However, before going into great detail on measures, we first must provide some context by discussing the benefits of the career model and providing some additional background on the career model.

5.1. BENEFITS

The assessment of leadership competencies is the primary method used in the Technical Leadership Development Framework to identify which competencies need improvement. Through the objective collection of information, the developing technical leader can document and understand their strengths and weaknesses across all of the competencies, recognize and prioritize gaps, inform development decisions and then, through annual assessments, track his or her progress. Finally, it serves as a tool for mentors and supervisors to counsel the developing technical leader.

5.2. MEASURING COMPETENCY ATTAINMENT

Competency attainment metrics provide an important feedback mechanism for the developing technical leader so they are aware of their proficiency level in a specific area. Some people overestimate their abilities, while others underestimate theirs. A competency measurement sheds light on the level of aptitude.

Competency attainment metrics can be used either by the developing technical leader themselves, or their supervisors. When used by the technical leader, the competency attainment metrics can serve as a benchmark for planning and development. Supervisors can use competency attainment metrics as benchmarks for planning and development as well as inputs for performance measurement.

5.2.1.Quality of Metrics

The method used to evaluate competency attainment affects the metrics' quality.

Illustrating Differences in Quality

Consider the differences in the following assessments.

A self-assessment competency attainment rating are of a lower quality than 360-degree competency attainment ratings. Self-assessments could be inaccurate because a person may have an incentive to rate themselves higher than they think they are, or simply believe they have a higher competency level than they actually do.

By contrast, a 360-degree competency assessment is of a higher quality because a rater does not have an incentive

to rate someone higher than they are. This means a 360-degree assessment is more likely to provide an unbiased opinion of the person's competency.

In preparation for the assessment, determine the type of rating to use. Subjective assessments produce results based on the perceived effectiveness of the development methods used while objective assessments measure performance. Then, set quality standards on for the type of assessment used.

Low versus High Quality Subjective Metrics

Subjective outcomes (or perceived effectiveness) are of lower quality than objective outcomes (or performance metrics) and should be used sparingly.

A competency attainment metric that incorporates the assessment of others, including assessments by the manager or peers, or other forms of 360-degree assessment, is a higher quality subjective competency attainment metric and is included in the Framework. The assessments of others are typically less biased than self-assessments.

Illustrating Different Way to Subjectively Assess Performance

Self-assessments are typically considered low-quality subjective assessments. Statements such as "My communication skills improved from a moderate rating (3 on a 5-point scale) to an excellent rating (5 on a 5-point scale) or "I develop my people well" are considered subjective statements.

A higher quality subjective assessment is one that incorporates the assessment of others. If a manager rates a person as having moderate communication skills based on the person's behavior rather than what they say or think or believe, the result is a higher, more realistic rating.

Quality Standards

If the objective outcome or performance metric is not measured, meaning it has an unmeasured or intangible benefit, it is a low quality metric. On the other hand, an objective measurement rated on a performance continuum produces a higher quality attainment metric.

Illustrating Quality Criteria

Simply stating "My productivity improved" or "The department's productivity improved" during a rating period is a low-quality metrics. There is no data to support those statements.

However, if a person calculates their productivity improved by 15% or their department's productivity improved by 15%, that is a higher quality metric. Objective reports or measurements include promotions and business outcomes and should be considered when producing high-quality assessments.

Measuring competency attainment circles back to providing evidence-based accomplishments to indicate a competency was achieved. During assessments, self or otherwise, remember that being able to support the rating may be more important than the actual rating itself.

5.2.2. Conducting Assessments

Once the elements of the Framework are understood, the developing technical leader can begin planning for and conducting their assessments. Whether as a new, junior employee, or as a veteran who is just starting to use the Framework, an initial assessment is necessary. Then, follow-up assessments can be scheduled.

Initial Assessment

The initial assessment serves as a baseline and starting point for development. As the baseline, upon which future efforts are judged, a thoughtful, evidence-based, objective approach is preferred. A validation of initial results and collection methods conducted by a trusted peer is ideal, though not necessary.

Follow-Up Assessment

With the initial assessment conducted, progress in development is tracked through recurring follow-up assessments. Again, objective evidence is the best way to inform the assessment. It is suggested that the follow up assessment be conducted on an annual basis and be aligned with annual performance reviews. Having committed to the specific development methods, the developing technical leader should use the follow-up assessment to evaluate not only their progress, but the effectiveness of the development method selected. Like the initial assessment, it can serve as a counseling tool and inform future development decisions.

5.3. The Competency Attainment Process

After completing the leadership development methods selected to improve a technical leader's competency in a given area, the degree to which that competency has been attained needs to be determined. This includes identifying evidence-based accomplishments, collecting ratings from multiple raters, and visualizing that information on spider plot diagrams. Developing technical leaders are encouraged to regularly and periodically perform this measurement process as it provides a window into the effectiveness of the development work that the person is doing to advance their technical leadership competencies.

5.3.1. Five-Step Competency Attainment Process

The following subsections explain the processes involved in each step of the Competency Attainment Process. The discussion follows a sample rating scenario to illustrate the concepts.

Step 1: Tailor the KCIs

The first step is to create an inventory of KCIs for the appropriate career stage, for each of the 24 competencies. Remember, KCIs are most powerful when tailored to a specific career field and organizational mission.

Competency	General KCI	Tailored KCI
Technical Planning	Develops technical plan for specialized item.	Develop program plan for Milestone 1.0 of Program 1234.
Technical Planning	Communicates openly and persuasively to mid-level leaders.	Present program plan for Milestone 1.0 of Program 1234 to mid-level leaders.

Table 19: Step 1: Tailor KCIs

Step 2: Identify Evidence-Based Accomplishments

Second, the developing technical leader provides evidence-based accomplishments to support the KCI. Next to each accomplishment, a blank rating system is provided for the rater to complete. The rater uses the accomplishments provided by the technical leader to inform their rating.

The table below is an example of how this raw data input form could look. In this example, the rating scheme assesses the degree of competency the rater observed from the developing technical leader with regard to the KCI and accomplishment. A rating of 1 means the developing leader needs improvement while a rating of 5 indicates the

developing leader demonstrated full competency in regards to the competency's KCI.

Competency	Tailored KCI	Accomplishment	Rater 1	Rater 2	Rater 3
Technical Planning	Develops technical plan for specialized item.	Delivered program plan for Milestone 1.0 of Program 1234. Milestone 1.0 was achieved on-time.	○ ○ ○ ○ ○ 1 2 3 4 5	○ ○ ○ ○ ○ 1 2 3 4 5	○ ○ ○ ○ ○ 1 2 3 4 5
Technical Planning	Communicates openly and persuasively to mid-level leaders.	Presented program plan for Milestone 1.0 of Program 1234 to mid-level leaders for review.	○ ○ ○ ○ ○ 1 2 3 4 5	○ ○ ○ ○ ○ 1 2 3 4 5	○ ○ ○ ○ ○ 1 2 3 4 5

Table 20: Step 2: Identify Evidence-Based Accomplishments

Step 3: Collect Ratings from Multiple Raters

Third, the developing technical leader needs to be rated. Recall that 360-degree assessments provide high quality competency assessment metrics. Developing technical leaders should reach out to peers, mentors, supervisors, and even junior leaders they mentor for feedback. The more data that can be collected on the degree to which a competency has developed over time, the better understanding the developing technical leader has of the efficacy of the methods used and how to move forward.

Competency	Tailored KCI	Accomplishment	Rater 1	Rater 2	Rater 3
Technical Planning	Develops technical plan for specialized item.	Delivered program plan for Milestone 1.0 of Program 1234. Milestone 1.0 was achieved on-time.	○ ● ○ ○ ○ 1 **2** 3 4 5	○ ○ ● ○ ○ 1 2 **3** 4 5	○ ● ○ ○ ○ 1 **2** 3 4 5
Technical Planning	Communicates openly and persuasively to mid-level leaders.	Presented program plan for Milestone 1.0 of Program 1234 to mid-level leaders for review.	○ ○ ○ ● ○ 1 2 3 **4** 5	○ ○ ○ ● ○ 1 2 3 **4** 5	○ ○ ● ○ ○ 1 2 **3** 4 5

Table 21: Step 3: Collect Ratings from Multiple Raters

In this example, the developing technical leader hasn't fully achieved competency in technical planning.

Step 4: Consolidate Ratings

Fourth, the rating forms are collected and the results are compared.

In the example, the junior developing technical leader was rated on two KCIs within the Technical Planning competency. For the first KCI, the developing leader's average was 2.3 out of 5. This average was obtained by adding each rating and dividing it by three (the number of raters). The average for the second KCI is 3.6 out of 5.

Using each KCI's average, the developing technical leader needs to then determine the overall competency level. The simplest approach is to add these two ratings, resulting in a net attainment score of 5.9/10.

It is important to note, that if the developing leader opts to use the addition method of determining the overall competency level, the denominator (in this example, 10) will change depending on the number of KCIs used within the competency. Therefore, it is possible to have some competencies rated x/10 while others could be x/20, indicating there were four KCIs rated within that competency.

Step 5: Visualize Results Using Spider Plot Diagrams

Finally, the score is plotted on the Technical Planning radial of the spider plot diagram. Figure 10 shows the rating of 5.9 out of 10 for the junior level developing technical leader's competency in technical planning.

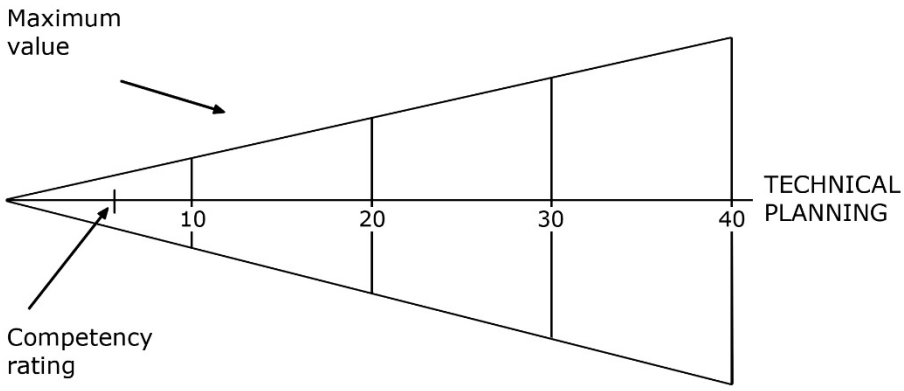

Figure 10: Plotting Total Attainment Score on Single Radial of the Spider Plot Diagram

The same steps are repeated for the remaining 23 competencies. Remember, the maximum values for each competency can change depending on the number of KCIs assessed. The points on each radial are connected and the resulting plot provides a visual overview of the developing leader's progress toward full competency. Notice that each career stage has its own section of the spider plot diagram.

It is not necessary to assess all the competencies at once. Although a full assessment using the 360-degree feedback mechanism is highly recommended on an annual basis, interim assessments of one or two competencies, including self-assessments, are fine to maintain focus and perspective.

Another Tool

It is easy to implement the assessment process in a spreadsheet for many variations of the rating scheme. Excel allows direct plotting of the calculated assessment values on a spider plot diagram (called a "radar" chart in Excel).

5.3.2.Spider Plot Diagram

Spider plot diagrams are visual representations of a developing technical leader's competency assessment results. They fuse the developing leader's competency attainment across all competencies into two easy-to-read plots. The objective assessment of the developing leader's mastery of each competency is plotted along each radial; the greater the mastery, the further the result is plotted from the center. Both technical and enabling competencies must be assessed and plotted on their respective diagrams to complete a full Framework assessment. Figure 11 shows the technical competency spider plot diagram on the left and the enabling competency diagram on the right.

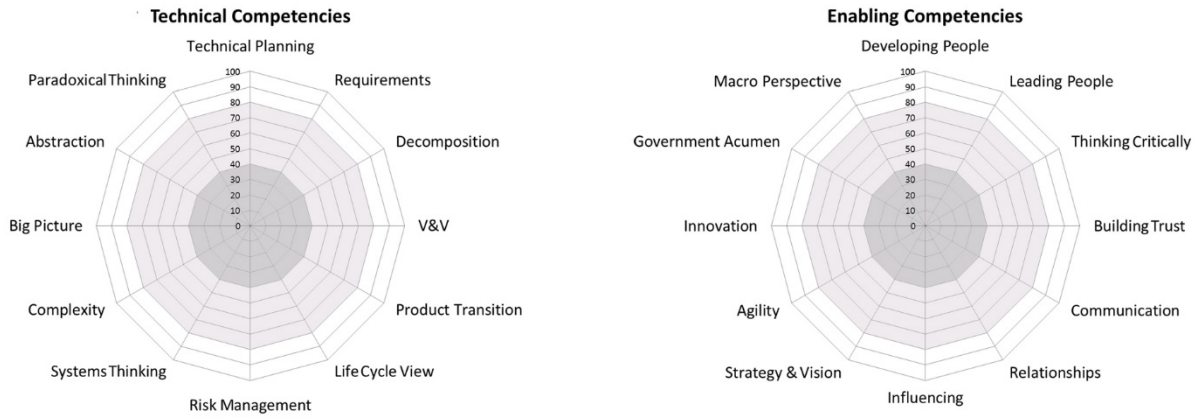

Figure 11: Sample Blank Spider Plot Diagrams

Full-size blank spider plot diagrams are provided at the end of this section as Figures 13 and 14.

Layout of a Spider Plot Diagram

12 radials originate from the center of both competency's diagrams, each labeled as a different competency. On the competencies' radials, the assessment results are plotted. The radials are sectioned off at intervals determined by the organization. Most often, it's at increments of 10.

The spider plot diagram is separated by career stage: junior, mid-level, and senior. The junior career stage is toward the center of the diagram while the senior stage is at the outer edge. Sometimes, the career stages are denoted by different colors or shading, but not always. The space designated for each career stage is established by the organization implementing the Framework.

Plotting Results on the Spider Plot Diagram

After the results of competency assessment are plotted, the developing leader "connects the dots" to complete the visual representation of competency attainment. It important to note that successful competency attainment within a career stage may not be a full circle. In the example in shown earlier in Section 5, the Technical Planning competency was rated only 5.9 out of a maximum of 10 because there were two competencies. Other competencies could have four or more, meaning the maximum values could be higher. After all the results are plotted and connected, the location of the connecting lines indicates the degree of competency within the career stage. If the pattern is smaller and closer toward the center of the spider plot within the appropriate career stage, the developing leader did not demonstrate competency attainment. If the pattern is wider, moving toward the outside edge of the career stage's area, the developing leader is closer to achieving full competency.

They key point of the spider plot is to visibly see growth in competency attainment over the course of time. Ideally, a follow-up assessment would have a wider "circle" than the initial one, since the leadership development methods used should have fostered competency growth in needed areas. Figure 12 shows the progression of competency attainment between the junior and mid-level career stages.

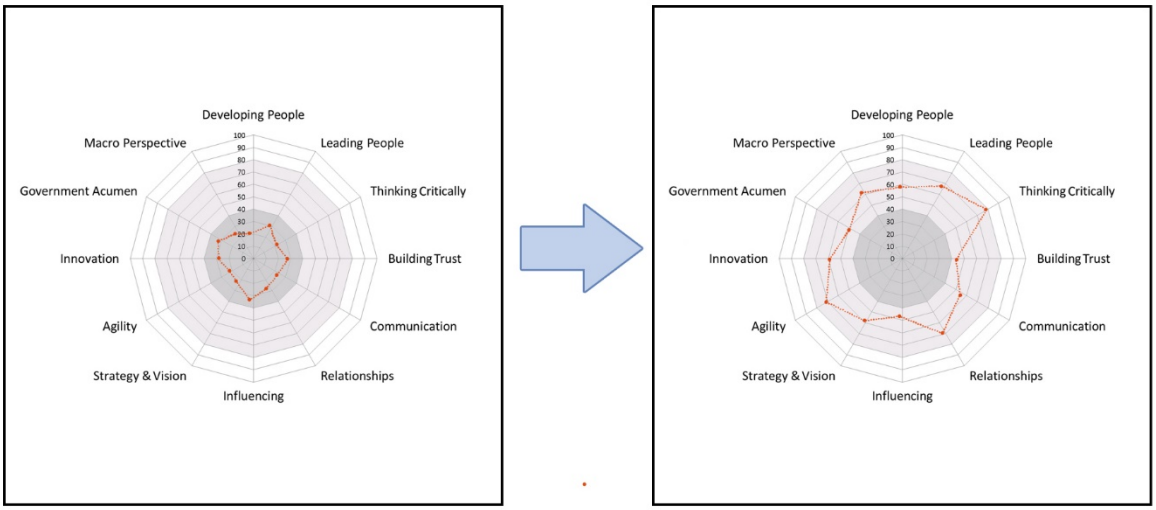

Figure 12: Example of Individual Competency Assessment Showing Progression from Junior to Mid-level

In Figure 12, notice that the developing technical leader improved in every competency, reaching senior-level competence in Thinking Critically.

Figures 13 and 14 are blank spider plot diagrams for both technical and enabling competencies.

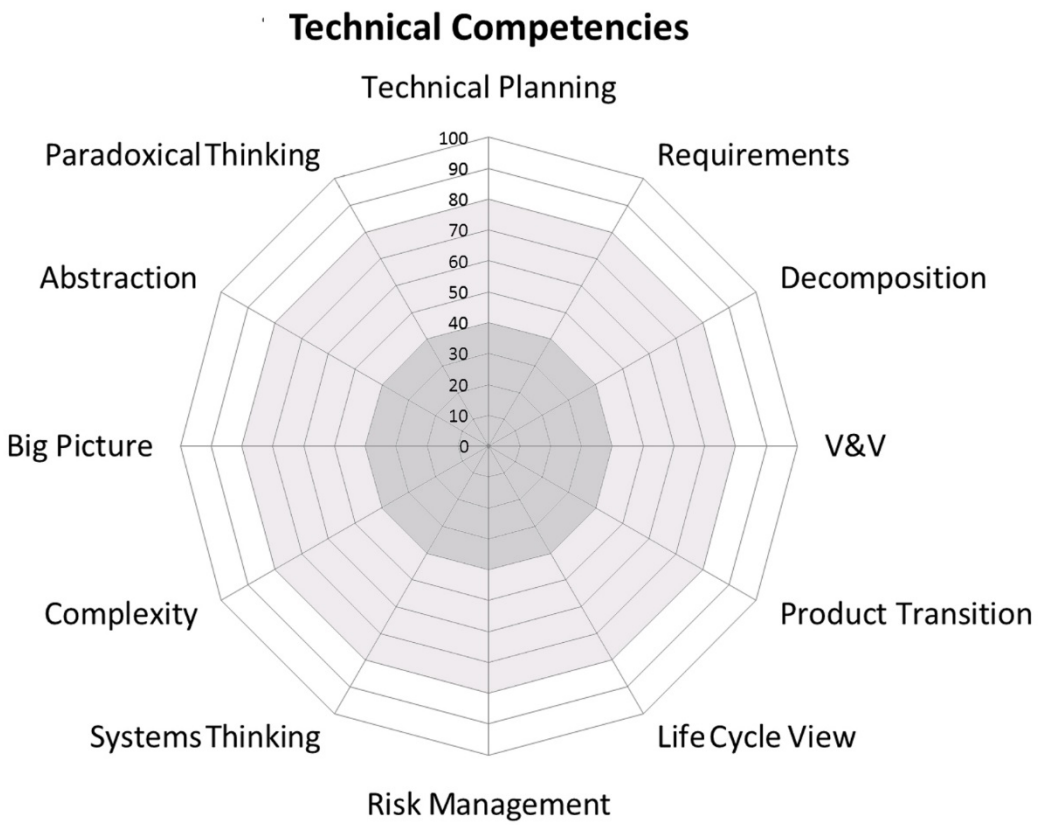

Figure 13: Technical Competency Spider Plot Diagram

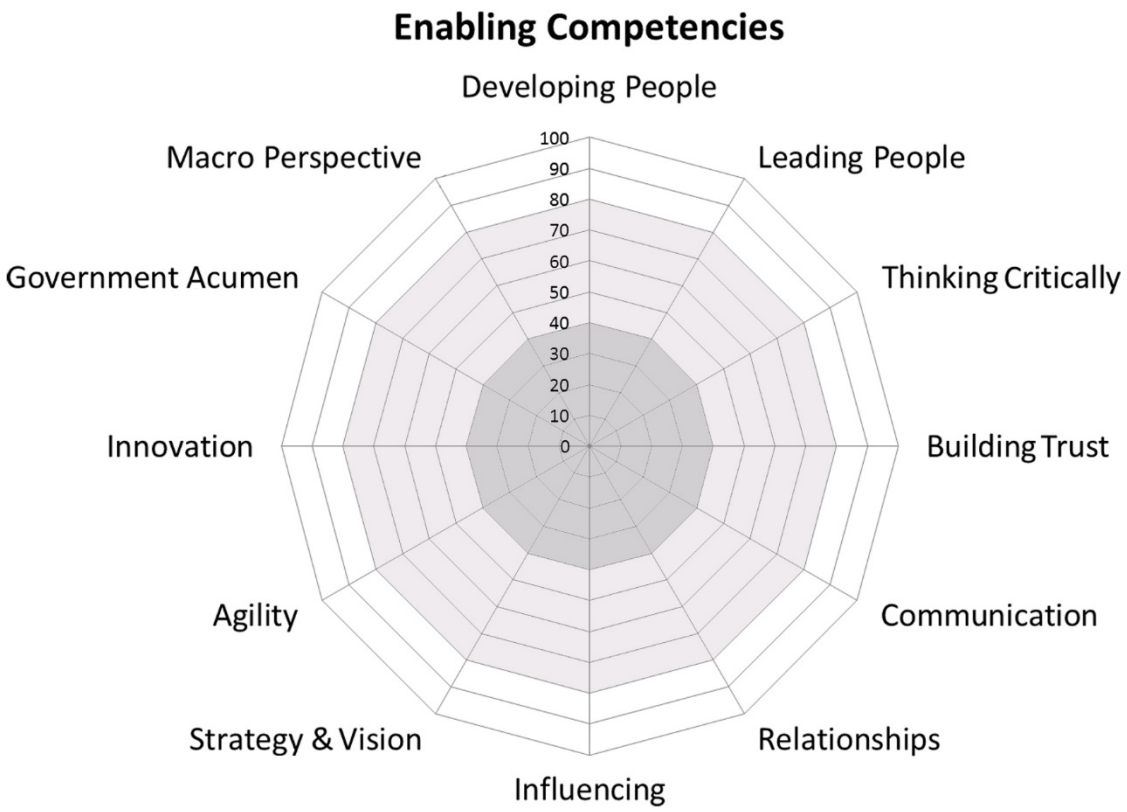

Figure 14: Enabling Competency Spider Plot Diagram

SECTION 6

Application of the Framework (with scenario)

The Technical Leadership Development Framework is the systematic application of processes and methods in order to advance in a technical career. That application would be meaningless if there were no assessments to determine the effectiveness of those methods and whether they've been useful in career progression.

In this section, we will combine the elements of the Technical Leadership Development Framework to see how they work together.

6.1. DEVELOPING TECHNICAL LEADER, TONY

Until now, discussions in the Guidebook have centered around abstract processes. In the following subsections, Tony, a fictional developing technical leader, follows the processes outlined in the Framework over the course of his career.

6.1.1.Scenario: Building Competencies Over a Career

Building upon and achieving proficiency in certain technical and leadership competencies is a multi-year, career-long process. Through thoughtful planning and diligent effort, the technical leadership competencies at each career level can be obtained. To illustrate this process, Tony will employ the use of the Framework early in his career as a junior engineer and continually adapt the leadership development methods needed to become a more competent technical leader.

Junior

Tony is a new engineer hired as a civilian with the Air Force Sustainment Center as a GS-0830 mechanical engineer. As a junior-level engineer and developing technical leader, he is writing technical plans (technical competency) on maintaining the operational readiness of the fixed-wing A-10 aircraft while receiving coaching from mid-level and senior engineers. Having taken a technical communications training course offered through the Sustainment Center, he uses his effective communication (enabling competency) skills to relay convincing, clear, and relevant technical planning information, specific to the reliability and maintainability of the landing gear, to his supervisor and the team as a whole.

Technical vs. Enabling

The 12 technical competencies list what needs to be accomplished while the remaining 12 enabling competencies focus on how to accomplish what needs to be done.

COMPETENCY	JUNIOR-LEVEL KCI (GENERIC)	HOW TONY DEMONSTRATED KCI
Technical Planning (Technical)	Develops technical plans for specialized item.	Wrote technical plans on maintaining the operational readiness of fixed-wing A-10 aircraft.

COMPETENCY	JUNIOR-LEVEL KCI (GENERIC)	HOW TONY DEMONSTRATED KCI
Effective Communication (Enabling)	Communicates openly and persuasively to mid-level leaders.	Relayed convincing, clear, and relevant technical planning information specific to the reliability and maintainability of the landing gear to supervisor.

Table 22: Demonstrating Junior-Level KCIs

Mid-level

Tony has been at the Air Force Sustainment Center for seven years and is considered to be a strong mid-level developing technical leader. His work has broadened to include aspects of industrial and aerospace engineering. He leads overall technical planning (technical competency) for unmanned aerial vehicles (UAVs), as well as reviews and approves technical plans for specialized items developed by junior-level engineers. Due, in part, to his several years of experience communicating technical requirements, as well as to his having taken a course on communicating technical information to non-technical audiences, Tony has gained a reputation as an excellent communicator. He provides clear direction related to system-level technical plans down the hierarchy to junior-level engineers, and at the same time, he can provide convincing, clear, and relevant information from the system-level technical plans to senior leaders, related program teams, end users, and contractors.

COMPETENCY	MID-LEVEL KCI (GENERIC)	HOW TONY DEMONSTRATED KCI
Technical Planning (Technical)	Develops technical plans for large/complex system. Reviews and approves technical plans developed by junior engineers.	Leads overall technical planning effort for UAVs at Air Force Sustainment Center. Reviews and approves technical plans for specialized items developed by junior engineers.
Effective Communication (Enabling)	Communicate technical information clearly and understandably to technical and non-technical audiences.	Provides clear direction related to system-level technical plans to junior engineers. Provides clear and relevant information from system-level technical plans to senior leaders, related program teams, end users, and contractors.

Table 23: Demonstrating Mid-Level KCIs

Senior

Tony is approaching 15 years as an engineer. He resigned from the Air Force Sustainment Center and spent four years at a major rotary-wing manufacturer as a lead engineer before joining the Defense Advanced Research Project Agency (DARPA) as a Chief Engineer overseeing the next generation of fast lightweight UAVs. Drawing on his years of experience in systems engineering, he oversees all aspects of research and development including technical planning (technical competency) of multiple program teams from a strategic, system of systems perspective. However, much of his time is dedicated to coaching mid-level developing technical leaders in the finer aspects and challenges of proper technical planning. In addition to programmatic responsibilities, as Chief Engineer, Tony relies heavily on his effective communication (enabling competency) skills honed throughout his career to brief senior leadership within DARPA, acquisition oversight leadership, and congressional representatives on the merits of the programs and justification for continued, and even expanded funding.

COMPETENCY	SENIOR-LEVEL KCI (GENERIC)	HOW TONY DEMONSTRATED KCI
Technical Planning (Technical)	Reviews and approves technical plans for a system developed by subordinate organizations. Guides and directs mid-level leaders to develop the over-all technical plan for large systems.	Oversees all aspects of research and development of technical planning of multiple program teams. Coaches mid-level leaders in the challenges of proper technical planning.
Effective Communication (Enabling)	Communicates persuasively about the quality of funding requests and generates support for those requests.	Briefs senior leadership on the merits of the programs and justification for continued funding.

Table 24: Demonstrating Senior-Level KCIs

How Competencies Work Together

Throughout his career, Tony worked hard to ensure his technical planning and effective communication skills remained current. Here's why: effective technical planning, a technical competency, is only realized through effective communication skills, an enabling competency.

Effective communication skills are not limited to just the Technical Planning competency, but underlie most all technical competencies, especially as the developing technical leader advances in their career working on and leading people on larger engineering activities and challenges. Effective communication of the leadership competency set dovetails the technical competency set. The truly capable technical leader understands this intersection and has worked hard to master both competency sets in unison.

6.1.2. Scenario: Career Model and the Competency Attainment Process

In Section 5, a five step competency attainment process was presented to measure competency attainment. In this section, these five ideas will be applied in a fictional scenario following Tony's progression through the assessment process as a junior engineer.

Getting Started: The Initial Assessment

In coordination with his supervisor, Tony conducts an initial assessment of his competency proficiency as a junior mechanical engineer at the Air Force Sustainment Center. Through self-reflection, conversations with peers and colleagues, and reliance on previous experience, Tony plots his initial competency proficiency on the spider plot diagram as illustrated in Figure 15.

Remember…

The Career Model consists of the Framework itself, defined competencies, and competency development methods, and relies upon the periodic assessment of competency attainment.

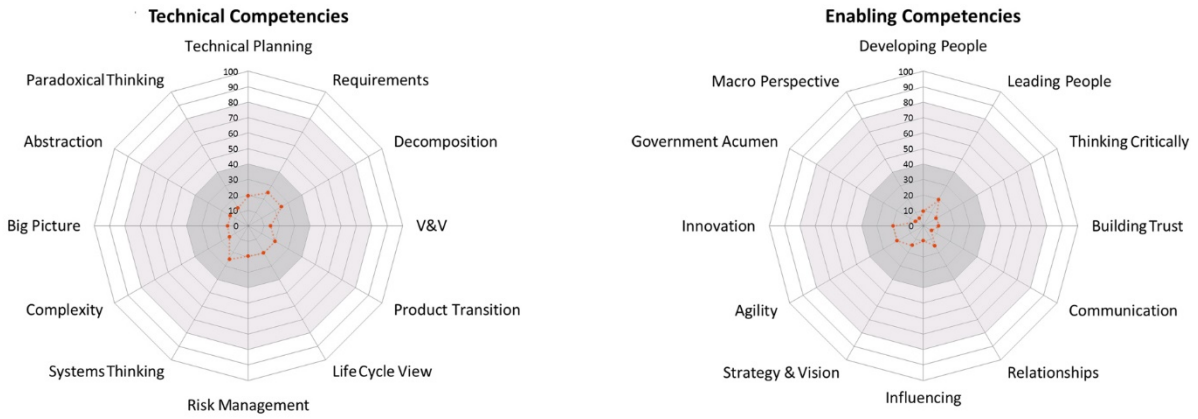

Figure 15: Tony's Initial Assessment

This initial assessment is used as a baseline to compare Tony's current competency set with those required of his current position, which may be listed in the job's position description. Accurately capturing competency proficiency at this career point is critical, as it serves as the baseline for all future competency development work.

Targeting Growth: Selecting Leadership Development Methods

Having spent much of his engineering training working independently in solving technical problems, Tony anticipated his communications competency score to be very low; the initial assessment corroborated his assumption. Tony recognizes that to become a more effective engineer, he must improve his communications skills and show development along the competency radial.

Using Tables 5 and 6, Tony sees that at the junior career stage, education and training are identified as having high impact on improving the Communicating Effectively competency. After talking to his mentor and supervisor and working with his organization's training department, he selects a formal training course which will help him develop both his writing and briefing skills. Tony adds the training course to his annual Individual Development Plan (IDP).

He reinforces this competency with practice, seeking opportunities to apply these newly learned skills on the job. Committed to self-directed development, Tony joins the local Toastmasters organization where he makes numerous presentations and receives the feedback from others.

Monitoring Progress: Conduct Follow-Up Assessment

Annual assessment of competency development is a best practice in applying the Framework. As a junior engineer, Tony aligns his competency assessment with his annual performance evaluation. Working with his supervisor and perhaps his mentor, he reviews the year's accomplishments and seeks evidence, work products, and artifacts that can support a fact-based, objective evaluation of his demonstrated competency achievement. This assessment can be supplemented with 360-degree evaluations or other tools. The results of this should lead to an update of the spider plot diagram. In Tony's case, the results are plotted in Figure 16.

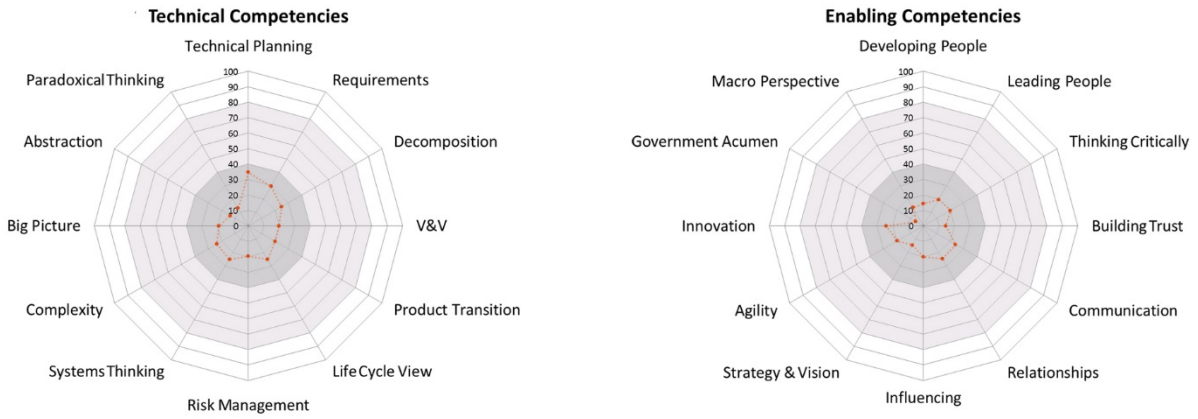

Figure 16: Tony's Follow-Up Assessment

This plot will allow Tony to track improvement from the initial assessment and enable him to evaluate the effectiveness of the development methods he chose, confirming that he is getting the results he desired. If the follow-up assessment does not show growth or improvement, Tony can use a different development method to ensure progress moving forward. The follow-up assessment also allows Tony to find new areas of needed competency growth.

After reviewing the plot and talking with his mentor and supervisor, Tony determines that he needs to develop the Fostering Agility competency. Returning to Tables 5 and 6, Tony sees that at the junior career stage, rotational assignments are considered a highly effective method of competency development, but looking forward to the mid-level career stage, job rotations are highly effective. In anticipation of advancement, Tony then decides to pursue a rotational assignment improve this competency.

Again using Tables 5 and 6, Tony recognizes that rotational assignments can help increase competency in other areas. Referring to his latest spider plot diagram, Tony expands his goals and decides to also concentrate on developing the Big Picture Thinking competency during the first year of the rotational assignment.

Building the Habits of Success

Finally, Tony captures his intentions in his IDP. By synchronizing the competency assessment with the annual performance appraisal cycle and development planning, technical leadership development is fully integrated with other mandatory, critical HR processes in an efficient and effective way.

Conclusion

The steps outlined above will serve Tony well as he progresses throughout his career. Forming a habit of an annual objective-based assessment, an informed and documented development plan and activities, and tracking progress against a baseline and goals allows the developing technical leader to take control of his own career and develop the competencies he needs to effectively lead in demanding technical leadership roles.

6.1.3. Using the Workbooks

The Technical Leadership Development Workbooks are separated by career stage. Each workbook outlines the processes a junior, mid-level, or senior employee needs to follow to identify technical leadership competencies and deficiencies, how to obtain 360-degree ratings, and visualize the results on spider plot diagrams. The workbooks are designed so competencies can be assessed and addressed one at a time or collectively as a set of 24.

Acronyms/Glossary

This section contains the acronyms and definitions of terms used in the Guidebook.

7.1. ACRONYMS

TERM	DESCRIPTION
BP	British Petroleum
DASD(SE)	Deputy Assistant Secretary of Defense for Systems Engineering
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DCAA	Defense Contract Audit Agency
DFARS	Defense Federal Acquisition Regulation Supplement
DoD	Department of Defense (United States)
EI	Emotional Intelligence
ELP	Executive Leadership Program
EPP	Executive Potential Program
FAR	Federal Acquisition Regulation
FEI	Federal Executive Institute
FY	Fiscal Year
GAO	Government Accountability Office (United States)
GS	General Schedule
HR	Human Resources
INCOSE	International Council on Systems Engineering
IPT	Integrated Product Team
IQ	Intelligence Quotient
IT	Information Technology
KCI	Key Competency Indicator
KLP	Key Leadership Position
KPP	Key Performance Parameter
KSA	Knowledge, Skills, and Abilities
MBA	Masters of Business Administration

Term	Description
MIT	Massachusetts Institute of Technology
OMB	Office of Management and Budget
OPM	Office of Personnel Management
SE	Systems Engineering
SME	Subject Matter Expert
STEM	Science, Technology, Engineering and Mathematics

Table 25: Acronyms

7.2. Glossary

Term	Description
Action Level	An organization within which the Career Model is implemented
Career Model	The implementation of the Leadership Development Framework
Career stage	One of three defined stages in a career—Junior, Mid-level, Senior
Coaching	One on one instruction from a SME to a recipient
Competency	One of the 24 desired traits of technical leaders—synonymous with KSA
Developing leader	A technical professional pursuing leadership development goals
Development Method	One of six techniques identified for competency development
Echelon	An hierarchical organizational level within the Department of Defense
Education	Formal academic coursework
Job assignment	An individual's full time, regular, work assignment
KCI	Key Competency Indicator—a sub-element of one of the KSAs
KSA	Knowledge, Skills and Abilities—synonymous with competency within this Guidebook
Mentoring	A relationship in which a junior professional receives advice from a senior
Organization	A specified sub unit of DoD
Rotation	A short or longer term assignment outside an individual's normal duties
Training	Any instruction not involving formal academic credit

Table 26: Glossary

Appendix 1: KCIs for Technical Leadership Competencies

In this appendix, we will discuss the key competency indicators for the 24 technical competencies at each career stage.

The KCIs listed in this appendix are representative indicators of competencies at each career stage. Individual situations may be different and developing technical leaders (and their organizations) shouldn't limit themselves to the KCIs listed here.

More Like Guidelines…

KCIs progress over a career. The KCIs presented in this Appendix are general, not exhaustive.

1.1. KCIs by Career Stage

1.1.1.Junior

Competency	Description
Technical Planning	• Develops technical plan for a specialized item, under the coaching of mid-level leaders • Relays convincing, clear and relevant information from the specialized item technical plan to mid-level leaders
Technical Requirements Definition and Analysis	• Understands requirements at the system level, and analyzes requirements documents • Writes a technical requirement at the component level under the coaching and direction of mid-level leaders • Provides input to requirements at the system level under the coaching and direction of mid-level leaders
Logical Decomposition	• Understands a decomposition, and performs a logical decomposition at the component or product level, under the guidance and direction of mid-level leaders • Provides input to logical decomposition at the system level, to mid-level leaders
Product Verification and Validation	• Understands product verification and validation, and associated requirement flow-down • Identifies from the verification and validation whether the original requirements were met, under the guidance and direction of mid-level leaders
Product Transition	• Transitions individual products or components, under the guidance and direction of mid-level leaders • Documents the product transition • Adheres to process discipline and accountability enforced by mid-level leaders, with regard to product transition policy and practice • Supports mid-level leaders as they transition the product to the external client

COMPETENCY	DESCRIPTION
Lifecycle	• Learns to manage a product at the appropriate stage in the lifecycle, under the coaching and direction of mid-level leaders • Learns to identify whether work is complete or not • Begins to develop collaborative relationships with peer junior level leaders "upstream" and "downstream" • Learns to understand the relationships and impacts of decisions from definition to retirement to disposal under the coaching from mid-level leaders • Learns to understand the interdependencies of different stages of the product lifecycle on the quality of the final product under the coaching of mid-level leaders
Technical Risk Management	• Learns to understand risk assessment • Identifies risks, under the coaching from mid-level leaders • Communicates identified risks to mid-level leaders
Systems Thinking	• Learns to focus on and understand the connections and interfaces among the subsystems in the system, under the coaching from mid-level leaders • Learns to consider the product or component, its place in the system, and the interfaces between components, under the coaching and direction from mid-level leaders
Systems Complexity	• Understands the complexity of a product, component, assembly, or system, and the resulting impact on system design and architecture decisions, under the coaching of mid-level leaders • Learns to recognize component designs that have the potential for emergent behavior, and to take steps to mitigate that potential through thoughtful design strategies, under the coaching of mid-level leaders
Big Picture Thinking	• Understands how the product or component fits into the system (e.g., how the valve fits in the engine), along with its budgetary, political, mission and support aspects, at the mid-level context, and therefore learns to place product or component requests effectively (e.g., product or component enhancement or development requests) • Focuses on external connections rather than internal structure in a product, when designing, developing, and deploying products or components • Learns to identify the overall context of the immediate technical product
Abstraction	• Discerns patterns and structures in the relationships among a few similar systems • Solves problems (across similar areas) effectively, by recognizing that a problem or solution in one domain is analogous to a problem or solution in a similar domain, and learns to do so in divergent domains under the coaching of mid-level leaders • Understands how concepts and tools can be applied in similar situations and domains, when designing, developing, and deploying technical solutions, and learns to do so in slightly divergent domains, under the coaching of mid-level leaders • Provides recommendations to mid-level leaders, because of the ability to abstract up ideas and solutions, to the appropriate organizational level
Paradoxical Mindset	• Raises and expresses divergent views in an appropriate manner, under the coaching of mid-level leaders • Keeps oneself motivated during times of divergence and paradox prior to resolution • Examines technical problems in their realm of responsibility from higher dimensions in which paradoxes may be resolved, under the coaching of mid-level leaders

COMPETENCY	DESCRIPTION
	• Resolves divergent technical approaches in their realm of responsibility at the appropriate time in the system lifecycle, under the coaching of mid-level leaders
Developing People- Self	• Understands their role and contribution in a technical team, communicating effectively with team members and not working in isolation • Expresses appropriate appreciation and recognition of others • Receives constructive feedback and coaching and mentoring guidance in a non-defensive manner, given their typically strong technical expertise • Undertakes training and learning opportunities provided by mid-level leaders • Defines and develops their career, under the coaching of mid-level leaders
Leading People- Self	• Receives the guidance, direction, and motivation of mid-level leaders in a non-defensive manner • Works well with mid-level leaders, stakeholders, and internal peers from many different cultures, backgrounds and countries • Participates well in meetings, understanding its importance • Possesses a strong set of personal and organizational values and ethics (when making ethical, but potentially unpopular, suggestions under risk, time and client pressures) • Communicates in a transparent manner to mid-level leaders, peers, and all stakeholders • Provides suggestions to mid-level leaders, peers, customers, and other stakeholders
Thinking Critically	• Uses analytical thinking to generate alternative courses of action and provide a recommendation for superiors to problems, decisions and requests identified by them, under the coaching of mid-level leaders • Expands his or her thinking by actively requesting new ideas and feedback from others, and constantly requests and collects new information • Applies analytical thinking across a narrow scope or range of problems and functions • Builds a library of ideas, frameworks, and models suitable for application in many areas • Emphasizes the recognition and prioritization of problems and analysis of courses of action • Possesses a balance between logical thinking and holistic thinking (e.g., intelligence quotient [IQ] and emotional intelligence [EI]) • Efficiently budgets time, balancing workload and schedule against completeness of work
Building Trust	• Listens carefully to mid-level leaders, peers, and all stakeholders, and communicates clearly, openly, and with transparency • Explains suggestions and recommendations clearly, including their motives and character as well as the logic of the decision, to mid-level leaders and peers • Uses own ability to achieve mid-level leader's goals and objectives • Contributes to and participates in decision making • Understands the personal experiences and connections that the mid-level leader makes • Keeps promises to mid-level leaders, and peers • Operates ethically and with high levels of integrity • Uses resources responsibly • Has the courage to do the right thing, even when there may be negative repercussions • Takes action in spite of risk or discomfort

COMPETENCY	DESCRIPTION
Communicating Effectively	• Speaks articulately to mid-level leaders and peers • Listens effectively and interprets information and translates it into work tasks • Writes non-technical documents concisely, clearly, and with crispness, rather than just using technical language • Understands non-technical requirements and ideas communicated by mid-level leaders • Communicates persuasively to mid-level leaders and peers about the quality of their ideas and requests and generates support for those ideas and requests; effectively sells ideas to their mid-level leaders and peers • Communicates openly and transparently
Establishing and Maintaining Stakeholder Relationships	• Builds internal relationships • Supports maintaining effective stakeholder relationships • Identifies stakeholders, and distinguishes among different stakeholder roles • Identifies stakeholder issues which are appropriate to be escalated to mid-level leaders • Learns how to maintain effective stakeholder relationships, conflict management, and negotiation • Joins professional societies (e.g., International Council on Systems Engineering [INCOSE])
Influencing Others	• Uses rational persuasion, including explanations, logical arguments, and factual evidence, to advocate a position, decision, request, proposal, or task, with mid-level leaders, peers and stakeholders • Utilizes inspirational appeals through an emotional or value-based request, to advocate a position, decision, request, proposal or task, with mid-level leaders, peers and stakeholders • When consulted by mid-level leaders (or taking own initiative), provides suggestions on a particular issue
Developing Strategy and Vision	• Defines vision and strategy for own self • Supports the mid-level leader's strategy and vision • Understands how junior level leader's actions/outputs/products align to the organizational strategy • Uses controls and feedback mechanisms provided by mid- or senior level leaders to assess their own performance of strategy and associated execution • Provides suggestions to superiors regarding suborganization strategy and vision
Fostering Agility	• Values sound approaches and remains open to ideas that solve problems, address issues, or improve processes and procedures • Adapts quickly and effectively to shifting demands and changing priorities from mid-level leaders or stakeholders, and other unexpected and unplanned events • Reorganizes, regroups, and renews own personal energy in changing and uncertain conditions and contexts, effectively handles frustration and stress, maintains a positive attitude, and contributes to increasing resiliency in the organization • Questions established work processes and assumptions and seek better ways to do their work • Makes valuable changes in their work processes • Uses practices introduced by mid-level leaders to do effective adaptive planning

COMPETENCY	DESCRIPTION
	• Adheres to standard operating procedures, actively contributes to knowledge sharing, uses knowledge management tools provided, and subsequently modifies their thinking, decision-making, and courses of action according to that learning
Promoting Innovation	• Contributes to the culture of technological innovation and interacts effectively with other junior level leaders regarding innovation • Generates new ideas, methods, products and processes, identifies any other innovation opportunities, makes the business case for them to mid-level leaders • Implements and/or follows processes that support innovation • Contributes to advancement in their own technical domain through innovation • Provides input to suborganization-level innovation strategy
Building Government Acumen	• Becomes aware of the importance of human resource best practices • Is aware of the impact that business procedures have on the successful accomplishment of technical work • Is aware that the law, congressional directives, Office of Management and Budget (OMB) and DoD policy directives and guidance, the Federal Acquisition Regulation (FAR) and the Defense Federal Acquisition Regulation Supplement (DFARS) impact technical success • Organizes and plans for success at the junior level in an uncertain and changing financial and regulatory environment
Possessing a Macro Perspective	• Is aware of the role of each organization and suborganization in the DoD enterprise • Understands how the junior level leader fits into the larger context at the mid-level leader's suborganization • Understands how the junior level leader is impacted by the political, economic, and social aspects or context or landscape • Builds a supportive, collaborative and respectful relationship with peer junior level leaders within the suborganization • Aligns the junior level leader's mission, objectives and vision so as to contribute to the achievement of the overall mission of the suborganization, organization and enterprise

Table 27: Junior Level KCIs

1.1.2. Mid-level

COMPETENCY	DESCRIPTION
Technical Planning	• Develops and details out the technical plan for a system to fit into the overall technical plan for a large (or complex) system • Reviews and approves technical plans for specialized items developed by junior-level leaders • Guides, directs and coaches junior-level leaders to detail out a technical plan for a technical component • Provides clear direction from the system-level technical plans down the hierarchical levels to junior-level leaders • Relays convincing, clear and, relevant information from the system-level technical plan to senior-level leaders • Coordinates the system-level technical plan and obtains consensus among peer internal suborganizations (both technical and non-technical)
Technical Requirements Definition and Analysis	• Defines and negotiates technical requirements at the system level, under the coaching of senior-level leaders • Transforms stakeholders' inputs into system requirements, translates potentially non-technical requirements into technical language, and evaluates their subsequent development into lower level requirements and specifications under the coaching and direction of senior-level leaders • Verifies and reviews component-level requirements, and integrates them into system-level requirements • Provides input to requirements at the system of systems level to senior-level leaders
Logical Decomposition	• Performs a logical decomposition at the system level, under the guidance and direction of senior level leaders • Guides, directs, reviews and approves component-level decompositions developed by junior leaders, and integrates them into system-level logical decompositions • Provides input to logical decomposition at the system of systems level, to senior-level leaders • Provides input to strategies for system decomposition to senior level leaders
Product Verification and Validation	• Conducts verification and validation at the system level, and end user verification and validation, under the guidance and direction of senior-level leaders • Adheres to process discipline and accountability with regard to verification and validation policy and practice • Coaches junior-level leaders in understanding the difference between building the thing right, and building the right thing • Coaches, guides, directs, reviews and approves verification and validation at the component level by junior leaders • Advocates strongly for verification and validation with superiors • Coaches peers that product verification and validation is a part of every step in the system lifecycle
Product Transition	• Transitions a few technical products (or a system) with full understanding by the receiving organization, under the guidance and direction of senior-level leaders

COMPETENCY	DESCRIPTION
	• Understands the transition process, effectively accepts incoming work, and provides high quality technical products for transition outside the organization, under the coaching, guidance and direction of senior-level leaders • Adheres to process discipline and accountability enforced by senior-level leaders, with regard to product transition policy and practice, and enforces this among junior level leaders • Learns to communicate effectively how to operate and maintain the technical product to technical and non-technical people, under the coaching of senior-level leaders • Supports senior level leaders as they transition the product to the external client
Lifecycle	• Manages products and systems at the appropriate stage in the lifecycle, under the coaching and direction of senior level leaders • Provides input to senior level leaders on the criteria by which the technical product may be evaluated (and therefore pass from one stage to the next), striking an appropriate balance among product quality, product risk, and product cost and schedule • Understands the lifecycle process, and is prepared to effectively accept incoming work, and provide high quality technical plans and activities to the next stage in the lifecycle, under the coaching, guidance and direction of senior level leaders • Learns to understand the relationships and impacts of decisions from definition to retirement to disposal under the coaching from senior level leaders • Learns to understand the condition of all technical products moving from one stage to another, including full knowledge of any unfinished technical work • Begins to develop collaborative relationships with peer mid-level leaders “upstream” and “downstream” • Learns to view the temporal dimension of a problem under consideration • Understands the interdependencies of different stages of the product lifecycle on the quality of the final product under the coaching of senior leaders • Learns to effectively negotiate product movement through the lifecycle, resulting in a win for both the acquiring and transitioning organizations, under the coaching of senior level leaders • Learns to avoid the temptation to take advantage of the other party, whether by passing a poorly performing product down the line, or by attributing product shortfalls to the organization making the handoff, even when the product is technically sound, under the coaching of senior level leaders
Technical Risk Management	• Quantifies technical risks, under the coaching of senior level leaders • Develops appropriate risk mitigation strategies under the coaching of senior level leaders • Assesses the cost to reduce or mitigate risks • Communicates quantified risk results, mitigation strategies, and costs to reduce or mitigate risks to senior level leaders
Systems Thinking	• Learns to seek out holistic explanations, descriptions, and relationships when examining technical problems; • Learns to focus on and understand the connections and interfaces among the subsystems in the system, when designing, developing, testing, deploying and operating systems, under the coaching from senior level leaders • Learns to consider the system’s place in the system of systems, when designing, developing, testing, deploying and operating systems, under the coaching from senior level leaders

COMPETENCY	DESCRIPTION
Systems Complexity	• Understands system complexity, and the resulting impact on system design and architecture decisions, under the coaching of senior level leaders • Coaches junior level leaders to understand product and system complexity, and the resulting impact on system design and architecture decisions • Coaches junior level leaders to recognize product designs that have the potential for emergent behavior, and to take steps to mitigate that potential through thoughtful design strategies
Big Picture Thinking	• Understands how the system fits into the system of systems (e.g., how the engine fits in the vehicle), along with its budgetary, political, mission and support aspects, at the senior level context, and therefore places system requests effectively (e.g., system enhancement or development requests) • Focuses on external connections rather than internal structure in a system, when designing, developing, and deploying system of systems • Identifies the overall context of the immediate system, and communicates that context to junior and senior level leaders • Communicates the decision context (including why and how a decision was made a particular way) to junior level and senior level leaders, as well as other key stakeholders • Coaches junior level leaders to identify the context of the technical system • Coaches junior level leaders to identify the decision context (why and how a decision was made a particular way)
Abstraction	• Discerns patterns and structures in the relationships among a few somewhat diverse systems • Solves problems (across a limited range of areas) effectively, by recognizing that a problem or solution in one domain is analogous to a different problem or solution in a somewhat divergent domain, under the coaching of senior level leaders • Understands how concepts and tools can be applied in situations and domains having some degree of variety, when designing, developing, and deploying technical solutions, under the coaching of senior level leaders • Coaches junior level leaders to solve problems effectively using abstraction, that is, by recognizing that a problem or solution in one domain is analogous to a different one in a slightly different domain • Coaches junior leaders in applying scientific, mathematical and engineering principles across slightly varied situations and insights • Coaches junior level leaders in identifying connections and new opportunities (including new component development) across domains, generated from abstract thinking, and how to apply tools in slightly varied situations and domains • Provides recommendations to senior level leaders, because of the ability to abstract up ideas and solutions, to the appropriate organizational level

Paradoxical Mindset	• Keeps divergent, and possibly contradictory, concepts in play simultaneously, without compromising project accomplishment, while:
	  o Providing reassurance and direction to junior level leaders during resolution of the resulting challenges
	  o Ensuring that senior level leaders and other stakeholders understand the reasons for keeping ideas in play, and are supportive of the process
	• Nurtures divergent views (views of a problem, solution, organizational situation, or environmental context) among junior leaders, under the coaching of senior level leaders

COMPETENCY	DESCRIPTION
	• Sustains junior level leader's motivation during times of divergence and paradox prior to resolution • Examines technical problems in their realm of responsibility from higher dimensions in which paradoxes may be resolved, under the coaching of senior level leaders • Resolves divergent technical approaches in their realm of responsibility at the appropriate time in the system lifecycle, under the coaching of senior level leaders • Coaches junior level leaders on how to nurture divergent views (views of a problem, solution, organizational situation, or environmental context) • Coaches junior level leaders on how to examine technical problems from higher dimensions in which paradoxes may be resolved • Coaches junior level leaders on when and how to resolve divergent technical approaches in their realm of responsibility at the appropriate time in the system lifecycle • Reassures subordinates and superiors that the presence of multiple divergent and possibly contradictory views is a good thing
Developing People-Team	• Develops junior level leaders personally through coaching and mentoring, enabling them to both lead and conduct their technical work more effectively • Establishes relationships with technical team members (in part to understand their personality and characteristics to assign them the right roles) • Participates in selecting technical team members, with a balanced view of technical competencies and people skills • Leads diversity at the junior and mid-levels, encouraging or accepting differing views. Beyond recognized demographics, diversity also includes different personality types, educational backgrounds, program experiences, technical background and other factors that generate a variety of viewpoints and approaches to solutions • Represents the technical team effectively (e.g., budget requests, recognition of accomplishments, accepts responsibility and does not "finger point" for technical inadequacies) to the senior level • Leads and shapes junior level leaders' roles, encouraging additional breadth and/or depth in the role (and therefore the associated skill set), while aligning it to the suborganizational vision and strategy • Helps junior level leaders define and develop their own careers • Provides training and learning opportunities for junior level leaders; and undertakes training and learning opportunities provided by mid-level leaders
Leading People-Leading the Team	• Guides, directs, and motivates junior level leaders in a dignifying and empowering way, under the coaching of senior level leaders • Motivates and rewards junior level leaders, including celebrating junior level leaders' accomplishments, as well as protecting them and the suborganization during failures • Works well with junior and senior level leaders, stakeholders, and internal peers from many different cultures, backgrounds and countries • Builds the team and suborganization with a diverse representation, to avoid using people with a similar demographic, personality type, educational background, program experience, technical background, and other factors • Learns to delegate, rather than doing the technical task themselves • Builds team cohesion (overcoming introversion and task orientation) • Learns to represent the team well in peers' meetings and senior level meetings, knowing when and what to speak and when to refrain from speaking

COMPETENCY	DESCRIPTION
	• Understands when to and is able to raise a different view for discussion, rather than following a strictly conflict-avoidance strategy • Possesses a strong set of personal and organizational values and ethics (such as making ethical, but potentially unpopular, decisions under risk, time and client pressures) • Communicates in a transparent manner to senior level leaders, junior level leaders, peers, and all stakeholders • Takes action to instill junior leaders with the organization's values, norms and cultural expectations • Sets priorities and expectations for junior level leaders, measures performance and accountability • Creates an environment where the team of junior level leaders feel valued and appreciated, are committed to their work and want to excel • Provides motivation for the junior level leaders to coalesce around common goals • Acts through and with other people, through formal mechanisms such as goal setting and performance measurement, and informal mechanisms such as building trust and influencing others • Provides guidance, direction, and motivation to superiors, peers, and customers, and other stakeholders
Thinking Critically	• Uses analytical thinking to generate alternative courses of action and provide a recommendation for superiors to problems, decisions and requests identified by them, under the coaching of senior level leaders • Expands his or her thinking by actively requesting new ideas and feedback from others, and constantly requests and collects new information • Applies analytical thinking across a moderate scope or range of problems and functions, under the coaching of senior level leaders • Utilizes junior level leaders' diversity of thought, experiences, and approaches to develop alternative solutions and explanations for observed phenomena and problems, and actively considers them routinely • Provides junior level leaders with a moderate-scope library of ideas, frameworks, and models suitable for application in many areas, under the coaching of senior level leaders • Supports junior level leaders with problem discovery and identification accurately (across an intermediate range of systems problems and functions) • Challenges junior level leaders to make inferences or draw conclusions that are justified by evidence • Possesses a balance between logical thinking and holistic thinking (e.g., intelligence quotient [IQ] and emotional intelligence [EI]) • Utilizes the team to solve problems • Efficiently provides oversight of junior leaders work while giving them sufficient free rein to make decisions on their own • Encourages diverse technical solutions to avoid the "my way is best" engineering bias • Coaches junior level leaders to apply analytical thinking for the problems and functions in their realm of responsibility
Building Trust	• Listens carefully to senior level leaders, junior level leaders, peers, and all stakeholders, and communicates clearly, openly, and transparency

COMPETENCY	DESCRIPTION
	• Explains decisions clearly, including their motives and character as well as the logic of the decision, to junior level leaders, senior level leaders, and peers • Delegates responsibility and relies on the ability of the junior level leaders to achieve their goals and objectives • Shares control and increases the participation of the junior level leaders in decision making • Shares personal experiences and makes connections with junior level leaders' experiences • Keeps promises to junior level leaders, senior level leaders, and peers • Leads ethically and models high levels of integrity • Uses resources responsibly • Has the courage to do the right thing, even when there may be negative repercussions • Takes action in spite of risk or discomfort • Nurtures an environment that results in team credibility and trust • Contributes to program-level reputation, avoiding the tendency to focus on own team • Coaches junior level leaders on how to do the above actions to build trust and credibility effectively
Communicating Effectively	• Speaks articulately, delivering a well-crafted message oriented toward a specific audience, and adapts messages to different audiences having a variety of viewpoints • Actively listens (understands what is meant, in addition to what is said), clarifies what has been heard, and conveys genuine interest, to senior level leaders, junior level leaders, peers, and all stakeholders, not just those having the louder voice • Socially perceptive: is aware of others' reactions; effectively interprets intent, influence, and nonverbal communication of mid-level and senior level leaders • Writes clearly and effectively, to senior level leaders, junior level leaders and peers • Translates non-technical requirements and ideas to technical staffs • Uses a variety of communications media to communicate technical information clearly and understandably to both technical and non-technical audiences • Communicates through framing and interpreting experience to junior level leaders and peers • Communicates persuasively to junior level leaders, senior level leaders, and peers about the quality of their ideas and requests and generates support for those ideas and requests; effectively sells ideas to their junior level leaders, senior level leaders, and peers • Coaches junior level leaders on how to do the above communication actions effectively
Establishing and Maintaining Stakeholder Relationships	• Maintains existing stakeholder relationships, by identifying and understanding their requirements, expectations, and needs; meeting or handling their expectations; and ensuring the right processes (including communication processes) are in place to sustain stakeholder relationships • Anticipates and reacts to changing clients and changing client needs • Identifies prospective new clients • Identifies stakeholder issues which are appropriate to be escalated to senior level leaders • Learns to balance competing stakeholder values, goals and interests, making subjective judgments and decisions about rights and accountability • Learns to manage expectations of technical and non-technical stakeholders • Learns to manage conflict constructively, both conflict between the stakeholder and the suborganization, and conflict between multiple stakeholders, and negotiates effectively with stakeholders

COMPETENCY	DESCRIPTION
	• Contributes to developing a unified approach to stakeholder care throughout the organization that helps meet stakeholder expectations • Learns to build new stakeholder relationships with senior level leaders • Participates in professional societies (e.g., INCOSE) • Coaches junior level leaders on building internal relationships, supporting existing stakeholder relationships, conflict management, and negotiation
Influencing Others	• Uses rational persuasion, including explanations, logical arguments, and factual evidence, to advocate a position, decision, request, proposal, or task, with junior level leaders, senior level leaders, peers and stakeholders • Utilizes inspirational appeals through an emotional or value-based request, to advocate a position, decision, request, proposal or task, with junior level leaders, senior level leaders, peers and stakeholders • Employs consultation, by requesting the team of junior level leaders to provide suggestions on a particular issue, or collaboration, by offering the team of junior level leaders the necessary resources to accomplish a task or proposal • Identifies and utilizes junior-level leaders' shared vision and values to generate support for views • Knows when and how to approach others to influence them (self-awareness and other-awareness) • Coaches junior-level leaders on how to use rational persuasion, inspirational appeals, and consultation when advocating with mid-level leaders, peers and stakeholders
Developing Strategy and Vision	• Develops and articulates the vision for their team that aligns to the organization and enterprise vision, and generates support for that vision from junior level leaders, senior level leaders, peers, and other stakeholders • Contributes to creating, understanding, and executing a strategy at the senior level that encompasses stakeholder expectations, industry trends, and emerging technologies • Connects strategy with day-to-day junior level leader's objectives; ensures that junior level leaders can see how the junior level leaders' actions/outputs/products align to the strategy • Utilizes suborganizational structures that support strategy and promotes knowledge sharing, clear accountability, and coordination • Uses strategy execution processes provided by senior level leaders • Uses controls and feedback mechanisms provided by senior level leaders to assess performance of strategy and associated execution • Coaches and enables junior leaders to create their own vision, which is aligned to and supports the mission and values of the superior organization • Provides advice, guidance and recommendations to superiors regarding organization and enterprise strategy and vision
Fostering Agility	• Values sound approaches and remains open to ideas that solve problems, address issues, or improve processes and procedures • Adapts quickly and effectively to shifting demands and changing priorities from senior-level leaders or stakeholders, and other unexpected and unplanned events • Reorganizes, regroups, and renews own personal energy in changing and uncertain conditions and contexts, effectively handles frustration and stress, maintains a positive attitude, and contributes to increasing resiliency in the organization

COMPETENCY	DESCRIPTION
	• Encourages junior level leaders to question established work processes and assumptions and seek better ways to work • Recognizes and rewards junior level leaders who make valuable changes while protecting those whose changes failed but learn useful lessons • Recognizes that not everyone navigates change at the same pace and seeks to support those overcome by their resistance to change • Fosters and encourages resiliency and responsiveness in junior level leaders • Uses practices introduced by senior level leaders to do adaptive planning, and introduces practices to help junior level leaders do effective adaptive planning • Adheres to standard operating procedures, actively contributes to knowledge sharing, and uses knowledge management tools to increase their own learning, junior level leaders' learning, and suborganizational learning, and subsequently modifies their thinking, decision-making, and courses of action according to that learning
Promoting Innovation	• Nurtures and champions a culture of technological innovation and promotes effective junior level leader team interaction regarding innovation • Generates new ideas, methods, products and processes, identifies any other innovation opportunities, makes the business case for them to senior level leaders, and coaches junior level leaders to do the same • Protects junior level leaders when their innovations fail • Contributes to advancement in their own technical domain through innovation • Coaches junior level leaders to generate, and seek from others, new ideas, methods, products and processes, and make the business case for them to superiors • Coaches, supports and guides junior level leaders as they implement and/or follow processes that support innovation • Provides input to organization-level innovation strategy
Building Government Acumen	• Learns to understand human resource best practices and leads, builds, and manages junior level teams successfully • Understands program budgets and operates within them effectively • Learns to understand the impact that business procedures have on the successful accomplishment of technical work • Understands how the law, congressional directives, OMB and DoD policy directives and guidance, including the Federal Acquisition Regulation (FAR) and the Defense Federal Acquisition Regulation Supplement (DFARS), and the Defense Contract Audit Agency (DCAA) impact a program course that leads to technical success • Organizes and plans for success at the mid-level in an uncertain and changing financial and regulatory environment • Coaches junior-level leaders on the importance of understanding OMB and DoD policy directives and guidance in order to deliver technical solutions successfully
Possessing a Macro Perspective	• Understands the role of each organization and suborganization in the DoD enterprise • Understands how the mid-level leader's suborganization, along with its budgetary, political, mission and support aspects, fits within the larger context at the suborganization, organization and enterprise levels; • Understands how the mid-level leader's suborganization is impacted by the political, economic, and social aspects or context or landscape, and takes this into account when developing strategy

COMPETENCY	DESCRIPTION
	• Builds a supportive, collaborative and respectful relationship with peer mid-level leaders within the organization • Champions the role of their suborganization as a trusted business partner across the suborganization and organization levels • Capitalizes on the value and worth of their suborganization's intellectual property, personnel, development efforts and products • Aligns the mid-level leader's sub0organization's mission, objectives and vision so as to contribute to the achievement of the overall mission of the suborganization, organization and enterprise • Coaches junior level leaders to understand how they fit into the mid-level leader's suborganization, organization, and the enterprise

Table 28: Mid-level KCIs

1.1.3. Senior

COMPETENCY	DESCRIPTION

Technical Planning	• Develops overall technical plans, for a large (or complex) system, that:
	  o Support the strategy, vision, mission and long range goals (which recognize needs) of the organization or enterprise
	  o Provide direction to mid-level leaders
	  o Is aligned with and supports the plans and objectives of peer organizations, both technical and non-technical
	  o Reflect the technical impact of the superior organization or enterprise's strategies and missions
	• Reviews and approves technical plans for a product or a system developed by subordinate suborganizations
	• Guides, directs and coaches mid-level leaders to detail out the overall technical plan for a large (or complex) system into the appropriate detailed plans
	• Provides clear direction from the technical plans down the hierarchical levels to subordinate suborganizations and their leaders
	• Relays convincing, clear and, relevant information from technical planning up the hierarchical levels in the enterprise
	• Coordinates the technical plan and obtains consensus (using influencing and negotiation skills) among peer internal suborganizations (both technical and non-technical)
	• Represents and communicates the overall technical plan in the larger technical and non-technical community
	• Communicates clear, relevant technical plan information to external organizations, including partners in other agencies, industry, academia and perhaps internationally, raising awareness and identifying potential areas of agreement and disagreement among external organizations

Technical Requirements Definition and Analysis	• Understands customer's role in setting requirements, and balances needs of a broad range of customers and other stakeholders at all levels and the essential (and necessary) inconsistency in the requirements they express • Negotiates technical requirements with customers • Provides clear explanations regarding inconsistencies • Understands and balances the hierarchical importance of requirements, i.e., key performance parameters (KPPs) with top-level goals, both functional and non-functional • Enforces discipline in managing and documenting the immediate and cascading impact to requirements, particularly at the system level • Coaches mid-level leaders in gathering and negotiating technical requirements with stakeholders • Coaches mid-level leaders in transforming stakeholder inputs into system requirements, in translating potentially non-technical requirements into technical language, and in evaluating their subsequent development into lower level requirements and specifications

Logical Decomposition	• Decomposes or segments system of systems (including large distributed system-of-systems of national importance) so that:
	  o the resulting decomposition is technically suited to ensure success of the system design and development
	  o the resulting decomposition takes into account of the resources, capabilities and workload of the executing organization(s)

COMPETENCY	DESCRIPTION
	• Develops strategies for system decomposition for review by executive-level technical and non-technical management • Coaches, guides, directs, reviews and approves system decompositions developed by mid-level leaders, and integrates them into system of systems logical decompositions
Product Verification and Validation	• Understands that verification and validation does not just come into play at the developmental and operational test phases of a program, and therefore ensures that it is part of every step in the system • Understands that allocating resources to verification and validation is a powerful tool for reducing lifecycle cost, and therefore budgets accordingly • Enforces process discipline and accountability among subordinate suborganizations with regard to verification and validation policy and practice • Coaches mid-level leaders in understanding the difference between building the thing right, and building the right thing • Advocates strongly for verification and validation with superiors, and if in a programmatic role, strongly supports verification and validation budgets even if this has a negative impacts, such as increasing time or cost, because of the larger positive quality impacts • Coaches peers (including those responsible for technical planning) that product verification and validation is a part of every step in the system lifecycle (including all system lifecycle phases in the technical plan)

Product Transition	• Coordinates all aspects of transition requirements for:
	  ○ Operations
	  ○ Maintenance
	• Fields the transition by handling different users, dealing with multiple agencies and multiple services
	• Coaches mid-level leaders in their understanding of the transition process, and ensures that they are prepared to effectively accept incoming work, provide high quality technical products for transition outside the organization, and that technical products are transitioned with full understanding by the receiving organization
	• Enforces process discipline and accountability among subordinate suborganizations with regard to product transition policy and practice
	• Provides input to enhance product transition policy and procedures to superiors
	• Communicates effectively how to operate and maintain the technical product to technical and non-technical people
	• Effectively leads the transition to the external client, handling both technical and non-technical users and clients with diverse expectations

Lifecycle	• Manages a technical system of systems at the appropriate stage in the lifecycle • Ensures entrance criteria are met for the next phase in the lifecycle • Sets the criteria by which the technical product may be evaluated (and therefore pass from one stage to the next), striking an appropriate balance among product quality, product risk, and product cost and schedule • Understands the condition of all technical products moving from one stage to another, including full knowledge of any unfinished technical work, and transmits this information “upstream” and “downstream” appropriately

COMPETENCY	DESCRIPTION
	• Negotiates product movement through the lifecycle, resulting in a win for both the acquiring and transitioning organizations • Avoids the temptation to take advantage of the other party, whether by passing a poorly performing product down the line, or by attributing product shortfalls to the organization making the handoff, even when the product is technically sound • Views the temporal dimension of a problem under consideration • Coaches mid-level leaders to manage products and systems at the appropriate stage in the lifecycle • Coaches mid-level leaders in their understanding of the lifecycle process, and ensures that they are prepared to effectively accept incoming work, and provide high quality technical plans and activities to the next stage in the lifecycle • Coaches mid-level leaders to understand the interdependencies of different stages of the product lifecycle on the quality of the final product • Coaches mid-level leaders to understand the relationships and impacts of decisions from definition to retirement to disposal • Provides input to enhance lifecycle policy and procedures to executive-level leaders • Maintains strong collaborative relationships with peer senior level leaders "upstream" and "downstream"
Technical Risk Management	• Understands organizational risk tolerance and appropriately mitigates risk to acceptable levels • Accepts or recommends acceptance of any residual risk • Aligns the technical risk profile with organizational risk tolerance using persuasion and reassurance, and ensures that both subordinates and superiors are comfortable with the risk profile advocated by a technical leader • Coaches mid-level leaders to quantify technical risks and to develop appropriate risk mitigation strategies • Coaches mid-level leaders, both probing them on their own assessments of risk, and providing them with "top cover" allowing them to be comfortable with their own risk taking • Articulates and communicates the technical risk profile to superiors and sometimes non-technical stakeholders, and obtains support for risk assessment and risk management decisions
Systems Thinking	• Seeks out holistic explanations, descriptions, and relationships when examining technical problems • Focuses on connections and interfaces among the subsystems in the system, when designing, developing, testing, deploying, and operating systems • Articulates a clear vision of system relationships among existing systems, and extrapolates individual system characteristics into attributes of a system of systems • Informs mid-level leaders, executive-level leaders, peers, and stakeholders, where the structural connections in a system can be found, and coaches them on how to identify these connections for themselves; • Coaches mid-level leaders as they design and develop technical products to consider the system, its place in the system of systems, and the connections and interfaces between components; • Provides advice and guidance to executive-level leaders as they develop effective organizational strategies and support of organizational missions based on systems thinking
Systems Complexity	• Recognizes the impact that system interdependence, data flows among systems, and the virtually infinite number of potential system states have on the design, development, test and operation of

COMPETENCY	DESCRIPTION
	complex systems, and manages the design, development, test, and operations of systems to account for system complexity • Coaches mid-level leaders to understand system complexity, and the resulting impact on system design and architecture decisions • Coaches mid-level leaders to recognize system designs that have the potential for emergent behavior, and to take steps to mitigate that potential through thoughtful design strategies • Ensures that superiors and peers, both technical and non-technical, are cognizant of the special risks associated with the highly distributed and digitally rich systems, particularly when they are embedded in a complex socio-technical environment, and are supportive of efforts to provide for mitigation of potential emergent behavior of a negative type • Leads by example through keeping current in the rapidly changing science of complexity
Big Picture Thinking	• Understands how the technical system, along with its budgetary, political, mission and support aspects, fits within the executive-level context, and therefore places system requests effectively (e.g., system enhancement or development requests) and develops appropriate system and technical strategy • Focuses on external connections rather than internal structure, when designing, developing, and deploying system of systems • Identifies the overall context of the immediate system or system of systems, and communicates that context to mid- and executive level leaders • Communicates the decision context (including why and how a decision was made a particular way) to mid- and executive level leaders, as well as other key stakeholders • Understands how the system fits in the context external to the agency, that is, in the Congressional and national technical contexts, in order to represent the system in relevant Congressional committees, and to provide advice and guidance to relevant national standards boards and national technical committees • Coaches mid-level leaders to identify the context of the technical system • Coaches mid-level leaders to identify the decision context (why and how a decision was made a particular way)
Abstraction	• Discerns patterns and structures in the relationships among multiple diverse systems • Solves problems (across a wide range of areas) effectively, by recognizing that a problem or solution in one domain is analogous to a different problem or solution in a different domain • Understands and applies concepts and tools from one domain to greatly differing domains and situations, when designing, developing, and deploying technical solutions • Coaches mid-level leaders to solve problems effectively using abstraction, that is, by recognizing that a problem or solution in one domain is analogous to a different one in a different domain • Coaches mid-level leaders in applying scientific, mathematical and engineering principles across varied situations and domains • Coaches mid-level leaders in identifying connections and new opportunities (including new product development) across domains, generated from abstract thinking, and how to apply tools in varied situations and domains • Provides recommendations to superiors, because of the ability to abstract up ideas and solutions, to the appropriate organizational level • Leads multidisciplinary teams in subordinate suborganizations across multiple technical fields

COMPETENCY	DESCRIPTION

Paradoxical Mindset	• Keeps divergent, and possibly contradictory, concepts in play simultaneously, without compromising program accomplishment, while:
	  o Providing reassurance and direction to mid-level leaders during resolution of the resulting challenges
	  o Ensuring that executive-level leaders and other stakeholders understand the reasons for keeping ideas in play, and are supportive of the process
	• Nurtures divergent views (views of a problem, solution, organizational situation, or environmental context) among mid-level leaders
	• Sustains mid-level leaders' motivation during times of divergence and paradox prior to resolution
	• Examines technical problems from higher dimensions in which paradoxes may be resolved
	• Resolves divergent technical approaches at the appropriate time in the system lifecycle
	• Coaches mid-level leaders on how to nurture divergent views (views of a problem, solution, organizational situation, or environmental context) with their team members
	• Coaches mid-level leaders on how to examine technical problems from higher dimensions in which paradoxes may be resolved
	• Coaches mid-level leaders on when and how to resolve divergent technical approaches at the appropriate time in the system lifecycle
	• Reassures superiors that the presence of multiple divergent and possibly contradictory views is a good thing

Developing People-Managers	• Develops mid-level leaders personally through coaching and mentoring, enabling them to both lead and conduct their technical work more effectively • Leverages rotational assignments of mid-level leaders to provide developmental opportunities where there may be a large domain knowledge divide, potentially accepting short-term inefficiencies (due to steep learning curve effects of stretch assignments) for long-term gains (of building cross-functional skills, breadth of experiences, systemic knowledge) • Leads diversity at the mid- and senior levels, encouraging or accepting differing views. Beyond recognized demographics, diversity also includes different personality types, educational backgrounds, program experiences, technical background and other factors that generate a variety of viewpoints and approaches to solutions • Leads and shapes mid-level leaders' roles, encouraging additional breadth and/or depth in the role (and therefore the associated skill set), while aligning it to the organizational vision and strategy • Helps mid-level leaders define and develop their own careers • Provides training and learning opportunities for those they are leading • Coaches mid-level leaders to coach and mentor their team members, to enable their team members to conduct their technical work more effectively, as well as to help the mid-level leaders to define and develop their team member's careers • Coaches mid-level leaders to incorporate and lead diversity among their team members • Makes recommendations regarding the people development process to their superior(s) and/or the appropriate lateral peer
Leading People-Leading Managers	• Guides, directs, and motivates mid-level leaders in a dignifying and empowering way • Motivates and rewards mid-level leaders, including celebrating mid-level leaders' accomplishments, as well as protecting them and the suborganization during failures

COMPETENCY	DESCRIPTION
	• Works well with mid-level leaders, superiors, stakeholders, and internal peers from many different cultures, backgrounds and countries • Builds a mid-level leadership team and suborganization with a diverse representation, to avoid using people with a similar demographic, personality type, educational background, program experience, technical background, and other factors • Creates an environment of empowerment and expression, allowing the voices of all constituencies to be heard, and listens to all constituencies • Possesses a strong set of personal and organizational values and ethics (such as making ethical, but potentially unpopular, decisions under risk, time and client pressures) • Communicates in a transparent manner to executive-level leaders, mid-level leaders, peers, and all stakeholders • Takes action to instill mid-level leadership ownership with the organization's values, norms, and cultural expectations • Sets priorities and expectations for mid-level leaders and their suborganizations, measures performance and accountability • Creates an environment where the mid-level leadership team feels valued and appreciated, and where these leaders are committed to their work and want to excel • Provides motivation for the mid-level leaders and suborganizations to coalesce around common goals • Acts through and with other people, through formal mechanisms such as goal setting and performance measurement, and informal mechanisms such as building trust and influencing others • Coaches mid-level leaders to guide, direct, and motivate their team members in a dignifying and empowering way • Coaches mid-level leaders to possess a strong set of personal and organizational values and ethics, and apply them in decisions under risk, time and customer pressures • Provides guidance, direction, and motivation to superiors, peers, customers, and other stakeholders
Thinking Critically	• Uses analytical thinking to generate alternative courses of action and provide a recommendation for superiors to problems, decisions and requests identified by them • Expands his or her thinking by actively requesting new ideas and feedback from others, and constantly requests and collects new information • Applies analytical thinking across a large scope or wide range of problems and functions • Utilizes mid-level leaders' diversity of thought, experiences, and approaches to develop alternative solutions and explanations for observed phenomena and problems, and actively considers them routinely • Provides mid-level leaders with a wide ranging library of ideas, frameworks, and models suitable for application in many areas • Supports mid-level leaders with problem discovery and identification accurately (across a wide range of system of systems problems and functions) • Challenges mid-level leaders to make inferences or draw conclusions that are justified by evidence • Possesses a balance between logical thinking and holistic thinking (e.g., intelligence quotient [IQ] and emotional intelligence [EI])

COMPETENCY	DESCRIPTION
	• Coaches mid-level leaders to use analytical thinking to generate alternative courses of action and provide a recommendation to problems, decisions and requests identified by the senior leader • Coaches mid-level leaders to apply analytical thinking for the problems and functions in their realm of responsibility • Coaches mid-level leaders to develop their own library of ideas, frameworks, and models applicable in many situations • Provides recommendations to superiors, peers, customers, and other stakeholders, regarding problems, problem issue and identification, decisions, and requests, using analytical thinking
Building Trust	• Listens carefully to executive-level leaders, mid-level leaders, peers, and all stakeholders, and communicates clearly, openly, and with transparency • Explains decisions clearly, including their motives and character as well as the logic of the decision, to mid-level leaders, executive-level leaders, and peers • Delegates responsibility and relies on the ability of the mid-level leaders to achieve their goals and objectives; • Shares control and increases the participation of the mid-level leaders in decision making • Shares personal experiences and makes connections with mid-level leaders' experiences • Keeps promises to mid-level leaders, executive-level leaders, and peers • Leads ethically and models high levels of integrity • Uses resources responsibly • Has the courage to do the right thing, even when there may be negative repercussions • Takes action in spite of risk or discomfort • Nurtures an environment that results in team credibility and trust • Coaches mid-level leaders on how to do the above actions to build trust and credibility effectively
Communicating Effectively	• Speaks articulately, delivering a well-crafted message oriented toward a specific audience, and adapts messages to different audiences having a variety of viewpoints • Actively listens (understands what is meant, in addition to what is said), clarifies what has been heard, and conveys genuine interest, to executive-level leaders, mid-level leaders, peers, and all stakeholders, not just those having the louder voice • Writes clearly and effectively, to executive-level leaders, mid-level leaders and peers • Translates non-technical requirements and ideas to technical staffs • Uses a variety of communications media to communicate technical information clearly and understandably to both technical and non-technical audiences • Communicates through framing and interpreting experience to mid-level leaders • Fosters a culture of open and transparent communication in their suborganization by example • Communicates persuasively to mid-level leaders, executive-level leaders, and peers about the quality of their ideas and requests and generates support for those ideas and requests; effectively sells ideas to their mid-level leaders, executive-level leaders, and peers • Coaches mid-level leaders on how to do the above communication actions effectively • Requires mid-level leaders to evaluate their communication plans (e.g., communication goals, requirements, challenges, message, media, and audiences)
Establishing and Maintaining	• Builds new stakeholder relationships, by identifying and understanding each potential stakeholder group's requirements, expectations, and needs; meeting or handling their expectations; and

COMPETENCY	DESCRIPTION
Stakeholder Relationships	ensuring the right processes (including communication processes) are in place to sustain stakeholder relationships • Identifies stakeholder issues which are appropriate to be escalated to superiors and shared with peers • Balances competing stakeholder values, goals and interests, balances objective data and subjective knowledge in making judgments and decisions about rights and accountability • Manages conflict constructively, both conflict between the stakeholder and the organization, and conflict between multiple stakeholders, and negotiates effectively with stakeholders • Develops a unified approach to stakeholder care throughout the organization that helps meet stakeholder expectations • Identifies and involves mid-level leaders in building new stakeholder relationships • Coaches mid-level leaders on maintaining effective existing stakeholder relationships, conflict management, and negotiation
Influencing Others	• Uses rational persuasion, including explanations, logical arguments, and factual evidence, to advocate a position, decision, request, proposal, or task, with mid- and executive-level leaders, peers and stakeholders • Utilizes inspirational appeals through an emotional or value-based request, to advocate a position, decision, request, proposal or task, with mid- and executive-level leaders, peers and stakeholders • Employs consultation, by requesting the team of mid-level leaders to provide suggestions on a particular issue, or collaboration, by offering the team of mid-level leaders the necessary resources to accomplish a task or proposal • Identifies and utilizes mid-level leaders' shared vision and values to generate support for views • Knows when and how to approach others to influence them (self-awareness and other-awareness) • Coaches mid-level leaders on how to use rational persuasion, inspirational appeals, and consultation when advocating with their team members, senior-level leaders, peers and stakeholders
Developing Strategy and Vision	• Develops and articulates the vision for their suborganization that aligns to the organization and enterprise vision, and generates support for that vision from mid- and executive-level leaders, peers, and other stakeholders • Creates, understands, and executes a strategy that encompasses stakeholder expectations, industry trends, and emerging technologies • Connects strategy with day-to-day mid-level leader's objectives; ensures that mid-level leaders can see how the mid-level leaders' teams' actions/outputs/products align to the organizational strategy • Develops subordinate suborganizational structures that support strategy and promotes knowledge sharing, clear accountability, and coordination • Develops strategy execution processes and employs incentives to support those processes and decisions • Modifies or creates effective controls and feedback mechanisms to allow mid-level leaders to assess performance of strategy and associated execution • Coaches mid-level leaders in creating a strategy and vision for their own teams, which is aligned to and supports the mission and values of the superior organization

COMPETENCY	DESCRIPTION
	• Provides advice, guidance and recommendations to superiors regarding organization and enterprise strategy and vision
Fostering Agility	• Values sound approaches and remains open to ideas that solve problems, address issues, or improve processes and procedures • Adapts quickly and effectively to shifting demands and changing priorities from executive-level leaders or stakeholders, and other unexpected and unplanned events • Reorganizes, regroups, and renews personal energy in changing and uncertain conditions and contexts, effectively handles frustration and stress, maintains a positive attitude, and contributes to increasing resiliency in the organization • Encourages mid-level leaders to question established work processes and assumptions and seek better ways to work • Recognizes and rewards mid-level leaders who make valuable changes while protecting those whose changes failed but learn useful lessons • Recognizes that not everyone navigates change at the same pace and seeks to support those overcome by their resistance to change • Fosters and encourages resiliency and responsiveness in mid-level leaders • Introduces practices to help mid-level leaders do effective adaptive planning • Establishes standard operating procedures and implements knowledge management tools to increase their own learning, mid-level leaders' learning, and organizational learning, and subsequently modifies their thinking, decision-making, and courses of action according to that learning • Coaches mid-level leaders on how to do the above actions fostering agility
Promoting Innovation	• Nurtures and champions a culture of technological innovation and promotes effective team interaction regarding innovation • Generates, and seeks from others, new ideas, methods, products and processes, identifies any other innovation opportunities, makes the business case for them to superiors • Protects mid-level leaders when their innovations fail, and coaches them to identify lessons learned • Creates and implements innovation strategies • Contributes to advancement in their own technical domain through innovation (including patentable inventions) • Coaches mid-level leaders to generate, and seek from others, new ideas, methods, products and processes, and make the business case for them to superiors • Coaches, supports and guides mid-level leaders as they implement processes that support innovation • Provides input to enterprise-level innovation strategy
Building Government Acumen	• Understands human resource best practices and leads, builds, and manages mid-level leadership teams successfully • Sets program budgets and defends them effectively • Understands business motivators and the impact that they have on the successful accomplishment of technical work • Works within the structures of the law, congressional directives, OMB and DoD policy directives and guidance, including the Federal Acquisition Regulation (FAR), the Defense Federal Acquisition Regulation Supplement (DFARS), and the Defense Contract Audit Agency (DCAA) to chart a

COMPETENCY	DESCRIPTION
	program course that leads to technical success, while respecting and dealing with the many obstacles involved • Organizes and plans for success in an uncertain and changing financial and regulatory environment • Coaches mid-level leaders to understand OMB and DoD policy directives and guidance, including FAR, DFARS, and DCAA, in order to deliver technical solutions successfully
Possessing a Macro Perspective	• Understands, appreciates, and appropriately utilizes the role of each organization and suborganization in the DoD enterprise • Understands how the senior-level leader's organization, along with its budgetary, political, mission and support aspects, fits within the larger context at the enterprise level, in order to develop a successful strategy • Understands how the senior-level leader's organization is impacted by the political, economic, and social aspects, context or landscape, and takes this into account when developing strategy • Builds a supportive, collaborative and respectful relationship with peer senior-level leaders within the enterprise • Champions the role of their organization as a trusted business partner across the enterprise • Capitalizes on the value and worth of their organization's intellectual property, personnel, development efforts and products • Aligns the senior-level leader's organization's mission, objectives and vision so as to contribute to the achievement of the overall mission of the organization and enterprise • Coaches mid-level leaders to understand how the mid-level leader's organization fits into the senior-level leader's organization and the enterprise, enabling them to take this into account when they develop their strategy and vision

Table 29: Senior KCIs

Appendix 2: Leadership Development Methods

In this appendix, we will discuss the seven leadership development methods used in the Technical Leadership Development Framework and explain how each method applies to each career stage.

Leadership Development Method	Definition
Education	The formal instruction received from academic or government institutions, typically resulting in a bachelor's, master's, or doctoral degree
Training	The formal instruction received from government, corporate, or academic institutions, spanning multiple weeks to multiple years, such as DAWIA Levels I-III, focusing on technical and/or leadership instruction
Experience	The process of gaining work knowledge and skills from performing in a specific role directly
Rotational Assignments	Allows the leader to broaden their skills by providing different experience in terms of function, role, or geographic location
Mentoring	Mentoring consists of formal or informal advising or developmental relationship with a more senior leader, in a one-on-one context
Coaching	Coaching is distinguished by a focus on applied, goal-oriented learning and behavioral change, also in a one-on-one context
Self-directed Development	Self-directed leadership development refers to the leaders themselves taking the initiative to learn without direction from someone else, such as through reading books, or observing other leaders

Table 30: Leadership Development Methods and Definitions

While mentoring and coaching are frequently lumped together, they are addressed separately in the Guidebook and this Appendix because they are different techniques that should be applied differently for different purposes. In this context, education refers only to university level academic coursework. Training is divided into formal technical leadership training provided by the Defense Acquisition University, and all other training.

Although certain development methods may be more effective in imparting certain KCIs, it is the application of a wide portfolio of techniques over the full spectrum of methods that leads to successful achievement of all the KCIs at a given career stage, resulting in full technical leadership competency at that stage. It is important to use the method best suited to the developing technical leader's learning style and the desired competency.

A comprehensive discussion of the application of each technique at each career stage follows. These are directed towards the developing technical leader, from the junior through to senior career stages.

2.1. Leadership Development Methods by Career Stage

2.1.1.Junior

Education

At the junior level, technical competencies are advanced through education and an important way to strengthen those competencies is through pursuing a bachelor's degree in a technical field. A technical, or bachelor's, degree in science, technology, engineering, or mathematics (STEM) is required for some positions.

If this has not been obtained, the developing technical leader should pursue a bachelor's degree. If it has been obtained, the pursuit of a graduate degree or certificate in technical or engineering leadership will accelerate the development of both technical competencies and enabling competencies.

Training

There are targeted courses of training and events specifically designed to deliver the content relevant to the KSA available for enabling competencies at the junior level. Training at the junior level is described as "basic" and the junior technical professional will benefit from training on management of self, handling difficult people, stress management, and English writing.

While training can be pursued in the traditional sense (taking courses through DAU), there are different types of training opportunities, such as participation in a toastmaster's club.

Experience

At the junior level, a developing technical leader is typically employed for a technical task, such as identifying and documenting requirements, decomposing a system to support architecture design, building a technical product, conducting verification and validation on a product, or transitioning a technical product into production. Therefore, within the context of the development of technical leadership skills, a critical early goal is to provide the individual with a chance to apply the basic technical knowledge acquired from education.

Since the essence of the junior level experience is "management of self," learning to manage one's own workload while producing excellent technical products is an essential goal for this level. Once an individual has demonstrated the ability to execute individual technical tasks efficiently and at a high level of quality, the next important experiential learning objective involves the ability to handle multiple assignments simultaneously.

Application Becomes Experience

The application of skills obtained through training and education provides experience in both technical and enabling competencies.

Two other concepts need to be introduced at the earliest stage of the junior career level.

- First, even the most junior technical professionals should be given an opportunity to:
- Interact with contractors, vendors, and suppliers.
- Attend program reviews, site visits, and technical interchange meetings.
- Participate in the review of deliverables and proposals relevant to their own technical specialty. (Proposal reviews, in this sense, are an ad hoc review of proposal material, not to be confused with the formal proposal review process.)
- Second, the developing technical leader should have the opportunity to work as part of a team, possibly in concert with other members of their discipline, possibly as members of a multi-disciplinary team.

Halfway through the junior career stage, having demonstrated proficiency in the technical leadership competencies required for the stage, the tone and tenor of assignments should change significantly. In this latter phase of the junior career stage, the developing technical leader should prepare for their first formal supervisory assignment, and should be given the opportunity to build leadership skills by being offered the following experiential roles.

- First, the most senior individuals in the junior career stage should be seen as local experts—"go-to people"—

in some particular aspect of their technical discipline.
- Second, they should be given the chance to lead teams through negotiation, example, and persuasion (leading without formal authority).
- Third, as they approach the end of this career stage, they should be given the responsibility to provide technical direction to contractors, under the supervision of a designated contracting officer's representative.

Each of these three experiences serves to familiarize the developing technical leader with providing inspiration and direction to others. The combination of these experiences ensures that the developing technical leader has the right mix of technical management and acquisition experiences required to succeed at the mid-career stage.

Rotational Assignments

Job Rotation Program Design Parameter	Job Rotation Program Design Parameter Values For the Junior Career Stage
Number of rotations	One (1)
Rotation Duration	Short (4 weeks-9 months)
Rotation Scope	Narrow (Within technical functional/discipline)
Rotation Location	On-site
Rotation Selection	Non-selective (All employees in the population set defined)
Rotation extent	Partial (part-time)

Table 31: Job Rotation Program Design Parameters for the Junior Career Stage

There are several key attributes of a good rotational assignment at the junior level.

- First, rotational assignments at the junior level should be of short duration; they shouldn't drag on or grow into permanent commitments of indeterminate duration. Important growth is underway in the technical professional's regular assignment, so such rotational duties should be limited and brief. Examples include:
  - Pop-up task teams
  - Proposal evaluations
  - Tiger teams
  - External reviews
- Second, the rotational assignment should involve a different supervisor. Part of the learning experience at this career stage is precisely about working for a different supervisor, helping junior folks build the extremely important network of their supervisors, from which future promotional opportunities are built.
- Third, it is highly advantageous for the junior technical professional if the leader of the rotational assignment is senior to their permanent supervisor. There are many reasons for this:
  - A higher premium on excellent performance
  - Visibility at a higher management level
  - The learning that comes from a "stretch" assignment
  - The chance to see how the more experienced folks do things

Another type of job rotation is volunteer service. Serving in volunteer organizations, including community service, religious, political, youth sports, emergency services, and charity organizations, can give a developing leader the chance to serve in a leadership position at one or two notches higher up in the responsibility scale than their day job makes possible. A leader who has served as a political Precinct Captain, church elder, or a Scout leader, is much more comfortable in their first formal supervisory role than one who has not.

Two In One

The White House Fellows program is both a rotational experience and a training program that serves junior career stage leaders.

Finally, the leadership opportunity afforded though military service cannot be discounted. Service in the Reserve and Guard brings the advantage of leadership training (of the highest quality) as well as the leadership skills gained through the experience.

Mentoring

Mentoring Attributes	Mentoring Attribute Values for the Junior Career Stage
Mentor-to-Mentee ratio	Individual
Mentor/mentee matching	Mentee has total discretionary choice
Job function distance	Distance is close
Career stage distance	Peer mentoring, where distance is zero or close
Demographic distance	Distance is zero or close
Mentor-mentee duration	Short
Mentoring communication method	In-person
Meeting frequency	Frequent
Mentoring Criteria	None

Table 32: Mentoring Attributes for Junior Career Stage

At the junior level, another important way to advance technical leadership competencies is by receiving and providing mentoring. During a mentoring relationship, the junior developing technical leader has the opportunity to observe and document the mentor's technical leadership competencies that are actively used. During conversations between the mentor and mentee, the junior developing technical leader has the opportunity to discuss what was observed of the mentor's use of the technical leadership development competencies.

A developing technical leader should have a portfolio of mentors, from different areas and different points in their career. While a mentoring system on the job is the most effective, a junior technical professional can also find mentoring opportunities outside of work, using former professors, supervisors, and community leaders to provide the shoulder to cry on, sage advice, and networking.

In addition to having mentors who are at a higher career stage, it is also advantageous to have peer mentors. In "dragon clubs," junior employees mentor each other thereby "dragging" their careers forward, often through peer mentoring or mentoring new employees to the team. In addition, junior developing technical leaders "drag" themselves and their peers along by:

- Retaining the membership in their professional society that they likely acquired as a student

- Attend those society meetings of their local chapter or sections
- Get involved in STEM outreach at local high schools and other K-12 venues

Mentoring is most successful in a culture where a key role of management is to encourage the success of the next generation by actively participating in the mentoring process.

Coaching

Coaching Attributes	Coaching Attribute Values for the Junior Career Stage
Coach-to-coachee ratio	Individual
Coach type	External
Coach criteria	None
Coach selection and coach/coachee matching	Coachee has total discretionary choice
Coaching style	Directive
Coach-coachee duration	Short
Coaching communication method	In-person
Meeting frequency	Frequent

Table 33: Coaching Attributes for the Junior Career Stage

While the new, junior level employee is coached by many others on an almost continual basis, how and where these employees are coached in the practice of technical leadership is essential to the Framework.

Junior technical leaders typically have two principle sources for such coaching:

- The employee's direct supervisor, who best coaches by demonstrating good leadership, and then explicitly explains to the new employee, during frequent private sessions, technical leadership competency application.
- An ever-so-slightly more experienced peer, who has absorbed some of the early lessons about technical leadership and can demonstrate them to the more junior partner in real life application.

The roles of coach and trainee are intimately connected at the junior level. It doesn't take long for the new employee to quickly become a subject matter expert on a variety of key skills, which can then be imparted through coaching to the next new person coming through the door. So, the junior leaders will spend some time being coached, will progress to a mix of coaching and being coached, and as they approach elevation to their first formal supervisory assignment, will find that they spend most of their time coaching others.

Self-Directed

During the junior career stage, the developing technical leader must make an early commitment to their professional development to form career-long habits of self-improvement. During this stage, the leader must create the practices and routines that will be utilized throughout their professional careers.

Specific self-directed activities at the junior stage should include:

- A survey of self-improvement and leadership literature
- Observing the behavior of other leaders
- Developing a personal leadership philosophy

2.1.2. Mid-level

Education

If the developing technical leader is in the mid-level career stage without a graduate certificate or degree, this is an opportune time to pursue academic graduate certificates or degrees in technical leadership or engineering leadership. Graduate degrees provide additional depth in the technical field beyond what is achieved in an undergraduate education.

There are a vast number of opportunities for the developing leader to obtain a technical graduate degree to expand beyond technical or engineering leadership into purely technical education.

Training

At the mid-level career stage, training courses associated with building team leadership skills—management of individuals—are more appropriate.

Training opportunities may arise from volunteer roles and experience. For example, learning about the Myers-Briggs Type Indicator tool from a training course attended as a charity board member is as effective as doing so in job sponsored training.

Training Opportunities

The ELP and EPP programs by the Graduate School USA offer training courses on the enabling leadership topics at the mid-level. DAU offers training courses to advance leaders' technical competencies at the mid-level.

Experience

A developing technical leader's experiences at the mid-level career stage are focused on the leadership of individuals. For the first time, the technical leader has both formal and informal authority, meaning they have the formal authority to tell subordinates what to do while encouraging them through informal authority to value the completion of the task. The focus of experience at this career level should be learning how to inspire using informal authority without relying strictly on formal authority to accomplish tasks.

With elevation to first level supervisory status comes a wide variety of new administrative responsibilities. A technical leader must be a good leader in general, and adequate experiential exposure to the nuts and bolts of first level supervision is essential. The variety of assignments at the mid-career level should include the following experiences in this sequence.

- First, line management of a team of technical specialists in the leader's field of discipline.
- Second, supervisory management of a project team or integrated product team (IPT) including the leader's discipline but also including complementary functions.
- Third, assignment as a contracting officer's technical representative with responsibility over some portion of an acquisition program.

After completing these assignments, a mid-level developing technical leader should be assigned to a technical staff position working with a second level manager. The specific staff assignment is not important, but it is preferable that the position have both technical and acquisition responsibilities, and that the developing technical leader should be afforded the opportunity to act "instead" of the second level manager in performing these duties. The key benefit from this is learning to handle problems across disciplines outside the leader's own area.

Rotational Assignments

Job Rotation Program Design Parameter	Job Rotation Program Design Parameter Values for the Mid-Level Career Stage
Number of rotations	Few (2–3)
Rotation Duration	Typical (1 year)
Rotation Scope	Intermediate (Across technical functions/disciplines)
Rotation Location	Off-site (but within the same country)
Rotation Selection	Selective (subset of employees in the population set defined)
Rotation extent	Full (full-time)

Table 34: Job Rotation Program Design Parameters for the Mid-Level Career Stage

The nature of the rotational duties changes at mid-level career stage as they involve management and supervision as a fundamental component. The developing technical leader should select a job rotation that advances technical leadership competencies at the mid-level career stage that need strengthening, or technical leadership competencies at the senior career stage so they are prepared for promotion.

At the mid-level career stage, job rotations focus on leading a team in a different technical specialty than the team they are currently leading or providing opportunities and experience outside the boundaries of their home organizations. For example, a mid-career leader could fill in as section head or branch chief for a supervisor from another division who is out on maternity leave. Such an assignment would fulfill several important criteria:

- Exposure to a different management and work culture
- Exposure (potentially) to a different technical specialty
- The potential for building a network with peers and managers across the broader organization

Finally, other possibilities are job rotations across agencies, such as an Army laboratory to a DARPA project, or Congressional Fellowships.

Mentoring

Mentoring Attributes	Mentoring Attribute Values for the Mid-Level Career Stage
Mentor-to-Mentee ratio	Group
Mentor/mentee matching	Mentee has limited discretionary choice
Job function distance	Distance is intermediate
Career stage distance	Distance is intermediate
Demographic distance	Distance is intermediate
Mentor-mentee duration	Intermediate
Mentoring communication method	Video-conference

Mentoring Attributes	Mentoring Attribute Values for the Mid-Level Career Stage
Meeting frequency	Typical
Mentoring Criteria	Some

Table 35: Mentoring Attributes for the Mid-Level Career Stage

The mid-level developing technical leader continues to strengthen their competencies by receiving and giving mentoring. A technical professional entering the mid-level career stage should do so with one or more well-established mentoring relationships in hand. One of these relationships could be the person who promoted or hired them to their first supervisory position. Additionally, a mid-level technical leader should providing mentoring to a group of mentees. In addition to benefiting from the mid-level leader's mentorship, these mentees will afford the leader the opportunity to hone their own mentoring skills as they progress toward the senior career stage.

Mentoring, in its "best practice" state, is an organic feature of the organizational culture, not a formal program. So what should the organizational role be in the nurturing of this organic best practice? There are really only two actions that top management must take to make effective mentoring a reality:

- First, "walk the walk" by taking on mentees and doing well by them.
- Second, through the pervasive encouragement of grass-roots mentorship practice.

Coaching

Coaching Attributes	Coaching Attribute Values for the Mid-Level Career Stage
Coach-to-coachee ratio	Team
Coach type	Internal
Coach criteria	Some
Coach selection and coach/coachee matching	Coachee has limited discretionary choice
Coaching style	Nondirective
Coach-coachee duration	Intermediate
Coaching communication method	Video-conferencing
Meeting frequency	Typical

Table 36: Coaching Attributes for the Mid-Level Career Stage

While the developing technical leader at the junior level spends more time being coached than coaching, at the mid-level, this balance reverses. As leaders of individuals, mid-level leaders actually spend almost all their effort coaching.

Mid-level leaders provide coaching to their junior team members on the technical leadership competencies that are most relevant. In the more senior phase of the mid-level career stage, where the leader has transitioned to a staff support role, they are a subject matter expert with the primary charge (or they should at least view this as their primary charge) of coaching their direct supervisor's entire workforce (including those who are the mid-level leader's peers) on the subject in which they are the expert.

Coaching at the Mid-Level

At this career stage, the technical leader is responsible for seeing that all other methods have "stuck" by reinforcing the lessons taught there via continuous monitoring of individual performance, and continuous adjustment through one-on-one sessions.

In terms of coaching the mid-level leaders, the targeted technical leadership competencies are typically those in which the mid-level developing technical leader is weaker and should be self-identified and identified by the mid-level leader's supervisor. The ELP/EPP programs use the self-identified approach. It is preferable that developing technical leaders seek out coaching in a wide range of areas related to the KSA at the mid-level.

Self-Directed

At the mid-level career stage, the practices and routines formed at the junior career stage are continued. Now in management positions, the mid-level developing technical leader should begin modeling the behavior of respected senior leaders. Then, taking advantage of available leadership opportunities, the developing leader should exercise and experiment with those behaviors to see what is most effective given a variety of scenarios. With this experience, they should settle upon their own leadership style. Like any learned behavior, the self-directed mid-level leader should actively seek opportunities to refine their methods and accept increasingly complex leadership challenges.

2.1.3.Senior

Education

Completion of a master's level academic degree is essential to the senior career stage, and pursuit of a PhD or other Doctoral program appropriate to the technical leader's field of scientific or engineering specialty is highly desirable.

Many advances in science and technology occur through original research. The process of conducting original research is learned primarily through a doctoral degree, where the student must take many research methods courses, and write a dissertation presenting an original contribution in the specific technical field.

Benefits

A doctoral program provides the in-depth guidance and experience in research methods, critical thinking through extensive research, and innovation through original research.

A doctoral degree is a way to achieve proficiency across a number of key competency indicators. Beyond critical thinking and innovation, doctoral programs build competencies as follows:

- Verbal communication skills through presenting work to dissertation committees and conferences
- Written communication skills through writing the dissertation and other papers
- Influencing skills by convincing others of the value of the dissertation topic (and associated research method) that a person wants to research
- Vision skills by envisioning an original topic that no one else has thought of or conducted research on
- Big picture skills by being required to place one's dissertation topic in the overall research landscape
- Technical planning skills through planning out the dissertation work
- Risk management skills by addressing the risks that arise during original research

Training

There are three training experiences that are vitally important for technical leaders at the senior level.

- **Media training**, which goes beyond the advanced speaking and writing skills at the mid-level, focusing on how to perform on television, understanding of how to deal with "investigative journalism" invitations ("no thanks"), and how to "do" the six-o'clock news.
- The **executive MBA**, which exposes senior leaders to general management level concepts of finance, debt and equity, export regulation, diversity, ethics, and liability. An executive MBA program provides this training more effectively and efficiently than a traditional MBA program.
- Attendance at a widely **focused residential training program** that involves interagency, whole-of-Government, and joint participation is a mandatory element of the technical leader's seasoning. A senior level developing technical leader can attend joint service school programs, such as the Massachusetts Institute of Technology (MIT) Seminar XXI program, or a similar high level course such as the Federal Executive Institute's (FEI's) basic executive leadership course.

Upon reaching General Schedule (GS)-15 at the latest, the senior technical leader should make a habit of attending at least one course annually at the Federal Executive Institute, preferably at the FEI's Charlottesville, VA, campus. These courses expose the senior leader to peers at agencies across the government. The focus is on deep understanding of key leadership concepts, coupled with a return to those "management of self" truths that a senior leader may have lost track of over the long years of a successful career: stress management, work/life balance, respect for diversity, honoring the workforce, and personal health. Service Schools fall under the category of "training" and are most appropriately encountered at the senior level.

Finally, technical leaders at the senior level are encouraged to take advantage of one of the many Congressional familiarization workshops that introduce participants to the legislative process, and typically include briefings by members and legislative staff. An understanding of how Congress works is vital to a senior technical leader in the acquisition community.

Experience

When it comes to experience, the distinctive difference at the senior career level involves diversity of technical field and functionality. Senior level technical leaders are "managers of managers," managing suborganizations, not individuals. Since the suborganizations they manage include multiple technical disciplines, and include non-technical elements (such as contracts, HR, and facilities), a senior technical leader is exposed to a wide range of ideas and processes.

To prepare the senior level for executive leadership, assignments at this level should concentrate on several types of experiences.

First, experiences should begin to emphasize application of technical knowledge broadly at some depth well outside the leader's own technical field. The senior leader must be able to "speak the language" of all the disciplines credibly enough, and to sufficient depth, to be able to provide cogent critical review to all the programs under the organization's direction.

Knowledge in All Disciplines

The key learning in this process is the Abstraction competency so that senior technical leaders can prepare themselves for the eventual executive leadership of highly diverse technical organizations of broad scope.

Second, experiences should permit the senior leader to build familiarity with, and knowledge of, the set of staff functions normally associated with general management, including finance, contracts, facilities, human resources, public affairs, legal, and security. This is best achieved where the senior technical leader is given "dotted line" supervisory responsibility for specialist staff functions that report directly to their own functional management at a geographically remote location. In this position, the senior leader shares performance review responsibilities with the "home room" manager, and serves as the day-to-day supervisor for the staff functions assigned. Learning the nuances of this role is best achieved through on the job experience, and is absolutely critical for anyone who will later be called upon to lead a large and diverse national enterprise.

Third, senior technical leaders are at a career stage where program management of large, multi-year projects of national visibility and importance is a critical experiential element.

The ideal sequence of assignments at this career level should focus on each of these elements in turn, to build a solid foundation through experience and learning. The preferred sequence for these assignments is that stated above, with the more technically oriented role coming first, followed by exposure to general management skills, because these two experiences build on one another and are essential prerequisites to successful program management on multi-year projects.

Technical leaders at the senior level can also benefit from staff positions with important responsibilities. These would include positions with titles such as Chief of Staff, Technical Director, or Deputy, where the senior leader serves in a direct reporting relationship to an Executive, preferably an executive filling one of the technical key leadership positions (KLPs).

In light of the increasingly important interconnections among communities in the defense community, one or more of these senior level assignments might well be in a joint, interagency, or whole of Government position. However, these opportunities tend to be limited in availability, so this aspect of experiential learning is probably best handled through rotational assignments.

Rotational Assignments

Job Rotation Program Design Parameter	Job Rotation Program Design Parameter Values for the Senior Level Career Stage
Number of rotations	Several (>=4)
Rotation Duration	Long (2–5 years)
Rotation Scope	Broad (Across technical and non-technical functions/disciplines)
Rotation Location	International

Table 37: Job Rotation Program Design Parameters for the Senior Level Career Stage

Rotational assignments become most meaningful at the senior level. At this level, the goal of rotational assignments is to:

- Build perspective
- Provide a broad base of understanding
- Offer wide technical scope
- Create a pervasive network of contacts that will serve the leader well in their executive career

At the senior level, rotational assignments carry titles such as "Chair," "SSO," "Study Director," and "Designated Federal Official." As a manager of managers, the senior technical leader should become comfortable acting as a leader of interagency peers, contributing to multi-agency interdisciplinary teams in high stakes, high intensity activities such as source selections, red teams, and blue ribbon panels. The senior technical leader should use these rotational opportunities for building the capacity to survive a room full of elephants, or the breakup of the ice floes, without being crushed in the process.

Senior leaders should be given rotational assignments that involve service as the principal point of contact for congressional staff, Government Accountability Office (GAO), Inspector General (IG) and other fact finding and audit organizations of similar nature.

Mentoring

Mentoring Attributes	Mentoring Attribute Values for the Senior Level
Mentor-to-Mentee ratio	
Mentor/mentee matching	Mentee has no discretionary choice
Job function distance	Distance is far
Career stage distance	Distance is far
Demographic distance	Distance is far
Mentor-mentee duration	Long
Mentoring communication method	Telephone conference
Meeting frequency	Infrequent
Mentoring Criteria	

Table 38: Mentoring Attributes for the Senior Level Career Stage

Mentoring during the senior career stage focuses on preparing the technical leader for future executive roles. At this level, it is the responsibility of the senior leader's immediate supervisor to determine whether the senior leader is adequately supplied with mentorship, and then either provide it directly or see that it is provided.

In addition to continuing to seek mentoring, it is at the senior level that service in role of "mentor" is most important. Senior technical leader should continue to provide mentoring personally and at the program level (as they are managers of managers), in addition to providing mentoring training to their teams.

Senior leaders should be required to maintain a mentoring program in their own organizations. If need be, they should receive training in the development and operation of such a program, as well as being given training in mentoring itself. Furthermore, they should be required to deliver such training to their staffs.

Coaching

Coaching Attributes	Coaching Attribute Values for the Senior Level Career Stage
Coach-to-coachee ratio	
Coach type	
Coach criteria	Many
Coach selection and coach/coachee matching	Coachee has no discretionary choice
Coaching style	
Coach-coachee duration	Long
Coaching communication method	Telephone
Meeting frequency	Infrequent

Table 39: Coaching Attributes for the Senior Level Career Stage

At the senior level, coaching changes in both the receiving and providing of coaching.

Coaching is during the senior career stages is accomplished in unique ways, such as the following:

- The senior level leader receives coaching on GAO interviews in which the senior leader is put on the spot; the executive "coach" monitors the interview and later reflects on the proceedings, providing feedback to the senior level leader.
- Major speeches, given by the senior leader with the executive coach in the audience with the coach providing insights and improvements after the speech is over for the next speech the senior leader needs to give.
- Specific coaching by management SMEs deigned to help the senior leader deal with leadership challenges in the wide variety of personnel and staff specialty subjects that are usually unfamiliar to the technically trained professional (legal, HR, finance, and public affairs).

Often, the senior level leader will find that their coaches will tend to be junior. Many times, these coaches are outside consultants who have been retained to impart specific competency related skills, which at the senior level are likely to be related to preparation for executive grade.

Self-Directed

Self-directed leadership development does not stop with the achievement of senior positions. To lead at the senior career stage, a more strategic perspective and a reading program, exposing the leader to such topics as business, economics, and new technologies, is required. Further, developing a broader network of professional relationships will accelerate leadership development and encourage higher levels of effectiveness regarding the leadership practices used. Participation and leadership in professional technical associations will provide the larger platform the developing senior leader needs. Finally, through serving as a mentor to juniors, the senior leader has the opportunity to give back while staying connected to those they are tasked to lead.

Appendix 3: Supervisor's Guide to Implementation

In this appendix, we will discuss how supervisors can use the Technical Leadership Development Framework to improve their team's technical leadership. In general, the four steps in the Framework remain the same, but are now viewed from the role of the supervisor.

3.1. ROLE

Supervisors are in a unique position to guide the individual developing leader in the selection of leadership development methods that are best suited for the individual in the context of the particular organization.

Supervisors play different roles in the Technical Leadership Development process depending on their own level in the organization, organizational policy with regard to Technical Leadership Development, employee career development in general, and other environmental factors.

Supervisor Roles in Different Environments

When a supervisor manages technical leaders in an organization with a robust development process and where the Framework is implemented by policy; the supervisor's role focuses on executing the program and ensuring that technical leaders are making good progress toward their career goals.

If the Framework is not implemented by policy and the supervisor wishes to use it within their organization, they need to promote its use through their own policy. To ensure successful implementation, the initial policy should be kept light (not directive or perscriptive) so the supervisors take an active interest and the time to work with their direct reports in understanding and applying the Framework. This collective exploration helps the developing technical leaders see what competencies are needed and have a good idea of how to go about building those necessary skills.

At a minimum, a supervisor needs to make this Guidebook available, be on hand to discuss training opportunities and job assignments with the developing technical leader, and consider the leader's progress as part of regular feedback sessions.

Reach Then Execute

The supervisor needs to read and understand the Technical Leadership Development Guidebook before implementing it within the organization.

3.1.1. Leadership Development Methods

The supervisor should draw upon previous experiences when guiding subordinates in the selection of leadership development methods. This guidance should also take advantage of the recommendations found in Tables 5 and 6, balanced against the needs and opportunities of their organization. As an example, if the supervisor had a positive outcome from a mentoring relationship, that leadership development method may be recommend to the developing technical leader. The supervisor should take the extra step of proposing candidate mentors and facilitating any introductions.

3.2. RESPONSIBILITIES OF THE SUPERVISOR

The term "supervisor" may range from a first level supervisor to a senior executive with reporting executives depending on the organizational echelon at which the Framework is implemented. This section focuses on those responsibilities unique to the supervisor of developing technical leaders.

The supervisor's role in the Technical Leadership Development Framework is twofold:

Abstraction and Preparation

The key learning in this process is the Abstraction competency so that senior technical leaders can prepare themselves for the eventual executive leadership of highly diverse technical organizations of broad scope.

- Provide direction and support on the leadership development methods
- Provide input and feedback on a person's competency attainment

The supervisor is responsible for providing support and direction on specific leadership development methods, such as particular courses or rotational assignments, to build specific competencies. In addition, the supervisor may provide formal input and feedback on competency attainment as part of HR processes, or on an informal basis.

3.2.1. Actions to Support the Developing Technical Leader

The supervisor has a responsibility to balance the needs of their developing technical leaders with the mission of their organization. Many development methods require significant time commitments and perhaps time away from the developing technical leader's primary job. As such, the supervisor should budget for selected leadership development methods, such as training and TDY costs, to ensure the appropriate opportunities are available and realistic. The supervisor should also ensure any selected development methods are added to the developing leader's Individual Development Plan (IDP) and tracked throughout the year.

Set Expectations

Capturing development methods and goals in an IDP is the primary way for supervisors to set their expectations for the developing leader. Created and updated as part of the annual employee appraisal cycle, the IDP outlines specific development goals and is approved by the supervisor. Regular follow-up on accomplishments is part of every supervisor's responsibility and provides the opportunity to modify expectations as the year progresses.

Promote the Program

Though the success of any technical leadership development initiative starts with its advocacy by an organization's executive leaders, its successful implementation falls squarely upon supervisors to execute the program. To promote a development program, supervisors must:

Abstraction and Preparation

The development of future leaders is a primary responsibility of supervisors and the Framework provides a researched methodology to do that.

- Understand the framework and its application. Without this fundamental knowledge the goals of the program will be difficult to achieve.
- Adopt its methods for their own development to promote credibility and gain greater insight into how it works.
- Insist upon its use with those they are charged to supervise.

3.2.2. Actions to Expect from the Developing Technical Leader

The developing technical leader needs to know what is expected of them when beginning a leadership development program while also ensuring their supervisor is aware of their career goal. The developing leader must be willing to have candid discussions regarding professional goals and their commitment to those goals with their supervisor. Many people with technical backgrounds have little interest in leading others, preferring to deepen their technical

expertise. If that is the case, then that should be communicated to the supervisor who can then provide the appropriate development path.

The supervisor should also expect a good faith effort in pursuing the selected development methods. Far too often, attendance at scheduled leadership training classes is overtaken by "higher priority" tasking. If the supervisor is taking the interest in time in the development of their personnel, that effort should be reciprocated.

3.2.3. Actions to Expect from the Executive Sponsor

The supervisor should expect support from the program's executive sponsor. Executive sponsor support should include:

- Resources for training courses
- Providing an appropriate level of staffing to allow for training absences
- The creation of mentoring and coaching programs
- An incentive structure which rewards those supervisors who execute the program

3.2.4. Provide Support

Because the role of supervisor can span career stages and may not have a clear-cut relationship to other job duties within the organization, supervisors need to be aware of the career stage of their subordinates. For example, if the subordinate is an individual performer, they are in the junior level and the supervisor should focus their efforts on ensuring they pursue KCIs appropriate to the junior level.

A supervisor can support developing technical leaders by conducting an "entrance interview" as they embark on the Technical Leadership Development path. This conversation would consist of a discussion of the individual's career stage and a walkthrough of the competencies and KCIs relevant to that level. Following this discussion, the supervisor can advise the developing technical leader on which steps to take to obtain the necessary competencies.

For leaders at the mid-level and senior stages, these conversations would involve discussion of competency at the earlier stages, as appropriate. A leader actively involved in the Technical Leadership Development Framework would have assessments for lower level competencies. The supervisor could use these previous assessments to direct the conversation concerning which competencies to continue to pursue and which leadership development methods have worked (or not worked) for the developing leader in the past.

Appendix 4: Executive Sponsor's Guide for Implementation

In this appendix, we will discuss the role of the executive sponsor in implementing the Technical Leadership Development Framework. The executive sponsor oversees and governs the tailored implementation of the Framework and accomplishes this organizational change through changing organizational policies, standard operating procedures, strategy, or culture.

Do The Research First

The executive sponsor needs to read and understand the Technical Leadership Development Guidebook.

4.1. Provide Support

To support developing technical leaders and their supervisors, executive sponsors must embody the 24 technical leadership competencies within their role in the organization. This "leading by doing" includes modeling technical leadership as an individual as well as a supervisor, including serving as a mentor. The executive is in the best position to provide:

- Oversight and governance regarding tailoring of the competency descriptions
- Assignment of grade levels to the appropriate career stages
- Provision for full attainment of competencies over the course of a career through application of the leadership development methods

4.2. Roles of the Executive Sponsor

As the executive within the organization where the Technical Leadership Development Framework is implemented, the executive sponsor drives organizational change through changing organizational strategies, policies, standard operating procedures, and the culture.

The executive sponsor must be just that, an executive, for two reasons.

- First, the Framework and Career Model encompass all career levels up to but not including executive rank, but including the most senior non-executive leadership (GS-15 or equivalent). Therefore, leaders at that most senior level are participants in the process as developing leaders and the process should be overseen by an individual senior to that grade; in other words, an executive.
- Second, successfully implementing the Career Model requires integrating the technical organization and the HR functions. Since these two functions do not normally have joint reporting responsibilities below the executive level, the tailored policy linking both functions should be in force at least at the organizational level where a mission-focused executive has a minimum "dotted line" supervisory authority over personnel matters.

The executive is in the best position to provide oversight and governance regarding tailoring of the competency descriptions, assignment of grade levels to the appropriate career stages, and provision for full attainment of competencies over the course of a career.

4.2.1. Establish Human Resources Processes

The executive sponsor can encourage a tight integration between technical leadership development and other HR institutional processes by implementing and incorporating the Framework and Career Model into the organization's processes for recruitment, selection, performance evaluation, and promotion. Through the executive sponsor's guidance, competency attainment by developing technical leaders becomes a matter of formal joint discussion and decision-making involving HR professionals, program managers, and functional managers.

4.2.2. Build a Culture of Learning

On-Going Discussions

Making competency development important means making it a part of superior-subordinate conversations on a period basis, not just an annual basis.

Changing the culture of an organization necessitates the intentional and systematic application of leadership development methods, and by extension to intentional and systematic application of the Technical Leadership Development Framework. Executive sponsors should create an environment where development and improvement of technical leadership is an open topic that can be discussed between and within career stages. If mentoring as a leadership development method is important, then peers will ask each other on a periodic basis about each other's current mentoring experience and share their own.

The development methods for mastering competencies and career model elements are to be thought of as DoD-wide best practices to be used in developing specific technical leadership development programs in different organizational Components. This allows flexibility at the organizational level to define specific GS grade levels at which the transition from junior to mid-level to senior might occur (while being generally consistent with the definitions of these stages in the overall Framework). Likewise, the specific description of a particular competency can, and should, be tailored to specific career fields, and to specific positions within a particular organization, as well as being applicable to specific job descriptions within such an organization.

Illustrating the Tailoring of KCIs

For any given job description within an organization, a determination will be made (mostly likely by HR) regarding the career stage that job represents. With the career stage established, each KCI for each of the 24 competencies should be considered for tailoring to fit the job description. When tailoring KCIs, take the mission and work environment into consideration, keeping in mind that sometimes, no tailoring is required.

Indeed, it is likely that there may be KCIs that are not represented in a given job assignment. In this case, it is the responsibility of the developing leader's organization to make provision for building competency through the use of rotational assignments, targeted training, and/or coaching. While the Career Model and the Framework are not prescriptive, waiving any competency related KCI at any level is not okay. The lack of any one of the 24 competencies identified in the Framework is likely to result in failure to achieve success as a technical leader.

High-Level Deployment Strategy

The strategy to deploy or implement the Technical Leadership Development Framework consists of a number of key aspects.

- Identify and document how technical leadership development aligns to and supports the organizational mission and vision.
- Integrate technical leadership development into the organizational strategy and strategic plan.
- Map the roles and responsibilities in technical leadership development to the appropriate roles and responsibilities in the organizational structure.
- Tailor and customize the technical leadership competencies in the Technical Leadership Development Guidebook to the organization and its associated career fields.

- Identify the highest level of the hierarchy of standards, standards, guidelines, and procedures where the executive sponsor is able to incorporate technical leadership development, and then incorporate it at that level.
- Integrate technical leadership development into the organization's web site (using an appropriate tool, such as a web form, Python application, or an Excel-based tool).
- Produce a communications plan.
- Generate a training plan (including decisions on single trainer, or cascading train-the-trainer).

4.3. Responsibilities of the Executive Sponsor

The executive sponsor has two key responsibilities:

- To oversee and govern the tailored implementation of the Framework and Career Model
- To model technical leadership by mastering the competencies, by serving as a mentor, and by requiring that direct reports to the executive do the same

4.3.1. Responsibilities to the Developing Technical Leader

The executive sponsor is charged with ensuring the proper resourcing is in place, in terms of both funding and staffing, to execute a leadership development program. These administrative and logistic efforts ensure that when the leadership development opportunities arise, the organization has the ability to support the qualified candidates.

Additionally, the executive sponsor needs to "walk the walk" of technical leadership through personal example and the decisions they make, providing a sound model of technical leadership for developing leaders to follow. Part of "walking the walk" includes recognizing the effort of developing technical leaders during leadership development, and rewarding that effort as appropriate.

4.3.2. Responsibilities to the Supervisor

Moving up, in addition to the same supporting aspects described above, the supervisor should expect that the executive sponsor will clearly articulate their policies and provide clear direction on how the program will be implemented across the organization. When this is done successfully, the sponsor should observe synergy and alignment between the executive and HR functions of the organization.