HULL, MECHANICAL, AND ELECTRICAL EQUIPMENT STANDARDIZATION IN THE U.S. NAVY SURFACE FORCE: A CASE OF COMPETING OBJECTIVES AND STAKEHOLDER TRADE-OFF DECISIONS

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

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by

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The lack of a successful Standardization Program for Hull, Mechanical, and Electrical (HM&E) equipment and components of ships in the surface force costs the United States Navy hundreds of millions of dollars annually. Approximately half of the total parts in the surface fleet are installed on three or fewer ships and nearly 20 percent are one of a kind. These parts are not officially considered to be "non-standard" since they have been approved by the Navy and entered into the National Stock Number system. However, variations in equipment brands, models, as well as technical and physical characteristics result in significant issues for the Navy each year.

The root cause of this real lack of equipment standardization is the existence of competing objectives and priorities on the part of stakeholders in the equipment selection process. These competing objectives lead to stakeholder trade-off decisions that effectively reduce equipment standardization throughout the Navy Surface Force. This is a result of decisions that are made in the best interest of the stakeholder instead of for the good of HM&E equipment standardization and moreover for the greater good of fleet operational readiness.

This research presents an analysis of the people, organizations, and activities that influence HM&E equipment standardization to determine the extent of their impact and the reasons for their equipment selection decisions. The analysis reveals that competing objectives exist at the National Strategic Level, at the DoD Strategic Level, and at both the Operational and Tactical Levels in the Navy. Finally, potential options are identified that the Navy could pursue to minimize the impact of competing objectives and stakeholder trade-off decisions on the HM&E equipment standardization process. With the explosion of new technology and the increased availability of high-performance systems and components, it is important for the Navy to begin a serious transformation of the overall HM&E Standardization program.

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ABSTRACT

HULL, MECHANICAL, AND ELECTRICAL EQUIPMENT STANDARDIZATION IN THE U.S. NAVY SURFACE FORCE: A CASE OF COMPETING OBJECTIVES AND STAKEHOLDER TRADE-OFF DECISIONS, by LCDR Jerome R. White, 155 pages.

The lack of a successful Standardization Program for Hull, Mechanical, and Electrical (HM&E) equipment and components of ships in the surface force costs the United States Navy hundreds of millions of dollars annually. Approximately half of the total parts in the surface fleet are installed on three or fewer ships and nearly 20 percent are one of a kind. These parts are not officially considered to be “non-standard” since they have been approved by the Navy and entered into the National Stock Number system. However, variations in equipment brands, models, as well as technical and physical characteristics result in significant issues for the Navy each year.

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This research presents an analysis of the people, organizations, and activities that influence HM&E equipment standardization to determine the extent of their impact and the reasons for their equipment selection decisions. The analysis reveals that competing objectives exist at the National Strategic Level, at the DoD Strategic Level, and at both the Operational and Tactical Levels in the Navy. Finally, potential options are identified that the Navy could pursue to minimize the impact of competing objectives and stakeholder trade-off decisions on the HM&E equipment standardization process. With the explosion of new technology and the increased availability of high-performance systems and components, it is important for the Navy to begin a serious transformation of the overall HM&E Standardization program.

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ACRONYMS

APL	Allowance Parts Lists
CASREPS	Casualty Reports
CFFC	Commander Fleet Forces Command
CICA	Competition in Contracting Acquisition
CNO	Chief of Naval Operations
COTS	Commercial-Off-the-Shelf
DASN A&LM	Deputy Assistant Secretary of the Navy for Acquisition and Logistics Management
DepSo	Departmental Standardization Officers
DoD	Department of Defense
DSP	Defense Standardization Program
DSPO	Defense Standardization Program Office
ESC	Executive Steering Committee
FFC	Fleet Forces Command
FY	Fiscal Year
GAO	Government Accounting Office
HEDRS	Hull, Mechanical, and Electrical Equipment Data Research System
HM&E	Hull, Mechanical, and Electrical
ILS	Integrated Logistics Support
LCDR	Lieutenant Commander
LMI	Logistics Management Institute
NAVICP	Naval Inventory Control Point
NAVSEA	Naval Sea Systems Command

NAVSUP	Naval Supply Systems Command
NDI	Non-Developmental Items
NSN	National Stock Number
PBL	Performance-Based Logistics
PEO	Program Executive Office
PM	Program Managers
SECDEF	Secretary of Defense
SECNAV	Secretary of the Navy
SWE	Surface Warfare Enterprise
TMA	Top Management Attention
TMI	Top Management Interest
US	United States

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CHAPTER 1

INTRODUCTION

> It is well known that when you do anything, unless you understand its actual circumstances, its nature and its relations to other things, you will not know the laws governing it, or how to do it, or be able to do it well.[1]
>
> Mao Tse-Tung

The lack of Hull, Mechanical, and Electrical (HM&E) equipment standardization poses significant problems for the United States (US) Navy. A 2000 case study[2] and 2004 independent study[3] provide alarming statistics that show the significant negative impact the lack of standardization has on naval operations. These studies show how non-standard equipment result in fiscal and shipboard mission readiness issues.

The 2000 HM&E Equipment Standardization Case Study concluded that the Navy can realize avoidable cost (see Definitions Section below) savings of $348 million annually by reducing (standardizing) the number of HM&E equipment introduced into the Navy's inventory each year. The case study used the statistical results of a Fiscal Year (FY) 1988 HM&E equipment study and FY 2000 statistical findings to support this assertion. First, the case study noted that the Navy maintained more than 180,000 different types of HM&E equipment for its 1988 fleet of nearly 500 ships. Roughly 50 percent (90,000) of these items were on three or fewer ships and had a total inventory of seven or fewer installations. Nearly 20 percent (36,000) were one of a kind. Next, the case study stated that in 1988 the Navy witnessed the introduction of nearly 8,700 new pieces of HM&E equipment into the fleet annually. The 8,700 new pieces of equipment resulted in 28,000 new National Stock Numbers (NSNs) for the new equipment and the

associated component parts. In FY 2000, the Navy witnessed the introduction of nearly 2,000 new HM&E items to its inventory. The estimated Integrated Logistics Support (ILS) cost for introducing a new piece of equipment into the Navy's inventory was $173,851 (FY 2000 data). Therefore, if the Navy introduced 2,000 fewer items annually, there could be a cost avoidance of an estimated $348 million each year. Based on data contained in the case study, there was a significant decrease in the number of items introduced in 1988 versus 2000. There were 8,700 items introduced in FY 1988 and 2,000 items introduced in FY 2000. The case study did not provide specific information explaining the significant decrease. However, an assumption is that the difference resulted from a reduction in the number of active ships (nearly 500 in 1988 and fewer than 280 in 2000), classes of ships, and new construction and repair activity. Further, the time in which the individuals conducting the research collected the data could be a factor. However, 2007 data shows a higher equipment introduction rate of 1,095 items per year based on the average number of items introduced from 2002 to 2006 (see figure 1).

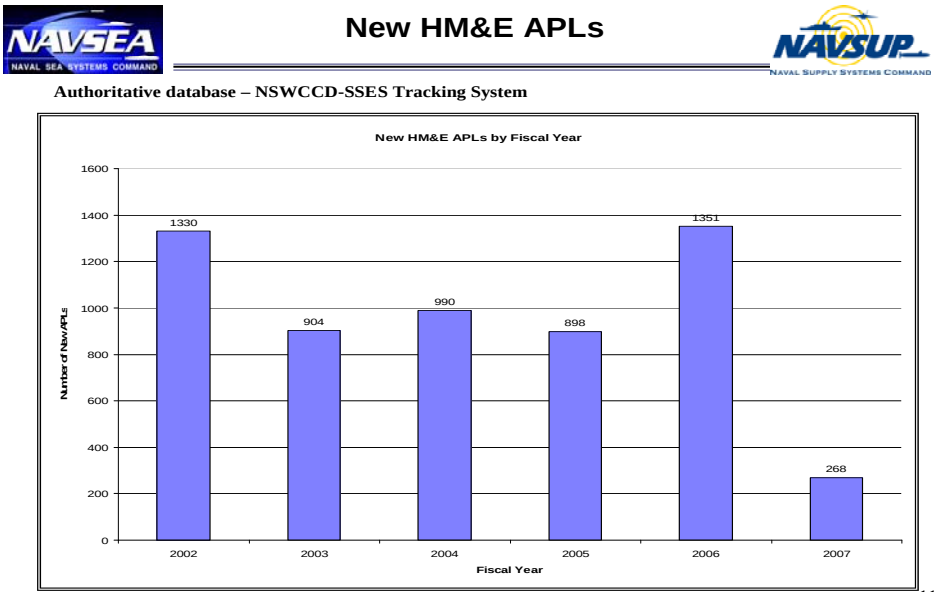

Figure 1. Hull, Mechanical, and Electrical Equipment Introduction Per Year
Source: Naval Sea System Command/Naval Supply Systems Command, Best Value Standardization Process Team, Brief to the HM&E Equipment Standardization Executive Steering Committee (ESC), January 2007.

The 2004 independent study concluded similar results as the 2000 study. But, there was an additional finding that addressed operational issues associated with poor HM&E equipment standardization. First, this study asserted that the Navy could save $166 million annually through standardization. The statistics used to support this assertion included more recent data than the 1988 study mentioned above. The study noted that the Navy maintained a total population of 145,000 different HM&E equipment to support its fleet of fewer than 280 ships. Greater than 50 percent (72,500) of these items were on three or fewer ships with a total of five or fewer installs. Nearly 20 percent (29,000) were one of a kind. The introduction rate of new HM&E equipment averaged 4,244 annually. The average ILS cost was $196,091.[4] Therefore, if the Navy could reduce the average number of new equipment introduced annually by 850 (roughly 20

percent), it would realize a cost avoidance of roughly $166 million annually. Additionally, this study reported that the Navy could realize increased operational readiness through standardization. The Navy witnessed 2.97 equipment Casualty Reports (CASREPS) per 100 installations when there was only one unique install of a piece of equipment in the fleet. A CASREP is an official naval message that provides details about the degradation of a ships mission readiness due to an equipment failure or system degradation. On the other hand, the rate was .13 CASREPS per 100 installations when there were greater than 100 installations of the same piece of equipment in the fleet. The assertion here is that if the Navy could increase the population of equipment in the fleet, it could decrease instances of mission degraded ships. This study concludes that a lack of standardization contributes to avoidable costs and decreased readiness.

Both studies show how non-standard equipment results in fiscal and or shipboard mission readiness issues. The 2000 and 2004 studies showed how the Navy could have realized cost avoidances of $348 million and $166 million respectively, if it could have reduced the annual introduction of equipment into the Navy's fleet by 2,000 items. The quantity of 2,000 items was selected to remain consistent with the 2000 case study data. Additionally, the 2004 study showed how the Navy could have realized increased mission readiness results if there were greater populations of equipment in the fleet. Each study indicates the significance of achieving HM&E equipment standardization.

Introduction

The primary research question for this thesis is: How can the Navy minimize the impact of competing objectives and stakeholder trade-off decisions to obtain an optimal HM&E standardization system representing the bets-fit solution for its surface force?

It is necessary for the reader to understand the relevance and significance of the research to be conducted for this thesis. Therefore, this chapter serves as the stage-setter. It frames the problem this research will address in a manner that allows the reader to understand why this research is important.

To frame the problem for the reader, this chapter links the capabilities of the HM&E Equipment Standardization Program to the requirements of the Navy's current transformation initiative to show the significance of achieving standardization goals and objectives. The chapter includes information about the Navy's operational environment, transformation initiative with associated challenges, and HM&E Equipment Standardization Program. The transformation initiative is a strategic objective and end-state. Its aim is achieving worldwide maritime superiority while pursuing national interests in an operational environment shaped by the characteristics of terrorism. It requires an increase in operational efficiencies (improved readiness and reduced costs). The HM&E Standardization Program is a tool or enabler to improve readiness and reduce costs. The HM&E Standardization Program is a viable means for achieving the operational efficiencies required to support transformation goals and objectives. Achieving a higher degree of standardization will significantly increases the likelihood of achieving transformation successes.

Properly identifying and understanding the root cause of a problem is critical to crafting the right solution to solve the right problem. To achieve standardization success, one must understand the root cause of the standardization problem. The thesis statement for this research is that the root causes of the standardization problem are competing objectives and stake-holder centric trade-off decisions. Therefore, the purpose of this

research is to understand the impact of competing objectives and stakeholder trade-off decisions on the standardization process and then to assess potential ways to minimize the impacts identified.

Background

The Navy's Operational Environment and Transformation Initiative

> Our security will require transforming the military . . . a military that must be able to strike at a moment's notice in any dark corner of the world.[5]

Since the end of the Cold War, the US military's operational environment changed. It evolved from a predictable Cold War environment to an unpredictable Global War on Terrorism environment. With this change, Secretary of Defense (SECDEF), Donald Rumsfeld, identified the need to transform the military and directed Defense agencies to change to meet the requirements of the new operational environment. As a part of the Navy's strategy to meet the SECDEF's directive, the Secretary of the Navy (SECNAV), The Honorable Gordon R. England; Chief of Naval Operations (CNO), Admiral Vern Clark; and Commandant of the Marine Corps, General Michael W. Hagee, outlined the Navy's transformation plan in the *Naval Transformation Roadmap 2003 Assured Access and Power Projection*.[6] The transformation plan addresses capabilities, requirements, and objectives to meet the changes directed by SECDEF Rumsfeld and demanded by the new operational environment.

The transformation plan addresses novel concepts underscored by common capability requirements. Concepts discussed in The Navy's Transformation Roadmap include the concepts of Sea Shield (naval defensive capabilities), Sea Strike (naval offensive capabilities), Sea Basing (uninhibited--self sustaining maneuver capabilities)

and Force Net (information management and dominance capabilities). These novel concepts depict capabilities which enable deploying and sustaining forces anywhere in the world to achieve maritime superiority in support of national interests. Underscoring these capabilities are the requirements for speed of response, flexibility, sustained operations, minimized limitations, operational freedom of action, decision superiority, surge capacity, operational availability, self-sufficiency, scalability, and "tailorability." The concepts are underscored by common capability requirements. The capability requirements are underscored by transformation objectives.

There are transformation objectives that support the capability requirements necessary to obtain the concepts outlined in the Transformation Roadmap. One objective is constantly challenging old thinking and introducing new concepts. Another is changing the way the Navy trains, educates, and employs its people. Additionally, there is the objective of reassessing the way the Navy organizes and equips war fighting formations. Achieving these objectives is necessary for the Navy to obtain the capabilities it requires to meet the challenges of the operational environment.

The Navy's leadership introduced these concepts, capabilities, requirements, and objectives to guide the efforts of the Navy-Marine Corps Team throughout the transformation process. The ultimate goal is to develop a Navy and Marine Corps team that will evolve from a Cold War operations posture of predictable six-month deployments in predetermined regions of the world (the Global Naval Forward Presence Concept) to a posture of less predictable deployments of varying durations supporting specific national priorities(the Flexible Deployment Concept). The capabilities necessary to achieve the goal are linked to the requirements. The requirements are linked to the

objectives. The objectives represent challenges. Overcoming the challenges is the first step in obtaining the capabilities required. Therefore, the transformation process comes with significant challenges, some which are related to the HM&E equipment standardization initiative.

The Transformation Initiative and Its Associated Challenges

> The transformation of America's naval forces is a continuous process, one that includes changes in the way we train, educate and employ our people; the way we organize and equip our war fighting formations; and the processes by which we distinguish and develop the naval capabilities that will be needed by future joint forces.[7]

The Navy's transformation initiative involves changing the Navy to meet current and projected operational environment requirements outlined in the *2001 Quadrennial Defense Review (QDR) Report*. As stated in the *Naval Transformation Roadmap 2003*, the desired end-state for the transformation process is as follows: "The sea base of the future will be an inherently maneuverable, scalable aggregation of distributed, networked platforms that enable the global power projection of offensive and defensive forces from the sea and includes the ability to assemble, equip, project, support, and sustain those forces without reliance on land bases within the Joint Operations Area."[8] To support the changes required to meet the demands of a new operational environment, the Navy introduced the Fleet Response Plan. The Fleet Response Plan enhances and expands readiness. It enables surge capabilities that increase the manner in which the Navy can augment deployed forces as contingencies dictate. The aim of Fleet Response Plan is the ability to consistently sustain a "six plus two carrier strike force where six carrier strike groups are available to deploy within thirty days of notification and two additional available within approximately ninety days of an emergency order."[9] The plan

necessitates swift deployment and employment capabilities; refined maintenance and modernization processes; and integrative, flexible, and mobile units. It emphasizes readiness and speed of response. It assumes a deployment mind-set of quickly making a ship available to deploy.

To transform to the Navy of the future, the leadership must overcome the challenges. These challenges include altering long-standing behaviors, techniques, tactics, processes, and procedures. Transforming the Navy comes with the associated challenges of organizational change: changing the institutionalized manner in which the Department of the Navy conducts business, time and budget constraints, resistance to change, and other like challenges. According to The Transformation Roadmap, the Navy's approach includes "transforming the methods by which we organize and train, deploy, and employ naval forces to enhance our ability to rapidly transition across the continuum from peacetime deterrence operations to major combat operations."[10] Applying the stated approach to invoke change will help the Navy overcome the challenges associated with transformation. As a result, the Navy will be able to achieve its desired end-state while meeting current and near-term demands.

Hull, Mechanical, and Electrical Equipment Standardization and the Navy's Transformation Initiative

There are various initiatives that can contribute to the Navy's transformation goals and objectives. One such initiative is the HM&E Equipment Standardization Program undertaken by the Defense Standardization Program (DSP) Office. The HM&E Standardization Program seeks to "conserve money, manpower, and time, while improving the operational readiness and availability of the fleet" by increasing the

standardization of HM&E equipment across Navy ships. According to DSP, "HM&E program efforts are primarily led and executed by the Naval Sea Logistics Center Mechanicsburg, PA, with support and involvement of the Naval Supply Systems Command (NAVSUP), the NAVSUP HM&E Equipment Standardization Steering Committee, and the Naval Sea Systems Command (NAVSEA)."[11] Currently, there is a joint NAVSEA-NAVSUP Executive Steering Committee and a Surface Warfare Enterprise, Best Value Standardization Process Team engaged in the standardization initiative. These two teams seek to "identify standardization opportunities, craft procurement strategies and identify strategic procurement vehicles while supporting DoD [Department of Defense] and DoN [Department of the Navy] standardization objectives"[12] The overall standardization program and initiatives undertaken by the individual teams and committees have significant potential benefits with respect to time, cost, and readiness along various lines of operations (engineering, procurement, quality control, inventory, production, and maintenance.

Matthew P. Tedesco, author of a research thesis about naval component and equipment standardization,[13] identified the benefits attributable to standardization (see Appendix A). Comparing the desired transformation end-state sought through employment of the concepts and capabilities described above (Sea Shield, Sea Strike, and Sea Basing and Force Net) with the list of potential benefits, one can see a high correlation between achieving naval transformation objectives and achieving HM&E equipment standardization objectives. Increased efficiencies in time, readiness, or cost result from achieving the benefits Tedesco listed. Therefore, the fundamental transformation concepts (such as surge, operational readiness, and speed of response)

directly correlate to one or more of benefits listed. For example, time efficiencies achieved from developing and introducing new products to market (the fleet) faster through the use of streamlined engineering practices and methods result from realizing the engineering benefits listed. Potential reductions in material and overhead costs as well as reductions in procurement and material delivery time result from achieving the procurement benefits listed. Reduced material and overhead costs, as well as time savings with respect to material availability and inventory management, result from realizing the inventory benefits. Lastly, increased operational readiness realized by time efficiencies derived from having less time between equipment failures correlates to achieving the maintenance benefits Tedesco listed. Less time between equipment failures can result in a more efficient use of manpower and time that would otherwise be spent obtaining and or expediting repair material, repairing and or replacing broken equipment, or obtaining training to conduct material repair. Ultimately, less maintenance and material requirements can result in less shipboard reliance on shore based facilities. The goals and objectives of the Navy's transformation initiative align with the potential resultant benefits of HM&E equipment standardization. The HM&E equipment standardization program is significant for developing the Navy of the future.

Hull, Mechanical, and Electrical Equipment Standardization Background

In 1988 when the Navy had nearly 500 ships in its inventory, the Navy conducted a study of HM&E equipment. The 2000 Defense Standardization Program Case Study[14] reported the results. The results contained four major statistical findings concerning the

HM&E equipment inventory and the proliferation of HM&E equipment Allowance Parts Lists (APL).

First, there were more than 180,000 different types of HM&E equipment, each supported by individual parts lists, technical manuals, preventive maintenance documents, and training equipment. Next, the inventory of HM&E equipment included a large percentage of sparsely-populated and unique items. Roughly 50 percent of all HM&E equipments installed on ships across the entire fleet were on three or fewer ships and had a total inventory of seven or fewer installations. Nearly 20 percent were one of a kind, unique-occurrence items installed for a single fleet application. This 20 percent of equipment cost the fleet an estimated $5 billion in ILS costs. Additionally, if the Navy could reduce the number of new APLs and NSNs introduced annually, it could realize significant cost-avoidances. The Navy generated nearly 8,700 new HM&E APLs each year resulting in an annual assignment of more than 28,000 new NSNs. The Navy estimates the ILS cost for introducing a new piece of equipment into the Navy's inventory is $173,851 (FY 2000 data). Therefore, if the Navy introduced 2,000 fewer items annually, there could be a cost avoidance of an estimated $348 million each year.

The final finding was that two activities, ship construction and conversion and scheduled depot maintenance, were responsible for the preponderance of new HM&E APLs and NSNs introduced into the Navy's inventory annually. Together they both were responsible for nearly 90 percent of all new APLs and NSNs introduced annually. However, ship construction and conversion alone accounted for 66 percent. These are significant findings that help to explain the current state of HM&E equipment and the associated implications. The findings help to explain why, for example, the Navy

manages multiple unique pumps when a single pump could meet the requirements for several ships. As a result of managing a high and continuously growing inventory of non-standard, low population pieces of equipment, the Navy experiences increased inventory management complexity, significant support problems, increased life-cycle costs, and reduced operational flexibility and availability to the fleet.

In 2004, the Navy had fewer than 300 ships in its inventory. The Naval Sea Logistics Command and Naval Inventory Control Point (NAVICP) Mechanicsburg, Pennsylvania, conducted joint research as part of a HM&E Standardization Executive Steering Committee (ESC) initiative. The results of the research included findings similar to the 1988 study discussed above.

But, there were unique findings concerning issues related to HM&E equipment standardization. The research results included updated 1988 research statistics (see figure 2). The total population of HM&E equipment in the fleet included a little more than 145,000 different types of equipment supported by individual parts lists, technical manuals, preventive maintenance documents, and training equipment. Greater than 50 percent of all HM&E equipment installed on ships across the entire fleet was on three or fewer ships with a total inventory of five or fewer installs. The introduction of new HM&E equipment averaged 4,244 annually. The average was based on the average number of new equipment installations from 1998 to 2002. The average ILS cost was $196,091.[15] The ILS cost average was based on the average of ILS costs for HM&E equipment from 1998 to 2002. If the Navy could reduce the average number of new equipment introduced annually by 850 (roughly 20 percent) it would realize a cost avoidance of roughly $166 million annually.

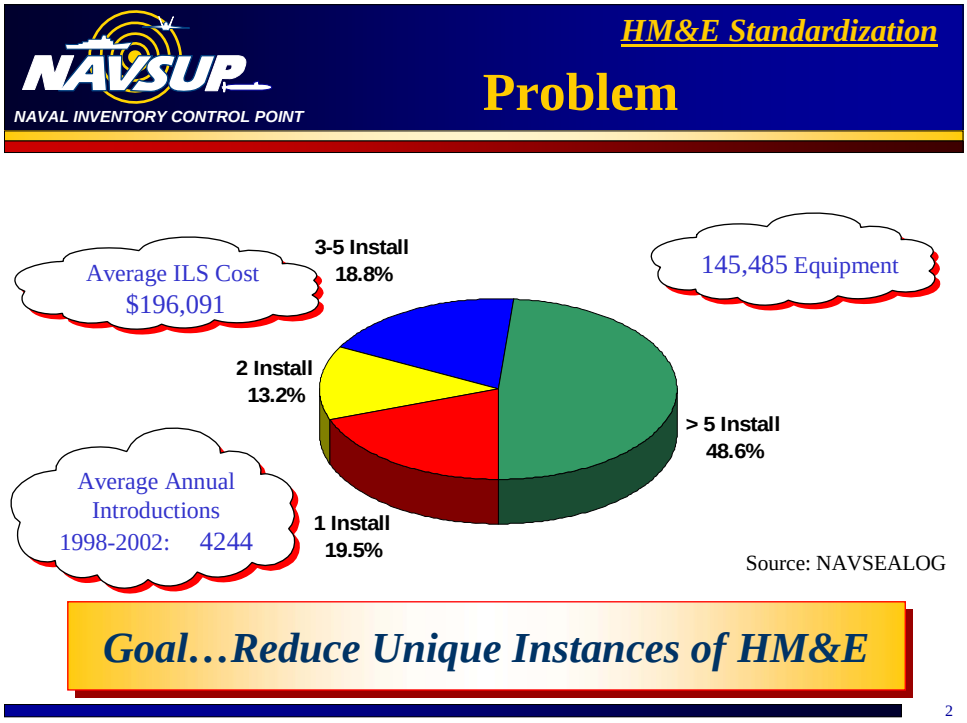

Figure 2. Hull, Mechanical, and Electrical Standardization Problem
Source: Naval Supply System Command, Naval Inventory Control Point, Brief to Deputy Assistant Secretary of the Navy for Logistics, Mechanicsburg, PA, February 2005.

Then there were two unique findings in this study that were not in the 1988 study. These findings entailed conclusions from a general analysis of the substitutability of equipment that was a part of the Navy's current inventory and statistics concerning the impact of the population of equipment in the fleet on the number of reported instances of equipment CASREPS. The CASREPS are detailed documentation of an equipment failure or system degradation resulting in the reduction of a ship's mission readiness.

The first unique finding was that a single model of a pump, motor, or valve could potentially replace multiple unique pumps, motors, and valves. Individuals conducting the research used technical data to group and compare equipment. They could not make a

final assessment of the substitutability of the equipment. Detailed engineering analysis was required.

The next unique finding was that there was a high correlation between the number of CASREPS and the population of equipment in the fleet. A higher equipment population yielded a lower CASREPS count and vice versa. The Navy witnessed 2.97 CASREPS per 100 installations when there was only one unique install of a piece of equipment in the fleet as compared to a rate of .13 CASREPS per 100 installations when there were greater than 100 installations of the same piece of equipment in the fleet (see figure 3).

Like the study of 1988, the findings in this study also help to explain the current state of HM&E equipment and the associated implications. The implications are the same. As a result of managing a high and continuously growing inventory of nonstandard, low-population pieces of equipment, the Navy experiences increased inventory management complexity, significant support problems, increased life-cycle costs, and reduced operational flexibility and availability to the fleet.

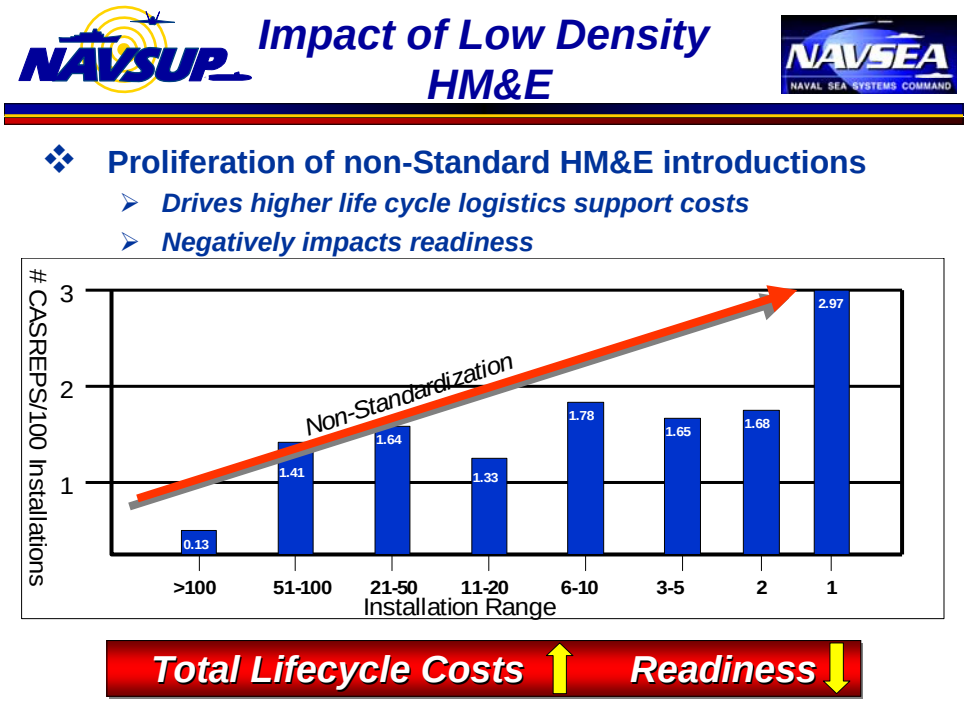

Figure 3. Impact of Low Density Hull, Mechanical, and Electrical
Source: HM&E Commodity Council Working Group, Brief to the HM&E Equipment Standardization Executive Steering Committee (ESC), July 2005

So what does this mean to the Navy? The data introduced above illustrates the problem from a quantitative (fiscal) and qualitative (operational efficiency) perspective and provides insight into reasons for the HM&E standardization problem. But, the reasons provided in the study only partially represent the causes for the HM&E equipment standardization problem. There are "reasons for the reasons." The Navy, as a component of the Department of Defense (DoD), has significant fiduciary responsibility given the fact that it shares and expends the largest allocation of federal funding of all other federal agencies. DoD incurred 71 percent acquisition obligations in comparison to other Federal agencies (see figure 4). As such, the Navy receives substantial fiscal oversight. Further, as a part of the Navy's effort to dutifully execute its fiduciary

responsibilities, it has disciplined material acquisition and inventory management systems. But, regardless of the fiscal oversight and disciplined material acquisition and inventory management systems, the Navy has experienced slow progress in achieving increased HM&E equipment standardization. Various factors exist that exceed the current span of control of existing oversight and management practices. These factors influence the slow progress of HM&E standardization and contribute to the introduction of numerous new pieces of HM&E equipment into the naval inventory every year. As a result, there is an increase in the non-standardization of the Naval Surface Force's HM&E equipment inventory. These root causes and influential factors come by way of competing objectives and stakeholder trade-off decisions. Therefore, to understand the fundamental nature of the HM&E standardization problem, it is first necessary to identify the competing objectives and stakeholder trade-off decisions that exist. Then, one must identify their influence and impact on the standardization process. This then is the first step in identifying a road map for change and transformation.

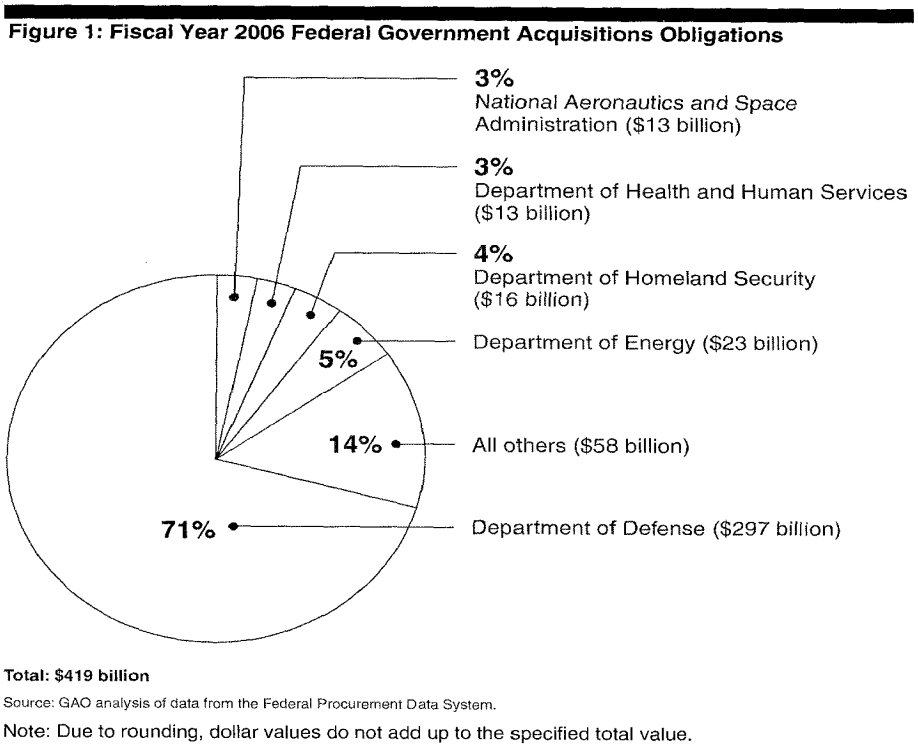

Figure 4. Fiscal Year 2006 Federal Government Acquisition Obligations *Source*: Government Accountability Office (GAO) Report GAO-07-1098T, *Federal Acquisition and Contracting Challenges: Systematic Challenges Need Attention* (Washington, DC: Government Printing Office, 2007), 1.

Research Questions

Primary Research Question

How can the Navy minimize the impact of competing objectives and stakeholder trade-off decisions to obtain an optimal HM&E standardization system representing the best-fit solution for its surface force?

Secondary Research Questions

1. What is the "as-is" state for the Navy Surface Force's current HM&E equipment standardization operational environment?

2. What competing objectives exist for the HM&E standardization program?

3. What trade-offs are made based on these competing objectives?

Definitions

Allowance Parts Lists (APLs): Maintenance support documentation that identifies a unique equipment type and provides the technical characteristic of a particular piece of equipment, its logistic and supply information, and all maintenance significant repair parts associated with the equipment.[16]

Avoidable costs: A cost that ceases if a firm or government agency discontinues an activity; an incremental variable cost.[17]

Casualty Reports (CASREPS): A classified naval message that provides detailed information about an equipment failure or system degradation which results in the reduction of a ship's mission readiness.

Competing Objectives: An aim, goal, performance target, or result an organization or individual seeks to achieve that conflicts or competes with one or more other aims, goals, performance targets, or results.

Hull, Mechanical, and Electrical Equipment: Equipment and component parts of the ship that are subcomponents to larger Navy defined systems and include equipment like pumps, motors, valves, switches, gauges, and others.

Integrated Logistics Support (ILS) Costs: The cradle-to-grave material cost (from procurement to disposal/depletion from inventory). This represents the cost of training,

provisioning, NSN and APL maintenance, technical manuals, installation drawing changes, configuration control, and planned maintenance.[18]

National Stock Numbers (NSNs): A 13 digit stock number assigned by the Defense Logistics Service Center, Battle Creek, Michigan, to identify an item of material in the supply distribution system of the United States. It consists of a four digit Federal Supply Classification number, and a nine digit National Item Identification Number.[19]

Stakeholder-centric trade-off decision (commonly referred to as simply stakeholder trade-off decisions): The judgment, resolution, or choice about the selection of an alternative from among many with different objectives, risks and often opposing benefits made by an individual or group who has an interest, right, or ownership in an organization, is affected by, or can influence, the issues and activities of the organization. The judgment, resolution, or choice is in the best interest or for the primary benefit of the decision maker.

Standardization: Commonality of equipment. The basis for comparing commonality of equipment is the APL number. The more a single APL number occurs throughout the fleet, the greater the degree of standardization.[20]

Limitations

The Navy's organizational structure and the manner in which data is organized impose limitations on the scope of this research. The scope of the Navy's HM&E standardization program is navy-wide to include air, surface, and subsurface units. In many instances, one will find shore activities that use equipment found in the air, surface, and subsurface communities. However, for the purpose of this research, the technical span of analysis is limited to the surface force only. This includes looking at

standardizing processes and equipment for the 280 plus ships presently in the Navy's inventory. The air, surface, and subsurface communities operate as distinct enterprises with unique cultures and institutionalized community management practices, business processes, and problem solving approaches. Data about fiscal activity, equipment, and specific standardization projects are normally community specific. Therefore, a focused view of the standardization problem from the surface force perspective was determined to be the best approach for analyzing the problem. The surface force presents the greatest opportunity to affect change in the standardization of HM&E equipment, given the volume of HM&E equipment installed. Lessons learned from studying the Surface Force's HM&E standardization program can then serve as a model for a Navy-wide program and the Navy's integration into the joint Defense Standardization Program.

Significance of the Study

The research in this paper is significant and relevant. First, successful naval operations are critical in the current and future operational environment. HM&E standardization is important to naval operations. Therefore, it is critical to understand how HM&E standardization impacts naval operations. Next, properly identifying the factors that contribute to poor standardization is important to understanding why the problem exists and how to solve it. But to properly identify the contributing factors, quality research is required. The research in this paper will help to clarify the impact of HM&E equipment standardization on naval operations and identify the contributing factors to poor standardization. Ultimately, the research conducted in this paper will contributes to the overall study of HM&E equipment standardization and hopefully will help individuals involved solve the problem.

HM&E equipment standardization has a high degree of relevance and importance to the Navy's performance in the current and future operational environment. In the current operational environment, the lack of effective HM&E equipment standardization results in the expenditure of funds and escalating costs. Further, the lack of increased HM&E equipment standardization results in the degradation of a ship's mission readiness. In the military's current operational environment, there is a degree of uncertainty concerning naval employment due to unpredictability in world events. Therefore, the Navy must use its resources in the most efficient and effective manner while maintaining its ships in the highest degree of readiness. Ships need to be able to respond to national and international crises with minimal delay. With regards to the future operational environment, in the *Naval Transformation Roadmap 2003,* Department of the Navy leadership outlined their thoughts on transforming naval capabilities, processes, and programs to guide the efforts of the Navy-Marine Corps Team to meet the challenges of an ever-changing operational environment through the year 2020. In doing so, they describe a world security environment characterized by uncertainty, chaos, surprise, and conflict. They then go on to characterize the Navy's operational environment using such concepts as asymmetric vulnerabilities, distant anti-access and area denial, unpredictable deployments of varied duration in support of various specific national priorities, for example; Homeland Defense, security cooperation events and prosecution of the Global War on Terrorism. To meet the challenges of the operational environment, SECNAV, the CNO, and Commandant of the Marine Corps envisioned naval forces possessing certain key capabilities: (1) increased surge capabilities with speed of response, (2) flexibility, (3) maneuverability and greater sustainment capabilities

with less reliance on shore facilities, (4) logistics without fixed and vulnerable stockpiles ashore, and (5) uninterrupted operational availability. HM&E standardization is an important aspect of meeting the operational and fiscal necessities of today and transforming the naval force to meet the challenges of the future. It relates to how the Navy will equip its forces to meet senior naval leadership's surge and sustainment requirements. HM&E standardization can significantly impact how well the Navy operates to meet current and future operational environment challenges. It can hinder or help the Navy achieve its transformation goals and objectives.

Factors contributing to a lack of standardization or roadblocks that hinder the Standardization Program's success are not adequately addressed in existing research. The reasons for a lack of standardization are discussed in broad contexts. Detailed information about contributing factors, roadblocks, or reasons for a lack of standardization was not always easily identifiable. Most of the information was implied and had to be deduced from the readings. Further, there was no specific research that dealt solely with contributing factors and causes for a lack of standardization. Information is available but, it is often embedded in pages of research. The primary reasons for the existence of the standardization problem, contributing factors and roadblocks are not given the level of literary attention it warrants. The study of HM&E standardization needs more information about the contributing factors and roadblocks that hinder standardization success.

Most of the research identified on this subject discusses technical factors and issues that contribute to the HM&E standardization problem. There was very little discussion about non-technical factors. There are organizational, social, and political

factors that contribute to the problem. Often times, they are the reasons for the technical factors. As the Navy tries to solve the standardization problem, it must fully understand all the factors that influence the process. To aid the Navy's understanding, more research about non-technical factors and their role in the standardization process is required.

The research conducted in this paper is significant and relevant. The study of HM&E standardization is important to solving the standardization problem. The research conducted in this paper contributes to the study of HM&E standardization by linking it to naval operations and analyzing and documenting the role and impact of technical and non-technical factors that influence the standardization process. To truly understand the problem, overcome the barriers, and make informed decisions for the success of the HM&E Standardization Program, the parties involved must clearly understand the spheres of influence at every operational level and their respective impacts on the success of the program. The HM&E standardization program is a current challenge for the Navy and remains an active program. The objective of this research is therefore to determine the true factors that influence HM&E standardization decisions and understand how the impact of competing objectives and stakeholder trade-off decisions on the standardization process can be minimized.

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[3]Commander Mark Pimpo, NAVICP, HM&E Standardization Commodity Committees Kick-Off Meeting, Presented to the HM&E Standardization Commodity Council Working Group, Mechanicsburg, PA, 7 February 2005.

[4]Ibid.

[5]Department of the Navy, Office of the Secretary of the Navy. *Naval Transformation Roadmap: Assured Assess & Power Projection . . . From The Sea* (Washington, DC: Government Printing Office, 2003), 8.

[6]Ibid.

[7]Ibid.

[8]Ibid.

[9]Ibid.

[10]Ibid.

[11]US Department of Defense, "Hull Mechanical and Electrical Equipment Standardization Program."

[12]Naval Sea Logistics Center, Maritime HM&E Standardization, http://www.nslc.navsea.navy.mil/hme/index;.nsf (accessed 7 November 2007).

[13]Matthew P. Tedesco, "An Approach to Standardization of Naval Equipment and Components" (Masters thesis, Massachusetts Institute of Technology, 1994), 20.

[14]US Department of Defense, "Hull Mechanical and Electrical Equipment Standardization Program.

[15]Pimpo.

[16]Department of the Navy, SPCC Instruction 4441.170A, *COSAL Use and Maintenance Manual* (Washington, DC: Government Printing Office. 9 June 1995), 1-5.

[17]Clyde P. Stickney and Roman L. Weil, *Financial Accounting: An Introduction to Concepts, Methods, and Uses*, 10th ed. (Ohio: R. R. Donnelley and Sons, Co., 2003), 873.

[18]Department of Defense, "Hull Mechanical and Electrical Equipment Standardization Program."

[19]Ibid.

[20]Ibid.

CHAPTER 2

LITERATURE REVIEW

Introduction

The primary research question for this thesis is: How can the Navy minimize the impact of competing objectives and stakeholder trade-off decisions to obtain an optimal HM&E standardization system representing the best-fit solution for its surface force? Based on the primary research question, the focus of this research is to identify competing objectives and stakeholder trade-off decisions that influence HM&E equipment standardization, explain why they exist, identify their roles, and analyze their impact on the standardization process. To do so, it is necessary to understand existing thoughts, theories, and arguments. Therefore, this chapter contains a review of some of the existing literary works related to the primary research question. The review includes a comprehensive summary and brief evaluation of individual works to include primary and secondary research literature. In the end, the author provides an overarching assessment of the literature reviewed by identifying patterns in trends of thought, gaps in research, as well as, relevancy to this research project.

The literature review revealed critical information about the HM&E equipment standardization program. First, there is sufficient literature about the subject to support the research pursued in this paper. Next, during the literature review process, a lack of information concerning the role of competing objectives and stakeholder trade-off decisions in HM&E equipment standardization was identified. No literature reviewed was devoted to addressing this specific topic. However, some of the literature reviewed discussed, to some degree, the existence of compromises and trade-offs in the pursuit of

standardization. Next, information about HM&E equipment standardization is fragmented. Researchers conducted research based on the sources of the problem (shipbuilding, repair, or inventory management). That being said, while the information is fragmented and not presented from a systems point of view, existing literature complement each other and serve as building blocks of information. In sum, the literature reviewed, serving as a sample of all literature available, are significant and relevant to the study of HM&E equipment standardization and the specific research contained in this paper. The literature reviewed highlights the need for, and serves as the foundation of the research contained in this paper.

Literature Review

"An Approach to Standardization of Naval Equipment and Components"

To fulfill the requirements for a Master of Science degree in Ocean Systems Management and Master of Science degree in Naval Architecture and Marine Engineering at the Massachusetts Institute of Technology in January 1994, Matthew Tedesco completed this research as an Office of Naval Research Fellow. He received a Bachelor of Science degree in Naval Architecture and Marine Engineering from Webb Institute of Naval Architecture in 1991. He is active in the field of Ocean and Marine Systems serving as either a consultant, a member of affiliated organizations, or participant in various conferences and symposiums.

The purpose of Tedesco's research was studying the role of HM&E equipment standardization as a means of reducing the costs associated with shipbuilding (acquisition and construction). Tedesco identified four roles: (1) reducing acquisition costs, (2)

reducing lifecycle costs, (3) reducing time to delivery, and (4) bolstering the US Shipbuilding Industrial Base. He analyzed methods for determining the appropriate degree and type of standardization. He presented means for identifying and prioritizing standardization candidates. Further, Tedesco identified benefits which may be attributable to and challenges associated with achieving HM&E equipment standardization. The benefits identified relate to engineering, procurement, quality control, inventories, production, and maintenance. The challenges identified are associated with decision systems, information systems, technical designs and manufacturing processes, planning and procedural processes, legal and contractual hurdles, and military specification application. In closing, the author asserts that for standardization to succeed, a great deal of information is required to adequately make decisions; requirements, processes, and procedures must be streamlined; and cooperation by all parties concerned to establish a balanced Navy acquisition policy along with a balanced general maritime policy is needed to support the survival of the U.S. shipbuilding industrial base.

As secondary research literature, Tedesco's work is relevant and significant to the overall study of standardizing HM&E equipment and the specific research conducted in this paper. Using a narrowly defined scope (shipbuilding), the author compliments existing research by adding greater insight into the HM&E standardization problem, its challenges, and ways for overcoming these challenges. In doing so, the author is guided by a clearly defined purpose with effectively developed arguments supporting his research objective. His research methodology was appropriate for the type of research conducted. He used a qualitative research approach which included collecting data from a

variety of sources to determine the historical, social and economic setting. The sources of data include observations, interviews, and other research documents and reports. His conclusive assertions are justified based on the research results.

The author does not specifically state how his research fits into the overall research on this subject. However, his research does compliment existing research. While narrowly focused on standardization in shipbuilding, the roles he identified for HM&E standardization in shipbuilding, methodology he presented for identifying and prioritizing standardization candidates, benefits and challenges highlighted, and conclusive assertions he made are applicable to other areas where standardization can be affected (repair, maintenance, in-service ship material management, and inventory management). Further, with regards to the objective of identifying the role of competing objectives and stakeholder trade-off decisions, a review of Tedesco's research shows a gap in research concerning these topics and how they influence the HM&E standardization problem. In the conclusion section of his research, he does state, "Standardization is an exercise in compromise" but, does not direct any of his research effort into discussing why, how, who, or what it is a compromise between. Therefore, Tedesco's work does show the relevance and significance of studying the role of competing objectives and stakeholder trade-off decisions and provides a foundation to begin research. The thoughts, theories, facts, findings, recommendations and conclusions of his research contribute to the advancement of HM&E equipment standardization. His work is relevant and significant to the study and implementation of HM&E equipment standardization and the specific research in this paper.

"Standardization of Hull, Mechanical, and
Electrical Equipment Inventory"

As part of his efforts to fulfill the requirements for a Masters of Science degree in Management from the Naval Postgraduate School, Lieutenant Commander (LCDR) John C. Corbett completed this research in September 1987. LCDR Corbett obtained a Bachelors of Science degree from Miami University in 1974 and a Masters of Business Administration degree from The George Washington University in 1985. Serving as a Navy Supply Officer, LCDR Corbett was responsible for logistics management of the Navy's material inventory.

The Objective of this research was to explore supply support problems caused by a lack of inventory standardization as well as the extent of these problems, and examine ways that increased standardization can improve parts availability while reducing costs. Supply support problems identified include APL and parts proliferation, inventory duplication, parts availability, and substitutability. Ways that increased standardization can improve parts availability while improving costs directly correlated with the identified supply support problems. The primary research question was: How can the Navy improve management of non-standard inventory? As part of his efforts to ascertain the information required to answer the primary and secondary questions, he evaluated the Federal Government and DoD's acquisition and standardization policies. Then, he narrowed his research by evaluating Navy acquisition and standardization policies. After gaining a top down understanding of acquisition and standardization policies to understand their impact on improving non-standard inventory management, he went on to explore cost models to estimate costs resulting from non-standardization of inventory. Asserting that costs are the driver in most standardization decisions, the author proposes

his own cost model to aid decision making on a cost effective basis. Eventually, Corbett concludes: (1) DoD has the capability to control entry of non-standard parts but does not provide responsibility or authority to organizations that can enforce standardization; (2) Technical data is necessary to affect standardization. Further, due to the fact that technical data is necessary to effect standardization, decisions to procure technical data should be based on life-cycle effectiveness and not the relative expensiveness of technical data. A cost-benefit analysis between out-year inventory support costs resulting from the lack of technical data and initial procurement costs of technical data packages should be considered; (3) While Navy policy supports the concept of standardization and its goals, full acceptance and commitment to the practice is not evident in the Navy as a whole; (4) To achieve greater standardization, there must be more incentives for contractors in conjunction with adequate tools to aid engineers in the part-selection process; (5) As annual budget appropriations decrease and non-standard part proliferation increases, weapon systems will receive inadequate support thus increasing the range of problems the Navy will experience with inventories and their subsequent support; (6) Standardization cost models should be a decision tool for Program Managers (PM) as they execute their duties. However, for a PM to accept use of a costing model it must be simple, reliable and practical; and (7) The cost of non-standardization is astronomical. But, with increased standardization, the Navy can realize increased savings, reduced logistics and operating costs, and increased fleet readiness.

In the end, the author recommends a four-step approach to achieving greater standardization. The four steps include: (1) Reduction of duplicate parts already in the supply system; (2) Identification of similar parts that lend themselves to consolidation;

(3) Re-investment of savings for increased depth; and (4) Education to sustain the standardization effort. Other recommendations include: (1) establishing a standardization proponent in the Competition Advocates Office on the Secretary of the Navy (SECNAV) staff; (2) allowing the Competition Advocates Office to play a larger role in acquisition decisions and program funding; (3) requiring PM's to address standardization during milestone review; and (4) having Hardware Systems Commands providing internal standards programs increased authority and an appropriate mission.

As secondary research literature, Corbett's work is relevant and significant to the overall study of HM&E equipment standardization and the specific research conducted in this paper. Focusing on the inventory management arena for HM&E equipment standardization, the author furthers the study on this subject by providing thoroughly researched facts and conclusions about the standardization problem, its secondary and third order affects on supply support and its adverse impact on parts availability and costs. Working from a well-defined purpose, the author researched and developed arguments, recommendations, and conclusions that articulate key data points and practical measures to pursue and achieve a greater degree of standardization. His research methodology was appropriate for the research conducted and lends credibility to the quality of information provided to answer his research questions and establish his positions on issues. He used a qualitative research approach to collect data from a variety of sources to determine the historical and economic setting. His data sources included primary and secondary research literature (books; interviews; articles; and Federal/DoD-Navy policy, guidance, instructions and directives). Further, with regards to the objective of the research contained in this paper, identifying the role of competing objectives and

stakeholder trade-off decisions, LCDR Corbett's research is relevant. He does not address these topics explicitly. But, while discussing the acquisition process and the PM's role, he alludes to competing objectives and decisions. For that matter, his work does reveal a gap in research and the relevancy of understanding these topics and their role in standardization. Corbett's work is significant and relevant to the overall study of HM&E equipment standardization and the specific research of this paper. It advances the study and implementation of HM&E equipment standardization and supports this specific research.

"Study of Hull Mechanical/Electrical Installed Equipment Standardization for Commissioned Ships"

As part of a series of ongoing studies supporting the goal of increased standardization for military weapons systems, Logistics Management Institute (LMI) conducted this study at the request of the Director of Standardization and Configuration Management, Navy Material (NAVMAT) Command. The objective of this research was to gain an understanding of how an equipment rotatable pool concept in support of ship repairs and overhauls could contribute to increased component and equipment standardization for "in-use" HM&E components and equipments. To conduct its research, LMI used a two-pronged research approach covering first, installed component and equipment standardization within classes of "in-service" ships and second, the interface between a rotatable pool program and the standardization program. Each part yielded its own conclusions and recommendations.

In part one, LMI discussed the advantages, costs associated with implementing standardization, feasibility, and a time-phased approach to achieving standardization. The

advantages of achieving equipment standardization are discussed in terms of the benefits realized by decreased ownership costs (support and supply) and increased readiness. The manner in which standardization contributes to increased readiness was determined to involve fewer repairs, less repair time, fewer part shortage delays, and greater versatility in maintenance practices. The costs associated with achieving standardization were identified as investment costs (acquisition costs, component removal costs, engineering and installation costs, disposal value, and replacement circumstances) and analytical costs (economic and technical analysis). In determining the feasibility of achieving standardization, LMI noted technical feasibility (reasonable degree of uniformity among the various performance requirements and use of standardized equipment without a degradation to the applicable system), economic feasibility (benefits over a period of time that exceed the required investment) and standardization maintainability (means to maintain standardization once achieved) as measures for consideration. The time-phased approach to achieving standardization includes a short-range outlook (visibility to current standardization efforts and policy establishment), mid-range outlook (use of new equipment in new design), and long-range outlook (implement policy to restrict acquisition of new items while retrofitting to increase standardization on in-service ships). Other approaches include replacing “onesies,” selecting preferred items, using “standardization friendly” procurement techniques and standardizing within commodity areas. In addition to the advantages, costs, feasibilities, and approaches, LMI’s research goes on to conclude: (1) Standardization must be justified on a case by case basis; (2) A uniform analytical approach is required if maximum potential benefits are to be achieved; (3) Achieving standardization requires considerable analysis and planning efforts; (4)

Selection of preferred components should be based on a disciplined approached; (5) A disciplined preferred components selection process will provide greater credibility for new construction and repair/overhaul equipment selection; (6) A measurement to indicate relative ratios of benefits to investments before undertaking an exhaustive standardization analysis is necessary; (7) Scheduled ship availabilities provide the best opportunity to achieve standardization among in-service ships; (8) The best way to achieve standardization is by eliminating items with one, then two, then subsequent applications from any group of functionally interchangeable components; and (9) In order to achieve the greatest degree of standardization, funds must be allocated for the purchase of preferred components for in-service ships. Recommendations include: (1) the Navy should introduce a formal program for retrofitting; (2) the Navy should apply a standardization index to approximate benefits gained from investments for specific component categories; (3) Component categories having a high standardization index should be evaluated for component replacement at the time of scheduled availabilities of the ships on which such components are installed; (4) Interchangeability should be established by commodity groupings thereby allowing for designation of preferred components; (5) Implementation of a test case within a single class of ship to establish the validity and usefulness of the methodologies recommended in this research; and (6) Issuance of a preferred component replacement policy.

In part two, the author researched the interface between the standardization program and the equipment rotatable pool concept. He reported interfaces between the two along the lines of benefits, costs, and sequencing affects. In doing so, the approach used was first to examine the interface between the process of establishing and using a

rotatable pool of equipment and the process of achieving a reduction in the variety of equipment components installed throughout the fleet. Then, a decision method for selecting equipment to be included in a rotatable pool was developed. Lastly, the organization for equipment repair with consideration of the justification for the rotatable pool concept based on the number of overhaul points involved was evaluated. In examining the interface between the process of establishing and using a rotatable pool of equipment to aid standardization efforts, the study argues that there are essential elements that must be considered. These elements include interchangeability (ability to substitute items based on form, fit and function characteristics), pipeline requirements (number of the components required to be in stock in the rotatable pool based on the frequency of overhaul and turnaround time), and mode of repair (level of maintenance required, type of personnel used and methods of repair employed). These interfaces are then analyzed in terms of benefits, costs, and timing associated with each process with the intent of determining the contribution of a rotatable pool to HM&E equipment standardization. The benefits identified were shortened availabilities, reduction in component ownership costs, increased standardization. The report further argues the need for the development of a rotatable pool decision methodology with a supporting statistical base to feed the decision model. Then, to sum up the discussion of the interface between the rotatable pool concept and standardization, the author notes the interface for a rotatable pool of equipment and standardization are found in the benefits and costs as discussed above as well as the sequencing effects of implementing a standardization initiative before implementing a rotatable pool initiative or vice versa.

In summary, the author outlines a list of conclusions and recommendations. The conclusions include: (1) Rotatable pools and standardization are two separate methods for achieving increased economy for logistics support of Navy ships; (2) Standardization directly contributes more to lowering life-cycle costs than rotatable pools of equipment. But, rotatable pools of equipment contribute more to shortening the total time required to perform maintenance actions than standardization does; (3) It is more difficult to justify standardization than it is to justify the establishment of rotatable pools of equipment; (4) In establishing a rotatable pool of equipment, development of interchangeability data is necessary prior to procurement of additional components necessary to establish a rotatable pool. Preference should be given to equipment with repair parts available from the manufacturer, equipment having an acceptable maintenance history, and equipment having a relatively high population in the fleet; (5) The potential benefits of a rotatable pool concept are large enough to warrant an immediate Navy-wide program implementation; (6) The major benefit of a rotatable pool of equipment is shortened availability with other such advantages as quality of repair, greater availability of repair parts at a cheaper cost, decreased component repair costs, and maintaining the existing degree of standardization; and (7) Justification for a rotatable pool is based on investment in additional pipeline inventory versus the benefits and an economic decision model reflecting these criteria which should be employed at the tender or shipyard level of maintenance. The author's recommendations included first, the Chief of Staff for Naval Material establishes a Rotatable Pool Management Program under certain guidelines. Secondly, the Chief of Naval Material designates an appropriate focal point for implementing, coordinating, and monitoring the Rotatable Pool Management Program.

As primary research literature, the LMI study is relevant and significant to the overall study of standardizing HM&E equipment and supports the research contained in the current thesis research. Focused on the use of rotatable pools of equipment during ship repair availabilities and the subsequent impact on standardization, this research complements other research on this topic. Additionally, LMI's study increases the reader's understanding about the complexity of the problem and the many factors involved in achieving greater standardization. The author broadens the span of focus with regards to the possibilities for achieving HM&E standardization. The author adds greater insight into a unique aspect of and approach to achieving standardization via rotatable pools of equipment. To establish relevancy and significance, the author works from a clearly defined purpose and scope to formulate conclusions and craft recommendations. He appropriately applies the qualitative research methodology to collect and analyze data from a variety of first-hand sources to include capitalizing on previous related research. The resultant was the presentation of significant facts and findings that validate the conclusions and recommendations. This research is relevant. It complements other research on this topic. Further, with regards to the objective of this research, identifying the role of competing objectives and stakeholder trade-off decisions, LMI's research is significant. It draws attention to competing objectives that are overlooked and not addressed as key factors for the lack of standardization. LMI's work advances the study of HM&E equipment standardization and the research contained in this paper.

"Hull Mechanical and Electrical Equipment Standardization Program" A Case Study

In the DSP case study, the author draws attention to the HM&E standardization problem, tools, successes, and way ahead. In doing so the author, provides some background data as a stage setter for the HM&E standardization problem, identifies factors that serve as stimuli for the proliferation of HM&E equipment, discusses the Navy's approach to the standardization problem, and talks about Navy tools used to aid standardizing HM&E equipment. Further, specific achievements are discussed relative to the LHD 1, Amphibious Assault, and LPD 17, Amphibious Transport, classes of ships as well as overall fleet accomplishments. In conclusion the author discusses future efforts and lessons learned.

In describing the background of the HM&E equipment standardization problem, the author highlights how the Navy's attention was drawn to this issue. As a point of reference, he refers to the identified proliferation of HM&E equipment whereas, for example, multiple unique equipment items were in the Navy's inventory when a single item could meet the requirement for several ships. Further, the author discussed a 1988 study whereas the increasingly high proliferation of HM&E equipment resulted in support problems. In short, the case study describes the Navy as having over 180, 000 different types of HM&E equipment with unique supporting material and channels. With the various types of equipment in inventory, some 8,700 new APLs were generated annually with a resultant 28,000 new stock numbers being introduced likewise. Moreover, the culprit for generating 90 percent of the all new APLs and NSNs were two activities, ship construction and conversion, and scheduled depot maintenance. Ship construction and conversion accounted for 66 percent of the new APLs. Lastly, the author

highlighted the fact that 50 percent of all HM&E items were installed on three or fewer ships and had a total inventory of seven or fewer installed units across the entire fleet.

In the case study, the HM&E standardization problem is described as being fueled by a number of contributing factors. The author identifies these factors as: (1) lack of engineering awareness and responsibility for life cycle costs; (2) lack of engineering access to data related to the performance, logistics, and cost of commercial equipment; (3) lack of contractual obligation or significant incentives for shipbuilders to choose standardized equipment; (4) equipment obsolescence due to rapidly advancing technologies; (5) the discontinuation of manufacturing lines as a result of turnover among original equipment manufacturers; and (6) the relatively small Navy market share and its influence on the commercial market. Together, all the factors come together to impart a negative influence on the ability to achieve a greater degree of standardization for HM&E equipment.

The Navy's approach to the standardization problem is centered on established goals that are divided into tiers. The goals for the HM&E standardization program include: (1) reduction in the number of equipment with similar functions, (2) promote commonality among weapons systems, (3) maximize the use of standard design equipment, parts, materials and processes, (4) maximize repetitive use of existing, reliable and fully supported equipment, (5) maximize use of common publications, manuals, drawings, training aids, and similar material, (6) conserve money, manpower, time, facilities, and natural resources, (7) exclude equipment that is not fully supported from the design, redesign, or production stage to the maximum extent possible, (8) improve operational readiness and availability of the fleet, and (9) reduce life-cycle

logistics support costs. The case study goes on to argue that the approach to achieving HM&E standardization is a methodical approach. It consists of engaging the standardization effort from the perspective of intraship commonality, intraclass commonality and intrafleet commonality. With outlined goals and a tiered approach, the author promotes the described approach as the right way to achieving greater standardization.

In the case study, two tools are noted as means of achieving HM&E equipment standardization. These two tools are Hull, Mechanical, and Electrical Equipment Data Research System (HEDRS) and the Navy Standardization Guide. HEDRS is described as the primary tool for standardizing HM&E equipment. It consists of a collection of databases (Components Characteristics File, Equipment Application File, Supportability Databases, and the Integrated Logistics Support databases) and analytical programs and serves as a repository of HM&E equipment data for use by maintenance, operations, engineering, planning, and logistics communities. It enables enhanced data and analytical capabilities concerning such subject areas as feasibility of equipment substitution, identification of potential problem equipment, and application of equipment. On the other hand, the Navy Standardization Guide was developed to aid in training and awareness of HM&E equipment pertinent program, policies and information. It contains standardization program planning documents, including military handbooks, DoD directives, SECNAV instructions, and sample standardization program plans. It also contains standard profile reports and an ILS cost-avoidance package that includes ILS cost tables and a cost calculator. Both tools together help those involved in the standardization process to ease the standardization analysis and decision making process.

As a method of solidifying the effectives of the standardization program, the author describes the effectiveness of the Standardization Program by providing specific successes achieved in the LHD 1 and LPD 17 classes of ships a well as the in the fleet overall. In every case, there was a higher degree of HM&E standardization realized via various means, methods, and approaches.

In the end, the author reflects on future efforts and lessons learned. The description of future efforts weighed heavily on the use of HEDRS. The lessons learned were Program lessons learned. The lessons learned included: Contractor furnished equipment using performance type specifications without standardization can result in unintended consequences; Monetary incentives alone are insufficient in supporting standardization decisions; Access to current manufacturing data can help overcome the negative effects of obsolescence and manufacturer turnover; Awareness of the impacts of standardization on logistics support costs is necessary for engineers and managers; Standardization for standardization's sake is not a best practice; Flexibility to incorporate new equipment as required is necessary; Documented progress reports on the level of standardization is a critical part of standardization management; Smart standardization can reduce total ownership costs, improve performance, readiness, and interoperability, as well as reduce program risks of diminishing manufacturing sources and obsolescence; and Finally, in today's standardization environment, the burden and benefits of standardization weigh heavily on program managers and end-item manufacturers and suppliers.

This study is relevant and significant to the study of standardizing US Navy HM&E equipment and supporting the research contained in this paper. It frames the

problem and an approach to solving the problem from a slightly different perspective of previous works reviewed in this section. By doing so, this case study broadens the scope of understanding the problem and opens up additional avenues of approach for solving the problem. The author did not clearly define the purpose of the literature, but did do a very good job in providing great insight into some of the causes, benefits, successes, and ways ahead for HM&E equipment standardization. It appears as if, along with being a part of an awareness campaign, this literature is a marketing tool to illustrate the success of and solicit support for the HM&E Equipment Standardization Program. The scope included both new construction and repair activity. There were no identified research methodologies, but one can conclude that the information was gathered using first-hand information from a variety of sources. This study compliments other research on this topic. As mentioned earlier, it discusses a totally different aspect of the standardization problem and potential approaches to achieving standardization. There were no specific findings, recommendations, or conclusions. There were, however, lessons learned that enabled to the development of findings, recommendations, and conclusions. With regards to the objective of this research, identifying the role of competing objectives and stakeholder trade-off decisions, The DSP study is relevant. It does not address these topics directly but, provides greater insight into the role of competing objectives and stakeholder trade-off decisions given the facts presented. This case study advances the study HM&E equipment standardization and this research.

"Reduce Program Costs Through Parts Management" A Case Study

In this case study, the author presents a method for estimating the cost savings over a program's life cycle that can be realized when a viable parts management program is used. The intent is to provide information to help managers determine the value of having a comprehensive parts management program. An additional intent is to define and validate the need for parts management.

In meeting the purpose and intent of this case study, parts management is defined as an integrated effort to streamline the selection of preferred or commonly used parts during the design of systems and equipment. It is also referred to as a process for determining the optimum part while considering all the factors that may affect program outcomes. These factors include: (1) application, (2) standardization, (3) cost, (4) availability, (5) technology (new and aging), (6) logistics support, (7) diminishing resources, and (8) legacy issues. The author talks about the benefits of parts management and lists them as: (1) improved logistics support, (2) enhanced supportability, (3) improved obsolescence management, (4) monetary savings, (5) enhanced logistics readiness and interoperability, (6) increased system reliability and safety, and (7) acquisition lead time reduction. He then goes on to detail the key objectives of the parts management program as: (1) improving logistics support, (2) enhancing equipment reliability, and (3) managing obsolescence. Essential elements of an effective parts management program are defined. Additionally, six myths surrounding parts management are discussed. These myths include: (1) Acquisition reform replaces parts management; (2) A standard part is one and the same as a military unique part; (3) Parts Management programs restrict design flexibility, new parts introduction, and technology

insertion; (4) The Parts Management process can serve as a bottleneck; (5) Parts Management is burdensome; and (6) Parts management is a cost driver. The case study then goes on to discuss the cost-benefit analysis of using a Parts Management Program based on six identified cost drivers: (1) engineering and design, (2) testing, (3) manufacturing, (4) purchasing, (5) inventory, and (6) logistics support. In the end, the author details a formula to estimate cost avoidance savings from using spare parts management practices.

This study is relevant and significant to the study of standardizing US Navy HM&E equipment and the research contained in this paper. Operating under the pretenses of a clearly defined purpose, the author discusses yet another unique aspect of the HM&E standardization problem. In doing so, he provides greater insight into the parts management aspect of the standardization problem and how an effective parts management program can contribute to increased equipment standardization. The scope included both new construction and repair activity. There were no identified research methodologies, but one can conclude that the information was gathered using first-hand sources. This study compliments other research on this topic. It is another piece of the standardization puzzle. There were no specific findings, recommendations, or conclusions. There were, however, facts and information provided (factors affecting a successful parts management program, myths, and cost benefit analysis) enabled the development of findings and conclusions. With regards to the objective of the research of this paper, identifying the role of competing objectives and stakeholder trade-off decisions, The Parts Management Program study is relevant. It does not address these topics directly but, in presenting the facts as it does, it reveals gaps in information about

competing objectives and stakeholder trade-off decisions and their direct role in the standardization problem. This case study advances the knowledge of HM&E equipment standardization and the research described in this paper.

"A Common Objective: How Public and Private Shipyard Initiatives Strive to Achieve Repair Part Commonality"

In this article, the author Ron Nason, discusses opportunities for the Navy, working with public and private shipyards, to achieve cost savings that can be recapitalized for future weapons systems, new construction ship acquisitions, and fleet maintenance. He identifies material support functions with the emphasis on streamlining HM&E equipment procurement as the biggest potential source for cost savings. Further, he discusses two specific shipyard initiatives the Navy can partake in to help achieve cost savings: Pattern Card Database (PCD), and Common Parts Catalog (CPC).

The first initiative discussed is use of the Pattern Card Database (PCD). PCD is a Navy-owned database that serves as a repository and manipulator for material procurement and technical data. The function of PCD is to aggregate material data from individual shipyard procurements into a central database and link technical commonalities. Using this database, the Navy and the shipyards can identify unnecessary transactional type activity and opportunities for economical bulk buys. As a result, the Navy can realize savings through reduced personnel workload via a lessened workforce realized by not having to manage such a diverse group of material.

The next initiative discussed is use of Common Parts Catalog (CPC). CPC is another collaborative Navy/Industry research program. It is in essence a material catalog that functions to identify best practices for material procurement by facilitating part data

standards, part commonality/equivalency determinations, and configuration data among all Navy shipyard partners. Like PCD, the Navy will realize cost savings via proper use of managerial reports produced by this system.

The author qualifies himself as being a career military logistician having worked logistics for three military departments (Army, Navy, and Air Force) for more than twenty-five years. In addition to his practical experience, he also has extensive advanced education in business and logistics.

This article is relevant to the study of standardizing US Navy HM&E equipment. While the scope was limited to cost savings that can be realized via collaborative Navy-Industry efforts for technical and procurement data with regards to overhaul and repair activity, this article highlights even more unique ways for specific stakeholders to contribute to achieving greater standardization. The purpose of this article was easily identifiable. There were no identified research methodologies but one can conclude that the information was gathered using first hand information. The author, in his official capacity, oversees the Navy's material support for shipyard repair periods. This study compliments other research on this topic given the unique perspective on efforts that can contribute to achieving greater standardization. There were no findings, recommendations, or conclusions. This article is relevant to the objective of the research in this paper, identifying the role of competing objectives and stakeholder trade-off decisions. The article alludes to information management as a contributor to cost savings and even standardization. It does not, however, discuss specifically to what extent these tools have contributed to increased standardization. Reviewing the article, one would be led to believe the full capacity of these tools is not being exploited. Therefore, the author

attempts to increase awareness and make the case for the utility of these tools. Then the question becomes why these tools are not being used to their full capacity in the pursuit of cost savings and greater standardization? The lack of information in this article reveals the need to investigate the answer to this question. Therefore, this article supports the relevancy of this research. Furthermore, this article contributes to the study of HM&E equipment standardization and the research contained in this paper.

Patterns in Literature

From the sampling of literature reviewed relative to the study of HM&E equipment standardization, patterns were identified with respect to literature content and the manner in which research was conducted. Areas where patterns in literature content were prevalent include: area of focus, reasons for non-standardization, benefits of standardization, and approach to achieving standardization. Patterns identified concerning the manner in which research was conducted include: research methodology, type of research, and sources for research, and relevance and significance to the study of HM&E equipment standardization. The patterns identified revealed greater insight into the overall study and approach to achieving greater standardization and the significance of the research pursued in this paper.

The contents of the literary works reviewed were different but similar in many ways. Each literary work had its own unique focus. The focus for each work was associated with a unique phase of the ships life cycle: program management (concept development and design), shipbuilding (initial construction), in-service ship equipment management, or overhaul and repair (reconstitution). All of the reviewed literature basically presented the same set of reasons for the lack of standardization in different

ways. Some included unique reasons not identified by others. General categories summarizing common thoughts of why there is a standardization problem include: lack of decision tools, lack of access to information, lack of complete buy-in across the Navy, lack of a central management focal point with responsibility and authority, inadequate degree of technical planning and information, and lack of a systematic and synchronized approach to standardization throughout the Navy. The literature review resulted in basically the same conclusion as far as the benefits of standardization are concerned. The benefits discussed or hinted at in all literature included reduced costs and increased readiness. When approaches were identified, they were different but similar too. The differences were derived from the unique focus areas emphasized and factors highlighted to achieve standardization.

A detailed look at the literature reviewed provides insight into the similarities and differences among them. Tedesco focused on shipbuilding and provided more of a systems approach to achieving standardization. He highlighted decision systems, information systems, technical factors, planning and procedural factors, legal and contractual factors and specifications as avenues of approach to achieve standardization. Corbett's four step approach involved a system component change. He focused on program and inventory management but, included education and involvement at the highest levels of Navy leadership as ways for achieving greater standardization. LMI applied a time-phased approach (short, mid, and long range) while the DSP study outlined a tiered approach based on intra-ship, intra-class and intra-fleet standardization. The differences in the content highlight the fragmented thoughts about the standardization problem and its root causes which lends to the disparate-pigeonholed

approaches to achieving greater standardization. The similarities highlight the need for unity of effort based on a common frame of what the problem is.

Patterns in the manner in which research was conducted were similar among all the literature reviewed when the research methodology could be identified. The unique perspective of each work made each of them individually relevant and significant to the overall study of HM&E equipment standardization and the research conducted in this paper. All of the literature reviewed applied the use of qualitative research methods using primary and secondary literature, along with interviews, as principal research sources. The content and trends of thought were fragmented as they concentrated on unique aspects/areas for equipment standardization. However, the fragmentation provides for greater depth and breadth of information on the focused areas of HM&E standardization that can be applied to understanding the overall problem. Accordingly, the content, analysis, findings recommendations and conclusions have unique significance and relevance to the greater study of HM&E equipment standardization and the research conducted in this paper.

Gaps in the Literature

Various gaps in the literature reviewed were identified. There were gaps in comparison to each other as well as to the overall study of HM&E equipment standardization. First, each literary work was written at different periods of time covering the span of a forty-year period, from the sixties to the nineties. The time difference could be the reason for the varying trends of thought, scope, and focus. There were varying thoughts about the cause for the lack of standardization. There appears to be varying degrees of thoughts about the scope of the problem as indicated by the sources of the

standardization problem discussed (shipbuilding, repair and overhaul, in-service ship management, program and inventory management). Additionally, the major focus of the literature reviewed varied from the root causes and the ways to overcome them to approaches to solving the standardization problem and ways to implement the approaches identified. The existing setting and prevalent themes of the time in which they were written also could have influenced the varying thought, scope, and focus. The gap between the literature reviewed and the overall study of HM&E standardization is summarized in each author's recommendations for further study. Further, each author outlined what he saw as the reasons for the standardization problem. But none went so far as to investigate the "reasons behind the reasons." Tedesco mentioned a need to look into law cases and even stated, "Standardization is an exercise in compromise." Therefore, there are indications of a void in research relative to what these compromises are and why they exist. Moreover, the role of competing objectives and trade-off decisions as the root causes of the standardization problem is not addressed. As a result, the study of the role of competing objectives and stakeholder trade-off decisions is necessary. The literature reviewed and summarized in this chapter highlight and support the study's relevance and significance.

Summary

This literature review has provided sufficient research data to determine what has and has not been discussed about the primary research question, "How can the Navy minimize the impact of competing objectives and stakeholder trade-off decisions to obtain an optimal HM&E standardization system representing the bets-fit solution for its surface force?" The correlations and variations in documented literature were identified.

Disparity and gaps in information were noted. More importantly, the literature review helped to identify the lack of information concerning the reasons behind the reasons for what they have identified as the root causes of HM&E standardization. So this research is necessary, relevant and significant based on its focus on competing objectives and stakeholder trade-off decisions as the “reasons behind the reasons” for a lack of increased HM&E equipment standardization.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

The primary research question of this research is: How can the Navy minimize the impact of competing objectives and stakeholder trade-off decisions to obtain an optimal HM&E standardization system representing the best-fit solution for its surface force? The focus of this research is identifying and analyzing the factors that contribute to the lack of standardization by creating competing objectives and or stakeholder trade-off decisions. In order to properly identify these factors, the appropriate research methodology must be identified and applied. Therefore, this chapter discusses the approach used to conduct the research contained in this paper (data collection). Additionally, the methodology used to organize and analyze data is addressed.

Data Collection

The research contained in this thesis is qualitative in nature. Therefore, qualitative research principles were applied to collect data from multiple sources. Literature reviews and interviews were the primary methods used.

The first method applied to collect data for this work was literature reviews using primary, secondary, and tertiary sources. This data collection method provided the majority of data used in this research. Primary literature used included: Federal, Department of Defense (DoD), Comptroller and Navy policy, directives and instructions; Congressional Report Studies, Government Accounting Office (GAO), Office of Management and Budget, DoD-Navy Comptroller reports, and individual studies and

research. Secondary literature used included: thesis research papers, case studies, and articles that included or referenced data found in primary research sources. Tertiary sources included items with general reference to HM&E standardization based on the content of secondary literature. These sources proved to be invaluable in identifying what others viewed as the causes, root causes, and contributing factors to the equipment standardization problem. Through an in-depth evaluation of these sources and the current collection of work on this topic, embedded competing objectives and stakeholder trade-off decisions at all levels of military operations were brought to the forefront. This highlighted the need for additional research in this area in order to identify an effective approach for HM&E equipment standardization.

The next method applied involved interviewing individuals representing key players, organizations, process owners, or major stakeholders involved in HM&E equipment standardization. The interviews were conducted through direct communications in person or using various communication mediums. Attempts were made to contact individuals from the organizations described above to include those representing industry (for example; equipment manufacturers, interest groups, professional societies and organizations); shipbuilding and repair organizations (for example; construction yards, planning yards, and repair yards), and DoD-Navy organizations (for example; Defense Standardization Program, ship program managers, Naval Sea Systems Command (NAVSEA), Naval Supply System Command (NAVSUP), Naval Systems Engineering Command, HM&E equipment users, acquisition personnel, and various working groups undertaking standardization initiatives). The data collected in

the interviews were utilized to confirm and or reinforce data identified during literary reviews or to identify new information not covered in existing research or literature.

The research methodology process involved a simplistic but yet comprehensive approach to support the objective of this research. First, facts and findings data were collected using literature reviews and interviews. The facts and findings were then analyzed and organized to identify competing objectives and stakeholder trade-off decisions. These data were further evaluated to identify the role of the individual competing objectives and stakeholder trade-off decisions in the standardization process. Next, the resultant information was used to answer the primary and secondary research questions. Then, the data and subsequent analysis were used to formulate conclusions and recommendations, to include a systems transformation approach to minimize the impact of competing objectives and stakeholder trade-off decisions.

Organizing and Analyzing Data

The focus of this research is identifying and analyzing factors that contribute to the lack of standardization by creating competing objectives and or stakeholder trade-off decisions. Therefore, identifying the variables of the HM&E equipment standardization "operating environment" that create demands, impose restraints, or facilitate opportunities for the standardization system is important. To identify these variables, a two-pronged approach is used. First, the people and organizations (stakeholders) involved in the standardization process are identified and analyzed. Then, activities that influence HM&E equipment standardization are identified and scrutinized. Understanding the stakeholders, their activities, and their relationship to each other is important for identifying competing objectives and stakeholder trade-off decisions.

Stakeholders and Competing Objectives

First, the people or organizations (referred to as stakeholders from this point forward) involved in the standardization process are identified and analyzed. An HM&E equipment stakeholder identification model was created and used to identify stakeholders of the standardization process (see figure 5). Then, individual research of the stakeholders' missions, goals, objectives, and activities was undertaken. Knowing who the stakeholders are, what their strategic outlooks are, and what activities they undertake to achieve organizational goals are important to understanding how each stakeholder affects the standardization process. The model was created based on the definition of a stakeholder as used throughout this research. The stakeholder is defined as an individual or group who has an interest, right, or ownership in an organization; or is affected by, or can influence the issues and activities of the organization. The model was created using a combination of contemporary models to make a model appropriate for the HM&E standardization organization. The first is "The Corporation and Its Stakeholders" model put forth by Post, Preston, and Sachs[1] (see figure 6). The second is the "Stakeholders of the Organization" model put forth by Hellriegel, Jackson, and Slocum (see figure 7).

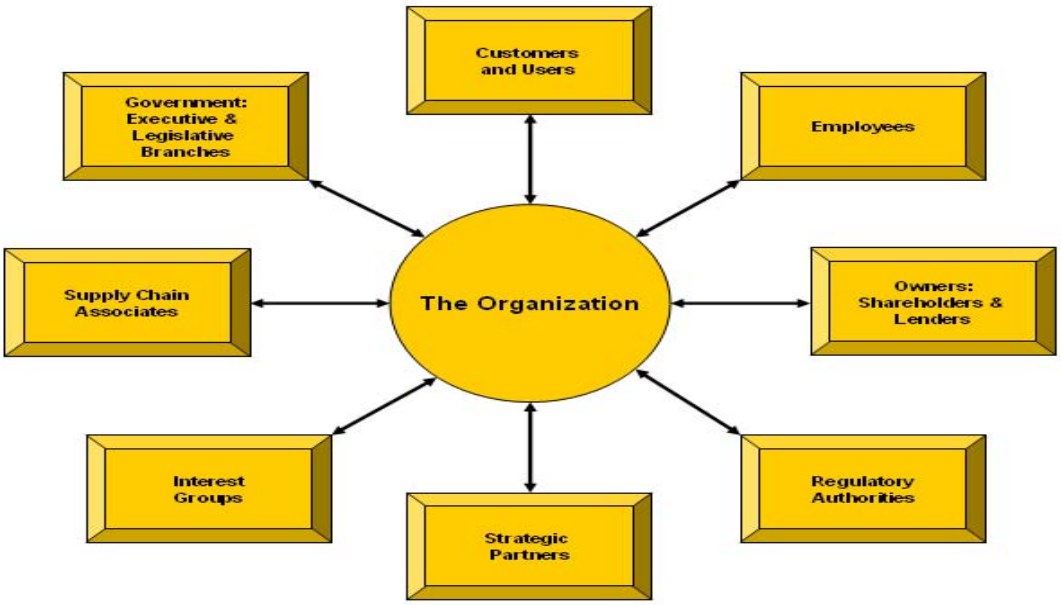

Figure 5. U. S. Navy HM&E Equipment Stakeholder Identification Model

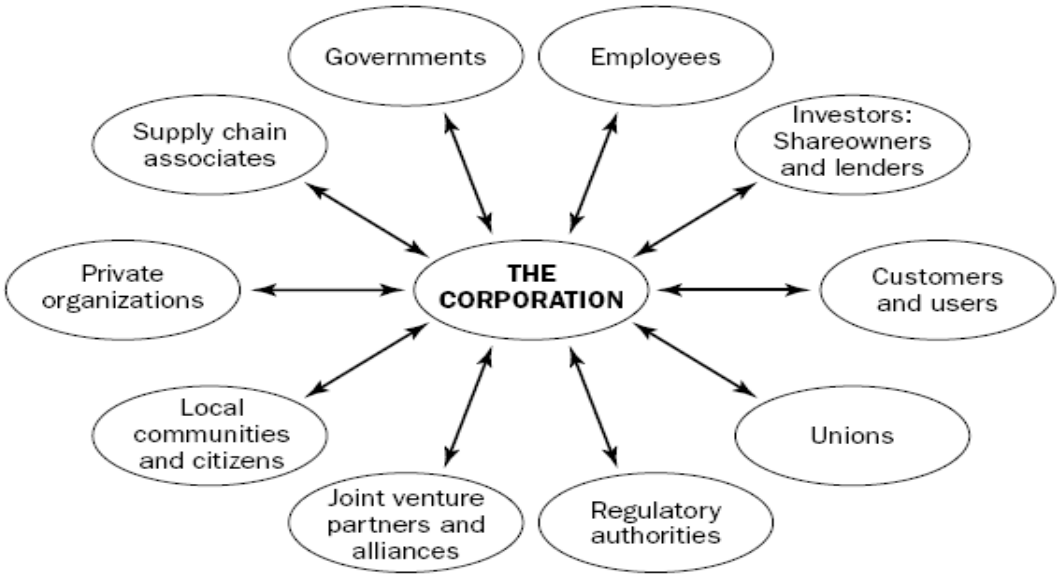

Figure 6. Stakeholder Identification Model: The Corporation and Its Stakeholders

Source: James E. Post, Lee E. Preston, and Sybille Sachs, *Redefining the Corporation: Stakeholder Management and Organizational Wealth* (California: Stanford University Press, 2002), 22.

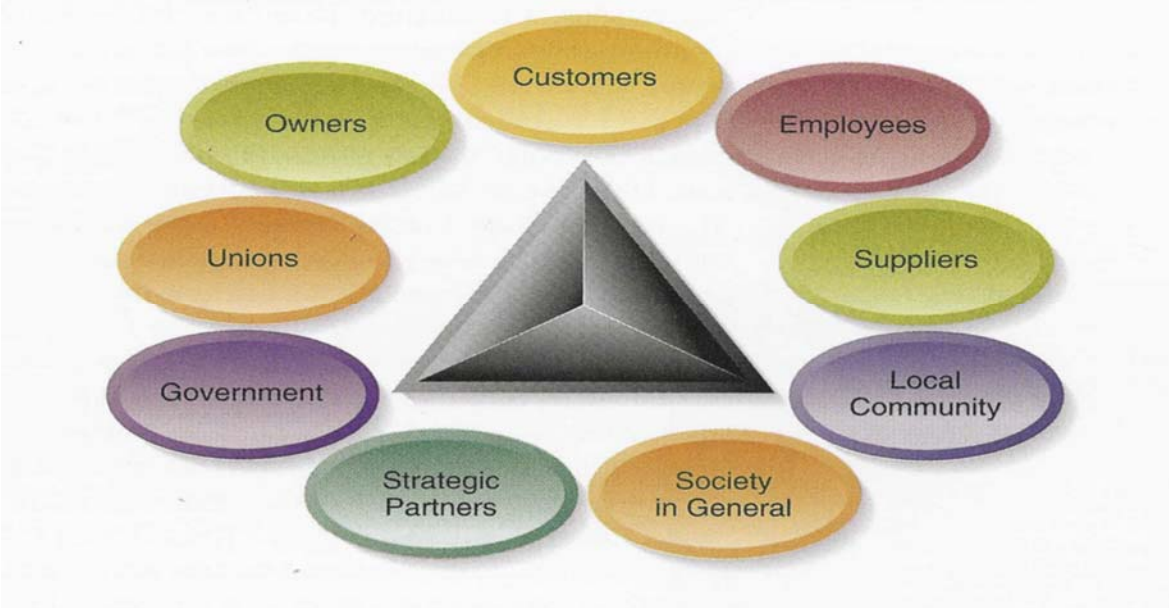

Figure 7. Stakeholder Identification Model: Stakeholders of the Organization
Source: Don Hellriegel, Susan E. Jackson, and John W. Slocum, *Management*, 8th ed. (South Western College Publishing, 1999), 199.

Both models used have unique corporate perspectives and application. Post Preston, and Sachs use the first model to support their assertion that "The legitimacy of the corporation as an institution, its "license to operate" within society, depends not only on its success in wealth creation but also on its ability to meet the expectations of diverse constituents who contribute to its existence and success. These constituencies and interests are the corporation's stakeholders--resource providers, customers, suppliers, alliance partners, and social and political actors. Consequently, the corporation must be seen as an institution engaged in mobilizing resources to create wealth and benefits for all its stakeholders."[2] Hellriegel, Jackson, and Slocum use their model to "explain how the stakeholder approach can be used to guide ethical decision-making and action."[3] They

assert, “Each group of stakeholders has somewhat different concerns. That is, each cares more about some aspects of an organization’s activities and less about others.”[4] Both stakeholder identification models have unique corporate applications. However, at the same time, they both have unique elements that, when fused, are useful in identifying the stakeholders for the HM&E equipment.

Given the corporate perspective and unique differences of the two models, an effective solution for the current research topic in this thesis may be developed by comparing and fusing both models to come up with a single stakeholder identification model applicable to the research of a public (government) versus a private (corporate) organization (see figure 5). While the basic principles of management remain the same, private sector management is different from public sector management. According to Downs and Larkey, the differences lie in “(1) the nature of public agency goals; (2) the limitation on executive authority, and (3) shorter time horizons (to make decisions).” [5] Therefore, “govermentalizing” the stakeholder identification models is necessary to identify the HM&E Equipment Standardization Program stakeholders. To rationalize the model with that of the two corporate models, it is helpful to identify the Navy as a production organization. The product and service is “Sea Power.” The market is the maritime domain and beyond. The individual organizations and units are production facilities that produce their own unique product or service that contributes to the end product--Sea Power.

Activities and Competing Objectives

Next, activities that influence HM&E equipment standardization were identified and scrutinized to identify competing objectives and stakeholder trade-off decisions that result from these activities. Using existing research, socio-political, economic, technical, and policy activities in the HM&E equipment environment were first identified and organized. The activities were organized and presented based on military operational levels (National Strategic, DoD Strategic, Navy Operational, and Navy Tactical). Presenting the data in this manner helps to frame the issues based on spheres of influence and avenues of approach to resolve the issues. The resultant competing objectives and stakeholder trade-off decisions were identified. Then, competing objectives resulting from activities identified were compared to the reasons stated in existing literature as being the root causes for the lack of standardization. The comparison was made in order to identify similarities and associations. Additionally, the comparisons were made in order to defend or oppose the assertion that competing objectives are the root causes for the lack of standardization. By using the methodology outlined above, a disciplined approach to obtaining and analyzing data is used to help gain a better understanding of the role that activities in the HM&E environment play in achieving or not achieving a greater degree of HM&E equipment standardization.

Optimizing The Hull, Mechanical, and Electrical Equipment Standardization Program

After identifying and analyzing the impact that stakeholders, activities, and the associated competing objectives and stakeholder trade-off decisions have on the standardization process, recommendations to minimize the impact of the same are

provided. To make recommendations, contemporary change and transformation models and concepts were explored to identify the best practices that are most applicable for affecting the desired change to enable the standardization process/program to be optimized.

Recommendations were structured to mirror the manner in which the research was organized. First, recommendations were made to minimize the impact of the unique stakeholder contributing issues. Then, recommendations were made to minimize the impact of the identified activities. In the end, general recommendations concerning the overall program are addressed.

Summary

An established, thorough, and disciplined approach was utilized to conduct the research required and present the data needed to answer the primary and secondary research questions as well as to make the appropriate recommendations. Qualitative research practices were applied to collect the data required. These practices include the use of primary, secondary, and tertiary research literature. Additionally, interviews were conducted. After identifying and obtaining the requisite data sources, data were drawn from these sources and organized using standard research methodologies. First, stakeholders were identified and analyzed based on the HM&E equipment standardization identification model exhibited in figure 5. Then, activities in the HM&E equipment environment were identified, analyzed, and compared. Applying the research methodologies and organizing the data as stated helped to maintain discipline and integrity in the research process used in this thesis.

[1]James E. Post, Lee E. Preston, and Sybille Sachs, *Redefining the Corporation: Stakeholder Management and Organizational Wealth* (California: Stanford University Press, 2002), 22.

[2]Stanford University Press, *Redefining the Corporation: Stakeholder Management and Organizational Wealth*, http://www.sup.org/book.cgi?book_id=4304%204310%20 (accessed 7 November 2007).

[3]Don Hellriegel, Susan E. Jackson, John W. Slocum, *Management*, 8th ed. (South Western College Publishing, 1999), 197.

[4]Ibid.

[5]George W. Downs and Patrick D. Larkey, *The Search for Government Efficiency: From Hubris to Helplessness* (New York: Newbery Awards, Inc., 1986), 50.

CHAPTER 4

FACTS, FINDINGS, AND ANALYSIS

Introduction

The primary research question is: How can the Navy minimize the impact of competing objectives and stakeholder trade-off decisions to obtain an optimal HM&E standardization system representing the best-fit solution for its surface force? This chapter provides detailed facts and findings that support the author in answering the primary and secondary research questions. Chapter 1 served as a stage setter. It gave the reader insight into the background, problem, and importance of this research. In Chapter 2, the author detailed the results of literature reviews and tested the relevance and significance of this research. The author determined that the research is significant and relevant based on the literature review. In chapter 3, specifics about the overall research process and details about the data collection and organization procedures were presented. The information in chapters 1-3 laid the foundation for the actual data collection, organization, and analysis performed in this chapter.

In this chapter, the author builds upon the work presented in chapters 1-3. Facts, findings, and analyses are presented before moving on to chapter 5 to close the research with conclusions and recommendations. A methodical approach is used to develop this chapter. As discussed in chapter 3, the stakeholders and their respective missions, goals, and or objectives are first identified using the HM&E equipment stakeholder identification model discussed in chapter 3 (see figure 5). Additionally, the activities the stakeholders undertake to achieve their organizational goals are identified. In the end, the missions, goals, and or objectives along with the respective stakeholder activities are

compiled in a list and analyzed to identify competing objectives and stakeholder trade-off decisions. Next, activities that influence the HM&E equipment standardization process are identified and organized based on military operational levels (National Strategic, DoD Strategic, Navy Operational, and Navy Tactical). Then, the same are compared to reasons stated in existing literature as being the root cause for the lack of standardization in order to identify similarities and associations to oppose or defend the assertion that competing objectives and stakeholder trade-off decisions are the true root causes for a lack of standardization. As a result, a better understanding of the root cause for the standardization problem will be developed. Further, data will be presented that serve as the precursor for the summary and conclusions in chapter 5.

HM&E Equipment Program Stakeholders' Mission, Purpose, Goals, Objectives, Responsibilities, and Activities

There are various HM&E equipment stakeholders. The term stakeholders as used in this research is defined as individuals or groups who have an interest, right, or ownership in an organization; are affected by, or can influence, the issues and activities of the organization. In this thesis, the HM&E Equipment Standardization Program with its mission and purpose is defined as the organization in which others have an interest, right, or ownership stake. The people who affect or are affected by, influence or are influenced by, the activities of the HM&E Equipment Standardization Program are identified as the stakeholders. Details about the mission, purpose, goals, objectives, responsibilities, and key activities undertaken by identified stakeholders are collected and compiled in Appendix B using the stakeholder identification model discussed earlier. The terms mission, purpose goals, objectives, responsibilities and key activities have gray

lines in terms of their meanings relative to each other. Throughout the research process, in many instances it was hard to identify and distinguish one from the other. In the final analysis, the role each person or organization plays in the standardization process is clearly articulated by what has been identified as their mission, purpose, goals, objectives, responsibilities, and key activities.

In this section, facts and findings are identified with respect to the role stakeholders play in the HM&E standardization process. To identify the roles, key management activities that relate to and impact the overall HM&E equipment standardization process were identified. Ship's management and HM&E Equipment Standardization Program management activities were identified. The ship management activities involve accepting and taking full ownership of the ships of the Surface Force and performing in-service ship management. The HM&E standardization program activities involve standardization program management and standardization execution management. These are critical activities. If they are not executed with proper management finesse, a poor HM&E equipment standardization posture can exist.

These facts are carefully analyzed to identify competing objectives and stakeholder trade-off decisions that exist in the HM&E environment. The competing objectives and trade-off decisions are listed in the associated sections. Later, they are used to formulate conclusions and recommendations.

Accepting Full Ownership

Various activities assume some degree of ownership of different parts of the ship at different periods during a ship's life. However, only one entity can claim full ownership and decision rights to manage the Navy's ships for optimal performance.

Naval Sea Systems Command (NAVSEA) engineers and builds the Navy's ships and then turns them over to Fleet Forces Command (FFC). NAVSEA receives the ship back from FFC when the ship is decommissioned or made inactive. Naval Supply Systems Command (NAVSUP) provides the material and logistics support to build and maintain the Navy's fleet. Material inventory management and accountability to support operational readiness is a key issue for NAVSUP. NAVSEA's engineering activities also have a sense of ownership for the performance and material readiness of ships. Nevertheless, FFC and its subordinate commands own the ships of the fleet. The primary subordinate command is Commander Naval Surface Forces (SURFOR) who oversees the activity of the Surface Force utilizing two primary subordinate organizations, Commanders Naval Surface Forces Atlantic and Pacific. They are ultimately responsible for equipping and maintaining the ships material and operational posture. As stated in FFC's 2007 Annual Plan, FFC serves as the "single voice for fleet requirements."[1] FFC and its subordinate commands partner with resource sponsors (OPNAV) and resource providers (NAVSEA NAVSUP) to "coordinate and standardize policy for maintaining fleet operation forces."[2] Additionally, FFC coordinates with other supporting units internally and externally to its organization to obtain material and support services to equip the Navy's fleet of ships.

Accepting full ownership of the ships of the Surface Force goes hand in hand with accepting full responsibility and accountability. Having full responsibility and accountability, the owner must have control of the resources and unlimited decision rights to make decisions as he sees fit to ensure optimal management, oversight, and operational readiness. Uninhibited management, oversight, and decision rights must

accompany the responsibility and accountability for operational performance. FFC has responsibility and accountability for the operational performance of the Surface Force. Therefore, it must have the resources, decision rights, and full latitude to manage and influence ships' management as it sees fit.

In-Service Ship Management

Many activities have a role in the management of in-service ships. Their roles are unique and based on the nature of the service or material support the organization provides. Some of the organizations that provide in-service ship management are Program Executive Office (PEO)-Ships, Commander Naval Surface Forces Atlantic (SURFLANT) and Pacific (SURFPAC), the Surface Warfare Enterprise (SWE) and Class Squadrons (CLASSRONS). The designated roles they play have a significant impact on how the ships are equipped and how material readiness is maintained. In many cases, the roles are blurred and people or organizations appear to do redundant work.

Program Executive Office (PEO)-Ships is a part of the NAVSEA organization. Commander, PEO Ships reports directly to Assistant Secretary of the Navy for Research Development and Acquisition regarding acquisition management and to the Commander of NAVSEA regarding support for in-service vessels. PEO Ships is a new organization. It was established in 2002 to create a stronger business focus and a more flexible and cost-effective management approach for developing and integrating technologies and systems across multiple ship classes. PEO Ships "manages acquisition and complete life-cycle support for all US Navy non-nuclear surface ships"[3] and "maintains "cradle to grave" responsibility including research, development, acquisition, systems integration,

construction and lifetime support. At the end of a ship's life, PEO Ships manages formal decommissioning from the Fleet."[4]

The primary in-service ship managers are the Force Provider staffs, SURFLANT and SURFPAC, working with the individual ship commanders and sailors aboard the respective ships. SURFLANT and SURFPAC are "responsible for equipping, and maintaining the material readiness and long term wholeness of platforms."[5] They are ultimately responsible and accountable for the overall operational and material readiness of the ships assigned to their commands. They play a major role in determining how the ships are equipped and maintained

The FFC's recent SWE initiative supplements existing Surface Force management and oversight processes. The overall objective of SWE is to produce "Warships Ready for Tasking." To achieve this objective, the SWE seeks to align and synchronize Surface Force leadership and actions externally with organizations supporting the Surface Force and internally among each other. The aim is to provide "warships ready at the right time, place, and cost . . . every time" by lowering total ownership costs, transforming sustainment and modernization strategies while serving as stewards of taxpayers' dollars.[6]

Class Squadrons are one of the latest management initiatives implemented to increase efficiency and effectiveness of surface ship operations. A CLASSRON is a "functional command organization specific to a particular ship class, which execute processes that ensure all ships within that particular class are at the right levels of combat readiness and available for tasking by combatant commanders."[78] The purpose of a CLASSRON is "to expand operational availability."[9] The goal is "to assess current

readiness, analyze metrics across ships of a class, examine class trends, determine root causes, establish lessons learned and provide recommendations and solutions, while emphasizing readiness and cost control processes."[10]

All of the activities noted above, in some form or fashion, support the basic functions of equipping, lowering total ownership costs, and maintaining material readiness of the Navy's fleet of ships. PEO Ships and the new CLASSRON organization have an almost similar focus of maintaining broad management perspectives for cost control and operational efficiencies and readiness across a specific class or multiple classes of ships. They all have similar responsibilities for cradle-to-grave or long-term wholeness of ships. However, the specific function for each command is not the same. They share some basic functions but operate under different command policies and use separate fiscal resources to execute their duties and responsibilities.

Hull, Mechanical, and Electrical Equipment Standardization Management

The HM&E Equipment Standardization Program has a complex organizational and management structure. The program has many ambiguous boundaries. It operates under the auspices of the DSP. There are many individuals and offices assigned standardization duties and responsibilities. There are even "ad hoc" teams that pursue standardization goals and objectives. But, identifying exactly who controls the resources and maintains overall decision-making responsibility and authority is difficult.

The Defense Standardization Program Office (DSPO) has the lead for DoD standardization initiatives. This office is responsible to the Under Secretary of Defense (Acquisition, Technology, and Logistics) and provides overall policy guidance for the

DSP. “The DSPO interacts with other federal agencies, defense treaty organizations, and non-government standards bodies on standards policy issues. DPSO also occasionally funds selected projects to promote standardization throughout DoD. The Director of DSPO serves as DoD’s Executive Agent for the DSP. He has authority over all functions of the DSP and chairs the Defense Standardization Council.”[11] The Defense Standardization Council is comprised of the Chair (DoD’s Standardization Executive), Acting Assistant Deputy Under Secretary of Defense, the Navy’s Standardization Executive, Deputy Assistant Secretary of the Navy for Acquisition and Logistics Management (DASN A&LM), and the Defense Logistics Agency Standardization Executive, Office Code: J-334.[12]

There are designated Departmental Standardization Officers (DepSo) in the various Defense Departments and Agencies. DepSos are responsible for managing and executing standardization policy, processes, practices, and initiatives in their respective organizations. The Navy’s DepSo is currently Mr. Jeff Allan of Naval Air Systems Command. He serves as a liaison between Defense Standardization Council and individual Navy command, program, or initiative representatives. There are individual command representatives for NAVSEA, NAVSUP, engineering, and Fleet Forces activities. Command representatives have document review responsibilities but little or no standardization decision responsibilities. The Navy DepSo position and command, program, and initiative duties are not a primary duty responsibility. The people involved in standardization program activities do so as a collateral job assignment.

The HM&E Equipment Standardization Program, in its officially capacity, is an administrative program with little to no management controls to affect standardization.

The official organizational entity is more of a policy management and support activity. The management chain is blurred along the lines of who is responsible for what, and what authority it actually has to make standardization a reality.

Hull, Mechanical, and Electrical Equipment Standardization Execution

Various internal Navy activities support standardization goals and objectives. In addition to the individuals officially assigned as command standardization representatives, there are various standardization committees, teams, and programs specific to HM&E equipment standardization. Some of these committees, teams, and programs include the Parts Management Program, Item Reduction Program, HM&E ESC, SWE Best Value Selection Process Team, Top Management Attention (TMA) and Top Management Interest (TMI) Program. These teams work as fragmented and pigeonholed organizations but they make up the true HM&E Equipment Standardization workforce.

The Parts Management Program is a standardization initiative to determine the optimum parts to use while considering all the factors which may affect the application, standardization, cost, availability, technology (new and aging), logistics support, diminishing manufacturing sources, and legacy issues. The intent is to achieve effective parts management in order to: (1) enhancing the interchangeability, reliability, and availability of parts; (2) minimize the proliferation of parts and drawings through standardization; (3) minimize diminishing source impacts and parts obsolescence; and (4) promote the use of non-Government standards and commonly used industry parts.[13] The Parts Standardization and Management Committee leads the program. This committee is

a combined Industry-Government body chartered by DSPO with the objective of reducing total life cycle costs and promoting commonality of parts and processes.

The Item Reduction Program is another DSPO sponsored program. “The purpose of the program is to reduce, to the highest degree practicable, the number of sizes and kinds of items in the Federal Supply System that are generally similar.”[14] To identify candidate items that can potentially be deleted from DoD-Navy inventory, studies are coordinated with all recorded users to determine a single item that can satisfy the requirements of one or more items.

The HM&E ESC is a joint NAVSEA-NAVSUP initiative. The mission is “to identify standardization opportunities, craft procurement strategies and identify strategic procurement vehicles while supporting Department of Defense and Department of the Navy standardization objectives.”[15] Membership in this committee consists of leadership, logistics and contracting representatives from NAVSEA, NAVSUP, OPNAV, DASN (A&LM), DASN (SHIPS), Commander Fleet Forces Command (CFFC), and PEOs (Carriers, Submarines, and Ships). The ESC has four working groups that address standardization with respect to new construction, repair and overhaul, commodity management, and governance respectively. The goals of this group are “to increase Fleet material availability, dramatically reduce the introduction of non-standard HM&E equipment into the fleet, reduce overall life cycle costs associated with the introduction of non-standard HM&E while maintaining or reducing the procurement cost of HM&E for new construction, maintenance, modernization and repair.”[16]

The Best Value Standardization Process Team is another standardization initiative that supports SWE goals and objectives. This team works closely with the HM&E ESC.

The mission is to "develop a "Best Value" process, instill a "Best Value" culture, and provide cost-wise decision-making ability for the selection of Navy Hull, Mechanical and Electrical (HME) material."[17] The goal is to achieve "a 10 percent reduction in new or previously unsupported material realized over five (5) years across the Surface Warfare Enterprise."[18] Membership on this team consists of most of the same representatives from the ESC.

The Top Management Attention (TMA) and Top Management Interest (TMI) Program is a FFC lead initiative. The CFFC Maintenance Officer is responsible for the program. The TMA and TMI programs are processes to "identify top material readiness and cost problems and develop solutions that effectively and efficiently achieve approved levels of performance while realizing near-term returns on investment."[19] The purpose of this program is to develop and disseminate HM&E and Combat System (CS) Technical Ticklers that identify common maintenance issues between Fleets.[20] Participants include Fleet Forces Command (CFFC and TYCOM Maintenance Officers), CNO (N43) and applicable Resource Sponsor (N7, N6) representative(s), Maintenance and Supply representatives from Fleet, TYCOMs, and Regional Maintenance Centers, Commander Naval Sea Systems Command Program Offices, engineering codes and logistics codes representative(s), In-Service Engineering Agent representatives, Naval Inventory Control Point (NAVICP) representative, Training Command representative, Naval Research Laboratory representative, and Board of Inspection and Survey representative.[21]

All of these programs have the same basic objectives: reduce lifecycle costs, improve readiness, minimize the proliferation of new equipment, address obsolescence, and partner with industry. But, although they have the same basic functions, they operate,

for the most part, as totally distinct entities out to solve their own list of standardization problems. They have little to no operating budgets and inadequate resources to conduct the full spectrum of activities required to execute a properly managed standardization program. These groups are not staffed or funded to fulfill the task they are assigned.

Hull, Mechanical, and Electrical Equipment Standardization Program Activities

In this section of the paper, activities that influence HM&E equipment standardization are analyzed. The activities are organized based on the level of military operations in which the activities occur. Competing objectives and stakeholder trade-off decisions are identified and noted. Later they will be used to formulate conclusions and recommendations.

National/Strategic Arena

Various strategic and national level activities occur that impact the HM&E equipment standardization for the Surface Force. While these activities occur miles away from any ship, they have a significant impact on basically all of the ships. Several specific activities that create competing objectives for the HM&E standardization program are the Presidents responsibility to create a healthy economy, the Environmental Protection Agency's programs for minimizing water and air pollution, and congressional representatives being savvy politicians.

Creating a Healthy Economy

As Chief Executive of the United States, The President has many responsibilities, objectives and priorities while a leading a large government organization. In the 2008

Budget Fact Sheet, the President noted his priorities of "A Balanced Budget By 2012, While: Keeping the Economy Strong and Taxes Low, Spending Taxpayer Dollars Wisely, Combating Terrorism and Protecting the Homeland."[22] As noted in his September 2007 address to Congress concerning the passing of FY 2008 Appropriations Bill, President George W. Bush highlighted the significant responsibility both he and Congress share in keeping a strong economy. He noted how the economic decisions and actions of those in Washington affect the basic well-being of the American people.

> This is an important time for our economy. For nearly six years we've enjoyed uninterrupted economic growth. Since August 2003, the economy has added more than 8.2 million jobs. Productivity is growing, and that's translating into larger paychecks for American workers. Unemployment is low, inflation is low, and opportunity abounds. The entrepreneurial spirit is strong. You know, this economic vitality just didn't happen--in other words, it's--I think it's the result of hard work and people dreaming big dreams and working hard to fulfill them. I also believe it's the result of pro-growth economic policies. And the job in Washington is to keep the environment sound for investment and for growth.[23]

A healthy economy translates into economic growth supported by more money circulating in the economy, lower inflation, more discretionary income, greater business revenue, more investment activity, more entrepreneurial activity (small business growth) and technological innovations (research and development), more jobs, and increased wages.

One way to attain a healthy economy is for the President and Congress to establish policy that promotes economic growth. Over the years, there have been various socioeconomic policies such as the 1984 Competition in Procurement Act, Federal Acquisition Streamlining Act (FASA), Small Business Set Aside Policy, and Acquisition Reform These policies promote government procurement of Commercial-Off-the-Shelf (COTS) material and Non-Developmental Items (NDI) based on performance

requirements. For the Navy, buying COTS resulted in a reduction in the procurement of equipment designed to military specifications. Additionally, because the Navy procured COTS and NDI items, the time required to procure and deploy technology decreased significantly. However, this capability came at a cost. With greater material options based on market place availability and rapid technological turnover, the Navy realized an increase in the make, models, and variations of HM&E equipment used throughout the fleet. The increase in material options, availability, and desire and or need to deploy the latest and greatest technology, complicated the Navy's inventory. The good intent for the economy resulted in larger material options, easier deployment capabilities, and greater inventory diversity for the Navy.

Trade-Offs: Standardization versus national economic growth, entrepreneurial activity, and technological innovations

Protecting the Environment

Along with socioeconomic policies, there are often environmental policies that influence the Navy's material use. Increased environmental concerns and continuous efforts to reduce environmental pollution is a major issue for the Navy. Whether it is equipment to support clean air and water pollution mandates or reduce environmental impacts during equipment disposal, the Navy is constantly trying to satisfy ongoing and incrementally higher environmental standards imposed by its sister federal agency, the Environmental Protection Agency. As a result, items of equipment onboard ships are replaced more frequently to meet environmental standards.

Trade-Off: Standardization versus environmental pollution

Politics

Politics plays its role in the standardization process. Congress represents the interest of the people who are their constituents. Like the President who has a responsibility to promote an environment of economic growth through policy for the entire nation, congressional representatives have a similar responsibility at a smaller scale within their states or congressional districts. Additionally, they share the burden of looking out for the economic well-being of the entire American populace with the President. Some responsibilities congressional representatives have that impact HM&E equipment standardization include protecting the industrial base and providing policy and funding to support effective and efficient military operations. In carrying out their responsibilities, congressional representatives' dual roles often result in conflicting actions. The Comptroller General of the United States, The Honorable David Walker, testified before the Committee on Homeland Security and Governmental Affairs, US Senate, concerning systematic acquisition challenges that warrant attention, he noted:

> Congress sometimes forces the Department of Defense to buy items (e.g. weapon systems) and provides services (e.g. additional health care for non-active beneficiaries, such as active duty members' dependents and military retirees and their dependents) that the department does not want and we can not afford.[24]

In other instances, there are cases where the government ordered the Navy to contract for a class of ship using a dual contracting procurement method (single class of ship built by two separate shipyards). One can assume the intent behind both actions, while good at heart, served to either protect a certain industry or companies of that industry or stimulate economic prosperity for the industry or region of the particular business. In either case, there is the potential for a negative impact on the Navy Standardization Program. If the selected companies do not offer material already in the

supply system or the two shipyards do not collaborate for maximum material standardization possibilities, HM&E equipment standardization can suffer.

All of these activities have the well-being of individuals, companies, industries, or congressional district constituents at heart. Relative to standardization, these activities trade-off the efficiencies and costs savings associated with standardization for economic growth, entrepreneurial activity, reduce harm to the environment, protecting required industry capacity for military use.

Trade-Offs: Standardization versus economic prosperity for a particular congressional district and protecting a company or industry economic well-being or capacity

Department of Defense Strategic Arena

In the DoD strategic level of military operations, there are various activities that create competing objectives for the standardization program. Initially, these activities appear supportive of government operational efficiency initiatives. But a second order affect is also imposed on the HM&E equipment standardization program. Some of these activities include the use of COTS and NDI; implementation of the Competition in Contracting Acquisition (CICA), performance specification, and evolutionary acquisition and spiral development philosophies; and execution of the Performance-Based Logistics (PBL) Concepts, Program Management activities and appropriations and funding practices.

Use of Commercial-off-the-Shelf and Non-Developmental Items

In support of the President and Congress' socioeconomic and government efficiency initiatives, DoD-Navy experienced culturally reforming acquisition policies. As a result, DoD-Navy pursued increased procurement of COTS and NDI items. Mr. Greg Saunders, Director of the Defense Standardization Program Office, noted DoD should use COTS because it provided "the latest technology, shorter development cycle, ready availability, reduced acquisition costs, lower support cost, faster technology refresh cycle, leverage commercial investments, benefit from best commercial practices, open system architectures, and more flexible, scalable, and configurable."[25] He listed additional factors that are driving DoD's use of COTS which include: "rapidly evolving technology, dramatic worldwide market growth, explosion of commercial use, shrinking DoD market share, declining supplier base for "Mil-Spec" components, and the need for the latest technology to maintain the technological lead."[26] Additionally, he noted COTS' success stating, "The business model works because the incentives and market pressures compel economically rational decisions, resulting in constant innovation, little waste, and a rising standard of development. COTS products adapt to avoid becoming obsolete. Open Market success brings competition and lower prices. A competitive market creates broader choices. Inferior products lose market share or die. A commercial developer is motivated to minimize cost and shorten development cycles."[27] On the other hand, he noted ongoing issues with COTS that included "obsolescence, inconsistent and short term availability, fast turning commercial technology, constantly changing Integrated Circuit (IC) design and processes, and IC changes "react differently" in some DoD applications."

The argument for the use of commercial items is significant. The issues that come along with them are equally significant. These issues serve as primers for non-standardization in HM&E equipment. By using commercial HM&E products, DoD-Navy is supporting a healthy economy. At the same time, DoD-Navy is assuming a significant amount of risk and uncertainty relative to the HM&E Equipment Standardization Program. A high churn of COTS and NDI items requires continuous training, technical manual updates, as well as removal, installation, and disposal costs that increase equipment lifecycle costs.

Trade-Offs: Standardization versus access to the latest and greatest technology available in the market, material cost reduction, support for the commercial market place, and value for taxpayers' dollars

Competition in Contracting Acquisition Philosophy

The Competition in Contracting Act (CICA) of 1984 established full and open contracting for the procurement of federal goods and services. Full and Open Competition requires the widest advertisement and most transparent procurement process possible. The intent is increased competition for best-valued goods and services at the lowest possible price while including the maximum number of qualified providers in the selection process. The requirement for full and open competition comes with possibilities for a waiver under exceptional circumstances. When a Contracting Officer has defined requirements, he operates under fiscal year time and funding constraints. When he has undefined requirements, he can let a contract with ceiling quantities for multiple years up to five years. In this case, he must consider funding availability and constraints. The use of Full and Open Competition gives equal opportunity and footing for maximum

participation of all qualified goods and services providers that can satisfy specification requirements. This allows increased government visibility of what is available in the market and improved procurement selection of best-valued material (trade-off of technical and cost factors). While this process favors best-valued procurement and supports CICA's intent, it can be counterproductive to HM&E equipment standardization. If technically compliant material exists in the market at a lower cost than that currently used, at times it can be difficult to justify a contract award decision for standardization's sake. CICA has its advantages, which include (1) smart spending of taxpayer dollars, (2) supporting the commercial marketplace, (3) allowing material differences evaluation, and (4) promoting the selection of the best-valued material. There are also disadvantages such as (1) increased complexity of achieving standardization objectives, and (2) continually growing population of diversified equipment inventories if procurements are frequent and decisions to exploit technological advances remain constant.

Trade-Offs: Standardization versus inventory discipline, competition for best-valued goods, equal opportunity for maximum vendor participation in government contracting, maximum government and evaluation of market material availability, support for the commercial market place, and value for taxpayers' dollars. Competition versus limited competition priorities compete with each other.

Performance Specification Philosophy

The performance specification requirement is a procurement philosophy "that results in greater flexibility with respect to equipment design and competition, which is intended to produce better quality at the lowest possible price."[28] The intent is to reduce

the stringency and increase the ability to meet military material requirements. Meeting the intent occurs in conjunction with opening the door for commercial material use in military applications. The mandated use of procurement specifications curtailed the use of military specifications. The reduction in the use of military specs, like other acquisition reform strategies, runs counter to standardization goals and objectives. Greater material options are available from more suppliers in an environment characterized by evolving technology and lower prices. Sands, Lu, and Loughlin noted that "achieving standardization is often in direct opposition to the use of performance specifications and commercial-off-the-shelf items."[29]

Trade-Offs: Standardization versus material cost reduction, support for the commercial market place, access to the latest and greatest technologies, and better material quality. Material cost reduction competes with better material quality and access to the latest and greatest technology objectives.

Evolutionary Acquisition and Spiral Development Philosophy

According to a memorandum[30] from Under Secretary of Defense for Acquisition, Technology and Logistics, The Honorable E. C. Aldridge, Jr., dated 12 April 2002, evolutionary acquisition is a "strategy that defines, develops, produces or acquires, and fields an initial hardware or software increment (or block) of operational capability."[31] There are two basic approaches to evolutionary acquisition. One approach defines the ultimate functionality at the beginning of the program and each deployable increment determined by the development of key technologies. In the second approach, the ultimate functionality cannot be defined at the beginning of the program and each increment of

capability is defined by the maturity of new technologies. Both evolutionary acquisition approaches depend on the maturation of technology for increased capability.

Spiral development represents an iterative process for developing a defined set of capabilities within one increment through continuous interaction between user, tester, and developer. The requirements are defined through experimentation and continuous user feedback in order to provide the best capability within the increment. There may be additional increments with a number of spirals.

The aim for both the evolutionary and spiral processes is to reduce cycle time and time for delivery of advanced capability to warfighters. The underpinning of both strategies is the continuous and almost immediate exploitation of the latest and greatest technology. Under both acquisition strategies, numerous variations of a particular piece of equipment may exist. The variations could exist due to the inability to conduct a technology refresh on all items at one time. This could occur because of a lack of funding or inability to obtain access to the material.

Trade-Offs: Standardization versus decreased time to field new technologies and use of the latest and greatest technology

Performance-Based Logistics Concept

Performance Based Logistics is a support strategy. The aim is to optimize in-use weapon system support through strategic partnerships with a Product Support Integrator (PSI) (a commercial or organic support facility). It places the burden and single point of accountability for a systems performance on the PSI. The PSI is normally responsible for all facets of the system's support to include repair and replacement parts management. Under this strategy, the Navy typically has no material support requirements. The burden

and choice for material support rest with the PSI. PBLs are "the Navy's preferred approach for product support implementation."[32]

Trade-Offs: Standardization versus system performance and material management

Program Management

Program Managers (PM) are critical to the standardization process. Their due diligence and sound decision-making in the planning and development phases of system and material development are necessary to achieve standardization. The PM works through an Integrated Product Team (IPT) composed of a diverse group of functional experts. The Program Manager must weigh performance versus cost, time to delivery versus quality, and technology versus supportability. They operate under various constraints. However, currently, they are not bound to comply with any standardization requirements. Few reporting requirements exist with regards to their accountability for standardization requirements. DoD Instruction 5000.2 only requires a PM to submit a one-line summary of the total life cycle costs. Standardization is a consideration not a mandate.

Trade-offs: Standardization versus system performance, delivery time to field new material, cost, supportability, and use of the latest and greatest technology. There is also the issue where the use of the latest and greatest technology also competes with acquisition and lifecycle cost objectives.

Appropriations/Funding

The manner in which government agencies and contracts are funded creates a burden on the standardization system. Strategic partnerships increase the likelihood of

standardization by enabling long-term commitments and investment security. However, current funding policy typically allows for procurements with current-year or earmarked funds only. There are some exceptions. But, given the fact that most congressional representatives have a relatively short career lifespan, they are not keen to make financial obligations that would place financial obligations on future administrations. Therefore, actual funding policies and the perceived reluctance of congressional representatives to fund long-term commitments reduce the establishment of strategic partnerships. Strategic partnerships provide security to the industrial base, stabilize material support relationships, and serve as an enabler for equipment standardization.

Trade-Offs: Standardization versus strategic partnerships, industrial base shrinkage, and industry-Navy relationships stability. Establishing strategic sole-partnerships often conflicts with maintaining a diversified customer or supplier and can lead to a shrinking industrial base.

Navy Operational Arena

Engineering "Equipment Time to Market" Dilemma

The ability of the engineering community to rapidly identify and deploy technologically acceptable material is a significant factor in achieving and maintaining standardization. The inability of an end-user to obtain equipment quickly to repair or replace malfunctioned equipment can result in the end-user seeking alternative means to fix an existing equipment problem. Often, the equipment malfunction is a high-visibility and emergent problem that engineers seek to resolve quickly. However, engineers operate in a constrained environment. As indicated in other sections of this thesis, they have limited access to critical information due to inadequate information systems. However,

they have the significant responsibility of managing a dynamic market and deciding to employ the right material while considering optimal performance and costs considerations. The engineer's role in the HM&E standardization process is a critical. His decisions are affected by time, changing technology, and long-term and short-term cost considerations.

Trade-Offs: Standardization versus use of the latest and greatest technology and material cost reduction

Technical Data Rights Ownership

Access to technical data is important to equipment standardization. But, two major issues often hinder the use of technical data in the standardization process. First, technical data is expensive. PMs and engineers bear the burden of making decisions for equipment use based on the availability and affordability of technical data. Then, there are the contractor's concerns. As Marcus, Zografakis, Tedesco states, "Putting oneself in the place of a typical contractor for a moment, there is an inclination to view data rights as "propriety" or as a "partial fail safe remedy" to long term corporate well being."[33] A contractor may be a little reluctant to provide full access to his technical data in an era when reverse engineering and "copy-cat" tactics are prevalent. The engineer faces a buy or do-not-buy decision. The supplier faces the decision to provide or not provide rights to technical data. Potential cost constraints may influence the engineer's decision. Survivability, competitive advantage, profits, and market share may influence the supplier's decision.

Trade-Offs: Standardization versus engineer: lack of technical data, lack of key data for supportability, reduced control of equipment stability; supplier: competitive

advantage, profits, control of critical business data. In addition to the objectives that compete with standardization, there is also the cost versus ownership issue.

Ship Costs

According to Arena, Blickstein, Younossi, and Grammich,[34] over the past four decades, costs for new-construction ships are escalating at a rate exceeding inflation. Research indicates that standardization and associated requirements are key drivers for the escalating ship costs.[35] Standardization initiatives addressed during the shipbuilding process result in unplanned change orders and demand extra management attention. The extra management attention and unplanned changes come with a hefty price tag. Reports, overhead, labor, and material costs associated with change orders and extra management attention significantly impact the final cost of a new-construction ship. It is costly to attempt standardization at any point in the ships lifecycle.

Trade-Off: Standardization versus higher ship acquisition costs

Navy Organizational/Tactical Arena

Misuse of Shipment Prioritization

In an attempt to expedite delivery of material, end-users may misuse the shipment prioritization system. This assertion is difficult to prove. It is difficult to find sufficient data or evidence to support this claim. However, a GAO report on the analysis of DoD Lessons Learned Studies and prior GAO reports[36] argues the fact that end-users misuse the shipment prioritization system.

The defense distribution network has a shipment prioritization system that allows priority movement based on an urgency of need. The individual requesting the material

assigns a priority to a material requisition based on his or her personal assessment of the requirement. The priority ranges from one to fifteen. One through thee indicates the highest urgency. Four through eight is the second tier and often receives the urgency afforded material assigned a priority of one through three. A priority of nine through fifteen receives routine processing. In GAO's analysis, the misuse of the shipment prioritization in the initial phase of Desert Shield overburdened the system. As a result, the system was unable to respond effectively due to an overwhelming amount of high priority requisitions. In the end, distribution system managers issued material on a first come, first serve basis until theater managers provided clarifying guidance. This incident may serve as an indication of what happens on a routine basis in regular peacetime operations. The visibility of the wartime operations brought this issue to the forefront. The crux of the issue is that an abundance of high priority requisitions taxes the system. Material moves slower through supply channels when there is an influx of high priority requisitions without the requisite distribution capacity. As a result, end users increase the priority of other requisitions hoping that will expedite their material shipment and often times create material request transactions that result in duplicate orders. At this point, there are duplicate orders and the assignment of material becomes increasingly complicated. This results in a customer receiving material in an untimely manner or not at all. Ultimately, customers seek alternative sources for material to satisfy their requirements. In the end, the possibility of a nonstandard item entering the supply system increases significantly.

Trade-Off: Standardization versus mission accomplishment

Personal Performance and Accountability

The natural tendency for individuals to act in their personal self-interest is a basic principle of economic thought. An individual's self-interest can come in the form of individual self-interest or an organizational interest. The assumption is that people are rational thinking beings who seek to do what is right. However, they have a unique view of the world from the position where they sit. Their perspectives of an issue or dilemma, and the manner in which they resolve problems may differ from the way someone else would react in the same situation, under the same circumstances.

Decision-making and judgment are some of the most difficult tasks for a person. At the same time, they are the most prized skills a person can have. There are factors that complicate decision-making. Factors noted by Foreman and Shelly[37] include cognitive limitations of the human mind, insufficient time for deliberation, limited organizational resources for information gathering, and related problem solving constraints.

While serving in leadership capacities onboard a Navy ship or at a higher headquarters with responsibility for material standardization decisions, individuals are affected by self-interest and decision-making constraints. A decision concerning material selection for HM&E equipment can be different in each situation. Consequently, each decision can potentially negatively impact HM&E equipment standardization.

Trade-Offs: Standardization versus self and organizational interest and mission accomplishment

Inventory Management

Inventory Managers play a key role in HM&E equipment standardization. They are the link between supply chain associates, program managers, inventory, and customers.

In this capacity, they balance inventory levels with investment and storage costs, requirements from planning and requiring activities with resources available, and inventory availability with Supply Material Availability standards. They have the greatest responsibility for equipment inventory management and availability. They too have various competing priorities and objectives. Heavily influenced by the decisions of others, they find themselves balancing unplanned requirements, funding shortfalls, obsolescence, disposal policy, stocking policy, industrial base shrinkage, political pressure, misused shipment priority in addition to their own personal self-interests. They balance all of these incongruent priorities while supporting standardization objectives for the multiple pieces of equipment they manage.

Trade-Offs: Standardization versus material availability, storage cost, support for the commercial market place, industrial base shrinkage, and personal interest

Trade-Off Decisions

Many objectives that compete with the equipment standardization objective were noted above. Likewise, a thorough analysis of the activities above revealed some trade-off dilemmas. Trade-off decisions identified include:

Quality versus total ownership costs: Trade-off decisions made between lowering total ownership costs of new material acquisitions by using existing and proven technology that has a mature maintenance support system versus improving the

performance capability and ultimately increasing total life cycle costs by using the latest and greatest technology that is not well populated in the fleet and has an immature maintenance support system.

Standardization versus acquisition costs: trade-off decisions during the shipbuilding process when standardization requirements often drive ship acquisition costs.

Performance versus Costs: Trade-off decisions made by Program Managers when they have to decide whether to increase system performance by acquiring the latest and greatest technology or use materials that exist in current systems that will provide performance capabilities equal to existing systems

Cost versus Supply Material Availability: Trade-off decisions made by Inventory Item Managers between procurement and acquisition costs and storage costs versus not acquiring the material due to exceedingly high acquisition and storage cost.

Research and Development versus Standardization: Trade-off decisions made by business activities to standardize equipment for military use and therefore they do not use their Research and Development or engineering departments to develop new technologies.

A Comparison of Competing Objectives and Reasons for a Lack of Standardization

One of the objectives of this research was to determine whether competing objectives and the resulting stakeholder trade-off decisions were the true root cause of the HM&E equipment standardization problem. The proposition in this research is that competing objectives and stakeholder trade-off decisions were the root cause of the

standardization problem. To test the proposition, reasons stated in contemporary literature concerning the reasons for a lack of standardization are compared to the competing objectives identified in this research to see if there are similarities. Based on the comparisons of competing objectives identified above and the reasons for a lack of standardization outlined in Table 1, similarities exist.

There is a high correlation between the competing objectives identified in this research and the reasons for a lack of standardization identified in contemporary literature as identified in Table 2. HM&E standardization competing objectives identified in this research that correlate with reasons for a lack of standardization identified in existing research include: technical data rights ownership, program management objectives, appropriations and funding practices, escalating ship costs, competition in contracting, promoting a healthy economy, and protecting industries and the market. In many instances, reasons identified were competing objectives. The correlation between the competing objectives identified in this research and the reasons for a lack of standardization identified in existing research supports the proposition of this research. The proposition states that competing objectives and stakeholder trade-off decisions are the root cause of the standardization problem.

Summary

In this chapter, various aspects of the Navy Surface Force were analyzed to determine the role of competing objectives and stakeholder trade-off decisions play in the HM&E equipment standardization process. Mission, purpose, goals, objectives, and responsibilities were evaluated to determine key management activities that relate to and influence the overall HM&E equipment standardization process. The management

activities identified include ship and HM&E Equipment Standardization Program management activities. The ship management activities involve accepting and taking full ownership of the ships of the Surface Force and performing in-service ship management. The HM&E standardization program activities involve standardization program management and standardization execution management.

Activities that occur in the various levels of military operations were identified. The key management activities that influence the overall HM&E equipment standardization process and activities that occur in the various levels of military operations were also analyzed to identify competing objectives and stakeholder trade-off decisions that influence the Navy's standardization program. The following competing objectives and stakeholder trade-off decisions were identified:

1. FFC lacks adequate ownership control to affect greater standardization. FFC owns the ships of the Navy Surface Force and bears the ultimate responsibility and accountability to achieve the optimal equipping posture. Organizations other than FFC that are not under FFC's operational control have duties and responsibilities that influence how ships are equipped. These organizations have equipping responsibilities similar to FFC and other Navy organizations. FFC competes with other Navy commands for adequate ownership control necessary to affect the appropriate level of standardization in the Surface Force.

2. The official HM&E Standardization Program is a standardization facilitator only. The HM&E Equipment Standardization Program, is merely an administrative program with little to no management controls or resources to affect standardization.

Standardization Officers are not properly employed for the standardization cause. The HM&E Standardization Program competes for resources to affect standardization.

3. National Strategic Level activities affect standardization. These activities include creating a healthy economy, protecting the environment, and politics. Competing objectives and trade-offs that result from these activities include management and operational efficiencies and costs savings associated with standardization versus economic growth, entrepreneurial activity, reduced harm to the environment, and protecting industry or company economic well-being or capacity.

4. DoD Strategic Level activities affect standardization. These activities include (1) use of COTS and NDI, (2) competition in contracting, (3) use of performance specifications, (4) Evolutionary Acquisition and Spiral Development acquisition practices, (5) use of Performance-Based Logistics, (6) Program Management activities, and (7) appropriations and funding practices. Competing objectives that result from these activities include: access to the latest and greatest technology available in the market, material cost reduction, support for the commercial market place, value for the taxpayers' dollars, inventory discipline, better material quality, decreased time to field new technologies, system performance, material management, shorter material delivery periods, supportability, strategic partnerships, industrial base shrinkage, and industry-Navy relationships stability.

5. Activities that occur in the Navy's Operational Level of military operations affect standardization. These activities include: (1) Engineering "equipment time to market" dilemma, (2) technical data rights ownership, and (3) escalating ship costs. The competing objectives that result from these activities include use of the latest and greatest

technology, reduced material costs, lack of data for supportability, reduced control of equipment stability, supplier competitive advantage, supplier profits, supplier's control of critical business data and increased ship acquisition costs.

6. There are activities that occur in the Navy's Tactical Level of military operations that affect standardization also. These activities include: (1) misuse of shipment prioritization, (2) personal performance and accountability, and (3) inventory management. Competing objectives that result from these activities include mission accomplishment, self-interest (personal or organizational, material availability, storage costs, support for the commercial market place, and protecting the industrial base.

Various competing objectives exist at all levels of military operations. As a result, there are various trade-off decisions HM&E stakeholders must consider. Trade-off decisions identified include:

1. Quality versus total ownership costs
2. Standardization versus acquisition costs
3. Performance versus Costs
4. Cost versus Supply Material Availability
5. Research and Development versus standardization

A proposition of this thesis is that competing objectives and stakeholder trade-off decisions are the root cause of the standardization problem. In an attempt to defend or oppose this proposition, the competing objectives of this research were compared to the reasons cited in contemporary literature to identify correlation between the two. There was a high degree of correlation. Most of the reasons cited in other literature were competing objectives.

Table 1. Reasons for a Lack of Standardization

(Implied or directly stated from the findings, analysis, conclusions and recommendations of researchers respective work.)

Researcher	Reasons
Tedesco[38]	1. Lack of a set of criteria in which to judge the merits of a standardization project (decision system) 2. Lack of a detailed database of Vendor Furnished Information and application statistics (information system) 3. Need for more flexible equipment designs that incorporate advanced manufacturing practices and meet foreseeable customer requirements and unforeseen scenarios 4. Need for standardization and engineering detailed involvement in ship's design process and production planning 5. Need for increased quality partnership with vendors 6. Legal and political hurdles (Competition in Contracting Act of 1984, FAR in general, DoD 5000 regulations, FAR Section 16) 7. Stringent and producibility challenging military specifications 8. Lack of common material interfaces and mounting methods 9. More concurrent engineering and design required up front to incorporate producibility considerations and design 10. Lead ship standardization policy lack significant strength to require contractors to utilize fleet supported equipment when possible, as is the case for follow-on ships 11. Lack of effective incentives to motivate contractors
Corbett[39]	1. Lack of policy that directs Program Managers to support standardization 2. Lack of technical documentation 3. Cost of technical documentation 4. Engineering lack of adequate tools to aid the parts selection process 5. Inability to rapidly screen DoD inventories for common parts – cumbersome process 6. Slow acceptance of the Standardization Program 7. Inadequate monetary support for Weapons systems 8. Lack of a simple, reliable, and comprehensive Standardization Costing Model to aid decision makers 9. New ship construction 10. Equipment introduction shipyard overhauls and availabilities 11. Procurement competition 12. Existence of "duplicate" parts in the supply system 13. Lack of a comprehensive systematic approach to identify duplicate and similar parts that lend themselves to consolidation/standardization 14. Lack of education program that inform managers in headquarters activities about the detrimental effects of non-standardization and the savings which can result from standardization 15. Lack of support from all echelons of leadership 16. Lack of a single standardization proponent in the Navy 17. Lack of financial support for standardization programs 18. Standards Offices' lack of authority with respect to acquisition decisions 19. Hardware Systems Commands' internal standards offices lack authority and an appropriate mission

Researcher	Reasons
Logistics Management Institute[40]	1. Need to maintain standardization once achieved 2. Lack of rotatable pools of equipment to permit replacement in kind during shipyard repair and overhaul 3. Lack of equipment replacement methodology based on prescribed techniques for achieving Component and Equipment Standardization on In-Service Ships 4. Navy and shipbuilders lack visibility of suitable and reliable in-use components and equipment 5. Lack of ability to limit competition in the procurement of material 6. Procurement activities not buying material on a life-cycle cost basis 7. Lack of the use of a "Standardization Index" that measure potential benefit to anticipated investment in order to determine the optimum value for the number of different varieties and installations of a given type of component and to establish categories of component priorities in achieving standardization 8. The need to carefully select preferred standard components based on a comparison of relative support costs, total standardization costs, and life-cycle procurement costs 9. Lack of investment (budget) for standardization of components which are currently installed aboard in-service ships 10. Lack of a uniform analytical approach 11. The need for considerable analysis and planning effort 12. The need for a disciplined approach to selecting preferred components for standardization 13. The need for a formal program and policy for retrofitting component 14. The need for a "Component Replacement Schedule" 15. Lack of equipment interchangeability by commodity groupings 16. Lack of a replacement policy statement
Marcus, Zografakis, and Tedesco's[41]	1. Need to include standardization concepts in the acquisition process as early as possible 2. Lack of manufacturer's data needed to fully describe each item 3. Free enterprise system 4. Direct competitive strategies 5. Regulations 6. Need for a comprehensive on-going approach to standardization utilizing an interdisciplinary organization with the necessary resources to carry out its work 7. Need for a shift to contracts with high volume production runs 8. Need for greater use of the "lead yard" approach in procuring equipment to achieve standardization
Defense Standardization Program Case Study[42]	1. Lack of Engineering awareness 2. Lack of data access 3. Lack of effective any and/or effective acquisition incentives 4. Equipment obsolescence 5. Manufacturer turnover 6. Low Navy market share

Researcher	Reasons
McKenna[43]	1. Technological improvements 2. Incorporating new contract standards or specifications based on lessons learned regarding safety or performance 3. Business closing of suppliers causing a unique design to become obsolete 4. Activities in the contracting chain contribute to non standardization as they operate under a different set of values, schedules, priorities, and deadlines 5. Lack of sufficient research, analysis, and management data from shipboard units to SPCC detailing why the unit installed or removed a piece of equipment
Sands, Lu, and Loughlin[44]	1. Length of time between shipbuilding programs 2. Manufacturer turnover 3. Obsolescence 4. Lack of acquisition incentives 5. Navy market share 6. Lack of engineering awareness 7. Lack of Data Access and communication

Table 2. A Comparison of Competing Objectives and Reasons for a Lack of Standardization

White's Competing Objectives	Reasons for the Lack of Standardization as Stated in Existing Research
Technical Data Rights (cost and ownership versus standardization)	Tedesco 2. Lack of a detailed database of Vendor Furnished Information and application statistics (information system) Corbett 2. Lack of technical documentation Marcus, Zografakis, and Tedesco 2. Lack of manufacturer's data needed to fully describe each item Sands, Lu, and Loughlin 7. Lack of Data Access and communication
Program Management (use of latest and greatest technology and acquisition/lifecycle costs versus standardization)	Tedesco 4. Need for standardization and engineering detailed involvement in ship's design process and production planning Corbett 1. Lack of policy that directs Program Managers to support Standardization
Appropriations/funding (Budget/acquisition funding practices and long-term partnerships with industry versus standardization)	Tedesco 5. Need for increase quality partnership with vendors

White's Competing Objectives	Reasons for the Lack of Standardization as Stated in Existing Research
Escalating ship acquisition costs (cost of achieving standardization in new construction versus standardization)	Corbett 9. New ship construction
CICA (contracting competition requirements versus limited competition and standardization)	Tedesco 6. Legal and political hurdles (Competition in Contracting Act of 1984, FAR in general, DoD 5000 regulations, FAR Section 16) LMI 5. Lack of ability to limit competition in the procurement of material Marcus, Zografakis, and Tedesco 5. Regulations McKenna 4. Activities in the contracting chain contribute to non- standardization as they operate under a different set of values, schedules, priorities, and deadlines
White's Competing Objective/Root Cause	**Existing Research Reasons for the Lack of Standardization**
Promoting a healthy economy (protecting the well-being of businesses and industries in support of economic activity and growth versus standardization)	Marcus, Zografakis, and Tedesco 3. Direct competitive strategies 4. Regulations McKenna 1. Technological improvements
Protecting industries and the market (pushing Navy to use certain companies and preserving the industrial base versus standardization)	DSP Case Study 4. Equipment obsolescence 5. Manufacturer turnover 6. Low Navy market share McKenna 3. Business closing of suppliers causing a unique design to become obsolete Sands, Lu, and Loughlin 1. Length of time between shipbuilding programs 2. Manufacturer turnover 3. Obsolescence 5. Navy market share

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CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Discoveries

1. Competing objectives and stakeholder-centric trade-off decisions are the drivers for the lack of increased standardization.

2. The HM&E standardization problem is not so much a technical problem but more a problem of competing objectives.

3. National economic growth and emerging technology as competing objectives are significant drivers of the standardization problem.

4. The FFC competes with other Navy commands for adequate ownership control necessary to affect the appropriate level of standardization.

5. The HM&E Standardization Program competes for resources to affect standardization.

6. Competing Objectives and stakeholder-centric trade-off decisions heavily influence standardization.

Competing Objectives and Stakeholder Trade-Off Decisions are the Drivers for the Lack of Increased Standardization

This research has identified a number of factors, both inside and outside the naval organization, which influence HM&E equipment standardization. For each factor identified, a competing objective existed. Stakeholder trade-off decisions are the result of competing objectives. Therefore, wherever there is a competing objective there is the potential for a stakeholder trade-off decision. Competing objectives can exist without

having a customer-centric trade-off decision. Decisions may be made that are for the greater good, or others that are customer-centric (for the good of the individual and or the organization he or she represents).

Competing objectives exist between DoD-Navy and organizations outside of DoD-Navy, between organizations internal to DoD, and between individuals. Each competing objective is a priority for a stakeholder and at the same time, a detriment to the HM&E standardization program. In many instances, an HM&E stakeholder with direct responsibility for standardization initiatives may have more than one priority to meet. In many cases, the priorities were in direct conflict with each other. In this case, the goals of one of the priorities had to give way to another. At the core of every factor that influences standardization, there is a competing objective that constantly exists and that may rival the goals and objectives sought. Competing objectives are the root cause of the standardization problem.

The HM&E Standardization Problem Is Not So Much a Technical Problem But More a Problem of Competing Objectives

The research in this paper identified and analyzed some of the key activities of the HM&E Standardization Program, the stakeholders of the Naval Surface Force, and the operational levels of the military environment. While the research only covered a sample of the more significant and relevant activities that goes on in the Naval Surface Force's HM&E equipment environment, the activities that were addressed correlated with many of the reasons other researchers identified as being the root cause of the standardization problem. When existing research stated the Navy had a standardization problem because it lacked equipment technical data information. The analyses in this research showed that

the Navy's lack of equipment technical data information is a result of the Navy's hesitation to procure technical data at times due to the high cost or the equipment manufacturer's hesitation to provide technical data because of the impact it may have on future profits. There are various other examples similar to this in Chapter 4 of this research thesis.

The few activities analyzed correlated to a significant number of the reasons stated as the root cause for standardization as described in the technical data information example above. Further research on other Surface Force standardization activities most likely would reveal more correlations between other competing objectives and the list of reasons for a lack of standardization. Therefore, the standardization problem is not so much a technical problem but more an issue of competing objectives and stakeholder trade-off decisions. Much of the existing literature reports technical, planning, tooling, and collaboration deficiencies as the reasons for the standardization dilemma. The technical issues have their roots in competing objectives and stakeholder trade-off decisions. So the navy's problem is framed incorrectly. As a result, the Navy is solving the wrong problem. They are trying to put out the technical sparks when they should be trying to extinguish the competing objective fires.

National Economic Growth and Emerging Technology as Competing Objectives Are Significant Drivers of the Standardization Problem

The push for economic growth is a significant driver of the standardization problem. The push for economic growth through socioeconomic agendas results in a market boom of more research and development, business development, and innovative technology introduction. This in turn leads to greater material options with greater

capabilities often at a lesser cost. As a result, the Navy's equipment selection process becomes increasingly complicated as decision-makers try to balance long-term material capabilities with short-term financial constraints. An explosive market and problems requiring complex decisions lend themselves to a standardization dilemma.

The introduction of new technology in the Navy's inventory is a by-product of economic prosperity. As entrepreneurs and businesses gain access to investment capital, they develop and inject new technology into the market. As they introduce new technology, older items become less popular. People in the commercial arena gravitate to newer technology. They like to have the latest and greatest gadgets. There is no difference for people that procure and employ equipment in the military. As noted earlier, the Financial Controller of the US, David M. Walker, in a testimony before the US Senate Committee on Homeland Security and Governmental Affairs noted "Agencies pursue wants versus needs." Budget allocations are based on increments or a percentage of the overall budget versus bottom up reviews. The allocation process indicates agencies are not conducting bottom up reviews to match requirements to resources. They do not expend resources based on future requirements but rather based on historical standards. As such, the indications are that we are buying based on what's available when needed. Further, we have a thinking adaptive enemy. We have to maintain the technological advantage over our opposing force competitors. For example, Improvised Explosive Devices (IED) was an operational surprise. Now, DoD is trying to catch up with technology to counter this unforeseen threat. Gaining and maintaining the capability to combat any operational or technological threat is a critical priority for DoD and the Navy.

FFC Competes With Other Navy Commands For Adequate Ownership Control Necessary to Affect the Appropriate Level of Standardization

FFC owns the ships of the Navy's Surface Force and bears the ultimate responsibility and accountability to achieve the optimal equipping posture. However, organizations other than FFC that are not under FFC's operational control have duties and responsibilities that influence how ships are equipped. NAVSEA initially outfits the ship with equipment when it is built. Engineering activities have a significant influence on what goes on a ship throughout the ships life. NAVSEA and NAVSUP are leading efforts to determine HM&E equipment standardization candidates. FFC is responsible for the ships of the fleet. They should have the lead and ultimate say about how ships are equipped from cradle to grave.

The HM&E Standardization Program Competes for Resources to Affect Standardization.

The official HM&E Standardization Program is a standardization facilitator only. It is merely an administrative program with little to no management controls or resources to affect standardization. Navy Standardization Officers are not properly employed for the standardization cause. Their positions are collateral duties and do not have the resources or authority to make procurement or equipment procurement decisions. The people that actually work standardization issues and initiatives (ESC, Best Value Standardization Process Team, and the Parts Management Program) serve as ad hoc members of the Standardization Program. Their standardization duties are collateral duties also.

Competing Objectives and Stakeholder Trade-Off Decisions Heavily Influence Standardization.

Competing objectives creates an environment of complex choices and complex decision sets that result in decisions that often appear to be in the best interest of the decision-maker. The mere existence of options or choices complicates matters. But, when you complement conflicting options with self-interested individuals (personal or organizational interests), a decision made under the same circumstances may result in different outcomes each time. The same applies for HM&E equipment standardization. An environment of an abundance of fast-changing technological solutions to solve existing problems complicates the decisions of individuals that have the ability to introduce new HM&E equipment into the Navy environment. When the same or other individuals encounter the same material-selection decision problem at a different time, the potential for a different outcome in each case is highly possible. The final decision is heavily influenced by the objective that has to be achieved at the point the decision maker has to make a decision and the material options and solutions available to the decision maker. Competing objectives drive the material selection and therefore the material standardization process.

Secondary Research Questions

What is the "as-is" state for the Navy Surface Force's current HM&E equipment standardization operational environment?

1. Complex relationships
2. Political
3. Abundance of fast changing technologies (abundance of choices)

4. Limited resources (time, money and skills)

5. Stakeholders with organizational or personal interest

6. Unknown technical and operational threats

7. Uncertainty of capability requirements

8. Information overload

What competing objectives exist for the HM&E standardization program?

1. National Strategic Level: Management and operational efficiencies and costs savings that can be gained from having standardized equipment versus economic growth, entrepreneurial activity, reduced harm to the environment, and protecting industry capacity

2. DoD Strategic Level: Standardized equipment versus access to the latest and greatest technology available in the market; material acquisition cost reduction realized from competitive procurement practices; support for the commercial market place; value for the taxpayers' dollars; inventory discipline; better material quality; decreased time to field new technology; system performance; material management; shorter material delivery periods; supportability; lack of strategic partnerships; potential shrinking of the industrial base; and industry-Navy relationships stability.

3. Navy's Operational Level: Standardized equipment versus use of the latest and greatest technology, reduced material costs, lack of data for supportability, reduced control of equipment stability, supplier competitive advantage, supplier profits, supplier's control of critical business data and increased ship acquisition costs.

4. Navy's Tactical Level: Standardization versus mission accomplishment, self-interest (personal or organizational, material availability, storage costs, support for the commercial market place, and protecting the industrial base

What trade-offs are made based on these competing objectives?

1. Quality versus total ownership costs

2. Standardization versus acquisition costs

3. Performance versus Costs

4. Cost versus Supply Material Availability

5. Research and Development versus standardization

Recommendations

Primary Research Question/Model for Change

How can the Navy minimize the impact of competing objectives and stakeholder trade-off decisions to obtain an optimal HM&E Standardization Program representing the best-fit solution for its surface force?

Based on the discoveries of this research, four proposals are recommended for action. The proposals are (1) the CNO should designate FFC the lead for HM&E equipment standardization; FFC should establish a full-time standardization staff; (2) Reframe the problem; (3) Provide continuous education and awareness; and (4) Define and pursue an initial standardization target. The recommendations and their associated benefits are highlighted in Appendix C.

1. Designate FFC full responsibility and authority for the HM&E equipment standardization: The CNO should assign FFC take the lead on the standardization initiatives. FFC should capitalize on the momentum of the Surface Warfare Enterprise

initiative to bring the right people to the table to make standardization a reality. FFC should consolidate the efforts of all the individual standardization groups currently undertaking standardization projects. Further, FFC should use the functional CLASSRON organization for data collection and metrics management. Most importantly, FFC should stand up a full-time team that would be dedicated to furthering standardization goals and objectives for the Surface Force. The team should be a cross-functional team with the capability to conduct engineering analysis, data mining, and statistical analysis. FFC should strategically place Standardization Champions in other stakeholder offices that influence standardization e.g. DASN Acquisition and Logistics and the respective NAVSEA Ship Class Program Executive Offices (PEO).

2. Reframe the problem: Based on the results of this research, the Navy should accept the fact that the root cause for the standardization problem is competing objectives and stakeholder trade-off decisions. The Navy should understand that competing objectives and stakeholder trade-off decisions exist at every military operational level. Therefore, the problem should be reframed in a manner whereas stakeholders from the most junior sailor on the ship to the Secretary if the Navy can understand and relate to it. A targeted communication strategy should be utilized that relates standardization benefits to its targeted audience and garners support for standardization goals and objectives.

3. Education and awareness: In addition to communicating the problem, launch a continuous education and awareness program. With the constant rotation of personnel, accession of new personnel, and frequent changes in technology, launch an education and awareness program is needed that would maintain standardization situational awareness in a dynamic environment.

4. Define and pursue an initial standardization target: Identify target equipment and a target standardization objective. The Navy should set a 20 percent standardization target objective. 20 percent was selected because, according to Mr. George Madden, Director of the HM&E Directorate at NAVICP Mechanicsburg, 80 percent of the logistics issues are caused by 20 percent of the items he manages. Further, roughly 20 percent of the HM&E equipment installed in the fleet is a one-of-a-kind item. As discussed earlier, the low population items have a significant impact on shipboard readiness. The target equipment can be the "one-of-a-kind" items.

Future Research

This research concentrated on identifying the role of competing objectives and stakeholder trade-off decisions in the standardization process. There were many discussions about the decisions that have to be made with respect to HM&E equipment standardization. However, the decision-making process for HM&E equipment selection was not addressed in this research. Therefore, detailed research and analysis on how individuals responsible for HM&E equipment material management and selection make selection decisions is recommended.

APPENDIX A

BENEFITS ATTRIBUTABLE TO STANDARDIZATION

Areas of Operations	Benefits Attributable to Standardization
Engineering	• Reduce technical time in processing product design • Reuse known items to improve reliability and reduce debugging • Reduce the hazard of technical error in judgments • Increase time available for work requiring special design or handling • Reduce errors arising from miscommunication between engineers. Draftsmen, production, etc. • Reduce "break-in' time for new technical personnel • Reduce the need for minor supervisory decisions • Reduce the need for waivers and non-standard part testing approval • Reduce re-design and redrafting effort • Improve interchangeability of parts, designs and packages, etc. • Promote the use of improved methods and products • Help eliminate unsound practices based on prejudice, tradition, advertising, etc. • Facilitate the development of cost estimating techniques • Facilitate and speed the delivery of critical information
Procurement	• Increase purchasing power through procurement of larger quantities of fewer items • Reduce the number of purchase orders, receipts ad payments • Reduce lead time • Provide common language between buyer and seller reducing time required for negotiations • Facilitate the formation of quality partnerships with vendors which lead to just in time delivery • Use standard dimensions, interfaces and design requirements to help put all suppliers on a fair and competitive basis • Promote purchase by intrinsic value rather than sales pitch
Quality Control	• Facilitate more rapid acceptance of designs which meet a particular standard • Facilitate quality control through the use of standard designs of known quality and specifications • Diminish the hazard of misunderstanding with suppliers • Provide better control of the end product • Reduce and simplify the inspection
Inventories	• Reduce capital requirements and amount of capital tied up in inventory • Reduce record keeping • Reduce storage area • Reduce material handling • Reduce obsolescence and spoilage hazards • Reduce stockkeeper's time requirements • Reduce stockkeeper's training requirement • Facilitate more accurate and predictable planning and budgeting • Provide quicker service

Production	• Facilitate more routine activity and familiarity with fabrication and assembly • Reduce rework • Facilitate mechanization • Avoid production delays through stocked standard parts • Emphasis on producibility in standard design accrues benefits with every application of the standard without the need for further design
Maintenance	• Reduce breakdowns and downtime • Reduce preventive maintenance time • Reduce repair time • Decrease critical part expediting • Reduce the number of unfamiliar jobs encountered • Decrease the number of service-spares • Reduce training time

Source: Matthew P. Tedesco, “An Approach to Standardization of Naval Equipment and Components” (Masters thesis, Massachusetts Institute of Technology, 1994), 20

APPENDIX B

STAKEHOLDER

Customers and Users

Shareholder: Fleet Forces Command (FFC)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Organize, man, train, and equip Naval Forces for assignment to Combatant Commanders; • Deter, detect, and defend against homeland maritime threats; • Articulate Fleet war fighting and readiness requirements to the Chief of Naval Operations. www.cffc.navy.mil <u>Performance Pillars</u> • Operational Readiness • Operational Effectiveness • Operational Primacy <u>Guiding Principles</u> • Ensure the combat readiness of Navy forces and Joint warfare. • Encourage and manage prudent risk-taking in all aspects of mission accomplishment. • Emphasize analysis and accountability in decision making and integrity, teamwork, and trust in execution. • Establish operational effectiveness as the fundamental measure of performance. http://www.cffc.navy.mil/mission.htm http://www.cffc.navy.mil/pillars.htm	• Commands and controls fleet assets on both the Atlantic and Pacific coasts for interdeployment training cycle purposes • Provides forward-deployed and surge-capable strike and expeditionary forces • Serve as single voice for fleet requirements • Coordinate standardize policy for manning, training, and maintaining fleet operating forces • Partners with OPNAV (resource sponsor) • Partners with NAVSEA & NAVAIR (resource providers) • Readiness Output – Navy unit and forces ready for tasking through integrated fleet training, manning, and equipping processes • Enterprise Alignment/Management - effective alignment and execution of FFC responsibilities to deliver optimal readiness and operational availability of forces at best cost, managed through best practices http://www.cffc.navy.mil/2007_Annual_Plan.pdf

Customers and Users
Shareholder: SURFOR (SURFPAC/SURFLANT)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Provide operational commanders with well trained, highly effective, and technologically relevant Surface Forces that are certified across the full spectrum of warfare areas through an unwavering commitment to high standards. http://www.surfpac.navy.mil/	• Provides operational commanders with well-trained, highly effective, and technologically superior surface ships and Sailors • To sustain peak levels of combat readiness, SURFOR equips its forces with the necessary training, tools, maintenance and material to successfully accomplish their mission -- across the entire spectrum of warfare operations. • Coordinate the manning, training, equipping, and sustaining of the fighting forces.

Customers and Users
Shareholder: SURFPAC/SURFLANT (FORCE PROVIDERS)
(Formerly referred to as Type Commanders)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Provide combat ready ships to the fleet; and supply those ships and supporting commands with the leadership, manpower, equipment, maintenance, training, and material needed to achieve operational excellence and conduct prompt, sustained combat operations at sea to ensure victory. http://www.cnsl.surfor.navy.mil/Mission.htm	• Serves as commander for the operation of various units (administrative chain of command); reports to FFC • Responsible for manning, equipping, and unit-level training • Responsible for long-term wholeness of platforms • Responsible for material readiness http://www.cffc.navy.mil/2007_Annual_Plan.pdf

Customers and Users

Shareholder: Surface Warfare Enterprise (SWE)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Produce war fighting readiness to Fleet Forces Command in support of the combatant commanders by providing: o Sailors trained and ready to fight, valued for their warrior ethos o Warships ready at the right time, place, and cost…every time o Teamwork among our Enterprise partners to continually improve and produce innovative enterprise solutions o A challenging and rewarding environment that embraces diversity and personal growth as essential components in the way we do business. • Produce prescribed levels of war fighting readiness • Deliver and maintain a diverse mix of people • Establish a strategic financial management process • Lower total ownership costs • Improve Enterprise Maturity file:///E:/hm%26e%20standardization/SWE/SWE%20101(15Oct07).ppt#2124	• Aligning surface leadership • Shifting from output to consumption culture • Making informed, metric-driven readiness decisions file:///E:/hm%26e%20standardization/SWE/SWE%20101(15Oct07).ppt#2124 • Develop Sailors and warships to produce an adaptable, dominant, lethal, Surface Force ready to meet warfighting requirements across all mission areas now and in the future • Produce "Warships Ready for Tasking," • Transform personnel, training, sustainment, and modernization strategies to ensure Surface Warriors continue to own the battlespace • Serve as good stewards of our Sailors, our taxpayers' dollars and our ships to produce operational excellence.

Customers and Users

Shareholder: SQUADRON COMMANDERS

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Serves as the administrative commander or Administrative, tactical and readiness commander • Immediate Superior in Command (ISIC) of the ships assigned to the squadron http://www.desron15.navy.mil/	• Serve as the readiness support and operational commander http://www.cds1.navy.mil/ • Direct Squadron Ships for the conduct of sustained naval operations http://www.cds9.navy.mil/ • **Operationally**: Conduct prompt and sustained combat or non-combat operations • **Administratively**: providing trained and materially ready combatants for deployment http://www.cds23.navy.mil/ • Conduct prompt, sustained combat operations at sea http://www.cds7.navy.mil/mission.htm

Customers and Users
Shareholder: CLASSRONS

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To assess current readiness, analyze metrics across ships of a class, examine class trends, determine root causes, establish lessons learned and provide recommendations and solutions, while emphasizing readiness and cost control processes. (http://www.swe.surfor.navy.mil/site%20pages/CLASSRONs.aspx) • Functional command organizations specific to particular ship classes, which execute processes that ensure all ships with that particular class are at the right levels of combat readiness and available for tasking by combatant commanders. • Expand operational availability http://www.swe.surfor.navy.mil/Site%20Documents/CGRON%20Standup.doc	• Support the commanding officers of assigned ships and their ships' immediate superiors in command (ISIC) • Identify the maintenance cost drivers for a single class of ships. http://www.swe.surfor.navy.mil/Site%20Documents/07-07%20CLASSRON%20Stand%20Up%20Release.doc • Align SWE processes with established waterfront support organizations • Establish the readiness and cost control processes required to provide greater overall enterprise effectiveness • Support ISICS with warships ready for tasking by aligning manning, training, equipping and maintaining processes of ships by the class • Identify deficiencies, track progress and implement permanent solutions to class-wide problems http://www.swe.surfor.navy.mil/site%20pages/CLASSRONs.aspx • Train, maintain, man and identify logistics processes for the entire class ships • Provide the Immediate Superiors in Command and TYCOM with the ability to find process inefficiencies and to apply resources to achieve desired results. • Use metric-based analysis to assess readiness, examine class trends and provide recommendations and solutions. http://www.swe.surfor.navy.mil/Site%20Documents/CGRON%20Standup.doc • Ensure ships within their class are at the right levels of combat readiness and available for tasking by combatant commanders. http://www.swe.surfor.navy.mil/Site%20Documents/13-07%20DDG%20CLASSRON%20Stand%20Up%20Advisory.doc

Customers and Users

Shareholder: Sustainment and Modernization Teams

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Achieve efficient and repeatable processes that enable continuous improvement • Enhance efficiencies in all sustainment and modernization processes • Absorb the SHIPMAIN program http://www.swe.surfor.navy.mil/site%20pages/cft-sm.aspx	

Employers

Shareholder: Department of Defense (SECDEF/OSD)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Provide the military forces needed to deter war and to protect the security of our country. http://www.gpoaccess.gov/usbudget/fy03/pdf/bud12.pdf • Provide oversight to assure the effective allocation and efficient management of resources consistent with Secretary of Defense approved plans and programs. • Conduct analyses, develop policies, provide advice, make recommendations, and issue guidance on Defense plans and programs. • Develop systems and standards for the administration and management of approved plans and programs. • Initiate programs, actions, and taskings to ensure adherence to DoD policies and national security objectives, and to ensure that programs are designed to accommodate operational requirements. • Review and evaluate programs for carrying out approved policies and standards. http://www.defenselink.mil/odam/omp/pubs/GuideBook/osd.htm • Inform appropriate organizations and personnel of new and significant trends or initiatives in assigned areas of functional responsibilities. • Review proposed resource programs, formulate budget estimates, recommend resource allocations, and monitor the implementation of approved programs. • Participate in those planning, programming, and budgeting activities, which relate to assigned areas of functional responsibilities. • Review and evaluate recommendations on requirements and priorities.	• In peacetime, DoD trains and equips military forces needed to deter aggression while protecting U.S. interests and promoting U.S. security objectives. • During wartime, DoD's goal is to defeat the terrorists and their supporters who threaten our freedom. http://www.gpoaccess.gov/usbudget/fy03/pdf/bud12.pdf

Employers

Shareholder: UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS (USD(AT&L))

Subordinate Officers:
Deputy Under Secretary of Defense (Acquisition and Technology)
Deputy Under Secretary of Defense (Logistics and Materiel Readiness)
Director of Defense Research and Engineering
Deputy Under Secretary of Defense (Acquisition Reform)
Deputy Under Secretary of Defense (Industrial Affairs)
Deputy Under Secretary of Defense (Science and Technology)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Principal staff assistant and advisor to the Secretary and Deputy Secretary of Defense for all matters relating to the DoD Acquisition System; research and development; advanced technology; developmental test and evaluation; production; logistics; installation management; military construction; procurement; environment security; and nuclear, chemical, and biological matters	• Serve as the Defense Acquisition Executive with full responsibility for supervising the performance of the DoD Acquisition System. • Chair the Defense Acquisition Board (DAB) • Serve as the DoD Procurement Executive • Establish and publish policies and procedures governing the operations of the DoD Acquisition System and the administrative oversight of defense contractors • Establish policies and programs that strengthen DoD Component technology development programs, encourage technical competition and technology-driven prototyping that promise increased military capabilities, and exploit the cost-reduction potential of innovative or commercially developed technologies. • Develop acquisition plans, strategies, guidance, and assessments, including affordability assessments and investment area analyses, in support of the acquisition Milestone review and the Planning, Programming, and Budgeting System (PPBS) processes. • Designate major defense acquisition programs as either DAB or Component programs, sign congressional certifications and reports to include Milestone authorization breaches, and administer the Selected Acquisition Report (SAR) and Unit Cost Report (UCR) systems. • Establish policies relating to the capability of U.S. defense industry to meet DoD needs. • Establish policies and procedures, in coordination with the Under Secretary

Employers

Shareholder: Under Secretary of Defense (Comptroller)/Chief Financial Officer

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Serve as tthe principal advisor and assistant to the Secretary and Deputy Secretary of Defense for budgetary and fiscal matters (including financial management, accounting policy and systems, budget formulation and execution, and contract audit administration and organization), DoD program analysis and evaluation, and general management improvement programs.	• Administer the planning, programming, and budgeting system of the DoD. • Supervise and direct the formulation and presentation of Defense budgets, the interactions with the Congress on budgetary and fiscal matters, and the execution and control of approved budgets; and maintain effective control and accountability over the use of all financial resources of the DoD. • Establish and supervise the execution of uniform DoD policies, principles, and procedures (including terminologies and classifications, as necessary)

Employers

Shareholder: Defense Logistics Agency

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To provide supply support, and technical and logistics services to the Army, Air Force, Navy and Marine Corps. http://www.dla.mil/public.aspx	• Provides worldwide logistics support for the missions of the Military Departments and the Unified Combatant Commands under conditions of peace and war • Provides materiel commodities and items of supply that have been determined, through the application of approved criteria, to be appropriate for integrated management by DLA on behalf of all DoD Components, or that have been otherwise specifically assigned by appropriate authority • Furnishes logistics services directly associated with the supply management function and other support services including scientific and technical information, federal cataloging, industrial plant equipment, reutilization and marketing and systems analysis, design, procedural development and maintenance for supply and service systems, industrial plant equipment storage and issuance, DLA logistics systems development, and the National Defense Stockpile Program • Maintains a wholesale distribution system for assigned items • Provides contract administration service in support of the Military Departments http://www.defenselink.mil/odam/omp/pubs/GuideBook/DLA.htm • The one source for nearly every consumable item, whether for combat readiness, emergency preparedness or day-to-day operations inside DOD. http://www.dla.mil/public.aspx

Employers

Shareholder: Defense Supply Center Columbus

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
To provide best value logistics and contract management support to America's Armed Forces, in peace and war... around the clock, around the world http://www.dscc.dla.mil/About/vision_mission.html Business Plan goals • Goal 1: Reducing customer wait time • Goal 2: Improving resource strategies • Goal 3: Enhancing knowledge management • Goal 4: Reducing cost recovery rates **DLA Strategic Plan goals:** • Goal 1: Consistently provide responsive, best value supplies and services to our customers • Goal 2: Structure internal processes to deliver customer outcomes effectively and efficiently • Goal 3: Ensure our workforce is enabled and empowered to deliver and sustain logistics excellence • Goal 4: Secure and manage DLA resources effectively and efficiently http://www.dscc.dla.mil/about/dscc_goals2.html	

Employers

Shareholder: Standardization Program Office (DSPO)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To identify, influence, develop, manage, and provide access to standardization processes, products, and services for warfighters, the acquisition community, and the logistics community to promote interoperability, reduce total ownership costs, and sustain readiness. http://www.dsp.dla.mil/APP_UIL/displayPage.aspx?action=content&accounttype=displayHTML&contentid=51 Objectives • Improved interoperability of joint and coalition forces. • Standardized parts that have lowered costs, reduced inventories, shortened logistics chains, improved readiness, and furthered civil-military integration. • A DSP that is a single source for information exchange and coordinating all defense standardization efforts. • Institutionalized development and use of performance and non-government standards in DOD. • A DSP that is a vital technical resource and that actively participates in military, civil, and international standardization activities. • Prioritized set of standardization domains and a core cadre of experts in those domains. • System requirements documents (MNS/ORD) that reflect standardization requirements. • Senior managers and program managers who view standardization as an essential element of acquisition program development. http://www.dsp.dla.mil/APP_UIL/displayPage.aspx?action=content&accounttype=displayHTML&contentid=51	To champion standardization throughout DOD to reduce costs and improve operational effectiveness. http://www.dsp.dla.mil/APP_UIL/displayPage.aspx?action=content&accounttype=displayHTML&contentid=51

Employers

Shareholder: Secretary of the Navy

Subordinate office:

Assistant Secretary of the Navy for Research Development and Acquisition

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Conducts all the affairs of the Department of the Navy, including: recruiting, organizing, supplying, equipping, training, mobilizing, and demobilizing. • Oversees the construction, outfitting, and repair of naval ships, equipment and facilities. • Formulating and implementing policies and programs that are consistent with the national security policies and objectives established by the President and the Secretary of Defense. http://www.navy.mil/navydata/leadership/secnav_resp.asp	

Employers

Shareholder: Navy Small Business Program

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• A dynamic advocacy that provides training, advice, guidance and innovative strategies ensuring quality solutions for Navy and Marine Corps acquisition teams to and maximize opportunities for small businesses **Goals:** • People • Teamwork • Innovation http://www.donhq.navy.mil/OSBP/about/stratplan.htm	

Employers

Shareholder: Naval Sea Systems Command (NAVSEAS)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Maintain the current Navy, acquire the next Navy and design the Navy after next. http://www.navsea.navy.mil/	• To engineer, build and support the U.S. Navy's fleet of ships and combat systems. http://en.wikipedia.org/wiki/Naval_Sea_Systems_Command

Employers

Shareholder: Program Executive Office(PEO)--Ships

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To acquire and support the current and future surface fleet, translating warfighter requirements into combat capability, producing and supporting ships, boats and craft from cradle to grave, enabling our nation and its allies to project presence in peace, power in war and assured access anytime. http://peos.crane.navy.mil/FAQ.htm	• To manage acquisition and complete life-cycle support for all U.S. Navy non-nuclear surface ships. http://peos.crane.navy.mil/default.htm

Employers

Shareholder: Naval Sea Logistics Center (NAVSEALOG)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To keep America's Navy #1 in the world by providing superior, cost effective, and innovative logistics, engineering, information technology, and quality assurance solutions that meet the life-cycle requirements of the current and future Navy. http://www.nslc.navsea.navy.mil/about/mission_vision.htm	• To serve as the Naval Sea Technical Agent for developing, maintaining, and assessing life-cycle logistics support policies, procedures, and data systems.; to interface between engineering and logistics; to perform a wide range of logistic support functions and work closely with our customers to identify and correct systemic problems and design procedural enhancements. http://www.nslc.navsea.navy.mil/about/index.htm

Employers
Shareholder: Naval Surface Warfare Center (NSWC)
Naval Ships Systems

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To provide the right technology, the right capabilities, and the specialized research and development facilities to support all aspects of surface warfare. http://www.nswcdc.navy.mil/	• To understand the technical dimensions of military problems and assist in finding competent solutions through a combination of government and private industry resources. http://www.nswcdc.navy.mil/ • To maintain only enough core capability to meet its mission, goals and requirements. http://www.nswcdc.navy.mil/

Employers
Shareholder: Naval Supply Systems Command (NAVSUP)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To provide U.S. Naval forces with quality supplies and services. https://www.navsup.navy.mil/portal/page?_pageid=477,261535&_dad=p5star&_schema=P5STAR	• To oversee logistics programs in the areas of supply operations, conventional ordnance, contracting, resale, fuel, transportation, and security assistance. Responsible for quality of life issues for our Naval forces, including food service, postal services, Navy Exchanges, and movement of household goods. https://www.navsup.navy.mil/portal/page?_pageid=477,261535&_dad=p5star&_schema=P5STAR

Employers
Shareholder: Naval Inventory Control Point (NAVICP)--Mechanicsburg

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To provide program and supply support for the weapons systems that keep our Naval forces mission ready. http://www.globalsecurity.org/military/facility/mechanicsburg.htm	• To procure, manage, and supply spare parts for Naval aircraft, submarines and ships worldwide. http://www.globalsecurity.org/military/facility/mechanicsburg.htm

Employers
Shareholder: Regional Maintenance Centers (RMC)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To provide ship repair, industrial, engineering and technical support services for naval ships, including procurement and administration of contracts for ship maintenance and moderation; and to train sailors in maintenance and repair of shipboard systems and components. http://www.sermc.surfor.navy.mil/default.aspx	• To be a customer service-oriented maintenance organization capable of performing our missions in a manner that meets or exceeds required standards and creates an environment conducive to improving capabilities and capacity to always meet our customers changing requirements. http://www.sermc.surfor.navy.mil/default.aspx

Employers
Shareholder: Supervisor of Shipbuilding Conversion and Repair (SUPSHIP)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To be the World's premier organization in the acquisition, servicing, and disposal of naval vessels for the United States Navy. http://www.sbath.navy.mil/Default_Mission.htm	• As a vital part of the shipbuilding enterprise, the SUPSHIPs will have an agile, innovative workforce to enable effective and efficient execution of DOD military shipbuilding and repair and further inspire customers' confidence and trust. http://www.supship.navy.mil/ • To serve as DoD's Contract Administrative Office for all shipbuilding, conversion, repair and modernization contracts accomplished at assigned private sector shipbuilding firms. • To serve as NAVSEA's and the PEO's on-site technical, contractual and business agents for all projects and contracts assigned to private sector shipbuilding firms. http://www.supship.navy.mil/

Government
Shareholder: Executive Branch

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To enforce the laws of the land. http://www.usa.gov/Agencies/federal.shtml	

Government
Shareholder: Legislative Branch

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To make the laws of the government. http://www.usa.gov/Agencies/federal.shtml	

Government

Shareholder: Department of Transportation--Maritime Administration

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To improve and strengthen the U.S. marine transportation system - including infrastructure, industry and labor - to meet the economic and security needs of the Nation. Promote the development and maintenance of an adequate, well-balanced United States merchant marine, sufficient to carry the Nation's domestic waterborne commerce and a substantial portion of its waterborne foreign commerce, and capable of service as a naval and military auxiliary in time of war or national emergency. • To ensure that the United States maintains adequate shipbuilding and repair services, efficient ports, effective intermodal water and land transportation systems, and reserve shipping capacity for use in time of national emergency. http://www.marad.dot.gov/welcome/mission.html	• To reduce congestion on the nation's inland waterway, marine and landside infrastructure; • To assure an intermodal sealift capacity to support vital national security interests; • To formalize environmental considerations in our operations and in our partnerships with other agencies and private stakeholders to streamline processes that lead to environmentally friendly transportation improvements; • Focus energies on implementation of the President's Agenda and on continual improvement in our efforts to manage for results. http://www.marad.dot.gov/welcome/mission.html

Supply Chain Associates
Shareholder: Tyco Valves and Controls

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Increase the value of our company and our global portfolio of diversified brands by exceeding customers' expectations and achieving market leadership and operating excellence in every segment of our company. http://www.tyco.com/livesite/Page/Tyco/Who+WeAre/Mission+and+Goals/	• Governance: Adhere to the highest standards of corporate governance by establishing processes and practices that promote and ensure integrity, compliance, and accountability. • Customers: Fully understand and exceed our customers' needs, wants and preferences and provide greater value to our customers than our competition. • People: Attract and retain, at every level of the company, people who represent the highest standards of excellence and integrity. • Operating Excellence: Implement initiatives across our business segments to achieve best-in-class operating practices and leverage company-wide opportunities, utilizing six sigma measurements. • Financial Results/Liquidity: Consistently achieve outstanding performance in revenues, earnings, cash flow and all other key financial metrics. Establish a capital structure that meets both long- and short-term needs. http://www.tyco.com/livesite/Page/Tyco/Who+We+Are/Mission+and+Goals/

Supply Chain Associates
Shareholder: Curtiss Wright Flow Control Corporation

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To build a partnership with our customers by providing solutions that have profound impact and enable them to achieve their core objectives. http://www.cwfc.com/About_Us/spokes/missionValues.htm	• To profitably grow the Flow Control businesses by providing solutions that deliver substantial value to our customers, provide highly valued careers for our associates, and deliver leading returns to our investors. http://www.cwfc.com/About_Us/spokes/missionValues.htm

Interest Groups

Shareholder: Valve Manufacturers Association of America (VMA)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To represent the interests of nearly 100 North American manufacturers of valves and actuators. http://www.vma.org/Index.asp	• VMA is the only organization exclusively serving U.S. and Canadian manufacturers of industrial valves and actuators. http://www.vma.org/Index.asp

Interest Groups

Shareholder: National Shipbuilding Research Program (NSRP)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Manage and focus National Shipbuilding and Ship Repair research and development funding on technologies that will reduce the cost of ships to the U.S. Navy and other National Security Customers by leveraging best commercial practices and improving the efficiency of the U.S. Shipbuilding and Ship Repair Industry. Provide a collaborative framework to improve ship related technical and business processes. http://www.nsrp.org/	• To reduce the cost of building and maintaining U.S. Navy warships. http://www.usashipbuilding.com/

Interest Groups
Shareholder: American Society of Naval Engineers

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To advance the knowledge and practice of naval engineering in public and private applications and operations; to enhance the professionalism and well-being of members; and to promote naval engineering as a career field. http://www.navalengineers.org/About/About.html	

Interest Groups
Shareholder: American Shipbuilders Association

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To educate policy makers and the American public on the need for a strong shipbuilding industrial base to build the ships that keep America secure and economically prosperous. http://www.americanshipbuilding.com/	

Interest Groups
Shareholder: Shipbuilders Council of America (SCA)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To be the national unifying association of the shipyard industry, serving as the definitive spokesman for the industry in Washington and around the country. http://cms-shipbuilders.advancedlegal.com/pdfs/113200684714A.pdf	

Regulatory Agencies

Shareholder: Office of Management and Budget (OMB)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• To assist the President in overseeing the preparation of the federal budget and to supervise its administration in Executive Branch agencies. http://www.whitehouse.gov/omb/organization/role.html	• To evaluate the effectiveness of agency programs, policies, and procedures, assesses competing funding demands among agencies, and sets funding priorities. To ensure that agency reports, rules, testimony, and proposed legislation are consistent with the President's Budget and with Administration policies. To oversee and coordinate the Administration's procurement, financial management, information, and regulatory policies. To help improve administrative management, to develop better performance measures and coordinating mechanisms, and to reduce any unnecessary burdens on the public. http://www.whitehouse.gov/omb/organization/role.html

Regulatory Agencies

Shareholder: Government Accountability Office (GAO)

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Support the Congress in meeting its constitutional responsibilities and helps improve the performance and ensure the accountability of the federal government for the benefit of the American people. http://www.gao.gov/	• To provide oversight of federal programs; insight into ways to make government more efficient, effective, ethical and equitable; and foresight of long-term trends and challenges. http://www.gao.gov/

Regulatory Agencies

Shareholder: Office of the Chief of Naval Operations (OPNAV)-- Director of Logistics and Readiness N4

Mission/Purpose Goals/Objectives	Key Responsibilities/Activities that relate to HM&E Equipment Standardization
• Assists the Chief of Naval Operations in his responsibilities over the command, utilization of resources, and operating efficiency of the Navy, and in his duty to advise the President and to the Secretary of the Navy on the conduct of war. http://www.usnews.com/usnews/biztech/best-places-to-work/sub-agencies/nv11_at-a-glance.htm	

APPENDIX C

RECOMMENDATIONS AND THE ASSOCIATED BENEFITS

Recommendation	Benefits
Assign FFC the lead for HM&E equipment standardization and establish a full-time staff	1. Establishes ownership of the problem 2. Establishes "unity of command" and "unity of effort" for HM&E equipment standardization. FFC will act as the central authority while working with resource sponsors and providers 3. Minimizes individual and organizational competing objectives for units of the Surface Force as a result of the commander providing his intent and guidance 4. Minimizes competing objectives for organizations outside the FFC organization as FFC (customer and owner of the Surface Force) defines support requirements that resource providers must provide 5. Establishes a full-time functional team versus individuals who work standardization as a subordinate issue to primary job duties
Reframe the problem	1. Creates a reality of what the problem really is 2. Changes what people pay attention to or deem important in solving the problem 3. Focuses attention, effort, and resources on solving the right problem
Provide continuous education and awareness	1. Provides continuous situational awareness in a dynamic environment 2. Reinforces standardization goals, objectives, and benefits 3. Promotes attitudes, values, and actions compatible with achieving and maintaining standardization 4. Solicits involvement and coordination from all stakeholders
Define and pursue an initial standardization target	1. Provides a defined enterprise objective 2. Focuses efforts and resources 3. Eliminates material selection decisions for targeted items

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