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LESSONS LEARNED FROM THE DEVELOPMENT AND IMPLEMENTATION OF A KNOWLEDGE MANAGEMENT PROGRAM FOR THE NAVAL SEA SYSTEMS COMMAND

by

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March 2017

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13. ABSTRACT (maximum 200 words)

This study applied knowledge management (KM) theories and principles to develop and implement a KM program for the Naval Sea Systems Command (NAVSEA) that strengthens the workforce's understanding of the technical business processes led by the NAVSEA Chief Engineer. This was accomplished by enabling the transfer of explicit and tacit knowledge that is resident within the NAVSEA enterprise through knowledge flow processes. Research methods employed include a literature review of theoretical knowledge concepts; observation of end-user reactions to developed products and methods of delivery; and continuous evaluation and adjustment in response to demand signals from the workforce.

The KM program was designed to accelerate knowledge transfer between personnel of all experience levels, while also encouraging collaboration and facilitating social learning for NAVSEA's Engineering Competency and its stakeholders. Lessons learned throughout this study were applied to shaping the KM program into a diverse set of communication tools that have improved the knowledge base and employee engagement with respect to engineering and technical authority concepts across the NAVSEA enterprise. Although the focal organization supports a military mission, the fundamental elements of this KM program can be replicated and tailored to suit the needs of any organization.

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LESSONS LEARNED FROM THE DEVELOPMENT AND IMPLEMENTATION OF A KNOWLEDGE MANAGEMENT PROGRAM FOR THE NAVAL SEA SYSTEMS COMMAND

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ABSTRACT

This study applied knowledge management (KM) theories and principles to develop and implement a KM program for the Naval Sea Systems Command (NAVSEA) that strengthens the workforce's understanding of the technical business processes led by the NAVSEA Chief Engineer. This was accomplished by enabling the transfer of explicit and tacit knowledge that is resident within the NAVSEA enterprise through knowledge flow processes. Research methods employed include a literature review of theoretical knowledge concepts; observation of end-user reactions to developed products and methods of delivery; and continuous evaluation and adjustment in response to demand signals from the workforce.

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LIST OF ACRONYMS AND ABBREVIATIONS

CD	compact disc
CEFP	Commander's Executive Fellows Program
CHENG	Chief Engineer
CNO	Chief of Naval Operations
COMNAVSEA	Commander, Naval Sea Systems Command
DOD	Department of Defense
DON	Department of the Navy
DWO	Deputy Warranting Officer
E&TA	Engineering and Technical Authority
ETE	Engineering and Test & Evaluation
FY	Fiscal Year
KM	knowledge management
NAPO	Naval Acquisition Program Overview
NAVSEA	Naval Sea Systems Command
PFS	Principal for Safety
SES	Senior Executive Service
SME	subject matter expert
SYSCOM	Systems Command
TWH	Technical Warrant Holder

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EXECUTIVE SUMMARY

The Naval Sea Systems Command (NAVSEA) is undergoing a period of significant loss of knowledge assets, as members of the baby boomer generation retire. Without knowledge management (KM) plans or programs in place to facilitate organizational and historical knowledge transfer to others, NAVSEA will face severe business continuity (Peña 2013) as employees depart.

This study applied KM theories and principles to develop and implement a KM program for NAVSEA that strengthens the workforce's understanding of the technical business processes led by the NAVSEA Chief Engineer. With the assistance of senior engineers, managers, and soon-to-be-departing retirees, a cross-functional team within the Naval Systems Engineering Directorate (SEA 05) initiated a KM program to preserve and accelerate the transfer of knowledge within its evolving technical workforce. This was accomplished by enabling the transfer of explicit and tacit knowledge that is resident within the NAVSEA enterprise through knowledge flow processes. The KM team developed products and services to ensure that a consistent knowledge base was established and is maintained to benefit NAVSEA's future technical leaders.

The KM program was designed to promote knowledge flows between personnel of all experience levels, while also encouraging collaboration and facilitating social learning for NAVSEA's Engineering Competency and its stakeholders. Lessons learned throughout this study were applied to shaping the KM program into a diverse set of communication tools to include classroom training, web-based training, a Competency-wide newsletter, and an intranet knowledge repository. The success factors described by Davenport, De Long, and Beers (1998, 50–54) and listed in Table 1 were used to qualitatively measure this KM program's impact and guide enhancements over time. The KM team's observations and review of workforce feedback also contributed to countless modifications to the KM products. While some changes refined the content of training modules and newsletter articles, other changes affected the manner in

which key concepts were presented to the workforce to improve knowledge transfer and accessibility of supporting artifacts.

Table 1. Success Factors for KM Projects. Adapted from Davenport, De Long, and Beers (1998).

Number	Success Factor
1	Link to economic performance or industry value
2	Technical or organizational infrastructure
3	Standard, flexible knowledge structure
4	Knowledge-friendly culture
5	Clear purpose and language
6	Change in motivational practices
7	Multiple channels for knowledge transfer
8	Senior management support

Overall, the KM program successfully achieved the broad objectives to: "(1) create knowledge repositories; (2) improve knowledge access; (3) enhance the knowledge environment; and (4) manage knowledge as an asset" (Davenport, De Long, and Beers, 1998, 44–45). The methodology and lessons learned from this study can serve as a model for other organizations developing a KM program to improve knowledge flows among their employees and key stakeholders. Further study of quantitative measures of KM program success, social networks, and collaborative advantage will build on this body of knowledge for improving organizational effectiveness.

References

Davenport, Thomas H., David W. De Long, and Michael C. Beers. 1998. "Successful Knowledge Management Projects." *Sloan Management Review* (Winter): 43–57.

Peña, Andrew M. 2013. "Institutional Knowledge: When Employees Leave, What Do We Lose?" HigherEdJobs. November 18. https://www.higheredjobs.com/articles/articleDisplay.cfm?ID=468.

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This thesis is dedicated to the 100+ professionals who teamed with me to bring this knowledge management vision to life for NAVSEA. I am truly grateful to have worked alongside the best and brightest to create this program for the workforce.

Of course, none of this would have been possible without the support from my friends and family. Their love and patience over the past few years enabled me to chase my dreams and achieve them on my own terms. I cannot say “thank you” enough.

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I. INTRODUCTION

A. BACKGROUND

The Naval Sea Systems Command (NAVSEA) is the largest of the Navy's five system commands with a workforce of more than 73,000 civilian, military, and contract support personnel (Naval Sea Systems Command 2017a, under "About NAVSEA"; Naval Sea Systems Command 2017c, 7). These knowledge workers "engineer, build, buy and maintain ships, submarines and combat systems that meet the Fleet's current and future operational requirements" (Naval Sea Systems Command 2017a, under "About NAVSEA").

Like many public and private organizations across the country, NAVSEA is transitioning through a period of significant loss of knowledge assets as its baby boomer generation of employees retires. "When highly skilled subject matter experts (SMEs), engineers, and managers leave their organizations, they take with them years of hard-earned, experience-based knowledge—much of it undocumented and irreplaceable" (DiGiacomo 2003, 1). Without knowledge management (KM) plans or programs in place to facilitate organizational and historical knowledge transfer to others, NAVSEA will face severe business continuity (Peña 2013) as employees depart.

NAVSEA can increase its capacity to respond to an array of challenges, including those resulting from retirements and other sources of turnover, by capitalizing on the intellectual resources within the organization to accelerate knowledge transfer (DiGiacomo 2003, 1). While it is certainly advantageous that NAVSEA's workforce is comprised of personnel with a wide range of experience and knowledge stores, these assets must be preserved to more effectively contribute to the success of NAVSEA's mission to "design, build, deliver and maintain ships and systems on time and on cost for the United States Navy" (Naval Sea Systems Command 2014, 2). In this case, the economies of scale

and scope are greatest when enabled by collaboration and knowledge sharing (Hansen and Nohria 2004, 22).

B. FOCAL ORGANIZATION

NAVSEA's Systems Engineering Directorate (SEA 05) provides "engineering and scientific expertise, knowledge, and technical authority necessary to design, build, maintain, repair, modernize, certify, and dispose of the Navy's ships, submarines, and associated warfare systems" (Naval Sea Systems Command). The SEA 05 Executive Director is the leader for NAVSEA's Engineering Competency (Naval Sea Systems Command 2017d, enclosure (2) page 1), previously known as the Engineering and Test & Evaluation (ETE) Competency. The Engineering Competency employs "approximately 20,000 engineers, scientists, mathematicians, and technicians…worldwide" (Naval Sea Systems Command 2016, 1). The work of the Engineering Competency is complex and diverse, supporting a broad spectrum of programs for the Navy.

The Engineering Policy & Standards, and Industrial Engineering Group (SEA 05S) assists SEA 05 with a considerable portion of KM activities for the NAVSEA Chief Engineer (CHENG), including development of technical policies, standards, guidance, procedures, training, and human capital strategies for the workforce (US Department of the Navy 2016, 1). SEA 05S is the lead organization responsible for developing and executing the KM program discussed herein on behalf of the NAVSEA CHENG for the Engineering Competency.

C. OBJECTIVE

The purpose of this study is to apply KM theories and principles to create a KM program for NAVSEA that increases awareness of and accessibility to Engineering and Technical Authority (E&TA) policies, best practices, procedures, and training. This effort is intended to establish a knowledge base that strengthens the workforce's understanding of the technical business processes led by the NAVSEA CHENG. This will be accomplished by enabling the transfer

of explicit and tacit knowledge that is resident within the NAVSEA enterprise through knowledge flow processes. The resulting KM program will be structured to accelerate knowledge transfer between personnel of all experience levels, while also encouraging collaboration, facilitating social learning, and establishing a knowledge culture for NAVSEA's Engineering Competency and its stakeholders.

D. BENEFITS OF STUDY

This study will produce a documented body of knowledge resulting from the development and implementation of the KM program for NAVSEA's Engineering Competency. It contributes to NAVSEA's Mission Priority of "Workforce Excellence and Judiciousness" by aligning to the associated Focus Areas of "Accelerate Knowledge Transfer" and "Modern/Learning/Knowledge Management" (Naval Sea Systems Command 2014, 2). Further, it responds to the challenge set forth by the Chief of Naval Operations (CNO) in 2016 to "achieve high velocity learning at every level" (7). Findings from this study will be most applicable to complex organizations that desire to improve knowledge flows among their employees and key stakeholders.

E. RESEARCH METHODS

Prior to beginning this research, SEA 05S personnel hosted roundtable conversations and brainstorming sessions with SMEs to learn where disconnects were occurring to cause breakdowns in collaborative behavior. Through this discovery process, some common concerns and complaints surfaced, validating the need to formalize a KM program for the Engineering Competency. Thus, the culture was ripe for change.

A variety of research methods were employed to support development of the KM program, including a literature review of theoretical concepts related to knowledge types, knowledge flow, KM, organizational learning, building collaborative advantage, and attributes of a successful KM project; observation of "customer" (i.e., workforce) reactions to developed products and methods of

delivery; and continuous evaluation and adjustment throughout the development and execution of the program in response to demand signals from the workforce. The challenge was to initiate a KM program that establishes a common knowledge base for the technical workforce at NAVSEA and institutionalizes a culture of knowledge sharing to build and sustain collaborative advantage.

F. OVERVIEW

Chapter II introduces readers to the theoretical concepts and fundamentals on which this study is based. The discussion establishes an understanding of knowledge types then builds on this foundation with a well-known model for knowledge creation and knowledge transfer. The knowledge concepts are then broadened to explore the idea of KM, its role in the workplace, and attributes identified as indicators of successful KM projects.

Chapter III applies the literature-based topics of Chapter II to the development and implementation of a KM program for NAVSEA. It outlines the design and development strategy of the KM program, highlights the roles and responsibilities of the people within the program, and discusses the execution and sustainment efforts.

Chapter IV reports the results and conclusions derived throughout the process of establishing the KM program. Observations and feedback data are presented to provide insight into the changes that occurred as the KM program matured. An assessment of the KM program's success is offered utilizing the framework identified in Chapter II. Recommendations are identified for the focal organization as well as other organizations considering establishment of their own KM programs. In closing, suggestions for future research lead the reader into related subject matter that may generate increased organizational benefits.

II. THEORETICAL CONCEPTS AND FUNDAMENTALS

A. KNOWLEDGE TYPES

There are many definitions and descriptions of knowledge available in the literature. For the purposes of this study, the author uses the definition of knowledge coined by Alavi and Leidner (2001, 109) as “information possessed in the mind of individuals” that has been internalized and personalized. This information has context “related to facts, procedures, concepts, interpretations, ideas, observations, and judgements” and it “increases an entity’s capacity for effective action” (Alavi and Leidner 2001, 109). As such, the knowledge base of an organization can be defined as the “collective knowledge that the firm uses for its productive purposes” (Saviotti 1998, 845).

Knowledge is widely known as either being explicit or tacit, although it is rarely completely explicit or tacit (Saviotti 1998, 848). Explicit knowledge, also referred to in this study as “content,” is easy to articulate, can be expressed formally such as through written text, drawings, speech (Nissen 2014, 20), standard procedures, manuals, and lessons learned databases (Brockmann and Anthony 2002, 440). Tacit knowledge differs from explicit in that it is practical knowledge learned informally (Brockmann and Anthony 2002, 436) through individual experience (Nonaka and Takeuchi 1995, viii). It “is subconsciously understood and applied, difficult to articulate…usually shared through highly interactive conversation [and] storytelling” (Silvi and Cuganesan 2006, 311). Tacit knowledge is “powerful, oftentimes the most valuable resource that an organization can possess” (Nissen 2014, 21).

Simply put, knowledge enables action. However, knowledge itself cannot lead an organization to be productive to meet its mission; knowledge is not distributed evenly and therefore must flow between people within the organization (Nissen 2014, 5–6). With this in mind, one must examine the

fundamentals of knowledge creation and understand how knowledge flows in order to establish a structure that promotes knowledge transfer.

B. KNOWLEDGE CREATION AND TRANSFER

Knowledge creation "comprises activities associated with the entry of new knowledge into the system, and includes knowledge development, discovery and capture" (Newman and Conrad 1999, under "Key Terms and Concepts"). Figure 1 represents organizational knowledge creation as "a continual interplay between the tacit and explicit dimensions of knowledge and a growing spiral flow as knowledge moves through individual, group, and organizational levels" (Alavi and Leidner 2001, 116). This model is known as the Socialization, Externalization, Combination, and Internalization (SECI) Model, so named for the four identified modes of knowledge creation.

Adapted from O'Dell and Hubert's (2011) Socialization, Externalization, Combination, and Internalization Model, based on the work of Nonanka and Takeuchi (1995).

Figure 1. Modes of Knowledge Creation—SECI Model. Source: Lerner (2013).

1. Socialization

Socialization is the process of creating new tacit knowledge from existing tacit knowledge "through social interactions and shared experience among organizational members" (Alavi and Leidner 2001, 116). Individuals can acquire tacit knowledge (i.e., learn) without language through observation, imitation, practice, or other experience gained such as on-the-job training. Tacit knowledge is exchanged most effectively when individuals spend time directly interacting with one another rather than by explicit instruction (Nonaka 1994, 19).

2. Externalization

Nonaka and Takeuchi define externalization as the "process of converting tacit knowledge into explicit knowledge" (1995, 86) by articulating it in a way that is understandable by others. Metaphors, analogies, narratives, and visuals are effective techniques for enabling externalization. Dialogues, such as those that occur during business meetings and training sessions, allow individuals to listen and contribute for the benefit of all participants. These exchanges are generally built upon personalized context that may require critical thinking on the part of the learner to translate the tacit knowledge into useful concepts (Nonaka 1994, 20).

3. Combination

Combination is the creation of new or more complex explicit knowledge by sorting, merging, categorizing, and recontextualizing existing explicit knowledge (Nonaka 1994, 19). Individuals and teams exchange explicit knowledge through social processes and convert it into shareable forms (e.g., plans, drawings, and reports) for the organization. The new knowledge artifacts may be disseminated directly to organizational members through meetings, presentations, and telephone calls (Alavi and Leidner 2001; Nonaka 1994) or indirectly via email and intranet sites.

4. Internalization

Nonaka describes internalization as an interactive process of converting explicit knowledge into tacit knowledge through action (1994, 19–20). Participation in a simulation exercise, for example, allows an individual to access knowledge from others in the organization while testing concepts about strategy and tactics to gain new tacit knowledge. The lessons learned from that experience build on the existing knowledge within the individual to benefit the organization.

C. KNOWLEDGE MANAGEMENT

KM is the integration of activities that "seeks to improve the performance of individuals and organizations by maintaining and leveraging the present and future value of knowledge assets" (Newman and Conrad 1999). A commonly cited definition for KM was offered by the Gartner Group in 1998 as "a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an enterprise's information assets. These assets may include databases, documents, policies, procedures, and previously uncaptured expertise and experience in individual workers" (Koenig 2012). Successful KM, then, can be defined as "capturing the right knowledge, getting the right knowledge to the right user, and using this knowledge to improve organizational and/or individual performance" (Jennex, Smolnik, and Croasdell 2011, 8).

D. ATTRIBUTES OF SUCCESSFUL KNOWLEDGE MANAGEMENT PROJECTS

To accomplish successful KM, organizations must first stand up KM projects to establish and institutionalize the necessary strategies, infrastructure and processes. Alignment of KM projects with business plans and strategic initiatives is an important step to ensuring that the KM project will support achievement of organizational objectives. While KM projects differ in size and scope depending on the organization and its needs, they are generally established to meet one or more of the following objectives:

- Create knowledge repositories.
- Improve knowledge access.
- Enhance the knowledge environment.
- Manage knowledge as an asset. (Davenport, De Long, and Beers 1998, 44–45)

Based on the results from the Davenport, De Long, and Beers (1998, 50–54) study of 31 KM projects at 24 diverse organizations, the impact of KM projects can be measured qualitatively using the success factors listed in Table 1.

Table 1. Success Factors for KM Projects. Adapted from Davenport, De Long, and Beers (1998).

Number	Success Factor
1	Link to economic performance or industry value
2	Technical or organizational infrastructure
3	Standard, flexible knowledge structure
4	Knowledge-friendly culture
5	Clear purpose and language
6	Change in motivational practices
7	Multiple channels for knowledge transfer
8	Senior management support

This study will utilize the objectives as a point of departure for designing a KM program for NAVSEA's Engineering Competency, and the success factors to evaluate and guide enhancements to the KM program as it matures over time.

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III. KNOWLEDGE MANAGEMENT PROJECT

A. DESIGN AND DEVELOPMENT STRATEGY

In the years following publication of the first implementing policy for NAVSEA's E&TA structure, several related policies and guidance documents were also published to codify the technical and business processes and procedures that were either being newly developed or refined to incorporate lessons learned of the time. One such document, the *Engineering and Technical Authority Manual* (ETAM), was developed as a directives manual or compendium of guidance precipitated from policies and other authoritative sources on the subject. The ETAM was published in 2011 as the first manual of its kind for NAVSEA's Engineering Competency. Because of this, the ETAM is inherently valuable as a foundational reference for the KM program.

Establishment of the KM program began in 2012 with a kickoff meeting to strategize its design and development. The way ahead was defined by asking and answering variations of the questions: Who? What? When? Where? Why? How? The following subsections describe the KM program design and development strategy utilizing research to guide decision making.

1. Define the Target Audience

The KM program was initiated to benefit the workforce that comprises NAVSEA's Engineering Competency. To more specifically define the target audience, one must examine the Engineering Competency to understand the hierarchy of roles, responsibilities and organizational relationships with respect to the E&TA construct. Figure 2 is NAVSEA's organizational structure, with the overlay of orange highlights to indicate the portions of the organization where the majority of personnel within the Engineering Competency reside.

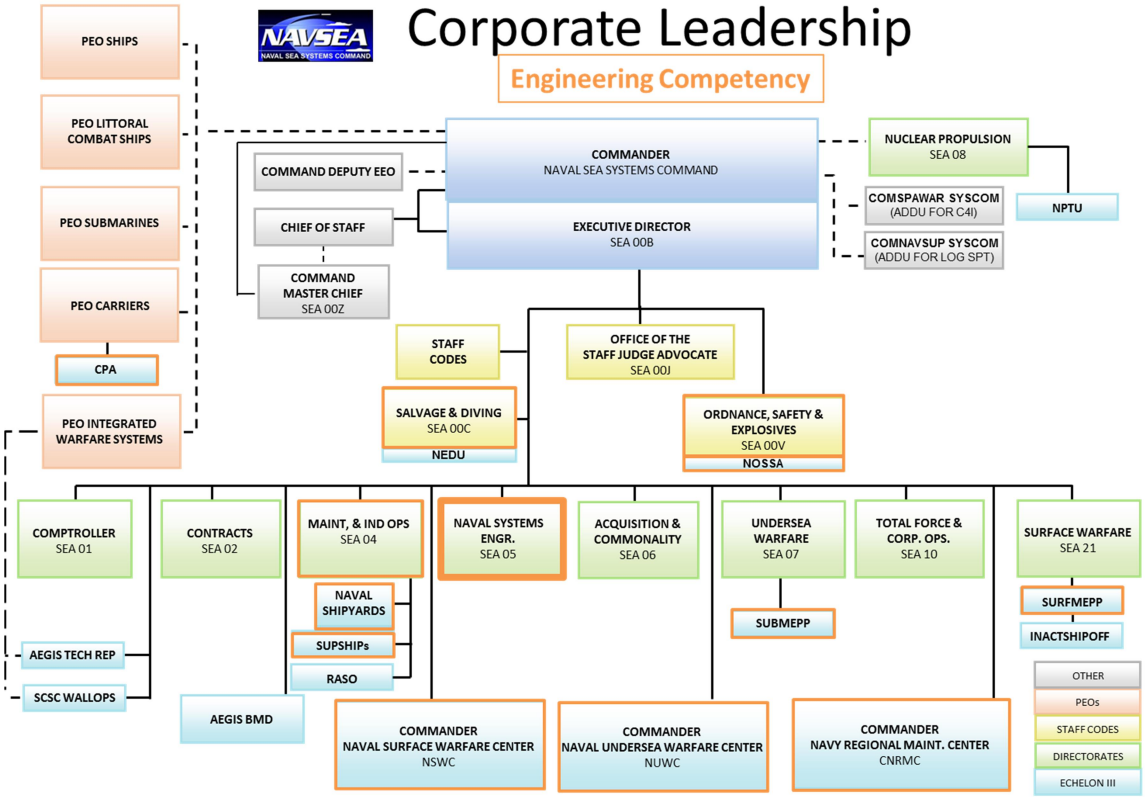

Figure 2. NAVSEA's Engineering Competency. Adapted from Naval Sea Systems Command (2017b).

Most of the employees within NAVSEA's Engineering Competency belong to one or more technical support networks. Figure 3 is a graphical representation of a technical support network, often referred to as an E&TA pyramid. NAVSEA's engineers, scientists, mathematicians and technicians are a significant portion of the technical workforce, forming the foundation layer. Lesser numbers of personnel with roles and responsibilities of respectively increasing complexity comprise each layer above, generally resulting in a pyramid shape.

Figure 3. Technical Support Network. Source: Naval Sea Systems Command (2017b).

The top four layers of the pyramid are inherently governmental positions that have technical authority. Technical authority is defined by the Secretary of the Navy as “the authority, responsibility, and accountability to establish, monitor and approve technical standards, tools, and processes in conformance with applicable Department of Defense (DOD) and Department of the Navy (DON) policy, requirements, architectures, and standards” (US Secretary of the Navy 2011, 3). Select personnel in the lower layers of the E&TA pyramid may have delegated technical authority agreements, while all have assigned tasking that contributes to the execution of technical authority responsibilities.

Personnel at each level of the pyramid have differing knowledge bases, experiences, and responsibilities, which result in different KM and workforce development needs. Since the size of the Engineering Competency is about 20,000 people strong, the differentiation of personnel within the technical support networks was an important factor in bounding the target audience to a manageable size. To put it into perspective, the technical authorities (Commander, Naval Sea Systems Command [COMNAVSEA]; NAVSEA CHENG; Deputy Warranting Officers [DWOs]; and Technical Warrant Holders [TWHs]) comprise roughly 1% of the overall structure. These are the most senior leaders of the Competency.

2. Establish Learning Objectives

Organizational knowledge has a collective character and is not limited to the knowledge within or "owned" by each individual (Saviotti 1998, 845). The collective knowledge, or knowledge base, is developed over time by contributions of the organizational members and stakeholders. Personnel draw upon and grow the knowledge base to use for the organization's productive purposes. Therefore, the desired minimum knowledge base for the target audience had to be defined as the basis for the learning objectives. A team of personnel working in SEA 05S engaged senior technical employees (i.e., technical authorities, managers, and senior engineers) to gain an understanding of the knowledge base and knowledge gaps perceived to be most critical to the personnel working within a technical support network. The purpose of these interactions was to determine the portion of the knowledge base that should be shaped into a training curriculum and more quickly transferred to the target audience.

The team coordinated separate roundtable conversations with each group in SEA 05 to initiate communications and define the scope and concepts for training. Each meeting began with an overview of the team roles and responsibilities; described the preliminary vision of the training as a set of courses tailored for proficiency level; and concluded with the team asking questions related to organizational effectiveness, and then noting comments for follow-up. This outreach approach made it possible for SEA 05S to obtain insight into knowledge gaps and challenges within the Engineering Competency that limited productivity. While the discussion topics and concerns differed among the groups, several common themes emerged with respect to the workforce's lack of understanding of

- technical authority roles and responsibilities;
- availability and/or accessibility of authoritative sources such as policies, standards and guidance;
- conflict resolution methods;
- technical risk management processes; and

- control processes such as engineering and technical authority critiques and Fleet feedback mechanisms.

Cognizance of these concepts is critical to the health of the Engineering Competency. The findings from the roundtable conversations highlighted knowledge gaps in some groups of the technical workforce that were recognized knowledge clumps in other groups. The degradation of collaborative behaviors due to the inconsistent knowledge base across the workforce is evidence that validates Nissen's knowledge flow principle #2: "knowledge is distributed unevenly and hence must flow for organizational performance. Hence, knowledge clumps need to be identified, and knowledge flows need to be enabled throughout the organization" (2014, xiii).

A review of the data collected indicated a prevalence of knowledge flow issues that could be resolved or at least improved by standing up a KM program. SEA 05S defined learning objectives for an E&TA training curriculum, then later broadened the project's scope to address all of the objectives outlined in Chapter II, Section D. The overall goals were to establish a minimum knowledge base for the technical personnel who directly support the NAVSEA CHENG, facilitate knowledge transfer, and break down barriers to collaboration to improve the performance of the Engineering Competency.

3. Identify Knowledge Clumps

Knowledge gaps are effectively ignorance areas where questions exist. The team started with the identified knowledge gaps and trend data from the roundtable conversations as the defined set of knowledge that needed to flow via this KM program. In order for it to flow, however, the team had to identify the knowledge clumps, or sources of explicit and tacit knowledge resident within pockets of the Engineering Competency that should be understood across all of the business units.

a. Explicit Knowledge

A significant trend in the feedback from the senior engineers during the roundtable conversations was the need for better knowledge of and access to the

technical policies and other documented authoritative sources of explicit knowledge to help with the execution of work. Although there is a myriad of technical policies, standards and best practices available that are fundamental to the business of the Engineering Competency, the knowledge clumps resided within SEA 05S and select other headquarters groups. It was not well known to the workforce how to access these documents or whom to consult with questions.

In response, the team structured the KM program around the authoritative sources key to NAVSEA's E&TA construct. This documentation codifies the explicit knowledge that should be understood as part of the Engineering Competency's knowledge base. Subject matter experts participated in developing reference libraries and training content to adequately and accurately explain the concepts. Through the process of combination (i.e., collecting, editing, reviewing, and connecting the knowledge), products were developed and used to speed up explicit knowledge transfer to grow the organization's knowledge base.

b. Tacit Knowledge

As Grant (1996) acknowledges, "the fundamental task of [an] organization is to coordinate the efforts of many specialists" (113). Naturally, specialists develop and retain tacit knowledge clumps; this knowledge must flow to support collaboration, improve production, and grow the organizational knowledge base. Therefore, mechanisms to encourage socialization, externalization, and internalization were built into the KM program to drive tacit knowledge flows and enhance the learning environment.

4. Define the KM Program Structure

The KM program is structured to address specific KM and workforce development needs as identified during the roundtable conversations and subsequent feedback. Training products, a web-based document library, and a

quarterly newsletter were developed to ensure a variety of knowledge transfer methods are available for the workforce.

a. E&TA Familiarization

The E&TA Familiarization training was designed to be formally taught in a classroom environment. The class is 16 hours long and includes professional classroom instruction, student engagement, SME-facilitated discussions, case study, and networking opportunities. Engineering and Technical Familiarization serves as the core curriculum, the basis from which other similar training is created. Figure 4 is a screenshot of the web-based version of this course, developed to increase capacity by being available to field employees and other stakeholders at any time.

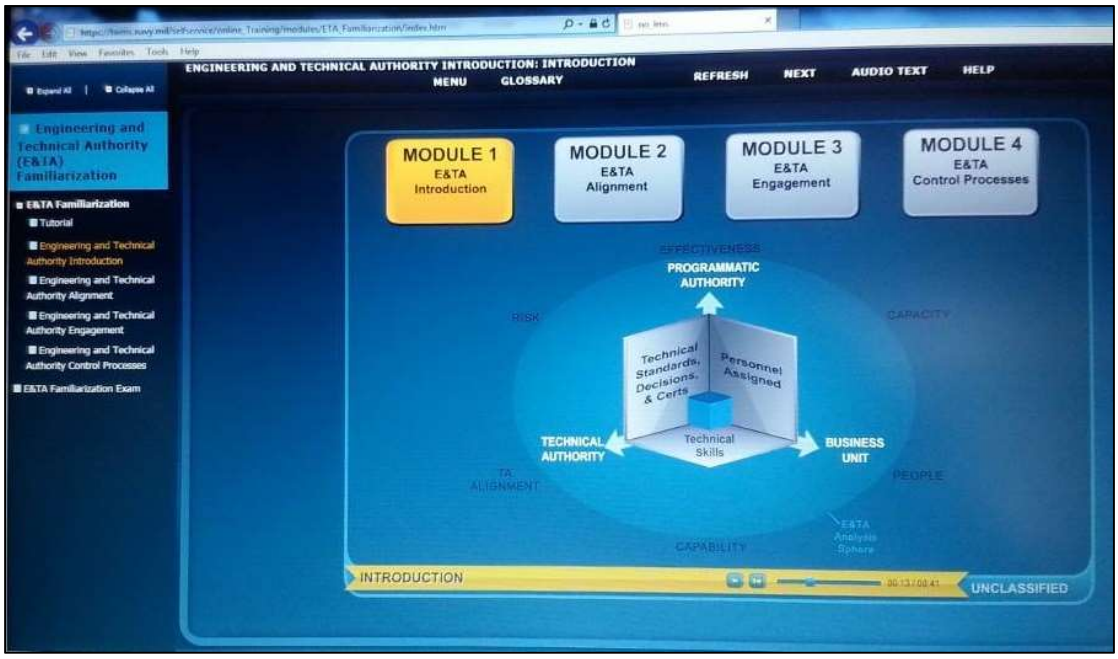

Figure 4. Web-Based Version of the Engineering and Technical Authority Familiarization Training.

b. E&TA Refresher

The E&TA Refresher was designed as a three-hour Microsoft PowerPoint presentation that can be taught one-on-one or in small groups by employees. For example, a manager may choose to use this version of the training to support a focused E&TA dialogue or reinforce basic concepts with colleagues. The presentation can also be combined with other presentations to complement a broader training program. NAVSEA incorporates this training format in its Commander's Executive Fellows Program (CEFP).

c. E&TA Overview

The E&TA Overview was designed as a one-hour, executive-level Microsoft PowerPoint presentation that can be used by employees for a variety of situations. Generally, the E&TA Overview is offered to personnel who need a quick introduction or review of the E&TA concepts. This version may be combined with other presentations or tailored as a standalone briefing for a specific audience. For example, a TWH may use the E&TA Overview to establish a common understanding of his/her role with the program manager. NAVSEA incorporates this training format in its web-based Naval Acquisition Program Overview (NAPO) training.

d. iNAVSEA Technical Authority Subsite

NAVSEA utilizes a Microsoft SharePoint-based intranet called iNAVSEA as an electronic knowledge repository. Each directorate, including SEA 05, operates a site within iNAVSEA for their business unit. The Technical Authority Subsite existed under SEA 05's site prior to initiation of the KM program, but has since been improved upon and is now more actively used by the Engineering Competency for knowledge sharing. The Technical Authority Subsite hosts document libraries, lists, and useful links that provide authoritative sources relevant to the technical workforce. These are accessible via the Technical Authority Dashboard, as shown in Figure 5.

Figure 5. Technical Authority Dashboard on iNAVSEA. Source: Naval Sea Systems Command (2017e).

e. Engineering Competency Newsletter

SEA 05 publishes a quarterly newsletter on iNAVSEA to promote knowledge sharing across the Engineering Competency and its stakeholders. Paper copies are provided to students in the E&TA Familiarization classes to raise awareness of this communication format and reinforce the importance of knowledge sharing within and beyond the Engineering Competency. All employees are encouraged to submit newsletter content for publication. Topics are not restricted, but generally fall into one of the following categories: workforce development, career advice, technical authority updates, policy publications and cancelations, and success stories. Figure 6 is the newsletter cover from the fourth quarter of fiscal year (FY) 2016 edition.

NAVSEA

ENGINEERING COMPETENCY NEWSLETTER

2Q FY17

LPD 22 Visits Warfare Center, Receives Top-Notch Support and Training

J.W. Marcum (NSWC PHD)

USS San Diego (LPD 22) visited Naval Surface Warfare Center, Port Hueneme Division (NSWC PHD), for mission-readiness assessment and training, Jan. 23.

NSWC PHD Technical Director, Dr. Bill Luebke and Deputy Technical Director, Mr. Vance Brahosky toured the ship along with Ship Defense and Expeditionary Warfare Department Manager, Tim Jones and Department Officer, CDR John Lukacs. The group met with the ship's Commanding Officer, CAPT Carl Meuser and Executive Officer, CAPT Peter Collins to discuss NSWC PHD services and how NSWC PHD can best meet their needs.

Dr. Luebke stated, "Visiting and touring LPD 22 in our harbor was the hit of my week and really affirmed the incredibly positive role Port Hueneme Division plays as a premier In-Service Engineering Agent of the first rank."

Dr. Luebke served as the program manager for the San Antonio Class (LPD 17) shipbuilding program in the 1990s, leading a team through the detail design and early construction phases. USS San Diego would be the sixth in its class of amphibious transport dock ships, which are warships that embark, transport, and land elements of a landing force for a variety of expeditionary warfare missions.

Visiting NSWC PHD is a priority for CAPT Meuser and LPD 22. Meuser took notice of the services provided here while serving as a combat systems weapons officer aboard USS Port Royal (CG 73). "Engineers will swarm aboard, fix things, change parts and conduct training," said Meuser.

Meuser stays focused on capacity versus capability, stating that "small investments can make large impacts." He wants to see an overall improvement in fleet-wide product support by increasing the capacity of ships and sailors. Meuser would like to see 3-D printers in repair shops aboard ships throughout the fleet. "Our ability to maintain a ship this size requires efficiency and effectiveness," said Meuser.

Engineers and technicians stayed busy aboard LPD 22 during the ship's visit. "This was an excellent opportunity for our command to showcase its fleet support expertise," said NSWC PHD Program Manager Marcus Stallings. "You could tell that the entire assessment team was focused, poised and eager to spread their level of knowledge to sailors onboard the ship."

(Above) Port Hueneme, California - Naval Surface Warfare Center, Port Hueneme Division (NSWC PHD), hosted USS San Diego (LPD 22) on site for a ship visit, training and readiness assessment, Jan. 23. (From left to right) LPD 22 Executive Officer CAPT Peter Collins; NSWC PHD Deputy Technical Director Mr. Vance Brahosky; NSWC PHD Technical Director Dr. Bill Luebke; and LPD 22 Commanding Officer CAPT Carl Meuser greet each other aboard the ship. (U.S. Navy Photo by J.W. Marcum/ Released) (170127-N-NM873-0040)

Employees at NSWC PHD spent approximately 166 hours troubleshooting systems onboard the ship and more than 220 hours of on-the-job-training was provided by NSWC PHD subject matter experts. Major systems and equipment assessed included ship self-defense weapons systems and shipboard electronic warfare systems and radar. Training included battle-force tactical training, cooperative engagement capability, and underway replenishment. Logisticians carefully evaluated and assessed maintenance assistance modules, publications, and test equipment data.

"Only through due diligence and teamwork were we able to increase the ships operational availability, which in turn, extends the Navy and Marines Corps' warfighting capability," said Stalling

Upcoming E&TA Training Sessions:

4-6 Apr NAVSEA HQ

11-13 Apr NSWC PCD

6-8 Jun NUWC Newport

20-22 Jun SUPSHIP NN

27-29 Jun SWRMC

18-20 Jul NSWC PHD Det VB

25-27 Jul NAVSEA HQ

4Q FY17 NUWC Newport

4Q FY17 FNSY

POCs:

Wynn Shiral (SEA 05B) 202-781-1818

Gale Richards (SEA 05B - CTR) 202-777-1477

March 2017

Figure 6. Engineering Competency Newsletter.

B. ROLES AND RESPONSIBILITIES

A team of dedicated professionals is paramount to developing and implementing a KM program. Support needs vary in level of commitment and responsibilities, but each of the subsequent roles perform important functions on the KM team.

1. Program Manager

The program manager is generally responsible for leading all aspects of the KM program. This person focuses "on aligning behaviors and support structures with overall strategic goals" (O'Dell and Hubert 2011, 119); motivates team members toward achieving a common vision for the program; directs and coordinates tasking; and balances cost, schedule, and technical risks. For this

KM program, the program manager also negotiates the budget; manages expenditures and contractor performance; edits and approves content for all products; and serves as Site Administrator for the Technical Authority Subsite. KM program managers serve in a connective role “as the liaison among senior leaders and others involved in KM activities” (O’Dell and Hubert 2011, 121).

2. Instructors

Professional instructors were contracted by SEA 05 to contribute to the development of the training strategy, course materials, and classroom delivery. These personnel are KM team members that support the goals of the focal organization through unbiased classroom instruction and continuity in training execution. They perform an active role in learning from the organization (i.e., organizational leaders, stakeholders, and other employees) while also teaching the organization during formal class sessions. The instructors serve on the front lines of communication to the workforce through face-to-face engagement; they report recommended changes in content and delivery as well as noticeable trends in workforce responses to the training experience.

3. Content Developers

A small team of people within the focal organization developed the vision for the KM program. This core group collaborated with the instructors throughout course development to “train the trainers” while also ensuring clarity in presentation and delivery. The content developers monitor classroom execution and student feedback to address questions or provide clarifications in the training materials. Content developers also maintain relevant authoritative sources in document libraries on iNAVSEA and author articles for publication in the Engineering Competency Newsletter.

4. Subject Matter Experts

Knowledge clumps reside in SMEs. To encourage knowledge flows, content developers must tap into knowledge clumps by including SMEs in

content development and review sessions. People with knowledge and experience related to the learning objectives were invited to meet with content developers to provide context and examples for the concepts defined in E&TA policies. It was challenging for the SMEs to provide this context via written testimony. The knowledge transfer process was often accomplished through personal interviews and storytelling sessions. The development team also reached out to senior personnel nearing retirement to capture their perspectives and lessons learned.

5. Early Adopters

"Early adopters carry no baggage and come with no preconceived idea of what your product should or should not do. They are the best at breaking what you have built, and giving you honest feedback on what you are doing right and wrong" (@TechCocktail 2013). For these reasons, early adopters were brought in at strategic times to obtain their opinions about the knowledge products and processes in development.

When a product or process impresses an early adopter, that person becomes one of the KM program's biggest assets. The individual will likely share their experience with their peers and encourage them to get involved. This behavior, or word-of-mouth endorsement, is widely known as the most valuable form of marketing.

Early adopters may choose to become more than a champion for the new product. Intense interest often leads early adopters to volunteer their services as part of a coalition of the willing. Their offer could result in additional manpower and knowledge sources to benefit the KM team's efforts at no cost to the program.

6. Central Connectors and Information Brokers

Most work in organizations is accomplished informally, through personal contacts or social networks (Cross and Prusak 2002, 5). Central connectors and

information brokers are two roles within social networks that are vital to organizational knowledge transfer and productivity (Cross and Prusak 2002, 6). Central connectors are valuable to the KM program because they are communicators that "link most people in an informal network with one another" (Cross and Prusak 2002, 6). Similarly, information brokers are communicators that "keep the different subgroups in an informal network together" (Cross and Prusak 2002, 6). In an organization as large as NAVSEA, central connectors and information brokers are necessary to grow organizational awareness about KM initiatives and solicit user feedback from their networks.

7. Classroom Facilitators

Each E&TA Familiarization class is team-taught with two independent instructors and classroom facilitators. The facilitators are government personnel with subject matter knowledge in areas being trained and may also be representatives of the organizations where the training is being held. Facilitators must have previously completed the course to understand the vision and concepts taught in the class. They enhance the learning environment by encouraging classroom discussion and providing credible context to the lessons through storytelling. "Because stories are more vivid, engaging, entertaining, and easily related to personal experience than rules or directives, the research would predict they would be more memorable, be given more weight, and be more likely to guide behavior" (Swap et al. 2001, 103). Facilitators are also responsible for bringing back their observations of the students' learning progress and experience to the KM team (Thomas et al. 2001, 337). This feedback helps team members make adjustments for continuous improvement of the KM program.

8. Guest Speakers

A segment in the E&TA Familiarization course is reserved for senior executives and other engineering leaders to share their perspectives on the E&TA concepts taught throughout the class. Generally, these personnel present in complementary pairs, determined by the technical authority roles that they

perform for NAVSEA. Their first-hand accounts of how the organizational structure works; technical responsibilities within their domains; experiences related to risk management and conflict resolution; and candid question-and-answer sessions are invaluable to promoting tacit knowledge flows. This level of involvement by senior leaders lends credibility to the KM program, and provides opportunities for them to connect with the workforce. “Leading by example, executives shape the values of [the] organization and establish a support system to initiate and manage change” (O’Dell and Hubert 2011, 130–131).

C. EXECUTION AND SUSTAINMENT

Execution of the KM program began with a series of pilot sessions to beta test the classroom versions of the E&TA Overview, Refresher, and Familiarization training. From the classroom experiences and participant feedback, the development team stimulated interest in the KM program and gained critical insights needed to adjust processes for smoother execution.

1. Marketing

As with any new product, it is not enough to expect that customers will find what you have to offer. Therefore, a marketing strategy was devised utilizing change management principles to build awareness and maximize reach to the target audience for the KM program. The marketing strategy was based on establishing community around each product launch, starting with the classroom familiarization training, to create momentum and interest across the board. This was accomplished by developing a dialogue with the workforce (@TechCocktail 2013) and identifying early adopters willing to participate in content development and reviews. By being transparent with employees and encouraging them to contribute their knowledge to the effort, gaining their buy-in came naturally. Early adopters were willing to socialize the KM program with others and become more engaged following consistent and continued successes.

It was especially beneficial to the program when early adopters provided direct feedback to senior leadership to ensure that management understood the

value of what was being produced. Success of the program as designed required a commitment from leadership to not only support, but also engage in the learning process. Through direct requests to Technical Senior Executive Service (SES) members for their involvement as guest speakers and senior technical managers to be among the first students to take the training, confidence in the course material grew and a critical mass of esteemed alumni was established. By "understanding and working constructively with the energy dynamics of the organization to facilitate change, such as creating a 'critical mass' of support for change and unblocking places that hold back performance energy" (Ackerman 1986, 4), this KM program took root and real transformational change occurred.

In addition to word-of-mouth, cross-platform communication formats were generated to inform the workforce about the KM program products. A summary sheet was created as a quick, one-page read to provide the objective of the E&TA Training, a listing of each training version available, and an overview of the learning objectives. This file is useful for explaining the overall structure of the training and the classroom versions available to NAVSEA. The syllabus is similar to the summary sheet, but focuses on the E&TA Familiarization version of the training. The syllabus is used primarily as a recruitment tool for senior leaders and potential students. In the first year of the KM program, the program manager also delivered monthly status briefings to senior leaders to report strategic plans and progress. These presentations are updated as needed to communicate training schedules and metrics as well as recruit students and supporters.

The iNAVSEA Technical Authority Subsite contains a document library where the summary sheet, syllabus, schedule, and other course materials are posted for the E&TA Training. Any iNAVSEA user can access this information to learn more about the classes and download files as desired. Links to this directory are distributed widely via status briefs, reports, emails, and articles in the Engineering Competency Newsletter. Students taking any version of the classroom training also receive the iNAVSEA links in their course materials along with a live demonstration of how to access these files on the iNAVSEA site. The

Engineering Competency Newsletter is also posted on the iNAVSEA site and hardcopies are provided to each student in the classroom. Each edition of the newsletter includes an updated listing of the class schedule with dates, locations, and points of contact.

2. Observation and Feedback

While marketing is important to bring about awareness of the KM program to gain stakeholder support and participation, observation is equally important for the KM team to evaluate how the KM products are received, utilized, and improving the behaviors of the target audience. The KM team members are responsible for observing classroom execution to streamline the structure and logistics of the classroom training when possible. They also observe student responses to course content including body language, questions posed, and discussion topics to evaluate how effective the material is being presented, received, and internalized by the students. Content developers and site administrators review system-generated usage data and user questions to glean insights for how organizational behaviors are changing with respect to using the Technical Authority Subsite on iNAVSEA. Adjustments are made over time in response to these observations in order to increase the effectiveness of these tools and optimize the workforce's experience.

Feedback forms with numerical evaluations and open-ended questions are provided to every student in the E&TA Familiarization classroom training. These forms are collected by the instructors, the comments are reviewed by the KM team, and the data is archived after each training session. The E&TA Familiarization classroom training is foundational to all aspects of the KM program; the formal feedback empowers the workforce to contribute to the continuous improvement of the KM program and helps the team prioritize follow-on efforts across the spectrum of products.

Knowledge transfer is the primary goal of the execution phase, which occurs among individuals and groups in all levels of the organization. The

instructors, guest speakers, facilitators, and content developers, all must be open to receiving knowledge transferred from students and other organizational stakeholders in the process of sharing their own knowledge. It is a constant, dynamic process in which the KM team learns and grows in their knowledge base while also sharing knowledge to grow the organizational knowledge base.

3. Content Management

The first phase of the KM program began with developing and evolving the E&TA Familiarization classroom training. As such, this part of the program serves as the authoritative source from which the other components are derived. The written feedback received from the workforce with respect to the classroom training is captured in a spreadsheet, adjudicated and prioritized by the team, and content changes are implemented on a constant basis. Typically, the classroom course materials are revised and printed monthly for the next month's sessions. Any actions that are not closed are carried over into the next revision cycle and addressed as time allows. Sometimes the comments are directed toward the policies, guidance, or procedures and cannot effect changes in the classroom training materials unless an official revision is made to the authoritative source. In this case, the comments are shared with the appropriate process owner for adjudication and action, if necessary. Whenever the classroom course materials are modified, the web-based training team members are provided the set of changes to ensure that they are incorporated into the web-based product for consistency.

Feedback for the Technical Authority Subsite and the Engineering Competency Newsletter is generally submitted by the workforce via email. These comments may be related to the functionality of the website or content available to users. The feedback is addressed quickly to resolve any issues and ensure that users can access the information most important to them. This process is particularly helpful to the KM team to stay engaged with the needs of the workforce while ensuring continuity between all products.

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IV. RESULTS AND CONCLUSIONS

A. OBSERVATIONS AND FEEDBACK DATA

Since the KM program's inception in 2012, the team's observations and review of workforce feedback have contributed to countless modifications to the KM products developed for NAVSEA's Engineering Competency. While some changes improved the content of the training modules and newsletter articles, other changes affected the manner in which key concepts were presented to increase knowledge transfer and accessibility of supporting artifacts.

1. Professional Training Support

Professional instructors were hired to teach 48 classroom sessions of the E&TA Familiarization training across FYs 2013–2016. This decision allowed the KM team to focus on content development and implementation of the program while ensuring continuity across all training products. In this regard, the instructors were valuable to the entire KM program; they learned from the workforce through each class taught, modified instructor notes to codify their new knowledge, and remained connected with the web-based training team members to inform them of any required content changes as a result of their learning.

Student feedback indicated general satisfaction with the instructors' performance in the classroom. They earned consistently high praise for their efforts and addressed reported concerns to improve performance from class to class. Having dedicated instructors allowed the KM team to minimize burden on workforce members who volunteered to support the training and encourage others to step up. Facilitators and guest speakers could be easily rotated depending on their availability and the needs of a given roster without compromising the overall structure of the training. This multi-faceted approach to team training enriched the learning environment for all involved.

Outsourcing professional training support proved advantageous to maintaining the quality and longevity of this KM program. They managed the

administrative tasks and execution of each class session while enabling senior engineers and engineering leaders to contribute their time and energy to facilitating classroom discussions as needed (Woodman 2016, under “More Effective Training Techniques”). Through this structure, the focal organization could take ownership of the course content and tailor the knowledge sharing experiences to the audience with minimal impact to their primary job duties or NAVSEA.

2. Senior Workforce Participation

Recognizing that “essential knowledge, including technical knowledge, is often transferred between people by stories” (Pfeffer and Sutton 1999, 90), the KM program incorporates opportunities for the workforce to engage colleagues outside of their normal work groups through storytelling. The E&TA Familiarization classroom training itineraries have time built in to allow for informal discussions around the formal instruction modules and multiple breaks for networking. To make best use of this time, senior engineers, TWHs, and engineering leaders were strategically chosen to facilitate discussions for richer knowledge transfer exchanges.

As explained by Pfeffer and Sutton, “knowledge management systems seem to work best when the people who generate the knowledge are also those who store it, explain it to others, and coach them as they try to implement the knowledge” (1999, 91). Therefore, the facilitators and guest speakers that were chosen either had subject matter expertise in the content presented or had established relationships and technical leadership responsibilities associated with the students in the class. These technical and social connections were critical to the success of the sessions, especially when introducing the course to a field activity or business unit for the first time.

During the field activity training sessions, local facilitators and guest speakers generally partnered with facilitators and guest speakers from headquarters to bridge the gap between business units and grow connections

across the enterprise. This teaming approach was one method used to not only train the trainer, but also encourage organizational buy-in. It promoted a greater sense of togetherness and initiated working relationships among the technical leadership that may not have otherwise occurred.

Local facilitators and guest speakers provided an additional benefit by serving as knowledge translators in the classroom. Specifically, they answered questions using real-world examples to illustrate the nuances of their part of NAVSEA business. This aspect of the course design often received the most praise because of the richness in the knowledge exchanges. These interactions dynamically shift between all four modes of knowledge creation for all participants (i.e., students and trainers), resulting in increased knowledge at the individual, group, organization, and inter-organization levels (Nonaka and Takeuchi 1995, 73).

In addition to being active in the classroom training, senior employees were valuable to the development and integration of the other KM program products into the NAVSEA culture. SMEs applied their knowledge to reviewing the web-based training and contributed specific language to ensure that the narrative scripts were accurate and clear for employees at all experience levels. Senior engineers contribute articles to the Engineering Competency Newsletter on topics such as workforce development, competency management, and career lessons learned, which prompts discussions about succession planning and preparing the workforce of the future. Managers now use the Technical Authority Subsite to find archived training, policies, TWH scope statements, and other types of documentation essential to their work efforts. They are learning how to use the document libraries for knowledge sharing; directing their employees to download files via web links in email vice sending large attachments; and offering suggestions for posting other types of information that may be of interest to the workforce. These are all particularly notable accomplishments and indicators of progress as older employees tend to be the most resistant to using information technologies for KM.

3. Class Composition

For the classroom training, the team experimented with class composition by adjusting the number of students per class while also considering diversity in the level of professional experience and organizational role of each student to optimize the quality of the learning environment. For most sessions held at NAVSEA headquarters, All Hands email announcements and word-of-mouth were the most effective means for recruiting students. The process for establishing the rosters for the classes held at the field activities was more selective as those sessions were not held as frequently, but were in equally high demand. In either case, all NAVSEA employees were afforded the opportunity to take the training at a location of their choosing, and were not necessarily required to take the class where they were geographically located.

As indicated in Figure 7, the first several classroom sessions of the E&TA Familiarization training were taught at NAVSEA headquarters and limited to 20–30 students to give instructors and facilitators an opportunity to master the course content and observe student engagement. Over time the content matured, the delivery became smoother, and the instructors and facilitators became more confident in their knowledge base. This increase in capability enabled an increase in classroom capacity, demand from the field activities, and leadership support to offer sessions onsite at the field activities. In only a few instances did the class size exceed 40 students, as indicated in Figure 8, to accommodate the high demand at the field activities while also experimenting to observe the effect of large class sizes on the overall classroom experience. One such experiment incorporated video conferencing to include personnel located at another field activity.

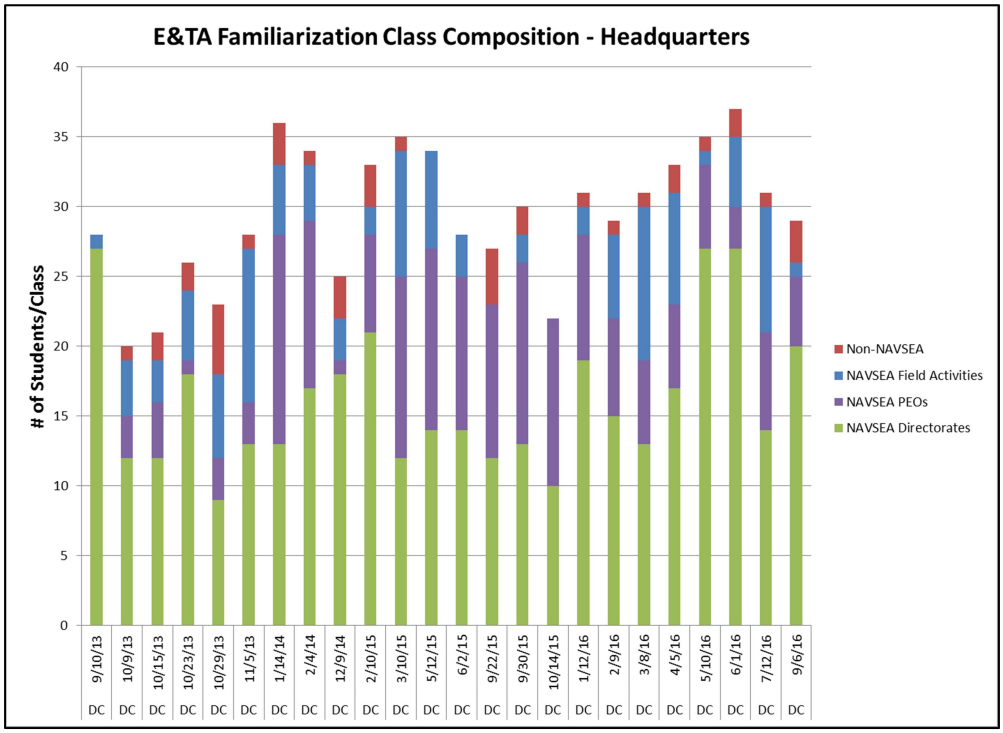

Figure 7. E&TA Familiarization Class Composition – Headquarters.

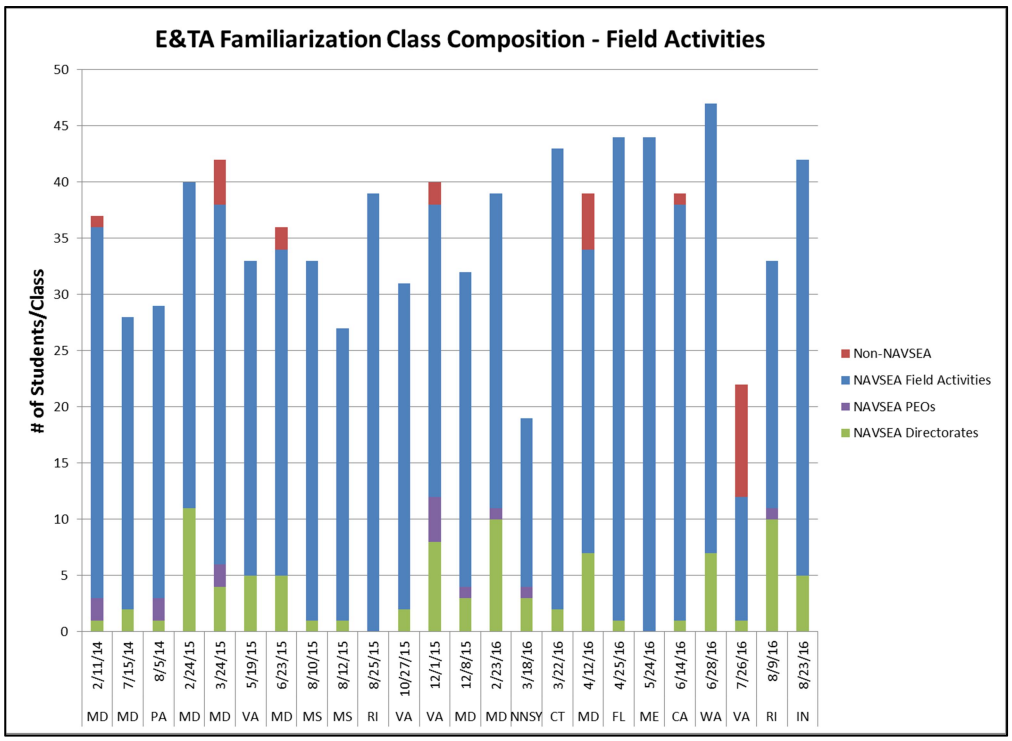

Figure 8. E&TA Familiarization Class Composition – Field Activities.

The sessions with 20–30 students generally had fewer questions and tended to get through the course content more quickly. While this class size was easier for the instructors and facilitators to manage, the student experience was limited by the collective experience of the people in the classroom. Fewer students generally meant less diversity of knowledge and fewer valuable knowledge transfer exchanges.

The sessions with 30–40 students seemed to be the most effective in knowledge transfer. They offered more networking opportunities among students who did not previously know each other and stimulated richer classroom discussions around the course content than those with fewer students. As the class size increased beyond 40, the level of classroom engagement changed among the students. Distractions among students were greater in larger classes and more opportunities were available for the quieter students to hide behind those who are more outspoken. It took more effort on the part of the instructors and facilitators to regulate the classroom environment, resulting in a corresponding degradation in classroom experience.

4. Section 508 Compliance for the Web-Based Training

The web-based E&TA Familiarization training was developed using the classroom version of the course as its basis with the intent of being hosted on the Navy's Total Workforce Management Services (TWMS) site. For TWMS to launch the training to all TWMS users, it had to be compliant with Section 508 of the Rehabilitation Act of 1973 to accommodate users with visual or hearing impairments (U.S. General Services Administration 2016, under "Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794 [d])"). A blind employee and a deaf employee each volunteered to beta test the courseware and provide feedback to help the development team with implementation. The team observed how the courseware performed on each volunteer's system with the respective assistive technology for his or her needs. This activity provided

perspective that enabled the team to empathize with the users and learn about additional design features that should be incorporated to achieve full compliance.

5. Engineering Competency Newsletter Topics

The Engineering Competency Newsletter was initiated about two years after the E&TA Training classes were first offered to the workforce. Hardcopies of the current edition of the newsletter are now provided to each student in the classroom sessions. The instructors use screen shots in the PowerPoint slides or live iNAVSEA demonstrations to show students where they can access current and past versions of the newsletter for download. The newsletter is intended to improve relations and awareness among different groups within and external to the Engineering Competency. By educating the workforce about its existence, where to locate it, and how to contribute content, the KM team empowers personnel to obtain and share knowledge with colleagues on a broader scale than they may generally be used to doing through other communication methods.

As the workforce becomes more aware and knowledgeable of the type of content documented in the newsletter, interest has increased. This is evidenced by a higher number of responses (e.g., emails, phone calls, personal feedback) to each subsequent edition that is published. Individuals contact the editor requesting broader distribution, specific content for future issues, or guidance for submitting articles to be included in the next edition. Employees are also embracing the newsletter as a tool for announcing Competency-wide topics such as upcoming training opportunities, notable accomplishments, or other general interest items such as new TWHs or technical publications. To keep the newsletter interesting and full of informative content, items used as filler in small white spaces include Navy trivia, riddles, or SharePoint tips and screen shots to help iNAVSEA users more easily navigate the Technical Authority Subsite.

6. Technical Authority Subsite Usage

When the KM team first launched the E&TA Familiarization classroom training in 2013, a reference compact disc (CD) was provided in the materials

package given to each student. The CD included electronic files of all course slides and authoritative sources that were discussed throughout the class. This practice added materials and labor expense to ensure that the files for the CDs were the latest and greatest before burning copies for each class. While the students trusted that the CDs contained current information for their reference in the classroom, over time the documents were revised resulting in CDs that quickly became outdated.

To remedy this, the KM program leveraged the capabilities of SharePoint by refining the document libraries within the Technical Authority Subsite to include the most current versions of all the authoritative sources used in the E&TA training. Now all iNAVSEA users, not just the students in a given class, have access to the electronic files in a dynamic web-based environment. Screen shots and web links were added to both classroom and web-based training formats, and live demonstrations are performed in the classroom to ensure that students know where to go and how to access the files for use in their work outside of the classroom.

Site usage data and other analytics were captured so that administrators could monitor site traffic and user behavior. Figure 9 is a graphical depiction of the number of daily users accessing the Technical Authority Subsite during a two-year period, starting 14 December 2014 to 14 December 2016. While there are many fluctuations in the number of unique site visitors from day to day, an overall increasing trend is visible. This indicates that the efforts to inform and encourage the workforce to use the Technical Authority Subsite are working. As the KM program matures and more people learn of the value that this site provides, they are choosing to access the site during the course of their workday. Other data (not shown) identifies users by name and business unit who are accessing the site, what pages they are viewing, and how often they visit in a day. Over the course of the same two-year period, more than 2000 users from across the NAVSEA enterprise accessed the site and returned multiple times, further validating that the workforce is aware of and using the knowledge system.

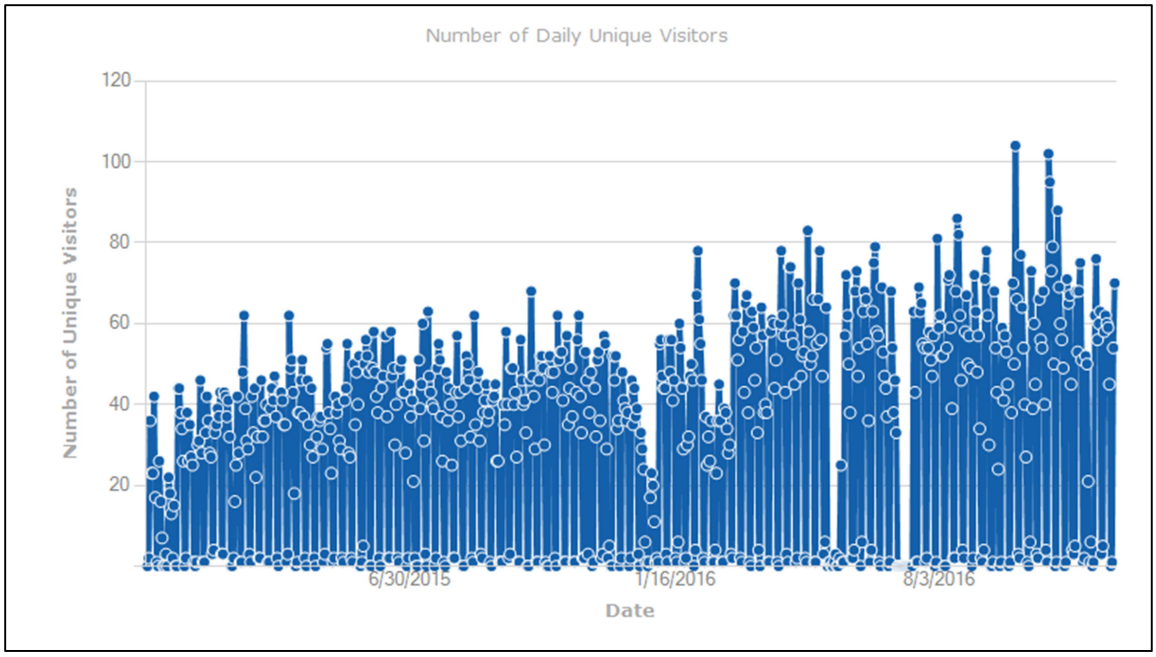

Figure 9. Trend of Daily Unique Visitors to the Technical Authority Subsite, Dec 2014 – Dec 2016.

B. ASSESSMENT

Consistent with the study conducted by Davenport, De Long, and Beers, this KM program "had an individual responsible for the initiative," a "commitment of human and capital resources," and a focus "on knowledge, as opposed to information or data" (1998, 44). All of the KM program objectives defined in Chapter II, Section D were accomplished while also considering the success factors in Table 1. The success factors serve as the basis for the assessment of this KM program and follow on recommendations.

1. Link to Economic Performance or Industry Value

Economic performance is generally characterized as money saved or earned which, by extension, includes saved time or manpower. This KM program incorporates enterprise-wide communication and training mechanisms that directly improve business processes. Through deeper understanding of roles and responsibilities for members of the Engineering Competency, awareness of web-based tools and knowledge repositories, and access to the technical support

networks, personnel feel a greater sense of empowerment to successfully accomplish the tasks that are assigned to them.

The KM program improves workforce satisfaction by making electronic files accessible for individual retrieval, significantly reducing the need to respond to phone calls and emails for frequently requested files. Knowledge codified in presentations and other technical documentation can now be reused with more frequency to ensure consistent messaging across NAVSEA program teams. Further, external stakeholders have a better appreciation for NAVSEA's organizational structure and technical processes, thus contributing to synergistic relationships and reducing time lost to misunderstandings.

2. Technical or Organizational Infrastructure

Tools and technologies that are knowledge oriented (e.g., networked laptops, email, iNAVSEA, web-based training) and the skills to use them were already in place at NAVSEA prior to kicking off the KM program. This helped the KM team gain traction with the workforce, as the new knowledge initiatives were launched (Davenport, De Long, and Beers 1998, 51). Each aspect of the KM program was designed to leverage and integrate the use of these technologies as much as possible.

As Davenport, De Long, and Beers describe, "building an organizational infrastructure for KM means establishing a set of roles and organizational groups whose members have the skills to serve as resources for individual projects" (1998, 51). This is often difficult for organizations to do because it adds cost to the effort. For this KM program, NAVSEA created new roles that were generally performed as collateral duties by representatives of the various business units throughout the Engineering Competency. The KM program manager leveraged the existing organizational structure to build a coalition of interested personnel to fulfill the duties for the KM program. These personnel included the content developers, SMEs, early adopters, classroom facilitators, and guest speakers. Support contractors were hired to perform the tasks that could not be completed

as collateral duties by NAVSEA employees, such as classroom instruction, integrated courseware (web-based training) development, and graphics/ administrative to support to the KM team.

3. Standard, Flexible Knowledge Structure

Davenport, De Long, and Beers affirm “knowledge is fuzzy and closely linked to the people who hold it; its categories and meanings change frequently” (1998, 51). After reviewing examples of knowledge repositories and systems that were created with no structure, they concluded that organizations building knowledge repositories must create categories and key terms in order for users to effectively extract knowledge (1998, 51). This lesson is incorporated into the Technical Authority Subsite design. It is a standard, flexible knowledge structure built in alignment with the technical terms and key concepts that underpin the Engineering Competency and Technical Authority construct. These terms and concepts are defined in the compendium of technical policies, guidance, and procedures and are reinforced through the E&TA Training curriculum.

Naturally, because of its organizational role, SEA 05S is the Site Administrator responsible for the Technical Authority Subsite structure, contents, and access permissions. System users are generally NAVSEA employees, support staff, and other stakeholders that require access to the stored knowledge. Users are encouraged to submit recommendations for improvement to SEA 05S. All feedback is reviewed and addressed as quickly as possible to ensure that the repository supports the needs of the workforce. As policies, terms, and categories change over time with the evolving knowledge base of the organization, the Technical Authority Subsite is updated to reflect the most current knowledge structure for users.

4. Knowledge-friendly Culture

The NAVSEA workforce’s interest in participating in the KM program has steadily increased since concept development first began in 2012. Word-of-mouth promotion has resulted in consistently full E&TA Training rosters with

waiting lists leading up to each classroom session. Increasingly more personnel outside of the Engineering Competency are attending classes and field activities are requesting that more classes be offered locally at their sites. Readership of the Engineering Competency Newsletter continues to grow since its first publication in 2016. This is evidenced by increasing feedback from the workforce in the form of emails, phone calls, and face-to-face conversations.

The Technical Authority Subsite has also experienced growth in the number of registered users and stored content since integrating live demonstrations in the E&TA Training. Employees are generally more aware of content that is available on the site and are more willing to search there to find what they need. As reinforcement, SEA 05S continues to support direct requests for documentation posted on the Technical Authority Subsite by responding with an email that includes a direct link to the file, not just the file itself.

Davenport, De Long, and Beers state that "a knowledge-friendly culture [is] one of the most important factors for a [KM] project's success" (1998, 52). Fortunately, NAVSEA's workforce has "a positive orientation to knowledge—employees are bright, intellectually curious, willing and free to explore, and executives encourage their knowledge creation and use" (Davenport, De Long, and Beers 1998, 52). Overall, employees are not inhibited from sharing knowledge and have embraced the KM program as one mechanism for doing so.

5. Clear Purpose and Language

"Knowledge managers must decide when and how to most effectively communicate their objectives" and "address the language issue in a way that fits their culture" (Davenport, De Long, and Beers 1998, 53). At NAVSEA, and more specifically in SEA 05, "knowledge management" was not a commonly used term or widely understood concept when this KM program was initiated. To obtain leadership buy-in and sponsor funding, it was necessary that the tasking and products were prioritized and delivered in phases in order of greatest need. Hence, the classroom training portion of the KM program was developed and

introduced to the workforce first. This strategy allowed the team to demonstrate high-value successes early and build momentum in followership. The other products were integrated over time as the demand for knowledge sharing and the willingness of the workforce to actively participate increased.

6. Change in Motivational Practices

During the first two years (FY14–15) of the KM program, the E&TA Familiarization training class rosters were largely filled by personnel who either desired to learn more about the subject or were encouraged to sign up by a trusted colleague. Demand was steady, classes generally stayed full, and waitlists were generated to handle cancellations. Many of the most experienced TWHs, however, were not motivated to participate in the training on their own accord. The reasons varied, but many doubted - given their workload and experience level - that the time in the classroom would be worth their while.

Senior engineering leaders and managers who had completed the training recognized its value to both the individuals' and organization's benefit. As the program's reputation strengthened, so did the NAVSEA CHENG's conviction that TWHs should complete E&TA Familiarization in the classroom. His office issued direction in November 2015 requiring that all TWHs complete the classroom version of the E&TA Familiarization training by 30 September 2016 and that it be included in their performance objectives for the year.

Figure 10 charts the progress of TWH completion of the E&TA Familiarization training, with clear inflection points in 2016 that indicate the steepest rates of participation than in either of the previous years. This data clearly reveals the positive impact that the change in motivational practices had on meeting organizational goals for training completion.

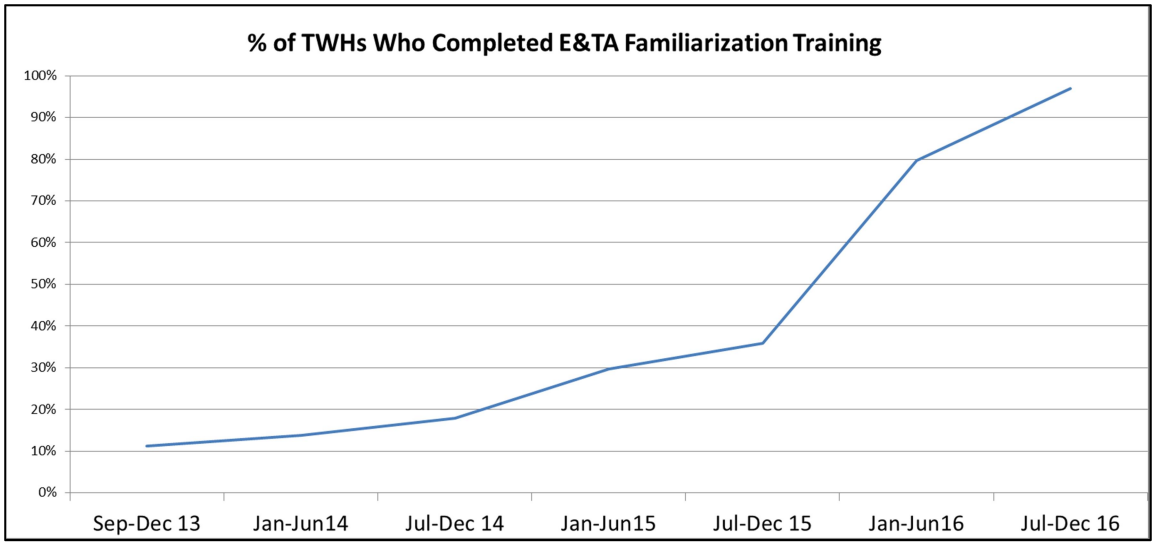

Figure 10. NAVSEA Technical Warrant Holder Completion of E&TA Familiarization Training.

7. Multiple Channels for Knowledge Transfer

Davenport, De Long, and Beers determined that when "knowledge is transferred through multiple channels that reinforce one another…each adds value in a different way and…their synergy enhances use" (Davenport, De Long, and Beers 1998, 54). This precept certainly applies to this KM program and its implementation is continuously improved to increase engagement.

The classroom training was developed by SMEs and is regularly maintained as a result of the classroom experience and student feedback. The classroom courseware serves as the primary "input," or authoritative source, for which the web-based training scripts and graphics are developed. The web-based modules are reviewed and edited by the SMEs that supported the classroom training development, and any applicable changes are fed back into the classroom courseware. The SMEs, including the instructors and several facilitators, participate in both the classroom and web-based courseware maintenance activities. Therefore, their knowledge and experiences are incorporated into all of the training products while their collective knowledge base matures with each class, resulting in a more effective KM team. Through this

continuous discovery, learning, and improvement process, the classroom and web-based training products stay aligned and reflect the most current organizational knowledge.

The classroom training design allows for knowledge transfer between the guest speakers, facilitators, and students to provide rich context to the explicit and tacit knowledge for a more meaningful learning experience. The classroom training also incorporates hardcopies of the Engineering Competency Newsletter for each student, which tangibly reinforce the concept of the Engineering Competency and offers short articles authored by employees from across the Command. Instructors walk students through slides with screen shots of the iNAVSEA intranet where the newsletters are hosted, as well as screen shots and live demonstrations to reinforce how students can access other resources and knowledge outside of the classroom environment. The web-based training is not as interactive of an experience as face-to-face training; however, there are web links and screen shots incorporated to point students to key knowledge sources.

8. Senior Management Support

“Like almost every other type of change program, knowledge management projects benefit from senior management support” (Davenport, De Long, and Beers 1998, 54). And while all of the success factors are valuable, this is possibly the most important success factor as it is integral to the accomplishment of the other success factors. Senior managers are the authorities over funding and other resources for infrastructure; they set the tone and drive behaviors with respect to KM and organizational learning; and they help clarify what types of knowledge are most important to the organization (Davenport, De Long, and Beers 1998, 54). For this KM program specifically, the more senior managers and leaders got involved in performing these actions, the easier it was for the KM team to overcome challenges, accomplish goals, and improve the quality and accessibility of the program for the workforce. The program manager promoted the successes of the KM program through communication tools such as status

reports, completion metrics, excellence awards, and newsletter articles. Additionally, testimonials from TWHs and business unit leaders who experienced performance improvements within their areas of responsibility helped to build momentum and encourage senior management support.

C. RECOMMENDATIONS

In addition to the establishment and institutionalization of a successful KM program for NAVSEA's Engineering Competency, this study has revealed areas that should be explored and developed to improve the KM program. The following sections highlight recommended actions that the focal organization and other similar organizations can take to reap greater benefits from this study.

1. Application to the Focal Organization

SEA 05 should continue to identify and invest in efforts that enable knowledge flows among its workforce and key stakeholders. These recommendations are initial steps that can be taken to further encourage behaviors that promote a knowledge-sharing culture within the Engineering Competency.

a. Establish an Engineering Competency Strategic Plan Linked to the NAVSEA Strategic Business Plan

The NAVSEA Strategic Business Plan is developed and updated periodically by the NAVSEA Commander and his staff. The KM program was designed in alignment with the NAVSEA Strategic Business Plan's focus area of "Accelerate Knowledge Transfer" through two focus area objectives:

- "Provide individual employees with experiences and/or learning opportunities to increase their expertise, through the transfer of… explicit knowledge…[and]…tacit knowledge…" (Naval Sea Systems Command 2014, 8).
- "Use the NAVSEA Competency Domain construct to encourage interaction and improve knowledge-sharing between employees at all experience levels" (Naval Sea Systems Command 2014, 8).

The KM program also aligned with the NAVSEA Strategic Business Plan's focus area of "Modern Learning/Knowledge Management" through two focus area objectives:

- "Leverage the Commander's Executive Fellows Program (CEFP)…to promote and instill leadership competencies to ensure NAVSEA's leadership focus on raising individual and organizational collective performance" (Naval Sea Systems Command 2014, 9).
- "Provide a variety of mechanisms for employees to share their knowledge and collaborate with others" (Naval Sea Systems Command 2014, 9).

In 2017, the NAVSEA Commander revised the strategic business plan and published it as the "NAVSEA Campaign Plan to Expand the Advantage". This plan updates the NAVSEA Strategic Framework and defines NAVSEA mission priorities in alignment with "A Design for Maintaining Maritime Superiority", published in 2016 by the CNO. Through these strategic updates, knowledge sharing—or more specifically—high velocity learning, was identified as one of four lines of effort for the Navy (Chief of Naval Operations 2016, 7) and one of two foundational lines of effort identified as critical drivers for NAVSEA's overall mission success (Naval Sea Systems Command 2017c, 4).

While the KM program aligns with the Navy and NAVSEA business strategies, an organizational strategic layer at the Competency level is missing. An Engineering Competency Strategic Plan would provide connectivity with specific, tailored objectives that direct the Engineering Competency's contributions toward NAVSEA's mission. The Engineering Competency Strategic Plan should then drive modifications to this KM program's strategy (O'Dell and Hubert 2011, 144), at a minimum, to increase knowledge flows between

- critical knowledge areas up, down, and across the Engineering Competency;
- the Engineering Competency and other NAVSEA Competency Domains; and

- NAVSEA's Engineering Competency and their counterparts in other Systems Commands (SYSCOMs).

These strategic alignments will strengthen KM's role in the technical community to ensure NAVSEA maintains its competitive advantage (Snyman and Kruger 2004, 6).

b. Build a Web-based Course Catalog That Links to Existing, Relevant Technical Training

As with any large, diverse organization, the workforce of the Engineering Competency needs access to relevant training to maintain its knowledge base and grow in proficiency. A variety of external sources exist today to provide tailored, specialized education to meet the needs of Navy professionals. However, gaps exist between access to higher education and access to the knowledge resident within individuals that supports performance of specific work for the organization. To address this need, the author recommends that the focal organization identify existing training developed and maintained within its business unit and related business units to share with the Engineering Competency.

NAVSEA's Corporate Operations Directorate (SEA 10) has taken the lead to establish an infrastructure on iNAVSEA called "NAVSEA University" to serve as a repository for training that is managed by each Competency. When it is fully implemented, NAVSEA University will provide web-based access to posted and linked training for all iNAVSEA users. This tool will enable the workforce to leverage and grow the collective knowledge of the organization by instituting a mechanism for storing, publishing and sharing materials that are traditionally maintained locally within business units and subunits.

c. Conduct a Comprehensive Review of the Student Feedback Received to Identify Additional Workforce Knowledge Needs

Student feedback is formally collected after every classroom training session and is informally collected through social networking as a regular part of

maintaining the KM program. While much of that activity resulted in action items that were subsequently resolved, there are many comments that have not been addressed. The KM team should conduct a comprehensive review of the student feedback received to date to identify trends and additional workforce knowledge needs, then prioritize actions for resolution. NAVSEA's technical workforce is changing quickly as is its knowledge base. The KM program must continue to evolve and be responsive to the workforce in order to stay relevant and effective.

d. Incentivize TWHs to Stay Engaged in the KM Program

TWHs are senior engineers and scientists who are responsible for leading technical support networks to plan and execute engineering efforts for naval programs. At NAVSEA, they are technical authorities that have authority, responsibility, and accountability for a specific technical scope that is defined and delegated to them by the NAVSEA CHENG. One common responsibility that applies to all TWHs is that of "stewardship of engineering and technical capabilities" (Naval Sea Systems Command 2006, enclosure (1) page 2). Because the TWH role is centrally located in the technical authority support structure, TWH participation and leadership in KM activities directly and positively influences stewardship of engineering and technical capabilities up, down, and across the NAVSEA enterprise.

While some TWHs did freely participate in the KM program and welcome opportunities for engagement, many others were driven to participate only when the NAVSEA CHENG required completion of the classroom training. KM is about changing behaviors, though, and cultural change is often a consequence of knowledge sharing. Motivating TWHs to become more actively engaged in this, or other KM-related initiatives that align to their areas of responsibility, will improve knowledge flows and drive positive KM behaviors across the Engineering Competency, affecting a more knowledgeable and connected workforce.

2. Application to Other Organizations

Other naval SYSCOMs have Engineering and Technical Authority structures similar to NAVSEA's. While each organization's internal structure and product lines differ, they are all competency aligned with technical authorities that lead their respective engineering efforts for the Navy. Because the SYSCOMs have missions that interconnect to support the success of the Navy's overall mission, naval technical authorities follow the same basic principles under common policy. Therefore, there is value for other SYSCOMs to have access to elements of this KM program and encourage interagency knowledge transfer.

Upon review of the participation metrics from the E&TA Familiarization training, four percent of the alumni over the course of three years came from organizations external to NAVSEA. These representatives generally reported that their purpose for attending the training was to better understand how NAVSEA engineering was structured and functioned to support programs so that they could be more effective in their cross-organizational teams. Some external students also reported that they serve a role within their organization in which they could influence their E&TA policies and were interested in learning about NAVSEA's structure and processes as a model.

Benefits exist for all parties when knowledge transfer can occur in an inter-agency environment that promotes knowledge sharing. Outside entities ask probing questions that encourage NAVSEA to think deeply into how and why activities are done the way that they are, and likewise, NAVSEA has the opportunity to do the same with their counterparts – each challenging and learning from the other.

Further, the lessons learned throughout this study were applied to shaping the KM program into a diverse set of communication tools that have improved the knowledge base and employee engagement with respect to E&TA concepts across the NAVSEA enterprise. Other functional areas and organizations can benefit by adding elements from this KM program to theirs or standing up a new

KM program that utilizes this one as a model. Although the focal organization and subject matter applies to a military mission, the design of this KM program can be replicated and tailored to suit the needs of any organization.

D. SUGGESTIONS FOR FUTURE RESEARCH

The following sections offer research suggestions that build on the experience and knowledge gained from this study. These emerging areas in the KM field could produce richer results to influence a KM program's design for positive impact on organizational effectiveness and competitive advantage.

1. Define Quantitative Measures for KM Success

Quantitative data captured and analyzed during this study primarily indicated growing awareness and involvement in the KM program. When participation metrics tie to outcomes related to strategic concerns, they are more valuable to the KM program (O'Dell and Hubert 2011, 151). At a high level, decision makers benefit from measures that address "impact on business processes, impact on strategy, leadership, and knowledge content" (Jennex et al. 2011, 11). O'Dell and Hubert suggest that a portfolio of KM measures consist of "activity measures, process efficiency measures, and business performance measures and outputs" (2011, 145). The KM measurement approach should be defined as part of the KM strategy, and tailored to produce actionable results for the targeted business unit(s).

2. Optimize Social Networks for Knowledge Sharing

Martin Schulz ascertained that "knowledge production by individuals or subunits is of limited value if they do not share the resulting knowledge with other parts of the organization" (2001, 661). Recognizing that fact, this study leveraged expertise location and social networking to promote explicit and tacit knowledge flows with respect to E&TA policies, processes, and practices throughout NAVSEA.

The TWH List, TWH scope statements, Principal for Safety (PFS) List, and technical support networks aid expertise location within the Engineering Competency; SEA 05 personnel centrally manage formal documentation, archival, and accessibility of these artifacts for use by the workforce (O'Dell and Hubert 2011, 114). Social networking, in contrast, is an informal, adaptive process that is highly dependent on relationships (O'Dell and Hubert 2011, 114). In their research, Cross and Prusak identify four critical linking roles to help manage social networks: the central connector, the boundary spanner, the information broker, and the peripheral specialist (2002, 6). Through development and execution of the KM program, personnel who fulfill these social networking roles emerged and proved to be invaluable enablers of knowledge flows at NAVSEA.

While there are a variety of formal and informal methods for knowledge flows, Cross and Prusak assert that "the real work in most companies is done informally, through personal contacts" (2002, 5). The effectiveness of this KM program could be enhanced by conducting a social network analysis for the focal organization. Given the size and complexity of the Engineering Competency, the scope of the study should be bounded with defined objectives that align with the business strategy (Cross and Prusak 2002, 7).

3. Measure Improvements in Collaborative Advantage

Collaboration occurs when knowledge flows between two or more people working together "through idea sharing and thinking to accomplish a common goal" (Hill 2016, under "Collaboration in the Workplace") such as resolving conflicts, making decisions, or developing/advancing a shared vision for the future (London 2012, under "Collaboration Vs. Other Models of Cooperation"). Collaboration, however, does not occur automatically. Because it requires effort to be successful, it is a source of competitive advantage (Hansen and Nohria 2004, 22).

Collaboration is a mutually beneficial activity that connects people across and between organizations, and generates value for the parties involved. It benefits organizations, especially large organizations like NAVSEA, by providing access to a wider variety of knowledge, skills and abilities embedded in the workforce. Opportunities to share ideas and knowledge allow employees to learn from each other. These experiences contribute to the development of a more agile workforce that is capable of handling increasingly complex situations. Growth in capability generally leads to an increase in capacity to make quicker decisions and drive improvements to the work environment, processes, and products. Work efforts that are accomplished more efficiently save precious resources like time, money, and the availability of expertise. As a result, successful teamwork leaves employees feeling more satisfied and willing to continue working for the organization. Adapted from Hansen and Nohria, five major categories of benefits that a company or organization may reap from collaboration include

- Cost savings through the transfer of best practices
- Better decision making as a result of advice obtained from colleagues in other business units
- Increased revenue or cost avoidance through the sharing of expertise and products among business units
- Innovation through the combination and cross-pollination of ideas
- Enhanced capacity for collective action that involves dispersed units. (2004, 23)

As advancements in KM continue, further research is needed to develop methods for measuring the competitive advantage gained through collaboration and social networking. The resulting metrics can lead to more informed decision making for investing in and managing knowledge sharing structures and systems.

E. FINAL THOUGHTS

KM programs require changing the way people think and behave about knowledge for an organization's benefit. While change may generate resistance from the workforce, a change management process anticipates this resistance and demonstrates respect by addressing people's needs, concerns, and fears (Mysliviec 2013, under "What is Knowledge Management?"). A KM program should document and employ a change management approach as part of its KM strategy. Some change management best practices that support KM program success include:

- Create a case for change management; involve stakeholders.
- Obtain leadership and stakeholder commitment early by building trust.
- Ensure open, two-way communication with all who need to be informed.
- Allow time and patience for change to take shape.
- Deploy change agents to engage the workforce and guide the change process. (Mysliviec 2013, under "Change Management Best Practices")

Gone are the days when organizations could afford for individuals to hoard knowledge. Knowledge *sharing* is a more powerful behavior that will lead organizations to achieve greater competitive advantage in the future (Mysliviec 2013, under "Why is Change Management Critical for Knowledge Management?").

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