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Navigating Career Advancement: Developing a Framework for Construction and Assessment of Processes for Evaluation of Technical Personnel for NAVSEA Warfare Centers

June 2025

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ABSTRACT

This thesis explores the potential for standardizing promotion processes within Naval Sea Systems (NAVSEA) Warfare Centers to enhance organizational effectiveness and talent retention. The primary research question examines whether insights from academic and procedural sources can guide the development of a framework for evaluating and improving technical personnel assessment within NAVSEA. The study uses a comprehensive literature review of relevant research, government policies, and existing procedures to create a new evaluation framework. The proposed framework integrates concepts of validity, fairness, and personality alignment, offering a structured approach to assess technical personnel in a way that aligns with NAVSEA's operational requirements. The study's findings suggest that implementing this framework can standardize promotion practices, mitigate unintentional biases, and enhance transparency across NAVSEA centers, ultimately improving talent retention and mobility. Recommendations emphasize refining selection methods and aligning assessment tools with technical and demographic characteristics to support long-term organizational capabilities.

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LIST OF ACRONYMS AND ABBREVIATIONS

ABET	Accreditation Board for Engineering and Technology
ADG	Assessment Decision Guide
CISA	Cybersecurity and Infrastructure Security Agency
CNO	Chief of Naval Operations
COMNAVSEA	Commander of NAVSEA
CSRA	Civil Service Reform Act
CTAP	Career Transition Assistance Plan
DEO	Delegated Examining Operations
DON	Department of the Navy
ECQ	Executive Core Qualification
EI	Emotional Intelligence
FWS	Federal Wage System
FV	Face Value
GS	General Schedule
HR	Human Resources
IH	Occupational Interest High Point
ICTAP	Interagency Career Transition Assistance
IT	Information Technology
JOLTS	Job Openings and Labor Turnover Survey
KSAs	Knowledge, Skills, and Abilities
LBES	Land Based Engineering Site
MOSAIC	Multipurpose Occupational Systems Analysis Inventory – Close-Ended
NAVSEA	Naval Sea Systems
NAICS	North American Industry Classification System
ND	Demonstration Scientific and Engineering Pay Plan
NEO PI-R™	NEO Personality Inventory-Revised
NH	Business Management and Technical Management Professional Pay Plan
NICCS	National Initiative for Cybersecurity Careers and Studies
NICE	National Initiative for Cybersecurity Education

NSWC	Naval Surface Warfare Center
NT	Demonstration Administrative and Technical Pay Plan
OI	Occupational Interest
O*Net	Occupational Information Network
OPM	Office of Personnel Management
PAL	Personality Assessment for Leaders
PEO	Program Executive Office
RIASEC	Realistic, Investigative, Artistic, Social, Enterprising, and Conventional
SME	Subject Matter Expert
SOC	Spectrum of Occupations
STEM	Science, Technology, Engineering, and Mathematics
T&E	Training and Experience
UGESP	Uniform Guidelines on Employee Selection Procedures
UNREP	Underway Replenishment

I.   INTRODUCTION

This thesis proposes a framework to increase efficacy of evaluation of technical personnel for NAVSEA. The concepts to be applied as input to the framework are rooted in literature reviews in the areas of bias, personality as it relates to occupational selection, and United States Federal Government process and regulations around technical selection. A conceptual framework will develop using a logical framework. Finally, the framework applies to the NAVSEA processes.

A.   PROBLEM STATEMENT

NAVSEA warfare centers play a pivotal role in providing unique engineering services, products, and critical technologies to meet the evolving needs of the U.S. Navy and its warfighters. Given the importance of staffing as a basis for maintaining organizational knowledge, skills, and abilities (KSAs), warfare centers are committed to attracting, employing, and retaining top-tier personnel. However, competitive promotion processes and associated developmental activities within these centers lack standardization across their parent organization and have not been subject to comprehensive study. NAVSEA is the sole organization in the United States charged with designing, building, delivering, and maintaining ships, submarines, and systems reliably, on time, and within budget for the U.S. Navy (Naval Sea Systems Command, n.d.-a). The technical nature of NAVSEA results in a unique composition of personnel by occupation. As of September 2023, science, technology, engineering, and mathematics (STEM) occupations compose about 53.3% of NAVSEA's workforce. The top 10 STEM occupations at NAVSEA compose 91% of that number (U.S. Office of Personnel Management [OPM], 2024), as shown in Table 1 and referred to as the "NAVSEA Top 10" in short.

Table 1. The Top 10 STEM Occupations at NAVSEA, Ranked by Composition. Adapted from OPM (2023).

1. Mechanical Engineering – 23.4%	6. Electrical Engineering – 6.3%
2. General Engineering – 14.6%	7. Computer Engineering – 5.0%
3. Electronics Engineering – 14.2%	8. Mathematics – 3.0%
4. Computer Science – 10.0%	9. Physics – 2.6%
5. Information Technology Management – 9.4%	10. Naval Architecture – 2.5%

NAVSEA's workforce is also getting less experienced. In 2019, 48.3% of NAVSEA's workforce had less than 10 years of experience, and in 2023, this figure increased to 53.2% (OPM, 2024). A 4.9% reduction in personnel with more than 10 years' job tenure over a 5-year period shows a workforce that is becoming less experienced at an alarming rate. Furthermore, the average service length for employees in STEM positions decreased from 13.3 years in 2019 to 12.5 years in 2023 (OPM, 2024).

Exploring enhancements to the technical personnel selection process within NAVSEA warfare centers could help retain talent. Good organizational selection processes will support objective evaluation and promotion of the best-fit personnel. According to Nevo (1985),

> a test with high FV (face value) may have a better chance than an equivalent test with low FV of (a) inducing cooperation and positive motivation among subjects before and during the test administration; (b) attracting potential candidates; (c) reducing dissatisfaction and feelings of injustice among low scorers; (d) convincing policymakers, employers, and administrators to implement the test; and improving public relations, including relations with the mass media and the courts. (p. 288)

Exploring measures to reassess and refine promotion procedures could contribute to NAVSEA warfare centers' ongoing efforts to attract and retain top-tier technical talent in multiple ways.

NAVSEA warfare centers play a crucial role in maintaining technological dominance. Employee development and promotion is critical for sustaining a workforce that can effectively navigate unique technological challenges associated with naval engineering support. No coordinated effort in improving or improving promotion processes within NAVSEA is apparent. Adequate preparation for a position at one

warfare center may not translate into preparation for another, stifling personnel mobility between warfare centers.

This capstone's main objective is to inform the development of standardized practices within NAVSEA warfare centers by providing an initial basis for standardization of competitive technical promotion processes. A detailed framework for development and improvement of technical evaluation processes is the primary mechanism to accomplish the objective.

B.   RESEARCH QUESTIONS

This capstone aims to answer a critical question at the core of professional development and promotion processes within NAVSEA and its warfare centers: How can research from related fields of study be used to create a framework for the construction and evaluation of processes used to assess technical personnel within NAVSEA warfare centers? This primary research question aims to explore how to incorporate research from pertinent or ancillary fields to bolster the effectiveness of assessment processes for career progression of technical personnel across the warfare centers.

With the main research question in mind, secondary research questions have been developed, and the assessment method will be applied to the promotion processes within warfare centers. The following secondary questions are addressed in this capstone:

1. Can this framework be used to evaluate current processes within NAVSEA warfare centers and compare them to industry practices?
2. How should employee development, in general, should align with assessment methods?

This report examines a broad range of literature to identify concepts that are useful for increasing the efficacy of current processes and an evaluation framework based on the identified concepts is provided. This framework is demonstrated on OPM processes to assess its effectiveness. Answers to these questions collectively support the development of a comprehensive framework for improving career advancement processes both inside and outside of NAVSEA warfare centers.

C. RESEARCH APPROACH

The literature review includes reviewing material such as government documents, academic studies, publications, and practitioner journals to establish a foundation for the study. A thorough examination of artifacts addresses relevant topics to provide a foundation of pertinent knowledge and insights that are used as a basis for framework development and its notional application. Additionally, the review analyzes an analysis of federal guidelines, procedures, and processes to identify existing guidance, laws, and their relation to NAVSEA. By integrating insights from academia and government sources, the study synthesizes the research to form a comprehensive understanding of NAVSEA's promotion and interview processes and related concepts, thereby informing the development of an effective evaluation framework.

D. LIMITATIONS AND SCOPE

This capstone focuses on canvassing available information sources, such as academia and organizational documentation. Limitations in obtaining permissions from warfare center captains to collect data, and gaps in the promotion process limit the scope. Future research, including surveys from multiple warfare centers, surveys, and interviews of various stakeholders in the process, would be invaluable. Acknowledging these limitations is crucial, as they could influence the scope of the data collection and analysis.

E. PROJECT ORGANIZATION

The thesis consists into six chapters to provide a structured exploration of research related to professional development and promotion processes for technical personnel. Chapter I outlines the project's foundation, the problem statement, research questions, research approach, research limitations and scope, and the organization of project. Chapter II offers insight into the NAVSEA organization and organizational context. The internal and external environments of NAVSEA are explored. Inferences are made about the internal environment of NAVSEA based on data in the public domain. Chapter III includes a comprehensive literature review that explores fairness and bias, various interview types and formats, the relationship between personality traits and different occupations, and relevant government guidance, policies, processes, and

procedures. Chapter IV proposes a notional framework for evaluation of promotion processes and development. Information discovered via the literature review is synthesized and used to define a framework. Chapter V applies of the notional framework against existing processes. Chapter VI provides a summary of research findings, conclusions drawn from the analysis, and recommendations for further research.

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II. BACKGROUND

A. NAVAL SEA SYSTEMS COMMAND

The Naval Sea Systems Command (NAVSEA) is the largest of the Navy's five commands. Currently, it is comprised of approximately 75,000 civilian, military, and contractor personnel, it is the only organization charged with the design, construction, and maintenance of shipboard systems. NAVSEA manages approximately one hundred and fifty acquisition programs, billions of dollars in foreign military sales, and in-service activities for the entire fleet (Naval Sea Systems Command, n.d.-a).

The organization has a well-defined structure. At the top of the organization is its leadership; the Chief of Naval Operations (CNO). Subordinate to the CNO are the Commander of NAVSEA (COMNAVSEA) and executive director pair. Leadership oversees the various program offices, directorates, and field activities which comprise the organization. The Program Executive Offices (PEOs) manage the business of shipbuilding and sustainment for the Navy. These represent the activities of the organization, as they manage the funding for a mix of government and non-government activities to execute programs. Directorates are responsible for competence in specializations germane to shipbuilding and sustainment. They promote adherence to specification, standard, and policy for naval shipboard systems. Field Activities represent the unique capabilities of the organization. They enable decision making in the business and technical capacities by providing expertise in specialized technical domains and execute specialized mission activities inherent to the defense of the United States, such as in-service weapon system sustainment and life cycle engineering services or provision of subject matter experts for acquisition support. They are custodial of invaluable national assets such as Four Navy (Public) Shipyards: Norfolk, Portsmouth, Puget Sound, Pearl Harbor, David Taylor Model Basin, DDG Land Based Engineering Site (LBES), Pacific Missile Range Facility, and numerous specialized test and research laboratories. A complete list of program offices, directorates, and field activities can be found on the NAVSEA website www.navsea.navy.mil.

B. WARFARE CENTERS DESCRIPTION AND MISSION

Naval Surface Warfare Centers (NSWCs), as part of Naval Sea Systems Command (NAVSEA), provide the Navy with critical technology, engineering services, and industrial support to the warfighter. These services and solutions are often of the nature that private industry cannot or will not provide. Warfare centers are also custodial of the engineering knowledge and facilities (often considered national treasures) required to build or support unique systems and equipment. These special organizations provide leverage to the government in working with private industry entities such as original equipment manufacturers and defense contractors. Warfare centers provide research, design and development, shipboard testing, land-based testing and evaluation, acquisition support, in-service engineering, integrated logistics support and overall life cycle engineering services for systems under their respective cognizance (Naval Sea Systems Command, n.d.-b).

There are eight surface warfare centers and two undersea warfare centers. The Carderock Division, based in Bethesda, Maryland, provides cradle-to-grave support of the surface fleet (and some undersea). Primary functional areas supported are environmental systems, hull forms (hydrodynamics), ship design and integration, signatures and silencing, and structures and materials. This division is also home to the David Taylor Model Basin (Naval Sea Systems Command, n.d.-d). NSWC Philadelphia, Pennsylvania, specializes in machinery controls, propulsion, electrical generation and distribution systems, and auxiliary systems and is responsible for cybersecurity of these systems. The Philadelphia Division houses various land-based test sites such as the DDG-51 Arleigh Burke Class Destroyer propulsion and electrical systems test site. NSWC Corona, California focuses on data analytics. Specifically, supporting fleet readiness. This division has classified laboratories and facilities to analyze data and assess the performance of Navy systems (Naval Sea Systems Command, n.d.-i). NSWC Crane, Indiana, is focused on harnessing the power of technology for the warfighter, specializing in expeditionary warfare, strategic missions, and electronic warfare (Naval Sea Systems Command, n.d.-c). NSWC Dahlgren, Virginia, primarily focuses on guns and ammunition. They research and innovate targeting and fire control systems, directed energy systems, weapons and missile systems integration (Naval Sea Systems Command,

n.d.-f). NSWC Indian Head, Maryland, focuses on energetics, such as explosives, propellants and fuels, and explosive ordinance disposal solutions (Naval Sea Systems Command, n.d.-g). NSWC Panama City, Florida, specializes in mine warfare, naval special warfare, diving and life support, and amphibious and expeditionary maneuver warfare systems, as well as other missions in the Littoral Battlespace (Naval Sea Systems Command, n.d.-h). NSWC Port Hueneme, California primarily specializes in surface warfare systems, underway replenishment (UNREP), surface gun and missile systems, radar systems, and directed energy weapons. NAVSEA also operates two undersea warfare centers that provide analogous support to the submarine fleet (Naval Sea Systems Command, n.d.-j).

1.　　Performance/Hiring Data

As of 1 October 2023, NAVSEA estimated its size to be 86,886, inclusive of active military, contractors, and government employees (Naval Sea Systems Command, n.d.-b) and of that number, there are 36,355 federal employees. As of September 2023, 19,376 of those employees were of the STEM category, and 17,364 of those personnel are STEM employees with the occupational distribution as described in Table 1. Those 17,364 employees (comprised of 10 occupations) represent 47.7% of the total workforce (OPM, 2024). This Top Ten STEM demographic at NAVSEA is also getting less experienced with time. Table 2 and Figure 1 show the number of personnel having a length of service less than 10 years has increased in 2023 as compared to 2019, and that pattern persists through the range, starting at the ten-year length of service mark (OPM, 2024). This trend indicates a less experienced population in 2023. Furthermore, the data indicates the number of employees with service lengths over 10 years have become 3.15% less experienced over that five-year period (OPM, 2024).
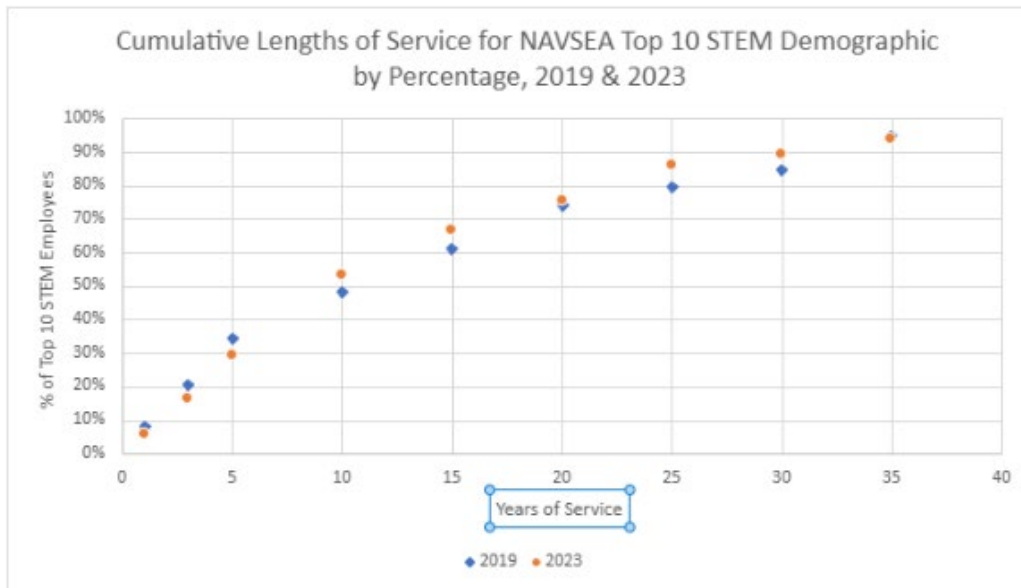
Figure 1.　Cumulative Lengths of Service for NAVSEA Top 10 STEM Demographic by Percentage, 2019 and 2023.

Turnover for the selected occupations is measured as a transfer of personnel within the government and between the government and private industry. Data to calculate the NAVSEA Top 10 turnover ratio was obtained from OPM's FedScope tool and is depicted in Table 2. The subsequent calculated turnover rates are presented in Table 3.

Table 2.　NAVSEA Top 10 STEM Demographic by Separations and Accessions 2015–2023

Year	Separations	Transfer Outs	Left NAVSEA	Accessions	Transfer Ins	New Hires	Size
2014							13394
2015	596	67	529	1308	40	1268	14289
2016	734	89	645	1275	40	1235	15014
2017	784	80	704	1004	32	972	15395
2018	863	101	762	1385	55	1330	16042
2019	985	107	878	1497	65	1432	16620
2020	868	97	771	1301	53	1248	17167
2021	1000	98	902	1112	47	1065	17492
2022	1494	106	1388	1044	41	1003	17253
2023	1056	160	896	1112	47	1065	17364

Note: Data retrieved from FedScope

Table 3. NAVSEA Top 10 STEM Demographic Calculated Turnover Rates
2015–2023

Metric	2015	2016	2017	2018	2019	Average
Determine how many employees left the company in a given time period (Separations).	596.00	734.00	784.00	863.00	985.00	
Calculate the average number of employees for the same time period by adding the number of employees at the beginning and the end and dividing it by two. =(FY19+FY20)/2	13841.50	14651.50	15204.50	15718.50	16331.00	
Divide the number of employees who left by the average number of employees.	0.04	0.05	0.05	0.05	0.06	
Multiply the result by 100 to get the turnover rate percentage.	4.31	5.01	5.16	5.49	6.03	5.20
Metric	2020	2021	2022	2023		Average
Determine how many employees left the company in a given time period (Separations).	868.00	1000.00	1494.00	1056.00		
Calculate the average number of employees for the same time period by adding the number of employees at the beginning and the end and dividing it by two. =(FY19+FY20)/2	16893.50	17329.50	17372.50	17364.00		
Divide the number of employees who left by the average number of employees.	0.05	0.06	0.09	0.06		
Multiply the result by 100 to get the turnover rate percentage.	5.14	5.77	8.60	6.08		6.40

Note: Calculations are based on data retrieved from FedScope

The turnover of the subject technical personnel at NAVSEA increased from its lowest value, 4.31% in 2015, to 6.08% in 2024, peaking at 8.6% in 2022. Given the data, it is clear that overall level of experience of technical personnel is trending downward.

2. Economic View

Reconciling differences in compensation between private industry and the federal government has proved challenging, and in some technical sectors, such as cyber security, the government has not been able to secure an adequate level of talent. To illustrate the difference, North American Industry Classification System (NAICS) data will be used. Federal agencies use the NAICS standard in "classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy" (U.S. Census Bureau, n.d.).

Existing categories of federal occupations as listed on OPM do not correspond with NAICS categories. To match the NAVSEA top 10 technical occupations closely, five similar occupational classifications were selected for comparison, depicted in Table

4. The average disparity in pay between these two sectors for these occupational categories in 2022 was a staggering 36.6%.

Table 4.   Pay Disparity between Federal and Private Sector Technical Occupations, 2022. Source: Quarterly Census of Employment and Wages (2024).

Occupational Category	Federal	Private	Difference
54–3 - Architectural, Engineering, and related services	$92,177	$132,767	$40,590
541511 Custom Computer Programming Services	$48,170	$152,069	$103,899
54169 Other Scientific and Consulting Services	$107,647	$111,973	$4,326
541–3 - Engineering Services	$92,197	$112,453	$20,256
541–1 - Computer System Design Services	$67,088	$132,767	$65,679
Average	$81,456	$128,406	$46,950

The BLS maintains data on the turnover in both public and private sectors via their Job Openings and Labor Turnover Survey (JOLTS) tool. However, technology, engineering, or related fields are not categorically represented. A summary of turnover for all private sectors beginning in 2014 is provided in Table 5.

Table 5.   Turnover in Private Sector Technical Occupations, 2014–2024. Source: BLS (2024).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	3.6	3.7	3.6	3.7	3.7	3.7	3.8	3.7	3.9	3.9	3.7	3.8
2015	3.9	3.8	4.0	3.9	3.8	3.9	3.8	3.9	4.0	3.9	3.9	4.0
2016	3.9	4.1	4.0	3.9	4.0	3.9	3.9	3.9	3.8	3.9	3.9	3.9
2017	4.0	3.9	4.0	3.8	4.0	4.1	4.0	4.0	4.0	4.1	4.0	3.9
2018	4.0	4.0	4.1	4.0	4.1	4.1	4.1	4.1	4.1	4.1	4.3	4.1
2019	4.0	4.1	4.1	4.2	4.1	4.1	4.3	4.1	4.2	4.1	4.1	4.2
2020	4.2	4.2	12.7	10.1	3.8	4.0	4.1	3.7	3.9	4.0	4.4	4.4
2021	4.1	4.2	4.2	4.4	4.3	4.3	4.4	4.4	4.6	4.3	4.6	4.5
2022	4.6	4.4	4.5	4.5	4.4	4.3	4.2	4.4	4.2	4.1	4.2	4.2
2023	4.3	4.2	4.2	3.9	4.1	4.0	4.0	3.9	3.9	4.0	3.8	3.8
2024	3.8	3.9	3.7	3.7	3.7	3.5	3.7	3.6	3.6	3.6		

3.   Technology

The internet offers many opportunities for both job seekers and posters. Online professional networks, specialty recruiting, and talent management firms and the widespread availability of online job boards are widely available. Companies like

roberthalf.com, dice.com, monster.com, indeed.com, and LinkedIn offer resources for both the job seeker and the job poster (Half, 2025).

These services include resume help, interview support, salary lookup, job search tools, and data such as job trending by location. Linkedin.com has partnered with Microsoft and brings technology to the forefront of the job market. The company currently has over 1 billion members in over 200 countries and territories, and its platform has permeated the global workforce (LinkedIn, n.d.). LinkedIn has the full weight of Microsoft and AI technology driving its core business in this area. According to Microsoft's 2023 annual report, they are using AI to "help our members and customers connect to opportunities and tap into the experiences of experts on the platform." (para 54).

4.   Roles and Importance of Technical Personnel

The technical personnel at NAVSEA hold various roles to support their respective mission and all of these roles support Technical Authority (TA). Technical authority within the context of NAVSEA is defined 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 DON policy, requirements, architectures, and standards" (Department of the Navy [NAVSEA], 2014). It is through technical authority that engineering activities are carried out competently, according to specification and standard. It is the role of technical authority to support program offices in making technically sound decisions.

NAVSEA instruction 5400.111 provides implementation policy of TA for organizations under NAVSEA cognizance. The purpose of this instruction is to define the engineering and technical authority policies by defining TA responsibility and roles for NAVSEA organizations. The policy defines interaction between three stakeholders or chains of command: business unit, technical authority, and programmatic authority. In this paradigm, program offices maintain the program according to cost, risk, and scope and rely upon support personnel provided by business units (warfare centers are considered business units). The technical authority heralds technical standards and best practices. All three parties collaborate in order to deliver products to the warfighter

competently, on time, and within budget. The policy also promulgates the concept of engineering agent, defined as "an individual or organization empowered to assist technical authorities to deliver best value products to the fleet" (NAVSEA, 2014). Business units source these resources.

Given the role of NAVSEA and its inherent responsibility of providing and maintaining capabilities to the warfighter, it is apparent that development and retention of technical personnel is paramount. The personnel within NAVSEA are directly responsible the well-being surface fleet. Program offices and Technical Authorities (known as technical warrant holders) rely on business units to provide evidence, and information, and technical surveillance on both industry and a target platform about propulsion, electrical, weapons, networks, and a litany of other functional areas. The government processes are specialized; thereby the personnel within NAVSEA are specialized. As government agents, insulated from the forces of supply and demand, our technical personnel provide an objective and impartial view to stakeholders, provide advantage as a technical resource for program offices to use when working with industry, and perform the work that industry cannot or will not perform for the betterment of the country. It is critical to not only retain these personnel but also support career management in a fashion that develops and promotes the best fit for positions within this ETA structure.

III. LITERATURE REVIEW

A. FAIRNESS AND BIAS

1. Introduction

The federal government addresses fairness in hiring via Civil Service Reform Act (CSRA) of 1978. Current merit system principles in the civil service are based on the CSRA, which aims to "...provide the people of the United States with a competent, honest, and productive workforce (Sect. 3, para. 1)." (CSRA, 1978). The CSRA also states "...to improve the quality of public service, Federal personnel management should be implemented consistent with merit system principles (Sect. 3, para. 1)" (CSRA, 1978).

Existentially related to the provision of an honest workforce are the concepts of fairness and bias. By definition, a process which contains bias is not fair, as concepts fundamental to meritocracy rest upon the foundation of objectivity. This section will elaborate on literature about guidance in fairness and bias in selection processes within the context of federal government, for ultimate application as input to the framework under development. This paper does not aim to contextually define fairness or bias outside of the traditional sense. For the purpose of concept exploration, the terms as defined by Meriam-Webster will be used as follows:

Bias - "an inclination of temperament or outlook, especially a personal and sometimes unreasoned judgment" (Merriam-Webster, n.d.-a)

Fairness - "the quality or state of being fair; marked by impartiality and honesty, free from self-interest, prejudice, or favoritism" (Merriam-Webster, n.d.-b)

The literature review is scoped to types of cognitive biases having evident and sensible relation to the technical selection process within the context of fairness. Selection processes and related activities are naturally subject to the fundamental aspects of the human condition and reduction of these effects is a central theme of this work.

2. OPM Guidance on Fairness and Bias

The Office of Personnel Management addresses fairness in the selection process through publicly available guidance documents intended to inform organizations about overall hiring and selection processes. The Assessment Decision Guide (ADG) was developed to serve "as a resource for agencies designing assessment strategies to fill critical vacancies at all levels" (U.S. Office of Personnel Management, n.d.-m, p. 1). Through this guide OPM refers agencies to the Uniform Guidelines on Employee Selection Procedures (UGESP, 29 CFR Part 1607). Through the ADG, OPM refers agencies to the Uniform Guidelines on Employee Selection Procedures (UGESP), 29 CFR Part 1607. The Uniform Guides on Employee Selection Procedures are part of the code of federal regulations, Title 29 – Labor, Part 1607. These procedures are intended to guide the proper use of test and selection procedures. As per the ADG, testing fairness and adverse impacts concerns are addressed in the UGESP.

3. Relevant Bias

Literature centering on bias is vast, and bias is categorized in many ways. Given the multidimensional nature of the topic, it is essential to scope the review to relevant elements. Thus, this section will focus on relevant bias and does not cover all of its forms.

The Misinformation Effect is the tendency for information introduced after an occurrence to alter a person's memory of that occurrence. This effect was first studied by Elizabeth F. Loftus and John C. Palmer and documented in their 1974 publication Reconstruction of Automobile Destruction: An Example of the Interaction Between Language and Memory. The study showed that information introduced about an event after its occurrence "can cause a reconstruction in one's memory of that event" (Loftus & Palmer, 1974, p. 585). Subjects viewed identical films of car accidents. Afterwards, the subjects were asked to estimate the speed of the vehicles during the accident, but different words were used to describe the collision, such as collided, bumped, contacted, smashed, and hit. Questions that used "smashed" resulted in higher speed estimates. Furthermore, upon retest one week later, many of those who were asked questions that used "smashed" in the wording would admit to seeing broken glass when there was no

broken glass associated with the accident (Loftus &Palmer, 1974, p. 587). The authors proposed that:

> two kinds of information go into one's memory for some complex occurrence. The first is information gleaned during the perception of the original event; the second is external information supplied after the fact. Over time, these two sources are integrated in such a way that we are unable to tell from which source some specific detail is recalled. (p. 588)

Guards against the misinformation effect are present in some legal systems, where asking a question in such a way as to suggest or imply information is prohibited ("leading the witness").

Anchoring bias is a bias that weighs the first piece of information learned about a situation too heavily. Subsequent evaluation of the situation tends to be skewed relative to that information. This bias is rooted in the works of Amos Tversky and Daniel Kahneman, as described in Judgment under Uncertainty: Heuristics and Biases. They demonstrated an anchoring effect, where subjects were asked to estimate various percentages of miscellaneous quantities with relation to a randomly chosen value as a starting point. Different groups of subjects were asked the same questions, but given different initial numbers, and then asked to adjust the number higher or lower to match their estimates. The arbitrary initial values had a marked effect on estimates (Tversky & Kahneman, 1974).

Framing bias, or framing effect, was first introduced in the work The Framing of Decisions and the Psychology of Choice, published in 1981 by Amos Tversky and Daniel Kahneman. Their work is centered on rationality of choice. The general thought is that rational choices should be consistent given consistent inputs, without regard to how the inputs are presented. In their work, the authors show that framing the same problem differently violates the principles of consistency and coherency in the decision-making process. The authors were able to obtain a systematic reversal of preferences of a subject population based on framing the same decision in different ways. In this study, two sets of students from different universities are presented with the same problem and a decision must be made as to the solution from the options presented, as shown in Table 6.

Table 6.   Framing Bias Example. Source: Tversky and Kahneman (1981).

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:	
If Program A is adopted, 200 people will be saved. [72 percent chose this] If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved. [28 percent chose this]	If Program C is adopted 400 people will die. [22 percent chose this] If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die. [78 percent chose this]

The response of the two groups was differentiated on framing. Although the problem is the same, the framing of the problem caused the groups to come to two different solutions. The prospect of saving two hundred people seemed more palatable than the certain demise of 400. The first set of students overwhelmingly chose Program A, and the second set of students overwhelmingly chose Program D. However, the problem was logically the same in both cases. The decision bias resulted from responses to positive versus negative framing of the options.

B.   INTERVIEW TYPES, FORMATS AND CANDIDATE SELECTION

1.   Introduction

Interviews can be useful to obtain insights into the experiences, viewpoints, and actions of participants. The three main methods of interviewing—structured, semi-structured, and unstructured—each have their own advantages and disadvantages in terms of providing different levels of flexibility, structure, and depth for gathering data. The benefits, difficulties, and best practices of structured, semi-structured, and unstructured interviews are all covered in this overview of the literature.

Structured interviews use a predetermined set of questions and scoring guidelines, which are crafted to guarantee consistency and objectivity in the evaluation of candidates. Their efficiency in reducing biases and improving dependability in evaluation processes is highlighted by the research. Semi-structured interviews provide an equilibrium between rigidity and adaptability, permitting researchers and participants to work together while discussing comprehensive topics. Unstructured interviews offer depth and

breadth of data collecting and give a relaxed, conversational setting that is ideal for delving into complex topics.

2. Structured Interviews

According to Structured Interviews: A Practical Guide, structured interviews are implemented to ensure that all candidates are provided with the same opportunity and assessed consistently. This is achieved by asking candidates the same set of questions in the same order and evaluating candidates by using the same rating scale. Moreover, all interviewers are trained to reach consensus on the job candidates' answers. It increases fairness and reliability in the assessment process. The effectiveness of structured interviews is proven by the evidence that they have high reliability, validities, and legal defensibilities as a selection tool (United States Office of Personnel Management, 2008).

Developing a structured interview involves eight key steps, including conducting a job analysis, determining the competencies to be assessed, selecting the interview format, developing questions, creating rating scales, piloting questions, creating an interviewer's guide, and documenting the process (United States Office of Personnel Management 2008). Each step is crucial for the structured interview to accurately evaluate candidates' qualifications and competencies while maintaining fairness and consistency in the assessment process (United States Office of Personnel Management, 2008). Fontana and Frey (2000) further explain that structured interviews follow a standardized format, with fixed questions and predetermined scoring criteria to facilitate objectivity and reduce bias.

Interviewers try to maintain a neutral stance throughout the interview, balancing casual friendliness with maintaining a professional demeanor. Although they strive to minimize errors, response effects can occur due to various factors such as respondent behavior, the nature of the task, or the interviewer's characteristics. In structured interviews, interviewer influence is minimized by following a predetermined set of questions, but some variation in communication style and tone may still exist.

Despite the efforts of researchers to guarantee consistency, Fontana and Prokos (2007) provided insight into the possible sources of error in structured interviews. They

pinpoint three main areas of inaccuracy: interviewer traits, task characteristics, and respondent behavior. Respondents may purposefully modify their answers to give socially acceptable answers or leave out pertinent details. The qualities of responses can also be impacted by the traits and questioning strategies of the interviewers. These findings highlight how crucial it is to create interview protocols that reduce bias potential and guarantee interviewer training to preserve consistency and dependability in data collection procedures. Structured interviews provide an accurate and legitimate way to evaluate applicants in job situations while maintaining consistency, fairness, and legal justifiability (Fontana & Prokos, 2007). Organizations can streamline their hiring procedures and choose qualified candidates for job openings by using the structured interview technique described in the literature.

3. Semi-Structured Interviews

A key role in qualitative research methodology is played by semi-structured interviews, which provide a middle ground between the flexibility of unstructured interviews and the rigidity of fully structured ones. According to Petrescu et al. (2017), semi-structured interviews serve as a bridge between unstructured interviews that rely heavily on oral communication and structured interviews that follow a more structured style and facilitate collaboration between the informant and the investigator. This cooperative element is essential because it allows respondents to provide open-ended answers, which promotes a more thorough sharing of data (Petrescu et al., 2017).

Furthermore, Mannan and Afni (2020) emphasize the value of semi-structured interviews in effectively gathering data. Researchers can go further into particular areas of interest by using a standard set of questions that allows for the inclusion of new questions as the conversation progresses. This flexibility makes it possible to thoroughly explore topics and guarantees that significant insights are not missed (Mannan & Afni, 2020).

Adhabi and Anozie (2017), who highlight that the lack of strict adherence enables researchers to modify their questions in response to the interviewee's answers, further explain the flexible aspect of semi-structured interviews. This flexibility allows for a closer relationship between the participant and the researcher, which enhances

comprehension of the topic being studied. Semi-structured interviews are particularly useful for drawing in participants and extracting subtle insights because of their flexibility, even with the inherent challenges of qualitative interviews (Adhabi & Anozie, 2017).

According to Newcomer et al. (2015), semi-structured interviews take place in real life in a conversational manner with an emphasis on one responder at a time. Interviewers move through subjects and allow room for follow-up questions to dive further into participants' responses by combining closed- and open-ended questions. This method enriches the process of gathering qualitative data by fostering an open discussion that can address unanticipated problems (Newcomer et al., 2015).

In conclusion, semi-structured interviews are a useful tool that strikes a compromise between structure and flexibility in qualitative research. They are valuable resources for obtaining comprehensive and detailed data in a variety of contexts due to their collaborative nature, versatility, and capacity to promote in-depth conversations.

4. Unstructured Interviews

Unstructured interviews are widely recognized for their flexibility and ability to gather detailed information. Unlike structured interviews, which rely on predetermined questions, unstructured interviews, "impose few limitations on the questions asked and may consist of spontaneous exchanges between the interviewer and candidate. Unlike the structured interview, the questions asked during an unstructured interview are not necessarily focused on job-related content, and follow-up, and probe questions are permitted and may be numerous" (Townsend, 2005, p. 5). These interviews are a tool for gathering qualitative data because they allow interviewers to delve deeply into topics while keeping the interview process flexible. Studies show "that unstructured interviews may be superior the structured interview when accurate personality judgement is the goal" (Townsend, 2005, p. 6).

Beyond information-gathering, unstructured interviews also create a more relaxed and conversational environment. This atmosphere can reduce stress and help candidates feel more comfortable sharing authentic responses. Alshenqeeti (2014) emphasizes this

advantage, pointing out the importance of a casual setting for both interviewer and interviewee. Building on this, Van der Zee et al. (2022) found that "Applicants are more favorably inclined to interviewers who are attentive, warm, and socially perceptive and unstructured interviews allow the communication of these qualities better than structured interviews. There is indeed some empirical evidence revealing that candidates evaluate unstructured interviews more positively than structured interviews" (p. 176). Such findings suggest that the relationships developed by unstructured formats can significantly influence candidate perceptions and possibly the outcomes of the interview.

The flexible nature of unstructured interviews relates to the practical aspects of planning and conducting them. Unstructured interviews, as opposed to structured ones, offer more latitude and flexibility in terms of organizing, arranging, and planning the questions and interview material (Alshenqeeti, 2014). Interviewers can adjust their strategies on the fly to better suit the context and research objectives. Given this flexibility, interviewers can adjust the process on the fly, customizing their strategy to the unique context and study objectives. Interviewers can obtain important insights into candidates' behavior and responses by asking them anything during an unstructured interview, which helps them make better hiring decisions (Chauhan, 2022). Unstructured interviews continue to be a useful tool in qualitative research and employment selection, providing organizations with the chance to conduct in-depth investigation and evaluation despite certain inherent challenges.

5.   Panel Interviews

Panel interviews, also known as board interviews, are a common method of assessing candidates in various selection processes. According to Dixon et al. (2002), a panel interview involves multiple interviewers who assess a candidate together in the same session. Each panelist assesses the candidate's answers separately throughout the interview; the ratings are combined together to produce the final panel score.

Dixon et al. (2002) review several meta-analyses that compare panel interviews to individual interviews, noting that the results are inconclusive. For example, Wiesner and Cronshaw (as cited in Dixon et al., 2002) found that the predictive validities for both structured and unstructured formats, whether individual or panel interviews, were similar.

In contrast, McDaniel et al. (as cited in Dixon et al., 2002) reported that individual interviews had higher predictive validity than panel interviews (p. 399). Interestingly, both studies examined interview structure as a moderating variable but obtained different results. Continuing with Dixon et al.'s (2002) analysis, Wiesner and Cronshaw found significantly higher validity for unstructured panel interviews compared to unstructured individual interviews, while McDaniel et al. found no significant difference between the two types. "These same two studies also found that when the interviews were highly structured, the individual interview had similar or higher validity than panel interviews" (Dixon et al., 2002). This suggests that the relationship between interview structure and format critically shapes outcomes, making it difficult to make broad claims.

Overall, panel interviews are a multifaceted selection tool that needs to be carefully considered in order to maximize their value and fairness in hiring practices. To improve panel interview reliability, validity, and fairness in practice, more research is required to better understand the mechanisms underlying panel interview dynamics.

6. Stress Interviews

In a stress interview, the applicant is deliberately out on guard, made to feel ill at ease or "tested." This technique is not recommended under any circumstance (Arthur, 2012). This method purposefully induces anxiety or unease in the candidate to observe how they respond and perform under pressure. Stress interviews have drawn criticism for their possible negative impact on candidates' wellbeing and the questionable validity of their results, even though they may reveal information about a candidate's capacity to manage stress and difficult circumstances.

Arthur (2012) outlines several examples of stress interviewing techniques, including the immediate firing of questions at the applicant upon entering the room, silent staring by the interviewer, and asking questions while appearing distracted or disinterested. These methods are intended to intentionally agitate the candidate in order to evaluate their capacity for composure and effectiveness under pressure.

Studies on stress interviews have investigated the psychological effects they have on applicants, their applicability as a method of selection, and ethical issues. For

example, studies have shown that stress causes individuals to behave nervously under pressure, which can negatively impact their performance and behavior; this disrupts communication, affects their appearance and alters their overall personality, resulting in a bad impression (Patil & Sharma, 2023).

In conclusion, stress interviews are a complex and controversial part of the hiring process. Although they could provide information about how well candidates manage stress, they should be carefully considered due to the possible harm they could cause to candidates' wellbeing and the questionable validity of their results. Organizations should compare the possible advantages of stress interviews with the ethical ramifications and disadvantages that could arise.

7.   Synchronous/Asynchronous Interviews

Asynchronous video interviews have gained popularity in employment selection processes due to advancements in digital technologies (Brenner, 2020). Candidates can record their answers to pre-selected interview questions in these asynchronous interviews, which eliminate the need for in-person communication with interviewers.

Brenner's (2020) study found that "initial research comparing two synchronous and asynchronous video interview formats found significant differences in interview scores and applicant reactions, with candidates in Skype interviews receiving lower ratings and asynchronous video interviews perceived less positively by candidates than synchronous interviews" (p. 3). Despite these preliminary results, more research has illuminated the possible advantages of asynchronous video interviews. Brenner (2020) conducted five empirical investigations using unique samples and "found that these non-interactive formats possess a sufficient level of interrater agreement as well as promising findings regarding criterion validity and incremental validity over cognitive ability tests" (p. 168). Brenner's study offers a more impartial view than previous research that suggested asynchronous interviews may result in lower candidate assessments than synchronous ones. With promising findings in predicting job performance and providing extra predictive value over conventional cognitive tests, these results demonstrate that, despite the lower ratings, asynchronous interviews provide insightful information about candidates' abilities. The findings from Brenner's (2020) systematic review and

empirical investigations suggest that asynchronous video interviews offer a viable alternative in the selection process, with advantages in terms of flexibility, scalability, and objective evaluation. Despite conflicting opinions at first, more investigation has shed light on the reliability and efficacy of asynchronous video interviews in determining a candidate's suitability.

To fully comprehend their ideal application and integration into selection procedures, more research on asynchronous video interviews is necessary in the future. Future studies should concentrate on determining optimal procedures, resolving issues raised by candidates, and enhancing the validity and reliability of these interview formats.

8. Interviews in Relation to Personality Types

Conducting interviews to assess personality types has become an important area of interest in academic study, sparking discussion and more research. Research by Powell (2008) suggests that "unstructured interviews format generated more accurate personality judgments" (p. 9). than structured interviews. On the other hand, Braathen and Sørensen (2017), who contend that using a structured interview approach can be advantageous regardless of personality type, offer a different viewpoint. Their findings suggest that, despite individual variances in personality, structured interviews have benefits in terms of consistency and reliability. This demonstrates the interaction between interview format and personality assessment. How well personality traits are evaluated can be influenced by the interview format itself, but it is important to distinguish between the purpose of personality assessment and any potential biases or impacts of the interviewers' and candidates' personalities during the process. Structured interviews offer a more uniform approach that helps reduce biases and guarantees impartiality in the assessment, although unstructured interviews might allow a more thorough examination of personality.

Building on these observations, Blackman (2002) proposes that candidates' personality traits are more likely to emerge during an unstructured interview process. Unstructured interviews have the potential to provide a more accurate assessment of candidates' personalities by allowing for greater spontaneity in responses and less scripting, so providing a real look into their personalities.

In conclusion, the analysis of structured, semi-structured, and unstructured interviews concerning personality types indicates a dynamic interaction between the format of the interview and the evaluation of the traits of the candidates. Structured interviews give a regulated method that improves consistency and reliability, whereas unstructured interviews present chances for deeper insights into personality traits. With a balance between rigidity and adaptability, semi-structured interviews foster cooperation and enable a thorough examination of personality traits. Interviewers can more accurately and effectively traverse the difficulties of personality assessment by utilizing the strengths of each approach.

9.   Types of Validity

The question of whether an assessment accurately measures what it intends to measure is known as validity, and it stands as the foundation in the assessment community (Cambridge Assessment English, 2020). Validity indicates whether an assessment truly captures the desired characteristics or aspects of performance, whereas reliability assures consistency in measurement. As outlined in the OPM Assessment Decision Guide, this section of the literature review attempts to investigate the complex idea of validity, including its types, significance, and methodologies.

Construct validity, which examines the fit between an assessment and the underlying trait it aims to measure, is essential to the validation process. To determine whether the assessment taps into the intended construct—such as intelligence or sociability—evidence must be gathered (U.S. Office of Personnel Management, n.d.-m). Construct validation functions as a thorough inspection, guaranteeing that the evaluation accurately conveys the essence of the characteristic in question.

Content validity assesses whether the assessment's items or tasks make sense in relation to the competencies or job requirements as established by expert judgment and job analysis (U.S. Office of Personnel Management, n.d.-m). A fundamental component of any assessment is content validity, which guarantees that all relevant aspects of the job role or trait being evaluated are covered in detail.

The degree to which an assessment's results predict or correlate with important criteria, like training success or job performance, is known as criterion-related validity (U.S. Office of Personnel Management, n.d.-m). This includes both concurrent and predictive validity (U.S. Office of Personnel Management, n.d.-m). "In a concurrent study, job incumbents (i.e., current employees) are tested and their job performance is evaluated at the same time. The relation between current performance on the assessment and on the job can then be examined" (U.S. Office of Personnel Management, n.d.-m, p. 50).

Face validity is an important factor in determining how applicants view the fairness and relevance of the assessment, even though it is not a conclusive measure of validity. It concerns the degree to which, upon initial inspection, an assessment seems to be a legitimate measure (U.S. Office of Personnel Management, n.d.-m). Face validity is important for encouraging applicant cooperation and acceptance of the assessment process, but it is not the only factor to consider.

According to the U.S. Office of Personnel Management (n.d.-m), incremental validity measures how much a new assessment improves the ability of previous assessments to predict job success. It emphasizes how additional evaluations can improve forecast accuracy above and beyond what can be achieved with stand-alone measurements.

Validity is the basis upon which good assessment procedures are constructed. Each component adds to the thorough validation process, from construct and content validity, which guarantee alignment with underlying traits and job requirements, to criterion-related validity, which establishes predictive power. Although they are different, face validity and incremental validity are crucial in determining how applicants perceive a program and improving predictive accuracy, respectively. It is essential to comprehend and implement these validity concepts when creating efficient assessment instruments that provide valuable insights into people's abilities and performance.

Section III of the Assessment Decision Guide goes into different varieties of assessment methods commonly used in personnel selection. Each method is evaluated based on validity, face validity (applicant reactions), administration methods, subgroup

differences, development and administration costs, and return on investment (ROI). The methods are as follows:

1. Accomplishment Records: Gather information on candidates past achievements, emphasizing how previous experiences relate to job competencies. This method encourages candidates to explain specific situations they have encountered and the outcomes of their actions, offering a detailed view of their past behavior (U.S. Office of Personnel Management, n.d.-m).

2. Assessment Centers: Employ exercises to assess a variety of skills and competencies, often replicating job-related scenarios. These centers involve interactive tasks such as group discussions and simulations, allowing for a broad evaluation of a candidate's suitability for a role. Assessors observe and rate performance based on predefined criteria, which can provide insight into both individual and group dynamics (U.S. Office of Personnel Management, n.d.-m).

3. Biographical Data (Biodata) Tests: Focus on a candidate's history, including experiences, behaviors, and personal characteristics. By looking at previous actions as an indicator of future performance, biodata tests offer a structured way of linking historical behaviors with job-related outcomes (U.S. Office of Personnel Management, n.d.-m).

4. Cognitive Ability Tests: Evaluate mental processes such as problem solving, reasoning, and memory. These tests aim to estimate an individual's ability to process information and adapt to new or complex job requirements, which provides insight into their potential cognitive capabilities in a work setting (U.S. Office of Personnel Management, n.d.-m).

5. Emotional Intelligence (EI) Tests: Evaluate a candidate's capacity to perceive, interpret, and control their emotions along with the emotions of people around them. This method is useful in determining how well an individual can navigate social environments and handle interpersonal challenges in the workplace (U.S. Office of Personnel Management, n.d.-m).

6. Integrity/Honesty Tests: Focus on assessing personal characteristics related to trustworthiness, reliability, and ethical behavior. These tests examine tendencies toward behaviors like dishonesty or theft and seek to gauge an individual's adherence to moral or professional standards (U.S. Office of Personnel Management, n.d.-m).

7. Job Knowledge Tests: Evaluate a candidate's proficiency in specific knowledge areas relevant to the job. These tests are used when specialized or technical knowledge is essential for the position, and they measure the depth and breadth of a candidate's expertise (U.S. Office of Personnel Management, n.d.-m).

8. Personality Tests: Examine the five traits that are best known as the Big Five or the Five-Factor Model. These assessments aim to understand how

a candidate's personal attributes align with the demands of a job, often using self-report measures to gather information about behaviors and preferences (U.S. Office of Personnel Management, n.d.-m).

9. Reference Checking: Involves gathering information from previous employers or other sources about a candidate's past work performance. This method provides additional context on the candidate's qualifications and reliability, offering third-party validation of their competencies (U.S. Office of Personnel Management, n.d.-m).

10. Situational Judgment Tests: Present hypothetical job scenarios to candidates and ask them how they would respond. These tests aim to assess decision-making skills, problem-solving abilities, and the application of judgment in workplace situations (U.S. Office of Personnel Management, n.d.-m).

11. Structured Interviews: Use predetermined questions to evaluate a candidate's competencies. By asking the same set of questions to all candidates, structured interviews provide a consistent and standardized approach to measuring how well individuals meet the job requirements (U.S. Office of Personnel Management, n.d.-m).

12. Training and Experience (T&E) Evaluations: Rely on self-reported assessments of a candidate's relevant job experience. This method helps screen applicants based on their previous roles and responsibilities, often used in the early stages of the hiring process (U.S. Office of Personnel Management, n.d.-m).

13. Work Samples and Simulations: Involve asking candidates to perform tasks or simulations that closely mimic actual job duties. This hands-on approach allows for direct observation of how well candidates can complete job-related tasks, providing practical insight into their abilities (U.S. Office of Personnel Management, n.d.-m).

Each method varies in its applicability depending on the specific job, competencies required, and the resources available for assessment development and administration (U.S. Office of Personnel Management, n.d.-m).

C. PERSONALITY TRAITS WITH RELATION TO DIFFERENT OCCUPATIONS

1. Introduction

The current research on personality traits as they relate to occupations is vast. For the purpose of this paper, interests lay in the relationship between occupational selection and personality type. Individual personality traits have been linked to class designation, occupational attainment, career progression, and other aspects of occupational interest. However, much of this work does not directly support the objective of this capstone. As

such, scope of the literature review will be those works relating personality types to occupation selection. Current research describing personality types and how they relate to occupation selection references or predicates on two theories: Holland's Theory of Career Choice and application of the Five Factor Model of Personality.

2. Significant Works

An early work of significance is Occupational Choice: A Conceptual Framework (Blau et al., 1956). In this book, the authors pose that individual selection of occupation can have psychological, economic, and social motivators, and the decision cannot be attributed to any one factor. They frame factors thought to contribute to individual occupational selection in terms of socioeconomics and invite the perspectives of three disciplines—psychology, economics, and sociology--in the development of an inclusive conceptual framework. Blau et al. (1956) asserted that isolated determinants cannot explain occupational choice, and that elements of choice must not be considered apart from the elements of selection, social structure, and several other variables. Furthermore, occupational selection is thought to be based on a culmination of developmental experiences, and people commit to different occupations at different junctures in their development.

Using information from each field, the authors developed a schema for individual occupational selection. The framework is centered on two facets of social structure as it relates to individual occupational selection: its effects on the individual and its effects on external factors, as shown in Figure 2. The boxes represent groups of factors at discrete junctures in the decision path and are traversed from top to bottom.

Internal Conditions	External Conditions
Biological Conditions	**Physical Conditions**
Native Endowment	Resources
	Topography
	Climate
Social Structure	**Social Structure**
Social Stratification System	Social Stratification System
Cultural Values and Norms	Cultural Values and Norms
Demographic Characteristics	Demographic Characteristics
Personality Development	**Historical Change**
Educational Development	Trends in Social Mobility
Process of Socialization	Shifts in Industrial Composition
Effect of Available Financial Resources	Historical Development of Social Organizations
Sociopsychological Attributes	**Socioeconomic Organization**
General Level of Knowledge	Occupational Distribution and Rate or Labor Turnover
Abilities and Education Level	Division of Labor
Social Position and Relations	
Immediate Determinants	**Immediate Determinants**
Occupational Information	Formal Opportunities
Technical Qualification	Functional Requirements
Social Role Characteristics	Nonfunctional Requirements
Preference Hierarchy	**Ideal Standards**
Expectancy Hierarchy	**Realistic Estimates**
Perceiving Individual	**Selection Agency Practices**
Occupational Entry	

Figure 2.   Schema of the Process of Occupational Selection, Source: Blau et al. (1956).

Individuals' internal factors are on the left side of the figure, and external factors thought to shape the decision are on the right side. Social structure is considered the root of the process and shared by both the individual and the environment. At the start of the process (top), the left side of the framework marries social structure with biological factors of an individual, and the right side marries social structure with physical conditions (environmental).

The implications described in Figure 2 are significant to this effort. Blau et al. (1956) argued "The internal conditions that govern occupational entry are the result of these different processes of personality development (Box 3), and the external conditions that govern entry have their roots in historical changes in the social structure" (Box 3). (p. 540).

Through their work, they asserted that social structure and biology are paired as the initial conditions to an individual's occupational selection. These elements are predicate to the formation of personality, which in turn supports sociological attributes, which support immediate determinants of the decision. Summarily speaking, it has been established that personality is deeply rooted in occupational selection, which is cornerstone to this work.

Dr. John Holland's theory of vocational choice pertains to occupation selection regarding personality. His work is widely used in career planning to pair individuals with careers suitable to their personality types. For example, a person who enjoys being physically active all day may not be suited for an office job, or a person who enjoys mathematical problem solving may not be the best candidate for a career in publishing.

Holland's theory is rooted in six background principles (Holland, 1997). These principles were considered in the development of both personality and environmental types:

1. The choice of vocation is an expression of personality.
2. Interest inventories are personality inventories,
3. Vocational stereotypes have reliable and important psychological and sociological meanings,
4. The members of a vocation have similar personalities and similar histories of personal development,
5. Because people of a vocational group, they will respond to many situations and problems in similar ways, and they will create characteristic interpersonal environments, and
6. Vocational satisfaction, stability, and achievement depend on congruence between one's personality and the environment in which one works. (pp. 7–11)

These principles are well justified by Dr. Holland in his works, citing literature on the subject from as long as 80 years ago.

According to Holland's theory, both people and environments can be classified as one of six personality types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). Within this framing, individuals will seek out environments which best suit their personality type, where their skills and abilities can be best applied,

and individual behavior is influenced by the relationship between a person's personality and their surroundings (Holland, 1997).

The "Holland Types" are well defined within the theoretical model. They are described in terms of Vocational and Avocational Preferences, Life Goals and Values, Self-Beliefs, and Problem-Solving Style. For this review, the focus is on Vocational and Avocational preferences and Problem Solving as they are mostly relative to a selection process. The types are described in Table 7.

Table 7.   Holland's Personality Types. Source: Holland (1997, pp 21–28).

Holland Type	Vocational and Avocational Preferences	Problem Solving Style
Realistic	Prefers Realistic occupations or situations (e.g., electrician or mechanic) in which one can engage in preferred activities and avoid the activities demanded by Social occupations or situations. Can also associate with people having similar beliefs, interests, and values and avoid people with dissimilar interests, beliefs, and values. Has narrow range of interests.	Uses realistic beliefs, competencies, and values to solve problems at work and in other settings. Prefers concrete, practical, and structured solutions or strategies as opposed to clerical, scholarly, or imaginative activities. Because the Realistic person possesses these preferences, beliefs, competencies, self-perceptions, and values, he or she is apt to be: Conforming Dogmatic Genuine Hardheaded Inflexible Materialistic Natural Normal Persistent Practical Realistic Reserved Robust Self-effacing not Insightful
Investigative	Prefers Investigative occupations or situations (e.g., biologist or medical technologist) in which one can engage in preferred activities and competencies and avoid the activities demanded by Enterprising occupations or situations. Can also find people with similar beliefs and values and avoid people with dissimilar beliefs and values.	Uses investigative beliefs, competencies, and values to solve problems at work and in other settings. Seeks challenging problems. Relies on thinking, gathering information, careful analyses, objective data, and related scholarly practices. Pays less attention to personal feelings or the social environment. Because the Investigative person possesses these beliefs, preferences, competencies, self-perceptions, and values, he or she is apt to be:

Analytical Cautious Complex Critical Curious Independent Intellectual Introspective Pessimistic Precise Radical Rational Reserved Retiring Unassuming |
| Artistic | Prefers Artistic occupations or situations (e.g., writer or interior decorator) in which one can engage in preferred activities and competencies and avoid the activities demanded by Conventional occupations or situations. Can also associate with people having similar beliefs and values and avoid people with dissimilar beliefs and values. | Uses artistic beliefs, competencies, and values to solve problems at work or in other settings. Perceives problems in artistic context, so artistic talents and personal traits (e.g., intuition, expressiveness, originality) dominate the problem-solving process. Because the Artistic person possesses these beliefs, preferences, competencies, self-perceptions, and values, he or she is apt to be:

Complicated Imaginative Disorderly Emotional Expressive Idealistic Impractical Impulsive |

		Independent Introspective Intuitive Nonconforming Open Original Sensitive
Social	Prefers social occupations and situations (e.g., * teacher or counselor) in which one can engage in preferred activities and avoid the activities demanded by Realistic occupations and Situations. Can also associate with people having similar beliefs and values.	Uses social beliefs, competencies, and values to solve problems at work or in other settings. Perceives problems in a social context so problems are viewed more often in human relations terms; social competencies and traits (e.g., seeking mutual interactions and help from others, etc.) dominate the problem-solving process. Because the Social person possesses these beliefs, preferences, competencies, self-perceptions, and values, he or she is apt to be: Agreeable Cooperative Empathic Friendly Generous Helpful Idealistic Kind Patient Persuasive Responsible Sociable Tactful Understanding Warm
Enterprising	Prefers Enterprising occupations or situations (e.g., salesperson or manager) in which one can engage in preferred activities and avoid the activities demanded by Investigative occupations and situations Can associate with people having similar interests, beliefs, and values.	Uses Enterprising beliefs, competencies, and values to solve problems at work or in other situations. Perceives problems in an enterprising context so problems are often viewed in social influence terms. Enterprising traits, competencies, and values (e.g., control of others, traditional beliefs) dominate the problem-solving process. Because the Enterprising person possesses these beliefs, preferences, competencies, self-perceptions, and values, he or she is apt to be: Acquisitive Adventurous Ambitious Assertive Domineering Energetic Enthusiastic Forceful Optimistic Excitement-seeking Resourceful Exhibitionistic Extroverted Self-confident Sociable
Conventional	Prefers Conventional occupations or situations (e.g., bookkeeper or banker) in which one can engage in preferred activities and avoid the activities demanded by Artistic occupations or situations. Can also associate with people having similar interests, beliefs, and values and avoid people with dissimilar qualities.	Uses conventional beliefs, competencies, and values to solve problems at work and in other situations. Follows established rules, practices, and procedures; looks to authorities for advice and counsel. Seeks practical solutions and engages in orderly and careful planning. Has difficulty with ambiguous problems or in synthesizing information from diverse sources. Because the conventional person possesses these beliefs, preferences, competencies, self-perceptions, and values, he or she is apt to be: Careful Conforming Conscientious Dogmatic Efficient Inflexible Inhibited Methodical Obedient Orderly Persistent Practical Thorough Thrifty Unimaginative

A popular graphical model depicting the relationship amongst types is the hexagonal model. This model graphically depicts the relationships between Holland types by the length of the lines between them. In this hexagonal model, the "relations among types, or the psychological resemblances among types, are assumed to be inversely proportional to the distance among types" (Holland, 1997, p. 29). A summary of the relationships is shown in Table 8. A value of three means the types are diametrically opposed, two depicts a more compatible relation, and one depicts the most compatible relation.

Table 8.   Analysis of Holland's Hexagonal Model. Source, Adapted from Holland (1997, p. 35). Source: Holland (1997, p. 35).

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Realistic		1	2	3	2	1
Investigative	1		1	2	3	2
Artistic	2	1		1	2	3
Social	3	2	1		1	2
Enterprising	2	3	2	1		1
Conventional	1	2	3	2	1	

In addition to the hexagonal model, Dr. Holland has formulated 27 well supported hypotheses on types and expected performance (Holland, 1997, p,36). One of these assertions is inextricably related to this work: A person's characteristic reaction to environmental stresses is predictable from his or her personality pattern (Holland, 1997, p,39). Holland (1997) found that:

Realistic type should find dealing with people in helping, teaching, or supervisory ways to be stressful; a conventional type should have difficulty in coping with ambiguous tasks or problems – planning or playing charades; and an Artistic type should have difficulty following prescribed work routines. The various types will cope with stress in the same way that they cope with everyday problems (Holland, 1997).

By this reasoning, a person's reaction to the stressors of an interview based on personality can be described, and an interview type can be characterized as helpful or harmful.

Dr. Holland's work was used by the United States Department of Labor as the basis for the Occupational Information Network (O*Net) and its database of over 1000 occupations. The O*Net content model defines the knowledge, skills, and abilities (KSAs), necessary to classify occupations and the O*net Spectrum of Occupations (SOC) defines the set of real-world occupations in terms of the content model (Putka et al., 2023). The O*Net resources heavily leverage Dr. Holland's work in their O*net Interest Profiler (O*NET® Interest Profiler Manual at O*NET Resource Center (onetcenter.org), O*Net Content Model, and other content.

The five-factor model (also referred to as "The Big Five") is a classification of personality traits by five categories: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience. These traits are assumed to be universal across cultures and form the dimensions of personality. As such, each trait is measured on a continuum ranging from low to high. Additionally, each trait contains sub-traits, called facets (Costa et al., 1992).

In this context, personality traits are dimensions to personality and measured as such. The measurement of each dimension is relative to its respective range between opposites: Neuroticism (N) vs. Emotional Stability; Extraversion (E) or Surgency; Openness to Experience (O) or Intellect; Agreeableness (A) vs. Antagonism; and Conscientiousness (C) or Will to Achieve (Costa et al., 1992). These are considered broad domains, and facets of each domain were developed to help measure the trait. A list of facets associated with their respective ranges is depicted in Table 9.

Table 9.   Costa and McCrae's (1992) NEO PI-R™ Facets. Source: John & Srivastava (1999).

Big 5 Dimensions	Facet (and correlated trait adjective)
Extraversion versus Introversion	Gregariousness (sociable)
	Assertiveness (forceful)
	Activity (energetic)
	Excitement seeking (adventurous)
	Positive emotions (enthusiastic)

Big 5 Dimensions	Facet (and correlated trait adjective)
	Warmth (outgoing)
Agreeableness versus antagonism	Trust (forgiving)
	Straightforwardness (not demanding)
	Altruism (warm)
	Compliance (not stubborn)
	Modesty (not show off)
	Tender-minded (sympathetic)
Conscientiousness versus lack of direction	Competence (efficient)
	Order (organized)
	Dutifulness (not careless)
	Achievement striving (thorough)
	Self-discipline (not lazy)
	Deliberation (not impulsive)
Neuroticism versus emotional stability	Anxiety (tense)
	Angry hostility (irritable)
	Depression (not contented)
	Self-consciousness (shy)
	Impulsiveness (moody)
	Vulnerability (not self-confident)
Openness versus closedness to experience	Ideas (curious)
	Fantasy (imaginative)
	Aesthetics (artistic)
	Actions (wide interests)
	Feelings (excitable)
	Values (unconventional)

The NEO Personality Inventory-Revised (NEO PI-R™) is the standard questionnaire measure of the Five Factor Model (NEO Personality Inventory-Revised | NEO PI-R, n.d.). It is a concise measure of the five major domains of personality and their traits. It includes a job profiler and is geared towards assessment of candidates in support of hiring decisions. There is a strong body of work which investigates occupational selection, and a number of recent studies strongly suggest personality type is a factor in occupational selection.

In the study "Does Personality Matter? Applying Holland's Typology to Analyze Students' Self-Selection into Science, Technology, Engineering, and Mathematics Majors," Chen and Simpson (2015) utilized both Dr. John Holland's personality typology with the Social Cognitive Career Theory (SCCT) "to examine the factors that may affect students ' self-selection into science, technology, engineering, and mathematics (STEM) majors" (Chen and Simpson, 2015, p. 725). The authors demonstrated personality type,

along with other socioeconomic factors, as a statistically significant factor in determining a student's odds of self-selecting a STEM field. The study sampled 2,745 freshmen at a large public research university to investigate the extent to which gender, race/ethnicity, high school academic achievement, parental education level, and family income level increases or decreases the odds that an incoming college student will major in a STEM field. Moreover, the extent to which personality increases or decreases the odds of engaging a STEM field and how personality interacts with the aforementioned factors was also investigated. The authors used logistical regression modeling to determine the relationship between the dependent and independent variables of the study. A student majoring in a STEM field is the dependent variable and the primary independent variables are the Holland personality types. Other independent variables included student demographics, high school achievement, socioeconomic status, and the interaction between demographics and personality type. In their study, Chen and Simpson (2015) found that gender and race, and high school academic achievement are significant predictors of self-selection into a STEM major. Also, they found that "male students were 2.39 times more likely than female students to choose a STEM major (p < .001), and African Americans/Blacks (odds ratio = 1.85, p < .001) and Asians/Pacific Islanders (odds ratio = 2.31, p < .001) were also more likely than Caucasians to major in STEM fields" (Chen and Simpson, 2025, p. 736). Family income or parental education status were not significant in selecting a STEM major (Chen and Simpson, 2015).

Personality type is demonstrated as a significant factor in STEM major selection. Specifically, the Holland personality types of investigative, enterprising, and artistic were the most influential. Chen and Simpson (2015) found that an "if a student's investigative personality score increased by one standard deviation, the odds that he or she would enroll in a STEM major increased by 1.5" (p. 738). They also found that an increase in standard deviation by 1 in the artistic and enterprising scores decreased the odds of enrollment in a STEM major by 1.96 and 1.22, respectively. Regarding interaction between personality type and other independent variables, Chen and Simpson (2015) determined that men with a high social personality score were less likely to engage STEM majors. They found that "if a male student's social personality score increased by one standard deviation, his odds of enrolling in a STEM major decreased by 1.9). The

same increase in a female student's social personality score increased her odds of enrolling in a STEM major by 1.2 "(p. 738).

The implications of this study are profound. The link between personality type and STEM major selection is clear; students with high investigative score or low artistic score or low enterprising personality scores are significantly more likely to engage STEM fields (Chen and Simpson, 2015). Chen and Simpson point out "This result seems to uphold the popular conception of male STEM students as "nerds" - people who lack social skills or are boringly studious (according to the Oxford Dictionaries, http://oxforddictionaries. com/definition/nerd), and it has an important implication for higher education (p. 740)."

The work "Personality traits, preferences and educational choices: a focus on STEM" Coenen et al. (2021) investigates the link between Big 5 personality traits and student preferences for STEM education and occupations. The paper examines a student's propensity towards STEM fields prior to and in addition to the student's actual choice to engage STEM in upper secondary education with respect to the Big Five personality traits. The authors find significant relation between Big 5 traits and both the preferences of a student for STEM education and the choice of specialization in each field. However, the traits for each scenario differ.

The data set for the study is sourced from the Education Monitor Limburg (Onderwijsmonitor Limburg, OML). This is a repository of information for Dutch primary and secondary education students in the province of Limburg and contains administrative data, cognitive test data, and parental data derived from questionnaires. STEM preferences were measured by different measures. The first measure, study preference, is derived from 11 items on a questionnaire for study choice counselling. The second measure, occupational preference, focuses on a 1–5 Likert rating of likelihood of entering a STEM field in the future. These were administered at grade 6 and 9 respectively. Grade 6 is the final year of primary education and grade 9 is the third year of secondary education where children choose their specialization for upper secondary education within the Dutch system. (Coenen et al., (2021), p. 6).

The authors used logistical regression techniques to estimate the relationship between variables and both preference for and choice of S&T specialization. They used an ordered logit model. The model was calculated six times, with each version successively adding variables to the model each time it was calculated. The first version accounted for only indicators of the Big 5, whereas the sixth version accounts for student characteristics such as sex, level of students (in Dutch education system), ethnicity, parental education level, perceived ability in mathematics, IQ test scores, and mathematics and reading test results. As factors are added to the model, trends in other factors can be observed for a specific outcome. The variables belonging to the six levels of progression of the models are shown in Table 10.

Table 10. Six Levels of the Logit Model. Adapted from Coenen et al. (2021, p. 16) and Coenen et al. (2021).

	1	2	3	4	5	6
Openness	X	X	X	X	X	X
Conscientiousness	X	X	X	X	X	X
Extraversion	X	X	X	X	X	X
Agreeableness	X	X	X	X	X	X
Neuroticism	X	X	X	X	X	X
Female		X	X	X	X	X
Atheneum		X	X	X	X	X
Gymnasium		X	X	X	X	X
Confidence in Arithmetic			X	X	X	X
IQ figures				X	X	X
IQ numbers				X	X	X
IQ words				X	X	X
Mathematics test					X	X
Reading test						X
Controls ethnicity and parental education	N	Y	Y	Y	Y	Y

The study found that personality traits are related to both educational and occupational self-selection into STEM fields and the association "rivals that of mathematics achievement and IQ" (Coenen et al., 2021, pp. 26). Although other factors strongly correlate with STEM selection, the Big 5 personality traits were significant determinants. Sex has the highest association with STEM selection, but the personality

traits Openness to New Experience, Agreeableness, and Extroversion had significant impact on the outcome.

As far as specialization choice, the authors analyzed the link between personality and the first decision a student makes in the Dutch educational system with respect to choosing the Science and Technology sub track (Grade 9). The Extraversion trait was found to be the strongest predictor of the actual choice of entering a STEM field and the study found that "higher Openness to Experience, lower Extraversion, lower Neuroticism, and lower Agreeableness are related to stronger preferences and specialization towards STEM" (Coenen et al., 2021, pp. 26).

The difference in the factors that influence these choices between the two genders is significant. Gender plays a significant role in both preference and choice. Through heterogeneity analysis the study found a "strong positive relation between choosing the STEM track and Openness to Experience for girls, while the negative relation between STEM specialization and Extraversion is especially strong for boys" (Coenen et al., 2021, pp. 26). The authors conclude the Big 5 traits are a stronger determinant of STEM preference rather than STEM specialization, except for Extroversion, which is consistent throughout. Higher Openness, lower Extroversion, Lower Neuroticism, and lower Agreeableness are related to stronger preferences. STEM specialization, although associated with preferential traits, is strongly associated with low Extroversion.

D.   GOVERNMENT GUIDANCE, POLICY, PROCESSES, AND PROCEDURES

1.   Introduction

The Office of Personnel Management (OPM) is composed of various offices and programs committed to the mission of guiding federal agencies in workforce policies, programs, and benefits. OPM oversees the civil service of the federal government, facilitates the recruitment of new government employees, and administers health insurance and retirement benefits programs. The practices within NAVSEA warfare centers will be examined by incorporating relevant information obtained from different sections of the OPM website such as Assessments and Selection, General Schedule Qualification Standards, Top 10 STEM Occupational Requirements, Career

Development, Leadership Assessments, Executive Order 13932, the National Initiative for Cybersecurity Careers and Studies (NICCS), government handbooks and additional government links.

The sections laid out below are structured to align with the sections found on the OPM website. Each section below corresponds to a specific tab, providing an analysis of the recruitment approaches, interview methods, assessment validity, and other aspects as presented by OPM. The entire OPM website is not explored because it contains an abundance of resources. This literature review aims to extract the most pertinent information without being overwhelmed by extraneous information.

2.   OPM Website: Assessments and Selection

The Assessment and Selection section of the OPM website serves as a comprehensive resource for individuals seeking to understand various aspects of personnel assessment, assessment methods, and the importance of effective assessment strategies in the federal sector (U.S. Office of Personnel Management, n.d.-b). OPM highlights the importance of performing job analyses to guide personnel assessment processes as a fundamental concept. Job analysis involves identifying job tasks, roles, responsibilities, and the competencies essential for effective job performance. "Basing personnel assessment closely on job analysis results makes the connection between job requirements and personnel assessment tools more transparent, thereby improving the perceived fairness of the assessment process" (U.S. Office of Personnel Management, n.d.-b, para. 5).

OPM highlights the importance of utilizing the Multipurpose Occupational Systems Analysis Inventory-Close-Ended (MOSAIC) methodology for conducting government-wide occupational studies. Utilizing the MOSAIC methodology, "is used to collect information from incumbents and supervisors on many occupations for a wide range of human resource management functions" (U.S. Office of Personnel Management, 2019, p. 2–13). For more detailed explanations, including a full breakdown of the Delegated Examining Operations (DEO) process and MOSAIC competencies, please refer to Appendix B.

3.   OPM Website: General Schedule Qualification Standards

The OPM website provides information regarding the General Schedule (GS) qualification standard for Professional and Scientific Positions. The General Schedule (GS) qualification standard for entry into each occupation covered by the standard and describes the requirements for GS positions involving professional and scientific work (U.S. Office of Personnel Management, n.d.-h). The standard places an emphasis on the specific requirements for each occupation and allows for flexibility in achieving the minimum requirements through training, work experience, or a combination of both (U.S. Office of Personnel Management, n.d.-h).

According to OPM's FedScope tool, 67.4% of the top ten STEM occupations are on the Demonstration Scientific and Engineering (ND) pay plan, 18.1% are on the General Schedule (GS) pay plan, 7.3% are on the Demonstration Administrative and Technical (NT) pay plan and 7.0% are on the Business Management and Technical Management Professional (NH) pay plan. Despite 67.4% of the top ten STEM workforce positions being under the ND pay plan, there is no corresponding section on the OPM website outlining ND qualification standards, unlike the detailed coverage available for GS positions.

According to the OPM website, candidates are deemed fully qualified for entry-level positions if they fulfill the basic criteria listed in each individual occupational requirement (U.S. Office of Personnel Management, n.d.-h). To reach higher-grade levels, candidates also need to meet extra requirements outlined in the standard. Different methods of qualification are allowed by the standard, such as completing a relevant bachelor's degree or having the right combination of education and experience (U.S. Office of Personnel Management, n.d.-h).

The grade level of the position determines the specific education needed, with higher grades requiring more advanced degrees or specialized training (U.S. Office of Personnel Management, n.d.-h). Specialized experience is another important consideration, and candidates should be able to demonstrate the knowledge, skills, and abilities needed for the role (U.S. Office of Personnel Management, n.d.-h). Additional qualification requirements for research positions are covered by the standard, which

emphasizes the value of academic background and experience in scientific research or investigation (U.S. Office of Personnel Management, n.d.-h).

Moreover, the standard provides guidelines for combining education and experience to meet qualification requirements and emphasizes the assessment of specialized experience in relation to grade level progression. It also addresses the use of selective factors for positions requiring specific qualifications or training, ensuring that applicants possess the necessary skills and credentials for the job (U.S. Office of Personnel Management, n.d.-h).

4. OPM Website: STEM Occupational Requirements

The occupational requirements outlined on the OPM website offer a basic understanding of the educational and experiential criteria necessary for these positions. However, they tend to be broad and frequently lack detailed information concerning acquisition roles, fleet-specific tasking, and other essential components integral to naval acquisition. For more detailed explanations, including a full breakdown of each of the occupational requirements, please refer to Appendix C.

5. OPM Website: Federal Wage System Qualifications

According to the OPM website, "The Federal Wage System (FWS) was created to guarantee that the salaries of Federal blue-collar employees align with the current pay scales in the private sector for each local wage area" (U.S. Office of Personnel Management, n.d.-f, para. 1). In contrast, the General Schedule (GS) "is a separate pay system covering most white-collar civilian Federal employees. Surveys of non-Federal employers (including State and local governments) determine the pay for GS employees" (U.S. Office of Personnel Management, n.d.-f, para 16).

The Federal Wage System Qualifications section of the OPM website outlines the Job Qualification System for Trades and Labor Occupations, "how applicants gained their skill and knowledge or the length of time they have spent in a line of work are not as important as the fact that they have the required ability or potential to do the job" (U.S. Office of Personnel Management, n.d.-g, para. 1). For a more detailed explanation of the FWS please refer to Appendix D.

6. OPM Website: Career Development

OPM "developed Governmentwide career path guides to support training and development initiatives with respect to occupations identified by the Chief Human Capital Officers Council, Congress or the President" (U.S. Office of Personnel Management, n.d.-c, para 2). There is a gap of guidance for the top STEM positions within the career path guides provided by OPM leaves personnel uncertain about the specific skills and knowledge they need to develop their careers. This notable gap underscores the need for more comprehensive coverage to address the unique career paths within STEM fields. Without a clear understanding of the competencies needed to advance in STEM fields, personnel might find it difficult to identify their areas of weakness or focus their professional development efforts. This lack of clarity may limit career advancement and effectiveness in roles by making it more difficult to actively seek opportunities for growth and advancement within these roles.

7. OPM Website: Leadership Assessments

The Office of Personnel Management (OPM) provides a range of leadership assessment tools, aimed at identifying, developing, and supporting leaders within the federal workforce. The Executive Core Qualifications (ECQs) serve as the foundation to evaluate leadership potential and effectiveness (U.S. Office of Personnel Management, n.d.-j). For a more detailed explanation of the OPM Leadership Assessments, please refer to Appendix E.

8. OPM Website: Designing an Assessment Strategy

The OPM document "Designing an Assessment Strategy" provides a guide for creating and implementing effective assessment strategies in employment contexts. It outlines the goals of assessment, emerging tools, and models. Effective assessments help organizations hire individuals with the right competencies (U.S. Office of Personnel Management, n.d.-e). The document identifies obstacles that may interfere with assessments efficacy, including a lack of experience and a poor IT infrastructure. The significance of validity, reliability, and minimizing adverse impacts in the selection process is highlighted. Techniques like employing multiple assessment hurdles to

maximize resource utilization and improve hiring decisions are also discussed. The document also covers practical concerns such as application acceptance, administration procedures, and development costs. It recommends that organizations assess each assessment technique according to its validity, reliability, and conformity to the competencies needed for the position (U.S. Office of Personnel Management, n.d.-e).

OPM offers support for agencies lacking assessment expertise. Through its Employee Services division, OPM provides guidance on policy interpretation and compliance with assessment-related regulations (U.S. Office of Personnel Management, n.d.-e). Additionally, OPM's Human Resources (HR) Solutions operates as a fee-for-service division, giving agencies access to government consultants with specialized knowledge in assessments, as well as connections to vendors who provide tailored assessment services (U.S. Office of Personnel Management, n.d.-e).

9. Delegated Examining Operations (DEO) Handbook

The DEO handbook provides guidance for federal agencies to independently manage their competitive hiring processes. It outlines the processes and regulations federal agencies must follow to ensure fair and open competition while complying with merit system principles. The handbook covers all aspects of the hiring process, from job announcements and application procedures to candidate assessment and selection, ensuring compliance with legal standards such as veterans' preference and equal employment opportunity laws. The DEO handbook has seven chapters and fourteen appendices, this section will review the pertinent sections and appendices that are relevant to this thesis. The sections of the DEO handbook that will be addressed are identify job and assessments, conduct/review job analysis to identify competencies/ KSAs, create/review a job opportunity, qualifications review, identify assessment tools, accept and review applications and assess applicants. Administrative portions, such as satisfying public notice requirements, notifying applicants, and requests to delegated examining unit etc., were excluded from this literature review. These sections are procedural in nature and do not have a significant influence on the core areas of job qualification assessments, requirements and competency evaluations. For a more detailed explanation of the DEO Handbook, please refer to Appendix F.

10. Executive Order 13932

Executive Order 13932 of June 26, 2020, "Modernizing and Reforming the Assessment and Hiring of Federal Job Candidates," is a policy directive intended to change how the federal government handles hiring and evaluation procedures (Executive Order No. 13932, 2020). This order, issued by President Trump, emphasizes the need to modernize the hiring practices within the federal civil service "to better identify and secure talent through skills- and competency-based hiring methods" (Executive Order No. 13932, 2020).

It seeks to replace traditional, degree-based hiring practices with a focus on skills and competencies relevant to the job role (Executive Order No. 13932, 2020). By doing so, the order aims to ensure that individuals hired for federal positions possess the necessary skills to fulfill their responsibilities effectively, aligning with the principle of merit-based employment (Executive Order No. 13932, 2020). Additionally, to promote inclusivity and lower barriers to entry into federal employment, the order seeks to expand opportunities for a wider range of candidates, including those with non-traditional educational backgrounds or experiential learning (Executive Order No. 13932, 2020).

The order emphasizes the significance of basing position descriptions and job postings on specific skills and competencies required for the job and orders the revision of job classification and qualification standards (Executive Order No. 13932, 2020). It requires that assessment procedures in the federal hiring process be improved, encouraging hiring agencies to evaluate applicants based on relevant knowledge, skills, competencies, and abilities rather than just academic achievement (Executive Order No. 13932, 2020).

Overall, Executive Order 13932 shows a dedication to updating the federal hiring procedure to make it more effective, inclusive, and representative of the skills required in today's job market.

11. National Initiative for Cybersecurity Careers and Studies (NICCS)

The Cyber Career Pathways Tool, developed by the NICCS (National Initiative for Cybersecurity Careers and Studies), offers an innovative approach to exploring work

roles within the Workforce Framework for Cybersecurity (National Initiative for Cybersecurity Careers and Studies, 2024). This tool offers comprehensive insights into 52 job roles, divides the cyber workforce into five skill communities, and offers practical guidance for professionals, employers, and those looking to enter the cybersecurity field (National Initiative for Cybersecurity Careers and Studies, 2024). Additionally, the tool includes TryCyber micro-challenges, which provide users with practical experience in completing various core cybersecurity tasks, thereby improving their practical skills (National Initiative for Cybersecurity Careers and Studies, 2024).

Through the Cyber Career Pathways Tool, users can gain a thorough understanding of the knowledge, skills, and abilities needed for various work roles, which enables them to identify, build, and navigate potential cyber career pathways (National Initiative for Cybersecurity Careers and Studies, 2024). In addition to helping professionals grow in their careers, the tool helps employers find cyber talent and direct staff members toward opportunities for training and development (National Initiative for Cybersecurity Careers and Studies, 2024). Students and recent graduates can use the tool to plan their training and certification paths to enter the cybersecurity field, explore the National Initiative for Cybersecurity Education (NICE) Framework, and identify relevant work roles (National Initiative for Cybersecurity Careers and Studies, 2024).

Accessible through the Cybersecurity and Infrastructure Security Agency's (CISA) NICCS website, the Cyber Career Pathways Tool is part of a larger initiative to facilitate the development and coordination of the federal cyber labor force (National Initiative for Cybersecurity Careers and Studies, 2024). Created in partnership with the Federal Cyber Workforce Management and Coordination Working Group, which is chaired by CISA, the Department of Veterans Affairs, and the Department of Defense, the tool exhibits a thorough comprehension of the constantly changing demands and characteristics of the cybersecurity environment (National Initiative for Cybersecurity Careers and Studies, 2024).

IV. FRAMEWORK FOR EVALUATION OF PROMOTION PROCESS AND DEVELOPMENT

A. CONCEPTUAL FRAMEWORK

Following is a framework to facilitate improvement and standardization in a way that optimizes outcomes for selection of technical personnel. Elements of related fields were used to develop guiding concepts, which in turn were used as input to the framework. Figure 3 illustrates this process.
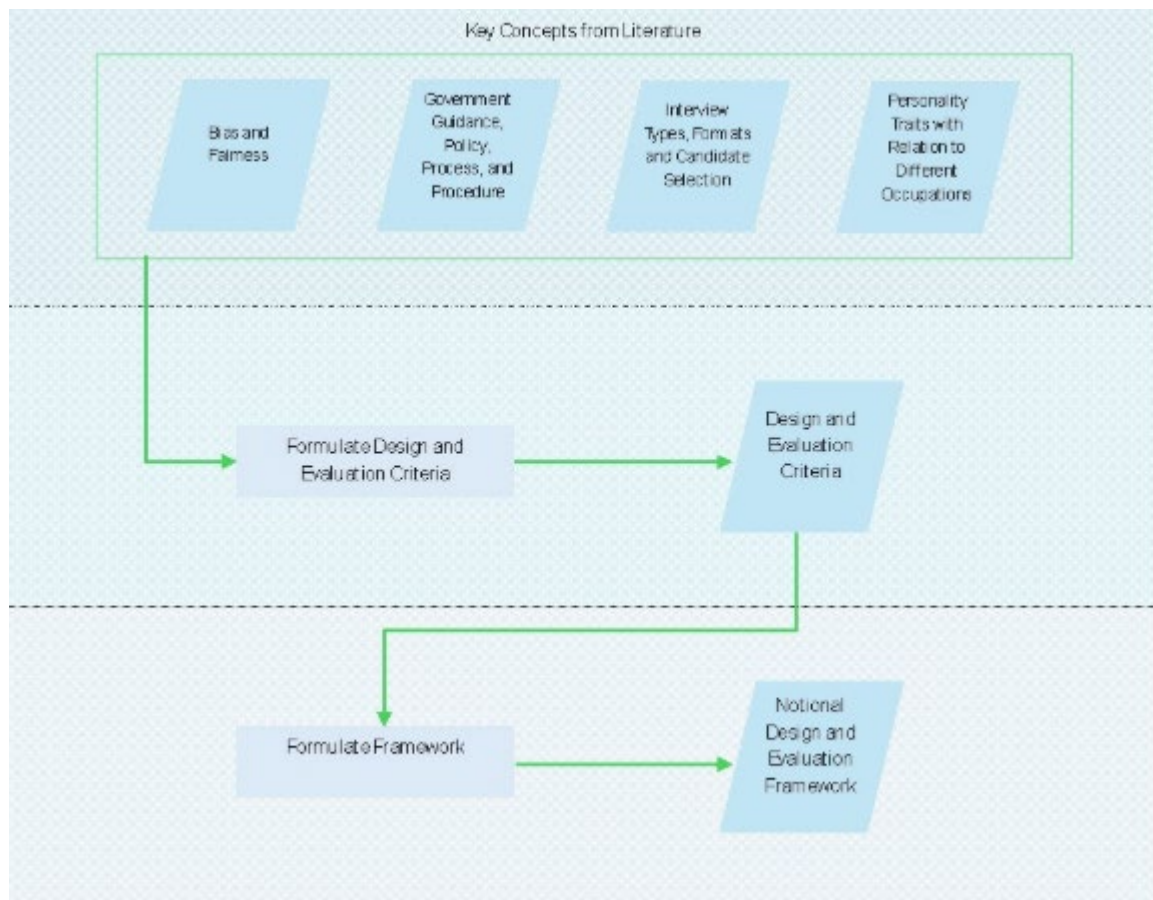
Figure 3.   Notional Framework

Design and evaluations criteria serve as the guiding concepts for the development of processes geared towards competitive selection of technical personnel. These are rooted in concepts derived from the literature review of related fields and are the basis of the framework. In addition to providing an anchor point for framework development,

definition of these concepts serves as the basis for evaluation criteria for facets of a proposed process.

B. CONCEPTUAL DEVELOPMENT

1. Personality and Occupational Selection Concept

A review of OPM guidance and documentation reveals that personality type and working environment is unaddressed, and no specific guidance is provided by OPM to the workforce that associates personality types and selection methods. In their study, Chen and Simpson (2015) demonstrated personality type is a statistically significant factor in determining a student's odds of self-selecting a STEM field. They found that the Holland personality types of investigative, enterprising, and artistic had the most impact on a student selecting a STEM major. Specifically, they found students with high investigative score or low artistic score or low enterprising personality scores are significantly more likely to engage STEM fields. Furthermore, Coenen et al. (2021) found linkage between the Big 5 personality types and STEM field engagement. In their study, they found the Extraversion and Agreeableness traits are negatively associated with STEM field selection and outcome on choosing a STEM occupation. The traits Openness to New Experience was positively associated with selecting STEM related academic tracks but not so much for actual occupational selection. This information is largely unaccounted for in the OPM material where selection of tools and techniques for interview and evaluation are advised. The O*Net 28.2 database is available to the public, free of charge, under a creative commons license. The "Interests" data set relates an occupation with its data in different models (occupational and content models). Within these data, occupations are scored by their established RIASEC categories. Table 11 shows the rankings in relation to the NAVSEA Top 10.

Table 11.   NAVSEA Top 10 associated with RIASEC Scores

NAVSEA Occupation	RIASEC Occupation	RIASEC	Scale Value
Electrical Engineering	Electrical Engineers	Realistic	6.35
		Investigative	5.31
		Artistic	2.01

NAVSEA Occupation	RIASEC Occupation	RIASEC	Scale Value
		Social	1.57
		Enterprising	2.31
		Conventional	5.01
Mechanical Engineering	Mechanical Engineers	Realistic	6.6
		Investigative	5.3
		Artistic	2.2
		Social	1.1
		Enterprising	1.76
		Conventional	4.65
Naval Architecture	Marine Engineers and Naval Architects	Realistic	5.72
		Investigative	5.48
		Artistic	2.34
		Social	1.43
		Enterprising	3.43
		Conventional	4.44
Electronics Engineering	Electronics Engineers, Except Computer	Realistic	6.23
		Investigative	5.8
		Artistic	2.03
		Social	1.59
		Enterprising	1.62
		Conventional	4.68
Computer Engineering	Computer Hardware Engineers	Realistic	5.79
		Investigative	5.64
		Artistic	1.84
		Social	1.79
		Enterprising	1.88
		Conventional	5.28
Computer Science	Software Developers	Realistic	3.93
		Investigative	5.86
		Artistic	2.26
		Social	1.88

NAVSEA Occupation	RIASEC Occupation	RIASEC	Scale Value
		Enterprising	1.87
		Conventional	5.46
Physics	Physics Teachers, Postsecondary	Realistic	3.75
		Investigative	5.87
		Artistic	3.21
		Social	6.01
		Enterprising	2.36
		Conventional	3.92
Mathematics	Mathematicians	Realistic	3
		Investigative	7
		Artistic	3.23
		Social	1.97
		Enterprising	1.16
		Conventional	5.27
Information Technology Management	Information Technology Project Managers	Realistic	1.72
		Investigative	3.68
		Artistic	1.83
		Social	2.66
		Enterprising	6.02
		Conventional	5.29
General Engineering	None	N/A	N/A

These occupations have been rated on two scales, Occupational Interest (OI), and occupational Interest High Point (IH). For the ten NAVSEA occupations, nine are matched with their RIASEC counterparts. The NAVSEA occupation General Engineer has no apparent match.

The occupational interest scale related to the values in Table 11 was developed to relate interests (RIASEC) to an occupations' work environment. In development of the data, the raters of an occupation were asked, "How descriptive and characteristic is the given Holland work environment of this occupation?" where a rating of 1 is "Not at all characteristic," and a rating of 7 is "Extremely characteristic" (Putka et al., 2023)

The high-point codes are designed to indicate which RIASEC dimension is most descriptive of an occupation, and can be taken as first descriptive, second descriptive, and third descriptive. This represents "the top three RIASEC construct categories most associated with the occupation" (Putka et al., 2023). These codes are enumerated as 0.00 = No high point available, 1.00 = Realistic, 2.00 = Investigative, 3.00 = Artistic, 4.00 = Social, 5.00 = Enterprising, 6.00 = Conventional. A detailed description of how the occupations were assessed and a description of associated ratings are given in "Using machine learning to develop occupational interest profiles and High-Point codes for the O*NET system. In National Center for O*NET Development" (Putka et al., 2023).

Analysis of the data in Table 11 yields some interesting observations:

1. 5 of 9 occupations scored over 5 in the Realistic and Investigative categories: Electrical Engineering, Mechanical Engineering, Naval Architecture, Electronics Engineering, Computer Engineering.
2. 8 of 9 occupations scored over 3 in the Realistic categories: Electrical Engineering, Mechanical Engineering, Naval Architecture, Electronics Engineering, Computer Engineering, Computer Science, Mathematics, and Physics.
3. All occupations scored over 4 in the Conventional category.
4. 8 of 9 occupations scored over 5 in the Investigative categories: Electrical Engineering, Mechanical Engineering, Naval Architecture, Electronics Engineering, Computer Engineering, Computer Science, Mathematics, and Physics.
5. Information Technology Management is not like the rest of the occupations.

Information Technology Management is an outlier, as its top two categories are Enterprising (6.02) and Conventional (5.29). As the title suggests, the position is rooted in management, and the data suggests the occupation lends itself to a different set of personality characteristics. Mean scores of the eight similar occupations and Information Technology Management are shown in Table 12.

Table 12. Similar Eight and Information Technology Management Mean Data

Occupation	RIASEC	Scale Name	Scale Value
The Similar Eight	Realistic	OI	5.1713
	Investigative	OI	5.7825
	Artistic	OI	2.39
	Social	OI	2.1675
	Enterprising	OI	2.0488
	Conventional	OI	4.8388
Information Technology Management	Realistic	OI	1.72
	Investigative	OI	3.68
	Artistic	OI	1.83
	Social	OI	2.66
	Enterprising	OI	6.02
	Conventional	OI	5.29
0801 - General Engineering	N/A	N/A	N/A

The High-Point data tells a different, but relevant, story. This rating can be interpreted as "the top three RIASEC construct categories most associated with the occupation," and the average of this data is not so telling. However, some pertinent observations can be made. A summary of the high-point data decoded and organized by occupation is shown in Table 13.

Table 13. High Point Ratings for Top 10 Stem at NAVSEA, The Top Three RIASEC Construct Categories Most Associated with an Occupation

Interest High-Point	Electrical Engineering	Mechanical Engineering	Naval Architecture	Electronics Engineering	Computer Engineering	Computer–Science	Physics Instructors	Mathematics	Information Technology Management	General Engineering
1st	Realistic	Realistic	Realistic	Realistic	Realistic	Investigative	Social	Investigative	Enterprising	N/A
2nd	Investigative	Investigative	Investigative	Investigative	Investigative	Conventional	Investigative	Conventional	Conventional	N/A
3rd	Conventional	Conventional	Conventional	Conventional	Conventional	Realistic	No Data	No Data	Investigative	N/A

Analysis of the data in Table 13 yields some interesting observations:

1. 5 of 9 occupations have completely identical classification: Electrical Engineering, Mechanical Engineering, Naval Architecture, Electronics Engineering, Computer Engineering. These are Realistic, Investigative, and Conventional categories.

2. Computer Science is more like Mathematics than Engineering. They both rank Investigative and Conventional as first and second. No comparison can be made about the third high point as data for Mathematics is inconclusive.

3. Physics is an outlier. The closest match to the NAVSEA occupation of Physics was Physics Teacher, and these may be too dissimilar to make any meaningful link in this regard.

4. Information Technology Management is again an outlier, Enterprising, Conventional, and Investigative are the top high-points for this occupation.

5. There are no occupations that characterize as artistic.

6. The only occupation to characterize as Enterprising is Information Technology Management

   3. The only occupation to characterize as Social is physics but this may be an outlier as noted in observation (3).

7. 8 of 9 occupations characterize as Conventional in some capacity. Again, Physics is an outlier, as there is no data point for its third high-point. Also, the occupational match may be too dissimilar to be of value.

8. All occupations are characterized as Investigative in some capacity.

Given the personality types that are characteristic of the ten occupations of study, conclusions can be drawn about related selection processes.

1. Engineers are like each other. Selection environments, contexts, and activities which align with the characteristics of RIASIC categories of Investigative, Realistic, and Conventional support positive construct, content, and face validity of a selection process for engineers.

2. Information Technology Management should be assessed differently than other technical personnel. Selection environments, contexts, and activities which align with the characteristics of RIASIC categories of Enterprising, Conventional, and Investigative support positive construct, content, and face validity of a selection process for Information Technology Managers.

3. Computer scientists are like mathematicians. Selection environments, contexts, and activities which align with the characteristics of RIASIC categories of Investigative and Conventional support positive construct, content, and face validity of a selection process for Information Technology Managers.

4. Investigative and Conventional types are the most common throughout the range of occupations.

2. Bolstering Fairness and Bias Concepts

A review of government literature on the topic of fairness and bias reveals the desire for a fair and honest workforce that is merit based. Given the specific definition of fairness in hiring, more specifically federal hiring, how does one ensure that processes account for fairness in every aspect? A natural starting point is definition; the concept must be well defined. For sake of this endeavor, the definitions of fairness and bias shall be the Meriam-Webster definition elaborated in Chapter III and are re-iterated here:

> Bias: "an inclination of temperament or outlook, especially a personal and sometimes unreasoned judgment." (Merriam-Webster, n.d.-a)

> Fairness: "the quality or state of being fair; marked by impartiality and honesty, free from self-interest, prejudice, or favoritism." (Merriam-Webster, n.d.-b)

Despite the lack of development of a complete standard for fairness and bias in selection, federal guidance suggests that fairness is closely related to job analysis results (Part 300 - Employment (General), 2025). By implication, the job analysis must be performed fairly, and closely following the job analysis will support fairness throughout the rest of the hiring processes. The government seeks to establish a transparent connection between job requirements and assessment tools to enhance fairness, or at least perceived fairness, of the selection process (U.S. Office of Personnel Management. (2019). Given the findings, the following statements regarding fairness can be made:

1. The job analysis must be impartial and honest, and free from self-interest, prejudice, or favoritism.
2. Transparency between the job analysis and assessment tools supports fairness and increases perceived fairness.

Given a definition of fairness or bias, how does one measure fairness within the context of selection of personnel, let alone technical personnel? The definition of fairness is contextual; the general concept is universal, but the particulars are rooted in context. Outside of qualitative evaluation of the basic definitions, there is no universal metric. The only apparent measure of fairness within the body of federal guidance is a "four-fifths" rule which is defined as "A selection rate for any race, sex, or ethnic group which is less

than four-fifths (4/5) (or eighty percent) of the rate for the group with the highest rate will generally be regarded by the Federal enforcement agencies as evidence of adverse impact" (Uniform Guidelines on Employee Selection Procedures, 1978). This definition is based on the concept of adverse impact and differing passing rates of existing processes with relation to the federal definition of fairness (as opposed to the Merriam-Webster definition). There is no basis for using it in process design or in any other context. Thus, there is no quantitative metric of fairness in this context, and the basic definition defined herein by Merriam-Webster in a qualitative sense will be used. In contrast to fairness, there are many well defined and proven types of bias, and the literature reviews show no specific guidance in addressing them. Considering all bias would be exhausting and counterproductive, some simply may not be significant to the process. However, it is conceivable that all facets of the selection process are susceptible to bias in one form or another, and addressing certain, harmful bias would support fairness and efficacy of selection processes. Although these qualities are not quantitatively measured, an assertion can be made that fairness of the process can be increased by considering the basic definition of fairness and reducing relevant bias throughout the components of the technical selection process. Thus, it can be asserted that:

3.   A reduction in bias positively supports fairness, and all reasonable bias should be considered.

Unlike various biases, the definition of fairness is contextual in the way that the general concept is universal, but the specifics are rooted in context. However, in both cases, there are no universally concrete criteria for fairness outside of the race, color, sex, religion or national origin, and more recently sexual orientations of an individual. Legal systems employ a mixture of application of law, case precedent, and subject matter experts (like judges and lawyers) to guard the concept of fairness within that system. In the same way that a legal system is based on laws, a meritocracy is based on merit, where adherence to the concepts of merit within a defined context should yield reward, and the degree of individual accomplishment is commensurate with reward. By this reasoning, fair evaluation of merit can increase fairness of a selection process, and that individual contribution, or merit, is measurable. As such, the following assertions are made:

4. Considering merit positively impacts fairness in a selection process.
5. Objective measurement and evaluation of merit supports fairness in the selection process.

As such, qualitative rating of certain facets of the selection process by judgement of subject matter expert is necessary, and who uses the framework is as important as what the framework measures and by what method. It is important that subject matter experts in the evaluator role be expertly qualified in the KSAs they evaluate, as they are serving as a measurement tool.

6. Subject matter experts acting as evaluators are proven experts of a set of KSAs belonging to a position.

Taking into account the possible repercussions of over-consolidation of responsibility to more than a human can reasonably assume, it is fair to consider the size and scope of the target position and decomposition of need allows just that. To consider these factors, the decomposition analysis requires an estimate of the percentage of tasks expected to be performed in each primary domain, as shown in Table 14.

Table 14.   Notional Decomposition of Technical Position

Position Description	Primary Domains	Secondary Domains	All domains
Controls systems expert who leads a government program that develops controls for missile launch systems for the United States Army	Control Systems	Electrical Engineering	Electrical Engineering
		Software Engineering	Software Engineering
		Systems Engineering	Systems Engineering
	Program Management		Program Management
	Leadership		Leadership
	Missile Launch Systems	Aerospace Engineering	Aerospace Engineering
		Launch Platforms	Launch Platforms
	Communication	Written Communication Skills	Written Communication Skills
		Oral Communication Skills	Oral Communication Skills

	Support Processes	Acquisition Processes	Acquisition Processes
		In-service support processes	In-service support processes

C. DETAILED DEVELOPMENT

OPM's guidance is not uniform across all facets, and an organization can "fill in the blanks" as they see fit, if higher-level guidance, laws, and policies are abided by. The framework will address these challenges and provide a context that will allow informed decisions in these areas. The following sections elaborate on these concepts.

1. Framework Structure

The framework takes a general approach towards assessment, it divides activities that support the hiring of personnel for technical positions into two categories that reflect the overall selection process: requirements and assessment. The methods of selection of candidates that involve translating the qualitative data into quantitative, ensuring organizational values are included, and various procedures are followed are beyond the scope of this framework.

The requirements portion of the framework is concerned with defining the needs of the organization and translating those needs into a viable position description. These needs are the backbone of the entire process, and accuracy is imperative, as ambiguity in this process allows for more individual latitude in determining the requirements of a position, providing opportunity for introduction of bias. Furthermore, without careful thought as to how requirements of the different facets of a position are organized, proper assessment is stymied. A solid set of requirements that is distinctly organized by area of evaluation, free of ambiguities and adequately reflects the desired KSAs of an incumbent is desirable.

The assessment portion of the framework deals in collecting information about a candidate to support an overall selection decision. An underlying theme of this paper is the assertion that uninformed interviewing practices can have detrimental effects on both the efficacy of the process and the target demographic. The primary focus of this process area is the selection and application of tools and techniques with relation to traits of technical personnel. Concepts about workforce personality traits and fairness and bias,

rooted in literature review, are used to optimize process fitness for technical personnel. It should be noted that "selection" is used ambiguously in this work. Within the context of this paper, it is used to describe the overall set of processes a NAVSEA organization uses to select personnel up until the point of certification. Within the context of the federal government, at the point of selection, processes are data and policy-based and the candidates have already been assessed according to requirements by a local organization. As such, this framework is scoped to the local organization and oriented towards their methods of defining positions and garnering data about candidates through the interviewing process, and their prioritization of candidates. Certification of process compliance, issuance of certificates, and operation of other such wickets are beyond the scope of the framework.

The framework is constructed with traceability in mind. All parts of the framework work together to evaluate and inform an overall selection process for technical personnel within a NAVSEA organization. They are intentionally defined to a granularity that supports simplicity in categorizing an organization's activities into process areas that are directly traceable to developed concepts, which are based on observation and data synthesized from the literature review. A clear association is apparent between any element in the framework to its supporting concepts and literature.

2. Framework Construction

a. *Requirements*

The root of any selection process is recognition and definition of need. Technical positions are complex and may demand expertise in more than one domain. It is important that selection processes adequately identify need and decompose it into its constituent KSAs. In doing so, the relationship between evaluation factors, assessment tools, and position requirements will be transparent. Clearly decomposing a tentative position into its constituent KSAs and sorting by domain helps to break down complex positions into their key components. Failure to identify and classify requirements at the beginning of the process can lead to ambiguity and allow bias during subsequent phases of the process. Table 14 shows a notional decomposition of a sample technical position.

Decomposition of a position may lead to the discovery of any number of related domains. Each domain has assessment criteria so prioritization of domains may be necessary to control the cost and complexity of the assessment process. Hiring managers and those with a purview into the context and working environment of the target position can use this technique to compare a proposed position to other positions to find redundancies or further develop a proposed position.

Clear requirements are necessary to fairly evaluate a candidate and reduce biases within the selection process. Grouping KSAs by domain reduces ambiguity in the process and clearly identifies the basis of ratings criteria. Furthermore, estimating the percentage of tasking within a domain helps draw attention to factors that may adversely affect the organization. Considering the size and scope of the position will help determine if the position is too demanding. In this case, de-scoping the job to its priority domains and creating support positions for other domains or outsourcing elsewhere in the organization are good courses of action. Performing this analysis early in the process will help set strategy. As such, the following assertions are made:

a) A target position should be analyzed to determine appropriate scope of work.
b) A target position should be analyzed to determine all required technical domains.
c) KSAs should be grouped by domain, and domains must be prioritized to reflect the day-to-day demands of the position.
d) A competitive promotion should not be biased towards any known employee or personnel functions within the organization.

The framework accounts for a position decomposition component that clearly lays out the pertinent KSAs of the position by requiring decomposition in the aforementioned manner:

1. Does the requirements development process include a decomposition activity that distinctly groups KSAs or other requirements by domain?
2. Does the requirements development process include a decomposition activity that identifies all domains characteristic of a position?
3. Does the requirements development process address simplification of overly complex positions?
4. Does the requirements development process account for similarity of tasks of positions within the home organization?

Technical positions may be interdisciplinary in nature and encompass multiple domains of expertise. This implies the subject matter experts must all possess true expertise of KSAs (criteria), and these KSAs should be identical to those of the target position. In this way, competency is transparent and traceable from the requirements of the target position. However, this paradigm does not allow for unique selection, where an advanced position involves expertise in multiple domains and is so unique that an amalgam of expertise in different subject areas is required to define and evaluate the position. Given the challenge of finding both identical yet unique personnel, it is asserted that individual subject matter experts who possess expertise in all or most subject areas are less important than competent evaluation of all criteria, and as many subject matter experts as needed may be used to evaluate specific aspects of the processes. For example, a target position defined as a controls systems expert who leads a program that develops controls for missile launch systems requires many KSAs, but a logistician who is amply qualified in leadership can evaluate process, procedure, and candidate from a leadership perspective, and leadership perspective only. Furthermore, in the interest of fairness, multiple subject matter experts should be used to perform ratings of each element by consensus of more than one subject matter expert. This could reduce the possibility of individual bias. Thus, the subsequent statements about subject matter experts are apparent:

a. Only qualified individuals should serve as subject matter experts.
b. Subject matter experts are proven experts of a set of KSAs belonging to a position, instead of the position itself.
c. Any number of experts may be used to ensure all criteria are addressed.

Subject matter experts are akin to the measurement instruments of the process, and objectively rating all criteria supports fairness and bias and positively contributes to validities of the process. In support of this notion, regarding this discussion, the framework will account for appropriate selection of subject matter experts in the following way:

1. Does the process solicit qualified subject matter experts input for each set of criteria associated with a defined position?

A prospective candidate may learn about a position through its advertisement. The advertisement communicates information about the position to candidates and is the

"face" of the position. Position descriptions that accurately reflect the KSAs of the day-to-day operations reduce the chance of deterring qualified candidates and attracting unqualified candidates. Thus, the presentation of a position affects desired outcome and is inherently susceptible to framing bias, regardless of intent. Guarding against framing bias aligns with fairness concepts. The following assertions can be made:

    a. Position descriptions that accurately reflect knowledge, skills, and abilities increase fairness.
    b. Position descriptions that accurately reflect the prioritized technical domains increase fairness.
    c. Position descriptions that accurately reflect real or anticipated day-to-day operations increase fairness.

These assertions reflect in the framework in the following way:

1. Does the position description align with the priorities documented in the decomposition activity?
2. Does the position description adequately communicate the day-to-day activities required of the target position?

b.   *Assessment*

Blau et al. (1956) assert that personality is deeply rooted in occupational selection, and Dr. Holland (Holland, 1997) further elaborates how personnel possess certain personality characteristics that lend themselves towards certain preferences, tasks, environments, and occupations. Based on inherent properties of people, selection methods can be agreeable or disagreeable to a wide swath of individuals, and improper selection methods can introduce bias towards a particular type of person or against another. The "Big Five" traits have sometimes been used as a filter to select those believed to be most fit for management positions, and the U.S. government to guide people into suitable occupations has historically used RIASEC model. The following assertions can be made:

    a. A process should avoid assessment methods that do not align with RIASEC types of the target occupation(s).

Furthermore, research shows that unstructured interviews are better for measuring personality characteristics of a candidate and structured interviews offer a more objective evaluation of job-related information. Interview processes can consist of a blend of structured and unstructured approaches but should document rationales for using each.

Also, this documentation reinforces positive face validity. Either selection formats which highly favor structured or unstructured formats are suspect due to the biases they impose. The following assertions can be made:

> b. A process should employ a mix of structured and unstructured interviews.
> c. A process should document its reason for using various interview formats.

To reduce the size and complexity of the effort, proven external criteria, standards, and certifications should be leveraged to the greatest extent practical. In this context, an organization is considered evaluative redundant in the case that it chooses to evaluate prospective candidates based on its own in-house criteria despite the availability of specialized external certifications and credentials. A reduction in the number of KSAs an organization must physically evaluate will allow them to focus on evaluation of their internal expertise and avoid evaluative redundancy. Any outside certification should be leveraged in the assessment. Furthermore, advanced degrees, such as graduate and doctorate level degrees in a related subject should not be ignored. The following assertions can be made:

> d. External evaluations or credentials, inclusive of advanced degrees, should be leveraged to the greatest extent possible.

These assertions are reflected in the framework in the following way:

> 1. Are the domains analyzed for evaluative redundancy?
> 2. Are advanced degrees or credentials over the minimum allowable considered within the evaluation process?
> 3. Does the process document the reasoning for employing various interview types?

Given what is known about RIASEC types and interview formats, the framework addresses the concepts in the following way:

> 4. Does the interview format align with target occupational RIASEC type?

The framework consists of two parts: Requirements and Assessment; where each portion addresses the concerns elaborated herein. The framework will be implemented utilizing a logical framework, which lists an overall goal, its indicators, verification methods, and assumptions, and associates the overall goal with associated outcomes,

outputs, and activities. A full primer on logical frameworks is beyond the scope of this paper, but information is readily available in the public domain.

Since the framework uses indicators and methods of verification, a method of collecting organizational data about the selection process is required. This method must be used prior to process change to establish adequate metrics and periodically thereafter to monitor process performance. Organizations must implement a feedback loop to engage the target demographic as this feedback is cornerstone to the operation of the framework. Recommended methods are direct workforce engagement via surveys, polls, and interviews. The detailed framework is shown in Table 15 and 16.

Table 15.   Detailed Framework – Requirements

Requirements	Project Summary	Indicators	Means of Verification	Risks/Assumptions
Goal	Increase efficacy of the selection process for technical personnel.	Face validity of assessment process. Construct validity of assessment process. Content validity of assessment process. Number of grievances or complaints about the interview process. Employee disposition towards the selection process. Diversity metrics in the pool of assessed candidates.	Comparison against baseline data. Evaluation by subject matter experts. Organizational surveys and interviews of target demographic.	The organization can develop repeatable, documented, processes having controlled outcomes. The organization collects data about process activities and develops key process indicators. The organization fosters a culture of continuous improvement.
Outcome	Improved objectivity of selection requirements. Reduced burden of evaluation for the organization. Improved ability to evaluate organization-specific talent.	Suitability of candidates. Resource utilization around evaluation process. Performance metrics of selectees. Satisfaction level of selectees.	Organizational surveys and interviews of target demographic. Comparison of process execution metrics. Comparison of employees'	N/A

Requirements	Project Summary	Indicators	Means of Verification	Risks/Assumptions
	Increased confidence in the assessment processes. Bias is reduced Fairness is increased. Disburdening of organizational process More candidates that are qualified are selected.	Frequency of process updates.	performance reviews Employee morale. Organizational resource utilization data. Employee performance.	
Outputs	1. Objective, clear and traceable position descriptions that include all pertinent domains. 2. Documented criteria and rationales for creation of positions.	Resource utilization metrics Position description objectivity. Position description clarity. Position description traceability. Position description completeness.	Documentation and process review. Evaluation by subject matter expert.	N/A
Activities	1. The requirements development process includes a decomposition activity that distinctly groups KSAs or other requirements by domain. 2. The requirements development process includes a decomposition activity that identifies all domains characteristic of a position. 3. The requirements development process addresses simplification of overly complex positions. 4. The requirements development process accounts for similarity of tasks of positions within	Number of pertinent domains identified. Completeness of domain association with KSAs. Number of KSAs specific to organizational specialty evaluated by organization. Number of KSAs verified by alternate methods.	Documentation and process review. Evaluation by subject matter expert.	N/A

Requirements	Project Summary	Indicators	Means of Verification	Risks/Assumptions
	the home organization.			
	5. The requirements development process solicits input from qualified subject matter experts for each set of criteria associated with a defined position.			
	6. Position descriptions are aligned with the priorities documented in the decomposition activity.			
	7. Position descriptions adequately communicate the day-to-day activities required by the target position.			

Using the framework against the chosen fields of research improves the efficacy and fairness of NAVSEA's selection process for technical personnel by enhancing validity, reducing bias, and increasing transparency. It is structured around clearly defining position requirements, ensuring assessment objectivity, and aligning selection criteria with technical domains. Key components include the breakdown of KSAs (Knowledge, Skills, and Abilities) into domain-specific requirements, expert evaluation of assessment methods, and continuous monitoring through employee feedback and organizational metrics. The framework allows development and evaluation of documented, repeatable processes based on data and continuous improvement. Some expected outcomes include improved candidate suitability, increased confidence in hiring decisions, and improved resource efficiency.

Table 16. Detailed Framework – Assessment

Assessment	Project Summary	Indicators	Means of Verification	Risks/ Assumptions
Goal	Increase efficacy of the selection process for technical personnel.	Face validity of assessment process. Construct validity of assessment process. Content validity of assessment process. Number of grievances or complaints about the interview process. Employee disposition towards the selection processes. Diversity metrics in the pool of assessed candidates.	Comparison against baseline data. Subject matter analysis. Organizational surveys and interviews of target demographic.	The organization can develop repeatable, documented, processes having controlled outcomes. The organization collects data about process activities and develops key process indicators. The organization fosters a culture of continuous improvement.
Outcome	Improved objectivity of assessment methods. Increased confidence in the assessment processes. Bias is reduced Fairness is increased. Disburdening of organizational process More candidates that are qualified are selected.	Assessment methods agree with target demographic. Employee morale. Organizational resource utilization data. Employee performance.	Evaluation by subject matter experts. Analysis of organizational data.	N/A
Outputs	1. Objective and verifiable selection criteria for all pertinent domains exist. 2.) A higher number of candidates with advanced degrees are selected for interviews and in turn advanced technical positions. 3.) Processes are more conducive to selection of technical personnel.	Objective and uniform selection criteria. Number of pertinent degrees or certifications leveraged in the assessment process.	Annual audits of policy and process. Bi-annual comparison of baseline organizational data	N/A

	4.) Appearance of individual grooming for positions dissipates. 5.) More efficient utilization of organizational resources	Processes leverage RIASEC types in selection of assessment methods and formats. Resource utilization around the assessment processes. Number of applicants.		
Activities	1. Domains are analyzed for evaluative redundancy. 2. Association between RIASEC type, target occupation, and evaluation format is considered in process development. 3. Documentation of reasoning for selection of assessment methods. 4. The interview formats consider target occupational RIASEC type	No equivalent position has been defined or filled at lower paygrade elsewhere within the organization. No employee is currently performing duties or tasks equivalent to the position Interview processes focus on in-house, specialized knowledge. Interview processes leverage RIASEC types. Number of personnel holding advanced degrees in target technical positions. Number of qualified individuals that are promoted into technical leadership roles.	Documentation review Peer review of process, policy, and process development activity.	Organization is willing to release evaluative responsibility over certain facets of evaluation such as leadership and technical skill.

The framework enhances the selection process for technical personnel by improving assessment validity, reducing bias, and increasing fairness. Utilizing subject

matter experts (SMEs), coordinating assessment methods with occupational and personality factors (RIASEC), and establishing unambiguous and impartial selection criteria are also addressed. Important tasks include examining domains for redundancy, documenting justifications for assessment methods, and making sure interview formats take into account the requirements of certain jobs. Some expected outcomes are improved hiring objectivity, increased confidence in assessment methods, and better placement between chosen candidates and technical roles. Regular audits, organizational data analysis, and expert evaluations support continuous improvement and accountability.

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V. NOTIONAL APPLICATION OF FRAMEWORK AGAINST EXISTING PROCESSES

In this section the framework will be notionally applied to existing NAVSEA process. The section serves as a guide to anyone who would apply the framework. Additionally, observations can be made about existing processes.

A. INTRODUCTION

In Chapter IV, a detailed approach for evaluating and improving the selection process for technical personnel was outlined. In this chapter, the new framework is applied to the existing NAVSEA process. While OPM sets guidelines and provides a litany of information, such as the DEO Handbook, the ADG, and the MOSAIC Competencies, it allows local organizations, such as NAVSEA, some discretion in how they implement and adapt these guidelines to their specific contexts. This flexibility is intended to accommodate the unique needs and circumstances of different agencies and positions, but it can lead to varying interpretations and customization at the local level.

Overall, this ambiguity at lower levels provides local organizations with the ability to adapt to their unique environments, but it also poses the risk of inconsistent interpretations of OPM's guidelines. By applying this framework to the existing process, it becomes apparent how the framework can be applied to identify areas of improvement. Visibility into all warfare centers processes is limited, and this exercise is not meant to serve as a critique or remedy. However, it is a roadmap to creating such a critique or remedy and ultimately aid in application of more consistent, fair, and effective methods for selecting technical personnel.

The Competitive Examining Process Flow Chart from the DEO Handbook shown in Figure 4 provides a step-by-step visualization of the process involved in recruiting, evaluating, and selecting candidates for federal employment. The competitive examination process's main steps are indicated in red font. Each of the steps in red has its own chapter in the DEO Handbook that goes into detail of what that step entails, offering agencies options, guidelines, and, if needed, operational procedures that are intended to ensure that programs under examination adhere to laws and regulations pertaining to the

merit system. The relevant components of the hiring process as requirements and assessment were identified and the flow chart was broken into these two sections. The red boxes represent the requirements, and the green boxes represent assessment. The boxes with the black Xs are non-essential elements with respect to the requirement and assessment process.

While conducting the analysis, focus was on portions of the DEO Handbook that have an immediate impact on the requirements and assessment process. Some sections are administrative in nature and are therefore excluded from the application of the framework. Such sections are related to topics including satisfying public notice requirements, notifying applicants, submitting requests to delegated examining units, etc. These areas do not directly affect the important areas of job qualification assessment and competency evaluation.

It should be noted that the term assessment is used ambiguously in this work and should be deconflicted. Within the context of OPM, assessment does not refer to the act of evaluating or assessing the candidate directly. Rather, it pertains to the identification and development of KSAs/competencies derived from the job analysis, which will later be used as criteria for evaluating candidates in the process.
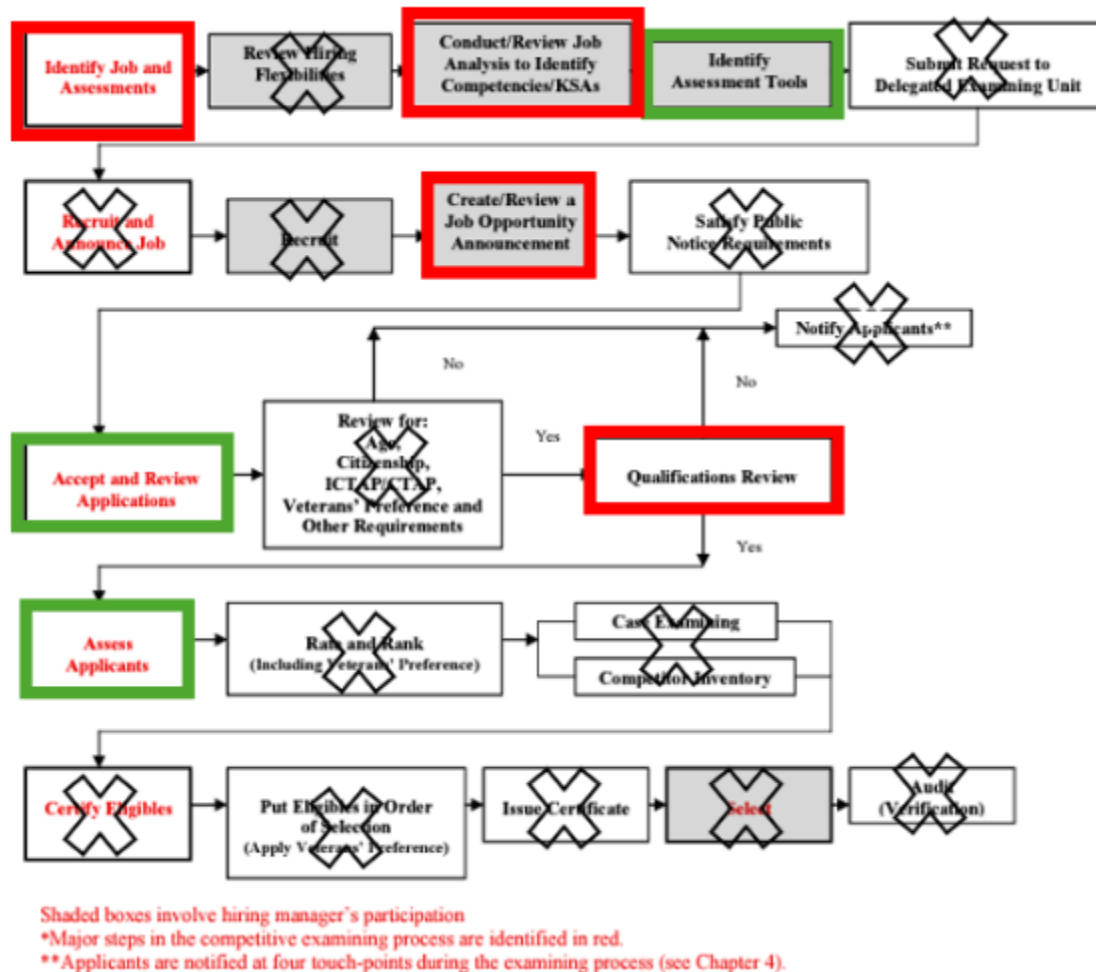
Figure 4. The DEO Handbook Competitive Examining Process Flow Chart.
Source: OPM (2019).

The framework is applied to the parts identified as relevant in Figure 4 as well as other pertinent OPM documentation that was identified during the literature review. The table in Appendix A provides information regarding the various OPM artifacts, their sections or sources, descriptions, points or discrepancies, and whether they pertain to requirements, assessments, or both. This is followed by application of the framework and discussion of findings. Application of the framework consists of evaluating all available process information against the tenets of the framework. The tenets are the activities provided in the logical framework and are as follows:

1. Are the domains analyzed for evaluative redundancy?
2. Are advanced degrees or credentials over the minimum allowable considered within the evaluation process?

3. Are advanced degrees and other forms of professional credentials leveraged to determine the focal points of any interviews?

4. Does the process document reasoning for employing various interview types?

5. Does the interview format align with the target occupational RIASEC type?

6. Does the position description align with the priorities documented in the decomposition activity?

7. Does the position description adequately communicate the day-to-day activities required of the target position?

B. APPLICATION OF THE FRAMEWORK

1. Requirements

Considering the overall process depicted in Figure 4, four boxes are relevant to the requirements analysis conversation. These steps are (a) identify the job and its assessments, (b) conduct/review job analysis to identify competencies/KSAs, (c) create/ review job opportunity announcement, and (d) review qualifications. These steps align with fundamental elements of the hiring process, focusing on the identification of job requirements and essential criteria prior to candidate evaluation.

The table in Appendix A offers a thorough summary of pertinent evidence from the literature review, which supports the analysis. The table is lengthy and includes pertinent content extracted from the following high-level documents:

- ADG
- UGESP
- DEO Handbook
- MOSAIC Competencies

These artifacts represent significant content in both process and policy about the evaluation of technical personnel and serve as the foundation of activities that define job roles, position requirements, aspects and methods of evaluation. Through the examination of these pieces of evidence, the framework can identify opportunities to improve the way requirements are determined for technical roles by highlighting areas of improvement and customization in relation to the concepts elaborated herein. Organizations like NAVSEA, which rely on specialized personnel for mission-critical positions and an overarching set

of interpretable guidelines, gain visibility into areas that might be detrimental to current evaluation activity.

2. Application of the Framework

In this section, the concepts explored in Chapter IV are applied to the NAVSEA processes. The aspect in consideration is italicized and discussion about how the concept applies.

The requirements development process includes a decomposition activity that distinctly groups KSAs or other requirements by domain.
and
The requirements development process includes a decomposition activity that identifies all domains characteristic of a position.

OPM outlines occupational requirements for all its series. The Federal Wage System includes a rigorous set of job elements but is used for trades, labor positions, and general blue-collar work and is not applicable to the NAVSEA Top 10. For blue collar work, specific job elements are defined, and graduating levels of responsibility are addressed. For the NAVSEA Top 10 (and the vast majority of technical positions), OPM relies on minimal educational requirements for the definition of entry requirements for a position. Decomposition does exist within the federal government on a macro-scale in the way that positions are defined in an occupational area and associated with some form of criteria, but OPM's approach is not granular enough to address the needs of NAVSEA organizations because the NAVSEA Top 10 KSAs and NAVSEA-relevant domains such as shipbuilding and life-cycle engineering do not exist within OPM.

The MOSAIC studies resulted in eight sets of competencies guidance for distinct career paths. However, there is a significant number of series in the federal government, and the NAVSEA Top 10 STEM positions are not well represented. Out of those 10, only "Information Technology Management" is accounted by association with the "Information Technology Program Management" MOSAIC. The MOSAIC studies do not account for the NAVSEA Top 10, as they apply to NAVSEAs core functions, namely engineering support and support services to the U.S. Navy. A litany of competencies

listed in each study exist, along with information such as which traits managers consider important for a position, but no methods of decomposition of KSAs and association with domains is present. Domains specific to shipbuilding or maintenance, such as acquisition support, are not addressed.

In elaborating the job analysis, the DEO Handbook refers to the MOSAIC studies and claims to "have identified the critical competencies and tasks employees need to perform successfully in nearly 200 federal occupations" (U.S. Office of Personnel Management, 2019, p. 2–14) but then provides a link to the eight aforementioned studies, which do not relate to the NAVSEA Top 10. At this juncture, the guide directs the reader to the UGESP, under the premise that it "provides a set of generally accepted principles on employee selection procedures" (U.S. Office of Personnel Management, 2019, p. 2–18) that are good to develop procedures against.

Appendix D outlines OPM's job analysis methodology. This method is detailed, requires comprehensive definitions of tasking, and links competencies with tasking. A review of the document shows evaluation by dimensions of competencies and tasks but no guidance on organizing these into domains of technical expertise. Instead, the guide relies on the MOSAIC Competency models, which are relatively high-level and do not reflect the specific nature of NAVSEA's line of business. For example, the technical model for cybersecurity lists generic specialties that most of the world can identify, such as requirements analysis, risk management, security, and software development. However, the domains are more detailed. Software development in the Department of Defense has its own set of policies, procedures, and methods that deviate from industry. This quality of the position definition processes can allow a great deal of latitude at an organizational level in defining these competencies, as it enables organizations to focus on more high-level aspects of their lines of business while ignoring the more granular levels at which expertise must be measured. There is no guidance to organizations as far as how detailed these competencies must be, how closely they relate to the actual position, or how to detangle advanced position descriptions that may involve scores of competencies. This ambiguity also provides opportunity for bias, as a malicious actor has latitude to define technical domains as they see fit. For example, a competency might be written toward a specific skill- and toolset that an organization developed in-house that

only a select set of employees can access. This might not be the best measure of technical competency, as it targets a limited set of employees who by chance or other factors work with the select technology. In fact, it is possible to target a single employee, defeating the tenets of fairness and intent of open competition by the U.S. government.

The requirements development process addresses simplification of overly complex positions.

As shown earlier in this work (Table 3), given the broad set of technical skill at NAVSEA, the decomposition of advanced technical positions into domains can lead to an unwieldy outcome. In all of the artifacts that were reviewed, the linkage between organizational priority and technical domain (or competency) is not explored. The Job Analysis Worksheet for Task and Competency Linkage in Appendix D of the DEO Handbook only addresses how important a task is in relation to a competency, but no map or guidance exists to help an organization use data or objective methods to assess their own priorities within a work unit or organization. Importance is a qualitative data-point, and there is no hard link between organizational or work unit priority and tasks or competencies (or technical domains). The Sample Job Analyses Worksheet for Competencies lists importance, need at entry, and distinguishing value as columns. However, this does not map organizational priority, and value is arbitrarily defined. Absence of this aspect within the processes can adversely affect its face validity, as it can appear that positions are created for other reasons, and no objective quality evidence can be produced to refute this claim.

The requirements development process accounts for similarity of tasks of positions within the home organization.

The DEO Handbook requires hiring agencies to conduct a job analysis to identify competencies and KSAs of a competed position. Chapter II of the handbook elaborates the identification of a job and its assessments. Section B of the chapter contains a wealth of knowledge regarding the application of hiring authorities and explaining the different types of appointments, direct hire authorities, and details of conducting a job analysis. There is no guidance on identifying similar positions within the home organization. A hiring manager has a fair degree of freedom in determining the KSAs or competencies for

a position under development, and there is no leveling of criteria across the organization. Thus, it is possible for the same or a vastly similar position to be filled elsewhere at a different paygrade or to match a specific person currently performing a set of tasks relative to a position under development. Appendix D of the handbook contains the job analysis methodology table, and step 1 instructs a hiring manager to collect information about the job, such as position descriptions, classification standards, SME inputs, and occupational studies, but nowhere in the example process is there a check for redundancy or if the capability is stewarded by another work unit.

Thusly, the lack of standardization for competed technical positions introduces bias to the selection processes. Hiring managers can believe a position or tentative position within their work unit merits a certain level of compensation or competition, whereas similar positions may exist within the organization under different working unit at a different rate of compensation. Furthermore, the absence of common standardization may allow a bad actor to define a position around a certain employee or group of employees. These conditions also adversely impact the face validity of the technical promotion process.

The requirements development process solicits input from qualified subject matter experts for each set of criteria associated with a defined position.

The processes outlined in Chapter II of the handbook do not specifically mention leveraging subject matter experts in the definition of a position. However, in Appendix D, OPM recommends using subject matter experts as a source information about the tentative position and heavily leverages them throughout their process to define importance and frequencies of tasks and associated ratings. Subject matter experts individually address the rating of competencies and linkages to corresponding tasks. Subject matter experts are leveraged throughout the position definition process.

Position descriptions are aligned with the priorities documented in the decomposition activity.

and

Position descriptions adequately communicate the day-to-day activities required by the target position.

The guidance on developing position descriptions within these processes is scant. Executive Order No. 13932 (2020) emphasizes the significance of basing position descriptions and job postings on specific skills and competencies required for the job and orders the revision of job classification and qualification standards within the competitive service. Although the DEO Handbook makes reference to position descriptions, it provides no specific guidance, requirements, or formats in developing them. However, OPM's job analysis methodology in the appendix refers to the position descriptions as an input to the process in the first step and serves as part of the foundation of the job analysis. Given the lack of guidance or standardization, and guidance to use OPM competencies instead of defining technical domains, it is possible for organizations to produce position descriptions that may not accurately represent all day-to-day tasks of the position, or in the case of an overwhelming number of tasks, selectively build position descriptions. Interdisciplinary technical positions may be more susceptible to this effect. Position descriptions that do not align with the priorities of the organization but do align with day-to-day activities adversely impact face validity, as the employees of an organization see a mismatch between description and position once filled. Furthermore, the descriptions may attract candidates from fields who more closely relate to the position description but may not be the best fit for the job. An example of this would be advertising a position for a lead electrical engineer who heralds organizational knowledge, propagates KSAs throughout the workforce, and is a de facto authority in the field, but in reality, using that person as a program manager or manager. Also, given the loose guidance on building position descriptions, process bias by a malicious or incompetent actor is possible. Since OPM delegates to local agencies and does not have the purview or expertise to understand the details of what these positions entail, it cannot prevent this effect.

3. Assessment

Considering the overall process depicted in Figure 6, there are three relevant boxes to the assessment analysis conversation. These are identify assessment tools,

accept and review applications, and assess applicants. These processes align with the core elements of the hiring process; they focus on assessing the qualifications, competencies, and job performance potential of candidates.

The table in Appendix A provides a summary of relevant evidence from the literature review, which supports the assessment analysis. Several of the artifacts listed are crucial for understanding how assessments are conducted in OPM's hiring practices. While the table includes numerous pieces of evidence, the most critical documents for assessment are the

- ADG
- UGESP
- DEO Handbook

These artifacts are essential to the assessment process's structure because they help guide the assessment of technical candidates in accordance with the established requirements. The framework can identify possible areas for enhancing the assessment techniques, such as improving the measurement of competencies and the application of evaluation tools, by incorporating these documents. This method enhances the alignment between assessment practices and the requirements of organizations such as NAVSEA, which depend on accurate assessments of technical skills for mission-critical roles.

4.   Application of the Framework

Domains are analyzed for evaluative redundancy.

An analysis of the ADG, UGESP, and DEO Handbook provides no guidance or requirement for organizations to essentially "offload" evaluation of KSAs that are not within the organizations' primary lines of business or specialization. For example, a technical position that has been determined to be a lead role in some interdisciplinary field should not focus on evaluation of leadership because it is not the primary area of the work unit's expertise, and a work unit may be working outside of their competencies. An alternative approach would be to outsource evaluation of a candidates leadership ability or potential to an entity who specializes in that field.. This approach would enable a shift of focus to the in-house KSAs that contribute to the organizations' inherent and primary function. Over half of the federal employees at NAVSEA occupy STEM positions. For those positions, leadership is important, but it makes sense that KSAs most pertinent to the technical domains should be of priority.

The ADG elaborates on the allowed usage of "Job Knowledge Tests," in which knowledge of a job is gauged but ability is not; licenses and certificates fall under this category. It does not specifically require evaluation of the most relevant organizational KSAs and outsourcing evaluation of other, secondary KSAs essential for the position. It does discuss development costs and states the "cost of purchasing off-the-shelf knowledge tests is typically less expensive than developing a customized test" (U.S. Office of Personnel Management, n.d.-m, p. 30). The guide also notes that these tests do not predict performance in the way of cognitive ability.

Failure to focus on the primary areas of an organization's specialty during assessment of a candidate erodes the organization's ability to adequately assess candidates in the most pertinent areas because it detracts from evaluation of the most important and specialized KSAs . This erodes at the construct validity of the assessment, as the underlying traits a warfare center requires in its personnel are unique and many.

Advanced degrees or credentials over the minimum allowable considered and leveraged within the evaluation process

The DEO Handbook discusses education and its efficacy as an indicator of proficiency and warns that it should be used in conjunction with an indicator of experience. Also, it considers a college degree transcript a "supplementary document" to be used in demonstration of meeting minimum KSAs. There is no guidance as to when to leverage a college degree, multiple degrees, or advanced degrees, such as doctorate degrees in the assessment processes. This is particularly important for technical leadership positions where a candidate would be expected to apply mastery of many interrelated fields and operations at a high level on Bloom's taxonomy is sought.

Only adhering to the minimum educational requirements in assessment of candidates for technical, interdisciplinary, and advanced technical positions may impose more cost on an organization, as it allows wide swaths of lesser-qualified candidates to engage in the selection and promotion process. Furthermore, it provides opportunities for bias, as the most advanced positions are typically well paid, few in number, and highly sought after This allows a large number of candidates, who are likely not highly qualified, to advance in the promotion process. Also, in the case of advanced technical

positions or lead roles, face validity suffers, as the expectation is that only the most well qualified individuals are considered.

The interview formats consider target occupational RIASEC type.

Although the federal government leverages RIASEC types to describe the employment landscape and help people find suitable employment, it is not considered anywhere in the processes for evaluating personnel. The ADG allows latitude in local organizations to determine their own assessment strategies, as local organizations have the best purview of the nature and complexity of the work performed in the positions to be filled.

Table 1 of the ADG provides the validity of various assessment tools and their validities alone and when combined with a cognitive method of evaluation. However, each format, or combination thereof, may agree or disagree with a personality type, as personality types are known to agree or disagree with certain environments, such as a structured interview, where a candidate must address a relatively small number of questions in a short period of time and is not allowed to communicate with the panel or proctor, essentially implementing unidirectional communication. Given the vast amount of KSAs associated with technical personnel and the NAVSEA Top 10 in general, such a format would be disagreeable. The NAVSEA Top 10, except for Information Technology Management, are considered to be realistic, investigative, and conventional. The work environment created by the example interview can be classified as enterprising in the way that an individual must emphasize their own accomplishments and sell them to the panel, aligning with the extroverted, self-confident, and sociable characteristics of the enterprising environment. Furthermore, the work environment relates to the artistic environment in the way that creativity must be leveraged to speak to a limited set of questions about a comparatively vast field of expertise. Also, when not paired with Accomplishment records, individuals are encouraged to "be creative," as there is no fact checking of the interview content. According to Dr. Holland's (1997) model, the enterprising and artistic types would thrive in this setting, whereas the NAVSEA Top 10 would, in theory, not do well, as these qualities are diametrically opposed.

The example also shows how an interview process can be either intentionally or unintentionally biased against the target demographic it intends to measure. In fact, an interview can be crafted to deter applicants of a certain type, serving as a people filter.

The process documents reasoning for employing various interview types.

Although the ADG encourages "documentation of the job analysis process and the linkages between job tasks, competencies, and selection tool content" (U.S. Office of Personnel Management, n.d.-m, p. 5), and ensuring the assessment strategy meets legal and professional guidelines, there is no requirement to document the rationalization of selecting a certain set of tools for assessment. Documenting the reason for the approach may increase face validity and overall morale. Furthermore, it may force an organization to ensure they are selecting strategies with validity and efficacy in mind.

The application of the framework to both requirements and assessment processes as documented by OPM yields some interesting observations. Analysis of these processes against the framework shows which responsibilities are relegated to a local organization, the level of guidance provided by OPM to an organization, where an organizations judgement is required. Through this analysis, opportunity for biases within these process are identified.

When applied to the requirements portion of OPM's processes, it is shown that OPM requires minimum educational requirements for its positions and does not provide guidance on how to apply advanced degrees. This quality grants an organization a certain degree of freedom in determining how to weigh advanced degrees within their selection processes. Also, no decomposition strategy for complex positions is offered. OPM's MOSAIC effort, although thorough in some areas, is not consistent across occupations and the NAVSEA Top 10 occupations are generally not covered. Furthermore, MOSAICs for functional areas such as shipbuilding are not addressed. OPM's job analysis methodology does offer general guidance on evaluation of tasking and competencies but does not offer any guidance on the complex task of further mapping these into domains of technical expertise. Similarly, no guidance is provided on the value of tasking or leveling of criteria across an organization, and an advanced position defined by one manager might be working level for another. This characteristic allows a good

deal of tailoring of job requirements. Also, minimal guidance is provided to an organization for developing position descriptions; no detailed guidance, requirements, or formats are offered, which allows an organization to fill in the gaps.

Analysis of the assessment processes against the framework also yields interesting observations. Review of ADG, UGESP, and DEO handbook do not provide any guidance on outsourcing evaluation of KSAs of which an organization might not possess the level of competency required to expertly evaluate. The ADG specifically allows usage of job knowledge tests which do not measure ability. Furthermore, the ADG acknowledges the cost of purchasing off-the-shelf knowledge is generally cheaper than creating it, but provides no guidance in this area as well. Guidance around leveraging advanced degrees or credentials is not present as the DEO handbook considers college degree transcripts supplemental to the process, allowing the minimum educational requirements in a process. This allows a variance in educational requirements for advanced position, thus introducing opportunity for bias. Although the government sees value in matching personality with occupation, as shown by the development of O*Net, the interview formats are not required to match personality type, and selection of interview types and methods are largely related to local organizations or commands but little to no guidance is provided on appropriate formats. There is also no requirement to document the reasoning of selection of such approaches. These factors also allow opportunity for bias.

VI. CONCLUSIONS AND RECOMMENDATIONS

This capstone project set out to develop a standardized framework for the evaluation and promotion of technical personnel within NAVSEA warfare centers, addressing challenges related to fairness, consistency, and efficacy in career advancement processes. Research has shown that although NAVSEA has highly skilled and technical personnel, the lack of standardization in its promotion procedures may contribute to discrepancies between warfare centers, reduced mobility, and possible retention issues. The primary objective of this work was to create a framework that leverages research in fields related to assessment of technical personnel with the purpose of improving the processes used by NAVSEA organizations. Chapter IV outlined the creation of the framework by developing the format and key concepts.

With careful thought about the target demographic, this work can be used to compare NAVSEA processes to industry. The framework takes into consideration the distribution of occupations across an organization, the priorities within the selection of RIASEC elements, domain definition, and other factors that may differ between organizations. For example, this work centers on the Top 10 STEM occupations amongst technical personnel within NAVSEA as defined by OPM and the GS schedule. A private organization may have a different distribution of technical occupations, and its RIASEC analysis may differ from that of a warfare center. Furthermore, tasks associated with certain job titles or occupations can vary significantly between government and industry. Dr. Holland's work (1997) has been adapted to the wider U.S. workforce via the O*Net Online, and it is not a far stretch to imagine an adaptation of these tools and concepts to provide a common ground in the definition of technical positions between industry and government.

Given the flexibility of the framework in addressing the unique challenges of technical personnel evaluation, its adoption across NAVSEA centers could lead to more objective and transparent promotion processes. This would enable NAVSEA to better attract top-tier talent while improving retention and employee satisfaction. Basing the technical development of the workforce around technical domains would align employee

development with the assessment processes, since these domains are used as inputs in the requirements portion of the evaluation activities. The establishment of technical domains at the working level across warfare centers is paramount to this concept.

A. RECOMMENDATIONS

The completion of this work yields valuable data about possible improvements to the technical selection processes within NAVSEA organizations and continuance of this work will offer opportunity to learn about and further improve current technical selection processes. The primary recommendation is to implement this framework around the topic of bias. Furthermore, this endeavor is rooted in literature reviews and the recommended path for continuance of this work is to directly engage NAVSEA technical centers, such as warfare centers, with aim to take data about the relation between interview and selection processes and employee disposition towards those processes. This feedback will offer valuable insight into the perspective of technical personnel and management about the processes and perceived or real biases and may lead to further improvement. The authors also recommend analysis of local or command promotion processes and developing a pilot program which aligns the target demographics RIASEC type with interview formats as that may yield valuable data about the efficacy of chosen processes. Additionally, it is recommended that an organization be cognizant of gaps in policy and guidance as they introduce opportunity for bias and objectively study those gaps to identify any biases which may exist.

B. LIMITATIONS AND FUTURE RESEARCH

In the development of this work a certain limitation became apparent. DoD instruction 3216.02, "Protection of Human Subjects and Adherence to Ethical Standards in DoD-Conducted and Supported Research" provides policy for protection of subjects participating in human subject research (HSR). The instruction requires "the key investigator must receive command or component approval to execute the research" (Office of the Under Secretary of Defense for Research and Engineering, 2020) for DoD-affiliated personnel used as subjects in DoD-conducted or supported HSR. During the development of this work, the authors found it difficult and failed to secure permission

from the commands, who are under no obligation to approve such requests. This was a limiting factor in the way that we were not able to gather data via interviews or surveys, access command hiring and promotion data, or otherwise examine the relations between interview formats, command policies, and employee disposition towards such.

While the framework provides a solid foundation, additional research and development are crucial to ensuring it evolves with NAVSEA's operational and technological needs. In the case of comparing two heterogeneous organizations, care must be used in the interpretation of results due to the differences in other elements of the framework. Several areas of further research are essential to enhance the framework:

1. Assessment of Work Environments: Research should concentrate on how interview formats affect workplaces, particularly by utilizing knowledge of personality traits. Dr. Holland's research on personality types and job alignment emphasizes that mismatching interview processes with the dominant personality traits of technical personnel can result in low work morale and engagement. A greater understanding of how interview formats work with NAVSEA's workforce could help ensure that employees are assessed in settings that support their performance, which in turn can increase efficiency and employee satisfaction. A pilot program could be launched within one or more NAVSEA centers to test the outcomes of these interview practices in real-world settings, which can help to ensure that the implementation of this research fosters an inclusive and supportive work environment.

2. Combinations of Assessment Methods: NAVSEA evaluates personnel using a range of assessment techniques, but uncontrolled combinations of these techniques may compromise the validity of the selection process. For instance, combining cognitive ability tests and unstructured interviews without a cohesive strategy may result in inconsistent results. More research is required in order to determine which combinations introduce biases or inefficiencies and which yield the most dependable results. The accuracy and equity of NAVSEA's hiring procedures will be guaranteed by establishing a clear methodology for the use of various assessment tools.

3. Workforce Engagement: Interviews and surveys of NAVSEA personnel could provide valuable insights about the effects of assessment methods on application rates, morale, and overall selection efficacy. By getting direct feedback from technical personnel, NAVSEA can improve its procedures to better suit the needs of the workforce, which could enhance organizational culture and long-term employee retention in addition to selection results.

4. Defining Technical Domains: Research could be conducted to improve the translation of workforce capabilities into clearly defined technical domains

that align with NAVSEA's operational needs. For example, many technical positions at NAVSEA require knowledge in several different fields, which can make hiring and career advancement more difficult. Standardizing these domains could help streamline the evaluation process and ensure that personnel are assessed based on the most relevant KSAs.

5.   Validation of Selection Tools: Future researchers should verify the predictive validity of the selection tools used within warfare centers to identify top technical talent. Research should be done to confirm whether these tools accurately forecast future job performance. NAVSEA must constantly verify and update its selection procedures as technology advances to make sure they are equitable, and in line with organizational objectives. The hiring process's credibility and honesty could be improved by this study.

6.   Evaluation of Current Promotion Practices: Additional research into current policies and procedures at warfare centers and other local organizations should be conducted to understand how NAVSEA has been promoting and the desired qualities of high-level technical personnel. Whether these practices promote long-term career growth and are in line with NAVSEA's mission will become clear through analysis. Furthermore, this study could identify areas for development, promoting procedures that are open, fair, and helpful in identifying future leaders.

C.   CONCLUSIONS

This capstone applied the concepts of fairness and bias to NAVSEA hiring and promotion. The framework synthesizes current research on effective interviewing and assessment practices. These could help minimize discrimination, nepotism, and political influence, leading to more accurate assessments, improved morale, and other positive outcomes. By matching interview formats with personality traits of the dominant occupations within a workforce, it is possible to increase efficacy of these processes.

In conclusion, a framework for increasing the efficacy of the hiring process based on a literature review in the areas of fairness and bias was developed to reduce biases caused by mismatches between personality type and work environment. Application of the framework on federal hiring processes revealed ambiguities and effects that are known to be detrimental to overall assessment activities. These ambiguities arise from the disconnect between technical organizations that use OPM resources and OPM itself, which provides materials and services for local agencies. However, there is no requirement to "push" these resources out to other government organizations. By addressing these ambiguities, NAVSEA can better position itself to meet workforce

management goals. The development and application of a standardized framework for technical personnel evaluation represents a critical step in NAVSEA's journey toward a more effective and equitable workforce management system. The organization must make sure that its personnel and procedures are prepared to handle the demands of a quickly changing operational environment while it maintains its crucial role in technical innovation for the country's defense. To address these issues and ensure that NAVSEA can continue to draw in, nurture, and keep the talented personnel required to carry out its purpose, the solution presented in this capstone offers a practical, research-driven answer.

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APPENDIX A. SUMMARY OF OPM ARTIFACTS - SOURCES, DESCRIPTIONS AND RELEVANCE

Table 17.   Requirements or Assessments or Both

Artifact	Section/Page/Link	Description
Assessment Decision Guide (ADG)	High level document	The Assessment Decision Guide (ADG) was developed to serve "as a resource for agencies designing assessment strategies to fill critical vacancies at all levels" (U.S. Office of Personnel Management, n.d.-m, p. 1). Through this guide OPM refers agencies to the Uniform Guidelines on Employee Selection Procedures (UGESP), 29 CFR Part 1607.
Uniform Guidelines on Employee Selection Procedures (UGESP)	29 CFR Part 1607 - High level document	"The Guidelines provide a set of principles for determining proper test use and selection procedures, covering topics such as test fairness and adverse impact" (U.S. Office of Personnel Management, n.d.-m, p. 1).
UGESP: "four-fifths" rule	Section 1607.4D	The rule states "A selection rate for any race, sex, or ethnic group which is less than four-fifths (4/5) (or eighty percent) of the rate for the group with the highest rate will generally be regarded by the Federal enforcement agencies as evidence of adverse impact" (Uniform Guidelines on Employee Selection Procedures, 1978, Section 1607.4D).
UGESP: Fairness	Section 1607.7B(3) & 1607.14B(8)	"Basing personnel assessment closely on job analysis results makes the connection between job requirements and personnel assessment tools more transparent, thereby improving the perceived fairness of the assessment process" (U.S. Office of Personnel Management, n.d.-m, p. 3).
UGESP: Unfairness	Section 1607.7B(3) & 1607.14B(8)	"When members of one race, sex, or ethnic group characteristically obtain lower scores on a selection procedure than members of another group, and the differences in scores are not reflected in differences in a measure of job performance, use of the selection procedure may unfairly deny opportunities to members of the group that obtains the lower scores" (Uniform Guidelines on Employee Selection Procedures, 1978, Section 1607.14(8a)).
ADG & UGESP: Construct validity	ADG: Page 50 UGESP: Section	Construct validity, which examines the fit between an assessment and the underlying trait it aims to measure, is essential to the validation process. In

Artifact	Section/Page/ Link	Description
	1607.5B & 1607.14D & 1607.15D	order to determine whether the assessment taps into the intended construct—such as intelligence or sociability—evidence must be gathered (U.S. Office of Personnel Management, n.d.-m). Construct validation functions as a thorough inspection, guaranteeing that the evaluation accurately conveys the essence of the characteristic in question.
ADG & UGESP: Content validity	ADG: Page 50 UGESP: Section 1607.5B & 1607.14C & 1607.15C	Content validity assesses whether the assessment's items or tasks make sense in relation to the competencies or job requirements as established by expert judgment and job analysis (U.S. Office of Personnel Management, n.d.-m). A fundamental component of any assessment is content validity, which guarantees that all relevant aspects of the job role or trait being evaluated are covered in detail.
ADG & UGESP: Criterion-related validity	ADG: Page 50 UGESP: Section 1607.5B & 1607.7B & 1607.14B & 1607.15B	The degree to which an assessment's results predict or correlate with important criteria, like training success or job performance, is known as criterion-related validity (U.S. Office of Personnel Management, n.d.-m). This includes both concurrent and predictive validity (U.S. Office of Personnel Management, n.d.-m).
ADG: Face validity	ADG: Page 9, 51	Face validity is an important factor in determining how applicants view the fairness and relevance of the assessment, even though it is not a conclusive measure of validity. It concerns the degree to which, upon initial inspection, an assessment is a legitimate measure (U.S. Office of Personnel Management, n.d.-m). Face validity is important for encouraging applicant cooperation and acceptance of the assessment process, but it is not the only factor to consider.
ADG: Predictive validity	ADG: Page 7, 17, 51	Predictive validity looks at the assessment's ability to predict job performance in the future.
ADG & UGESP: Concurrent validity	ADG: Page 50 UGESP: Section 1607.14B(4)	"In a concurrent study, job incumbents (i.e., current employees) are tested and their job performance is evaluated at the same time. The relation between current performance on the assessment and on the job can then be examined" (U.S. Office of Personnel Management, n.d.-m, p. 50).
ADG: Incremental validity	ADG: Page 7, 51	Incremental validity measures how much a new assessment improves the ability of previous assessments to predict job success. It emphasizes how additional evaluations can improve forecast

Artifact	Section/Page/ Link	Description
		accuracy above and beyond what can be achieved with stand-alone measurements.
Multipurpose Occupational Systems Analysis Inventory-Close-Ended (MOSAIC) methodology	High level document	MOSAIC "provides agencies with a basis for building integrated human resource management systems that use a common set of tasks and competencies to structure job design, recruitment, qualification and assessment, selection, performance management, training, and career development so that employees receive a consistent message about the factors on which they are selected, trained, and evaluated" (U.S. Office of Personnel Management, 2019, p. 2–14).
OPM Website: General Schedule (GS) Qualification Standards	https://www.opm.gov/policy-data-oversight/pay-leave/pay-systems/general-schedule/	The General Schedule (GS) qualification standard for entry into each occupation covered by the standard and describes the requirements for GS positions involving professional and scientific work (U.S. Office of Personnel Management, n.d.-h). The standard places an emphasis on the specific requirements for each occupation and allows for flexibility in achieving the minimum requirements through training, work experience, or a combination of both.
OPM Website: Top 10 STEM Occupational Requirements	https://www.opm.gov/policy-data-oversight/classification-qualifications/general-schedule-qualification-standards/#url = Occupational-Series	The occupational requirements outlined on the OPM website offer a basic understanding of the educational and experiential criteria necessary for these positions.
OPM Website: Federal Wage System Qualifications	https://www.opm.gov/policy-data-oversight/classification-qualifications/federal-wage-system-qualifications/	The Federal Wage System (FWS) offers a framework for assessing and selecting federal blue-collar positions, featuring structured evaluation and transparent pay determination aligned with local wage rates.

Artifact	Section/Page/Link	Description
OPM Website: Career Development	https://www.opm.gov/policy-data-oversight/training-and-development/career-development/#url=Career-Paths	OPM's career path guides offer outlines for various occupations, including one for Information Technology (IT): IT program management and various human resources positions such as classification, compensation, employee benefits, executive services, human resource development, policy, information systems, military, Performance Management/Employee Relations/Labor Relations, and Recruitment and Placement.
OPM Website: Leadership Assessments	https://www.opm.gov/services-for-agencies/assessment-evaluation/leadership-assessments/	OPM provides a range of leadership assessment tools, aimed at identifying, developing, and supporting leaders within the federal workforce. The Executive Core Qualifications (ECQs) serve as the foundation to evaluate leadership potential and effectiveness.
Executive Order 13932	https://chcoc.gov/content/interim-guidance-eo-13932-modernizing-and-reforming-assessment-and-hiring-federal-job	"Modernizing and Reforming the Assessment and Hiring of Federal Job Candidates," is a policy directive intended to change how the federal government handles hiring and evaluation procedures.
National Initiative for Cybersecurity Careers and Studies (NICCS)	https://niccs.cisa.gov/workforce-development/nice-framework	Offers an innovative approach to exploring work roles within the Workforce Framework for Cybersecurity (National Initiative for Cybersecurity Careers and Studies, 2024). This tool offers comprehensive insights into 52 job roles, divides the cyber workforce into five skill communities, and offers practical guidance for professionals, employers, and those looking to enter the cybersecurity field.
Delegated Examining Operations Handbook (DEO handbook)	High level document	Comprehensive guide for federal agency examining offices, offering detailed instructions on conducting job analysis and implementing effective assessment strategies.

Artifact	Section/Page/ Link	Description
DEO Handbook: Identify Job and Assessments	Chapter II (pages 2–1 through 2–37)	Identifying the job and its assessments portion of the OPM process consists of determining the duties of a position and selecting appropriate tools for evaluating candidates.
DEO Handbook: Conduct/Review job analysis to identify competencies/KSAs	Chapter II Section B (pages 2–13 through 2–16) & Appendix D (pages D-1 through D-19)	Conducting a job analysis is a component of identifying the job and its assessment. A job analysis determines the competencies/KSAs that are directly linked to job performance. A job analysis involves collecting and examining the details regarding what a job involves, including the tasks they will do, their responsibilities and the skills they will need to perform the job effectively.
DEO Handbook: Create/Review a job opportunity announcement	Chapter III Section C (pages 3–11 through 3–16)	Creating and reviewing a job announcement includes the essential job details such as position title, salary, required qualifications, and how applicants will be evaluated. Job announcements must reflect not just the position title and pay but also the specific KSAs needed for the job.
DEO Handbook: Qualifications Review	Chapter IV Section B (page 4–23 through 4–27)	Qualifications review provides instructions for evaluating job applications, emphasizing actions like using a documented job analysis to identify the job's selectivity factors. In order to ensure compliance with federal regulations, this section also emphasizes the significance of using validated assessment procedures, such as job knowledge tests, structured interviews, and work samples, when reviewing applications for competitive service positions.
DEO Handbook: Identify assessment tools	Chapter II Section C (page 2–17 through 2–34)	The assessment tools measure the competencies and KSAs identified in the job analysis. UGESP provides additional assessment tools.
DEO Handbook: Accept and review applicants	Chapter IV Section A & B (pages 4–1 through 4–27)	The DEO handbook provides guidance on reviewing applications, including focusing on determining minimum qualifications and KSAs/competencies.
DEO Handbook: Assess applicants	Chapter V (pages 5–1 through 5–31)	Using quality ranking factors from OPM, agencies are able to rank applicants according to how proficient in the KSAs/competencies they are.
Designing an Assessment Strategy	Fee based help: Slide 81	Describes the processes for creating and utilizing evaluation tools for organizations. It covers different assessment models, things to think about when creating an assessment plan, and how to put these plans into practice. The document also emphasizes

Artifact	Section/Page/ Link	Description
		factors like development costs, possible roadblocks, and the necessity of continual review to guarantee accurate and valid assessments.
ADG: Accomplishment Records	Page 14–15	Gather information on candidates' past achievements, emphasizing how previous experiences relate to job competencies. This method encourages candidates to explain specific situations they have encountered and the outcomes of their actions, offering a detailed view of their past behavior.
ADG: Assessment Centers	Page 17–18	Employ exercises to assess a variety of skills and competencies, often replicating job-related scenarios. These centers involve interactive tasks such as group discussions and simulations, allowing for a broad evaluation of a candidate's suitability for a role. Assessors observe and rate performance based on predefined criteria, which can provide insight into both individual and group dynamics.
ADG: Biographical Data (Biodata) Tests	Page 20–21	Focus on a candidate's history, including experiences, behaviors, and personal characteristics. By looking at previous actions as an indicator of future performance, biodata tests offer a structured way of linking historical behaviors with job-related outcomes.
ADG: Cognitive Ability Tests	Page 23–24	Evaluate mental processes such as problem-solving, reasoning, and memory. These tests aim to estimate an individual's ability to process information and adapt to new or complex job requirements, which provides insight into their potential cognitive capabilities in a work setting.
ADG: Emotional Intelligence Tests	Page 25–26	Evaluate a candidate's capacity to perceive and interpret emotional cues in themselves and others, and to regulate those emotions effectively in the workplace (U.S. Office of Personnel Management, n.d.-m). This method is useful in determining how well an individual can navigate social environments and handle interpersonal challenges in the workplace.
ADG: Integrity/ Honesty Tests	Page 27–28	Focus on assessing personal characteristics related to trustworthiness, reliability, and ethical behavior. These tests examine tendencies toward behaviors like dishonesty or theft and seek to gauge an individual's adherence to moral or professional standards.

Artifact	Section/Page/Link	Description
ADG: Job Knowledge Tests	Page 29–30	Evaluate a candidate's proficiency in specific knowledge areas relevant to the job. These tests are used when specialized or technical knowledge is essential for the position, and they measure the depth and breadth of a candidate's expertise.
ADG: Personality Tests	Page 31–32	Examine the five traits that are best known as the Big Five or the Five-Factor Model. These assessments aim to understand how a candidate's personal attributes align with the demands of a job, often using self-report measures to gather information about behaviors and preferences.
ADG: Reference Checking	Page 33–34	Involves gathering information from previous employers or other sources about a candidate's past work performance. This method provides additional context on the candidate's qualifications and reliability, offering third-party validation of their competencies.
ADG: Situational Judgment Tests	Page 35–36	Present hypothetical job scenarios to candidates and ask them how they would respond. These tests aim to assess decision-making skills, problem-solving abilities, and the application of judgment in workplace situations.
ADG: Structured Interviews	Page 37–38	Use predetermined questions to evaluate a candidate's competencies. By asking the same set of questions to all candidates, structured interviews provide a consistent and standardized approach to measuring how well individuals meet the job requirements.
ADG: Training and Experience (T & E) Evaluations	Page 40–41	Rely on self-reported assessments of a candidate's relevant job experience. This method helps screen applicants based on their previous roles and responsibilities, often used in the early stages of the hiring process.
ADG: Work Samples and Simulations	Page 43–44	Involve asking candidates to perform tasks or simulations that closely mimic actual job duties. This hands-on approach allows for direct observation of how well candidates can complete job-related tasks, providing practical insight into their abilities.
ADG: O*Net	Page 1	This document was created by the U.S. Department of Labor (DOL) to help managers and HR specialists make decisions pertaining to assessments.
DEO Handbook: Appendix D – Job	Page D-7 & D-13	Have the SMEs rate job-related competencies on three scales: important, need at entry, and

Artifact	Section/Page/ Link	Description
Analysis Worksheet for Competencies		distinguishing value (the ability to differentiate high performers from low performers).
DEO Handbook: Appendix D – Worksheet for Task and Competency Linkages	Page D-8 & D-14	Connects specific tasking to required competencies. SMEs rate the importance of each competency for effective task performance, and tasks not linked to competencies are eliminated.
DEO Handbook: Appendix D – Accomplishment Worksheet	Page D-9 & D-15	Is used to help agencies organize and rate tasking based on SME input, which is averaged to identify the most critical elements.
DEO Handbook: Appendix D – Multiple Choice Yes/No Worksheet	Page D-10 & D-16	Is used to evaluate a candidates KSAs that are important to job performance. Each question can be rated for its difficulty and relevance by the SMEs to ensure they align with job performance.
DEO Handbook: Appendix D – Rating Schedule Benchmark Worksheet	Page D-11 & D-17	Is used to establish a standardized scoring system for assessment tools, such as open-ended questions or structured interviews. The responses are rated on a scale (exceptional, satisfactory, and unsatisfactory) based off of the SMEs criteria.
DEO Handbook: Interdisciplinary positions	Chapter VI (page 6–3 through 6–4)	Interdisciplinary positions involve responsibilities across multiple professional or scientific fields, requiring candidates to have relevant academic credentials and ensuring equal evaluation based on specific competencies. These roles are categorized into two types: Category 1, which combines distinct duties from different professions, and Category 2, where various professionals, with hiring processes designed to maintain uniform assessment standards across disciplines, can perform similar tasks.

APPENDIX B. OVERVIEW OF THE MOSAIC METHODOLOGY AND DEO COMPETENCIES

Personnel assessment, as defined by OPM, "refers to any method of collecting information on individuals for the purpose of making a selection decision. Selection decisions include, but are not limited to, hiring, placement, promotion, referral, retention, and entry into programs leading to advancement" (U.S. Office of Personnel Management, n.d.-b). The significance of implementing suitable assessments tailored to meet the specific requirements of every position and company environment is emphasized on the OPM website. OPM asserts that assessment tools are essential for evaluating job-related competencies, interests, and suitability for employment, with predictive validity being a crucial characteristic for effective selection decisions. "An assessment tool is any test or procedure administered to individuals to evaluate their job-related competencies, interests, or fitness for employment. The accuracy with which applicant assessment scores can be used to forecast performance on the job is the tool's most important characteristic, referred to as predictive validity" (U.S. Office of Personnel Management, n.d.-b).

One of MOSAIC's features is its literature review, which draws occupational data from public and private sector organizations as well as organizational and psychological research. MOSAIC "provides agencies with a basis for building integrated human resource management systems that use a common set of tasks and competencies to structure job design, recruitment, qualification and assessment, selection, performance management, training, and career development so that employees receive a consistent message about the factors on which they are selected, trained, and evaluated" (U.S. Office of Personnel Management, 2019, p. 2–14).

A series of MOSAIC studies have been conducted for the following fields (U.S. Office of Personnel Management, 2019, p. 2–14):

1. Cybersecurity
2. Grants Management
3. IT Program Management
4. Financial Management

5. Human Resources Management
6. Law Enforcement, Compliance, Security, and Intelligence Related Occupations
7. Executive Core Qualifications
8. Government Performance and Results Act Modernization Act

OPM provides guidance on competencies, distinguishing between general competencies that encompass cognitive and social capabilities applicable across various occupations, and technical competencies tailored to specific job knowledge and skill requirements (U.S. Office of Personnel Management, n.d.-b). The Delegated Examining Operations Handbook (DEO handbook) serves as a comprehensive guide for federal agency examining offices, offering detailed instructions on conducting job analysis and implementing effective assessment strategies (U.S. Office of Personnel Management, 2019). The DEO handbook provides a flow chart breaking down the steps of the examining process. The main components of this process are as follows:

1. Identify the job and its assessments
2. Recruit and announce the job
3. Accept and review applications
4. Assess applicants
5. Certify eligibles

According to the DEO handbook, "a job analysis identifies the competencies/ KSAs directly related to performance on the job. It is a systematic procedure for gathering, documenting, and analyzing information about the content, context, and requirements of the job. It demonstrates that there is a clear relationship between the tasks performed on the job and the competencies/KSAs required to perform the tasks" (Office of Personnel Management, 2019, p. 2–13). A more detailed breakdown of the pertinent sections of the DEO handbook are explained in section 9. The MOSAIC competencies are used to "identify the critical competencies and tasks employees need to perform successfully" (Office of Personnel Management, 2019). According to the MOSAIC competencies the definition/tasking of an electrical engineer is "Knowledge of the concepts, principles, theories, and methods related to the design, analysis, test, and integration of electrical systems; energy conversion; electrical power generation; and energy transmission, control, distribution or use" (United States Office of Personnel

Management, 2013). The definition/tasking of a computer scientist or computer engineer cannot be found in the pdf, only the definition of computer or computer skills.

Note the lack of MOSAIC studies for STEM occupations. The MOSAIC competencies provide basic definitions of occupations. The lack of detail in this aspect limits the information's relevance to those looking for advice on assessment procedures unique to STEM positions, which are essential for organizations such as NAVSEA. The MOSAIC competencies also lack detail in order to effectively evaluate technical personnel, leading to ambiguity in the assessment and selection process. Definitions like "Knowledge of the concepts, principles, theories, and methods related to the design, analysis, test, and integration of electrical systems" offer a general understanding but lack the specificity needed to assess the unique skills and technical expertise required for specialized positions. Broad definitions of competencies may leave out the intricate details of particular technologies, processes, or industry standards, making it difficult to discern between candidates' technical proficiency levels during the selection process. This uncertainty can result in the hiring of employees who may not be fully qualified for the position technically, which could have an effect on team productivity and project results.

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APPENDIX C. EXPANDED ANALYSIS OF OPM OCCUPATIONAL REQUIREMENTS

The Computer Science Series focuses on professionals applying "computer science methods and techniques to store, manipulate, transform or present information by means of computer systems" (U.S. Office of Personnel Management, n.d.-d, para 1). This necessitates familiarity with relevant mathematical and statistical sciences in addition to a solid theoretical background in computer science, including system architecture and information representation. Typically, applicants must have completed coursework in mathematics and statistics at recognized universities and hold a bachelor's degree in computer science or a closely related discipline (U.S. Office of Personnel Management, n.d.-d).

The Professional Engineering Positions series covers a broad spectrum of engineering roles, necessitating a bachelor's degree in engineering or a related field accredited by Accreditation Board for Engineering and Technology (ABET) (U.S. Office of Personnel Management, n.d.-a). Positions in this series involve applying engineering principles to solve complex problems and may require professional registration or license. Specific coursework in engineering sciences is essential, with additional education or experience sometimes considered (U.S. Office of Personnel Management, n.d.-a).

The Information Technology (IT) Management Series encompasses positions involved in managing IT systems and services (U.S. Office of Personnel Management, n.d.-i). These roles demand expertise in computer science, engineering, information science, or related fields. Educational requirements vary based on grade level, with higher levels typically requiring advanced degrees or additional experience. Basic requirements include a bachelor's degree in relevant fields or equivalent education and experience (U.S. Office of Personnel Management, n.d.-i).

The Mathematics Series includes positions primarily focused on mathematics research or application (U.S. Office of Personnel Management, n.d.-k). These roles necessitate a robust understanding of mathematical concepts, including calculus and

advanced mathematics. Candidates typically hold a bachelor's degree in mathematics or equivalent coursework, including differential and integral calculus (U.S. Office of Personnel Management, n.d.-k).

The Physics Series covers positions involving physics research or application (U.S. Office of Personnel Management, n.d.-l). Candidates must have a bachelor's degree in physics or a related field, with coursework in general and specific physics subfields.

Those looking for such positions may be unsure of the skills needed to succeed in the organization because these requirements do not go into detail about the duties or projects carried out by NAVSEA. The occupational requirements provide a basic understanding of the requirements for STEM positions at NAVSEA, but they fall short of giving people the specific information they need to understand the selection and assessment criteria or to navigate their career paths within the organization.

APPENDIX D. FEDERAL WAGE SYSTEM (FWS) QUALIFICATIONS OVERVIEW

Three major steps in job element examining are highlighted as: identifying job elements necessary for success, developing a plan to measure applicant qualifications, and rating applicants. The identification of job elements involves categorizing jobs based on their required skills, knowledge, abilities, and personal characteristics (U.S. Office of Personnel Management, n.d.-g). Each job has a critical screen-out element, ensuring that applicants meet the minimum requirements. The plan to measure qualifications assigns point values to different types of experience, training, or other information, reflecting their relative worth to the job. Rating applicants involves evaluating their degree of ability in each job element and assigning a final rating based on their demonstrated or potential ability (U.S. Office of Personnel Management, n.d.-g).

The Job Elements section of the OPM website outlines the sets of job elements approved by OPM (U.S. Office of Personnel Management, n.d.-g). These elements encompass skills, knowledge, abilities, and personal characteristics deemed necessary for job success. Applicants must meet the minimum requirements for these elements to be considered eligible for consideration (U.S. Office of Personnel Management, n.d.-g). Furthermore, it discusses the process of using approved sets of elements, allowing for modifications to suit specific needs without altering the fundamental structure. It also categorizes job elements into five groups, ranging from worker-trainee to high-level supervisory jobs, each tailored to different skill levels and types of work (U.S. Office of Personnel Management, n.d.-g). These categories serve as a framework for identifying and assessing job-specific requirements, aligning applicant qualifications with job demands.

The process of rating applicants involves several key steps and considerations (U.S. Office of Personnel Management, n.d.-g). Initially, agencies must develop an examination plan, which includes job elements, a crediting plan for rating applicants, announcement information, and other relevant details (U.S. Office of Personnel Management, n.d.-g). This plan is ideally prepared by a panel consisting of examiners and agency officials familiar with job requirements (U.S. Office of Personnel

Management, n.d.-g). Developing the examining plan entails studying the job, identifying job elements, and deciding on the best methods to obtain applicant information (U.S. Office of Personnel Management, n.d.-g). Forms, interviews, reference checks, and tests may be used to assess applicants' qualifications (U.S. Office of Personnel Management, n.d.-g).

The crediting plan, a component of the examining process, involves describing acceptable experience, training, or other information for each job element and assigning point values based on the level of ability demonstrated (U.S. Office of Personnel Management, n.d.-g). The preparation of the crediting plan often involves collaboration with subject-matter experts to ensure accuracy and relevance (U.S. Office of Personnel Management, n.d.-g). After the crediting plan is developed, it undergoes testing to ensure consistency and validity in assessing applicants' qualifications (U.S. Office of Personnel Management, n.d.-g).

During the rating process, raters evaluate applicants' qualifications against job elements and assign point values accordingly (U.S. Office of Personnel Management, n.d.-g). Emphasis is placed on the quality and intensity of experience and training, with raters using their judgment to determine final ratings (U.S. Office of Personnel Management, n.d.-g). Applicants must meet the minimum requirements for the screen-out element to be considered eligible for further rating (U.S. Office of Personnel Management, n.d.-g). The raw scores obtained during the rating process are converted to a rating scale of 70 to 100 using a conversion table (U.S. Office of Personnel Management, n.d.-g).

The Federal Wage System (FWS) offers a framework for assessing and selecting federal blue-collar positions, featuring structured evaluation and transparent pay determination aligned with local wage rates. Standardized qualification standards and clear job elements maintain consistency in candidate assessment and provide competitive compensation to blue-collar workers, fostering job satisfaction and retention. In contrast, the assessment process for white-collar workers (which includes the top ten STEM occupations) lacks standardized assessment and selection criteria and transparent pay determination, potentially leading to disparities. Adopting elements of the FWS, like

standardized qualifications and job elements could enhance the assessment and selection process for STEM employees, making it more structured, equitable, and conducive to attracting and retaining top talent in critical fields. This adaptation could provide selecting supervisors with eligible candidates possessing the necessary skills, knowledge, abilities, and personal characteristics for the job.

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APPENDIX E. OVERVIEW OF OPM LEADERSHIP ASSESSMENT TOOLS

The ECQs, which cover six areas, are the basis of OPM's leadership assessment framework. Among these are the Fundamental Competencies, which include integrity, communication skills both written and oral, interpersonal skills, and ongoing learning. The Leading Change category emphasizes resilience, creativity, and strategic thinking. Results Driven incorporates responsibility, customer service, problem solving, and entrepreneurship, whereas Leading People concentrates on team building, conflict resolution, and utilizing diversity. Technology, human capital, and financial management are all covered by business acumen. Coalition building, political acumen, and influencing/negotiating are covered in Building Coalitions. These credentials offer a method for developing and evaluating leaders (U.S. Office of Personnel Management, n.d.-j).

A simulation-based method for assessing leadership competencies is provided by the Leadership Assessment Center. The exercises that candidates take part in mimic real-world scenarios that federal managers or supervisors may encounter. Agencies can evaluate a variety of skills using this method, such as decision-making, problem-solving, interpersonal skills, and strategic thinking. The exercises, which include group discussions, strategic analysis drills, individual assignments, and management problem-solving scenarios, can be tailored to match the needs of any agency (Leadership Assessments, n.d.-j).

The Personality Assessment for Leaders (OPM-PAL) is a developmental tool used by OPM to assess the personality traits of federal leaders and how those traits relate to effective leadership. Openness, conscientiousness, extraversion, agreeableness, and emotional stability are the "Big Five" personality factors that have been the subject of research. Participants can learn how their personality traits match OPM's leadership competencies by using this online assessment, which provides comprehensive feedback that links personality traits to the ECQs (U.S. Office of Personnel Management, n.d.-j).

OPM-PAL is flexible and made for executives as well as team leaders at all levels of leadership. A confidential report that includes specific aspects of each of the five major personality traits and the participants' scores for each trait is given to the participants. The feedback compares these characteristics to federal norms and emphasizes how they relate to effective leadership. In addition, OPM offers aggregate reports for agencies with ten or more participants and one-on-one feedback sessions with certified coaches (U.S. Office of Personnel Management, n.d.-j).

OPM's Leadership 360TM offers comprehensive feedback on all 28 OPM leadership competencies found in the ECQ's. With the help of multiple sources of information, this assessment provides leaders with a comprehensive understanding of their areas of strength and growth. Agencies have flexibility in their leadership assessment approach with the OPM Leadership 360TM, which can be administered either independently or as a component of a larger developmental program (U.S. Office of Personnel Management, n.d.-j).

APPENDIX F. RELEVANT SECTIONS OF THE DEO HANDBOOK ON JOB QUALIFICATIONS AND ASSESSMENT

A.   IDENTIFY JOB ASSESSMENTS

Identifying the job and its assessments portion of the OPM process consists of determining the duties of a position and selecting appropriate tools for evaluating candidates. The process includes reviewing hiring flexibilities such as Direct-Hire Authority, Federal Career Intern Program, Veterans Recruitment Appointment, etc., conducting a job analysis, identifying assessment tools, and submitting a request for approval. However, this thesis only focuses on the components identified as most relevant to the requirements/assessment process.

During this process, the hiring manager and appointing officials (delegated examining staff, test administrators, test control officers, and human resources offices) work together in order to "understand the position the hiring manager is trying to fill and the competencies an appointee would need to possess in order to perform the position effectively" (U.S. Office of Personnel Management, 2019, p. 2–1). Specific duties of the position, the competencies that candidates must possess beyond the minimum qualifications, the best ways to assess candidates' competencies, and effectively marketing the job are discussed during this step. The subsequent sections of this thesis will provide details on the remaining components of the job and its assessment box from the DEO handbook.

B.   CONDUCT/REVIEW JOB ANALYSIS TO IDENTIFY COMPETENCIES/KSAS

Conducting a job analysis is a component of identifying the job and its assessment. A job analysis determines the competencies/KSAs that are directly linked to job performance. A job analysis involves collecting and examining the details regarding what a job involves, including the tasks they will do, their responsibilities and the skills they will need to perform the job effectively. This is provided in Appendix D of the DEO Handbook. The DEO Handbook underscores the role of job analysis in identifying competencies directly linked to job performance. The MOSAIC methodology aims to

guide this, but the literature review notes its lack of detail in defining KSAs for technical roles. For example, the review points out that the competencies for roles like engineers or scientists are not as well defined as they need to be, potentially leading to gaps in the hiring process.

Appendix D of the DEO handbook provides a job analysis methodology action table that provides step-by-step instructions to gather job information and analyze tasking/competencies (DEO Handbook, U.S. Office of Personnel Management, 2019). It includes collecting job data, evaluating importance and frequency of tasking, and refining competencies that are important to job performance. Within this table, there are worksheets that OPM provides to help agencies identify, rate and link job tasks to competencies. The "Job Analysis Worksheet for Tasks" is used to list tasks relevant to the job based on subject matter expert (SME) input. SMEs rate the tasks for importance and frequency and then they are averaged to identify critical tasking's for the job. The "Job Analysis Worksheet for Competencies" have the SMEs rate job-related competencies on three scales: important, need at entry, and distinguishing value (the ability to differentiate high performers from low performers). The "Worksheet for Task and Competency Linkages" connects specific tasking to required competencies. SMEs rate the importance of each competency for effective task performance, and tasks not linked to competencies are eliminated.

C.   CREATE/REVIEW A JOB OPPORTUNITY ANNOUNCEMENT

Creating and reviewing a job announcement includes the essential job details such as position title, salary, required qualifications, and how applicants will be evaluated. The following are included in a job announcement (U.S. Office of Personnel Management, 2019, p. 3–11):

- Name of Issuing Agency
- Announcement Number
- Position Title, Series, Pay Plan, Grade (or Pay Rate) and Starting Salary
- Job Type (i.e., permanent or time-limited including the expected duration of the time limited job)
- Duty Location of the Position(s)

- Number of Job Openings (see "How to create an effective job opportunity announcement" for more information)
- Opening and Closing Dates, including cut-off dates
- Qualification Requirements, including competencies/KSAs or job elements required for successful performance
- Brief Description of Duties
- Basis of Rating – How You Will Be Evaluated
- What to file
- How to Apply
- Information on how to claim veterans' preference
- Definition of "well-qualified" for Interagency Career Transition Assistance (ICTAP) and Career Transition Assistance Plan (CTAP) eligibles
- Contact Person or contact point with a telephone number or email address

D.   QUALIFICATIONS REVIEW

Qualifications review is where applicants' credentials are assessed to determine whether they meet the basic eligibility and qualification standards required for a given position announcement (U.S. Office of Personnel Management, 2019). This review verifies the candidate's relevant education, experience, and any specialized qualifications or selective factors needed to perform the job successfully. The main goal is to ensure that only those candidates who meet the minimum qualifications move forward to the assessment phase. It is important to note that qualifications review does not rank candidates or determine who is the best qualified but rather serves as the first screening step to separate eligible from ineligible applicants' announcement (U.S. Office of Personnel Management, 2019). During the review process, agencies apply standards such as those set forth in the "Operating Manual: Qualification Standards for General Schedule Positions" or other OPM-approved standards for specific occupations announcement (U.S. Office of Personnel Management, 2019). Additional proficiency-based assessments may be required to show competency in important areas.

E.   IDENTIFY ASSESSMENT TOOLS

Identifying assessment tools is a component of the identifying the job assessments box that was covered above in the requirements section of this thesis. The assessment tools measure the competencies and KSAs identified in the job analysis. The assessment approach depends on several elements pertaining to operational concerns as well as the

roles that need to be filled. These considerations include (U.S. Office of Personnel Management, 2019, p. 2–17):

- Competencies/KSAs identified in the job analysis
- Consequences of making a bad hire
- Grade level of positions to be filled
- Validity of assessments
- Expected number of applicants
- Resources such as raters and automated systems
- Time to develop
- Costs

Examples of assessment tools include structured interviews, tests, assessment center, work sample, and occupational questionnaire (crediting plan/rating schedule) (U.S. Office of Personnel Management, 2019). Additional assessment methods can be found in the Uniform Guidelines on Employee Selection Procedures and Department of Labor's Testing and Assessment: An Employer's Guide to Good Practices.

F.   ACCEPT AND REVIEW APPLICATIONS

Accept and review applications provides guidelines on managing the receipt and initial review of job applications. The process begins after the job announcement has been made. The chapter outlines points, such as requiring applicants to submit only a résumé and necessary forms to demonstrate qualifications, without mandating the use of specific résumé formats or agency-specific forms. This approach aligns with the Presidential Memorandum on improving federal hiring processes by streamlining application submissions and reducing unnecessary burden on applicants (U.S. Office of Personnel Management, 2019, p. 4–13).

The steps in reviewing applications are as follows:

Step 1: Determine eligibility. This step involves reviewing applications based on career transition programs, veterans' preference, and other requirements such as citizenship, conditions of employment, selective service registration, etc. Step 2: Determine minimum qualifications, including any selective factor(s) if applicable. Step 3: Refer minimally qualified applicants for assessment to determine (i) whether the applicant achieves a passing grade (i.e., qualified to be considered for this particular position pursuant to a pre-established score under an assessment instrument or set of quality indicators) and (ii) the relative degree to which

the applicant possesses the competencies/KSAs required for the position (which, together with any veterans' preference due, determines final score and rank or the quality category in which the candidate will be placed) (U.S. Office of Personnel Management, 2019).

Appendix D of the DEO handbook provides an assessment development table that provides step-by-step instructions to leverage the job analysis output to develop assessments for evaluating applicants (DEO Handbook, U.S. Office of Personnel Management, 2019). Within this table, there are worksheets that OPM provides to help agencies identify, rate and link job tasks to competencies. The "Accomplishments Worksheet" is used to help agencies organize and rate tasking based on SME input, which is averaged to identify the most critical elements. The "Multiple Choice Yes/No Worksheet" is used to evaluate a candidates KSAs that are important to job performance. Each question can be rated for its difficulty and relevance by the SMEs to ensure they align with job performance. The "Rating Schedule Benchmark Worksheet" is used to establish a standardized scoring system for assessment tools, such as open-ended questions or structured interviews. The responses are rated on a scale (exceptional, satisfactory, and unsatisfactory) based on the criteria set by the SMEs.

G.   ASSESS APPLICANTS

According to the DEO handbook, assessing applicants is broken into three steps. They are as follows (U.S. Office of Personnel Management, 2019, p. 5–3):

- Step 1: If applicable, apply quality-ranking factors.
- Step 2: Conduct the assessment(s) to evaluate the applicant's numerical score or rating, and/or to determine their placement in a quality category. If a passing grade has been set, you must verify if the applicant has met this threshold before moving forward. If the applicant did not achieve the passing grade, they should not advance to the final rating or be placed in a quality category.
- Step 3: Apply veterans' preference. This step is not relevant to the scope of this thesis, so it will not be discussed further.

The steps above consist of using assessment tools to rate and examine applicants based on competencies identified in the job analysis. Unlike selective factors discussed in the section above (Accept and Review Applications) quality ranking factors are considered here which enhance job performance but are not required for the job such as

advanced education, certifications, experience, etc. (DEO Handbook, U.S. Office of Personnel Management, 2019). Those with quality ranking factors may be ranked higher. Then agencies choose from different rating procedures such as:

- Numerical test scores - based on test performance
- A-C-E rating - applicants are categorized into levels like A (exceptional), C (good), and E (minimally qualified) based on their experience and education
- Job element examining - or wage-grade positions, specific job-related skills are assessed

There are two main examining processes, case examining and competitor inventory. Case examining is used for immediate job openings where an agency issues a job announcement, and applicants apply for specific jobs (DEO Handbook, U.S. Office of Personnel Management, 2019). Competitor inventory involves creating a list of qualified applicants who may be referred for future vacancies without needing to reapply for each job (DEO Handbook, U.S. Office of Personnel Management, 2019).

H. INTERDISCIPLINARY POSITIONS

Interdisciplinary positions are roles that involve duties and responsibilities across two or more professional or scientific occupations (DEO Handbook, U.S. Office of Personnel Management, 2019). These positions provide candidates from various disciplines the opportunity to be evaluated equally for their ability to do the work. Individuals must possess academic credentials from accredited universities in order to be eligible. It is important to note that interdisciplinary positions must exclusively combine professional or scientific fields, they cannot include a combination of administrative, technical, or clerical roles.

These interdisciplinary roles are divided into two categories. Category 1 positions require a specific combination of competencies or knowledge from two or more professions, with each profession contributing distinct duties (DEO Handbook, U.S. Office of Personnel Management, 2019). For instance, a project in nuclear disposal may require both civil and nuclear engineering skills. Category 2 positions, on the other hand, involve work that is essentially the same across multiple professions, like research in flood control, which could be handled by a civil engineer or a hydrologist (DEO Handbook, U.S. Office of Personnel Management, 2019).

When filling an interdisciplinary position, only one Certificate of Eligibles is created, even though the position may span different occupational series (DEO Handbook, U.S. Office of Personnel Management, 2019). Applicants are evaluated based on the qualification standards for their series, and assessment tools are developed using the competencies required for the role. All candidates, regardless of their series, are rated and ranked on the same competencies. The certificate then ranks eligible candidates, with their qualified series noted beside their names.

Finally, "the position description must show clearly that the position is interdisciplinary and indicate the various series in which the position could be classified" (U.S. Office of Personnel Management, 2019, p. 6–4). The appointee's final classification will be based on their qualifications (U.S. Office of Personnel Management, 2019, p. 6–4). This strategy guarantees hiring flexibility while upholding uniform evaluation criteria across various disciplines.

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