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THESIS

ASSESSMENT OF PERSONALITY AS A REQUIREMENT FOR NEXT GENERATION SHIP OPTIMAL MANNING

by

Paul Garrett O'Daniel

September 2012

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In an effort to reduce next generation naval vessel total operational cost, significant manpower reductions were incorporated into their overall design strategy while maintaining expected mission and performance capabilities. It is contended reduced manpower availability is mitigated through advanced technology integration and increased systems automation. Little research exits on how personnel requirements shifted with changes in ship design. This study examines the potential use of personality traits in recruiting and determining crew assignments. Surveys were administered to Surface Warfare Officers (SWOs) attending the Naval Postgraduate School. Select SWOs initially participated in a focus group to support developing an on-line survey, and subsequently a larger population of SWOs answered an on-line survey to provide comparative data on personality traits vs. knowledge, skills, and abilities believed to directly impact performance on current traditionally manned "Small-Boy" ships and future optimally manned vessels. The results of the survey indicate personality traits are found to be ranked second in importance in all operational tempo levels and across both ship types. The findings suggest personality traits should be considered in staffing the next generation of U.S. Navy ships.

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ASSESSMENT OF PERSONALITY AS A REQUIREMENT FOR NEXT GENERATION SHIP OPTIMAL MANNING

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In an effort to reduce next generation naval vessel total operational cost, significant manpower reductions were incorporated into their overall design strategy while maintaining expected mission and performance capabilities. It is contended reduced manpower availability is mitigated through advanced technology integration and increased systems automation. Little research exits on how personnel requirements shifted with changes in ship design. This study examines the potential use of personality traits in recruiting and determining crew assignments. Surveys were administered to Surface Warfare Officers (SWOs) attending the Naval Postgraduate School. Select SWOs initially participated in a focus group to support developing an on-line survey, and subsequently a larger population of SWOs answered an on-line survey to provide comparative data on personality traits vs. knowledge, skills, and abilities believed to directly impact performance on current traditionally manned "Small-Boy" ships and future optimally manned vessels. The results of the survey indicate personality traits are found to be ranked second in importance in all operational tempo levels and across both ship types. The findings suggest personality traits should be considered in staffing the next generation of U.S. Navy ships.

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LIST OF ACRONYMS AND ABBREVIATIONS

CG	Cruiser Guided Missile
CO	Commanding Officer
DDG	Destroyer Guided Missile
DIVO	Division Officer
DOD	Department of Defense
DOT&E	Department of Operations Test and Evaluation
DT&E	Department of Test and Evaluation
FFG	Frigate Guided Missile
FFM	Five Factor Model
FY	Fiscal Year
HRO	High Reliability Organization
HSI	Human Systems Integration
KSAs	Knowledge Skills Abilities
KSAO	Knowledge Skills Abilities Other
LCS	Littoral Combat Ship
NCAPS	Navy Computer Adaptive Personality Scales
NPS	Naval Postgraduate School
OMP	Optimally Manning Program
OPTEMPO	Operational Tempo
PI	Primary Investigator
SMEs	Subject Matter Experts
SWO	Surface Warfare Officer
U.S.	United States
XO	Executive Officer

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EXECUTIVE SUMMARY

The U. S. Navy faces a constant challenge to reduce monetary expenditures while maintaining operational effectiveness. An estimated 48% of ship life-cycle costs and 60% of the Navy's total annual budget are attributed to personnel (Kreisher, 2005). These challenges have led to reducing Navy surface fleet personnel costs by initially making minor crew reductions in current ships and significantly larger crew reductions in next generation surface combatants (Kreisher, 1999; Kreisher, 2005). Programs were established to reduce current and future ship manning levels up to 67% (Kreisher, 2005). This significant change will result in a socio-technical shift, where individual personality traits can significantly impact performance (Klein, Bigley, & Roberts, 1995). Presently, personality traits are not assessed as part of the Navy's recruitment and detailing process; however it may represent an opportunity to increase job fit and reduce the impact of reduced crew size. This study explores the notion of using sailor personality traits as part of establishing an optimal manning environment for next generation combat ships.

The Navy has acknowledged the importance of increased Knowledge, Skill, and Ability (KSAs) requirements in the detailing process of future combat ships (Fein, 2007b). However, personality traits are potentially an important fourth personnel staffing criteria. Studies have shown personality traits are good predictors of work-relevant behavior, not only at the individual level, but also in leadership and team performance (Peeters, Rutte, van Tuijl, & Reymen, 2006). An exploratory study was conducted to determine the necessity of including the determination of desired personality traits in the detailing process for the crews of next generation naval vessels.

Two instruments were used to collect information from subject matter experts in the possible benefit of personality testing in the detailing process. First, two focus group sessions were conducted with U. S. Navy Surface Warfare Officers (SWO) for an independent qualitative validation of the subject matter and in direct support of the construction of a survey instrument. Second, a survey instrument was utilized to collect data of 84 subject matter experts (SMEs). The survey instrument was designed to obtain

SWO feedback on their professional insights and experiences on the successful personality traits of the sailors who served under them.

SMEs overwhelmingly believe that personality traits are a key contributor to positive performance. SMEs believe that the level of importance personality traits influence performance is independent of a sailor's job type and has a growing importance as the group size is reduced. Personality traits were found to be increasingly more important as the operational tempo (OPTEMPO) level increased including a greater magnitude of increase when shifting from a moderate to high OPTEMPO within ship types. However, it was determined that the level of importance SMEs place on personality traits is not dependent on ship type. This was an unexpected determination in the study.

Determining the relative importance of sailors possessing beneficial personality traits as compared to KSAs in their observed performance by the SMEs can provide insight to the need of personality testing in the detailing of sailors to future combat vessels. Personality traits ranked exceptionally high among KSAs on both traditionally manned vessels and Optimal Manning Program (OMP) vessels. When comparing within ship type at low and moderate OPTEMPO, personality traits are statistically no different than knowledge or skills, but are more important than abilities and at high OPTEMPO, associated importance levels change. On traditionally manned vessels knowledge is the most important. Second are personality traits and skills, which are determined to be the essentially equal in value. Lastly, ability is found to be less than the other three. On an OMP vessel at high OPTEMPO knowledge and personality traits are valued the most and are equally important. Personality traits are found to be ranked second in importance in all OPTEMPO levels and across both ship types. This study has provided significant evidence to the benefit of personality trait testing in the recruitment and detailing process for the U.S. Navy surface warfare community.

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I. INTRODUCTION

A. BACKGROUND

The Department of Defense (DOD) continues to face growing budget constraints that ultimately trickle down to each branch of service. Budgetary challenges within the U.S. Navy resulted in an effort to reduce personnel costs (Kreisher, 1999). Currently, 48% of expected ship life-cycle costs and 60% of the Navy's total annual budget are attributed to personnel (Kreisher, 2005). Under the Optimal Manning Program (OMP), in-service surface ship manning was leaned out to minimize personnel costs. In addition, it established reduced manning policies for the design of all future surface vessels. OMP equates to a 67% reduction in the manning of next generation vessels, purportedly mitigated by handpicking sailors who receive specialized training, leveraging advanced technologies, and employing automated systems (Kreisher, 2005).

Next generation ship design represents a significant socio-technical shift. A reduced number of select sailors will be required to work in a sustained, and at times high, workload environment with limited human capital reserve (Herbst, 1974). Studies of organizations with such structures have determined individuals possessing specific personality traits have been proven to be significantly more successful in such environments (Klein, Bigley, & Roberts, 1995). Presently, the Navy employs cognitive testing and assessment of knowledge, skills, and abilities (KSAs) as part of the personnel recruiting process, which in turn is used in detailing sailors. However, personality trait assessment is not extensively used in recruitment or subsequent detailing except for special rates (e.g., nuclear submarine) or assignments (e.g., special operations). Personality trait assessment may provide the Navy an opportunity to increase job fit and foster greater success transitioning to the next generation ship design.

B. STATEMENT OF THE PROBLEM

OMP is a concept for reducing operational costs, while maintaining surface warfare capability for current and future U.S. Navy vessels. OMP calls for manpower reductions by leveraging technology, which as a byproduct serves to increase system

complexity and rigidity, placing a potentially greater demand on a ship's crew to maintain successful mission performance (Bost, Truver, & Knutson, 2007). It has been recognized that sailors with enhanced KSAs are critical to the success of next generation ship programs. This fact is currently demonstrated by hand selection in the detailing process for the Littoral Combat Ship (LCS). Currently, personality traits which may enhance functioning in a highly complex, tightly coupled OMP socio-technical organization is given limited to no consideration in recruitment and detailing. This research investigated the concept of using personality traits in staffing the next generation of U.S. Navy ships.

C. OBJECTIVES

This study explores using sailor personality traits as part of establishing an optimal manning environment for next generation surface combat ships. This objective was met by examining the current organizational environment, identifying the shortfalls in personnel staffing criteria, and projecting recommended requirements for next generation ship designs. A review of related organizational theories assisted in identifying personal traits found to complement the organizational structure associated with next generation ship design. Next, this study determined if there is a mismatch between current personnel staffing criteria and the identified trait requirements associated with prospective changes in ship organizational design.

To address the objectives of the study, five research questions were raised. These questions pertain to next generation OMP ships (e.g., LCS and DDG 1000) and their planned reduced manpower levels from traditional ones found in current surface combatant ships.

1. Do SMEs consider crew member personality traits important in overall ship performance independent of crew size?

2. Do SMEs perceive the relative importance of crew member personality traits differently at varied OPTEMPO levels?

3. Are crew member personality traits considered more important by SMEs on next generation OMP ships relative to traditionally manned surface combatant ships? If so, is the magnitude of importance greater in varied OPTEMPO levels relative to traditionally manned surface ships?

4. How do SMEs value crew member personality traits relative to traditional KSA attributes? Does that value differ when comparing OMP ship manning vs. that on traditionally manned surface combatant ships?

5. Do SME perceptions suggest a need to incorporate personality traits in the detailing process for next generation surface combatant ships?

D. RELEVANT HUMAN SYSTEMS INTEGRATION DOMAINS

Human Systems Integration (HSI) is comprised of seven individual domains: manpower, personnel, training, safety human factors engineering, survivability, and habitability that provide integral value to the design and development of systems requiring human interface (Defense Acquisition University, 2009). Each HSI domain can interact and influence each other and impact the total system design, performance, and cost (Defense Acquisition University, 2009). The HSI domains are used to help determine and work the science and technology gaps to address the hardware, software and human aspects of a system (Defense Acquisition University, 2009). The following paragraphs review the HSI domains are integral components in the present study.

Manpower is defined by DOD Instruction 5000.02 Enclosure 8 as "the mix of military, DOD civilian, and contract support personnel necessary to operate, maintain, and support (to include providing training) the system". Currently 48% of the expected life-cycle cost of a ship and 60% of the Navy's total annual budget is attributed to personnel costs. The OMP was designed to reduce in-service surface ship manning by removing crew positions that were identified as unnecessary. To address future projected budget cut requirements, the Navy has designed next generation surface vessels to be manned by a crew approximately two-thirds that of the current complement. While this significant reduction is to be mitigated by better-trained sailors, advanced technologies,

and automated systems, it can be expected to produce dramatic shifts both in the organizational design and personnel requirements. These shifts are not currently addressed in current personnel staffing criteria.

Personnel factors are those human aptitudes (i.e., cognitive, physical, and sensory capabilities), knowledge, skills, abilities, and experience levels that are needed to properly perform job tasks (Defense Acquisition University, 2009). This domain focuses on assessing the types of people needed to operate, maintain, and support a system. The experience, aptitudes, and physical characteristics can all be used to describe personnel requirements (Booher, 2003). Personnel research theories indicate that specific personality traits are necessary to operate in specific environments and are a critical staffing criterion in highly successful organizations (Schmitt & Chan 1998). Because OMP reduces manning requirements, sailors will have to be provided training to promote a greater breadth of KSAs to maintain and operate next generation U.S. Navy combat ships.

Safety can be broken out in two broad areas, occupational safety and system safety. Occupational safety refers to the prevention of illness or injury induced by factors at the workplace to promote the physical, mental and social wellbeing of workers (Mayer, 2005). System safety is the application of principles, criteria, and techniques to achieve acceptable mishap risk, within the constraints of operational effectiveness and sustainability (Department of Defense, 2010). In the consideration of safety as a domain, concern is not limited to death or injury. OMP next generation vessels will have fewer watchstanders at any given time than a traditionally manned vessel. With reduced manning, each watchstander becomes increasingly critical to the safe operation of the vessel especially during high stress operations.

Training exists to promote the acquisition, retention, and transfer of specific sets of skills and abilities (Hettinger, 2003). Training is not the same as education. The two domains have traditionally been differentiated by emphasizing training's concentration on very specifically defined sets of skills as opposed to education's more global purpose of ''broadening the mind'' and developing the intellect (Hettinger, 2003). As we attempt

to prepare individuals to become adept at coping with rapid and significant change in work environment characteristics, much may be gained by broadening the scope of training to include skills associated with ‘‘learning to learn’’ (Hettinger, 2003).

As system complexity increases, greater consideration to the resulting organizational design and its influence on individual and team traits that function within it should be given (Hettinger, 2003). Specifically, personality traits are likely to be helpful when operating in stressful conditions even though a sailor may possess the KSAs to perform watch station requirements, (Kirwin & Ainsworth, 1992). Changes in current and future naval vessel designs, reduction of manpower, and the resulting complex sociotechnical organizations may require a more robust personnel selection process for the recruitment and detailing of sailors to include personality trait criteria.

E. SUMMARY

The applicability of HSI can aid in the design and development of socio-technical systems identifying the system complexity including the organizational design, people, technology and their interactions (Hettinger, 2003). However, if system design has already been established, HSI can provide a necessary perspective to help ensure the personnel and associated system requirements will provide the greatest impact for life-cycle costs and performance improvements. Chapter II of this study describes its applicable literature providing the background information for context. Chapter III provides the analysis methods of the study. Chapter IV provides the results of the analysis data, and Chapter V provides the study’s conclusions and recommendations for future action.

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II. LITERATURE REVIEW

Personality traits are a critical portion of our reaction to others, individual and group interaction, and the process in which we interact within our environment (Peeters, Rutte, Van Tuijl, & Reymen, 2006). These aforementioned areas exist in our workplace where, in several meta-analyses, personality has been shown to predict different indicators of occupational performance (Barrick, Mount, & Judge, 2001). This chapter reviews the increasing importance of personality traits on occupational performance within a complex socio-technical system. Additionally, organizational design structure and the introduction of High Reliability Organizations (HRO) are discussed. This discussion provides insight to the personality traits of individuals that are conducive to specific organizational designs and link possession of definitive personality traits in individuals to increased occupational performance. Finally, the evolution from current U.S. Navy surface ship design to next generation designs is discussed associating a proposed organizational design shifts. The resultant organizational design requirements can be argued to necessitate incorporating Sailor's personality traits in the detailing process of next generation ships.

A. SOCIO-TECHNICAL SYSTEM

A socio-technical system is the complex human to technology interaction and human to human interaction in an environment with potential external and internal influences (Hettinger, 2003). Hettinger also points out the trend in both private and public sector organizations in the design, deployment, and operation of complex socio-technical systems is reduced requirements for manpower, skilled personnel, and reduced training while maintaining required or improved performance (Hettinger, 2003). This is evident in the Navy as the transition from large force availability, the number of personnel and weapons platforms, toward increase reliance on technology in the LCS and DDG1000 platforms. HSI principles continue to provide guidelines for effective accomplishment of these objectives.

Socio-technical systems can range from a highly complex organization with thousands of interactions between technology and people to small devices within functional systems (Hettinger, 2003). Table 3 provides an example list of established socio-technical system levels of complexity for reference. As the transition from small systems and devices to complex systems-of-system technology is addressed, the HSI approach must incorporate the influence of an increasing number of disciplines and considerations (Booher, 2003).

	Mission Areas			
Socio-technical Systems	**Military**	**Health Care**	**Energy**	**Transportation**
A. Very highly complex organization				
Governmental agencies	Army department		Dept. of Energy	Dept. of Trans.
Unpredictable environments	War fighting units			
B. Highly complex organizations				
Procurement/regulation agencies	DOD acquisition	Food and Drug Admin.	Nuclear Reg. Com.	Federal Aviation Admin., Federal highway Agency
Product/service organizations	Large contractors	Hospitals	Nuclear power plant	
C. Complex organizations				
Systems of systems	Aircraft carrier	Emergency room		
D. Major technological system	Aircraft, tank, command & control	Operating room	Power generator control room	Train, car, Air Traffic Control (ATC) room
E. Critical technological subsystem	Aircraft cockpit		Controls/displays	ATC console
F. Small systems/devices (system parts)	Radio, radar (engine, wings)	MRI, monitors (tubes, cables)	Feed water pump (steam pipes)	Bicycle (tires)

Table 1. Socio-technical Systems-Levels of Complexity by Mission Area (After: Booher, 2003)

Socio-technical systems continue to become more complex with technological advances to promote efficiency, safety, and increased performance (Perrow, 1984). Additionally, while manpower is reduced, engineers and designers have failed to prevent increased operational risk by personnel (Perrow, Normal Accidents- Living with High-Risk Technologies, 1984). Production pressure can result in increased voluntary and imposed risk taking behavior, otherwise known as "risk homeostasis". Risk homeostasis is a theory that individuals naturally have a tolerance for risk behavior and if an activity is made safer, an individual will increase risk back to their tolerance level to increase their performance (Perrow, Normal Accidents- Living with High-Risk Technologies, 1984). Growing production pressures in the Military are analogous with increased OPTEMPO and reduced asset availability. With this theory in mind, the failure in the system resides in the design and engineering of its safe operation and not that of the personnel.

A second consideration in a socio-technical system is whether it is loosely or tightly coupled (Perrow, 2001). A tightly coupled system refers to the unavailability of in delay of processes, little forgiveness in supplies or personnel required, and little possible substitution available of equipment and personnel. This would be due to reduced manpower availability in order to increase cost efficiency. The combination of a system with complex interactions and are tightly coupled increases the vulnerability of an accident occurring (Perrow, 2001). Each characteristic requires conflicting needs in the decision making process within the organizational design. A tightly coupled system requires a centralized decision making process due to the top levels of the system having the complete view of its status while complex interactions require a decentralized organizational structure to provide lower-level operators the ability to act based on their specialized comprehension of the system (Perrow, 2001).

B. ORGANIZATIONAL DESIGN STRUCTURE

Common organizational designs: the simple structure, bureaucracy, and matrix structure, define how job tasks are divided, grouped, and coordinated (Robbins & Judge, 2012). Robbins and Judge illustrate these structures in a myriad of job types based on characteristics including:

- **Work Specialization**- the degree to which activities in the organization are subdivided into separate jobs. Are they a mechanic or an electrician?
- **Departmentalization**- the degree to which subspecialties are grouped into common tasks. Does the team specialize in a certain field, such as Engineering?
- **Chain of Command**- the unbroken line of authority that extends from the top of the organization to the lowest echelon and clarifies who reports to whom.
- **Span of Control**- the number of employees managers can efficiently and effectively direct. To what degree is their circle of influence?
- **Centralization and Decentralization**- the degree to which decision making is concentrated at a single point in the organization. Can the decision be made locally or do you have to wait for higher authority?
- **Formalization**- the degree to which jobs in the organization are standardized. Is there allowance for adapting standard operating procedures to the situation or environment as necessary or do you have to wait for an entirely new instruction to be written?

These characteristics are then used to determine the established organizational design in a current organization or provide a reference to the type of organizational structure which is desired in a future institute.

Robbins and Judge (2012) provide an overview of organizational designs and its associated characteristics (see Table 2). The simple structure is usually a flat organization containing members who perform a wide variety of tasks, but are governed by a centralized authority. This structure would normally be found in a small business environment where manager and owner is likely the same person. The advantage to this structure is its flexibility, speed in decision-making, and it's inexpensive to operate.

	Organizational Design		
	Simple Structure	**Bureaucracy**	**Matrix Structure**
Work Specialization	Low	High	High
Departmentalization	None	Functional	Functional & Product
Chain of Command	Horizontal	Hierarchal	Two-Boss Hierarchal (Production & Functional)
Span of Control	Wide	Narrow	Narrow
Centralization & Decentralization	Centralized in Single Person	Centralized	Centralized in Relation to Specific Manager w/ Ambiguity
Formalization	Very Little	High	High

Table 2. Organizational Design Characteristics (From: Robbins & Judge, 2012)

The two organizational designs that seem to most closely match the surface ship forces are the Bureaucracy and Matrix Structures. The Bureaucracy Structure is characterized by (Robbins & Judge, 2012):

- Highly routine operating tasks achieved through specialization.
- Very formulized rules and regulations.
- Tasks are grouped into functional departments.
- Centralized authority.
- Narrow spans of control.
- A decision making process that follows the chain of command.

These characteristics provide an ability to perform standardized activities in a highly efficient manner resulting in economies of scale, minimum duplication of personnel and equipment, and a common language among peers (Robbins & Judge, 2012). This organizational structure also presents weaknesses in its design. High formalization and standardized operations allows for less decentralized decision making, an obsession with following the rules leaving little need for innovative and experienced decision makers

(Robbins & Judge, 2012). This lack of flexibility leaves little room for confronting unfamiliar problems. Figure 1 represents an example bureaucracy structure model.

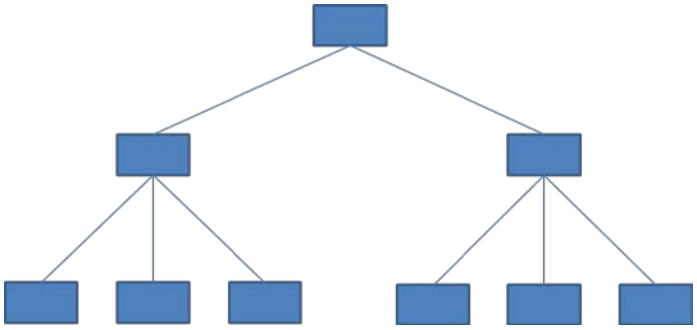


Figure 1. Example Bureaucracy Structure Model (After: Robbins & Judge, 2012)

The characteristics of a Matrix Structure are less definitive (Robbins & Judge, 2012). It is best described by providing a comparative of its strengths and weaknesses within the functional and product based departmentalization (see Table 3). The matrix design structure is similar to a ship's organizational structure by the combining two forms of departmentalization. First is the product department (the department you work for) and second is the functional department the Sailor falls under while performing duties on their watch station.

DEPARTMENTALIZATION	STRENGTH	WEAKNESS
Functional	Minimizes the number necessary while pooling specialized resources across products.	- Difficulty coordinating tasks of diverse functional specialist within time and budget.
Product	-Provides coordination among specialists to achieve tasks on-time and under budget - Provides clear Responsibility to all activities related to a product.	-Completes activities with duplication and costs

Table 3. Matrix Design Strengths and Weaknesses (From: Robbins & Judge, 2012)

The goal of the matrix structure is to utilize its strengths of one department to mitigate the weaknesses of the other. Robbins and Judge also point out that the overall benefit of the matrix structure is its ability to facilitate coordination when an organization

is performing a number of complex and interdependent activities. However this organizational structure can creates confusion, possible power struggles between product and functional managers, and increases the stress placed on the individuals within the organization (Robbins & Judge, 2012). Figure 2 provides an illustration of a possible matrix design that would exist on a Navy surface vessel.

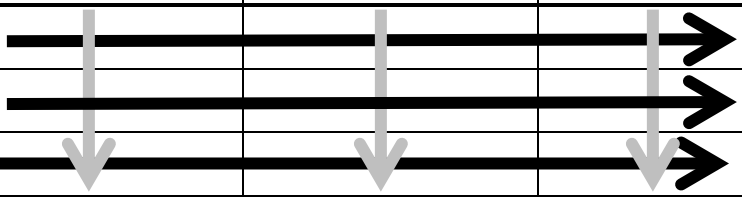
Product	**Function**	**Engineering Watch Station**	**Combat Watch Station**	**Bridge Watch Station**
Engineering Dept.				
Combat Systems Dept.				
Executive Dept.				

Figure 2. Example Matrix Structure Model

C. HIGH RELIABILITY ORGANIZATIONS

High Reliability Organizations (HROs) are required to do everything possible to avoid negative outcomes, "an event leading to the loss of human life, despoiling the environment or some other event leading to the sense of alarm" (Bierly III & Spender, 1995, p. 640) as well as complex in nature and tightly coupled (Perrow, 1984). When comparing HROs to other organizations, two distinguishing characteristics were identified (Klein, Bigley, & Roberts, 1995). The first is "process reliability is as important or a more important goal for HROs than is outcome reliability and HROs must perform at high tempo for sustained periods of time and maintain the ability to do so repeatedly without damaging themselves or others" (p. 772). This leads to the development of shared set of values which impact the culture of the organization due to the inherent dangers of its environment. These patterns of culture can be related to the "member attitudes and role perceptions expectations and perceived fit in the organization" (p. 773). Furthermore Klein et. al, observed that various forms of HROs seek entirely "different personalities" (p. 789) as valued assets depending on the governing organizational structure.

D. PERSONALITY AND OCCUPATIONAL PERFORMANCE

The Navy acknowledges the importance of increased KSA requirements in the detailing process of future combat ships (Fein, 2007a). However, there is a potentially important element as a fourth category of personnel staffing criteria. The fourth category, *Other Characteristics*, refers to individual characteristics that may be helpful in the performance of certain tasks such as willingness to work under relevant adverse conditions (Rasmussen, 2005). Among these characteristics are personality traits defined as "the ways in which a person thinks, feels, and behaves; the ingrained pattern of behavior that each person evolves, both consciously and unconsciously, as the style of life or way of being in adapting to the environment" (American Psychiatric Association, 1980, p.103).

Research determining the relationship between personality and occupational performance has taken a dramatic shift in its findings since the mid-1980s. From the early 1900s the overall conclusion of this research was that "personality and job performance were not related in any meaningful way across traits and across situations" (Barrick, Mount, & Judge, 2001, p. 9). Consequently, little advancement was made in the understanding and utilization of the personality trait to performance relationship. In the mid 1980's the use of the Five Factor Model (FFM) to classify personality and their associated scales provided a renewed foundation for personality trait research (Digman, 1990). Costa and McCrae's (1992) FFM of personality traits (openness, conscientiousness, extraversion, agreeableness, and emotional stability) has developed into the framework for understanding the relationship between personality and various work behaviors. Additionally, the introduction of meta-analytic methods allowing a quantitative application of results has led to positive and significant findings. In the short period of time to 2001 there had been 15 meta-analytic studies, 11 published articles, and 4 conference presentations all lending to the conclusion that the prior era of study was in error (Barrick, Mount, & Judge, 2001). A meaningful relationship of personality to performance had

been identified. Further studies have also proven personality traits can predict various indicators of work-relevant behavior, not only at the individual level, but also in leadership or team performance (Peeters, et al, 2006).

E. THE OPTIMALLY MANNED PROGRAM (OMP) EVOLUTION

The term "Small-Boy" refers to the Oliver Hazard Perry class Frigate, Arleigh Burke class Destroyer, and Ticonderoga class Cruiser currently in the Fleet. Modifications, technological advances and mission changes permitted a controlled reduction of approximately 20% in ship manpower requirements and led to the development of the OMP concept (Kreisher, 2005). Table 1 provides the original manning requirements for each ship class and today's required manning complements.

SHIP CLASS	ORIGINAL MANNING REQUIREMENT (2001)	OPTIMAL MANNING REQUIREMENT (2009)	MANNING REDUCTION
FRIGATE	218	178	18.3%
DESTROYER	324	259	20.0%
CRUISER	383	301	21.4%

Table 4. Comparative Chart of Ship Manning Levels (From: Bost, Truver, & Knutson, 2007; GAO, 2010)

The OMP has its roots in the "Smart Ship" experiment, an initiative to examine the concept of reduced manning operation from established manning requirements (Bost, Truver, & Knutson, 2007). The USS Yorktown (CG-48), a Ticonderoga-class Aegis guided-missile cruiser, was the subject of a two year test (1995–1997) assessing its ability to operate with a reduced crew of 350 sailors from an initial compliment of 396 sailors. The Smart Ship experiment was deemed highly successful, making the reduced manning concept a reality. Its success was attributed to innovative concepts, installation of advanced technology systems, and a shift in ingrained practices. (Kreisher, 1999)

Next generation ship design is heavily influenced by OMP and the necessity to reduce Fleet operational costs. New platforms employing a combination of advanced technology and improved training provides for operation with greatly reduced crew sizes (Kreisher, Smart, Smarter, Smartest, 1999). The LCS and Zumwalt class Destroyer are expected to operate with a crew size of 40 (plus 15 mission specific personnel) and a crew of 125, respectively (Kreisher, 2005). The continued integration of advanced technology focused around "Smart Ship" applications, increased automation, reduced crew maintenance and logistical requirements through distance support, and better-trained sailors will mitigate the need for a larger crew (Fein, 2007b).

F. FUNCTIONAL CONCERNS OF NEXT GENERATION SHIPS

The LCS program, which employed the DOD's current dual acquisition award strategy, required OMP in system design (Kreisher, 2005). Presently, the two LCSs in service, the USS Freedom (LCS 1) built by Lockheed Martin and the USS Independence (LCS 2) built by General Dynamics are prototypes for 20 ships (10 ships each) to be built based on OMP. The FY2003 DOT&E Annual Report, the first publication that included the LCS Program, warned "the accelerated acquisition timeline for LCS leaves very little time to apply any lessons learned from the construction/operational testing of Flight 0 ships to Flight 1 hull and mission packages design." Evidence of these same concerns persists in the FY2011 DOT&E Annual Report, the most current publication. In fact, the Developmental Test & Evaluation (DT&E) of each LCS variant had not been completed prior to placing both vessels in service.

Considerable concerns have been identified regarding next generation design of U.S. Navy ships (Gilmore, 2006). Two of the most notable concerns were determining the capability to conduct high task demand missions for extended periods of time and combating a significant damage control scenario. According to the report it was:

> previously recommended the Navy conduct analysis to ensure 75 is the appropriate number of personnel necessary to accomplish LCS missions. Initial conclusions indicate manning levels do not portend success in a stressing mine warfare scenario. Unanticipated damage control efforts and

> other contingencies may lead to excessive fatigue and failure to accomplish tasks. (Gilmore, 2006, p. 138)

In the FY2011 DOT&E Annual Report this issue remained unresolved and there was a recommendation for continued analysis.

G. NEXT GENERATION SHIP ORGANIZATIONAL DESIGN STRUCTURE

There has been a recent and significant shift in surface combatant ship design (Fein, 2007b). The basis for this shift is the reduction of total life-cycle cost through reduced manning of next generation ships (Kreisher, 2005). Additionally, advanced technology, automation, and additional training programs have mitigated the impact of manpower reductions. Sailors on ships with OMP manning levels will likely be exposed to a tightly coupled organizational design structure with near-zero slack in human capital (Fein, 2007b; Herbst, 1974). The term "slack" refers to the quantities of specific resources for successful operation. Sailors will need to possess personality traits conducive to this environment in order to maintain expected performance levels.

Sailors operate in one of the most complicated forms of a socio-technical system (Descleves & Letot, 2001). If an organization faces a dynamic and changing environment and requires employees to be flexible in tasks and team involvement, an employee's personalities fit becomes more critical than that of specific job requirements (Robbins & Judge, 2012). On traditionally manned vessels there exist greater amounts of human capital that can accommodate a changing environment. On an optimally manned vessel there is little surplus of human capital to accommodate a change in the environment; therefore, the burden falls on the capabilities of the sailors. This requires sailors readily able to change tasks and move easily between teams and functions (Kreisher, 2005).

H. PERSONNEL CONCERNS OF NEXT GENERATION SHIPS

Navy leadership, including the office of the Director, Operational Test & Evaluation (DOT&E) and the associated DOT&E FY2003-2011 annual reports, addressed a number of concerns regarding the reduced crew size of current and future ships. The majority of the concerns target mission effectiveness and operational safety in

performing functions ranging from normal steaming to casualty control (Fein, 2007a). The impact of a ship's organizational design and staffing requirements when crew size is reduced is a new challenge in the design and development of a system (Hettinger, 2003).

The Navy has gone to great lengths to tailor the necessary training plans to provide select sailors with the knowledge, skills, and abilities (KSAs) required to successfully perform onboard the LCS. "*Knowledge*" refers to the foundation upon which abilities and skills are built; "*skills*" refers to the capability to perform tasks with ease and precision; and "*abilities*" refers to the cognitive capabilities necessary to perform a job function (Rasmussen, 2005). Initially, the LCS acquisition process delayed the timely design of training programs because the final system configuration had not been resolved (Fein, 2007b). Vice Admiral Terrance Etnyre, then the Commander, Naval Surface Forces established tailored training pipelines designed to meet the required breadth of KSAs for each billet. Because he acknowledged that "a single existing rating could not do everything an LCS billet required" (p. 1); thus, LCS sailors were hand-selected and then received specialized training to meet operational requirements (Fein, 2007b).

I. SUMMARY

Standardized cognitive testing has been providing a metric for the recruitment and detailing process for the U.S. Navy. However, due to the recent paradigm shift in the relation between manpower, personnel, and the increased complexity of ship sociotechnical organizations, the U.S. Navy should also shift from its current person-job fit strategy to a person-organization fit strategy. Currently there is a mismatch between the Navy's rapidly changing organizational environments and the process used to effectively recruit and detail sailors into that environment.

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III. RESEARCH METHODOLOGY

A. OVERVIEW

This study provides insight into the use of personality traits in the staffing of OMP surface combatant ships. The design concept of next generation ships results in a socio-technical organizational structure that necessitates greater reliance on a smaller, select crew compliment. It has been suggested that individuals with given personality traits may perform better in sustained, and higher workload conditions. Therefore, the inclusion of these traits in the recruitment and detailing process is likely to be critical in the future effective, efficient, and safe operation of next generation vessels.

Due to the acquisition timeline of the LCS program, the most recent OMP ship, it was fielded before many of the past lessons learned were addressed (Christie, 2003). Consequently, there is on-going concern with respect to the adequacy of manning and personnel requirements. An exploratory study evaluating additional personal attributes, conducive to the optimal manning environment of next generation surface combatant ships, may improve the Navy's personnel staffing process. An initial focus group and subsequent survey of subject matter experts (SMEs) was conducted to elicit professional opinions on the importance of personality traits such as the "Big 5" (i.e., openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism) in staffing crews for surface combatant ships. A survey of SMEs concerning selection, assignment, training, and motivating of enlisted sailors was conducted to assess the relevance of personality traits in the detailing process. The focus group provided a basis for generating the survey as well as qualitative data to interpret the aggregated survey responses.

B. FOCUS GROUP

1. Participants

The target population for the Focus Group was U.S. Navy SWOs graduate students at the Naval Postgraduate School. Approximately 208 U.S. Navy SWOs were currently enrolled at NPS. Within the target population, specific qualifiers were identified

to verify their experience relative to the Focus Group objective: participants were required to (1) have served onboard Frigate, Cruiser, Destroyer, LCS, or any combination of these vessel classes, (2) be a Lieutenant (O-3) or above to ensure they have the required level of experience, and (3) have, at a minimum, served in a position of Division Officer on a Frigate, Cruiser, Destroyer, or LCS. Volunteers recruited participated in one two Focus Group sessions of five SMEs each.

2. Instrument

The Focus Group sessions were to elicit SME opinions on the necessity of considering personality traits in personnel detailing of optimally manned surface vessels. To facilitate this process, a list of questions was developed based on the literature reviewed. The questions generally touched on the importance of individual crew member personality traits in relation to the Sailor's performance while serving onboard ship under the supervision of the surveyed SMEs (see Appendix D).

3. Procedure

A facilitator was present for each group meeting to provide topics for discussion and ensure direction of discussions remained on focus. A brief overview was provided to participants in preparation for each group session (Appendix C). Each participant was asked to sign a "Consent to Participate in Research" document required by the Internal Review Board (see Appendix D). Aside from informing subjects their participation was voluntary and that they could stop at any time it informed them that the session would be recorded for future reference and subsequently destroyed after transcribing all pertinent information. The duration of each Focus Group session was approximately 1 hour and 20 minutes each. The facilitator commenced each discussion topic using the predesigned questions listed and offered minimal input only when discussion was becoming off topic or allowed time mandated the progression to the next question.

4. Data Collection

Focus group data collection was completed on 14 June 2012. Two one-hour facilitated sessions were conducted in an open forum of five SME in each session. Audio recording of the group discussions provided for the ability for review and transcription of pertinent information. At the completion of each focus group session, participants were asked to provide a rank order of ten personality traits against themselves and the attributes of knowledge, skills, and abilities. Next, each rank order was assigned an ordinal point value for the associated traits and attributes the participant assigned to it. For example, there were 13 possible rank order assignments, rank number 1 was assigned 13points, and rank number 2 was assigned 12 points and so on. This provided a point system that helped identify the level of importance the SME placed on each trait or attribute as compared to one another. The values for all participants were then compiled for each trait and attribute to provide a total score for each. The total score for each trait and attribute were then placed in a bar chart with the associated variances to provide a comparative analysis relative to each other (see Appendix E).

5. Data Analysis

The data gathered from the Focus Groups was used to develop the survey tool. First, it provided the qualitative validation of the survey subject matter. No difficulties were identified in the SME's understanding of the information provided to them. The SMEs did not demonstrate any hardship in expressing their expert opinions within the scope of the focus group topic. Second, personality traits from the Navy Computer Adaptive Personality Scales (NCAPS) and the "Big Five" personality traits provided were identified by the SMEs to be too similar in meaning. These similarly defined words were purposefully introduced to determine which of them would provide for easier recognition and understanding to participants in the survey tool language. The reduced number of terms introduced to the survey tool participants would facilitate less data

scatter and obtain a richer result of informative data. Lastly, the Focus Group sessions provided a qualitative component that would provide context consideration for survey responses.

C. SURVEY QUESTIONNAIRE

1. Participants

The target population for the survey was U.S. Navy SWOs, identified as potential SMEs, enrolled at the Naval Postgraduate School. Approximately 208 U.S. Navy SWOs were currently stationed at NPS. Within the target population, specific qualifiers were identified to verify their experience relative to the Group Study objective: participants were required to (1) have served onboard Frigate, Cruiser, Destroyer, LCS, or any combination of these vessel classes, (2) be a Lieutenant (O-3) or above to ensure they have the required level of experience, and (3) have, at a minimum, served in a position of Division Officer on a Frigate, Cruiser, Destroyer, or LCS. Of the sample population 84 SWOs completed the survey.

2. Instrument

The survey instrument was designed to obtain SWO feedback on their professional insights and experiences on the successful personality traits of the sailors who served under them. Information gathered during the focus group sessions was used to shape the survey tool end product. A systematic survey design process was implemented following the guidelines of successful survey methods introduced by Dillman, Smith, & Christian, (2009). The survey was distributed via Survey Monkey. The instrument was carefully constructed in five stages: (1) SME focus group for exploration and relevance (2) expert review of initial draft, (3) interviews with resident SWO participants, (4) limited fielding of survey to verify functionality, skip logic, and delivery method, and (5) fielding the full survey to the target population.

The survey instrument design incorporates “good practice” techniques to reduce the need for data cleaning: 1). Most questions were close-ended; open-ended questions

were minimized, 2) Skip logic, based on previously asked questions, prevented a participant from answering a question that does not apply, 3) Duplicate responses are minimized by the online tool which provides each participant an opportunity to make a single submission, 4) Participants who do not meet the required job experience were removed, 5) Surveys completed too quickly were identified to ensure they did not just give a set response as they "clicked through the survey", those determined not to have been properly completed were removed, and 6) Incomplete surveys were considered for removal if they do not respond to the majority of questions.

This study investigates whether personality trait information in addition to individual KSA data is a useful requirement for proper personnel staffing of next generation OMP U.S. Navy surface combatants. Three focused environmental scenarios were utilized: (1) Normal Steaming/Transit Operations (low stress environment), (2) Nominal Ship Evolution Operations, e.g., Live Fire Exercise (moderate stress environment) and (3) Casualty/Emergent/Critical Mission Operations (high stress environment). First, the survey provided data identifying the professional opinion of SMEs whether the OMP reduces the availability of traits that leaders call upon in a successful shipboard environment. Next, the survey identified the SME professional opinion of whether the OMP results in an organizational design not currently found on traditional U.S. Navy surface combat ships. Finally, the survey supported a comparative analysis of a SME's perspective on the necessity and/or importance of personality traits vs. the current KSA requirements in staffing and whether there is a shift in KSAO levels when faced with different operational stress levels. Categorization of respondent demographics provided the availability of both categorical and whole population sample analysis.

3. Procedure

Following the survey pilot test, to ensure the content of the survey and online mechanism used to take the survey was appropriate, the survey was fielded to the target population via Survey Monkey. Informed consent was obtained on the initial webpage

each participant was directed to by a unique webpage link. This first webpage provided detailed information including the purpose of the survey, it was voluntary to participate, and participants could withdraw at any time. The contact method for NPS SWO participation was made via the NPS SWO email list on the NPS Microsoft Exchange server. There are four primary errors that can degrade the value of a survey: errors in coverage, sampling, non-response, and measurement (Dillman et al., 2009).

Proposed Schedule (Time, in days):

- T-1 Pre-Notification email sent to target population
    - Explains the nature of the survey
- T+0 Formal Invitation email sent to target population
    - Provides survey information and embedded hyperlink to survey
- T+3 First Non-Response email sent to target population
    - Reminder to take survey and stress its importance
- T+5 Second Non-Response email sent to target population
    - Reminder to take survey and stress its importance
- T+11 Third Non-Response email sent to target population
    - Request to complete survey with increased tone to stress its importance
- T+13 Final Notification email sent to target population
    - Request to complete survey emphasizing the last opportunity to participate in the survey

The style of the notification and reminder emails adhered to the social exchange principles introduced by Dillman et al. (2009), increasing the perceived benefits of and reducing the potential for non-response. The pre-notification email was sent to all participants to explain the nature of the survey and why it is being conducted. The email requests participation and was signed by the Principal Investigator (PI), an HSI expert. The day after the pre-notification email is sent, the initial survey email was sent with an embedded hyperlink that takes the participants to the survey. An opt-out link was made available and a contact email was provided in case participants have concerns or questions. Once respondents complete the survey, they were marked as complete and removed from the email list. This process required a nightly examination of communications from respondents to ensure their email addresses are removed from the list so they did not receive unnecessary email reminders. Reminder emails were sent to non-respondents to request they take the survey and to stress the importance of their feedback. A final reminder was sent prior to closing out the survey.

The survey tool was disseminated to participants through an online survey provider Survey Monkey. Approximately 208 SMEs were solicited for participation using the NPS email directory. All SME received an invitation email providing information regarding the purpose of the survey and an invitation to participate. Survey Monkey provides a secure method of collecting survey data without compromising personal privacy and maintains the ability for the participant to provide data without the fear of reprisal. The survey was open for participation from July 12th, 2012 and closed two weeks later on July 25th, 2012. Reminder emails were sent to those participants who had not completed the survey or had not opted out of survey participation on July 18th and July 23rd, 2012.

4. Data Collection

Survey data was acquired from NPS SWO students via the web-based survey instrument Survey Monkey. No Personal Identifying Information (PII) was collected. The survey data consisted of individual responses to questions about the opinions of SWO

SMEs concerning personnel staffing criteria for optimal manning of U.S. Navy combat vessels. The Thesis Advisor, Second Reader, and Thesis Researcher are responsible for safeguarding the data and were the only people with access to the complete data set. They have ensured all provisions to safeguard the data are fully implemented.

Survey data was then transferred into a Microsoft Excel spreadsheet and organized into a useful format in order to analyze it. The prepared data was then imported into the statistical analysis tool JMP 10.0 for detailed analysis using parametric and nonparametric statistical analysis.

5. Data Analysis

Data from the Survey questionnaire was analyzed using parametric and non-parametric statistics. When comparing ranked data between two variables which require that both variables be measured in an ordinal scale, the Spearman Rank-Order Correlation Coefficient is used to identify any correlation between personality traits and the ship types or OPTEMPO levels. When comparing within ship type and across OPTEMPO, the Wilcoxon Signed Ranks Test is used. This allows for the relative magnitude and the direction of the difference to be considered, providing a more powerful test. It accomplishes this by giving more weight to pairs with a large difference between the two conditions than to pairs with a small difference (Siegel & Castellan, 1988).

When comparing ranked data of eighty-four subjects across four characteristics the Kendall Coefficient of Concordance is used to establish if the subjects are in agreement in the data. Next, the Kruskal-Wallace One-Way Analysis of Variance by Ranks (KW) is used to determine if the difference among the samples signified genuine population differences or whether they represent variations that are to be expected among random samples from the same population. Finally, the Wilcoxon Signed Ranks Test is used to establish a relative magnitude and direction of the differences between the variables (Siegel & Castellan, 1988).

When comparing discrete categorical data between two independent groups (i.e., True/False, Yes/No/Uncertain), a Chi-Squared Test for two independent samples was used. The purpose of this test is whether the differences in proportions exceed those expected as chance or random deviations from proportionality (Siegel & Castellan, 1988). When comparing data of two independent groups with continuous integers, the Two-Proportion z-Test was used. This test is appropriate due to independent simple random sampling of an adequate sized population in a success/failure condition (De Veaux, Velleman, & Bock, 2009).

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IV. RESULTS

A. INTRODUCTION

This study explores the notion of using sailor personality traits as part of establishing an optimal manning environment for next generation surface combat ships. OMP calls for manpower reductions by leveraging technology, which as a byproduct serves to increase system complexity and rigidity, placing a potentially greater demand on a ship's crew to maintain successful mission performance (Bost, Truver, & Knutson, 2007). In examining SMEs' perceptions of personality traits and their relative importance in performance, comparisons are made between traditionally and optimally manned vessels across three levels of OPTEMPO, low, moderate and high. Additionally, the relative importance of sailor personality traits and KSAs was evaluated between ship type and across OPTEMPO. The demographics of the participant sample are first presented to establish the populations sampled. Next, non-parametric statistics are used to identify 1) the relative level of importance of personality traits at three OPTEMPO levels, 2) whether personality traits are considered more important on OMP vessels compared to traditionally manned vessels and if so, the effect of OPTEMPO level on the importance of personality traits, 3) whether personality traits are considered relatively more important than KSA attributes and whether that perception varies between OMP and traditionally manned vessels, and 4) whether SME support personality trait testing as an integral part of the detailing process for next generation surface combat ships.

B. PARTICIPANT DEMOGRAPHICS

Survey data was collected from 84 designated U.S. Navy SWOs, and with approximately 208 SWOs were currently stationed at NPS a 40.4% return rate was achieved. Within the target population, specific qualifiers were identified to verify their experience relative to the group study and survey objective: participants were required to (1) have served onboard Frigate, Cruiser, Destroyer, LCS, or any combination of these vessel classes, (2) be a Lieutenant (O-3/O-3E) or above to ensure they have the required

level of experience, and (3) have, at a minimum, served in a position of Division Officer on a Frigate, Cruiser, Destroyer, or LCS. Of the sample population, 84 SWOs met the established requirements and completed the survey. Figure 3 presents the number of ship platforms participants served aboard and the senior positions they held in their career onboard the listed ships.

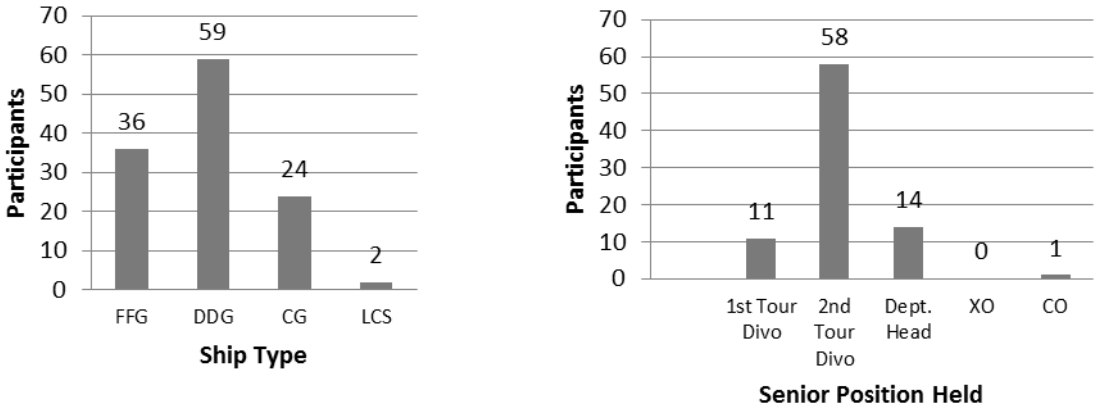

Figure 3. Participants' Experience: (A) Ship Platforms, (B) Senior Positions Held.

The participants served as SMEs to address the objectives of the study. Five research questions were raised pertaining to next generation OMP ships and their planned reduced manpower levels from traditional levels found in current surface combatant ships.

C. RESEARCH QUESTION STATISTICAL ANALYSIS

The survey responses from the 84 qualified SMEs who participated served to meet the objectives of the study. Five research questions pertaining to next generation OMP ships and their planned reduced manpower levels from traditional levels found in current surface combatant ships were raised to address the stated objectives. The corresponding results for those questions are as follows:

1. Do SMEs consider crew member personality traits important in overall ship performance independent of crew size?

Figure 4 shows the relative frequencies of SMEs' answers to a series of questions on the impact of personality traits on a sailor's performance and on how personality traits influence performance when considering work group size (N) and the direction of performance change when group size is reduced. These questions were asked to establish if personality traits are independent of work group size (N).

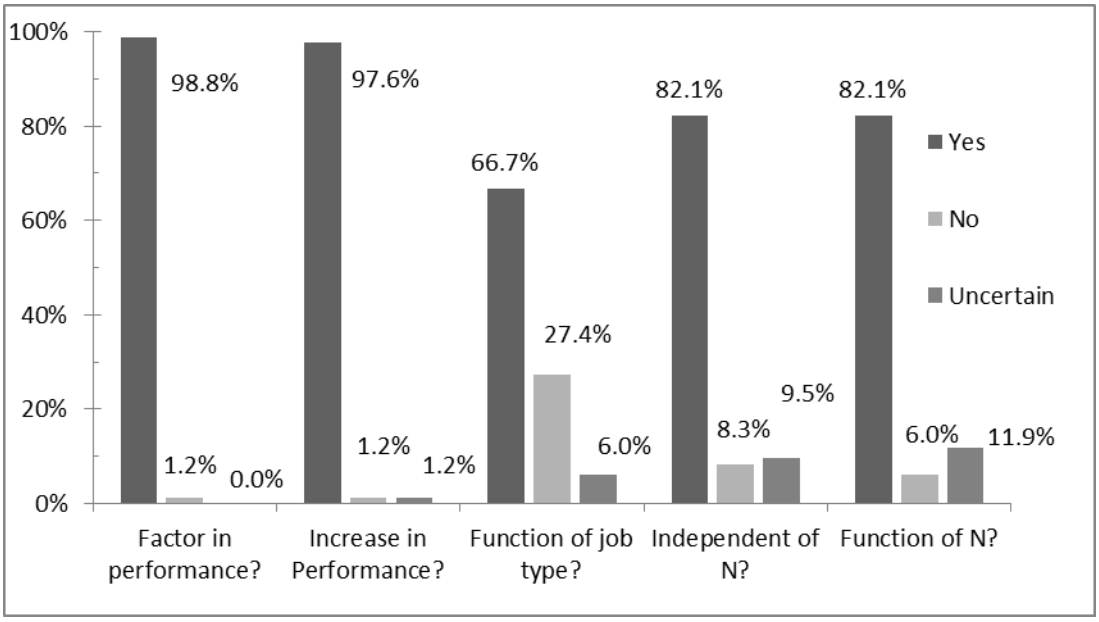

Figure 4. Influence of Personality Traits as a F(N)

Inspection of Figure 4 suggests there is significant SME support for the notion that personality traits influence performance. Nearly all SMEs agreed that personality traits are a factor in performance and provide an increase in performance. Next, 66.7% of the SMEs agreed the impact of personality traits on job performance is dependent on job type. When considering group size, 82.1% of SMEs indicated that they feel that personality traits improve group performance independent of group size; however the magnitude of personality trait influence on group performance increases as group size is reduced.

After establishing the results of the influence of personality traits as a function of work group size, SMEs were then asked to provide their opinion on the impact of personality traits on a ship's performance. This question was provided for both traditionally manned vessels and optimally manned vessels for comparison (Figure 5).

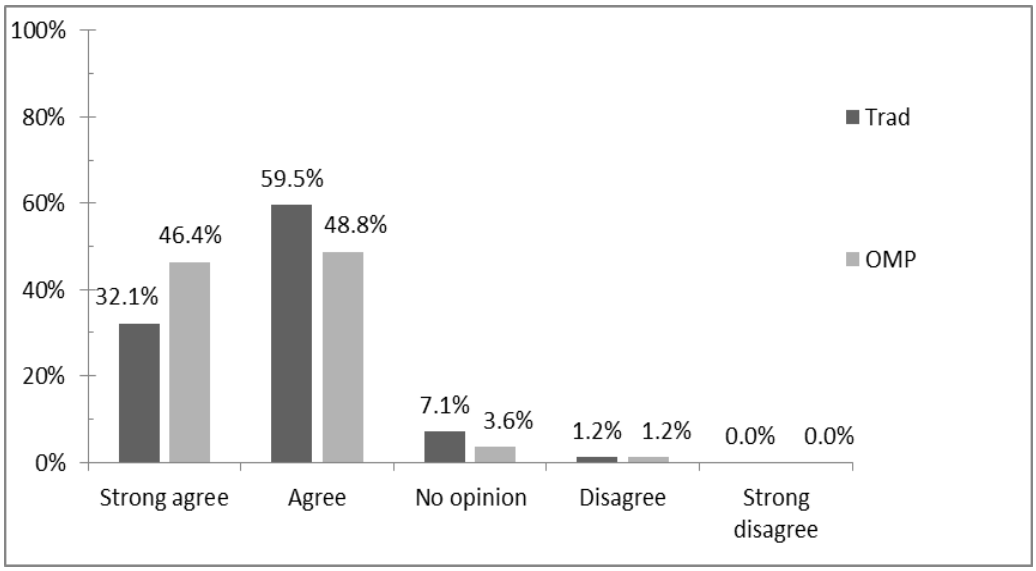

Figure 5. Influence of Personality Traits as an F (Ship Type)

As shown in Figure 5, there is strong agreement among SMEs in that 93.4% agreed that personality traits have a direct impact on a ship's performance level independent of ship type. OMP vessels show a stronger agreement in the SMEs opinion of the impact of personality traits on its performance, 32.1% for traditionally manned vessels vs. 46.4% for OMP vessels.

The data displayed in Figures 4 and 5 support the need for further rigorous statistical analysis of the conditions in which personality traits are considered to be performance enhancing factors. The text by Siegel & Castellan (1988) was used to establish the appropriate analyses. An alpha level of .05 was used for all statistical tests.

2. Do SMEs perceive the relative importance of crew member personality traits differently at varied OPTEMPO levels?

SMEs were asked to rate the importance of personality traits at three OPTEMPO levels. These levels are defined as Low OPTEMPO (Low stress normal steaming operations/training), Moderate OPTEMPO (Moderate stress mission operations on deployment), and high OPTEMPO (Critical high stress mission operations or damage control efforts). There were four rating choices available to the SMEs to assign to each prescribed OPTEMPO conditions. These rating choices were categorized in a descending level of importance as very important, important, moderately important, and not important. Each SME was asked to rate the importance of personality traits in each OPTEMPO level for a traditionally manned vessel and OMP vessel separately resulting in 168 total ratings. The Wilcoxon Signed Ranks Test (SRT) was used to provide an across OPTEMPO analysis of the importance of personality traits to establish the relative magnitude and direction of the difference in SME ratings (Siegel & Castellan, 1988). The number of pair comparisons (N) was adjusted for tied pair ranks that had to be dropped for the analysis (see Table 5).

OPTEMPO	**(N)**	**Test statistic T^+**	**$z=F(T^+,N)$**	**p**
Low vs. Moderate	76	963	-2.589	$p<0.001$
Moderate vs. High	74	116	-6.85	$p<0.001$

Table 5. Wilcoxon SRT Difference Within Pairs

The results of the Wilcoxon SRT in Table 5 show that personality traits are increasingly more important at higher levels of OPTEMPO. This is an important consideration when determining personnel requirements to maintain expected performance levels while reducing manning requirements. In fact, the magnitude of

change in the need of personality traits, when comparing a shift in OPTEMPO from low to moderate vs. a shift from moderate to high, shows that the desirability of personality traits increases at higher OPTEMPO environments.

3. Are crew member personality traits considered more important by SMEs on next generation OMP ships relative to traditionally manned surface combatant ships? If so, is the magnitude of importance greater in varied OPTEMPO levels relative to traditionally manned surface ships?

SMEs were asked to rate the importance of personality traits across ship types at each of the three defined OPTEMPO levels. The Spearman Rank-Order Correlation Coefficient (r_s) was used to measure the association between ship type and OPTEMPO (Siegel & Castellan, 1988). Correlation coefficients were adjusted due to the large proportion of tied observations in both of the variables. Table 6 summaries the results of the correlation analysis across traditionally manned and OMP vessels at each of the three OPTEMPO levels.

Association	OPTEMPO	N	r_s	z	p
Traditionally Manned vs. OMP	Low	84	0.530	4.829	p<0.001
	Moderate	84	0.550	5.015	p<0.001
	High	84	0.374	3.410	p<0.001

Table 6. Spearman Rank-Order Correlation Coefficient (r_s) Across Ship Type

The Spearman Rank-Order Correlation Coefficients reveal highly significant correlations between ship types in all OPTEMPOs. Thus, the level of importance SMEs place on personality traits on traditionally manned vessels and OMP vessels are not independent. Therefore, personality traits are valued by SMEs on both traditionally manned vessels and OMP vessels at a level that is not significantly different from one another. Decisions regarding the level of importance personality traits influence performance can be applied across the fleet without regard to surface ship design.

The next important consideration is whether there is a difference in the importance of personality traits when shifting OPTEMPO levels given a ship type. The

Wilcoxon SRT was used again to assess the relative magnitude and direction of change in the importance of personality traits across levels of OPTEMPO. Table 7 summarizes the results of the analysis within ship type and across each shift in OPTEMPO.

Ship Type	OPTEMPO Shift Comparison	(N)	T^+	$z=F(T^+,N)$	p
Traditionally Manned	Low to Moderate	40	268	-1.90	p=0.057
	Moderate to High				
OMP	Low to Moderate	26	215.5	1.02	p=0.133
	Moderate to High				

Table 7. Wilcoxon SRT Within Ship Across OPTEMPO

The Wilcoxon SRT failed to reject the null hypothesis of no difference in the importance of personality traits within a ship type and across OPTEMPO levels. However, Figure 6 indicates that although the statistical test was not significant, there is a pragmatically meaningful shift in opinion when OPTEMPO increases on a traditionally manned vessel. The two previous analyses support the claim that the importance of personality traits is not influenced by either ship type or OPTEMPO level. However, this reinforces the observation that the magnitude of personality trait importance increases across both ship types as OPTEMPO is increased. SMEs appear to value personality traits on both ship types as a function of OPTEMPO with a larger change in the traditionally manned vessel. The application of personality trait benefits to legacy systems is shown to be as positive, if not more positive, a benefit to ship performance than it is to OMP vessels.

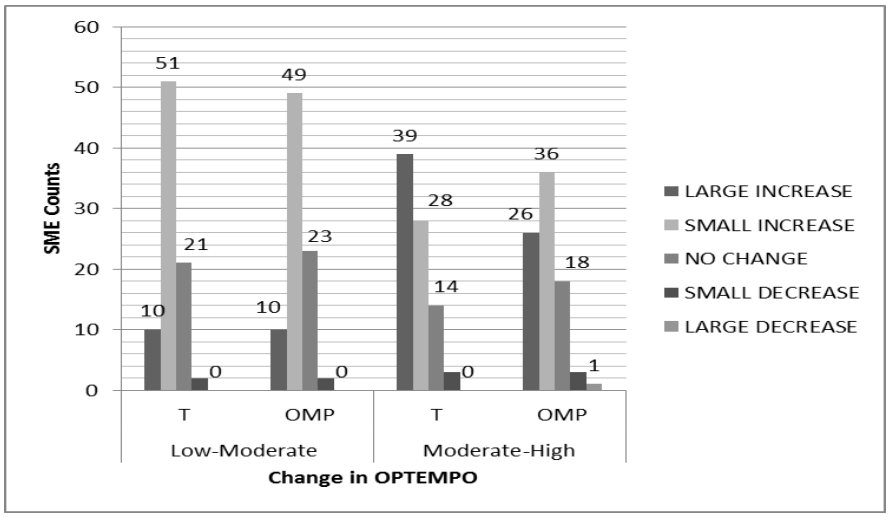

Figure 6. Change in Personality Trait Importance Level Across OPTEMPO

4. How do SMEs value crew member personality traits relative to traditional KSA attributes? Does that value differ when comparing OMP ship manning vs. that on traditionally manned surface combatant ships?

SMEs were asked to rank personality traits against KSAs in three OPTEMPO levels (Low, Moderate, and High) for both traditionally manned vessels and OMP vessels. A comparison was then made to determine whether the rank order of personality traits, knowledge, skills, and abilities changed across ship types given the OPTEMPO level. Three nonparametric statistical methods were employed. First, the Kendall Coefficient of Concordance (W) was used to establish the measure of association among the SMEs' rankings (Siegel & Castellan, 1988), that is, whether the SMEs have a consensus on the ranking of personality traits against KSAs in a given OPTEMPO. Second, the Kruskal-Wallis One-Way Analysis of Variance by Ranks (KW) Test was used to determine if there are significant differences between the rankings of personality traits and KSA. Third, the Wilcoxon SRT was used to establish a relative magnitude and direction of any differences detected by the KW test. These statistical calculations were performed for each ship type, traditional and OMP, and then analyzed for differences in the resulting rank order of the variable. Tables 8 and 9 respectively present the results for the Kendall W and KW Test.

Ship Type	N (variables)	k (sets of rankings)	W	Chi-Square	p
Traditionally Manned	4	84	0.082	20.69	p<0.001
OMP	4	84	0.091	22.87	p<0.001

Table 8. Kendall W analysis for Personality Traits vs. KSA

Table 8 provides the results of the Kendall W analysis for the ranking of personality traits vs. KSAs to ensure there was a general consensus of the SMEs opinions. The degree of association among the SME is important to establish. When (W) is significant, $p<0.05$, it signifies that the opinions of the SMEs are in agreement rather than the opinions so varied that no associated ranking can be determined. Each of the four variables (N) personality traits, knowledge, skills, and abilities, were ranked and a very strong association among the SMEs was established providing confidence that the findings reflect the views of most SMEs.

Ship Type	N	k	KW	p
Traditionally Manned	4	84	46.30	p<0.001
OMP	4	84	46.85	p<0.001

Table 9. KW Test for Personality Traits vs. KSA

As shown in Table 9, the KW Test established that there is at least one variable (personality traits, knowledge, skills, and ability) that was rated in a manner that is statistically different from the others. This finding applies to both traditionally manned and OMP vessels. In order to establish which variable or variables are indeed different, the Wilcoxon SRT is required.

The Wilcoxon SRT provided both a magnitude and direction of difference for the pair comparison. Appendix C provides the results for the Wilcoxon SRT for each pair

comparison of personality traits and KSA. Each pairwise comparison was completed for both ship types. Table 10 provides a summary of the statistical findings.

Ship type	OPTEMPO	Variable Relationship
Traditionally Manned	Low	K S T A
	Moderate	K T S A
	High	K T S A
OMP	Low	K S T A
	Moderate	K T S A
	High	K T S A

K= Knowledge, S= Skill, A= Ability, T= Personality Traits

Table 10. Summary of Variable Relationships

The summaries of relationships in Table 10 indicate a progressive trend in importance of personality traits. When comparing within ship type at low and moderate OPTEMPOs, personality traits are statistically no different than knowledge or skills, but are more important than abilities. At High OPTEMPO, associated importance levels change, on traditionally manned vessels knowledge is the most important. The second most important are personality traits and skills, which are determined to be the essentially equal in value. Lastly, ability is found to be less important than the other three. On an OMP vessel at high OPTEMPO knowledge and personality traits are valued the most and are equally important. Personality traits are found to be ranked second in importance in all OPTEMPO levels and across both ship types providing evidence that the perceived benefits of testing for personality traits could be applied across the Fleet, rather than limited to the scope of this research.

5. Do SME perceptions suggest a need to incorporate personality traits in the detailing process for next generation surface combatant ships?

SMEs were asked to provide their opinion of the incorporation of personality trait testing in the detailing process for next generation surface combat vessels and the level of importance the implementation should be given. There were five rating choices available to the SME for the level of priority that should be given to implement personality testing. These rating choices were categorized in a descending level of priority as highest priority, moderate priority, uncertain, low priority, and no priority (see Figure 7).

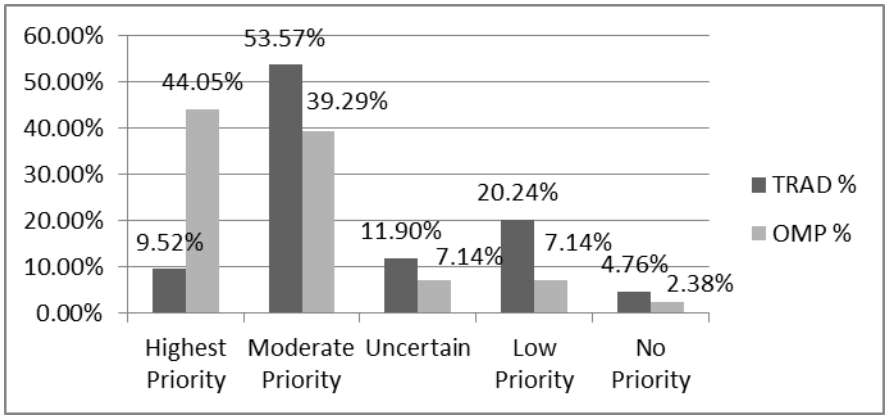

Figure 7. SME's Suggested Required Attention to Personality Trait Testing

A Chi-Square Test for Independence was used to determine that their opinions were independent of the ship type, Chi-Square (4) =168, $p<0.001$. Figure 7 provides the results of the survey question. Personality traits receive a much higher priority in OMP vessels than traditionally manned vessels. Although the level of importance was statistically indistinguishable across ship type and OPTEMPO levels, the priority that should be given to include personality trait testing in the recruitment and detailing of sailors is found to be in greater for OMP vessels. Additionally, when viewing the combined results of the ship types SMEs have scored the importance of personality trait testing in moderate to highest priority with high marks.

D. SUMMARY

This analysis has distilled self-report data to identify SME opinions about incorporating personality trait testing for future traditionally manned and OMP vessels. This analysis found that SMEs believe that performance is a function of personality traits. Further, they believe that traits become increasingly important as group size is reduced, are a function of OPTEMPO, and are independent of ship type. They ranked personality traits second overall when compared to KSAs and indicated that personality trait testing, while important regardless of ship type should be given precedence to OMP vessels recruitment and detailing. The following chapter provides discussion points relevant to each research question.

V. DISCUSSION

A. BACKGROUND

This study sought to identify the need of personality trait testing as a requirement in personnel recruitment and detailing process for future OMP surface combat vessels. This was premised on the basis that, as current and next generation ship design reduces manpower by leveraging technology and automation, a shift in the vessel's socio-technical organization results. Studies of organizations with similar structures have determined the benefit of individuals possessing desired personality traits to increased individual and group performance in similar environments (Klein, Bigley, & Roberts, 1995). Currently, the Navy only employs cognitive testing and assessment of KSAs as part of the personnel recruiting process, which in turn is used in detailing sailors.

B. PERSONALITY TRAIT IMPACT ON PERFORMANCE

Five research questions were addressed to determine SMEs' opinions pertaining to next generation OMP ships and their reduced manpower levels from traditional levels found in current surface combatant ships. The following sections discuss the findings as they relate to each research question.

1. Do SMEs consider crew member personality traits important in overall ship performance independent of crew size?

SMEs overwhelmingly believe that personality traits are a key contributor to positive performance. This expected outcome was used to establish a basis of research into its application onboard U.S. Navy surface combat vessels and is in direct alignment with the finding of Peeters, et al. (2006) of a meaningful relationship of personality to performance and the notion that personality traits can be used as a predictor to individual and team performance. SMEs are in 82.1% agreement that the positive impact of personality traits on performance exists regardless of group size, however becomes increasingly important as group size is reduced. Two-third of the SMEs surveyed also suggested that the influence of personality traits is job type dependent. In other words, the

personality traits desired in a sailor depends upon the type of job the sailor performs. Officers have relied on the "can-do" attitudes of their sailors in challenging times for generations. New struggles, increased requirements, and reduction in forces are just a few of the examples leadership have continued to battle. Relying on those sailors who possess the qualities in character as well as aptitude to get the job done and encourage other sailors around them to strive for the highest performance level possible is a staple in personnel management. SMEs believe that the level of importance personality traits influence performance is independent of a sailor's job type and has a growing importance as the group size is reduced.

Expanding the perspective of the impact of personality traits beyond the individual and group levels, SMEs also had a strong belief that it is a fundamental contribution to an overall ship's performance. Although the survey asked the level of importance of personality traits separately for each ship type, both traditionally manned vessels and OMP vessels likely performance were found to be strongly linked to the observed crew's personality traits it possessed. The notion that personality traits influence individual, sub-system, and system performance as a whole was then investigated under varying OPTEMPO levels.

2. Do SMEs perceive the relative importance of crew member personality traits differently at varied OPTEMPO levels?

The level of importance SMEs place on personality traits at varied levels of OPTEMPO was investigated. Personality traits were found to be increasingly more important as the OPTEMPO level increased including a greater magnitude of increase when shifting from a moderate to high OPTEMPO within ship types. The three OPTEMPO levels represented a variation in operational stress that the SMEs have likely experienced. Low stress represented a normal steaming condition with expected operation and training associated in that environment. Moderate stress levels were represented by expected real-life operations the SMEs would experience on a deployed

status. High stress conditions were described as critical mission operations on deployment or expected stress levels they SMEs would experience during a significant real-life damage control efforts.

Navy combat ships are by analogy a HRO existing in a socio-technical organization. The personnel operate in a highly complex man-machine interface where everything possible to avoid negative outcomes is required. The system is complex in nature and is increasingly more tightly coupled as manning levels are reduced by policy or design. A shared set of values are naturally developed in an environment focused on reliability and performance level and is contingent on the sailor's attitude, role expectations, and their perceived fit in the organization as found by Klein et. al, (1995). As the level of OPTEMPO increases, the efficiency and effectiveness of the ship must be maintained without overwhelming the system. As the availability of manpower becomes more constrained, required human capital surplus is drawn from the capabilities of the personnel in the system.

3. Are crew member personality traits considered more important by SMEs on next generation OMP ships relative to traditionally manned surface combatant ships? If so, is the magnitude of importance greater in varied OPTEMPO levels relative to traditionally manned surface ships?

After determining the increase level of importance SMEs place on personality traits as the OPTEMPO level increases, the comparison of that level of increase was made across ship type. It was determined by a strong statistical significance that the level of importance SMEs place on personality traits is independent of ship type. This was an unexpected determination in the study. There was a suspicion that on OMP vessels, containing the most significant socio-technical organizational shift would have a greater reliability on individual sailor's personality traits to maintain expected ship's performance. This was found not to be of the SMEs opinion. In fact, overall the SMEs provided data that personality trait level of importance between traditionally manned vessels and OMP vessels was statistically the same.

When comparing the magnitude of personality trait level of importance across ship type there was no statistical difference between the traditionally manned vessel and OMP vessels. In other words, both ship types experienced essentially the same increased level of personality trait importance shift as the OPTEMPO level was increased. The interpretation of this finding is likely to be due to the limited number of SMEs who have experienced leadership roles on both traditionally manned vessels and OMP vessels. Additionally, both vessel types are considered HROs in a socio-technical environment. It is likely that the resultant organizational designs on both ship types have reached a level transcending a perceived difference in the level of personality trait importance for either.

4. How do SMEs value crew member personality traits relative to traditional KSA attributes? Does that value differ when comparing OMP ship manning vs. that on traditionally manned surface combatant ships?

Personality traits ranked exceptionally high among KSAs on both traditionally manned vessels and OMP vessels. When comparing within ship type at low and moderate OPTEMPOs, personality traits are statistically no different than knowledge or skills, but are more important than abilities and at high OPTEMPO, associated importance levels change. On traditionally manned vessels knowledge is the most important. Second are personality traits and skills, which are determined to be the essentially equal in value. Lastly, ability is found to be less than the other three. On an OMP vessel at high OPTEMPO knowledge and personality traits are valued the most and are equally important. Personality traits are found to be ranked second in importance in all OPTEMPO levels and across both ship types. This is a fundamental finding of this research. This provides a conclusive result that personality traits are found to be an important component to the expected performance of a ship, whether traditionally manned or an OMP vessel. Additionally, personality traits, relative to the current metric which determine personnel recruiting and detailing, is a variable shown to be more important than both ability and skill in every OPTEMPO level and either ship type.

Establishing that personality traits overall are 1) considered an important factor in performance by SMEs, 2) considered more import as the OPTEMPO level increases, and

3) are independent of ship type the determination of the relative value of personality traits to the KSAs sailors possess is necessary. Determining the relative importance of sailors possessing beneficial personality traits as compared to KSAs in their observed performance by the SMEs can provide insight to the need of personality testing in the detailing of sailors to future combat vessels. Presently, the Navy employs cognitive testing and assessment of knowledge, skills, and abilities (KSAs) as part of the personnel recruiting process, which in turn is used in detailing sailors. However, personality trait assessment is not extensively used in recruitment or subsequent detailing except for special rates (e.g., nuclear submarine) or assignments (e.g., special operations). The importance of a sailor's personality fit with the overall organizational culture then becomes more important than the required characteristics of any specific sailor rate. This shift from a person-job fit organizational structure to a person-organization fit structure is the foundation of incorporating personality testing as part of the detailing process to OMP vessels.

5. Do SME perceptions suggest a need to incorporate personality traits in the detailing process for next generation surface combatant ships?

At the conclusion of the survey, the SMEs were provided the opportunity to provide the level of importance the implementation of personality trait test should be given in the detailing process for traditionally manned and OMP vessels. This study elicited the opinions of a large number of SMEs within the U.S. Navy SWO community possessing various levels of leadership experience across ship types. The SMEs are in a general agreement that regardless of ship type, each warrant a level of priority worthy of applying personality trait testing to each. From a selection of five choices (highest priority, moderate priority, uncertain, low priority, and no priority) each ship type received scores in the highest or moderate priority levels equaling 63.1% for traditionally manned vessels and 83.3% for OMP vessels. However, there was a statistical difference between the two ship types that showed SMEs to have a stronger opinion that a higher priority level is required to incorporate personality testing into the recruitment and detailing of sailors to OMP vessels. The recognition of a priority between ship types

provides a direction for the implementation process of personality trait testing and that it should first be focused on next generation OMP vessels.

C. CONCLUSIONS AND RECOMMENDATIONS

This study has provided substantial evidence on the benefit of personality trait testing in the recruitment and detailing process for the U.S. Navy surface warfare community. Current and future design OMP vessels will continue to become increasingly reliant on technology and complex systems of system designs resulting in socio-technical organizations that become increasingly tightly coupled. As the reduction in manpower decreases in an HRO, where process reliability and sustained performance at a high OPTEMPO for sustained periods of time is required, each individual's contribution to the ship's performance becomes increasingly significant to its success. While understanding a sailor's knowledge is second to none when determining factors that influence performance, it is the sailor's attitude, role perceptions, and perceived fit into the organization that will trump their skill and ability.

The Office of Naval Research is currently sponsoring the development of the Navy Computer Adaptive Personality Scales (NCAPS) to investigate the usefulness of adding a measure of non-cognitive attributes to supplement the Armed Forces Vocational Aptitude Battery. The goal of NCAPS is to apply personality assessment to the selection and classification of Sailors for entry level Navy enlisted jobs. While this study is similar in the consideration of personality traits recruitment of sailors into a person-job fit organization, NCAPS has is constrained to sailors' first tour and initial job selection for placement in specific rates. Considering the direction of OMP vessel design and the required cross-rate integration of current sailor job ratings, this study supports the claim that personality trait testing is an important consideration at all stages of a sailor's career. Its consideration is especially important in the current transition phase of the U.S. Navy surface combat vessel design and the resultant evolution of their socio-technical organizational design.

Practical application of HSI continues to be an under-utilized practice. As the technological requirements of systems continues to increase in legacy and future combat vessels, HSI can aid in the design and development of the resultant socio-technical systems and their complexity by providing insight to its domains for performance efficiency and effectiveness. Naval vessels that are currently fielded which undergo system alterations, for the purpose of manpower reduction or increased system capability by leveraging technology, can also benefit from the application of HSI by improved understanding of the sociotechnical impact to the system and the vessel.

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APPENDIX A. FOCUS GROUP DISCUSSION TOPICS

Assessment of Personnel Selection Requirements That Surpass Traditional Knowledge, Skills, and Abilities for Next Generation Ship Optimal Manning Program

Overview: As Subject Matter Experts (SMEs) you will be participating in a discussion session concerning the importance of individual crew member personality traits. The discussion will be facilitated by the research student, LT Paul O'Daniel, who will provide questions for group discussion based on your experience as a Surface Warfare Officer (SWO).

Proposed SME Focus Group Questions:

Here is a list of common personality traits for reference: (feel free to incorporate any others you identify)

NCAPS	BIG 5
Adaptability/ Flexibility	Openness to Experience
Attention to Detail	Extraversion
Achievement	Agreeableness
Dependability	Neuroticism
Dutifulness	Conscientiousness
Social Orientation	
Stress Tolerance	
Willingness to Learn	
Vigilance	
Self-Reliance	

*Note: Operational definitions will be provided to participants for reference.

1. In your experience while stationed onboard "Small Boys", do personality traits matter in job accomplishment or performance?

2. When you have been in charge of different teams that have different job task requirements, (i.e., Engineering Division vs. a Weapons system Division vs. Deck Division) did the importance of personality traits vary?

3. Have you ever experienced having "enough people" for normal operations, but an event occurs resulting in increased workload or a high stress environment for your people? If so, what, if any changes did you see in your personnel?

4. Did you rely on specific individuals or your “go-to Sailor”? If so, what was it about that person that made them the “go-to Sailor”?

5. Knowledge, Skills, and Abilities in a Sailors job is an important aspect. Pick the top 10 personality traits from the list above as a group consensus. In addition to you top ten pick, please include knowledge, skills, and abilities on your list. Please rank them in order of precedence in the following environments. You do not have to rank all choices if you feel they do not apply.

	Low OPTEMPO (routine training off the coast of your home port)	Moderate OPTEMPO (Mission Ops on Deployment)	High OPTEMPO (Casualty control/Critical Mission Ops on Deployment)
1 Knowledge			
2 Skills			
3 Ability			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

NCAPS	**BIG 5**
Adaptability/ Flexibility	Openness to Experience
Attention to Detail	Extraversion
Achievement	Agreeableness
Dependability	Neuroticism
Dutifulness	Conscientiousness
Social Orientation	
Stress Tolerance	
Willingness to Learn	
Vigilance	
Self-Reliance	

6. Given that there are varying sizes of groups onboard ships for job performance. Does the importance of personality trait composition vary based on group size?

7. Would the navy benefit from including personality testing in current surface ships? If so, why and to what extent? (How strong is your opinion?)

8. Would the Navy benefit from including personality testing on the LCS, DDG-1000, and future design ships? If so, why and to what extent? (How strong is your opinion?)

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APPENDIX B. SURVEY INSTRUMENT

Personnel Selection for Optimal Manned Ships

1. Naval Postgraduate School
Consent to Participate in Research

Introduction: You are invited to participate in a research study entitled:

Assessment of Personnel Selection Requirements That Surpass Traditional Knowledge, Skills, and Abilities for Next Generation Ship Optimal Manning Program

The purpose of the study is to better understand the importance of personality traits that you, the subject matter expert, believe Sailors under your supervision require to accomplish their job activities and responsibilities in an optimally manned system. This is your chance to provide input to the recruitment and detailing of personnel and how it can best serve you and the future Sailors under your leadership.
Procedures:
1. Please review this "Consent to Participate in Research" in its entirety.
2. After your review, select whether you consent or do not consent to participate. If you choose to participate the survey will continue. If you choose not to participate, you will be redirected to the survey exit.
3. It should take you approximately 20 minutes to complete the survey.
4. Approximately 215 Surface Warfare Officers (SWOs) enrolled at NPS are requested to participate in this survey.
5. As a participant, you will be asked to provide professional SME input based on your experience as a SWO.
6. With a robust response from our NPS SWO students, I can provide useful feedback about your wants and needs in the fleet.

Location: This survey can be completed at any location of your choice that provides internet access.

Cost: There is no cost to participate in this research study.

Voluntary Nature of the Study: Your participation in this study is strictly voluntary. If you choose to participate you can change your mind at any time and withdraw from the study. You will not be penalized in any way or lose any benefits to which you would otherwise be entitled if you choose not to participate in this study or to withdraw.

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Personnel Selection for Optimal Manned Ships

Potential Risks and Discomforts: The potential risks of participating in this study are: Breach of confidentiality: The possibility exists for data to be compromised, however, every effort will be made to ensure confidentiality be maintained through the duration of the study. No information will be collected that can identify a participant based on their response data.

Anticipated Benefits: There are no direct benefits of participation. However, there may be substantive indirect benefits in years to come. The physical design requirements of next generation ships potentially results in a sociotechnical organizational design structure that necessitates incorporating beneficial personality traits. Therefore, the inclusion of identifying these traits in the personnel staffing process is likely to be critical in the safe, effective, and efficient operation of these vessels. This survey is your opportunity to help shape the staffing process for next generation ships.

Compensation for Participation: No compensation will be given.

Confidentiality & Privacy Act: Any information that is obtained during this study will be kept confidential to the full extent permitted by law. All efforts, within reason, will be made to keep personal information in your research record confidential but total confidentiality cannot be guaranteed.

No sensitive personal identifying information such as SSNs will be collected in the survey. The survey data consist of your responses to questions about personnel selection criteria for optimally manned U.S. Navy combat vessels. These topics pose minimal to no risk to you. Electronic data will be maintained on the NPS server. The Thesis Advisor: CAPT John K. Schmidt, Second Reader: Senior Lecturer Kip Smith and Thesis Author: LT Paul O'Daniel bear sole and complete responsibility for safeguarding the data and will be the only people with access to the data set. They will ensure that a

◯ I agree to participate in this study

◯ I do not agree to participate in this study

The following questions verify whether you meet the criteria as a subject matter expert (SME) for the purpose of this study.

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1. Are you currently or have you ever served as a Surface Warfare Officer (SWO)?

- ◯ yes
- ◯ no

2. While serving as a SWO, which of the following ship platforms have you been stationed on as a Division Officer, Department Head, XO, or CO? (select all that apply)

- ☐ FFG
- ☐ DDG
- ☐ CG
- ☐ LCS
- ☐ None of the above

3. While stationed on any of the previously mentioned ship platforms, what was your most senior position held?

- ◯ 1st Tour Divo
- ◯ 2nd Tour Divo
- ◯ Dept. Head
- ◯ XO
- ◯ CO
- ◯ None of the above

4. Are you currently an O-3/O-3E or higher pay grade?

- ◯ Yes
- ◯ No

DIRECTIONS: The following questions inquire about your SWO experience with regard to leading Sailors, whether in direct Chain of Command (COC) or watchstation positional authority. The questions focus on personality trait impact on job performance. The term "personality trait" is defined below and followed by a list of example personality traits for your reference.

PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.

Examples include: Adaptability/Flexibility, Agreeableness, Attention to Detail, Dependability, Dutyfulness/Integrity, Self-Reliance, Stress Tolerance, Vigilance, and Willingness to Learn

Personnel Selection for Optimal Manned Ships

1. In your experience, have individual Sailors' personality traits been an important factor in their performance?

- ◯ Yes
- ◯ No
- ◯ Uncertain

2. In your experience, do Sailors who possess certain personality traits demonstrate higher performance results than Sailors who do not?

- ◯ Yes
- ◯ No
- ◯ Uncertain

3. In your experience, did the importance of personality traits vary depending on the type of work the Sailors you were in charge of performed? (i.e., Engineering Division vs. Weapons Division vs. Deck Division)

- ◯ Yes
- ◯ No
- ◯ Uncertain

4. In your experience, do personality traits influence group performance regardless of group size?

- ◯ Yes
- ◯ No
- ◯ Uncertain

5. In your experience, do personality traits have a greater influence on group performance as the number of people in the group is reduced?

- ◯ Yes
- ◯ No
- ◯ Uncertain

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DIRECTIONS: The following questions pertain to your experience as a SWO on TRADITIONALLY MANNED platforms in regards to individual Sailors' personality traits.

TRADITIONALLY MANNED is defined as current manning levels for the size and mission of FFG/DDG/CG platforms.

PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.

Examples include: Adaptability/Flexibility, Agreeableness, Attention to Detail, Dependability, Dutifulness/Integrity, Self-Reliance, Stress Tolerance, Vigilance, Willingness to Learn

Knowledge, Skills, and Abilities (KSAs) are attributes necessary to perform tasks in a specified job requirement.

KNOWLEDGE: organized body of information (i.e., facts, rules, and procedures).
SKILLS: capability to perform tasks with ease and precision.
ABILITY: cognitive capabilities necessary to perform job function.

1. Do you agree with the following statement?
"Ship's crewmember personality traits impact ship performance on a traditionally manned vessel."

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral
- ◯ Disagree
- ◯ Strongly disagree

2. Assume a crew of 200 Sailors is a fully manned surface combat vessel with an expected departmental distribution of personnel. In your opinion, how many Sailors with undesirable personality traits would it take to negatively impact a ship's performance to an extent that would require immediate attention?

The term "undesirable personality traits" is defined as those traits that negatively impact the work environment.

Please enter your answer here. [ ]

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Personnel Selection for Optimal Manned Ships

3. On a traditionally manned ship assuming a LOW OPTEMPO (i.e., Low Stress Normal Steaming Ops/training off your home port coast)

What level of importance do you place on a Sailors' personality traits on their level of job performance?

- ◯ Very important
- ◯ Important
- ◯ Moderately Important
- ◯ Not important

4. On a traditionally manned ship assuming a MODERATE OPTEMPO (i.e., Moderate Stress Mission Ops on Deployment)

What level of importance do you place on your Sailors' personality traits on their level of job performance?

- ◯ Very important
- ◯ Important
- ◯ Moderately Important
- ◯ Not important

5. On a traditionally manned ship assuming a HIGH OPTEMPO (i.e., Critical High Stress Mission Ops/Damage Control Efforts)

What level of importance do you place on your Sailors' personality traits on their level of job performance?

- ◯ Very important
- ◯ Important
- ◯ Moderately Important
- ◯ Not important

6. When progressing from a LOW OPTEMPO environment to a MODERATE OPTEMPO environment, to what degree, if any, do personality traits importance levels change?

- ◯ Large increase
- ◯ Small increase
- ◯ No change
- ◯ Small decrease
- ◯ Large decrease

7. When progressing from a MODERATE OPTEMPO environment to a HIGH OPTEMPO environment, to what degree, if any, do personality traits importance levels change?

- ◯ Large increase
- ◯ Small increase
- ◯ No change
- ◯ Small decrease
- ◯ Large decrease

8. When progressing from a LOW OPTEMPO environment to a HIGH OPTEMPO environment, to what degree, if any, do personality traits importance levels change?

- ◯ Large increase
- ◯ Small increase
- ◯ No change
- ◯ Small decrease
- ◯ Large decrease

Sailors are generally trained in their job designation and in shipboard requirements in various knowledge, skills, and abilities (KSAs). These KSAs can vary from individual to individual based on experience and specialized training. Please select True of False for the following statements.

9. In a LOW OPTEMPO environment, personality traits are more important than KSAs.

- ◯ True
- ◯ False

10. In a MODERATE OPTEMPO environment, personality traits become increasingly more important than in a LOW OPTEMPO environment.

- ◯ True
- ◯ False

Personnel Selection for Optimal Manned Ships

11. In a MODERATE OPTEMPO environment, personality traits become more important than KSAs.

- ◯ True
- ◯ False

12. In a HIGH OPTEMPO environment, personality traits become increasingly important than in a MODERATE OPTEMPO environment.

- ◯ True
- ◯ False

13. In a HIGH OPTEMPO environment, personality traits are more important than KSAs.

- ◯ True
- ◯ False

In the following OPTEMPO environments please rank 1-9, in order (1 representing the most important trait and 9 representing the least important trait) traits you would desire Sailors under your supervision to possess given the OPTEMPO environment on a TRADITIONALLY MANNED ship.

Personnel Selection for Optimal Manned Ships

1. In a LOW OPTEMPO environment please rank 1-9, in order (1 representing the most important trait and 9 representing the least important trait) traits you would desire Sailors under your supervision to possess on a TRADITIONALLY MANNED ship.

☐	ADAPTABILITY/FLEXIBILITY: willing to change their approach to tasks and projects; likes considerable variety at work; able to work effectively with many different types of people in many different types of situations; adapts readily to changes in their environment.
☐	AGREEABLENESS: tends to be compassionate/cooperative rather than suspicious and antagonistic towards others.
☐	ATTENTION TO DETAIL: exacting, precise, and accurate; spots minor imperfections or errors; is meticulous and thorough in their approach to tasks; dislikes clutter; enjoys developing methods for keeping materials methodically organized.
☐	DEPENDABILITY: reliable, well organized and orderly; uses time efficiently; prioritizes tasks; stays on schedule; not easily distracted or bored by routine tasks.
☐	DUTIFULNESS/INTEGRITY: has a strong sense of duty and moral obligation; tries to do what is right and ethical; accepts authority and follows laws, rules, and regulations; honest and trustworthy.
☐	SELF-RELIANCE: self-sufficient, resourceful, and likely to make decisions; avoids becoming dependent on others to get things done; has a no-nonsense approach to things; realistic and unsentimental.
☐	STRESS TOLERANCE: maintains composure and retains ability to think clearly and takes effective action when confronted with stressful situations; can readily put aside worries and feelings of guilt.
☐	VIGILANCE: able to constantly scan the environment for things that require attention, even when no action may be required for long periods of time (e.g., stays alert to possible safety hazards).
☐	WILLINGNESS TO LEARN: willing to learn new material in a classroom environment or on the job and applies that material in new work situations; learns from mistakes, takes useful advice, and asks questions when unsure about something; actively seeks out learning opportunities; interested in learning many different things.

Personnel Selection for Optimal Manned Ships

2. In a MODERATE OPTEMPO environment please rank 1-9, in order (1 representing the most important trait and 9 representing the least important trait) traits you would desire Sailors under your supervision to possess on a TRADITIONALLY MANNED ship.

☐	ADAPTABILITY/FLEXIBILITY: willing to change their approach to tasks and projects; likes considerable variety at work; able to work effectively with many different types of people in many different types of situations; adapts readily to changes in their environment.
☐	AGREEABLENESS: tends to be compassionate/cooperative rather than suspicious and antagonistic towards others.
☐	ATTENTION TO DETAIL: exacting, precise, and accurate; spots minor imperfections or errors; is meticulous and thorough in their approach to tasks; dislikes clutter; enjoys developing methods for keeping materials methodically organized.
☐	DEPENDABILITY: reliable, well organized and orderly; uses time efficiently; prioritizes tasks; stays on schedule; not easily distracted or bored by routine tasks.
☐	DUTIFULNESS/INTEGRITY: has a strong sense of duty and moral obligation; tries to do what is right and ethical; accepts authority and follows laws, rules, and regulations; honest and trustworthy.
☐	SELF-RELIANCE: self-sufficient, resourceful, and likely to make decisions; avoids becoming dependent on others to get things done; has a no-nonsense approach to things; realistic and unsentimental.
☐	STRESS TOLERANCE: maintains composure and retains ability to think clearly and takes effective action when confronted with stressful situations; can readily put aside worries and feelings of guilt.
☐	VIGILANCE: able to constantly scan the environment for things that require attention, even when no action may be required for long periods of time (e.g., stays alert to possible safety hazards).
☐	WILLINGNESS TO LEARN: willing to learn new material in a classroom environment or on the job and applies that material in new work situations; learns from mistakes, takes useful advice, and asks questions when unsure about something; actively seeks out learning opportunities; interested in learning many different things.

3. In a HIGH OPTEMPO environment please rank 1-9, in order (1 representing the most important trait and 9 representing the least important trait) traits you would desire Sailors under your supervision to possess on a TRADITIONALLY MANNED ship.

☐	ADAPTABILITY/FLEXIBILITY: willing to change their approach to tasks and projects; likes considerable variety at work; able to work effectively with many different types of people in many different types of situations; adapts readily to changes in their environment.
☐	AGREEABLENESS: tends to be compassionate/cooperative rather than suspicious and antagonistic towards others.
☐	ATTENTION TO DETAIL: exacting, precise, and accurate; spots minor imperfections or errors; is meticulous and thorough in their approach to tasks; dislikes clutter; enjoys developing methods for keeping materials methodically organized.
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☐	VIGILANCE: able to constantly scan the environment for things that require attention, even when no action may be required for long periods of time (e.g., stays alert to possible safety hazards).
☐	WILLINGNESS TO LEARN: willing to learn new material in a classroom environment or on the job and applies that material in new work situations; learns from mistakes, takes useful advice, and asks questions when unsure about something; actively seeks out learning opportunities; interested in learning many different things.

In the following OPTEMPO environments please rank 1-4, in order of importance (1 representing the most important trait and 4 representing the least important) the traits you would desire Sailors under your supervision to possess given the OPTEMPO environment on a TRADITIONALLY MANNED ship.

1. In a LOW OPTEMPO environment please rank 1-4, in order of importance (1 representing the most important trait and 4 representing the least important) the traits you would desire Sailors under your supervision to possess on a TRADITIONALLY MANNED ship.

☐	ABILITY: cognitive capabilities necessary to perform job function.
☐	KNOWLEDGE: organized body of information (i.e., facts, rules, and procedures).
☐	PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.
☐	SKILLS: capability to perform tasks with ease and precision.

Personnel Selection for Optimal Manned Ships

2. In a MODERATE OPTEMPO environment please rank 1-4, in order of importance (1 representing the most important trait and 4 representing the least important) the traits you would desire Sailors under your supervision to possess on a TRADITIONALLY MANNED ship.

☐	ABILITY: cognitive capabilities necessary to perform job function.
☐	KNOWLEDGE: organized body of information (i.e., facts, rules, and procedures).
☐	PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.
☐	SKILLS: capability to perform tasks with ease and precision.

3. In a HIGH OPTEMPO environment please rank 1-4, in order of importance (1 representing the most important trait and 4 representing the least important) the traits you would desire Sailors under your supervision to possess on a TRADITIONALLY MANNED ship.

☐	ABILITY: cognitive capabilities necessary to perform job function.
☐	KNOWLEDGE: organized body of information (i.e., facts, rules, and procedures).
☐	PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.
☐	SKILLS: capability to perform tasks with ease and precision.

DIRECTIONS: The following questions pertain to your experience as a SWO concerning OPTIMALLY MANNED NEXT GENERATION LCS/DDG1000 platforms in regards to individual Sailors' personality traits.

OPTIMALLY MANNED is defined as current manning levels for the size and mission of LCS (55 Sailors) and DDG 1000 (125 Sailors) platforms.

PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.

Examples include: Adaptability/Flexibility, Agreeableness, Attention to Detail, Dependability, Dutifulness/Integrity, Self-Reliance, Stress Tolerance, Vigilance, Willingness to Learn

Knowledge, Skills, and Abilities (KSAs) are attributes necessary to perform tasks in a specified job requirement.

KNOWLEDGE: organized body of information (i.e., facts, rules, and procedures).
SKILLS: capability to perform tasks with ease and precision.
ABILITY: cognitive capabilities necessary to perform job function.

Personnel Selection for Optimal Manned Ships

1. Do you agree with the following statement?
"Ship's crewmember personality traits impact ship performance on an optimally manned vessel."

- ◯ Strongly agree
- ◯ Agree
- ◯ Neutral
- ◯ Disagree
- ◯ Strongly disagree

2. Assume a crew of 75 Sailors is a fully manned surface combat vessel, comparable in size to LCS and FFG platforms, with an expected departmental distribution of personnel. In your opinion, how many Sailors with undesirable personality traits would it take to negatively impact a ship's performance to an extent that would require immediate attention?

Please enter your answer here. [ ]

3. On an optimally manned ship assuming a LOW OPTEMPO (i.e., Low Stress Normal Steaming Ops/training off your home port coast)

What level of importance would you place on your Sailors' personality traits on their level of job performance?

- ◯ Very important
- ◯ Important
- ◯ Moderately Important
- ◯ Not important

4. On a optimally manned ship assuming a MODERATE OPTEMPO (i.e., Moderate Stress Mission Ops on Deployment)

What level of importance would you place on your Sailors' personality traits on their level of job performance?

- ◯ Very important
- ◯ Moderately Important
- ◯ Important
- ◯ Not important

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5. On a optimally manned ship assuming a HIGH OPTEMPO (i.e., Critical High Stress Mission Ops/Damage Control Efforts)

What level of importance would you place on your Sailors' personality traits on their level of job performance?

- ◯ Very important
- ◯ Important
- ◯ Moderately Important
- ◯ Not important

6. When progressing from a LOW OPTEMPO environment to a MODERATE OPTEMPO environment on an optimally manned ship, to what degree, if any, do personality traits importance levels change?

- ◯ Large increase
- ◯ Small increase
- ◯ No change
- ◯ Small decrease
- ◯ Large decrease

7. When progressing from a MODERATE OPTEMPO environment to a HIGH OPTEMPO environment on an optimally manned ship, to what degree, if any, do personality traits importance levels change?

- ◯ Large increase
- ◯ Small increase
- ◯ No change
- ◯ Small decrease
- ◯ Large decrease

Personnel Selection for Optimal Manned Ships

8. When progressing from a LOW OPTEMPO environment to a HIGH OPTEMPO environment on an optimally manned ship, to what degree, if any, do personality traits importance levels change?

- ◯ Large increase
- ◯ Small increase
- ◯ No change
- ◯ Small decrease
- ◯ Large decrease

Sailors are generally trained in their rates and in shipboard requirements in various knowledge, skills, and abilities (KSAs). These KSAs can vary from individual to individual based on experience and specialized training. Please select True of False for the following statements.

1. In a LOW OPTEMPO environment, personality traits are more important than KSAs.

- ◯ True
- ◯ False

2. In a MODERATE OPTEMPO environment, personality traits become increasingly important than in a LOW OPTEMPO environment.

- ◯ True
- ◯ False

3. In a MODERATE OPTEMPO environment, personality traits become more important than KSAs.

- ◯ True
- ◯ False

4. In a HIGH OPTEMPO environment, personality traits become increasingly important than in a MODERATE OPTEMPO environment.

- ◯ True
- ◯ False

5. In a HIGH OPTEMPO environment, personality traits are more important than KSAs.

- ◯ True
- ◯ False

Personnel Selection for Optimal Manned Ships

In the following OPTEMPO environments please rank 1-9 in order (1 representing the most important trait and 9 representing the least important trait) traits you would desire Sailors under your supervision to possess given the OPTEMPO environment on an OPTIMALLY MANNED ship.

1. In a LOW OPTEMPO environment please rank 1-9 in order (1 representing the most important trait and 9 representing the least important trait) traits you would desire Sailors under your supervision to possess on an OPTIMALLY MANNED ship.

☐	ADAPTABILITY/FLEXIBILITY: willing to change their approach to tasks and projects; likes considerable variety at work; able to work effectively with many different types of people in many different types of situations; adapts readily to changes in their environment.
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☐	SELF-RELIANCE: self-sufficient, resourceful, and likely to make decisions; avoids becoming dependent on others to get things done; has a no-nonsense approach to things; realistic and unsentimental.
☐	STRESS TOLERANCE: maintains composure and retains ability to think clearly and takes effective action when confronted with stressful situations; can readily put aside worries and feelings of guilt.
☐	VIGILANCE: able to constantly scan the environment for things that require attention, even when no action may be required for long periods of time (e.g., stays alert to possible safety hazards).
☐	WILLINGNESS TO LEARN: willing to learn new material in a classroom environment or on the job and applies that material in new work situations; learns from mistakes, takes useful advice, and asks questions when unsure about something; actively seeks out learning opportunities; interested in learning many different things.

Personnel Selection for Optimal Manned Ships

2. In a MODERATE OPTEMPO environment please rank 1-9 in order (1 representing the most important trait and 9 representing the least important trait) traits you would desire Sailors under your supervision to possess on an OPTIMALLY MANNED ship.

☐	ADAPTABILITY/FLEXIBILITY: willing to change their approach to tasks and projects; likes considerable variety at work; able to work effectively with many different types of people in many different types of situations; adapts readily to changes in their environment.
☐	AGREEABLENESS: tends to be compassionate/cooperative rather than suspicious and antagonistic towards others.
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Personnel Selection for Optimal Manned Ships

3. In a HIGH OPTEMPO environment please rank 1-9 in order (1 representing the most important trait and 9 representing the least important trait) traits you would desire Sailors under your supervision to possess on an OPTIMALLY MANNED ship.

☐	ADAPTABILITY/FLEXIBILITY: willing to change their approach to tasks and projects; likes considerable variety at work; able to work effectively with many different types of people in many different types of situations; adapts readily to changes in their environment.
☐	AGREEABLENESS: tends to be compassionate/cooperative rather than suspicious and antagonistic towards others.
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☐	WILLINGNESS TO LEARN: willing to learn new material in a classroom environment or on the job and applies that material in new work situations; learns from mistakes, takes useful advice, and asks questions when unsure about something; actively seeks out learning opportunities; interested in learning many different things.

In the following OPTEMPO environments please rank 1-4, in order of importance (1 representing the most important trait and 4 representing the least important) the traits you would desire Sailors under your supervision to possess given the OPTEMPO environment on an OPTIMALLY MANNED ship.

1. In a LOW OPTEMPO environment please rank 1-4, in order of importance (1 representing the most important trait and 4 representing the least important) the traits you would desire Sailors under your supervision to possess on an OPTIMALLY MANNED ship.

☐	ABILITY: cognitive capabilities necessary to perform job function.
☐	KNOWLEDGE: organized body of information (i.e., facts, rules, and procedures).
☐	PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.
☐	SKILLS: capability to perform tasks with ease and precision.

Personnel Selection for Optimal Manned Ships

2. In a MODERATE OPTEMPO environment please rank 1-4, in order of importance (1 representing the most important trait and 4 representing the least important) the traits you would desire Sailors under your supervision to possess on an OPTIMALLY MANNED ship.

☐	ABILITY: cognitive capabilities necessary to perform job function.
☐	KNOWLEDGE: organized body of information (i.e., facts, rules, and procedures).
☐	PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.
☐	SKILLS: capability to perform tasks with ease and precision.

3. In a HIGH OPTEMPO environment please rank 1-4, in order of importance (1 representing the most important trait and 4 representing the least important) the traits you would desire Sailors under your supervision to possess on an OPTIMALLY MANNED ship.

☐	ABILITY: cognitive capabilities necessary to perform job function.
☐	KNOWLEDGE: organized body of information (i.e., facts, rules, and procedures).
☐	PERSONALITY TRAIT: the sum total of the physical, mental, emotional, and social characteristics of an individual. The organized pattern of behavioral characteristics of the individual. The essential character of a person.
☐	SKILLS: capability to perform tasks with ease and precision.

1. In your opinion, what level of attention do you believe should be placed on the assessment of individual personality traits in the detailing process for traditionally manned platforms (FFG, DDG, and CG)?

- ◯ Highest priority
- ◯ Moderate priority
- ◯ Uncertain
- ◯ Low priority
- ◯ No priority

2. In your opinion, should the Navy include the assessment of personality traits in the detailing process for traditionally manned platforms (FFG, DDG, and CG)?

- ◯ Yes
- ◯ No
- ◯ Uncertain

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Personnel Selection for Optimal Manned Ships

3. In your opinion, what level of attention do you believe should be placed on the assessment of individual personality traits in the detailing process for optimally manned platforms (LCS and DDG 1000)?

- ◯ Highest priority
- ◯ Moderate priority
- ◯ Uncertain
- ◯ Low priority
- ◯ No priority

4. In your opinion, are individual personality traits considered more important on optimally manned platforms (LCS and DDG 1000) compared to traditionally manned platforms (FFG, DDG, and CG)?

- ◯ Yes
- ◯ No
- ◯ Uncertain

5. Based on your previous answer, how much more important do you consider personality traits to be on optimally manned platforms (LCS and DDG 1000) compared to traditionally manned platforms (FFG, DDG, and CG)?

- ◯ Critical increase of importance
- ◯ Moderate increase of importance
- ◯ Small increase of importance
- ◯ No change of importance
- ◯ Uncertain

Thank you for your participation in the Personnel Selection for Optimal Manned Ships Survey. Your input will provide a valuable resource for the future of personnel selection criteria.

APPENDIX C. WILCOXON SIGNED RANKS TEST VARIABLE COMPARISON BY SHIP TYPE ACROSS OPTEMPO

Ship Type	OPTEMPO	Variable Comparison	N	T^+	$z=F(T^+,N)$	p
Traditionally Manned	Low	Knowledge vs. Skill	84	1867.5	0.368	p=0.715*
		Knowledge vs. Ability	84	2713.5	4.14	p<0.001*
		Knowledge vs. Personality Traits	84	1970	0.83	p=0.408*
		Skill vs. Ability	84	2603	3.65	p<0.001*
		Skill vs. Personality Traits	84	1820	0.156	p=0.886*
		Ability vs. Personality Traits	84	1023	-3.40	p<0.001*
	Moderate	Knowledge vs. Skill	84	1977.5	0.859	p=0.196*
		Knowledge vs. Ability	84	2614	3.70	p<0.001*
		Knowledge vs. Personality Traits	84	1856.5	0.319	p=0.376*
		Skill vs. Ability	84	2415	2.81	p=0.003*
		Skill vs. Personality Traits	84	1628	-0.700	p=0.242*
		Ability vs. Personality Traits	84	951	-3.72	p<0.001*
	High	Knowledge vs. Skill	84	2527.5	3.31	p<0.001*
		Knowledge vs. Ability	84	2847.5	4.74	p<0.001*
		Knowledge vs. Personality Traits	84	2393.5	2.71	p=0.007*
		Skill vs. Ability	84	2076.5	1.30	p=0.194*
		Skill vs. Personality Traits	84	1613.5	-0.765	p=0.447*
		Ability vs. Personality Traits	84	1317.5	-2.08	p=0.0376*
OMP	Low	Knowledge vs. Skill	84	1427.5	-1.59	p=0.111*
		Knowledge vs. Ability	84	2382.5	2.66	p=0.008*
		Knowledge vs. Personality Traits	84	1418	-1.64	p=0.102*
		Skill vs. Ability	84	2626	3.75	p<0.001*
		Skill vs. Personality Traits	84	1659.5	-0.560	p=0.575*
		Ability vs. Personality Traits	84	826.5	-4.27	p<0.001*
	Moderate	Knowledge vs. Skill	84	1841.5	0.252	p=0.401*
		Knowledge vs. Ability	84	2570	3.5	p<0.001*
		Knowledge vs. Personality Traits	84	1730.5	-0.243	p=0.810*
		Skill vs. Ability	84	2452.5	2.98	p<0.001*
		Skill vs. Personality Traits	84	1610	-0.780	p=0.435*
		Ability vs. Personality Traits	84	955	-3.70	p<0.001*
	High	Knowledge vs. Skill	84	2343	2.49	p=0.013*
		Knowledge vs. Ability	84	2764	4.37	p<0.001*
		Knowledge vs. Personality Traits	84	2007.5	0.992	p=0.322*
		Skill vs. Ability	84	2217	1.93	p=0.0536*
		Skill vs. Personality Traits	84	1432.5	-1.57	p=0.116*
		Ability vs. Personality Traits	84	1033.5	-3.35	p<0.001*

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APPENDIX D. CONSENT TO PARTICIPATE IN RESEARCH HANDOUT

Naval Postgraduate School
Consent to Participate in Research

Introduction. You are invited to participate in a research study entitled:

Assessment of Personnel Selection Requirements That Surpass Traditional Knowledge, Skills, and Abilities for Next Generation Ship Optimal Manning Program

The purpose of the research is to provide insight to the necessity of testing for desirable characteristics and personality traits in personnel selection process of optimally manned surface vessels.

Procedures.
1. Please arrive at the designated time and place on time.
2. Review the "Consent to Participate in Research" document provided and ensure it is completed. Additional copies will be available if you did not bring yours with you.
3. Hand in the "Consent to Participate in Research" the Research Student, LT Paul O'Daniel.
4. A brief overview of the subject matter will be provided to you and time will be allowed for any questions prior to the start of the Focus Group session.
5. The Facilitator, LT Paul O'Daniel, will provide an introductory question to stimulate conversation and SME opinions on the subject matter. The Facilitator will only intervene to maintain the topic on subject and provide further areas of conversation for continued participant input.
6. Audio recording of the Focus Group will be gathered for future reference.
7. Participants are asked to provide professional SME input based on their experience.
8. Professional courtesy will be expected at all times and all material shared in the Focus Group is expected to be maintained in a confidential manner.
9. The Focus Group Session will last 1 hour from the introductory question introduced by the Facilitator.
10. Again, please do not share any information about the study outside of the Focus Group session.

Location. The Focus Group session will take place in the HSI Lab (GL-221) at a coordinated time and date meeting yours and the other participants' scheduling needs.

Cost. There is no cost to participate in this research study.

Voluntary Nature of the Study. Your participation in this study is strictly voluntary. If you choose to participate you can change your mind at any time and withdraw from the study. You will not be penalized in any way or lose any benefits to which you would otherwise be entitled if you choose not to participate in this study or to withdraw. The alternative to participating in the research is to not participate in the research.

Potential Risks and Discomforts. The potential risks of participating in this study are:
Breach of confidentiality: The possibility exists that Focus Group participants may converse with others concerning the details of the meeting. However, every effort will be made to emphasize that confidentiality be maintained at the beginning and the conclusion of the Focus Group meeting. Within the Consent to Participate document, specific instruction will be given stating that all information shared in the Focus Group is to be maintained confidential and not discussed outside of the Focus Group. This will help facilitate participant comfort in the freedom to contribute to the Focus Group without fear of reprisal.

Anticipated Benefits. Anticipated benefits from this study will provide insight into the utility of considering personality traits in the staffing of OMP U.S. Navy combat vessels. The physical design requirements of next generation ships result in a socio-technical organizational design structure that necessitates incorporating beneficial personality traits. Therefore, the inclusion of identifying these traits in the personnel staffing process is likely to be critical in the safe, effective, and efficient operation of these vessels.
You will not directly benefit from your participation in this research.

Compensation for Participation. No tangible compensation will be given.

Confidentiality & Privacy Act. Any information that is obtained during this study will be kept confidential to the full extent permitted by law. All efforts, within reason, will be made to keep your personal information in your research record confidential but total confidentiality cannot be guaranteed. Personal identifying information, particularly if it contains SSNs, can be highly sensitive. No PII of this type will be collected in the Focus Group. The Focus Group data itself will consist of individual responses to questions about the opinions of SWO SMEs of personnel selection criteria for optimal manned U.S. Navy combat vessels. These are quite innocuous subjects that pose minimal to no risk to Focus Group respondents. Electronic data including survey data and Focus Group audio files will be maintained on the NPS server. All other data will be maintained in a secured cabinet. Audio files will be permanently deleted after pertinent information is transcribed. The Thesis Advisor: CAPT John K. Schmidt, Second Reader: Senior Lecturer Kip Smith and Thesis Author: LT Paul O'Daniel bear sole and complete responsibility for safeguarding the data and will be the only ones with access to the complete data set. They will ensure that all provisions of data safeguarding, as well as any other requirements levied by the NPS Institutional Review Board, are fully and completely implemented.

If you consent to be identified by name in this study, any reference to or quote by you will be published in the final research finding only after your review and approval. If you do not agree, then you will be identified broadly by discipline and/or rank, (for example, "fire chief").

☐ I consent to be identified by name in this research study.

☐ I do not consent to be identified by name in this research study.

Points of Contact. If you have any questions or comments about the research, or you experience an injury or have questions about any discomforts that you experience while taking part in this study please contact the Principal Investigator, *CAPT John K. Schmidt, ,jkschmid@nps.edu.* Questions about your rights as a research subject or any other concerns may be addressed to the Navy Postgraduate School IRB Chair, Dr. Maiah Jaskoski majaskos@nps.edu (831)656-3167.
Statement of Consent. I have read the information provided above. I have been given the opportunity to ask questions and all the questions have been answered to my satisfaction. I have been provided a copy of this form for my records and I agree to participate in this study. I understand that by agreeing to participate in this research and signing this form, I do not waive any of my legal rights.

_____ _____
Participant's Signature Date

_____ _____
Researcher's Signature Date

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