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To: Garry Shafovaloff, Director, AT&L Human Capital Initiatives

Dr. Eric Parrish, Office of the Undersecretary of Defense (OUSD), Acquisition, Technology, & Logistics (AT&L), Assistant Secretary of Defense for Research and Engineering (ASD R&E), Systems Engineering Mission Assurance

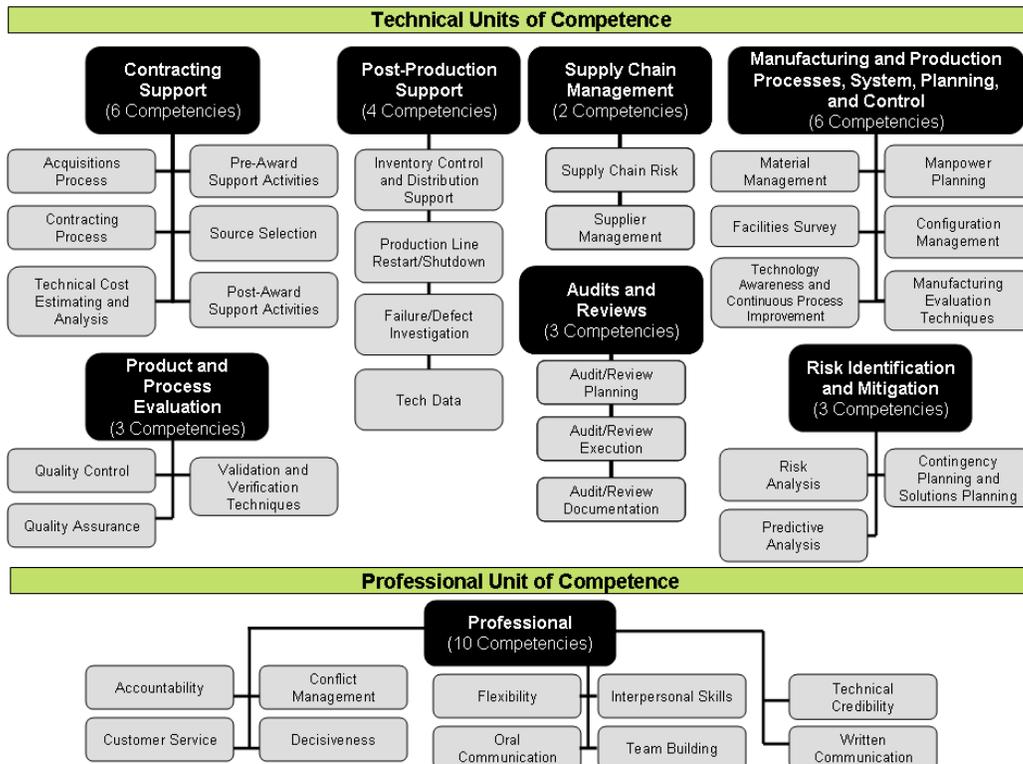
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Subject: PQM Career Field Competency Model Development

Overview

The Director of Human Capital Initiatives (HCI) for Acquisition, Technology, and Logistics (AT&L) has deployed a Department of Defense (DoD) competency assessment of the acquisition workforce to understand the challenges and opportunities for developing, retaining, and recruiting a high quality workforce. This memo documents the competencies required for superior performance in the PQM Career Field. Figure 1 represents a summary of the model at the current stage of this initiative, Phase II. This memo details the background, methodology, and findings of this phase and recommends next steps to assess the workforce.

Figure 1. PQM Competency Model (units of competence and competencies)



The competency development and assessment initiative is driven by Director of Human Capital Initiatives, in support of the Undersecretary of Defense for Acquisition, Technology, and Logistics. The competency model and subsequent workforce assessment will allow PQM leadership to:

- Assess the entire PQM career field to identify strengths and gaps
- Revise the human capital plan for succession planning, training, and recruiting
- Formulate next steps moving forward and target solutions to specific challenges.

Background

Research Drivers

The U. S. Department of Defense is the largest buying enterprise in the world. The people who perform this work are the nearly 150,000 AT&L employees whose mission it is to deliver equipment and services that meet the needs of the warfighter. DoD is analyzing the acquisition workforce to ensure that it has the skills needed to meet its important national security mission. Mandates and governance related to this initiative include the following:

1. The National Defense Authorization Act (NDAA) in 2008 assigned responsibility to the Director of AT&L for providing an addendum to the civilian human capital strategic plan to address management and oversight of the acquisition workforce.
2. Public Law 111-84 of NDAA FY10 codified DoD workforce planning and reporting requirements, Title 10 of United States Code, Section 115b as follows:

“The Secretary of Defense shall submit to the congressional defense committees on an annual basis a strategic workforce plan to shape and improve the civilian employee workforce of the Department of Defense. The plan shall include:

- An assessment of the critical skills and competencies that will be needed in the future within the civilian employee workforce by the DoD
- The appropriate mix of military, civilian, and contractor personnel capabilities
- The critical skills and competencies of the existing civilian employee workforce of the DoD and projected trends in the workforce based on expected losses due to retirement and other attrition
- The gaps in the existing or projected civilian employee workforce that should be addressed to ensure that DoD has continued access to the critical skills and competencies
- A plan of action for developing and reshaping the workforce
- Specific recruiting and retention goals
- Specific strategies for developing, training, compensating and motivating the workforce
- Any incentives necessary to attract or retain any civilian personnel possessing the skills and competencies identified.”

The Department of Defense AT&L, HCI Office supports the development of acquisition workforce personnel and leaders, enabling them to make important business decisions that provide the best dollar value while supporting DoD agencies' missions. HCI initiatives include programs such as competency development and assessment. The Office of HCI goals include improving acquisition workforce performance, making necessary investments in training, conducting trend analysis, and emphasizing the criticality of acquisition work to agency mission success.

PQM Career Field

At the request of the Director of HCI, CNA analysts are developing a validated competency set for the PQM career field. The results of the competency model development and the subsequent workforce assessment will allow PQM leaders to target learning and organizational development interventions needed to fill performance and knowledge gaps.

An acquisition employee is considered a member of the PQM career field based on the responsibilities of his or her position. The Defense Acquisition Workforce Improvement Act (DAWIA), 10 USC Chapter 87, Section 1721 establishes requirements for designating Defense acquisition positions. PQM employees support the acquisition, management and support of major weapon systems. They provide the same functions for other equipment, support systems, and services that support the warfighter. People in PQM positions are responsible for all aspects of quality, production and manufacturing support for defense acquisition programs. PQM employees establish essential quality standards and controls and they develop and execute design conformance/fitness for use requirements. They also integrate quality plans into system engineering processes; develop policies, procedures, test provisions, and quality requirements in specifications, standards and solicitations. PQM specialists evaluate quality assurance during acquisition using design reviews, functional and configuration audits, production readiness reviews, and milestone reviews.

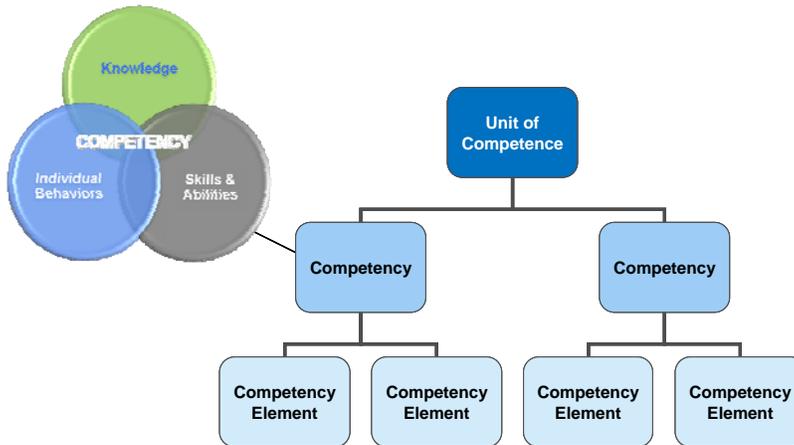
Methodology

The Office of Personnel Management (OPM) defines a competency as “an observable, measurable pattern of skills, knowledge, abilities, behaviors and other characteristics that an individual needs to perform work roles or occupational functions successfully.” CNA uses OPM's definition as the competency model foundation. The model includes units of competence, competencies, and competency elements. These terms are defined as follows:

- Unit of Competence – Area of work
- Competency – Patterns of skills, knowledge, abilities, and behaviors
- Element – Behavior resulting in superior outcome (Written using the convention Action Verb + Activity + Purpose).

To illustrate, figure 2 shows how knowledge, skills and abilities create a competency, and how competencies, units of competence, and competency elements are related.

Figure 2. Components of a Competency Model

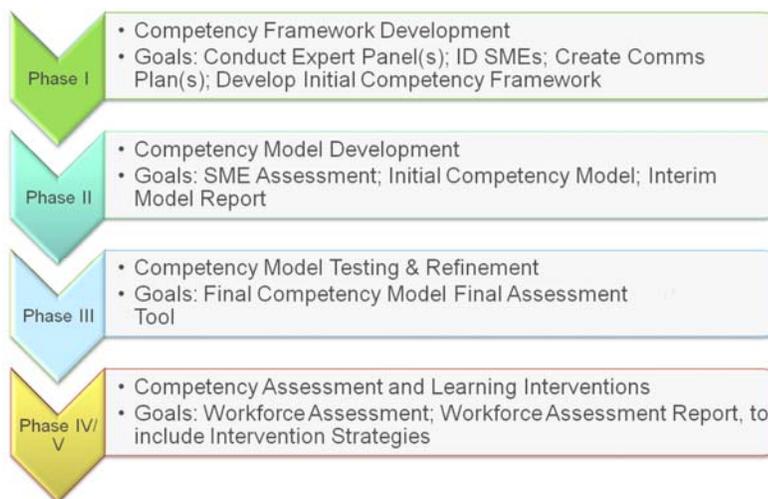


Competency models include both technical and professional components. Technical competencies are defined as competencies that pertain to a specific career field. Professional competencies were generated from OPM Executive Core Qualifications (ECQs) distributed to all Chief Human Capital Officers (OPM Memo, Springer 2006). Professional competencies are universal and can be applied to all career fields.

AT&L Competency Management Process

The information in figure 3 describes the phases and associated deliverables of the competency-based management approach. This memo covers Phases I and II. Subsequently, Phases III, IV, and V will produce a workforce assessment with recommendations to the career field for bridging any performance gaps identified through the assessment.

Figure 3. Competency-Based Management Approach



Phase I: Competency Framework Development

In May 2009 the CNA team met with PQM career field functionally integrated process team (FIPT) chair and the Defense Acquisition University (DAU) liaison to Systems and Software Engineering (SSE) to discuss PQM leadership's goals for the competency assessment effort. Also attending were representatives from the Defense Contract Management Agency (DCMA) and DAU. In addition to sharing their objectives for the competency initiative, these leaders also shared concerns they had about whether PQM was indeed a homogeneous workforce. This issue was something we believe can be answered through a deeper understanding of the competencies required for superior performance in PQM. We address the differences and commonalities in how these two groups – quality specialists and production/manufacturing specialists – rate the competencies in the Findings section.

The protocol used to develop all AT&L workforce competencies begins with CNA analysts reviewing the existing competency material. In the case of the PQM workforce, this included AT&L workforce position descriptions for PQM employees, DAU's employee self-assessment form that asks PQM employees to answer detailed questions about their level of competence in multiple areas, DAU PQM architecture, DCMA manufacturing competencies, the PQM competencies from 2005, and Executive Core Qualifications (established by OPM). The team reviewed and summarized the competencies identified through these source documents and developed a hypothesized framework for use in the first expert panel meeting.

PQM leadership identified ten expert panel members for development of the PQM competency framework. Members came from DCMA, Defense Logistics Agency (DLA), Army, Navy and DAU. At the first expert panel meeting, CNA analysts provided participants with a brief overview of the competency initiative goals, drivers, and terminology, and reviewed a high-level schedule for the PQM task. The CNA team used a highly participatory affinity exercise to guide the expert panel in development of the framework during the two days of facilitated sessions. This approach allowed CNA analysts to extract new competency information from the experts to augment the competencies identified through source material. The affinity process also provided an efficient way to elicit information and expedite consensus in a very short timeframe. Sessions took place on June 1-2, 2009 and successfully generated a complete sketch of the competency framework. The expert panel sessions generated a PQM competency framework with units of competence, competencies, and associated elements and knowledge items.

CNA delivered the framework to the expert panel members via email on June 5, 2009 for another refinement step. Expert panel members were asked to share the framework from the competency initiative with their respective managers. Through subsequent emails and telephone conferences with the expert panel, CNA worked with expert panel members to further refine the framework. CNA delivered the completed framework to PQM leadership in July 2009.

Phase II: Competency Model Development

The next major step in development of the PQM model was subject matter expert (SME) validation and enhancement of the framework. SMEs provide the qualitative and quantitative data to validate the competencies required for superior performance. Expert panel members identified over 200 SMEs. They are chosen by the expert panel members and are superior performers, with more than two years' experience and the ability to effectively communicate the competencies needed to perform his/her job. During August and September 2009, CNA

worked with expert panel members to identify, recruit and coordinate communication with the SMEs.

The CNA research team devised a multi-method approach to collecting the data. During the fall of 2009, CNA developed an on-line development site on CNA's web-based data collection tool, COMPASS®. Using this tool, PQM SMEs were guided through a structured set of interview questions to facilitate and capture SME insights to the competency framework. Launch of the SME phase of the project was delayed for roughly nine months while CNA sought privacy licensing from the government for the competency initiative. The CNA PQM team was very active in this licensing approval process as the PQM Phase II model development tool became the prototype for all Phase II competency development sites. Demographic questions were rewritten and reframed to meet licensing requirements, and the team enhanced the user interface in response to suggested changes. The PQM SME Phase II launch took place in late September 2010.

Phase II, Part 1: Demographic Questions

In the first section of the tool SMEs were asked to provide basic demographic information about themselves. Demographic information areas for the PQM SMEs were the following:

1. Job Title
2. Grade/Equivalent Rank
3. Employment Status
4. Highest Level of DAWIA Certification Level
5. Highest Level of Education Achieved
6. Years worked in Industry or DoD Program Office/Organization
7. Years of Acquisition Experience
8. Acquisition Category
9. Service/Defense Agency
10. Current Functional or Subject Matter Expertise

Phase II, Part 2: Rating Competencies

The second section of the tool asked SMEs to refer to the competency framework developed by the expert panel and to add, delete or change the framework to more accurately describe the skills, knowledge and ability they consider critical to superior performance in the PQM field. They rated the importance of each competency element to successful performance of their work, the frequency with which they perform the specific behavior, and level of their PQM career in which they first needed each of the behaviors to successfully perform their work. Table 1 shows the response options available for each of the questions. SME responses to these questions help analysts to understand and convey to leadership the relative priority of elements for the PQM career field. Responses are summarized in the Findings section of this memo.

Table 1. Possible SME response values for Competency Rating

Value	Frequency	Importance	Level First Used
1	Almost Never	Not Important	Entry Level
2	Rarely	Less Important	Mid-Level
3	Occasionally	Moderately Important	Expert/Senior Level
4	Frequently	Important	-
5	Very Frequently	Very Important	-
0	Not Applicable/ Not needed in my job	-	-

Phase II, Part 3: Key Situation Structured Interviews

CNA used key situation interview questions in the third section of the COMPASS® tool to get SMEs to share detailed information about their performance on the job. Key situation narratives describe the elements and key behaviors required for superior performance. SMEs were asked to describe an experience on the job that resulted in a particularly effective outcome. Analysts use the Situation/Task Action Reasoning Results (STARR) method to guide SMEs through this process. It is an efficient and effective way for the SMEs to reflect on a situation, organize their thoughts, and write descriptively guided by the following questions:

- **Situation/Task** –What was the situation context? What were you doing?
- **Action** – What did you do? What steps did you take to get to an effective outcome?
- **Reasoning** – What was the reasoning/rationale that led to the action?
- **Results** – What was the result/outcome of the key situation?

Each SME wrote on average two situations and then chose the three technical competencies and three professional competencies they associated with their superior performance. These stories are a rich source of information about the nature of PQM activity and clearly identify the types of behavior associated with superior performance in this workforce. We have drawn from these written stories the five technical and two professional competencies chosen most often by T&E SMEs as associated with superior performance.

Findings

Over 200 PQM SMEs were invited to provide feedback on the PQM competency framework. Seventy-four people registered, 66 completed the demographic section, and 59 completed the section asking for feedback on the framework. Forty-five SMEs also provided 96 STARR key situation narratives.

The PQM competency model validated by the SMEs is composed of eight units of competence with 27 technical competencies and 10 professional competencies and 75 elements. The PQM competency model, including units of competence, competencies, and elements is provided in Appendix A.

PQM SMEs Demographics

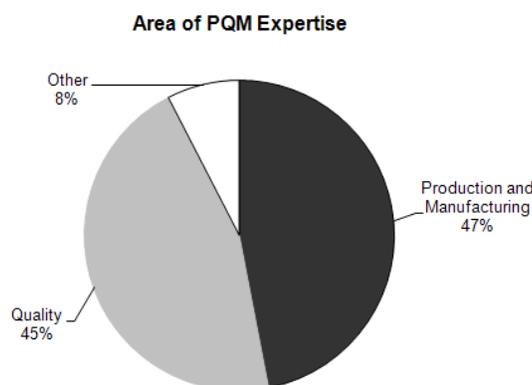
The PQM career field was composed of 9,491 employees at the time of the competency model development. PQM SMEs represented Army, Navy, Air Force, and 4th Estate. The majority of SMEs resided in the 4th Estate. Figure 4 provides important demographic information provided by respondents. It shows that SMEs were equally divided between Production and Manufacturing employees (47%) and Quality employees (45%).

Figure 4. PQM SME Demographics

Years of Acquisition Experience	#	%
Less Than 5 years	2	3%
5 to 10 years	8	12%
11 to 15 years	5	8%
16 to 20 years	5	8%
21 to 25 years	16	24%
26 or more years	30	45%
Total	66	100%

Service/Defense Agency	#	%
Air Force	1	2%
Army	10	15%
Navy	6	9%
Not Applicable	1	2%
Other Defense Agency	48	73%
Total	66	100%

PQM Certification Level	#	%
Level I	1	2%
Level II	14	21%
Level III	51	77%
Total	66	100%



Development and Revisions of the PQM Competency Rating

The CNA project team reviewed SME suggestions for modifying the framework to more accurately describe the competencies needed for superior performance by PQM employees. SME responses indicated that eight elements be removed from the framework because they were either not needed in their job or they were used infrequently.

Technical Competencies

The PQM Competency Model has seven technical units of competence with 27 competencies. PQM technical competencies were retained if either the SME frequency or the SME importance rating for a particular competency was above 2.5. By including competencies above 2.5, analysts use an approach that is more inclusive and which will be further validated through the larger workforce assessment and qualitative discussions with PQM workforce leadership. This method excludes competencies that were rated with a frequency of “almost never” and “rarely” and an importance of “not important” or “less important.”

CNA analysts also compared the responses from quality specialists to responses provided by production and manufacturing specialists. Findings from this comparison address the question of workforce homogeneity raised by PQM leadership in Phase 1. This comparison indicates that quality specialists do perform audit related competencies more frequently than their production and manufacturing counterparts. However, there is a high level of agreement among PQM employees on the importance of these functions of the workforce. The ratings from both groups are presented in Appendix B.

Professional Competencies

The PQM model also has one professional unit of competence that contains 10 competencies. PQM professional competencies are derived from the Executive Core Qualifications (ECQs) determined as most relevant by the Expert Panel. ECQ competencies are required for employees to achieve and sustain senior positions within the government. They reflect the skills, knowledge and abilities needed by leaders to build a federal corporate culture that drives for results, serves customers, and builds successful teams and coalitions within and outside the organization.

All 10 professional competencies identified by the Expert Panel were retained because SMEs related them to situations in which they were able to perform their jobs in a particularly effective way and resulted in effective outcomes as identified by the STARR method¹. This method of inclusion of professional competencies was developed because professional competencies represent behaviors that require context (i.e., STARR stories) in order to understand their relationship to the job function. For those that were included in the stories, we also examined whether they met the same criteria applied to technical competencies (i.e., whether the SME frequency or importance rating was above 2.5). Table 2 lists the PQM professional competencies identified by SMEs as critical for successful performance in this career field and their linkage with the ECQs.

Table 2. Linkage Between ECQs and PQM Professional Competencies

ECQ Qualifications and Competencies	Key PQM Professional Competencies
Fundamental Competencies	<ul style="list-style-type: none"> • Interpersonal Skills • Oral Communication • Written Communication
Leading People	<ul style="list-style-type: none"> • Conflict Management • Team Building
Leading Change	<ul style="list-style-type: none"> • Flexibility
Results Driven	<ul style="list-style-type: none"> • Accountability • Customer Service • Decisiveness • Technical Credibility

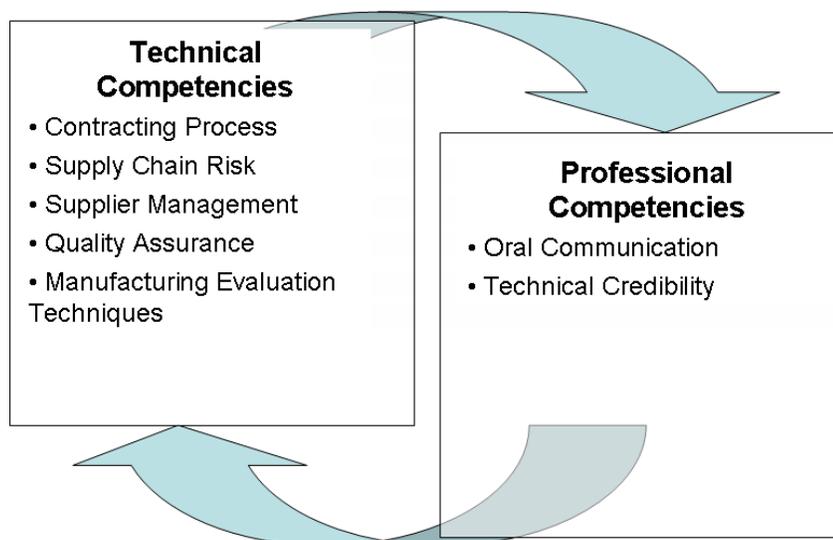
¹ Professional competencies were retained in the model if they were chosen three or more times by SMEs in the STARR stories. This type of qualitative triangulation, or cross-verification, from more than two sources increases the credibility and validity of the results.

An overview of the PQM competency model is shown in Figure 1. Appendix C displays the frequency and importance ratings SMEs gave to the competencies. The table in Appendix C also shows how many times SMEs associated each competency with their narratives of superior performance.

PQM Competencies Found to Differentiate Superior Performance

When asked to provide examples of superior performance in the STARR stories, PQM SMEs described scenarios in which specific professional and technical competencies were critical to a successful outcome. We included competencies as differentiators of superior performance if they were chosen by the SMEs most frequently² as related to stories of superior performance. The five technical competencies and two professional competencies identified most often by PQM SMEs in the key situation structured interviews are shown in figure 5. These competencies are very consistent with the competencies that have been suggested independently by the PQM expert panel. The relationship between these technical competencies specific to PQM activities and these more universal and contextual professional competencies provides an important perspective on what PQM SMEs consider essential to successful outcomes and superior performance.

Figure 5. Competencies Found to Differentiate Superior Performance: Relationship Between Technical and Professional Competencies for the PQM Career Field



²Top 20% of the competencies based on the number of times a competency was associated with the STARR scenarios.

Next Steps

The PQM competency model presented here will be the basis of the PQM workforce assessment. The results in this memo serve as the completion of Phase II and the launching point for the competency assessment and the remaining phases of the PQM competency task.

CNA will complete Phases III - V by validation of the PQM competency model through an assessment of the entire PQM workforce. We will also provide recommendations for learning and organizational development interventions related to the performance gaps identified through our analysis of the workforce assessment results.

Phase III Model Testing & Refinement

After this report is complete, the competency model is tested and refined and next steps for assessing the workforce are implemented including:

- Collecting and synthesizing feedback from leadership about the competency model report
- Identifying a stratified sample of the workforce to assess
- Developing and deploying assessment communications to the workforce.

The goal is to further refine the model by collecting input from the career field leaders on how the model will be used for application. This data will help target the analysis of the workforce assessment.

Phases IV and V, Assessment and Learning Interventions

During Phases IV and V, a representative sample or census of the workforce is identified and assessed using the competency model through an online assessment. Results are analyzed and evaluated to understand the criticality of the competencies and the proficiency of the workforce in relation to the competencies. In addition, CNA assesses and determines Organizational Development (OD) problem areas. CNA proposes a process for PQM senior leaders to address gaps through developing necessary learning interventions like training, executive coaching, mentoring, job rotation, and other developmental activities intended to close competency gaps identified in the assessment.

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Appendix A: PQM Career Field Competency Model

Unit of Competence	Competency	Element
Contracting Support	Acquisitions Process	Element 1. Select, develop and/or tailor manufacturing and production technical requirements appropriate for each acquisition phase.
		Element 2. Provide in-depth understanding of DoD Acquisitions Framework (5000.02) and key milestones as they relate to production, quality and manufacturing (PQM) functions.
		Element 3. Demonstrate familiarity with how systems evolve from mission needs through development and production to deployment and disposal.
	Contracting Process	Element 4. Determine contractor requirements and deliverables related to carrying out PQM functions and responsibilities.
		Element 5. Identify quality assurance requirements required by the Federal Acquisition Regulation (FAR) and the Defense Federal Acquisition Regulation Supplement (DFARS) and plan for appropriate responses to potential contractual actions or problems.
		Element 6. Analyze and resolve issues regarding prime/subcontractor relationships, contract changes, amendments, modification, and contract change notices in order to set up a reasonable delivery schedule and ensure schedules are met.
	Technical Cost Estimating and Analysis	Element 7. Guide negotiations of contracts, contract modifications, and or overhead rates through preparation of Technical Support to Negotiations (TNS) and provide contracting officers with an assessment of the adequacy, reasonableness, and necessity of proposed contractor labor and material charges.
		Element 8. Anticipate possible production program cost drivers under various circumstances and identify significant production cost risks for contractor proposals, manufacturing plans, production schedules, etc. and ensures proper mitigation strategies are developed.
		Element 9. Compare planned work and costs against actual work completed and actual costs completed to provide program managers, contracting officers, and others with an objective estimate of program progress and cost to complete.
	Pre-Award Support Activities	Element 10. Prepare and evaluate QA, manufacturing delivery requirements in solicitation, RFPs, RFQs, and SOWs in order to validate manufacturing process and product delivery and identify gaps between contract proposal and requirements.
		Element 11. Evaluate and assess prospective contractor technical capabilities, industrial capacity, manufacturing strong points, and manufacturing risks to establish QA requirements that should be included in a RFP.
		Element 12. Demonstrate awareness of the existence, purpose, and relationship between the acquisition strategy, acquisition plan, and RFP to provide input into or validate the consistency of production and manufacturing requirements throughout a system's acquisition cycle.
	Source Selection	Element 13. Participate on source selection teams as assigned to develop source selection evaluation criteria related to manufacturing/production, quality management, manufacturing risk reduction and contractor past performance for use in assessing contractor proposals.
	Post-Award Support Activities	Element 14. Support progress payment and award fee determination as well as government liability through assessment of contractor delivery progress and production performance.
Element 15. Demonstrate awareness of the purpose, process, importance of, and roles/responsibilities associated with the post-award conference.		
Post-Production Support	Inventory Control and Distribution Support	Element 16. Review inventory control and distribution depot operations to ensure product is acquired, stored, and distributed to meet customer needs.
		Element 17. Ensure that military capabilities and/or sensitive technology and equipment no longer needed by DoD are removed or made non-usable before items are sent to disposal by either DoD activity or a contractor.
		Element 18. Facilitate delivery of priority spares and repair parts to minimize degrading operational availability of systems and equipment.
		Element 19. Respond to need for additional sources of supply and/or increases in required production capacity to satisfy spare and repair parts requirements.

	Production Line Restart/Shutdown	Element 20. Review shut-down plans to ensure all key production elements (i.e. tech data, equipment, automated test equipment, tooling, etc.) are captured and retained.	
		Element 21. Adequately plan for production line verification, first article test, process proofing, data management, and critical item control to ensure efficient restart of production line.	
	Failure/Defect Investigation	Element 22. Identify, analyze and report product or system failures to address quality deficiencies reported by users after delivery of products by the contractor; investigate and resolve PQDRs to SCRs.	
		Tech Data	Element 23. Validate tech data used by procurement is complete, accurate, and reflects current requirements when determining best course of action to maintain equipment and/or acquire spare/repair parts.
			Element 24. Validate obsolescence management program to identify components or technologies likely to become obsolete, unavailable, or expensive during the life of a program and identify alternatives to satisfy program requirements to prevent an impact on production.
	Element 25. Validate the value engineering program to ensure effectiveness, reduce costs and to ensure the utilization of new and appropriate technologies.		
Supply Chain Management	Supply Chain Risk	Element 26. Identify products with single, sole, or foreign sources to highlight potential risks to DoD supply.	
		Element 27. Mitigate threats to contractor's ability to meet schedule and contractual requirements through analysis of potential issues and recommendations to minimize risks to program.	
		Element 28. Understand impact of risk areas, formulate appropriate risk strategies, and provide Program Manager with actionable recommendations.	
	Supplier Management	Element 29. Track vendor delivery times to ensure supply availability.	
		Element 30. Demonstrate familiarity with DoD contractor performance appraisal systems and databases, including CPARS, PPIRS, PDREP, and CPIMS available to program for use in reporting and evaluating supplier on-time delivery and quality.	
		Element 31. Assess supplier performance and determine supplier capability to ensure prime control of subcontractors and vendors.	
Audits and Reviews	Audit/Review Planning	Element 32. Ensure contractor has adequate supplier base to support the life-cycle of programs and contracts.	
		Element 33. Develop schedule for audits and reviews for both internal audit team and contractor to allow sufficient time to prepare, gain customer buy-in and achieve the intended purpose.	
		Element 34. Communicate with contractor concerning all phases and schedules allowing sufficient time to prepare and gain customer buy-in and achieve the intended purpose.	
	Audit/Review Execution	Element 35. Develop audit criteria, applicable performance standards, and associated checklists to facilitate team's evaluation of performance and required supporting material and or data for a final report.	
		Element 36. Identify audit team members with appropriate expertise in the product/process to be audited in order to obtain proper level of coverage.	
	Audit/Review Documentation	Element 37. Conduct quality audits and reviews.	
Element 38. Document findings from audits/reviews to clearly identify audit scope, criteria, and findings.			
Product and Process Evaluation	Quality Control	Element 39. Draw conclusions from audit/review findings to determine whether the audited organization satisfactorily meets defined criteria and identify areas needing improvement, as well as areas of excellent performance.	
		Element 40. Write audit report to ensure a clear, well documented description of what was reviewed and disclosed is produced and that the significance of the findings, conclusions and/or follow-on requirements are documented so the audit team and audited organization clearly understand action needed.	
		Element 41. Apply statistical analysis and sampling techniques to determine compliance with applicable requirements.	
	Quality Assurance	Element 42. Implement full range of test and inspection techniques, including functional and nondestructive tests/inspections, at process steps throughout the product/process.	
		Element 43. Detect conditions that may compromise quality, such as measurement error.	
		Element 44. Plan, coordinate and interpret failure analysis and reliability tests to ensure products perform reliably.	
Element 45. Conduct oversight activities in accordance with regulatory requirements to ensure compliance.			

		Element 46. Review material handling and shipping processes to ensure product is properly packed and shipped in a timely fashion to end users.
		Element 47. Ensure conformance with prescribed standards for process capability and control requirements.
	Validation and Verification Techniques	Element 48. Conduct predictive analysis of results from equipment tests, inspections, and operational usage to statistically forecast the likelihood and criticality of failures, maintenance requirements, and if need exists for manufacturing or design changes.
		Element 49. Conduct modeling and simulation (MandS) in the place of actual performance data when time and expense of buying and testing the item itself is not possible.
Manufacturing and Production Processes, Systems, Planning and Control	Material Management	Element 50. Interpret material specifications to determine suitability for use of possible production facilities.
		Element 51. Identify and evaluate critical suppliers and schedules to ensure sub-contracted requirements and support production schedules.
	Facilities Survey	Element 52. Determine suitability of existing or planned facilities to meet current and future capacity from specifications.
		Element 53. Identify and evaluate potential safety, health, and environmental issues to be addressed to ensure compliance.
	Technology Awareness and Continuous Process Improvement	Element 54. Apply lean manufacturing principles to reduce waste in new and existing processes on and above the shop floor to improve production efficiency and effectiveness.
		Element 55. Read, interpret and understand implications of technical data to assess potential implementation of new technologies in design platforms.
		Element 56. Understand potential application of new and emerging technologies to manufacturing and production.
	Manpower Planning	Element 57. Assess and validate workforce size, workforce skill levels, training requirements, and maintain timely and efficiently responses to hiring needs to ensure successful production and quality management.
	Configuration Management	Element 58. Assess actions taken to implement configuration management programs and recognize appropriate government actions in each program phase.
	Manufacturing Evaluation Techniques	Element 59. Review manufacturing in-process reviews, non-conformance material assessment, compliance reviews, and establish plan, ID, and team members to conduct PRRs and MRAs.
Element 60. Conduct process capability studies to determine whether processes are able to meet design requirements.		
Risk Identification and Mitigation	Risk Analysis	Element 61. Construct a detailed integrated master schedule based on program goals/objectives, identified risk, and the integrated master plan.
		Element 62. Perform risk assessment and apply decision analysis in the selection of risk handling options.
		Element 63. Correctly apply the mechanics of problem solving tools and perform required calculations for various risk scenarios.
	Contingency Planning and Solutions Planning	Element 64. Identify potential risks and determine how to mitigate, post-pone, delay, or eliminate risks.
Predictive Analysis	Element 65. Use risk management software to track, rate, and handle risk events, as well as identify critical path in order to determine probabilities of program completion dates and costs.	
Professional	Accountability	Element 66. Hold self and others accountable for measurable high-quality, timely, and cost-effective results, comply with established control systems and rule and accept responsibility for mistakes.
	Conflict Management	Element 67. Anticipate and take steps to prevent counter-productive confrontations and resolve conflicts and or disagreements in a constructive manner.
	Customer Service	Element 68. Anticipate and meet the needs of both internal and external customers. Deliver high-quality products and services; committed to continuous improvement.
	Decisiveness	Element 69. Make well-informed, effective, and timely decisions, even when data are limited or solutions produce unpleasant consequences; perceive the impact and implications of decisions.
	Flexibility	Element 70. Consistently open to change and new information; rapidly adapt to changing conditions and unexpected obstacles.

	Interpersonal Skills	Element 71. Treat others with courtesy, sensitivity, and respect and respond appropriately to the needs and feelings of different people in different situations.
	Oral Communication	Element 72. Make clear and convincing oral presentations, listen effectively and clarify information as needed.
	Team Building	Element 73. Inspire and foster team commitment and trust and facilitate cooperation and motivate team members to accomplish group goals.
	Technical Credibility	Element 74 Understand and appropriately apply principles, procedures, requirements, regulations, and policies related to specialized expertise.
	Written Communication	Element 75. Write in a clear, concise, organized, and convincing manner for the intended audience.

Appendix B: Comparison of Quality SME responses to Production/Manufacturing SME responses

Unit of Competence	Competency	Element	N/A	Frequency Used	Importance
Contracting Support	Acquisitions Process	Element 1. Select, develop and/or tailor manufacturing and production technical requirements appropriate for each acquisition phase.	23	1.9	3.7
		Element 2. Provide in-depth understanding of DoD Acquisitions Framework (5000.02) and key milestones as they relate to production, quality and manufacturing (PQM) functions.	9	2.7	3.5
		Element 3. Demonstrate familiarity with how systems evolve from mission needs through development and production to deployment and disposal.	12	2.4	3.4
	Contracting Process	Element 4. Determine contractor requirements and deliverables related to carrying out PQM functions and responsibilities.	6	3.6	4.4
		Element 5. Identify quality assurance requirements required by the Federal Acquisition Regulation (FAR) and the Defense Federal Acquisition Regulation Supplement (DFARS) and plan for appropriate responses to potential contractual actions or problems.	10	3.2	4.2
		Element 6. Analyze and resolve issues regarding prime/subcontractor relationships, contract changes, amendments, modification, and contract change notices in order to set up a reasonable delivery schedule and ensure schedules are met.	8	3.4	4.2
	Technical Cost Estimating and Analysis	Element 7. Guide negotiations of contracts, contract modifications, and or overhead rates through preparation of Technical Support to Negotiations (TNS) and provide contracting officers with an assessment of the adequacy, reasonableness, and necessity of proposed contractor labor and material charges.	19	2.0	3.9
		Element 8. Anticipate possible production program cost drivers under various circumstances and identify significant production cost risks for contractor proposals, manufacturing plans, production schedules, etc. and ensure proper mitigation strategies are developed.	12	2.4	3.6
		Element 9. Compare planned work and costs against actual work completed and actual costs completed to provide program managers, contracting officers, and others with an objective estimate of program progress and cost to complete.	19	2.0	3.6
	Pre-Award Support Activities	Element 10. Prepare and evaluate QA, manufacturing delivery requirements in solicitation, RFPs, RFQs, and SOWs in order to validate manufacturing process and product delivery and identify gaps between contract proposal and requirements.	9	2.9	4.1
		Element 11. Evaluate and assess prospective contractor technical capabilities, industrial capacity, manufacturing strong points, and manufacturing risks to establish QA requirements that should be included in a RFP.	13	2.6	4.1

		Element 12. Demonstrate awareness of the existence, purpose, and relationship between the acquisition strategy, acquisition plan, and RFP to provide input into or validate the consistency of production and manufacturing requirements throughout a system's acquisition cycle.	13	2.4	3.5
	Source Selection	Element 13. Participate on source selection teams as assigned to develop source selection evaluation criteria related to manufacturing/production, quality management, manufacturing risk reduction and contractor past performance for use in assessing contractor proposals.	17	1.9	3.9
	Post-Award Support Activities	Element 14. Support progress payment and award fee determination as well as government liability through assessment of contractor delivery progress and production performance.	15	1.9	3.4
		Element 15. Demonstrate awareness of the purpose, process, importance of, and roles/responsibilities associated with the post-award conference.	13	2.3	3.6
Post-Production Support	Inventory Control and Distribution Support	Element 16. Review inventory control and distribution depot operations to ensure product is acquired, stored, and distributed to meet customer needs.	35	1.2	3.1
		Element 17. Ensure that military capabilities and/or sensitive technology and equipment no longer needed by DoD are removed or made non-usable before items are sent to disposal by either DoD activity or a contractor.	30	1.1	2.8
		Element 18. Facilitate delivery of priority spares and repair parts to minimize degrading operational availability of systems and equipment.	22	1.9	3.6
		Element 19. Respond to need for additional sources of supply and/or increases in required production capacity to satisfy spare and repair parts requirements.	24	1.9	3.6
	Production Line Restart/Shutdown	Element 20. Review shut-down plans to ensure all key production elements (i.e. tech data, equipment, automated test equipment, tooling, etc.) are captured and retained.	24	1.2	3.0
		Element 21. Adequately plan for production line verification, first article test, process proofing, data management, and critical item control to ensure efficient restart of production line.	19	2.3	3.9
	Failure/Defect Investigation	Element 22. Identify, analyze and report product or system failures to address quality deficiencies reported by users after delivery of products by the contractor; investigate and resolve PQDRs to SCRs.	15	2.8	4.3
	Tech Data	Element 23. Validate tech data used by procurement is complete, accurate, and reflects current requirements when determining best course of action to maintain equipment and/or acquire spare/repair parts.	20	2.2	3.6
		Element 24. Validate obsolescence management program to identify components or technologies likely to become obsolete, unavailable, or expensive during the life of a program and identify alternatives to satisfy program requirements to prevent an impact on production.	24	1.7	3.7

		Element 25. Validate the value engineering program to ensure effectiveness, reduce costs and to ensure the utilization of new and appropriate technologies.	33	1.2	2.8
Supply Chain Management	Supply Chain Risk	Element 26. Identify products with single, sole, or foreign sources to highlight potential risks to DoD supply.	13	2.6	3.9
		Element 27. Mitigate threats to contractor's ability to meet schedule and contractual requirements through analysis of potential issues and recommendations to minimize risks to program.	9	3.3	4.1
		Element 28. Understand impact of risk areas, formulate appropriate risk strategies, and provide Program Manager with actionable recommendations.	11	3.1	4.1
		Element 29. Track vendor delivery times to ensure supply availability.	11	3.1	3.9
	Supplier Management	Element 30. Demonstrate familiarity with DoD contractor performance appraisal systems and databases, including CPARS, PPIRS, PDREP, and CPIMS available to program for use in reporting and evaluating supplier on-time delivery and quality.	17	2.5	3.6
		Element 31. Assess supplier performance and determine supplier capability to ensure prime control of subcontractors and vendors.	4	3.7	4.4
		Element 32. Ensure contractor has adequate supplier base to support the life-cycle of programs and contracts.	14	2.5	3.7
		Element 33. Develop schedule for audits and reviews for both internal audit team and contractor to allow sufficient time to prepare, gain customer buy-in and achieve the intended purpose.	17	2.8	3.9
		Element 34. Communicate with contractor concerning all phases and schedules allowing sufficient time to prepare and gain customer buy-in and achieve the intended purpose.	10	3.0	3.8
	Audits and Reviews	Audit/Review Planning	Element 35. Develop audit criteria, applicable performance standards, and associated checklists to facilitate team's evaluation of performance and required supporting material and or data for a final report.	8	3.2
Element 36. Identify audit team members with appropriate expertise in the product/process to be audited in order to obtain proper level of coverage.			13	2.7	3.8
Element 37. Conduct quality audits and reviews.			12	3.0	4.4
Audit/Review Execution		Element 38. Document findings from audits/reviews to clearly identify audit scope, criteria, and findings.	8	3.4	4.3
		Element 39. Draw conclusions from audit/review findings to determine whether the audited organization satisfactorily meets defined criteria and identify areas needing improvement, as well as areas of excellent performance.	7	3.3	4.4
Audit/Review Documentation		Element 40. Write audit report to ensure a clear, well documented description of what was reviewed and disclosed is produced and that the significance of the findings, conclusions and/or follow-on requirements are documented so the audit team and audited organization clearly understand action needed.	8	3.2	4.3

Product and Process Evaluation	Quality Control	Element 41. Apply statistical analysis and sampling techniques to determine compliance with applicable requirements.	13	2.7	3.8
		Element 42. Implement full range of test and inspection techniques, including functional and nondestructive tests/inspections, at process steps throughout the product/process.	24	2.3	4.1
		Element 43. Detect conditions that may compromise quality, such as measurement error.	20	2.7	4.2
	Quality Assurance	Element 44. Plan, coordinate and interpret failure analysis and reliability tests to ensure products perform reliably.	26	2.0	3.8
		Element 45. Conduct oversight activities in accordance with regulatory requirements to ensure compliance.	16	3.0	4.3
		Element 46. Review material handling and shipping processes to ensure product is properly packed and shipped in a timely fashion to end users.	16	2.5	3.6
		Element 47. Ensure conformance with prescribed standards for process capability and control requirements.	16	2.8	4.1
	Validation and Verification Techniques	Element 48. Conduct predictive analysis of results from equipment tests, inspections, and operational usage to statistically forecast the likelihood and criticality of failures, maintenance requirements, and if need exists for manufacturing or design changes.	22	1.9	3.8
		Element 49. Conduct modeling and simulation (MandS) in the place of actual performance data when time and expense of buying and testing the item itself is not possible.	35	0.8	2.8
	Manufacturing and Production Processes, Systems, Planning and Control	Material Management	Element 50. Interpret material specifications to determine suitability for use of possible production facilities.	21	2.0
Element 51. Identify and evaluate critical suppliers and schedules to ensure subcontracted requirements and support production schedules.			12	2.8	4.1
Facilities Survey		Element 52. Determine suitability of existing or planned facilities to meet current and future capacity from specifications.	17	2.2	3.7
		Element 53. Identify and evaluate potential safety, health, and environmental issues to be addressed to ensure compliance.	19	2.0	3.5
Technology Awareness and Continuous Process Improvement		Element 54. Apply lean manufacturing principles to reduce waste in new and existing processes on and above the shop floor to improve production efficiency and effectiveness.	15	2.3	3.6
		Element 55. Read, interpret and understand implications of technical data to assess potential implementation of new technologies in design platforms.	16	2.3	3.7
		Element 56. Understand potential application of new and emerging technologies to manufacturing and production.	12	2.5	3.8
Manpower Planning		Element 57. Assess and validate workforce size, workforce skill levels, training requirements, and maintain timely and efficiently responses to hiring needs to ensure successful production and quality management.	18	2.3	3.7
Configuration Management		Element 58. Assess actions taken to implement configuration management programs and recognize appropriate government actions in each program phase.	18	2.5	3.8

	Manufacturing Evaluation Techniques	Element 59. Review manufacturing in-process reviews, non-conformance material assessment, compliance reviews, and establish plan, ID, and team members to conduct PRRs and MRAs.	14	2.7	4.1
		Element 60. Conduct process capability studies to determine whether processes are able to meet design requirements.	19	2.1	3.8
Risk Identification and Mitigation	Risk Analysis	Element 61. Construct a detailed integrated master schedule based on program goals/objectives, identified risk, and the integrated master plan.	29	1.3	3.6
		Element 62. Perform risk assessment and apply decision analysis in the selection of risk handling options.	5	3.2	3.9
		Element 63. Correctly apply the mechanics of problem solving tools and perform required calculations for various risk scenarios.	11	2.6	3.7
	Contingency Planning and Solutions Planning	Element 64. Identify potential risks and determine how to mitigate, post-pone, delay, or eliminate risks.	7	3.2	4.1
	Predictive Analysis	Element 65. Use risk management software to track, rate, and handle risk events, as well as identify critical path in order to determine probabilities of program completion dates and costs.	21	1.8	3.4
Professional	Accountability	Element 66. Hold self and others accountable for measurable high-quality, timely, and cost-effective results, comply with established control systems and rule and accept responsibility for mistakes.	6	3.8	4.4
	Conflict Management	Element 67. Anticipate and take steps to prevent counter-productive confrontations and resolve conflicts and or disagreements in a constructive manner.	6	3.4	4.2
	Customer Service	Element 68. Anticipate and meet the needs of both internal and external customers. Deliver high-quality products and services; committed to continuous improvement.	1	4.5	4.6
	Decisiveness	Element 69. Make well-informed, effective, and timely decisions, even when data are limited or solutions produce unpleasant consequences; perceive the impact and implications of decisions.	0	4.3	4.5
	Flexibility	Element 70. Consistently open to change and new information; rapidly adapt to changing conditions and unexpected obstacles.	0	4.4	4.3
	Interpersonal Skills	Element 71. Treat others with courtesy, sensitivity, and respect and respond appropriately to the needs and feelings of different people in different situations.	0	4.8	4.7
	Oral Communication	Element 72. Make clear and convincing oral presentations, listen effectively and clarify information as needed.	1	4.5	4.7
	Team Building	Element 73. Inspire and foster team commitment and trust and facilitate cooperation and motivate team members to accomplish group goals.	2	4.3	4.7
	Technical Credibility	Element 74. Understand and appropriately apply principles, procedures, requirements, regulations, and policies related to specialized expertise.	2	4.1	4.5
	Written Communication	Element 75. Write in a clear, concise, organized, and convincing manner for the intended audience.	1	4.5	4.6

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Appendix C: PQM SME Competency Ratings and STARR Scenario Counts

Type	Unit of Competence	Competency	Frequency Used	Importance	No. times Chosen by SMEs in STARR
Technical	Contracting Support	Acquisitions Process	2.4	3.5	18
		Contracting Process	3.4	4.3	24
		Technical Cost Estimating and Analysis	2.1	3.7	9
		Pre-Award Support Activities	2.6	3.9	15
		Source Selection	1.9	3.9	5
		Post-Award Support Activities	2.1	3.5	9
	Post-Production Support	Inventory Control and Distribution Support	1.5	3.3	5
		Production Line Restart/Shutdown	1.7	3.4	4
		Failure/Defect Investigation	2.8	4.3	12
		Tech Data	1.7	3.4	7
	Supply Chain Management	Supply Chain Risk	3.0	4.0	19
		Supplier Management	2.9	3.9	26
	Audits and Reviews	Audit/Review Planning	3.0	3.9	10
		Audit/Review Execution	3.2	4.3	7
		Audit/Review Documentation	3.3	4.4	9
	Product and Process Evaluation	Quality Control	2.6	4.0	6
		Quality Assurance	2.6	3.9	22
		Validation and Verification Techniques	1.3	3.3	11
	Manufacturing and Production Processes, Systems, Planning and Control	Material Management	2.4	3.9	2
		Facilities Survey	2.1	3.6	6
		Technology Awareness and Continuous Process Improvement	2.3	3.7	8
		Manpower Planning	2.3	3.7	5
		Configuration Management	2.5	3.8	4
		Manufacturing Evaluation Techniques	2.4	3.9	20
		Risk Identification and Mitigation	Risk Analysis	2.4	3.7
	Risk Identification and Mitigation	Contingency Planning and Solutions Planning	3.2	4.1	4
		Predictive Analysis (REMOVED)	1.8	3.4	7
Average:		2.4	3.8		
Professional	Professional	Accountability	3.8	4.4	20
		Conflict Management	3.4	4.2	14
		Customer Service	4.5	4.6	37
		Decisiveness	4.3	4.5	24
		Flexibility	4.4	4.3	15
		Interpersonal Skills	4.8	4.7	29
		Oral Communication	4.5	4.7	38
		Team Building	4.3	4.7	33
		Technical Credibility	4.1	4.5	57
		Written Communication	4.5	4.6	21
Average:	4.3	4.5			
<p>Technical competencies were included in the model if they were above the 2.5 threshold in average frequency or average performance.</p> <p>Professional competencies were included in the model if they were above the 2.5 threshold and if they were chosen three or more times by SMEs in the STARR stories. This type of qualitative triangulation or cross-verification from more than two sources increases the credibility and validity of the results.</p> <p>Competencies that differentiate superior performance (top 20% of technical and top 20% of professional competencies) are highlighted in pink.</p>					