Naval Surface Ship Maintenance: An Unconventional Approach to Improve Performance
by
Darien A. Sears
B.S. Ocean Engineering, United States Naval Academy 2014
Submitted to the Department of Mechanical Engineering and the System Design and Management Program
in partial fulfillment of the requirements for the degrees of Naval Engineering and Master of Science in Engineering and Management at the
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Abstract

This thesis presents an alternative approach towards meeting the challenge of delays within Private Sector repair of Naval Surface Ships. The quest to create greater efficiency, effectiveness, and excellence at the workplace has been a source of discussion and debate in the Navy for decades, particularly within the complex Private Sector Surface Ship maintenance enterprise. Recently, the Chief of Naval Operations (CNO) emphasized the priority to improve depot-level maintenance of Navy ships, which directly impacts our readiness to project power against our most lethal adversaries. The Regional Maintenance Center (RMC) presented the delay and overall underperformance of depot-level maintenance as a "challenge [that] is not new" [25]. I submit that there is too much focus on overcoming this ship repair issue through the use of money and policy and not enough attention directed toward improving the underlying human relationships involved in executing these complex jobs.

To explore this concept, this thesis describes the main stakeholders involved in the Navy non-nuclear surface ship maintenance enterprise; briefly outlines the current maintenance process from contract formation to ship delivery; and discusses the known factors contributing toward private sector surface ship maintenance delays. I make use of direct reports from the Navy, formal analytical reports, other relevant literature, and interviews conducted with 20 respondents including Navy Commanding Officers, a Private Shipyard General Manager, and a Regional Maintenance Center Waterfront Operations Director, among others. Four themes emerged for areas of suggested improvement: a refocused purpose and vision, updated motivation techniques, more systems thinking, and effective communication and coordination. I also present a case study of two private shipyards at one company which have practiced an alternative approach to maintenance challenges in relation to findings within the four themes. An analysis of this case in the context of the broader literature, in connection to the four themes led to further insights, recommendations, and areas for
future research.

Thesis Supervisor: John S. Carroll
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imparted so much insight and wisdom to this work. With each conversation not only was I more informed about this area of research, but I was more inspired to keep pressing on.

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Acronyms

3M  Maintenance Material and Management

3PP  Third Party Planner

ATC  Alaska Tanker Company

AWP  Availability Work Package

BRM  Bridge Resource Management

CASREP  Casualty Report

CNO  Chief of Naval Operations

CO  Commanding Officer

COVID-19  Coronavirus

CPM  Critical Path Method

CRUDES  Cruiser or Destroyer

CSMP  Current Ship’s Maintenance Plan

DFARS  Defense FAR Supplement

DH  Department Head

DIVO  Division Officer

FAR  Federal Acquisition Regulations
FFP  Firm Fixed Price
FP   Fixed Price
FRAGO Fragment Order
GAO  Government Accountability Office
IT   Information Technology
JFMM Joint Fleet Maintenance Manual
LCPO Leading Chief Petty Officer
LTI  Lost Time Injuries
MAC-MO Multiple Award Contract-Multiple Order
MARMC Mid-Atlantic Regional Maintenance Center
MSMO Multi-Ship Multi-Option
MT   Maintenance Team
NAVPLAN Naval Plan
NAVSEA Naval Sea Systems Command
NMD  Navy Maintenance Database
NSTM Naval Ship Technical Manual
OFRP Optimized Fleet Readiness Plan
OPNAVINST OPNAV Instruction
P2P  Performance to Plan
PACNORWEST Pacific Northwest
PARM Participating Acquisition Resource Manager
PB4M  Planning Board for Maintenance

PM  Project Manager

PMS  Precision Micro Scheduling

POAM  Plan of Action and Milestone

POD  Plan of the Day

PSIA  Private Sector Industrial Activity

PSNS & IMF  Puget Sound Naval Shipyard & Intermediate Maintenance Facility

PT  Project Team

QA  Quality Assurance

RC  Relational Coordination

RCC  Request for Contract Change

READ-E  Readiness Evaluation

RMC  Regional Maintenance Center

SBS  Shipbuilding Specialist

SDVG  Small Dollar Gross Value

SECNAV  Secretary of the Navy

SERMC  South East Regional Maintenance Center

SFTRM  Ships Fleet Training Response Manual

SME  Subject Matter Expert

ST1  Surface Team One

SUPPO  Supply Officer
**SUPSHIP**  Superintendent of Shipbuilding

**SURFMEPP**  Surface Maintenance Engineering Planning

**SWO**  Surface Warfare Officer

**TRIR**  Total Recordable Incident Rate

**TYCOM**  Type Commander
Chapter 1

Introduction

The global Coronavirus (COVID-19) pandemic has revealed an urgent need for change within Private Sector Navy Surface Ship repair, as organizations from all affiliated stakeholder groups have suffered losses in both people and capital. This has further exacerbated the serious challenge of depot-level maintenance delays and under-performance. The ship repair industry was forced to rethink policies to become more flexible and efficient with whatever workforce is available, while adhering to the required safety measures. This pandemic has forced the industry to prioritize how to protect and serve each person responsible for executing the mission in as safe a manner as possible. Increased financial resources and regulatory methods are absolutely necessary to improve these situations, however, this has not been the only potential response. Other less popular responses are rooted in the following quote:

“Use your freedom to serve one another in love ... Love your neighbor as yourself.” – Galatians 5:13

In other words, I submit that there is too much focus on overcoming this ship repair issue through the use of money and policy and not enough attention directed toward improving the underlying human relationships involved in executing these complex jobs. To explore this concept, this thesis does the following: describes the main stakeholders involved in the complex Navy non-nuclear Surface Ship maintenance enterprise; briefly outlines the current maintenance process from contract for-
mation to ship delivery; and discusses the known factors contributing toward private sector Surface Ship maintenance delays as declared by the Navy in formal analytical reports and other relevant literature, and as revealed through 20 personal interviews with a variety of experienced maintenance managers, Ship Commanding Officers, and shipyard employees, among others. I also present a case study of two private shipyards at one company which have developed an alternative approach to maintenance challenges. An analysis of this case in the context of the broader literature leads to further insights, recommendations, and areas for future research.

1.1 Motivation

Both fully established and newer business organizations seek to understand how to maximize worker performance, productivity, profitability, and schedule predictability. Although the same issues continue to defeat some establishments today, some companies have implemented successful strategies that have overcome these same challenges. This challenge has been a source of discussion and debate in the Navy for decades, particularly within the complex Private Sector Surface Ship maintenance enterprise.

Around the globe, the quest to create greater efficiency, effectiveness, and excellence at the workplace continues within two camps. Typically, the divide arises between enterprises using strictly quantitative approaches such as contract management, data analytics, or implementing new technology, and enterprises using predominantly qualitative approaches such as worker engagement and human-centered activities.

In December 2019, CNO Admiral Michael Gilday issued a Fragment Order (FRAGO) [24] followed up with his Naval Plan (NAVPLAN) that called for improving mission readiness. In this plan, the CNO declared that "American security [especially from our most lethal threats, China and Russia] rests upon our ability to control the seas and project power ashore" [25]. The first priority mentioned as needing change that directly impacts our readiness to control and project power is depot-level maintenance of our Navy assets—surface ships, submarines, and aircraft.

At the same time, the White House issued a 10-year goal to achieve and maintain
a Naval Fleet of 355 ships [43], compared to the current fleet of 289. Given the need to stand tall against adversaries that are rapidly growing in power, maintaining 355 ships is a challenging goal, especially since the Navy struggles to maintain its current fleet.

From FY2014 through the end of FY2019, Navy ships spent over 33,700 more days in maintenance than expected [35]. The Navy was unable to complete scheduled ship maintenance on time for about 75% of the maintenance periods conducted during FY2014-2019, with more than half of the delays in FY2019 exceeding 90 days. When maintenance is not completed on time, fewer ships are available for training or operations, which can hinder readiness.

The CNO presented this delay and under-performance of depot-level maintenance as a "fiscal challenge [that] is not new. [And] to preserve our readiness and modernization efforts, we must sensibly manage global force demands and focus our investments on improving our advantages over China before addressing other challenges" [25, p. 6].

This thesis, however, proposes an alternative perspective to this challenge and idea of what improving our advantages should include. This viewpoint was motivated by lessons learned during the ongoing Coronavirus (COVID-19) global pandemic—arguably the second most fatal pandemic in our nation’s history—which has led to devastating losses, both in human capital as well as in business enterprises. It caused the United States to declare a state of emergency in March 2020, and forced the hum of everyday life to change or stop. Those who have not been directly infected are still affected in some way. For example, on the job, an employee may be expected to carry the additional work of an absent colleague who has been infected. Although devastating to lives, businesses, and fundamental ways of life, this period has simultaneously given us time to reflect: we have an opportunity to think creatively to counteract disruption and become aware of, understand, and include a holistic view of a human being at work. Additionally, upheavals of systemic racism, and economic and political turmoil hit simultaneously and are ongoing. Due the number and gravity of changes, it is difficult to ignore the current state of our lives, and it would be a disservice to employees if they were asked to continue duties and roles as usual, or
get back to the “old” normal because in many cases, the “old ways” may not have been satisfactory—hence the pressures for change.

In this thesis, I advocate for a shift from our current economy focused on hyper-productivity—with its rigid emphasis on finances, rules and impending deadlines—to an economy also including care, that considers the whole person, and that will ultimately maximize long-term overall performance and productivity. Better working conditions often result in greater performance and productivity, while more strict and severe conditions with associated pressures can result in the opposite. I propose that to invest in the whole person, both leaders and workers alike—to love one another—is our best approach towards maximizing performance, decreasing delays, and ultimately staying ahead of our adversaries.

The productivity mindset, at its core, is driven by the belief that there is never enough time and that everything is urgent all the time. This mindset is fear-based, and affects many downstream actions and decisions. However, a culture of care seeks to help people take advantage of the time, capabilities, and resources they have available, rather than emphasizing everything that feels amiss. One emphasizes lack of resources and prevention of failure, while the other teaches people to see opportunity and promote success: focusing on what is available rather than what isn’t. In so doing, perhaps we might be surprised to find that humans are capable of far more than we are often led to believe. This thesis proposes that fear inspires more fear and worse long-term performance. However, love—self-sacrifice, honor, courage, personal commitment, integrity, patience, and generosity, among other actions towards each other—also produces more love and ultimately better performance and fewer delays in the long term. As an example of the power of love for one another, love of mission, and love of country, I present a case study highlighting one shipyard leader who has practiced this simple principle in two different facilities and brought about significant overall improvements in both ways of working and living. When we can remind people of what they are truly working for each day, whether in mundane activities or chaotic situations, we might be amazed at how much each person is willing to sacrifice for that cause—not out of obligation, but of their own volition. This is hard and uncom-
fortable daily work, that cannot be perfect because we are human; yet I believe that
this intentional refocus on purpose and love can be our greatest advantage.

1.2 Thesis Objectives

The main objective of this thesis is to offer a meaningful alternative approach—one
that is rooted in using our freedom to serve others in love—to holistically address the
issues faced by the Navy Surface Ship maintenance enterprise regarding performance,
productivity, timeliness and cost. To support this goal, I intended to contribute to
the exploration of the following major questions:

- Why does Navy Surface Ship maintenance still face delays, under-productivity,
  and under-performance?
- How has the enterprise responded to improve this complex issue?
- What other factors should be considered further—or for the first time—in this
  complex challenge, and why?
- What assumptions underlie the choices being made?

1.3 Scope

The scope of this thesis focuses on Naval non-nuclear surface ship maintenance in part
since this is my area of expertise after serving aboard USS KIDD (DDG-100) as a 1LT
and as part of Amphibious Squadron One (CPR-1) staff aboard USS ESSEX (LHD-2)
prior to commencing my graduate studies. Most of my knowledge comes from personal
connections and experiences from these two surface ship tours in San Diego where I
was engaged in CNO-Availabilities, dealing directly with the RMC and shipyard. I
focus on CNO-Availabilities, which fall under depot-level maintenance, since these are
the most complex and long-lasting maintenance periods a ship will experience, aside
from new construction. Furthermore, specific attention is given to the interdependent
dynamic of the RMC, private shipyards and the ships. This is where much of the
proposed whole-human change must take root. Given time constraints and access
to data from public shipyards especially with added restrictions during COVID-19, it was not feasible to include an analysis of public (nuclear-focused) shipyards and their impact on private industry maintenance challenges. Therefore, submarines and aircraft carriers are not discussed. Additionally, this thesis covers contributions to challenges specifically within the maintenance and operational fields and excludes the acquisition process due to the nature of interviews conducted and resources available.

1.4 Research Approach

This research project evolved through an iterative and exploratory process that applied multiple methods as illustrated through the simplified diagram in figure 1-1. The primary methods of research consisted of a series of interviews, review of documents from scholarly literature, Navy reports, media reports, and finally, drawing on my own observations in my Naval career to provide further perspective.

![Research approach flow chart](image)

Figure 1-1: Research approach flow chart

I began this study by researching and reviewing many scholarly articles, journals, Navy reports and media reports. I drew on these sources for a literature review, which was an iterative process in itself. This base knowledge enabled me to compile an initial list of questions to ask each interviewee according to his or her current or previous positions. As outlined in figure 1-1, the scope of the project changed over time as I researched. I shifted the scope of research from how COVID-19 was impacting
the entire Naval Ship Maintenance operation, to a focus on providing an alternative perspective on how to view and tackle the challenge of delays within Private Shipyard repair of Naval Surface Ships in a major CNO availability as seen in figure 1-2.

![Figure 1-2: Defining research boundary layers](image)

1.4.1 Participants

Table A.1 in A lists the 20 interviewees. The table details applicable rank or rate of each participant, their gender, interview media, and number of interviews conducted, how I connected with each one, and their job title or association with Naval ship maintenance.

Of note, 3 of the 20 participants were civilians, 7 of the 20 participants were active-duty military, and 10 were retired-military civilians. 90 percent of the participants were male. 45 percent of participants agreed to conducting more than one interview session, with three participants interviewed three times. These willing participants contributed significantly to my data collection and theory refinement. About 50 percent of total participants were identified through my personal network and 50 percent were recommended by other interviewees (snowball sampling). The lists of participants evolved alongside the literature review and through the snowball sampling process.
1.4.2 Procedure

Setting up interviews took persistence, requiring initial contacts and many follow-ups to schedule interview dates and receive supporting documents from interviewees. I believe disruptions to personal and work lives because of self-quarantining during COVID-19 made it more difficult to get on, or remain on interviewees’ calendars. Appendix B provides the list of questions posed to some of the participants, as examples. As the study evolved, the quantity and content of questions also evolved.

Interviews were conducted individually by phone or video when possible or via e-mail if they were not able to accommodate the synchronous options. Questions were emailed to all participants ahead of time, except in a few cases where interviews were conducted within a short window of accepting my interview invitation. The response time for e-mail interviews varied from the same week to a month later depending on the individual. The average phone or video-call interview was 60 minutes long, ranging between 30 to 90 minutes. I took typed or hand-written notes during the earliest phone conversations. However, I discovered that this was not sustainable or helpful. The remaining conversations were recorded, saved, and initially reviewed within three days after the interview.

Some of the participants were interviewed more than once, as shown in Appendix A, or had follow-up conversations and e-mail exchanges. As part of these continued conversations, I received additional documents, extra recommended resources or contacts they recommended, or answers to follow-up questions that evolved during our initial interview sessions. An important aspect of the interview process was ensuring I asked enough of the right questions.

1.4.3 Analysis

Each interview recording was listened to from one to three times, in order to identify themes and outliers. I made sure to pay careful attention to items I wanted to follow-up on. Each interview response was then compared against the literature I either already had read or was recommended to read. Chapter 2 outlines processes and
stakeholders involved in this private sector ship maintenance enterprise. Chapter 3 categorizes and investigates the discovered contributing factors by common themes. Chapter 4 explores the same themes through a case study of one private shipyard. Chapter 5 discusses alternative approaches to addressing this Navy repair challenge. Chapter 6 wraps up the analyses by offering a brief exploration into the implications of conducting business out of love versus out of fear through simple causal loop diagrams.
Chapter 2

Background Information: Holistic View of Navy Ship Maintenance

The goal of this chapter is to provide a holistic viewpoint and brief breakdown of the maintenance process, the key stakeholders, and their roles and responsibilities within the process. This literature review of background information provides an opportunity to gain a greater insight into the preceding system engineering analyses of the challenges within this complex system.

2.1 Maintenance within a Ship’s Life Cycle

The Navy Maintenance system for a surface ship is complex. To simplify this process, we begin with a basic understanding of what is included in the full life cycle of a single ship. A typical ship is intended to stay commissioned roughly between 40 and 50 years. Figure 2-1 provides a general 36-month life cycle timeline, known as the Optimized Fleet Readiness Plan (OFRP), for a Cruiser or Destroyer (CRUDES) surface ship [15]. The OFRP was designed to help maximize employability of ships and includes four main phases: Basic, Integrated, Sustainment, and Maintenance.

We begin by defining the four main phases of the OFRP. The order of events has higher priority over the duration of time within each phase and milestone. Each phase, as described in table 2.1 which is distilled from Ships Fleet Training Response
Manual (SFTRM), includes a progressive Readiness Evaluation (READ-E) that helps prepare the ship for the subsequent phase with material condition and training.

It is important to note that a Sailors or Officers can join a ship's crew during any of the aforementioned phases of a ship's lifecycle. It should also be noted that a maintenance center Program Managers or repair facility contractors are typically in their jobs longer than the average Sailor or Officer, they are also subject to rotation. However, before discussing the key players, the next section will explore even further on relevant aspects of the Maintenance Phase and process.

2.2 Maintenance Phase in Depth

We must first understand the basics of the maintenance process in order to identify why certain stakeholders are critical and how their responsibilities affect the maintenance process. We begin with the different categories and levels of maintenance in accordance with the Maintenance Policy for Naval Ships [42]. Figure 2-2 below
Table 2.1: OFRP phases defined [15]

<table>
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<tr>
<td>Basic Phase</td>
<td>Includes unit-level (individual ship) training of watch teams in various mission areas within all divisions and departments of the ship. Here, the entire ship is training in their respective duty positions, in order to certify their ability to perform operations as a unit. Successful Basic Phase completion enables the ship to immediately transition into the Integrated Phase. During this phase, the ship is active, and able to conduct short-term underway movements at sea.</td>
</tr>
<tr>
<td>Integrated Phase</td>
<td>The purpose of this phase is to combine the individual ships into their respective deploying groups (ex: Carrier Strike Group-CSG) and to train and certify each group in integrated warfare operations and missions to ensure they are deployment ready. The INSURV Material Inspection and/or TYCOM Material Condition Inspections are the most comprehensive and highest reporting-level material condition inspections within a ships lifecycle, that significantly contribute to the work conducted during the maintenance phase availability. During this phase, the ship is active, conducting more frequent and lengthier underway movements at sea.</td>
</tr>
<tr>
<td>Sustainment Phase</td>
<td>This is the longest phase, which includes the typical long-term deployments. The focus during this time is to maintain readiness and employability. This phase also includes conducting various internal inspections and major external inspections that contribute to the development of the Availability Work Package (AWP) which drives the work performed during the Maintenance Phase. During this phase, the AWP must be 100% completed with enough time for the shipyards and/or repair facilities to plan and prepare for execution of the work items during the maintenance availability period. During this phase, the ship is active either on deployment or conducting quick underway movements at sea.</td>
</tr>
<tr>
<td>Maintenance Phase</td>
<td>While intermittent maintenance performed by both the ships’ crew and outside entities occurs throughout all phases of the OFRP, the bulk of important repairs occur during the Maintenance Phase. The focus in this phase is to perform all maintenance required in order to meet Basic Phase requirements, to perform subsequent operations and meet the ship’s expected service life. Additionally, crewmembers are expected to attend any school-house training during this time to prepare for deployment. Of note, Figure 3.1 illustrates how far in advance the AWP is planned prior to commencement of the maintenance phase -- almost 2 years in advance, which will be discussed further in later sections. During this phase, the ship is inactive by either dry-docking or permanently tied to the pier of a maintenance facility.</td>
</tr>
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</table>

Provides a simplified outline of the different categories and levels of maintenance. This section will only outline as much of the process as necessary to gain a better understanding of where a CNO-Scheduled Maintenance Availability falls (bordered in red), since that is the scope of this research.

Overall, as shown in figure 2-2, there are two categories of maintenance—planned and emergent (unplanned)—which are derived from OPNAVINST 4700.7M and defined in table 2.2.

Table 2.2: Types of Maintenance [42]
Furthermore, as shown in figure 2-2, there are three primary levels of maintenance: Organizational-Level, Intermediate-Level, and Depot-Level. These levels depict the scale of repair required, and the entities typically responsible for the repair—also derived from OPNAVINST 4700.7M and described in table 2.3.

![Diagram of Navy Ship Maintenance types]

**Table 2.3: Levels of Maintenance [42]**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational-Level</td>
<td>The lowest maintenance echelon. Organizational-level maintenance consists of all maintenance actions within the capability and resources provided to the organization who routinely oversees equipment operation (e.g., ship’s force). It is the first defense against allowing small defects to become major material problems, which could impact ship operations and mission capability. (pg C-7)</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td>Intermediate-Level</td>
<td>Maintenance that requires a higher skill, capability, or capacity than organizational-level maintenance. Intermediate-level maintenance is normally accomplished by centralized repair facility personnel such as Navy fleet maintenance activities, submarine repair and support facilities, RMCs, and battle group or other intermediate maintenance activities. (pg 5-1)</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td>Depot-Level Maintenance</td>
<td>The highest maintenance echelon. Depot-level maintenance consists of maintenance tasks that focus on repair, fabrication, manufacture, assembly, overhaul, modification, refurbishment, rebuilding, test, analysis, design, upgrade, painting, assemblies, subassemblies, software, components, or end items that require specialized facilities, tooling, support equipment, personnel with higher technical skill, or processes beyond the scope of the intermediate maintenance activity (IMA).</td>
</tr>
<tr>
<td>CNO-scheduled Availability</td>
<td>An availability is when outside sources perform maintenance on a ship, and thus reduce the ship’s operability. A CNO-Avail can be either major or minor depending on the length of time required to accomplish the maintenance. Major CNO-Avails are the largest scale maintenance periods, the most complex, and thus require the most advanced planning and attention to detail in every stage of execution.</td>
</tr>
</tbody>
</table>

As mentioned in 1, the emphasis will be on depot-level repair, specifically the CNO-Avails. It is important to note from figure 2-2 that CNO-Avails are not typically
considered emergent maintenance due to the inherent nature of required planning and execution. CNO-Avails can be performed by either public or private shipyards, although this paper’s analysis is based only on information from private shipyard operations.

Now we examine the basics of government-private industry contract agreements, and project planning.

### 2.2.1 Government Sector Contracting Basics

A project begins with the formation of a legal contract. From this contract, associated stakeholders will plan the contracted project based on required terms. Over the last decade, the government has modified its contract strategy with private shipyards from Firm Fixed Price (FFP) to Multi-Ship Multi-Option (MSMO) to Multiple Award Contract-Multiple Order (MAC-MO). The significance of these shifts will be discussed in later chapters. However, they are briefly described in table 2.4, accompanied by a few key contracting terms to be referenced throughout this study.

Additionally, reports from the Government Accountability Office (GAO) provide a simplified diagram of the intended sequence of events in the Navy’s current MAC-MO contract strategy process for maintenance availabilities of less than, and greater than 10 months (see figures 2-3 and 2-4). Stakeholders in this process will be defined in following sections.

The salient point in figure 2-4 is the Delivery Order Award, which includes a description, “additional required work,” to be negotiated and implemented afterwards. As we will see beginning in Chapter 3, this is where many of the challenges for delays in ship repair happen. In the middle of negotiating a contract, multiple entities are already engaged in initial planning and estimates to determine how they might accomplish the mission.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FFP</strong></td>
<td>A contract strategy that sets firm prices for services and/or supplies, and places the risk on the contractor to meet requirements within this agreed-upon budget.</td>
<td>FAR, 2020</td>
</tr>
<tr>
<td><strong>MSMO</strong></td>
<td>A cost-reimbursement based contract strategy with incentives, that places the risk on the government to reimburse the private contractors for any extra cost associated with completing the work defined in the contract. Here, the contractor performing the availability also plans it. These contracts were awarded to a single private shipyard with multiple options to perform ship repair.</td>
<td>Duncan &amp; Hartl, 2015</td>
</tr>
<tr>
<td><strong>MAC-MO</strong></td>
<td>A FFP-based contract strategy that places the risk back on the shipyards to perform work within the contracted budget, while receiving some award and incentive fees based on pre-calculated formulas. Naval Sea Systems Command contracts a third-party planner (3PP) to plan the availability but does not compete to execute the availability. This strategy enables multiple private shipyards to compete for the same award.</td>
<td>GAO 17-54, 2016</td>
</tr>
<tr>
<td><strong>Work Item</strong></td>
<td>&quot;Work specifications that are prepared to accomplish repair or alteration work in ship repair. These items must be locally reviews for applicability, quality and technical requirements and tailored to suit the specific work requirements.&quot;</td>
<td>JFMM VOL7, 2019, B-6</td>
</tr>
<tr>
<td><strong>Specification</strong></td>
<td>&quot;The document that prescribes the requirements with which the product or service has to conform.&quot;</td>
<td>JFMM VOL7, 2019, B-5</td>
</tr>
<tr>
<td><strong>Scope of Work</strong></td>
<td>An agreement of the work that will be performed during a project. Comprised of all the work items to be completed, and detailed specifications. The scope of work is outlined in a formal contract between the government and private shipyard.</td>
<td>JFMM VOL2, 2019</td>
</tr>
<tr>
<td><strong>Availability Work Package (AWP)</strong></td>
<td>Includes all authorized industrial work and associated Ship's Force work for modernization, maintenance and repair to be completed during the availability. It is developed from NAVSEA and TYCOM instructions, the Class Maintenance Plan (CMP), Class Ship Maintenance Plan (CSMP), and results of pre-availability tests and inspections.</td>
<td>JFMM VOL2, 2019</td>
</tr>
<tr>
<td><strong>Baseline AWP (BAWP)</strong></td>
<td>&quot;Consists of the repair, assessment, modernization and service tasks to support the Fleet Response Plan (FRP) maintenance cycle for each ship.&quot;</td>
<td>navsea.mil/SURFMEP</td>
</tr>
<tr>
<td><strong>Integrated Production Schedule/Plan</strong></td>
<td>A overall availability schedule that &quot;integrates all repair and modernization work, including Alteration Installation Team (AIT) work items.&quot; This should be updated and followed by all project stakeholders.</td>
<td>JFMM VOL2, 2019, pg II-II-2A-1</td>
</tr>
<tr>
<td><strong>Growth Work</strong></td>
<td>&quot;Any additional work that is identified after contract award or definitization that is related to a work item included in the contract award. Growth does not include pre-priced options or reservations that were specifically identified in the solicitation or defined package.&quot;</td>
<td>JFMM VOL7, 2019, pg B-3</td>
</tr>
<tr>
<td><strong>New Work</strong></td>
<td>&quot;Any additional work identified after contract award or definitization that is not related to a work item that was included in the original contract award.&quot;</td>
<td>JFMM VOL7, 2019, pg B-4</td>
</tr>
</tbody>
</table>

Table 2.4: Government-Sector contract strategies and terms defined [19] [31] [50]

Figure 2-3: Availability planning process under MAC-MO contract strategy for surface ship repair [41, p. 8]
2.2.2 Project Management Basics

Once a private shipyard has been awarded the contract, it can begin detailed project planning. To even grasp the complex relationship between key stakeholders in the maintenance process, it is imperative to having knowledge and understanding of the terms that explain projects from planning to delivery. In complex projects, like Navy surface ship maintenance, project managers use the Critical Path Method (CPM) to plan and execute an entire project from start to finish. “The critical path method is a planning and control technique that overcomes the disadvantages of using only a Gantt chart and provides an accurate, timely, and easily understood picture of the project. It comprises two products: a logic network and a precedence diagram” [18, p. 69]. Figure 2-5 provides an example of the CPM.

The content of this plan includes calculations of both early start to early finish dates to as well as late start to late finish dates of each individual job. These calculations are based on numerous factors, including estimated completion time, available
workforce and required material, available capital, and cost assigned to each job. All the individual jobs are combined to find interdependencies based on the aforementioned factors. While the illustrative details are based on preference, the most important part of CPM is the identification of individual jobs critical to the project remaining on-schedule, called critical path items or critical path jobs. A job is critical if these items are delayed in anyway—due to factors such as material long-lead times, worker underperformance or absenteeism, unplanned growth work—all of which result in the delay of the entire project.

At least one critical path always exists in a project. In order to deconflict competing priorities and have the most accurate view of the project from all members, it is imperative to have consistent and incremental updates on the status of each job. It is also important to note that an accumulation of small delays from non-critical jobs
can also lead to an overall schedule delay. A Gantt chart (figure 2.6) is typically used to illustrate the overall project schedule, by task, for the entire project planning and maintenance team, whom will be discussed in following sections.

![Gantt Chart and related histogram example](image)

Of note, figure 2-6 represents the critical path and constrained resources in red for each day of labor. The histogram provides a summary of required resources and any other constrained items per day of the project. These tools are designed to help supervisors keep their workers productive and on schedule each day [18].

For a project to flow efficiently, each individual work specification needs to be detailed thoroughly—time estimates (especially those of critical path jobs) need to be precise and accurately reflect the integrated schedule, so the optimum performance can be achieved. Table 2.5 below provides a summary of important project man-

<table>
<thead>
<tr>
<th>CAL</th>
<th>DESCRIPTION</th>
<th>Estimated Float</th>
<th>MAY</th>
<th>JUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>017000</td>
<td>Move-In</td>
<td>0</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>311000</td>
<td>Clear and Grub</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>312020</td>
<td>Excavate</td>
<td>72</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>031000</td>
<td>Prefab Forms Foundation</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>031000</td>
<td>Prefab Forms Inte</td>
<td>14</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>031040</td>
<td>Prefab Forms Beam</td>
<td>15</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>032000</td>
<td>Prefab Rebar Foundation</td>
<td>12</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>032000</td>
<td>Prefab Rebar Beam</td>
<td>27</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>221000</td>
<td>Install Septic Tank</td>
<td>72</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>312000</td>
<td>Subgrade Fill</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>312020</td>
<td>Backfill Septic Tank</td>
<td>72</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>033010</td>
<td>Place Concrete</td>
<td>24</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>017010</td>
<td>Layout Building</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>312010</td>
<td>Excavate Footer</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>312040</td>
<td>Level, Compact</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>031010</td>
<td>Set Forms</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>331000</td>
<td>Water Main</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>331010</td>
<td>Waste Lines</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>312050</td>
<td>Backfill/Compact</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>032010</td>
<td>Set Rebar Foundation Stab</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>331020</td>
<td>Floor Drains</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>265000</td>
<td>In-slab Electrical</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.5: Summary of Important Project Man-

Figure 2-6: Gantt Chart and related histogram example [18, p. 77]
agement terms to offer a basic understanding of relevance for context in proceeding chapters.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man-days</td>
<td>&quot;A unit of work performed by one person in 8 hours. &quot;These are not the same as typical workday hours- it will always be 8 hours. Schedules are planned based off of estimated man-day hours. (pg 3-2)</td>
</tr>
<tr>
<td>Finish-to-Start</td>
<td>Most common CPM method used by military engineers to calculate longest duration of a project from start to finish. A work item cannot start until its preceding work item is completed.</td>
</tr>
<tr>
<td>Early/Late, Start/Finish</td>
<td>An estimate of the earliest or latest a single work item can start or finish</td>
</tr>
<tr>
<td>Float</td>
<td>&quot;Extra time available to complete an activity beyond the activity’s actual duration such as having 6 days available to do 4 days of work. It is the scheduling leeway. No activities on the critical path have float.&quot; (pg 3-10)</td>
</tr>
<tr>
<td>Total Float</td>
<td>&quot;The number of days an activity can be delayed without delaying the project completion date.&quot; (pg 3-10)</td>
</tr>
<tr>
<td>Free float</td>
<td>&quot;The number of days an activity can be delayed without reducing float from the follow-on activity by delaying its ES date.&quot; (pg 3-10)</td>
</tr>
<tr>
<td>slack</td>
<td>Many times used interchangeably with &quot;float&quot;. The slight difference between the two, is that slack refers to the &quot;amount of time an activity can start later than planned and float is about the time when the activity takes longer than planned.&quot; (planners.com, 2020)</td>
</tr>
<tr>
<td>Long-lead Items</td>
<td>Any material or resources that take substantially long to receive, that might constrain activity, and overall project schedule execution. These must be identified and ordered way in advance.</td>
</tr>
</tbody>
</table>

Table 2.5: Basic Project Management terms and definitions [18]

2.2.3 A Glance of the Process through Three Focused Perspectives

This study explores three main perspectives—the Ship’s Crew, RMC, and the Shipyard. These three stakeholders are key to the success of any CNO maintenance availability because their relationships are interdependent and dynamic. Their specific roles are explained further in the next section.

Ship’s Force

For a Sailor or an Officer assigned to a ship, maintenance occurs in all phases of the OFRP. As explained above, organizational maintenance is typically conducted by Ship’s Force. These types of work items are conducted by Sailors within each respective division and department and checked by the Division Officers (DIVOs) and Department Heads (DHSs) through the Maintenance Material and Management (3M) system, which will be touched upon briefly in this study. During the maintenance phase, Sailors and Officers are expected to work with shipyard and RMC representatives to allow access to various spaces required to conduct work items, and conduct
necessary trainings and school courses related to their watch positions or owned pieces of equipment and systems. During this time, Ship’s Force personnel also manage their personal lives, families, hobbies and more.

During the Basic Phase, Sailors and Officers are immersed into onboard training, still sending personnel to schools and ensuring that all individuals are certified to use their respective equipment properly. They begin brief at-sea underway periods to certify systems of equipment and individual watch teams. The Maintenance Phase can reveal if any systems require more troubleshooting or repair. The ship transitions into longer periods away from family, which are in addition to normal overnight duty rotations. The Integrated Phase is an intensified version of the Basic Phase, which involves more frequent and longer at-sea underway periods and continued performance of routine maintenance.

Finally, in the Sustainment Phase, Sailors and Officers are away from their families for the longest consecutive time, and must be fully trained at this point to carry out duties at sea. Routine maintenance is being conducted, while planning for the next maintenance phase availability upon completion of deployment. During this phase, it is imperative that the 3M system be carried out efficiently and thoroughly since work items that are not able to be accomplished by Ship’s Force must be classified as either intermediate or depot-level jobs in the next maintenance availability.

The effectiveness and timeliness of the OFRP depends partially on how well Ship’s Force carries out their duties—maintenance and operation of the ship systems as an individual ship and integrated with other ships. If Ship’s Force is not diligent in their maintenance performance and checks, important items that could have been planned for could end up contributing to growth work or new work. Outside of screening jobs to higher maintenance levels, Ship’s Force is not deeply involved in the availability planning process until a month prior to the availability start date. The Ship’s Availability Coordinator is the principal representative that maintains contact with the RMC for planning purposes during this brief window, until the ship is ready to pull into the dry-dock. Ship’s Force generally meets with key shipyard personnel and RMC representatives right before the docking event to go over the plan, and then
during regularly scheduled morning update meetings through the entire availability.

**RMC**

RMCs also have complex responsibilities surrounding the proper execution of a ship’s CNO maintenance availability. As previously mentioned, major CNO-Avail planning begins roughly two years in advance of its occurrence. RMCs are planning multiple availabilities of various levels at one time. Some of the same planners are distinct to a single project, while many others are stretched across multiple ships. During the planning periods, the RMCs are working closest with the designated shipyards and higher-level military authorities known as Type Commander (TYCOM) who control the budget for all maintenance contracts [50].

RMCs begin the planning process by opening a Technical Instruction two years in advance. Often, the Ships Commanding Officer (CO) is not yet named because of duty rotations. As depicted earlier, Surface Maintenance Engineering Planning (SURFMEPP) develops the BAWP that goes into the Current Ship’s Maintenance Plan (CSMP) that consists of an average 1,000 work items. The RMC turns these received work items into contractual items.

Simultaneously the RMC is finalizing the work package, where all of the work items are individually estimated, rather than listed as one full package. The RMC then waits as the contractors receive and consider the contract proposal. Contractors then add in market and other complex factors to the entire package, develop cost estimates and send back their bid to the RMC. Through this process, TYCOM is also managing many contracts and budgets as RMCs and shipyards work through negotiations around estimates that reflect differences in estimating individual work items versus the joint package. At the same time, Participating Acquisition Resource Managers (PARMs) who are in charge of supporting ship modernizations have their own separate projects, that in certain instances, are added to the integrated planning schedule many months after the work packages have been revised and planned. The RMC finally awards the contract to a private shipyard and meet with Ship’s Force right before entering the shipyard.
The OFRP in part works smoothly if the RMCs can properly define all necessary work items within the contract with ample time for the shipyard contractors to accurately estimate a work budget, and plan of execution for the entire availability. This can be time consuming if it is not completely accurate as there is little room for mistakes or even minor inaccuracies.

Private Shipyard

The Private Sector Industrial Activity (PSIA) performs complex projects. At any given time, a shipyard has at least one ship being repaired, often two at a time depending on the geographic location, space and workforce capacity. A private shipyard is dependent on the timeliness and thoroughness of the government contract to plan its work properly and deliver quality ships back to the fleet on time. Once the private shipyard receives the contract, the quality and content are reviewed and a bid is placed, depending on best estimates of cost to perform all outlined work. Once the private shipyard is awarded the contract, it hires all its workforce, begins purchasing materials and conducts other required logistical planning. During the availability, the Project Officer representative will lead the daily production meetings that are attended by many representatives from Ship’s Force and the shipyard, and a few from the RMC and Superintendent of Shipbuilding (SUPSHIP). The OFRP of a ship follows along smoothly when a shipyard can perform the required maintenance on time, on budget, and at the best quality.

As we can already see, each of these three stakeholders plays an integral role in the interdependent and complex process of ship repair. These are just basic descriptions of the intertwined relationships of these prime players have in the maintenance process, which will be discussed further in later sections and chapters. Now, we will examine in depth each key player in this maintenance enterprise.
2.3 Stakeholder Decomposition

The Navy’s Maintenance Enterprise is vast and complex. As a fundamental prerequisite to understanding the challenges of ship repair delays, we must first know the principal players associated with the process. To paint a picture of how each stakeholder relates to the other, we must first have a working knowledge of the different Chains of Command. Figure 2-7 provides a hierarchical flowchart of the key stakeholders involved in Navy non-nuclear surface ship repair and maintenance.

![Figure 2-7: Navy Operating Forces and Shore Establishment Responsible for non-nuclear Surface Ship Repair and Maintenance [41, p. 5]](image_url)

As seen in figure 2-7, Naval Sea Systems Command (NAVSEA) has two reporting channels in this matrix-type organization. In this higher-level view, we already begin to see the inherent nature of complexities formed through cooperating with multiple organizations, which produce multiple standards, requirements, and reporting procedures that must be balanced and deconflicted. The main study will focus on Ship’s
Force and field activities associated within NAVSEA that are boxed in red in figure 2-8.

![Diagram](image)

Figure 2-8: NAVSEA Offices responsible for implementation of MAC-MO contract strategy for surface ship maintenance [3]

### 2.3.1 Stakeholders Defined

This section briefly describes the roles of each stakeholder mentioned above. First, table 2.6 defines the organizations responsible for Navy non-nuclear surface ship repair and maintenance.

Additionally, “the Navy contracts with private shipyards and other firms—collectively known as the ship repair industrial base—for the repair of maintenance of non-nuclear surface ships” [41, p. 5]. Within the industrial base, there are supplemental planners who coordinate and collaborate with a main Project Team (PT) and Maintenance
Table 2.6: Organizations responsible for Naval non-nuclear surface ship repair and maintenance

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretary of the Navy (SECNAV)</td>
<td>&quot;Civilian leader, with responsibility and authority, under Title 10 of the United States Code, to conduct all the affairs of the Department of the Navy, including: recruiting, organizing, supplying, equipping, training, mobilizing and demobilizing. He or she also oversees the construction, outfitting and repair of naval ships, equipment and facilities.&quot;</td>
<td><a href="http://www.defense.gov">www.defense.gov</a></td>
</tr>
<tr>
<td>Assistant to the SECNAV, Research &amp; Development (ASN, RD&amp;A)</td>
<td>&quot;Serves as the Navy Acquisition Executive. The Assistant Secretary has authority, responsibility and accountability for all acquisition functions and programs, and for enforcement of Under Secretary of Defense for Acquisition, Technology and Logistics procedures. The Assistant Secretary represents the Department of the Navy to USD(AT&amp;L) and to Congress on all matters relating to acquisition policy and programs. The Assistant Secretary establishes policies and procedures and manages the Navy's Research, Development and Acquisition activities in accordance with DoD 5000 Series Directives.&quot;</td>
<td><a href="http://www.secnrv.navy.mil">www.secnrv.navy.mil</a></td>
</tr>
<tr>
<td>Chief of Naval Operations (CNO)</td>
<td>&quot;The CNO is the senior military officer and a member of the Joint Chiefs of Staff. The CNO is the principal naval advisor to the President and to the Navy Secretary on the conduct of war, and is the principal advisor and naval executive to the Secretary on the conduct of the Navy. The CNO is a four-star admiral who is responsible to the Navy Secretary for the command, utilization of resources, and efficiency of the operating forces of the Navy and of the Navy shore activities assigned by the Secretary. The Office of the CNO act as the administrative assistants and resource managers to the CNO.</td>
<td><a href="http://www.defense.gov">www.defense.gov</a></td>
</tr>
<tr>
<td>Type Commander (TYCOM)</td>
<td>&quot;Units operating together for a specific task, perhaps the air defense units within a carrier strike group, which receive a separate task unit designation. The commanders of these units coordinate to make sure resources and procedures are compatible so it’s easier for sailors to transfer from coast to coast or command to command. For surface vessels, leading TYCOM Commander Naval Surface Forces (COMNAVSURFOR-CNSF) is dual-batted with are U.S. Pacific Fleet (COMNAVSURFPAC-CNSP). The other regional surface TYCOM is Commander Naval Surface Force U.S. Atlantic Fleet (COMNAVSURFLANT-CNSL) and Commander Naval Surface Force. They are &quot;one of the most important [shore command] activities involved in the scheduling ship repair planning activities that directly involve the ship or the ship's crew.&quot;</td>
<td><a href="http://www.defense.gov">www.defense.gov</a>, JFMM VOL7, 2019, 1-8</td>
</tr>
<tr>
<td>Naval Sea Systems Command (NAVSEA)</td>
<td>One of five System Command (SYSCOM) that oversees the technical requirements of the Navy, specifically as they relate to ships in the United States Fleet. NAVSEA 21 handles non-nuclear surface ship maintenance and modernization.</td>
<td><a href="http://www.defense.gov">www.defense.gov</a>, 2020</td>
</tr>
<tr>
<td>Surface Ship</td>
<td>A surface combatant vessel that is managed and operated by the ship's crew (ship's force), who train together to deploy where needed for certain exercises or operations as directed. Surface ships report to immediate supervisors in command (ISICs) called Squadron's (e.g.: Destroyer Squadron -21), and then Group Commands (e.g.: Carrier Strike Group-1) that ultimately report to their respective TYCOM.</td>
<td><a href="http://www.defense.gov">www.defense.gov</a>, 2020</td>
</tr>
<tr>
<td>Regional Maintenance Center (RMC)</td>
<td>A field activity within NAVSEA that performs surface ship maintenance and modernization. RMCs are designed to execute standardized maintenance and modernization processes, follow common policies, and conduct standardized training in an effort to sustain a consistent business model across the RMCs and to provide cost-effective readiness to the Navy's surface ship fleets. They are located near major ports around the nation: Mid-Atlantic RMC in Norfolk VA, Southeast RMC in Jacksonville FL, and Southwest RMC in San Diego CA, to name a few.</td>
<td><a href="http://www.defense.gov">www.defense.gov</a>, 2020</td>
</tr>
<tr>
<td>Surface Maintenance Engineering Planning Program (SURFMEPP)</td>
<td>Field activity within NAVSEA21 that provides centralized surface ship life cycle maintenance engineering, class maintenance and modernization planning and management of maintenance strategies aligned with and responsive to national, fleet, surface type commander and NAVSEA needs and priorities.</td>
<td><a href="http://www.navsea.navy.mil">www.navsea.navy.mil</a></td>
</tr>
<tr>
<td>Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP)</td>
<td>&quot;The Navy’s on-site technical, contractual and business authority&quot; for the repair and modernization of ships performed by private shipyards.</td>
<td><a href="http://www.navsea.navy.mil">www.navsea.navy.mil</a></td>
</tr>
</tbody>
</table>
Team (MT) “in order to accomplish availability planning, execution and close out efficiently and effectively” [51, p. 966]. The MT forms the core of the PT. Within these formalized structures are levels of authority outlined by the Joint Fleet Maintenance Manual (JFMM), that are defined in table 2.7.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naval Supervisory Authority (NSA)</td>
<td>Assigned by TYCOM as “the single Naval authority responsible for the integration, oversight, and verification of all work accomplished by all activities (RMCs, TYCOM sponsored contractors, Ships Force, etc.) within the assigned availability. The NSA acts as the single point of contact for this work.” For private sector CNO-avails, the RMC is the NSA.</td>
<td>JFMM VOL2, 2019, pg II-l-2-2</td>
</tr>
<tr>
<td>Lead Maintenance Activity (LMA)</td>
<td>“The single activity responsible for work being accomplished and integrating all maintenance and modernization on U.S. Naval ships during any type of availability.” For private sector CNO-Avails, the Contractor is the LMA.</td>
<td>JFMM VOL2, 2019, pg 2-6</td>
</tr>
<tr>
<td>Fleet Maintenance Activity (FMA)</td>
<td>“Includes shore-based maintenance activities and supporting activities that perform maintenance on Fleet assets.”</td>
<td>JFMM VOL2, 2019, pg B-1</td>
</tr>
</tbody>
</table>

Table 2.7: Authority Levels of Maintenance Team for surface ship repair [50]

Each ship is required to be assigned a permanent and formally structured MT. As a whole, they are responsible for managing “the advanced planning and planning of maintenance, the routine maintenance of the ship and modernization following the maintenance policies, directives and business rules of the Fleet Commanders, TYCOM and the NSA” [51, p. 966]. The members of the MT are described in table 2.8.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashore Ship's Maintenance Manager (ASMM)</td>
<td>For surface ships, the Port Engineer (PE) is the ASMM assigned by TYCOM that leads the MT. &quot;Validates, screens and brokers all maintenance and modernization, including assessments, requiring off-ship assistance. Ensures the Project Manager (PM) has visibility of all assigned work.&quot; They are also accompanied by a Combat Systems PE in charge of combat systems-related maintenance.</td>
<td>JFMM VOL6, 2019, pg VI-41-1</td>
</tr>
<tr>
<td>Ship's Commanding Officer (CO)</td>
<td>&quot;Primary representative for the ship, and may delegate to a representative.&quot;</td>
<td>JFMM VOL6, 2019, pg VI-41-2</td>
</tr>
<tr>
<td>I-Level Ship Superintendent</td>
<td>&quot;Manages RMC or FMA Government production work for the CNO availabilities. Manages I-Level production work planning, integration, execution and close out, reporting progress and status to the PM and ASMM.&quot;</td>
<td>JFMM VOL6, 2019, pg VI-41-2</td>
</tr>
<tr>
<td>Project Manager (PM)</td>
<td>&quot;NSA support to the ASMM in the advanced planning and close out phases of the maintenance availability.&quot; “The RMC PM is the Senior NSA representative, leads the NSA PT and has the overall responsibility to plan, integrate and execute availabilities.&quot;</td>
<td>JFMM VOL6, 2019, pg VI-41-2, VI-41-12</td>
</tr>
<tr>
<td>Ship Material Maintenance Officer</td>
<td>&quot;Coordinates Maintenance Team activities with Ship's Force personnel.&quot;</td>
<td>JFMM VOL6, 2019, pg VI-41-2</td>
</tr>
<tr>
<td>Contracting Officer</td>
<td>&quot;A person with the authority to enter into, administer, or terminate contracts and make related determinations and findings.&quot; The Contracting Officer is assigned by the RMC.</td>
<td>JFMM VOL7, 2019, pg B-2</td>
</tr>
</tbody>
</table>

Table 2.8: Maintenance Team for surface ship repair [51]

The PT supplements the MT, and must be assigned to the ship availability. The MT’s Project Manager (PM) leads the PT, and some of the key members are listed
in table 2.9.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract Specialist</strong></td>
<td>&quot;Acts as the Administrative Contracting Officer (ACO)&quot; <em>(pg VI-41-18)</em></td>
</tr>
<tr>
<td><strong>Quality Assurance (QA) Specialist</strong></td>
<td>&quot;Supports the administration of the Contract Administration QA Program to evaluate the effectiveness of the Contractors Quality Management System on work being performed both shipboard and in the contractor's plant.&quot; <em>(pg VI-41-18)</em></td>
</tr>
<tr>
<td><strong>Technical Matter Expert (TME)</strong></td>
<td>&quot;The Maintenance Control Team leader an acts as the principle assistant to the NSA for non-nuclear propulsion plant work. Accountable as owner of the work and the person who makes the final decision on a task and has the ultimate ownership over that task.&quot; <em>(pg VI-41-23)</em></td>
</tr>
<tr>
<td><strong>Shipbuilding Specialist (SBS)</strong></td>
<td>&quot;Individuals that possess a primary trade background but effectively perform across trade lines in two or more trade skill disciplines. Team assignments are made to balance trade expertise appropriately with the type of work in the project...expected to act as decision makers with comprehensive knowledge of each work item assigned.&quot; <em>(pg VI-41-23)</em></td>
</tr>
<tr>
<td><strong>AIT Coordinator/Manager</strong></td>
<td>Government activity tasked to &quot;initiate, fund, plan, coordinate, schedule, manage and oversee the successful accomplishment of the alteration or ship change.&quot; <em>(pg VI-41-26)</em></td>
</tr>
</tbody>
</table>

Table 2.9: Project Team for surface ship repair [50]

Now that all of the important players to non-nuclear surface ship repair have been outlined, I will highlight some of their important responsibilities.

### 2.3.2 Key Stakeholder Responsibilities

Depending on perspective, there are many different sets of stakeholders that have interest in this complex enterprise. The ones that I prioritize in this study are TY-COM, NAVSEA, RMC, the private shipyard and Ship’s Force. Here I will discuss the different roles and key responsibilities that each plays in relation to private sector ship maintenance.

The leading technical authorities for policy and procedures for private sector maintenance are OPNAV Instruction (OPNAVINST) 4700.7M Maintenance Policy for Ships [42], the Federal Acquisition Regulations (FAR), Defense FAR Supplement (DFARS), and specific Naval Ship Technical Manuals (NSTMs). The JFMM serves as the next highest source for policy and procedures that integrates a large portion of information from the aforementioned documents into one resource. Roles and responsibilities for all other stakeholders not discussed below can be found in these aforementioned documents. This study is largely based on a review of these documents. Tables 2.10 to 2.14 outline the roles and responsibilities for each of the aforementioned stakeholders.

While this only scratch the surface of the responsibilities needed of each stake-
<table>
<thead>
<tr>
<th>Responsibilities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Responsible to their Fleet Commanders for the material condition of their assigned ships.&quot; (pg 3-4)</td>
<td></td>
</tr>
<tr>
<td>&quot;Ensure assigned ships are mission-ready to meet operational commander requirements.&quot; (pg 3-4)</td>
<td></td>
</tr>
<tr>
<td>Provide funding for the planning and execution of CNO availabilities for each ship, to the respective maintenance team. (JFMM VOL7, 2019)</td>
<td></td>
</tr>
<tr>
<td>&quot;Manages emergent and scheduled maintenance, including the identification and prioritization of corrective maintenance actions and alterations on assigned ships.&quot; (pg 3-4)</td>
<td></td>
</tr>
<tr>
<td>&quot;Advise Fleet Commanders, Program Executive Offices (PEOs), Program Managers (PMs), and COMNAVSEA on standardization of maintenance and modernization processes and products.&quot; (pg 3-4)</td>
<td></td>
</tr>
<tr>
<td>&quot;Manage maintenance resources to meet reference requirements and expected service life (ESL). &quot; (pg 3-4)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.10: TYCOM Roles and Responsibilities in surface ship maintenance [42]

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Serve as the Lead Technical Authority for the life cycle management of ships. (JFMM VOL7, 2019)</td>
<td></td>
</tr>
<tr>
<td>Establish naval shipyard and RMC operating policies (pg 6-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Furnish timely information on the prospective workloads of public and private shipyards to the respective Fleet Commanders for their guidance, recommending changes to the scheduled availsts to balance workload, and avoid excessive cost to the Navy.&quot; (pg 6-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Establish performance standards for the accomplishment of maintenance, modernization, and all other ship work scheduled for accomplishment by depot-level maintenance activities.&quot; (pg 6-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Ensure that Naval Shipyards, and RMCs execute ship repair and modernization within the scope of work authorized, employing prescribed technical methods, specifications, and quality assurance requirements in the most cost-effective manner.&quot; (pg 6-8)</td>
<td></td>
</tr>
<tr>
<td>&quot;Establish and implement minimum requirements for qualification and certification of docking officers and observers for floating dry-docks, graving docks, and marine railways.&quot; (pg 6-8)</td>
<td></td>
</tr>
<tr>
<td>&quot;Ensure the management information systems used for the collection and analysis of post-avail completion and as-found condition are compatible with the 3M system, and report this information to the 3M database.&quot; (pg 6-8)</td>
<td></td>
</tr>
<tr>
<td>&quot;Conduct system and equipment engineering analysis to eliminate or refine maintenance periodicities.&quot; (pg 6-8)</td>
<td></td>
</tr>
<tr>
<td>&quot;Assist PEOs or direct reporting PMs and Fleet Commanders or TYCOMs in the coordinating private sector, CNO-scheduled, depot avail assignments and contracting within established FAR and DFARS guidelines.&quot; (pg 6-8)</td>
<td></td>
</tr>
<tr>
<td>&quot;Develop and implement processes to continuously review ship class maintenance plans to incorporate lessons learned, refine the balance between confidence and risk, and identify areas where technological development can be brought to bear the reduce cost or increase operational availability.&quot; (pg 6-8)</td>
<td></td>
</tr>
<tr>
<td>&quot;Develop contract specifications to be invoked when contractors are required to provide messing and berthing during CNO-scheduled availsts.&quot; (pg 6-8)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.11: NAVSEA Roles and Responsibilities in surface ship maintenance [42]
<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aid TYCOM in managing funds in support of maintenance availabilities, material readiness and training of assigned ships.</td>
<td>JFMM VOL7, 2019</td>
</tr>
<tr>
<td>RMC contracting Officer is the direct representative of the US Government and COMNAVSEA as Head of Contracting Agency.</td>
<td>JFMM VOL7, 2019</td>
</tr>
<tr>
<td>&quot;Provide contract administration and technical oversight for ship repairs conducted by the private sector.&quot;</td>
<td>OPNAVINST 4700.7M, 2019, 2-7</td>
</tr>
<tr>
<td>&quot;For CNO avails, participate in all work definition, planning and completion conferences.&quot;</td>
<td>JFMM VOL2, 2019, 2-4</td>
</tr>
<tr>
<td>&quot;For CNO avails, ensure detailed planning and integration of the work package is accomplished.&quot;</td>
<td>JFMM VOL2, 2019, 2-4</td>
</tr>
</tbody>
</table>

Table 2.12: RMC Roles and Responsibilities in surface ship maintenance [52, 42, 50]

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serve as the LMA for the CNO-Avail.</td>
<td></td>
</tr>
<tr>
<td>&quot;Conduct or attend routine progress review meetings with all assigned repair activities. Identify and resolve coordination problems and work conflicts. Advise the appropriate maintenance sponsors (e.g., NSA, NAVSEA, TYCOM, AIT Sponsor, Ship’s Program Manager, etc.) of significant quality, cost and schedule impacts and problems.&quot; (pg 2-6)</td>
<td></td>
</tr>
<tr>
<td>&quot;Coordinate work and testing controls to include Work Authorization Forms, tagouts and test sequencing.&quot; (pg 2-6)</td>
<td></td>
</tr>
<tr>
<td>&quot;Integrate the work of all repair activities. For CNO availabilities, this includes an integrated schedule...The schedule must ensure adequate time is provided for crew training.&quot; (pg 2-6)</td>
<td></td>
</tr>
<tr>
<td>&quot;Coordinate preparations by assigned repair activities for all key events (e.g., docking, undocking, hot ops, dock trials, fast cruise, sea trials, etc.) to include verification signature checklists of readiness to start.&quot; (pg 2-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Track progress of all maintenance activities.&quot; (pg 2-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Coordinate crane operations, pier laydown areas, dry dock work areas and resolve other real estate conflicts which may impede efficient execution of the availability.&quot; (pg 2-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Maintain a list of activities authorized to work on the ship the LMA is responsible for and ensure the list is updated weekly or on an as-needed basis.&quot; (pg 2-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Attend all production and maintenance management meetings to communicate and resolve priorities, problems, job interferences and issues.&quot; (pg 2-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Define, identify and provide resolution to coordination problems and work conflicts between the Maintenance Managers, Maintenance Activities, Maintenance Brokers and the ship.&quot; (pg 2-7)</td>
<td></td>
</tr>
<tr>
<td>&quot;Conduct Ship’s Force and contractor orientation briefings and training...as applicable prior to commencement of shipboard work.&quot; (pg 2-7)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.13: Private Shipyards Roles and Responsibilities in surface ship maintenance [50]
Table 2.14: Ship’s Force Roles and Responsibilities in surface ship maintenance [42, 50] holder, it provides enough context for the next chapter, which analyzes the significance of these duties and the impact of interdependencies among roles. One important consideration is that all the players require extensive coordination, collaboration, co-production and cooperation with each other in order to be successful. Furthermore, all entities are responsible and accountable for engaging in difficult conversations—such as schedule deconfliction and performance evaluation—that are inherent to complex projects like ship maintenance. Each organization has its own goals and responsibilities, however, it is important to keep in mind the model of shared goals, vision and values for the common good.

In the next chapter, I will dive deeper into the implications of these concepts, and look at why, despite all of these clearly outlined policies and responsibilities, ships are continually being delivered late and not achieving overall success.

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Responsible for their own proper self-assessment, preservation repair, maintenance, and operation for cost-effective management of required maintenance actions. Ship’s Commanding Officers (CO) will ensure proper inspections, readiness reporting and documentation of all maintenance and modernization conducted onboard their ships.&quot;</td>
<td>OPNAV 4700.7M, 2019, 3-10</td>
</tr>
<tr>
<td>&quot;Monitor all maintenance activities to ensure they are on the master authorization list.&quot;</td>
<td>JFMM VOL2, 2019, II-I-2-8</td>
</tr>
<tr>
<td>&quot;Ensure a current master authorization list is maintained by the Ship’s Duty Officer (SDO).&quot;</td>
<td>JFMM VOL2, 2019, II-I-2-8</td>
</tr>
<tr>
<td>&quot;Provide the LMA with information on ship-brokered work so all activities are placed on the master authorization list.&quot;</td>
<td>JFMM VOL2, 2019, II-I-2-8</td>
</tr>
</tbody>
</table>
Chapter 3

Reasons for Surface Ship Depot-Maintenance Delays

The reasons for surface ship depot maintenance delays are numerous, according to some of the findings in this paper and other research. This chapter will dig deeper into each one and analyze them to offer a better understanding on why they occur. And most importantly, to prevent them from occurring.

The CNO has amplified the need to “revers[e] the trend of delivering only 40% of our ships from maintenance on time” [24, p. 2]. The CNO’s goal was to determine the proper metrics for improving productivity and key levers to decreasing lost work days and executing on those findings. Throughout several decades, the performance of ship maintenance has evolved to meet the needs of the Navy and our nation. During this same time, the complexities of this process have grown significantly, therefore making it more difficult for stakeholders to precisely identify root causes for maintenance delays, as well as solutions to the challenges. Identifying best performance metrics and key levers of on-time delivery execution should be the precursor toward finding solutions.

Before identifying solutions, it has become imperative to first recognize the nature and foundation of the system and potential points of intervention for these continuing delays in surface ship maintenance. The goal of this chapter is to explore various expert perspectives on the reasons why the Surface Navy continues to suffer from late
3.1 The Navy and GAO Analyses

Common themes emerged from various reports, scholarly articles and publications on why the Navy experiences late delivery of surface ships. The GAO focused directly on this issue through a series of reports from 2016 to 2020 and offered a summary of conclusions, organized around three main categories of acquisition, ship operation, and physical maintenance as shown in figure 3.1.

<table>
<thead>
<tr>
<th>Acquisition</th>
<th>Operations</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Ineffective requirements for ship reliability and maintainability</td>
<td>✓ Ships' low crew levels and performance</td>
<td>✓ Workforce capacity, capability, and prioritization</td>
</tr>
<tr>
<td>✓ Ineffective acquisition oversight of issues impacting sustainment</td>
<td>✓ Deferred maintenance</td>
<td>✓ Unplanned work</td>
</tr>
<tr>
<td>✓ Optimistic sustainment assumptions not evaluated</td>
<td>✓ Extended deployments</td>
<td>✓ Adherence to planning process</td>
</tr>
<tr>
<td>✓ Providing ships to fleet with defects due to gaps in the Navy’s delivery policy</td>
<td></td>
<td>✓ Condition of facilities and equipment</td>
</tr>
<tr>
<td>✓ Insufficient technical data</td>
<td></td>
<td>✓ Insufficient shipyard capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ Availability of parts and materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ Information technology infrastructure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ Modernizations and alterations</td>
</tr>
</tbody>
</table>

✓ = Identified in the Navy’s July 2020 report as contributing to maintenance delays
✗ = Not identified in the Navy’s July 2020 report as contributing to maintenance delays

Figure 3-1: GAO-identified factors contributing to delays in Navy maintenance during three phases [36, p. 1]

The Navy self-reported most of the physical maintenance factors contributing to delays. However, the GAO provided a more holistic account by identifying delays stemming from acquisition and operations. While all of these factors are critical in understanding the whole system, as mentioned in section 1.3, this thesis focuses more on the operations and maintenance factors that are within the control of NAVSEA21 organizations: the RMC, shipyard and the ship. Factors affecting overall cost and schedule performance over time were analyzed. This included multiple surface ship platforms in various regions. This study focuses less on the comparison of the effectiveness or efficiencies of the various contract strategies as conducted in research by
Duncan & Hartl [19]. However, greater emphasis is placed in discussing the implications of their foundations and intentions as they contribute to this challenge. Most of the information and data presented in this section are based on MAC-MO contract strategies. The next sections review contributing factors by the two categories of focus from figure 3-1: Operations and Maintenance.

### 3.1.1 Operations

According to the GAO, the **three main contributing factors** for delays in surface ship maintenance within “operations” are: “Ship’s low crew levels and performance, deferred maintenance, and extended deployments” [36, p. 8]. In 2002, the Navy began **downsizing the number of personnel** assigned to ships each year to reduce costs [13]. GAO analysis shows correlations between the decrease in Ship’s Force with an increase in minor maintenance being deferred. This is due to lack of quantity, or quality of skilled personnel available to complete the required maintenance. When minor maintenance is deferred or not completed properly, it has the potential to cascade into longer-lasting issues or spread to other areas of the ship.

The GAO found that “**maintenance deferred** while a ship is deployed can develop into more costly issues that must be addressed later, often during depot-level maintenance” [36, p. 8]. When there is a lack of qualified maintenance personnel, the same sailors become burnt out as they are conducting the maintenance on their own, and eventually their performance suffers. This shows itself by sailors perhaps spending less time thoroughly checking a piece of equipment, skipping a layer of paint, skipping steps on the required maintenance cards and more.

Another “operations” delay identified by the GAO was that many ships are commanded to continue operating at sea for extended deployments. For the majority of the time, Ship’s Force finds out about the extension while they are already deep into the originally-scheduled deployment. These recurrent decisions “can result in declining ship conditions and increased time that ships are required to complete maintenance in the shipyards” [36, p. 8]. Before Ship’s Force leaves for deployment—typically six-to-seven months—they already have a plan on what maintenance will be conducted
during this phase. The additional deployment can be detrimental leading to ship maintenance delays.

By the end of a "normal" deployment, the Ship has experienced wear and tear and many systems have reached capacity, where they require I-level or D-level maintenance, especially if maintenance had already been deferred from a previous availability. One report noted that deferred maintenance from previous availabilities creates a maintenance backlog, worsens the state of the deferred system/equipment, and leads to more extensive or new work during the next planned availability. A case study conducted on DuPont, the “largest U.S. chemical manufacturers” [12] found similar patterns. As they are also under

strong pressure to reduce costs and improve productivity, nearly all the cut has to come from activities such as planning and preventative maintenance rather than corrective maintenance, because breakdowns in critical equipment must be fixed. At the same time, cost-cutting often results in other actions (e.g., postponing replacement of older, less reliable equipment or eliminating backup capacity) which increases the load on maintenance departments. With resources for preventative maintenance diminishing and maintenance needs increasing, a plant’s equipment begins to break down more often. Maintenance managers must then shift more of their limited parts stocks and mechanics from preventative maintenance to corrective maintenance. Growing volumes of work order for corrective maintenance further reduce resources available for preventative maintenance, leading to still more breakdowns, in a vicious spiral of self-reinforcing feedback.[12, p. 4]

At the current moment, there is no clear end in sight for delayed maintenance, so the Navy applies a 6 percent fester factor to deferred work since deferred maintenance costs rise on average about six percent annually [33] [29]. Extending the ship on deployment only exacerbates issues already in place that may increase in severity by the time they reach the shipyard, especially considering that Ship’s Force personnel
are not qualified to perform all work items. The Fleet Commanders, in collaboration with TYCOM, are in charge of the allocation of ships and must carefully balance operational mission needs with the needs of each individual ship.

### 3.1.2 Maintenance

The GAO identified numerous contributing delay factors related to the shipyard maintenance category, listed in figure 3-1. The first is in parallel with the dilemma discussed above with Ship’s Force personnel, that there are “**workforce shortages, inexperience, and underperformance**” [36, p. 8] issues within private shipyards. One report mentions that shipyards are experiencing and will continue to experience a shortage of skilled tradesmen such as welders [33]. Private Shipyard employees expressed concerns that this shortage stems from multiple sources. The first is that fluctuations in market demand produce job insecurity and instability, so private shipyard workers will accept or seek more stable employment at public shipyards where they are hired as long-time civil servants.

Related to market demands and instability as well, are when contracts are awarded late, the hiring process also begins late. Many times, qualified workers have already accepted jobs elsewhere, and contractors hire whoever is available to complete the ship repair. Larger private shipyards, such as BAE, NASSCO and Vigor, rely primarily on Navy contracts for work and steady income. With this in mind, there have been further concerns about lack of work based on coast-wide bidding, which results in a few shipyards securing all the work contracts, and leaving others with uncertainty over whether or not they will receive work to keep their business afloat and workers employed [33]. Other reports expand this challenge across the maintenance spectrum, to include a shortage of qualified PMs, Shipbuilding Specialists (SBSs), Contract Officers and Specialists among others [33, 31]. The shortage covers not just the workers, but also those who coordinate the work.

The most frequent and severely impactful contributing factor identified for the maintenance delays in private shipyards was **unplanned work** [43]. This includes new work, growth work, rework, emergent repairs, testing, and late identification of
work and requirements. This all occurs after the contract is awarded. The development of unplanned work can stem from various sources including deferred maintenance that exacerbates and spreads issues (as discussed above), and poor contract implementation, work specification, and Availability Work Package (AWP) development. One report noted that between FY2012-2018, “the Navy has reported over 3,900 days of unplanned maintenance across the ships they reviewed” [40, p. 33].

As seen in Chapter 2, contract writing is key in the successful execution of ship maintenance, and is the most common cause of delay throughout Navy reports [19, 33, 36], when not executed properly. The report suggests this is principally due to either lack of training or experience, lack of thoroughness and attention to detail, or inability to identify potential unknowns. These issues can be caused by multiple parties: the Third Party Planner (3PP), the PM, the RMC Contract team, the SURFMEPP representative, Ship’s Force, or the private Shipyard PM. Each representative has influence on the content of a work item or AWP in some capacity—this is a team effort. This system of teams can influence (either positively or negatively) unplanned work through both contract strategy type and composition. Having too many stakeholders can lead to the creation of weak contracts, which is the opposite of their intended goal. Some experts identified private shipyard concerns that contract strategies (whether MSMO or forms of MAC-MO) were either overly collaborative or overly competitive, and had yet to reach a sufficient compromise [33]. Figures 3-2 and 3-3 show performance metrics of initial MAC-MO contract implementation compared to three years under MSMO contracts [19].

From these data, it was concluded that MAC-MO was more efficient and effective for use in a CNO-Avail in some ways, and not in others. After initial implementation of MAC-MO, the study observed a 21% increase in growth and new work compared to 48% using MSMO contracts; however, contractors still experienced about the same number of late contract awards as well as the number of days that ships lost to operate at sea. Further research has continued to observe these patterns since 2015 of CNO-Avail performance under the MAC-MO contract strategy. While MAC-MO implementation has been found to have “increased competition, gained flexibility for
Figure 3-2: Percent Increase in Growth and New Work, and OTC [19, p. 40]

Figure 3-3: OTA Days Late and LOD [19, p. 40]
the Navy to ensure quality work and limited cost growth, schedule delays still persist, "[41, p. 1] as displayed in figure 3-4.

For a future study, it would benefit to analyze reasons that contributed to Mid-Atlantic Regional Maintenance Center (MARMC) proportionally having less ships delivered on time. Regardless of the specific RMC, the new contract strategy has not solely solved the issue of late CNO-Avail completions, and thus requires continued attention and problem exploration.

Arguably, even more important than the strategy itself is the content within the contract that defines what work will be performed. Poorly written work specifications are a result of deficient key inputs such as: inadequately defined requirements, lack of expertise, lack of thoroughness, and lack of available data/resources.

When work specifications are low quality, 3PP delivers an inadequate work package. Then, RMC spends more time fixing the work package to ensure a first-rate contract. This leads to the contract being awarded late to the contractor, who then rushes into detailed planning, hiring workers hastily, and accommodating their shipyard to meet the demands of the agreement. Despite the timeline when the award is given, contractors are still expected to start the Availability on schedule. Once the Availability begins, the undefined requirements begin to surface, turning into growth work, new work, or rework. As an example, for the USS Stout’s CNO-Avail, the Navy considered 60 instances of growth work unidentifiable, whereas the MT did not consider these items unusual [41]. These additions must flow through a Request for Contract Change (RCC) process, as detailed in Northrup’s research [39], that can take anywhere from one day to several months.
Because this work specification issue has yet to be resolved, the Navy has established two funds for these unplanned work items based on price so they do not have to endure long negotiation processes and further work delays [31]. These two funds are identified as the Small Dollar Gross Value (SDVG) for growth work under $25k, and the Level of Effort to Completion fund for growth work over $25k [41]. While this is certainly not a long-term solution, it provides a temporary workaround to allow work to resume within one man-day.

However, even with MAC-MO fixed price, the risk falls onto the contractor to provide an accurate estimate of cost and duration for the entire AWP, otherwise they will pay the cost differences if it runs over or receives decreased profit in proportion to the new modified scope of work and quality delivered. This reinforces the cycle of deferred work for the next availability [41]. When contractors receive inadequate contracts late relative to intended availability start dates, they already have the short end of the stick leading to inevitable delays [33] unless they have enough experts in all areas to compensate.

For years, Private Industry has voiced concerns over the lack of care by the Navy for the industrial base in this regard—they are able to provide the best service when they can secure a contract early and plan their share of work [33]. Either way, these unplanned work items cascade into a combination of delays across various parts of the project, some of which might infringe upon the critical path, which as we learned, is detrimental to the overall success of the project.

Unplanned work exacerbates the remaining factors: adherence to the planning process, conditions and capacity of shipyard and repair facilities, availability of necessary parts, inefficient Information Technology (IT) infrastructure, and ship modernizations and alterations. Research has found that the Navy is inconsistent with following its own planning process due to reasons such as scheduling conflicts, high operational tempo, and planned or unplanned personnel shortages [35]. Many of these reoccurring issues fall within the control of higher-level executive leadership, such as Congress.

When private shipyards are not guaranteed work, they have neither incentive nor
budget to be able to improve their facilities, which perpetuates the cycle of not being awarded contracts, and less overall space for the Navy to consider competition for and placement of ship repair.

“Visibility regarding planned workloads within a given port and their assessment of the share of work that they are likely to win, are two key factors private shipyards consider to drive their decisions for workforce and facilities” [41, p. 1]. Parts are commonly unavailable and the ship has to receive TYCOM assistance to cannibalize parts from other ships, which are not as close to operational or deployment status. This continues the same cycle of parts unavailability for the ships being cannibalized. Businesses may stop making that part, or have a long-lead time for items not purchased in advance, or go out of business entirely. IT databases that coordinate the project are only as good as the person inputting the data. The Navy Maintenance Database (NMD), used by most RMCs and repair facilities, is not able to stay up-to-date with real-time work progress [39]. Finally, the addition of “new equipment and systems adds complexity to a maintenance period” [36, p. 8].

### 3.1.3 Summary of Reports

It is important to emphasize that this is a complex system with complex problems, all of which are interdependent and influence one another. A change in one area will have downstream impact on another variable, which oftentimes gets overlooked due to the nature of complexity, especially when the problem is not tackled with a systems thinking mindset—that is, looking at a full feedback system, rather than separate sections to be handled in isolation.

From the reports above, we can now agree with Private Industry’s claim that it provides the best service to the Navy when it receives sufficient time to plan a detailed work package [33]. No stakeholder wins when a ship is delivered late—just a downstream cascade of losses. To emphasize this point, figure 3-5 illustrates the number maintenance days lost for Surface ships between FY14 and FY20.

It is estimated that “maintenance days lost in 2019, equated to the Navy losing 19 surface ships in FY19 and 11 surface ships in FY20” [34, p. 17]. Lost ships mean
lost operational capability, decreased protection of our nation, higher burn out for ships’ crew who are operationally capable and deployed, greater demand for more ships, and the cycle restarts with deferred maintenance from extended deployments. Analysis shows that the fluctuations in demand for work from the Navy for repair facilities will continue. Figure 3-6 is an example from South East Regional Maintenance Center (SERMC) in Mayport Florida, of historical and forecasted maintenance Navy workload between FY19 and FY23. The wide swings in required resources are due to market demand (i.e., Navy operations). It is evident that resources are planned for the low point of required resources, and therefore when required resources exceed available resources, there will be backlogs, worker burn out, quality issues, and so forth, which then exacerbate resource shortages and continue the cycle.

In addition to these already severe factors, there are other abnormal factors that exacerbate these problems. The year 2020 was a prime example: MTs and PTs for availabilities for 2020 did not anticipate a number of severe factors that affected the final outcome. The teams were not planning for a global pandemic to disrupt production. They did not plan for the fire on USS Bonhomme Richard (LHD-6) to
cause even further cascading maintenance delays. They did not plan for ships like USS John S. McCain (DDG-56) and USS Fitzgerald (DDG-62) to have collisions at sea that push other ships out of availabilities so that they could be attended to [34].

Although it is impossible to forecast and include every potential perturbation in the development of an integrated production schedule, the system must be resilient enough to counter unplanned occurrences so that success is still achieved [21, 22]. Organizations must have adequate emergency protocols and flexible resources for situations such as those outlined above. The Navy said it was on track to meeting its goal of an 80% reduction in maintenance delays across the maintenance industry, but claims that this failed due to all the aforementioned perturbations, especially COVID-19 [36].

The quest to identify root causes relating to maintenance delays is still in progress. There is neither one cause nor one solution, but a system of interdependencies. Now that the problems identified by the Navy and major Navy analytical organizations have been outlined, I will briefly discuss their efforts to address them thus far.
3.1.4 The Navy’s Response

NAVSEA declares it is the primary stakeholders that needs to implement new initiatives [36] and has tried a few courses of action over the years to help address these challenges. In response to the CNO’s 2019 FRAGO, NAVSEA implemented a Plan of Action and Milestone (POAM), that included initiatives already established. Programs such as Performance to Plan (P2P) and Surface Team One (ST1) are two major activities the Navy uses to analyze and implement maintenance processes to help with delays in private sector ship repair [36].

In addition, NAVSEA has continued to improve contract strategies, creating packages with better incentives for private contractors, and emphasizing a plan to give them “more time to plan work, procure material and prepare their workforce before the start of a maintenance period” [36, p. 15]. Figure 3-7 provides a timeline of milestone revisions produced by NAVSEA that reflect this effort of advanced planning.

![Figure 3-7: Revised milestones for ship repair availabilities [41, p. 28]](image)

By enforcing planning completion 200 days earlier than before, theoretically, the Navy is able to better serve the contractor’s preparation efforts by awarding contracts four months prior to the CNO-Avail start rather than the infeasible two-month period as before.

Since the Navy has less control over capabilities provided by the private sector than the public sector, they have to create incentives to receive what they desire. Private-sector shipyards “require confidence in a business-base workload and financial
incentive to maintain and develop new capacity to meet future repair and modern-
ization needs of the Navy" [33, p. 23]. To this effect, the Navy has tried bundling
contracts to private shipyards both horizontally and vertically to help with future
workload predictability for shipyards.

Horizontal bundling is contracting sequential availabilities within a single request
and results in longer duration of guaranteed work, while vertical bundling enables
concurrent ship availabilities within a single request and provides a lot of guaranteed
work at once if the contract has space for dual dockings [41]. NAVSEA also saw a need
to motivate 3PP toward conducting proper ship checks and providing better quality
of work specifications, so they were provided monetary incentives supplemented by
formalized regulations [31]. The tendency toward resolving issues by using external
incentives such as rewards and rules should be kept to the forefront as this will be
important in later sections.

Finally, outside of the maintenance realm, the Navy has required and implemented
more training of Surface Warfare Officers (SWOs) and Sailors to help prevent unnec-
essary casualties [34]. More training requires more time needed away from desks,
away from leading their divisions, and away from eyes on systems and equipment.
Middle managers of the ship, the DIVOs, are typically called upon to attend to issues
as they arise during the maintenance period as it relates to their own equipment.
Given the foundation of Navy and expert perspectives, this research will examine the
perspectives and insights of our interview participants.

3.2 Interview Result

The various participants listed in Chapter 1 are a useful but small sample of stake-
holders. Their perspectives do not reflect the Navy as a whole, nor their own or-
organizations. Their personal opinions are based on years of experience working in
and around Navy Surface Ship maintenance through various positions. Interviewees
conducted from RMCs, SURFMEPP and the Shipyard are drawn from the Pacific
Northwest (PACNORWEST) region, specifically the Puget Sound Naval Shipyard &
Intermediate Maintenance Facility (PSNS & IMF).

The major themes derived from the interviews are grouped into four categories that will be explored even further in later chapters. These are purpose and vision, motivation and incentives, systems thinking, and communication and coordination.

3.2.1 Purpose & Vision

Five interviewees representing the RMC, Shipyard and Ship’s Force, agreed that there seems to be a lack of alignment with the importance of embracing and being driven by a shared and substantial purpose. One Ship CO mentioned that it gets harder to truly execute a major CNO-Avail as one team fighting towards a common goal when we are not anchored in the “same values, vision, mission, and goals.” While the interview process only began shining a light on the importance of investing in purpose and vision, other literature outlined in the next Chapters goes further in depth.

3.2.2 Motivation & Incentives

It is arguable that the United States of America is one of the richest countries in the world, which also has the biggest wealth gap [23]. For decades, as the value of our currency has continued to rise, so has America’s dependency on it. Generally, as people become more wealthy, they continue to demand more as more becomes available. In this dynamic, we inevitably begin to see money as more than just a resource to improve the lives of all people, but it becomes a primary way to manipulate behavior to get a desired outcome. This overvaluation of money has impacted private sector ship repair as the Navy continues to place substantial focus on its contracts and the cost of the contracts: negotiating the best deal that provides a profit, no cost overruns, and guarantees a quality repaired ship on schedule.

It is interesting to first consider who the real customer is in ship repair. According to RMC representatives, “the customer is whoever pays the bills.” In practice for many stakeholders, TYCOM—rather than Ship’s Force—is seen as the customer because they are in charge of funding the project from advanced planning to completion. This point
of view has a few significant implications, the most important is about to the dynamic between power and service, which will be discussed in depth in Chapters 4 and 5. The funding for these ship maintenance projects is delivered through contracts.

As previously discussed, the Navy has continued the improvement of its contract strategies on the basis of cost and associated regulations. In a MSMO contract strategy, the contractor was not responsible for cost overruns, and in theory, could add to the contract anything deemed necessary to meet the demands of their original contract. TYCOM will provide the extra funding for growth or new work. Of course, there was better collaboration with the contractors, however, an RMC representative agreed that “the Navy was still paying too much money unnecessarily without getting quality – [the Navy] was just getting speed.” In MSMO, there was no real incentive to keep costs down or produce quality work–it was essentially like writing a blank check. Modified rules through MAC-MO placed the risk back on the contractor to pay all cost overruns and get better quality, but as we know, schedule still struggles. It has been about seven years since the implementation of the MAC-MO strategy–what is it going to take for schedules to also improve?

Some participants believe the Navy must continue to focus its attention on improving the way it uses money to leverage contract behavior–as “it is the only real way to get what we desire,” an RMC Contract Specialist declared. NAVSEA is still in process of determining proper metrics of analysis toward this effort of understanding how proper monetary incentives can motivate the desired outcome–greater productivity, quality, timeliness, and overall performance. For the Contracting teams, this is their area of expertise, and they are relied upon to help determine the best type of strategy to use based on the intended result.

The Secretary of the Navy (SECNAV) has a policy in place for surface ship repair progress payments, which is monitored by the SBS that does the following: “Determines the physical progress, as a percentage of work completed, of each work item and each contract modification assigned. This information is updated weekly in a comprehensive progress report that is used in calculating the contractor’s entitlement to progress payments as well as in evaluating the contractor’s schedule performance"
[14, p. 31]. This policy, combined with fixed price contracts under the MAC-MO strategy, is intended to allow the Navy to better control the quality and completeness of work performed; contractors will not receive payment until they provide the substantial proof required. Of course, this has not completely solved the issue of delayed work. While money is a necessity to live in this world, conduct business, and provide services, it is only one way if used correctly, to help improve performance, and serve as best as possible. The narrow focus on money has limited the playing field for other possible viable levers toward motivating or incentivizing positive change, which will be discussed in Chapters 4 through 6.

A different component of motivating good performance is ownership and accountability. When people are effectively motivated, they are often more likely to exude a greater sense of ownership and accountability in their involvement in work. Five interviewees frequently observed a lack of ownership and accountability on multiple fronts during meetings especially, where people consistently take offense when hard truths requiring discussion are illuminated, rather than honoring feedback and demonstrating a willingness to adjust if necessary. One Supply Officer (SUPPO) noted that during one weekly CO production meeting, a contractor “became extremely defensive when the CO asked him why certain tasks that were said to be progressing along, were in fact not progressing as advertised by the contractor. He began to search for an excuse or someone to blame as he asked why he was being called out”, rather than simply answering the question, and seeing it as an opportunity to help the team move forward. While many representatives from RMCs, shipyards and TYCOM staff have served onboard at least one Surface Ship, the overall impressions from the Ship perspective especially, was that somewhere along the line these representatives forgot about their experiences as part of Ship’s Force and the origins of why they have “skin in the game” as one CO described.

According to one senior shipyard leader, the idea of “one team one fight should be the guiding principle” to how the navy maintenance industry actually practices business. Both former Ship COs agreed that it was typically unclear if the shipyards were motivated or “willing to go into the level of detail realistically required”—not by
contract—to truly succeed and not just go through the motions of meeting milestones to receive payment. While some believe that with MSMO contracts, for example, ownership of proper maintenance execution was improved, one senior Shipyard leader voiced that MSMO contracts allowed contractors to be "weak and lazy". Fixed Price (FP) contracts on the other hand, empowered contractors to rise to the challenge and master their work to provide the best service to the ship—stemming from a one team one fight invested mentality—while others, as previously mentioned, only did explicitly what was on the contract regardless, with a paycheck collection mindset.

As previously discussed, the JFMM holds the following statement:

The Ship is the customer and the Commanding Officer often knows when work is not progressing properly or the quality of work is unsatisfactory. During these [period meetings of RMC personnel with the Ships COs and DHs], the Availability Project Manager must brief Ship’s Force on the status of all work-by-work items and on corrective measures being taken by the contractor to advance the work or redo unsatisfactory work. [52, p. 57]

Nevertheless, the Ships are still under the impression that this is not practiced. Although the JFMM states that the Ship CO is the TYCOM representative during a CNO-Avail, they are not often respected with that level of authority, which often leads to delaying necessary real-time change. Participants have observed the difference in urgency to respond when the TYCOM Admiral himself visits a Shipyard or RMC to ask the same questions the Ship CO is already asking, but getting a different response. While the Admirals do not always have the ability to make frequent visits, it is important to realize the weight of influence inherently residing in their position and continue to help their Ship CO representatives more in this process towards achieving better results. Schedule delays not only impede successful on-time delivery of a quality ship, but also reduce opportunities to train, or to spend time with family before deployment.

Effective motivation to even have an open mindset is needed to engage problems.
Consistently prioritizing monetary and regulatory manipulation as the leverage to behavior modification towards better performance, naturally blockades the possibility of viewing the whole system in the problem, and thus deriving an optimized solution.

### 3.2.3 Systems Thinking

Five interviewees voiced that the Navy struggles with strategic thinking and leaders who then “choose very short-term thinking about how to implement a solution rather than long-term thinking of how to implement the system.” One RMC lead believes that in our maintenance environment, supervisors and workers alike, are “not trained to be systems thinkers and understand feedback and downstream effects so that they are no longer unintended consequences” but are actually expected. Since the standard way of thinking is attracted to immediate results, higher-level leadership does not buy into the value of investing in additional middle managers who are available to think and strategize, and to lead, coach and mentor their employees—middle managers are viewed as unnecessary costs and more people doing less real work.

“Arguably the hardest thing is for people to understand the system,” says a SURFMEPP representative—how it is decomposed, how different parts are interdependent, and who needs to understand what is important to analyze. There is an overall sense, one RMC lead explains, that most major contractors are more committed to “geeking it out instead of planning it out, creating a wall that Ship’s Force can’t climb—which ends up being a total waste of time, money, and effort”. A lack of understanding the system is often highlighted in the inadequate advanced planning process and contract changes after contract award. RCCs over a certain dollar amount, even “for very minor changes, would often times take months to gain clearance” one Ship Officer noted. All interviewees agreed that if the entire planning process is commenced earlier—as now mandated—and adhered to, “the contractors would have more time to plan properly, make better cost estimates and provide better service” to the ships, as previously discussed. Additionally, improvement is needed in detecting issues early in this planning process to help eliminate the need for RCCs.

Part of this systems thinking challenge is learning and applying how to effectively
manipulate levers within the system to achieve positive change. According to the same RMC leader, “the change management process is another primary struggle of the Navy”. From figuring out how to manage the RCC process, to adapting to a new social norm of working and living during COVID-19 as a prime example, the overall way the Navy processes and adapts to system change must be improved.

Another systems thinking-related factor is the scarcity of necessary elements—parts or qualified professionals—to conduct the work required. As found in the literature review, one of the former Ship COs and a prior Ship SUPPO DH agreed that a major pain during the CNO-Avail was “acquiring the parts necessary” to continue progressing on time. This included long-lead items that were either ordered incorrectly or too late, or were disrupted in the supply chain process and did not make it to the ship in time for the necessary work item to be accomplished as scheduled.

Other issues that bogged down progress consisted of obsolete or unique parts that took a tedious process to cannibalize from another ship, whom would then be delinquent during their own maintenance availability. These processes required Ship’s Force spending far more time than planned helping contractors find parts, resulting in delays for both stakeholders. The SUPPO recounted one instance where contractors had not properly planned for maintenance on a system that required a particular type of bolt replacement, which they did not have and had difficulty acquiring. In an attempt to find a solution, the Ships CO sent the SUPPO, which trickled down to the respective division’s DIVO and Leading Chief Petty Officer (LCPO), to call other ships, companies and even go to local stores to find these bolts. Sometimes higher-level authorities would even cancel the Casualty Report (CASREP) that documented the urgent need for the repair of, or replacement of a piece of equipment, which only led to deferred maintenance and more backlog.

Furthermore, according to seven interviewees, the lack of experienced managers and supervisors was very concerning. RMC representatives and the Ship COs overwhelmingly agree that “more, and better SBSs and PMs are needed to run the show”—to provide sufficient and timely expert opinion and leadership that these complex projects require. Inexperienced or unskilled managers often lead to poor work specifi-
cations, poor quality of work slipping through the cracks, and more delays in schedule because things were not right the first time. At the same time, shipyards have been noted to be lacking in employees available to fully carry out the project as previously mentioned.

Considering all these factors, in order to properly think in systems and apply the system analysis, we need to be able to communicate well—otherwise, it is hidden in the mind of the few people doing the systems thinking.

### 3.2.4 Communication & Coordination

Communication might be the toughest but most important challenge to overcome. Recent research has supported demands for more effective communication, but others suggest that the Navy is more focused on finding ways to cut costs incurred rather than focusing on "increasing efficiency across the entire value stream" [39, p. 69] to yield cost reductions. Northrup adds that stable relationships are the foundation of cooperation and coordination, and it takes time to build trust within these relationships—this is not a quick fix, but an achievable and necessary effort. In order to build trust, we must improve how personnel communicates with each other. Many of the interview participants agreed, and one Ship CO voiced that “ineffective or insubstantial communication has been one the biggest blockades to achieving success.”

All Navy maintenance-related communication is mediated through scheduling technology and software databases. All interviewees emphasized the inadequacies of Navy maintenance scheduling. One shipyard leading manager believes that “scheduling of Navy maintenance is broken and must be improved.” The tools currently being used industry-wide are not robust enough to thoroughly include and align all details of an availability plan from start to finish – this includes Ship’s Force plans, Shipyard plans, and AIT plans. There is currently little value seen by executive leadership from all parties in investing in this area of deep diving scheduling and planning needs because they are not immediate results or “homeruns right out of the gate” as one RMC executive phrased, to support the return on investment.
The information must be understood by all parties involved in doing work or making decisions about the work to be conducted. These tools must enable real-time progress updates to be made so that real-time decisions can be made. Real-time information leads to enhanced schedule deconfliction, not just for the one ship of focus in the maintenance phase, but other ships that might be docked in the same shipyard, or are completing their availabilities before or after that ship. This schedule must be updated and reviewed by all players to ensure constant alignment and avoid grey areas or misinterpretation. It must transcend sole reliance on the expertise level or timeliness of the person manually inputting information, and catch up with commercial business technological concepts like “Superminds” [32] as described by Thomas Malone (2018): integrating brilliant humans with smart computers. This seeks to allow more time for leaders to actually think strategically about the data presented and make tactical decisions much more quickly. According to both RMC and Shipyard leadership, there are on order of 70,000 Quality Assurance (QA) items per ship availability—“it is impossible for the currently available systems and personnel to keep track of all individual items in real-time, track each change, and make the necessary decision.”

A second challenge to communication is a work climate that does not make space for people to feel comfortable asking for help or for clarification, whether on seemingly trivial or major issues. Personnel have been shunned for asking certain types of questions or asking the wrong person at the wrong time. Perhaps they are fearful of being incorrect and then embarrassed. People feel as if they must know everything and shouldn’t be asking questions, fearful that they will seem incapable or incompetent. As organizations and projects are becoming more complex, many lower level or middle managers feel uncertain about their roles, or the intended nature of relationships within and across affiliated organizations in order to properly execute tasks. Employees assume that the conversation has been already had, or the other person already knows the information to carry out their assignment. One RMC leader commented that, “the biggest problem with communication is thinking that it already exists.” A former Ship CO also pleaded to “not assume the conversation doesn’t need to be had.
Most people are hiding something on the inside that could have made the process a lot smoother if it made its way into the light and was affirmed or clarified.” There are additional climate issues, perhaps more toxic, that further compound the latter.

Seven interviewees also identified organizational norms that tolerate or condone a spirit of purposeful unhelpfulness. Contracts require contractors to provide only what is in the contract–if it is not in the contract and costs time or energy then it is seen as a burden even if it could have been helpful. Both Ship COs have emphasized that certain contracting organizations do not share the information needed so everyone can succeed–many times because it “simply wasn’t written in the contract.” Instead, it became “a battle against one another” for individual goals, one CO explained. Participants further noted that there is no sense of necessary transparency about progress–sometimes because the actual progress is unknown at the time of inquiry, or there is fear to acknowledge the real reasons why work is delayed. The term “in progress” is used in the production meetings, but “the true meaning hides behind a Gantt chart bar” as one Ship CO expressed, and no resolutions are able to be discussed.

Considering the notion that TYCOM is viewed as the customer, Ship COs agreed that they were “frequently left out of the loop on important information.” This led the COs to hold more and longer meetings, which reduced time focused on executing work, which led to people feeling offended as senior leadership strove to extract more information. One CO noted his experience at one shipyard, being “met with resistance” when desiring open communication about issues through each week, to the point where he felt compelled to “use the contract against them so that they would finally pay attention and listen” to him, since he knew the contract in much more detail than many of the lead contractors. It is impossible to be aligned on the schedule and actually work together towards delivering the ship on time, when decisions are made to withhold information. Everyone needs to be able to understand critical path items, how their piece affects the whole–an integrated production schedule accessible by all parties. An unhealthy byproduct of this lack of willing transparency was an increase in ineffective communication that included more meetings that sometimes
missed the important players and Subject Matter Experts (SMEs).

Teams and organizations have also had to figure out the best ways to hold effective meetings without being face-to-face with everyone due to the social distancing mandate. Extensive research conducted in the MIT Human Dynamics Laboratory, found “patterns of communication to be the most important predictor of a team’s success” [45]. More specifically, they found that “the most valuable form of communication is face-to-face” [45] while the second most valuable form is “by phone or video-conference but with a caveat: Those technologies become less effective as more people participate in the call or conference” [45]. This is unfortunate in cases like the ongoing pandemic where many people are involved in the surface ship maintenance process.

Additionally, the MIT Human Dynamics Laboratory data revealed that great teams all possess several characteristics:

Everyone on the team talks and listens in roughly equal measure, keeping contributing short and sweet, members face one another, and their conversations and gestures are energetic, members connect directly with one another- not just with the team leader, members carry on back-channel or side conversations within the team, and finally, members periodically break, go exploring outside the team, and bring information back.[45]

A former Ship CO agreed that “face-to-face interactions are key to resolving conflicts and perpetuating situations unnecessarily.” He continued that “when we show up for meetings, such as the daily production meetings, we get to observe body language, gestures that really paint a full picture of attentiveness, engagement, and any other feelings like fear, during a conversation.” Over time, it gives space for being more authentic with one another. Less face-to-face contact and eyes on the system slowly leads to work becoming an abstraction. However, this inevitability must be “compensated with deep empathy and deep thinking”, as mentioned by the same Ship CO. Without this mindset, it is much easier to drift away from the original shared purpose and plan, towards clinging to individualistic ideals and goals when perturbations
One final concept influenced by good communication and coordination is the
“whole-human” concept. This encompasses an awareness and acceptance of the bril-
liance in contributions from each person’s diversity, including upbringing, family,
values, hobbies, interests, and spirituality to name a few. Although this concept
is not new, it is not well supported by traditional bureaucratic organizations. One
Shipyard senior leader and one partner in leadership development, have both taken
a stand in advocating for the benefits of “bringing awareness to the brilliance of each
person” regardless of job title or position. They believe that not truly seeing a whole
person and investing in all people, leaves untapped potential for greater performance.
This untapped resource could lead to delays in the completion of the maintenance
availability.

“Until the Navy RMCs build functioning relationships with the contractors, there
is no contract type that will fix the Navy’s cost and schedule issues” [39, p. 90]. But
the responsibility of building functioning relationships must involve all stakehold-
ers:RMCs, the Ship, and the Shipyard. These ideas will be further discussed in the
remaining chapters.

3.3 Summary

Overall, this chapter outlined various perspectives from official government reports to
outside expert research and first-hand personal accounts on the contributing factors
to poor performance, and delays in complex systems, as they pertain to Navy surface
ship maintenance. This outline is not comprehensive, and would benefit from more
study in future research of more MAC-MO contract strategy correlation data, more
quantity and diversity in interview participants, and more thorough system dynamics
analysis of all of the contributing factor themes presented here, among many others.
Chapter 4 will explore these themes even further.
Chapter 4

Reexamining Navy Ship Repair:
Relevant Literature and Three Lenses

Now I will now reexamine the Navy maintenance system, from an alternate view. Beyond the Navy, there are many other relevant experts who have spent years researching root causes of inefficiencies in the workplace and workflow of complex projects. According to Project Management experts, Bryan Moser and Ralph Wood, “recent dynamics of complex projects yields surprises and variations undetected even by teams considered best performers. Rather than elimination of these unexpected variations by forcing the engineering project to fit anticipated form and processes, Moser and Wood’s research examines the systemic conditions which lead to these surprises” [38, p. 52]. The systemic conditions also mentioned by other experts across the various fields of organizational studies are consistent with the same four themes I have laid out in Chapters 3. These themes are further discussed throughout the chapter as they relate to the Three Lenses.

4.1 Three Lenses Framework

The Three Lenses approach provides a practical framework for analyzing organizations from three viewpoints: Structural Design, Political, and Cultural. “Each lens is a perspective on organizations that distills the essence of related theories that share
ideas about human nature, the functions of organizations, the meaning of organizing, and the information needed to make sense of an organization" [11, p. 3]. Through the three different lenses, "[we] gain new insights and a richer picture of an organization" [11, p. 3]. In order to implement effective change to a system, we must first see the system from all three lenses, and how they are interdependent. Many people and organizations use one or two lenses, and therefore miss the benefits of a holistic perspective. Furthermore, “most people think that their model of the situation is the obvious and appropriate one, and they do not appreciate that others operate with different models" [11, p 2].

The Structural Design lens seems natural, logical, and obvious to many people. It examines the flow of tasks and information, or how to get things done. Managers are taught that an organization exists to achieve its vision or reach its goals (in public corporations, the goal is typically shareholder wealth). An organization is like a machine designed by the strategic visionaries of the organization—founders and executives—based on:

rational analysis of opportunities and capabilities... In order to enact that vision, particular people are hired with necessary skills or given appropriate training, grouped into departments or teams in order to carry out subtasks, connected by information systems and work flows to coordinate tasks, monitored for their performance according to plan, and rewarded to promote continued performance. [11, p. 3]

The Political Lens breaks apart the assumption underlying the Structural Design lens that an organization has an agreed-upon goal and a logical way to optimize division of labor. Instead,

the political lens assumes that any organization is a diverse collection of stakeholders with different and sometimes conflicting interests. The organization is heavily influenced by those with power, the dominant coalition, but power is constantly shifting and being contested... [A]s the environ-
ment shifts or new strategies are developed, groups come to the fore that have the capabilities to deal with these new demands.[11, p. 7]

Finally, the Cultural lens considers that a workplace is a community with its own ways of thinking and acting, its stories of heroes and villains, its norms, values and beliefs, developed over time because it has been effective, and passed on too new members as the proper way to do things. Organizations are “social systems in which people must work and live together, and therefore the management of meaning is as critical as the management of money and production” [11, p. 9].

This is just one approach to viewing the system, and there is always more to learn as the system, its participants, and its observers, continue to evolve. Now I will return to the themes, using the Three Lenses as a way to deepen analysis of each themes, as proposed in figure 4-1.

![Figure 4-1: Discussing each theme through the Three Lens](image)

4.2 Purpose & Vision

I share the belief that “humans by their nature, seek purpose – to make a contribution and to be part of a cause greater and more enduring than themselves" [47, p. 223]. One renown speaker and author, Simon Sinek, believes that “companies with a strong sense of why are able to inspire their employees. Those employees are more productive and innovative, and the feeling they bring to work attracts other people eager to work there as well" [49, p. 95]. Both Meadows and Sinek agree that “purposes are deduced from behavior, not from rhetoric or stated goals" [37, p. 14]. Many of the Navy surface ship maintenance stakeholder organizations have great mission statements
and company goals, but few are aligned in what they say they do and what they actually do, as seen in Vigor’s case. This constrains the ability to build trust within and across organizations, which is unfortunate because dedicated hard work flows most naturally from those who trust you.

Many hierarchical organizations are experts at explaining how and what they do, to the point that why they come to work is unknown, trivial to the point that it is deemed unnecessary to repeat, or misinterpreted with a faulty substitute that is far from the original intent. Through the cultural lens, what is constantly being repeated, matters a lot. If leaders and managers exhibit more concern for executing what they do (e.g. fixing ships), than why they are doing the work or the values underlying how they want the work to be done, all they will think about is just getting the job done. From a structural design viewpoint, this is the intended goal, and leaders are using their power to reinforce behavior that achieves that goal. However, when the focus is narrowly on what is being done rather than why and how, workers may take shortcuts, exercising their power to interpret what they believe leaders really want, and feeling that they are just “tools” wielded by leaders. This could undermine their own motivation to do their best every day and shift their understanding of what “best” really means. Sinek models this concept through the golden circle as seen in figure 4-2.

![Figure 4-2: Golden circle of hierarchical organizations](image)

In this model, the WHY must be the centerpiece for how an organization does what it does—it cannot be replaced by HOW or WHAT. The WHY is the anchor everyone relies on to keep the organization afloat and from drifting into unintended waters—so investing time in getting this right is important. From the WHY, everything else
flows—such as the strategies used to create the products that fulfill the why. Both strategy and products evolve naturally over time, such as types of Naval surface ships, or even what private industry could be responsible for repairing in the future as the Navy continues expanding. Sinek argues that the leaders must own their purpose so that the lower-level workers will do what is necessary to fulfill this purpose, and serve the customers—in this case, Navy surface ships.

The analysis of Navy maintenance reports suggests that many of our surface ship repair and maintenance organizations confuse and overlap WHAT they do, or their current role, with their overall purpose. This leaves them on a plateau short of reaching greater potential: they make great contractual deals intended to maximize profit and deliver quality repaired ships to the fleet, however their real purpose should be serving the surface Navy fleet and ensuring they are mission ready to fight our nation’s battles at sea. The difference is that mission readiness is more than fixing ships, as the CNO noted in his NAVPLAN: “Readiness touches all elements of our Navy—from our shipyards and aviation depots to steaming and flying hours our Sailors use to hone their skills” [25, p. 7]. While it is understood that a shipyard, teamed with the RMC and Ship’s Force, is supposed to repair the ship to get back to sea, it is easy to forget the part that matters most—the fact that it will be repaired and operated by human beings and goes beyond simply having a repaired ship that meets the contract.

This commonly narrowed perspective is a stumbling block towards realizing greater performance across all levels from the RMC CO to the custodians cleaning the shipyard or the E-1 cleaning their space on their ship. Meadows claims that “the original purpose of a hierarchy is always to help its originating subsystems do their jobs better. This is something, unfortunately, that both the higher and the lower levels of a greatly articulated hierarchy easily can forget” [37, p. 84]. In Navy surface ship repair, there are systems of hierarchies as seen in the stakeholder decomposition in Chapter 2. There are thousands of lower-level workers, fewer middle managers, and even fewer lead supervisors. Once the organizations’ purpose is clearly defined, the lead executives and supervisors must be the most immersed in that purpose so that
it overflows down to each level: to the middle managers, who are as one RMC leader described, “far too removed from either side... and stick to the same thinking”, and especially to the lower-level front-line workers who are directly responsible for producing the intended outcome—an on-time, within-cost, quality repaired ship.

Meadows adds that “to be a highly functional system, hierarchy must balance the welfare, freedoms, and responsibilities of the subsystems and total system—there must be enough central control to achieve coordination toward the large-system goal, and enough autonomy to keep all subsystems flourishing, functioning, and self-organizing” [37, p. 85]. This is an important and necessary overlap between all three lenses: navigating how to properly use the power inherent to each person—most commonly based on positional authority, networking connections, or level of expertise within these organizations—to achieve the overarching goal (which is not always aligned among all stakeholders), all while balancing sustainable cultural norms, values, and beliefs.

Ideally, if the overall purpose of Ship’s Force, RMC and Shipyard are in alignment, the power that each stakeholder possesses should work for each other towards this purpose and deliver the Readiness the Nation needs from these Navy Ships. If the purpose is unknown, unintended, or forgotten by each of the thousands of employees, they will all work towards whatever they assume is right—many times people are working hard to achieve very different goals, find out they are unaligned and must rework. Instances like these, without a clear and repeated purpose, can lead to decreased performance over time. Meadows declares that “drift to low performance is a gradual process...but if it drifts down slowly enough to erase the memory of (or belief in) how much better things used to be [or could be in this case], everyone is lulled into lower and lower expectations, lower effort, lower performance” [37, p. 123].

After a while, people get tired of working on something and desire to work toward something. Our Navy ship repair contracts are written for contractors to execute in full. The contractors, along with the RMC and even the ship, will only do what they are told to do, however, “if they are constantly reminded WHY the [organization] was founded and told to always look for ways to bring that cause to life while performing their job, they will do more than their job” [49, p. 99]. Knowing our purpose in
why we work enables sustained and long-lasting growth, loyalty, and inspiration to continue to succeed [49].

4.3 Motivation & Inspiration

Seen through both the structural and political lenses, the current MAC-MO contract strategy is designed to optimize profit, schedule and quality of the ship repair through the leveraging of money, imposed rules, and “if-then” incentives. While this has worked to an extent, I have provided evidence thus far suggesting that this “carrot and stick” manipulation cannot by itself produce the full desired sustained outcome the Navy maintenance industry seeks to achieve. Pink declares that while the original bureaucratic motivation method required compliance, the improved alternative method of motivation towards great performance, as proven by decades of science, requires personal engagement to become a master in something that matters, along with being trusted to work autonomously, driven by a robust, transcendent, and aligned purpose [47] as discussed in the previous section, as illustrated in figure 4-3.

Once each member of each stakeholder group is in-tuned with why what they do truly matters and meditate on it, they can truly progress on the path to mastery. The desire to master a trade or skill spans from the shipyard welder producing the most durable ship material, to the RMC PM becoming the best at coordinating ship repair projects, and to the Surface Warfare Officer mastering how to best drive the ship to keep everyone out of danger. Just like purpose, mastery is an intrinsic mindset that manifests in action. The more competent we become in an area, the more we earn trust to not be micromanaged in doing our jobs, and have space to create, innovate, continue to improve, and help others along the way. In this framework, there is freedom to invest in personal evolution and subsequently, willingly self-sacrifice selfish desires, ego, pride, time and attention, to contribute to the team’s success. Imagine for example, shipyard workers ruminating on a purpose-driven vision expecting Sailors to effectively use the equipment to engage in important missions across the globe after they repair the ship. This vision of customer usage is necessary to encapsulate a fuller
picture of the system and fuel the workers to do their best out of a place of love for the Sailors who will bear the fruit of their service that includes sustained greater productivity, timeliness, and quality of product.

Unfortunately, manipulative techniques have become such a mainstay in American business today that it has become virtually impossible for some to kick the habit. Like any addiction, the drive is not to get sober, but to find the next fix faster and more frequently. And as good as the short-term highs may feel, they have a deleterious impact on the long-term health of an organization. Addicted to the short-term results, business today has largely become a series of quick fixes added on one after another after another.[49, p. 29]

The goal that is most often repeated to workers in either stakeholder group, is to do whatever it takes to get the ship fixed expeditiously and within budget. This good-
intentioned mindset inherently ends up mastering the practice of taking shortcuts to achieve the goal and high productivity will be all that is achieved. When shortcuts are taken, for instance, more rules are put into place, further extinguishing intrinsic motivation and the desire to be great at their job to be helpful outside of themselves. In this case, people are more fearful of not following rules, meeting deadlines, or running over budget and invite more mistakes and rework to happen as they work in a state of constant fear.

Because of the intentional hierarchical structure of government organizations, however, top-down management continues to operate in ways that exercise positional power. This involves telling people what to do with rules and regulations and how they should think, and promising only incentives they feel are worthwhile (like a great bullet point on an evaluation, extra time-off, or a promotion), that are good but fleetingly attractive and unsatisfying goals. This inspires more fear of failing to meet these rules, progressive resentfulness in being constrained in how to use their unique gifts to contribute to the overall mission, and an increasingly fickle attitude toward working because now they are resting their hope in being satisfied through all the tangible incentives. The worker level has expertise, which should be a base of power and championed for the good of the mission, however, position and money are still the strongest power bases. It is in the interest of the shipyard, RMC and the ship that all workers are fully, voluntarily engaged in their work, because their expertise is critical to overall performance. In experiments conducted at MIT, researchers gave a group of students a set of challenges in which they were incentivized by three hierarchical levels of rewards. Results revealed that for any complex task that called for cognitive skill, higher reward led to poorer performance—money clouded out any other reason for doing the task, and proved to be a faulty dead-end [47]. This experiment has been replicated numerous times and the same results prevail. Every job involved in the surface ship repair requires some level of cognitive skill and creativity because the tasks are inherently complex and less assembly-line routine. This emphasizes the need for intrinsic motivation to sustain great performance.

In a world that is becoming more complex, and thus requires systems thinking
and marshalling expertise and collaborative problem solving at every level of the organization, it is imperative to come to terms with the limits of monetary and rules-based manipulation. Not only must we become aligned in awareness, we must make decisions based on proven scientific knowledge, rather than the fear of changing the way we think and act. The less time we spend paying attention to these intrinsic purpose-driven motivators like autonomy and mastery, the harder it will continue to be think in whole systems rather than in single elements, which makes it even harder to work together and build relationships with people to achieve higher performance.

4.4 Systems Thinking

In Chapter 3, systems thinking was one area where all interviewees agreed that improvement was needed in the ship maintenance community. This concept is structural in nature because it is the essence of how elements are positioned and interconnected to maximize success. Through one of her most influential books, “Thinking in Systems”, notable systems thinking pioneer, Donella Meadows, has left a legacy of proven lessons about the significance of viewing the world and everything in it as a system, how to begin understanding systems, and the consequences of neglecting this holistic framework. She begins by decomposing the system into three essential categories: “elements [stocks], interconnections [flows], and a function or purpose" [37, p. 11]. We sometimes focus more on identifying the elements of the system rather than digging into the hard, yet necessary aspects of interconnections and the “relationships that hold these elements together" [37, p. 13]. When we look through the political lens, we realize that due to the inherent diversity of individuals within each stakeholder group—with sometimes conflicting interests—excelling in relationships between these members is key for proper system integration and operation.

While manipulating the elements is the easiest part of changing the system, it is typically the least effective, whereas changing the interconnections and relationships can produce a dramatic impact. Take for instance, the recent firing and replacement of the Gerald Ford-Class Aircraft Carriers Program Manager, in July 2020 [20]. While
all the details of this case are not publicly available, I would suggest further analysis on the impact of holding one leader accountable, as opposed to the whole team who were also responsible for the daily execution of the mission, or his bosses that were either unaware or allowed the situation to fester. It seems to have solved immediate issues of project progress, and maybe it was one bad apple that needed to be removed, but it would be interesting to know what evolved over time in order for the Program Manager to get to a point where he needed to be removed. From a cultural lens we would ask, what organizational norms played a role in the entire project being behind, what made the Program Manager lead the project the way he did for the time he was in charge? Even if project performance and productivity improved after his removal, was it due to more than the exchange of a leader? In a world that functions more smoothly around things we are more certain about, it makes sense that we attend to the stocks which are easily seen, measured or counted, such as the one program manager versus the number of operational Gerald Ford-Class aircraft carriers, and less to the less visible and more complex flows, like the teams of workers physically building the ship.

Either positive or negative, surprises often occur when the organization lacks a clear understanding of the natural rates of change, and when decisions are made without understanding their associated inherent feedback loops and the fact that those decisions only affect future behavior, rather than fixing the behavior that drove the decision of change in the first place. Considering the same case as above, it would be interesting to note what new change has begun now that a new leader has been implemented into the same system, and did it resolve any real issues that led to the firing of the first leader. We also tend to be caught off guard by what most people call “side-effects” because of the false boundaries initially placed on the system in order to obtain greater clarity, which can lead to drawing “illogical conclusions from accurate assumptions, or logical conclusions from inaccurate assumptions” [37, p. 87]. When un-intended feedback occurs, it becomes easy to stray away from the main mission because we get fixated on solving the short-term fires, and the long-term goals of the system become more distant or forgotten all together.
Many researchers agree with Meadows when she summarizes that “living successfully in a world of systems requires more from us than our ability to calculate. It requires our full humanity—our rationality, our ability to sort out truth from falsehood, our intuition, our compassion, our vision, and our morality” [37, p. 170]. The overarching culture in the Navy surface ship repair enterprise has behaved in a way that it is “obsessed with numbers, [and] has given us the idea that if what we can measure is more important than what we can’t measure” [37, p. 176]. The P2P effort for example, specifically teaches leaders in workshops to exclude things that cannot be definitively measured, when looking at how to improve performance (p2p.navy.mil). This approach towards improvement is not wrong, it is simply incomplete. “If quantity forms the goals of our feedback loops, if quantity is the center of our attention and language and institutions, if we motivate ourselves, rate ourselves, and reward ourselves on our ability to produce quantity, then quantity will be the result” [37, p. 176].

This is coherent with the “whole-human” concept discussed in the proceeding case study. “Decision makers [to include Ship’s Force, RMC, and the Shipyard among others] can’t respond to information they don’t have, can’t respond accurately to information that is inaccurate, and can’t respond in a timely way to information that is late” [37, p. 173]. It is a fact that we live in and operate as systems, and it is imperative to not “distort, delay, or withhold information” [37, p. 173] to benefit from each person’s ability. In order to live out these principles of holistic systems thinking, we must improve the way we communicate with one another on a daily basis.

4.5 Communication & Coordination

In a system there is one body but many parts. Meadows states that “hierarchies evolve from the lowest level up—from pieces to the whole, from cell to organ to organism, from individual to team, from actual production to management of production” [37, p. 84]. The binding link in these networks of individuals are the relationships that exist between people. While structural change is important, organizational change
must begin with reshaping our relationships with people. The concepts of greater communication, systems thinking, inspiration through purpose, autonomy and mastery, among others, amount to nothing if they are not shared with someone other than the individual in which those skills are being developed. Information flow is a structural design concept that is often left as a great plan, whereas enabling this flow involves political and cultural elements like trust which take harder work to actually cultivate and practice.

A framework through which we can unite all of these brilliant individuals into high performing teams is through dynamic relationships termed by a pioneer in organizational studies research, Jody Gittell, as: Relational Coordination (RC) amongst co-workers, relational co-production between workers and their clients and families, and finally, relational leadership between leaders and their employees [26]. Figure 4-4 illustrates a simple feedback loop of how good relationships anchored in shared goals, knowledge and mutual respect foster good communication that is frequent, timely, accurate and conducive towards solving problems.

Figure 4-4: The seven dimensions of RC [26, p. 14]

According to Gittell, “relational coordination is a mutually reinforcing process of communicating and relating for the purpose of task integration” [26, p. 4]. Since each person in an organization plays a part in making the system whole and func-
tional, relational coordination must apply to each person, from the customer to top leadership. Gittell offers proven practical interventions for all levels of the organization to play their part in being the change that will lead to greater organizational success—structural interventions for top and mid-level leadership (Leading Officers at TYCOM, RMCs, Shipyards and on the Ships), more intimate relational interventions for the immediate front-line leaders, workers and the customers (MT, PT, Ship’s Force), and finally work process interventions that improve the actual work.

While all of the listed components are important, I focus more on relational coordination and relational interventions. Each person must be aligned in vision and established goals so that no one is working counterproductively: Structurally, incentives must align properly; politically, stakeholders must negotiate varied interests fairly; culturally, common values and goals must inspire a shared vision. There must be a safe space with enough mutual respect to share knowledge and help each other learn and grow, rather than humiliate or blame others for getting something wrong or not knowing enough, regardless of how you feel about them. Positive constructive reinforcement encourages people to learn from their own and others’ achievements.
and mistakes, and inspire them to continuously do better no matter how hard or stressful something might be. In every CNO-Avail, there are formal meeting points such as daily production meetings, CO schedule updates, Planning Board for Maintenance (PB4M) among others, that serve to create a space for alignment across all necessary stakeholders and workers. Because the system does not operate on account of the heroics of one individual, collective accountability must be the norm—the team shares in triumphs and failures—which is why presence matters. One person getting promoted or fired for a team outcome reinforces the individualistic mentality and undermines systems thinking and good relational coordination.

This unconventional relational environment empowers individuals to better understand who they are interconnected with in their work, so that they can contribute better towards the organizations mission. When left to our own natural ways of relating with people, we tend to grow stronger relationships with people who are similar to us and weaker ones with those who are the least like us. However in a highly interdependent system, the strongest relationships must be with those where task interdependence is the strongest [26]. We stop trying or don’t make efforts to relate with people who we don’t find the need to speak to, don’t see often, or who we don’t personally connect with, but this mindset limits the depths of performance we are able to reach. For example, a common excuse is that Ship’s Force rotate too much to invest in relationships, so no one practices forming relationships at all with the people needed to be part of the execution team. When we really invest in this relational communication, every person from Ship’s Force to TYCOM in this case, can truly begin to work as a team and enhance the system and help produce the quality outcomes desired. Chapter 5 will discuss a case example of the implications of investing in this form of communicating, which are further explored in Chapter 6.

Unfortunately, buy-in for this concept in surface ship maintenance organizations transcending beyond leadership and culture programs and workshops or the Human Resource department, has been largely neglected. One reason is that “relationships among large numbers of people are [. . . ] more difficult to change in an intentional way, and even more difficult to sustain in an intentional way” [26, p. 9], along with the
fact that it costs in money and time, both of which are hard to sacrifice for uncertain long-term results. Due to the inherent fact that every participating organization in ship repair has a large number of individuals, it is imperative to have buy-in from leaders who can empathize with their workers in what they do every day because they have either been in their shoes, or are so invested in their people that they “understand and respect the complexity of the work” [26, p. 6] expected of and executed by their employees. Regardless of whether the relationships between individuals is good or bad, all of them interconnect and affect performance. Many of the responsibilities listed for these key stakeholders involved deconfliction of some sort, coordination, cooperating and leading teams. It is difficult to carry out these responsibilities well if there is no personal commitment to intentionally fulfill the purpose of serving and honoring the people involved through humble and transparent communication.

4.6 Summary

Overall, structural roles and positions within each stakeholder group are pre-set, and the least likely to change. The people in them change often, personalities change which are sometimes inherently “hard to deal with” as one RMC leader noted, and regardless, everyone performing their job is expected to execute it well, working with people towards the set mission. Politically, each stakeholder group and individuals within, possess different interests and power bases. Senior leadership is most often focused on revenues, pleasing customers, predictable results, cutting costs, producing a functioning ship—which are all important elements. Workers on the other hand, once their basic needs are met, are more often interested in how their work is affecting their family or personal life, how they can get their job done fast the first time, and how to work with their teammates/co-workers to achieve that. Major sources of power are financial, hierarchical position, levels of expertise, amount of information one has or has access to. Culturally, each individual comes to work with a set of personal values, beliefs, and desires that must be balanced within the workplace so that people can and will want to talk to each other, see each other as dignified and contributable
human beings, and as a result, do a great job fixing our Navy’s ships on schedule. Now that we have reviewed pertinent literature relating to these major themes, I will discuss a case study of one shipyard who has experienced positive transformation while applying these same outlined principles.
Chapter 5

Case Study: Analyzing principles in Vigor Industrial LLC

One relevant case study to examine with of the concepts in Chapters 3 and 4 is Vigor Industrial LLC, a privately-held corporation with multiple shipyards and related heavy manufacturing facilities. Seven interview participants were representatives of Pacific Northwest organizations: PSNS & IMF, Vigor Industrial, and Ship’s Force, and have participated in CNO availabilities at Vigor or are closely connected with members from these organizations. Vigor is a good example because of its past and current organizational change efforts to improve its maintenance of quality Navy ships, on time, and within budget. This chapter will outline Vigor’s corporate identity and self-assessment, describe two local Vigor facilities that experienced successful transformations, and consider where they currently stand in regard to the aforementioned concepts.

5.1 Vigor Background

According to the very first tab on its homepage,

Vigor is a values-driven, diversified industrial business operating in seven locations with approximately 2,300 people in Oregon, Washington and
Alaska. Built around a collection of powerful, unique assets and differentiated capabilities, Vigor excels at specialized shipbuilding, ship repair and handling important, complex projects in support of energy generation, our nation’s infrastructure and national defense. [4]

Vigor was founded in 1995 by CEO Frank Foti, who was inspired to “create a new kind of manufacturing company, values-driven and people inspired” [6] starting with the acquisition of a former ship repair company called Cascade General. However, one interviewee who participated in the value creation process said that when this vision seemed to “interfere with production and/or had too steep of a cost, it was back-burnered” [6].

In 2011, Vigor expanded into Puget Sound and Seattle in Washington, and Ketchikan, Alaska in 2012, “making the company the largest ship repair operation in the region” [6], with another expansion into Portland, Oregon, as they merged with Oregon Iron Works in 2014. Currently, the company has seven locations in the Pacific Northwest region. All of these acquisitions brought in great customer bases, skilled workers, and reputable track records, as observed first-hand by two interviewees. In 2019, a new equity firm and capital management company acquired Vigor with the assumption and expectation that the acquiring firm was aligned with Vigor’s pre-established values and long-term goals for continued growth and success.

Table 5.1 outlines the stated values that serve as the aspirational foundation for Vigor culture, especially in Ketchikan and Seattle, along with the company code of how they will work, that is, how they will put their values into daily action. Theoretically, everyone in the organization is charged with owning these values and codes, and actually living by them. However, that is exactly where most people and organizations might falter—in the daily application of the values they claim to believe. This knowing vs. doing gap [46] is what will be explored in this case study.
5.2 Transformation at Vigor Ketchikan

In 2014, Mike Pearson—a former SWO and long-time Navy veteran—joined the team as General Manager at the facility in Ketchikan, Alaska. When he arrived, the facility was struggling financially and with overall performance of ship repair. The way in which Mike Pearson led the maintenance teams at Vigor Ketchikan differed from typical approaches to a rough industrial job like ship repair. Pearson brought with him a passion to see people succeed, not just within his organization, but also on the ships that the organization served. He always remembered the “skin he had in the game,” as one Ship CO described, when he was serving aboard Navy surface ships in various roles, and how it felt going through ship repair periods or working on the ship before or after those availabilities. He embodied the concept of “one team one fight” every day, as he strove to align all players to that concept. Of course, as with any meaningful change in a system, there was substantial resistance and many problems that needed to be overcome.

When Pearson arrived at Vigor Ketchikan, organizational performance and morale were weak. There was a sense of “get it done, ready, fire—forget aiming,” as leadership development and culture change partner, Tom Mann, described. The shipyard was
struggling to get out of debt and consistently losing money from ship repair projects. There was a cultural norm encouraging risk taking in order to meet schedule and cost targets, which contributed to frequent injuries and then fewer workers available to execute the required maintenance. There was an overall feeling of disconnection and dichotomy among workers, supervisors, and customers—everyone was just “doing their job” individually as Mann observed, and this subconsciously demotivated people over time.

It did not take long for Pearson to notice “quiet suffering, dissatisfaction and isolation among so many people, that seemed to be growing.” As he states, there was “a broken-heartedness that [was] turning to anger and separation.” Pearson, along with Mann, initiated a quest to transform the organizational culture of Vigor Ketchikan by using a co-developed “Whole Human Model” approach. Together, they looked at the data on human behavior both from research and direct experience at Ketchikan. They explored questions such as “what do employees really want, their desires beyond money, what do they need to feel engaged, what role does leadership plays, and how is it most effectively developed,” among many others.

They soon committed to the process of creating a “critical mass” of more aware, engagement-oriented leaders, however many people it took, Mann noted. He said that part of their analysis consisted of “over 80 in-depth employee interviews with nearly all front-line leaders, asking them about their hopes, dreams,” and more. From their analysis, they agreed that people want to feel loved at work, loved in the sense of being seen (as a human being, not a number), heard (their opinions and perspectives matter) and valued (they want their work to be meaningful, and contribute to something bigger than themselves). And they want a path forward. [They want] to master their work, or to move into something that’s more in line with their own individual passion and purpose.

This approach encourages the freedom of employees “to be their most brilliant, creative and compelling selves” as Pearson and Mann described. This framework for
life and work seeks to embolden and engage employees, which is expected to pay off in healthy results for employee retention, mission effectiveness, and profitability. Living out this model became Ketchikan’s purpose—to “honor the brilliance of the human spirit” [7], and enabled them to progress towards their “150-year Cathedral Vision” of “building a yard that employees seven generations from now will be proud of" [28]—a generational principle for awareness and decision making that is also held in high esteem by Indigenous peoples.

During Vigor Ketchikan’s lengthy evolution, Pearson and Mann led the charge in creating a place where people wanted to work. Due to their unique location in a tribal Native American community, and thus surrounded by villages of Native American tribal members, Pearson intentionally reached out to invite them to be part of their mission and to bring awareness to the culture that surrounded this Vigor facility. Persistent practices of positivity and inclusivity fostered a work environment that stretched beyond working on a job: feeling free to live, and integrate each person’s personal lives into their work. This intertwining of personal life did not mean the stereotypically negative connotation of just bringing all personal “drama” and burdens to work and expecting everyone to be sympathetic or fix the situation. Instead, it was about allowing every employee to be uplifted and helped by their team at work—acknowledging that who they are and what they do outside of work directly influences their work. Unveiling this brilliance from the fullness of each individual in daily work is believed to be a great asset in further improving productivity, performance and overall morale. Pearson and Mann fought for a work environment where employees would be “free to become more aligned, and to work more closely together, and free from the fear of losing money and failing” [7]—and “it worked,” Pearson declared.

It took more than a year before real change surfaced, amidst many groans and moments of doubt that nothing was actually taking root and effort was being wasted—but “they committed to stay the course,” as Mann said. In a work environment that requires grit, strength, toughness, skill, perseverance and more, it was against the norm for Pearson to approach change management by starting with a deep investment in people’s self-esteem and personal development. Vigor Ketchikan has some of the
tallest, roughest workers, and they employ many former prisoners, being given a second chance at life. One report noted that for a few moments at the start of each work day,

bosses circle up their crews... They roll their heads, shoulders and wrists. They ask about each other’s families. They celebrate pregnancies, raises and second chances. They jump, they lunge. They do pushups and back-bends... Then—in jeans and work boots, sweatshirts and hardhats—they meditate. [10]

These same men and women noted that while they may have “thought it was kind of weird’ [10] at first, it helped them communicate more effectively, and they felt better prepared and encouraged to begin the day more at peace, despite all the stress, chaos, and hundreds of required tasks [10]. They felt that their safety, well-being, and lives were valued—they were not just cognitive-less machines that would manage their personal stuff on their own time away from work—and thus were motivated to perform a hard day’s work.

This sense of being valued and experiencing true unit cohesion was also developed through “celebrating zero” together as one team. Pearson would hold all-hands meetings, and have each craft place a zero—signifying no safety incidents—and had a display board in the yard that documented their progress and status at working toward or maintaining no safety incidents. Table 5.2 details the Total Recordable Incident Rate (TRIR) for Ketchikan under Pearson’s leadership, and exemplifies the progress they accomplished through uniting in purpose.

<table>
<thead>
<tr>
<th>Year</th>
<th>TRIR</th>
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<tbody>
<tr>
<td>2013</td>
<td>18</td>
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<tr>
<td>2014</td>
<td>8.1</td>
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<tr>
<td>2015</td>
<td>4.83</td>
</tr>
<tr>
<td>2016</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 5.2: TRIR for Vigor Ketchikan from 2013-2016 [7]

Mann said that “each zero brought thunderous applause” [7], encouraging each other to stay the course. Although some would argue that “celebrating-zero” could
inhibit reporting, Mann noted that this practice provided a tangible metric of performance, and encouraged workers and leaders alike to continue moving forward together with their awareness of the “whole-human” through this purpose-filled team-building practice.

Therefore, Pearson inspired a culture in the organization that focused on the brilliance of each person’s uniqueness. Workers were empowered with the sense of purpose that they served something bigger than themselves, granted the autonomy to master their craft, and trusted to learn from their mistakes rather than fearing blame. They embraced openness and transparency through face-to-face conversations for both good and bad topics, feeling free to offer suggestions to colleagues and bosses, and received immediate constructive correction with a feedback loop of continual individual team improvement.

For instance, Pearson described when his second in command “came to [his] office to tell [him] he strongly disagreed with [him] and the director of operations. It was a highly satisfying experience. The conversation inspired [him].” Rather than being filled with societal norms of immediate defensiveness or embarrassment, Pearson appreciated the courage and freedom in having a necessary open conversation about conflict so that they could progress. Instead of responding in rejection or pride, Pearson responded constructively out of love through patient active listening and welcoming every word that needed to be voiced. They recognized that when one person failed, the whole team failed and vice versa. Personal development for each individual is essential for organization development because each individual makes up the organization.

These Vigor representatives cared so much about service to their customer, taking ownership of their jobs and facility, and ensuring safety for everyone, that they are now one of the cleanest shipyards in an industry where attentiveness to a clean shipyard is not usually the norm. When you walk around this yard “you will not see trash” one Ship CO proclaimed, and if anyone becomes careless, he or she is held accountable. The CO further expressed that “when you see a shipyard who values and practices cleanliness, you can expect quality work to happen”–if they can be trusted with small
things like picking up trash around a shipyard, then they can be trusted with more complex tasks, for it is written that “whoever can be trusted with very little can also be trusted with much, and whoever is dishonest with very little will also be dishonest with much” [8] Luke 16:10. Through this transformation, Vigor not only rebounded from debt, but also became profitable, as declared by Pearson and Mann. (Due to data sensitivity, I was unable to get actual values of change over time.) Even local politicians, including Alaska’s senators, became eager to see and experience what Vigor Ketchikan was living out, Mann noted.

5.3 Extending Transformation to Vigor Seattle

After three years in Alaska, Pearson was promoted to lead General Manager at the larger Vigor Seattle facility, because he was acknowledged to be successful at building effective teams and producing good results for the company. The culture at the Seattle facility prior to Pearson’s arrival was even worse than Ketchikan: they were “unionized and beaten down,” with a deeply engrained “lookout for yourself” mentality, Mann noted. Financially, they were losing money. “It was dilapidated, filthy, and not a positive or inclusive environment. There were cliques, lots of milling around and avoiding work, and, like Ketchikan initially, horrendous safety,” Mann continued. However, Seattle also had a greater number of skilled workers, many of whom wanted to improve and have a better work experience, as noted by both Pearson and Mann.

Pearson began building on the same principles and used the lessons learned at Ketchikan. “While there was no budget to make purpose real and actionable” Mann noted, Seattle was able to develop a “whole human-centered” culture with “safety” as the vehicle. Through this approach they were able to naturally rally personnel around this common point of interest and empower them to directly and meaningfully transform safety on the yard, highlighting deep care for people’s lives and focusing less on profits, production numbers, or other traditional metrics. Pearson along with other company leaders at Seattle began emphasizing safety, inspired by the successful safety culture movement at Alaska Tanker Company (ATC). As seen in figure 5-1,
ATC made progress from five Lost Time Injurieess (LTIs) and 33 reportable injuries to zero LTIs and one recordable injury over the span of 15 years.

Figure 5-1: Alaska Tanker Company Loss Control Pyramid [16]

As expected, it took an extended time for this new culture to take root and manifest beyond individual leaders. Everyone had to understand that an increase in reported near misses, as shown in figure 5-1, is not a huge failure of safety but actually a success for the culture. In 2001, ATC had fewer reported near misses because most people were not aware of or were not reporting safety hazards, so injuries were occurring without being recorded or reported. Conversely, the new safety culture encouraged every person to report any kind of potential safety risk so each would learn from, and correct problems before they led to actual injuries. ATC emphasized that this was not a new set of rules and regulations, but a deep mindfulness of and personal commitment to safety and security.

Figure 5-2 shows the ATC approach to performance improvement that Pearson and his team applied to bring a safety culture to Vigor Seattle, “to the extent that they could without the support of senior leadership,” Mann said. The underlying assumption is that incident rates decrease as personal commitments to enhanced communication and attentiveness increase, and is enhanced and supplemented by team and organization commitments to their responsibilities.

As Vigor Seattle implemented this framework, they too began to experience the same improvements. To begin, “the top 35 people of the yard, the influencers, admin,
craft and project management” were gathered to find consensus, leading to three major agreements, which took root in the yard: (1) hold “face-to-face conversations first, over email, phone and text,” (2) “speak directly to people with no behind the back conversations,” and finally, (3) “ask for and offer help.”

These agreements, coupled with “doubling down on Vigor’s values”, empowered workers and supervisors to more freely speak up more often when they noticed things that did not seem right. Mann mentioned one recent instance when a supervisor felt empowered and “fully supported when he submitted a work refusal for a work item that he felt, based on the specification and work package, was unsafe for himself and other workers involved.”

Another instance was reported by a Ship CO: a yard worker continued eating in a work space without a hard hat while he used his personal phone while on the job. This occurred even after he was reprimanded by this CO. Pearson immediately removed this employee due to his unwillingness to be respectful or listen to the request of Ship’s Force, their own teammates or bosses, or abide by their contract. Pearson says that leadership “has to be willing to remove toxic employees” no matter what level they are, if they are unwilling to change.

Vigor Seattle also held leadership and culture training programs at the yard, which were unfortunately not funded as fully as at Ketchikan. Soon after the initiation of
a “whole-human” centered focus on safety in 2017, Pearson and the Seattle Safety Director began noticing improvement. Table 5.3 shows the trajectory of injuries at Vigor Seattle from 2016 to 2020 or recordable injuries on the job. (Did not get access to recordable near misses.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Recordable Injuries</th>
<th>TRIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>72</td>
<td>15.11</td>
</tr>
<tr>
<td>2017</td>
<td>73</td>
<td>10.05</td>
</tr>
<tr>
<td>2018</td>
<td>42</td>
<td>8.68</td>
</tr>
<tr>
<td>2019</td>
<td>14</td>
<td>4.24</td>
</tr>
<tr>
<td>2020</td>
<td>18</td>
<td>3.77</td>
</tr>
</tbody>
</table>

Table 5.3: Recordable injuries at Vigor Seattle [9]

This improved safety culture was reflected in the contracted availability beginning in February 2020 with USS Chosin, for example. Their arrival conference brief included a slide dedicated to highlighting shared mission goals which were as follows:[44]

- Nobody gets hurt- celebrate zero
- Meet all milestones and key events
- Do quality work, provide all Objective Quality Evidence on time
- Build trust with an Integrated Team
- Extreme Clean
- Facilitate the Ship’s Force ability to train
- Get USS Chosin back to sea fully combat capable

Their strategy, as repeated every day, began with “one team one fight” and they “approach safety as indistinguishable from excellence in daily production planning and work execution” [44]. This use of safety as a leverage point to create a culture of excellence parallels the successful practices instituted by former Alcoa CEO, Paul O’Neill, in using workplace safety figures as its top performance metric. In an interview he gave while still CEO of Alcoa, he said,

> Our safety record is better than the general American workforce. . . I intend to go for zero injuries. . . If you want to understand how Alcoa is doing, you
need to look at our workplace safety figures. If we bring our injury rates down... It will be because of individuals at this company have agreed to become part of something important: They’ve devoted themselves to creating a habit of excellence. Safety will be an indicator that we’re making progress in changing our habits across the entire institution. That’s how we should be judged.[53]

As a result, Alcoa’s “annual net income was five times larger than before [O’Neill] arrived, and its market capitalization had risen by $27 billion” [53]. At the same time, they “became one of the safest companies in the world”–prior to O’Neill, each plant experienced “at least one accident per week” [53], and afterward, there would be “years without one employee missing work.” This same mindfulness has been an integral part of Vigor Seattle’s overall culture transformation. Pearson and Mann have testified to O’Neill’s comment that “when employees believe their employer is aiming to keep them safe, it unleashes the kind of reciprocity that affects more than just the accident rate”[53].

As previously mentioned, the necessary personal commitment requires enhanced communication. Pearson firmly believed that leaders especially “should be speaking to employees all the time, and 95 percent of it reinforcing their strengths,” which is why he would conduct one-on-one counseling and mentorship throughout each week. This was seen as more valuable than the mandatory annual feedback evaluations. The team continued to emphasize that it is safe to have an open conversation, which was extremely fruitful, as experienced by one Ship CO in a 2020 Vigor Seattle CNO availability. The CO commented that “there was always an open-door policy, especially when hard conversations needed attention.” His “issues and concerns were always welcomed and discussed without delay,” and were aligned against Vigor’s “plan on how everything was linked together, which was huge”–they “placed a large focus on synergy” and it showed. He said it also gave way to building relationships with the shipyard through small gestures like “hand-written notes of appreciation to yard workers and supervisors” alike and mutual trust was built.

Pearson and his team practice “Precision Mirco Scheduling (PMS),” where they
post a huge picture of the ship in their large, dedicated planning cell room for the
duration of the availability, so that each person can clearly see how each system and
part of the schedule connects at any time. They use their internal resources, like three
Webb-Institute (College of Naval Architecture and Marine Engineering) graduates,
to contribute heavily toward critical thinking during the planning process to ensure
success. They engage in daily deep dives open to all parties who are or might be
involved or affected by the particular system or space being discussed. These deep
dives analyze a specific part of the schedule or the ship, in order to bring to light any
questions, concerns, and opinions. This creates an effective communication space for
early deconfliction, team alignment and overall learning—without fear of saying the
wrong thing.

Through this thorough planning and analyses, they are able to have clear two-
week schedule look-aheads to ensure that critical path tasks are actually on track.
They are intentional with daily documentation of actual ship condition and worker
progress in order to “manage change to make daily tactical adjustments and mitigate
risk” [44]. This helps overcome one of the major contributing factors toward delays—
the inability to expeditiously and accurately document real-time changes to make
real-time decisions as required. To support documentation and decision making,
enhanced technology and database software are important, but these do not yet exist
at the capacity and capability required.

5.4 Current Status of Vigor

Now serving as Vice President of Navy & Puget Sound Ship Repair and Navy Pro-
grams, Mike Pearson states that he has a “contentious relationship with the leadership
in Seattle” due to his counter-cultural views and practices of purpose, vision and val-
ues. He continues to put his career on the line for the sake of the vision, which
recognizes the brilliance and potential of the whole human being, but he “receives lit-
tle support from senior leadership”, as he noted. Despite the successes at Ketchikan
and Seattle that are documented with data, Pearson and Mann claim that Vigor
executives believe that contractual features and financial indicators are what matter most for company success. Multiple attempts to request increased funding for the leadership development and culture change programs were “denied each time,” with reactions that discouraged pushing the issue. Nevertheless, Mann estimates about 75-80 percent of Vigor’s work has been commercial contracts, and from the time Pearson began culture change implementation with him, 90 percent of their contracts were signed with the US Navy, indicating an increased trust to perform highly complex and significant projects. While Vigor Seattle is still doing well and improving, both Pearson and Mann firmly believe that, with leadership support, they would flourish even more. Pearson continues to voice the paradox that as “you care less about money and more about people, you make more money”—which is an important goal for both Vigor and the Navy.

5.5 Insights

To understand these cases and extract lessons learned, following is an outline of the major points of comparison between Vigor Ketchikan and Vigor Seattle, as shown in table 5.4. Note, that I make no claims about other Vigor locations, as I have no data or interviews from there.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Vigor Ketchikan</th>
<th>Vigor Seattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Founding</td>
<td>founded in 2012</td>
<td>founded in 2011</td>
</tr>
<tr>
<td>Pearson's involvement</td>
<td>Pearson served as PM from 2014-2017</td>
<td>Pearson served as GM from 2017-2020?</td>
</tr>
<tr>
<td>Community</td>
<td>Small surrounding community with present cultural heritage</td>
<td>Large city area with many businesses</td>
</tr>
<tr>
<td>Community involvement</td>
<td>large intentional community involvement</td>
<td>less dedicated community outreach</td>
</tr>
<tr>
<td>Workforce</td>
<td>Small pool of workers</td>
<td>larger pool of workers</td>
</tr>
<tr>
<td>Strategy</td>
<td>Focused on purpose (“honoring the brilliance of the human spirit”), awareness and team-building</td>
<td>Focused on awareness, transcending ego, &amp; listening</td>
</tr>
<tr>
<td></td>
<td>Used team building efforts (exercises, retreats, workshops) to develop whole-human centered culture</td>
<td>Safety used as major performance metric, and leverage point for spreading whole-human-centered culture</td>
</tr>
<tr>
<td>Leadership &amp; Culture Development Program Funding</td>
<td>more buy-in, more funding</td>
<td>less buy-in, underfunded</td>
</tr>
<tr>
<td>Financial Progress</td>
<td>from debt to profitable</td>
<td>from debt to profitable</td>
</tr>
<tr>
<td>Safety Progress</td>
<td>Decrease in safety incidents</td>
<td>Decrease in safety incidents</td>
</tr>
</tbody>
</table>

Table 5.4: Key comparisons between Vigor Ketchikan and Vigor Seattle

Now I will apply lessons learned through this case, in relation to the concepts
previously outlined in Chapters 3 and 4.

5.5.1 Purpose & Vision

Providing workers and leaders at both Vigor locations with a transcendent purpose to fuel their motivation to do great work was a priority to Pearson and Mann. This was not merely because they thought it was a great idea, but because they drew this conclusion from intentionally observing their people, their performance, and being open to the potential of already supported research on how leading with purpose is actually accelerate and sustain business performance. Pearson and Mann realized that without working toward a purpose and a vision, progress toward meaningful and lasting success is not realistic. Providing a purpose that extended beyond self–and focused on bringing out the best in each person, through various strategies–was the element that enabled other supporting chain reactions to occur for their good.

5.5.2 Motivation & Incentives

At the beginning of their research and quest to improve the shipyard, Pearson and Mann took the time to ask questions like “what (if anything) people desired more than money,” not only through their job, but in life. As supported by research discussed in Chapter 4, people want much more than money–they want and need to be helpful, master their craft, serve and contribute to something larger than themselves, and to be seen, heard and loved. Money can only satisfy those desires to a point. If that is not acknowledged, performance and productivity can suffer. By acknowledging this fundamental need, Pearson and Mann helped cultivate a culture and way of life that workers bought into, and that resulted in better performance at the shipyards.

They sought to move away from the old ways of behavior manipulation through bombarding reminders of deadlines, costs, or people who would be upset or disappointed in mistakes being made–ideals rooted in fear–to those that instead focused on great performance simply out of a place of love for others. This new way of inspiration could only be manifested from a purpose that stretched beyond natural boundaries.
of “just fixing the ship” or “just getting the best contract deal” for example. This type of motivation invites a wider perspective on the full system and enables greater systems thinking. Paradoxically, by not focusing solely on money and following rules, the shipyards made more money.

Additionally, from the set of values listed on Vigor’s website, it would seem as if Vigor as a whole was on the right track with its acting on these principles. Instead, Mann observed that the values and codes “have not been used as determining, substantive factors in decision-making” by senior leadership, with the exception of Pearson. He added that they had been “poster-ized”: “they appear on posters, email signatures and more, and there is virtually zero onboarding (for new hires) or ongoing, for current employees on the meaning, use, etc. of either values or the code.” If there is a lack of motivation to be accountable to the shared values set by the company, this can lead to many people working against the grain toward different goals, which does not set the system up for sustainable success.

Pearson led by example and gave employees the voice they’ve been longing to use. He realized that it not only matters, but that it is fruitful and serves everyone—themselves, their customers, and the company—and is better than being ruled over by senior leaders who are barely engaged with them and who don’t fully understand the work that is being done. Pearson’s and Mann’s initiative is seeking eradication of this unproductive power contest, by empowering the laborers to master their craft, contribute innovative ideas fueled by the greater purpose that they are in this business for something larger than monetary reasons, assuming that those basic needs would be met in order to come to work every day ready to give their all.

5.5.3 Systems Thinking

Systems thinking optimizes the elements of a system and its interconnections. Using safety as a strategy through which a whole-human centered culture could be nurtured demonstrated a keen awareness of their system and empowered others to practice system thinking as well. There was an understanding of the feedback loop that includes people being aware of their passions and contributions and aware that others
are aware of that within themselves. This new freedom of simply “being" leads to individuals wanting to work as a team and help others realize their passions and contributions. This in turn leading to a desire of taking safety seriously and a feeling of being seen, heard, valued, and loved by their bosses and teammates, which produces a healthy byproduct of productivity and profitability, as well as a higher level of care and concern for others’ wellbeing. This positively reinforced safety and a dedication to be fully available to work.

Pearson and Mann committed to staying the course as the program evolved not only through Vigor Ketchikan, but then onto Vigor Seattle. They recognized the similarities, differences, things that worked and didn’t work as the program began in Ketchikan and continued to improve through time, using the resources and funding that was made available to them. Overall, they recognized that change takes time, commitment, support, and learning to push through the resistance. They did not replicate Ketchikan exactly, but used the same fundamental principles at Seattle to achieve sustainable change in a similar situation.

The better their ability to think of the full system and observe behavior feedback loops, the more effective their communication and resulting coordination and collaboration became.

### 5.5.4 Communication & Coordination

The three agreements that leadership and workers practiced at Vigor Seattle are anchored in effective communication. They agreed to have face-to-face conversations, speak directly to people—no behind the back conversations, and to ask for help and offer help. There is an underlying acknowledgement that great coordination towards successful mission execution can only happen with great communication, the hardest part of the human dynamic. Fear is the root of many insecurities masking as pride, ego, and shame among many others, that lead to these agreements being broken in some way. These agreements are often neglected in normal human life—many people shy away from conversations that involve really seeing the other person, we find it easier to gossip in this age of fake news and gossip-filled social media, and society
condemns help-seekers because the culture says help-seeking portrays weakness, inferiority, and incompetence. Pearson’s example of providing intentional, frequent, and productive feedback continued the cycle of growth at Seattle, and encouraged other employees to share with others ways they could continue to grow.

Pearson noted that effective teams were built through living out “transparency and complete honesty”—even when it hurt—which built trust and allowed “every voice to be heard and valued.” His efforts at active listening and acting on the presented needs at Vigor, are an example of how to work towards bridging the gap between underlying interests of stakeholder groups—building a coalition among these groups that can pursue mutual interests and agree that the distribution of benefits (e.g., safety, job security, salary) is fair for everyone, and engage all employees in healthy relational co-production by showing that their voices matter. For example, One Ship CO praised how seamless it was getting information to and from the Vigor Seattle PM and other key maintenance team members throughout their entire availability—with emphasis on concerns and issues from either side, which are typically the hardest information to communicate. He also made it clear that when the “whole-human” awareness is absent, you get a totally different response—stress, chaos, deception, striving for information and bottlenecks. System bottlenecks most often happen where relational coordination is needed the most, and where it is the least present.

Pearson served as an example of harnessing true relational coordination through the optimization of routine meetings (PB4M, CO schedule updates etc. . .): practiced precision planning with a dedicated planning cell, a routine two-week schedule look-ahead and daily deep dives, and ensuring that all players were present, free to openly contribute regardless of position, and understood the information before departing. He openly welcomed disagreements, encouraging others to view these as learning opportunities to hear different perspectives of the system, rather than an invitation for dissention and offensiveness from a place of pride and insecurity.

Communication is too easy to get wrong, but investment in better communication can lead to improvement and prosperity. Breaking barriers in this area is hard, but necessary. Pearson’s intentional devotion to tackling this area of the system paved
the way for the system to output greater productivity, quality and timely work and overall greater performance.

5.6 Summary

While Vigor Ketchikan and Seattle are not perfect, Pearson, Mann and others found a successful and sustainable way to help improve shipyard repair while also helping people. I agree with Pearson and Mann that their intentional focus on developing people led to a natural improvement in the ship repair process—performance, productivity, quality, schedule and profitability—that is supported by data. The “whole-human” centered culture initiative provided the shipyard workers with something that will last longer than their jobs or paychecks—a sustainable community of workers and their families who then continue contributing to the improvement of this industry.

Paul O’Neill at Alcoa summarized it succinctly when he said that when employees are “treated with dignity and respect every day... A down payment on that is nobody ever gets hurt here, because we care about our own commitment to our safety, and we care about the people we work with. And it swells up into everything you do, so it creates a sense of pride about the organization you’re involved in” [53]. These achievements could be enhanced with the full and consistent support of senior leadership, but is also a testament to the payoff of hard work and dedication when there is a fulfilling and sustaining cause.
Chapter 6

Two frameworks modeled

Now that I have provided a case study that has demonstrated improvement in performance from the application of principles outlined in Chapters 3 and 4, I will propose a model of the a fundamental interconnection between all of these themes. To understand the implications of these root themes, we must further outline each key stakeholders interests and powers reside–outlined in figures 6-1 and 6-2, to see where these fundamental principles are active and can be leveraged.

Figure 6-1: Stakeholder interest during the maintenance phase
In the case of the ship's maintenance phase, we note that according to the listed interests (not all inclusive or in any particular order of significance), Ship's Force would be considered as the "beneficial" stakeholders, whereas the shipyard and RMC would be the "problem" stakeholders. Beneficial stakeholders “receive value outputs... and provide value inputs” [17, p. 242], whereas problem stakeholders are the primary value deliverers. From this point, we begin to understand why there might be inherent friction between stakeholders: the Ship is dependent upon the RMC and shipyard to coordinate quality completed work to be completed for the ship to return to operational duty. This is the case even though, as previously discussed, TYCOM is valued as the “customer,” the RMC and shipyard must collaborate completely to provide value added to multiple ships at a time. However, previous chapters have noted that this is not satisfactorily carried out. Additionally, it should be noted that one similar interest among all three stakeholders is to deliver the ship from the yards back to sea on time.

![Stakeholder powers during the maintenance phase](image)

Figure 6-2: Stakeholder powers during the maintenance phase

Each stakeholder has inherent powers (expert, positional, network etc..) through which they can meet needs, as discussed in Chapter 4. The purpose for, and the ways in which these powers are wielded, is important toward understanding potential performance gaps in the outcomes of interests being met. As supported by previously
discussed literature and as seen in figures 6-1 and 6-2, each stakeholder depends on
the others to adequately and efficiently do their jobs—they all require constant cross-
collaboration. Each stakeholder has the power to be helpful or not. So the question is
what would motivate a stakeholder towards either end of this spectrum in the process
of meeting the shared interests?

As mentioned in Chapter 4, in a highly interdependent system, the strongest
relationships must be with those where task interdependence is the strongest [26].
It was also discussed that relationships are built from trust, and trust is cultivated
through effective communication and delivering on what you promise, i.e., living up
to your values.

So a few more questions to ponder: how can these stakeholders better invest in
these important relationships through better communication? Do we change rotation
patterns to enable longer lasting partnerships between contractors, RMC representa-
tives and Ship’s Force as this was one reason why relationships and thus good
communication were neglected? Do we train for quick relationships based on roles, as
conducted by ship handling teams through practicing Bridge Resource Management
(BRM)—a tool that seeks to eliminate fatal human errors in ship driving? Or possibly
quick team-building practices are developed into every scheduled meeting? Perhaps,
we attempt to ignore individual personalities altogether, especially those who make
communication more difficult: even though this is an unrealistic expectation for hu-
man beings.

Other than the last suggestion, all of the recommendations are potential options
for aiding in improving effective communication. I however, submit that we focus
particular attention on the underlying intrinsic factors briefly mentioned in Chapters
4 and 5, that influence the process of communication for any of those suggestions:
fear and love. Fear, as most often used and experienced, is defined as “an unpleasant
emotion caused by being aware of danger” [1]. Love, as intended in this thesis, is
defined as “unselfish loyal and benevolent concern for the good of another” [2].

Considering that fear is at the root of most motivational techniques whether in-
tentionally or subconsciously, figure 6-3 provides a simple causal loop diagram that
illustrates the role fear plays in communication, and ultimately work performance. Each arrow represents a cause-effect relationship that can either be supportive (designated s), such as Fear → Cover-ups, or opposite (designated o), such as Cover-ups → Information Flow.

Figure 6-3: Fear causal loop diagram [27]

This cyclic diagram shows how fear encourages secrets and thus less information flow and knowledge of current reality. This lack of knowledge of the true current status decreases the ability to effectively solve problems which produces errors for which we blame individuals and create more fear. The greater the fear, the less people are willing to take risks and think innovatively, which further exacerbates the ability to solve problems effectively. Despite the fact that many people actually know some form of this story to be true, many people still continue to use fear to encourage higher productivity and better performance out of people. This fear causal loop is rightfully placed in the work harder balancing loop shown in figure 6-4.

In the work harder–identical to hyper-productive–balancing loop, more pressure to do work increases the time spent working which should therefore decrease the gap between actual performance and desired performance. When fear becomes part of this loop, it affects time spent working because of the errors (poor quality) that are inherently part of the fear reinforcing loop. Then, this increases the gap between actual and desired performance which results in delays and cost overruns, despite the fact that more work is actually being conducted. Fear ruminates on the dangers of scarcity: time, money, quantity and quality of work produced and people satisfied.
In the human, fear manifests itself in a number of ways such as pride, ego, anger, rudeness, impatience, stress, and chaos, among other characteristic actions. People fear being blamed, being humiliated or put to shame, disappointing people, not being trusted, and not performing well. The fear of experiencing all these actions from someone inspires more fear to then share less, invest less in learning, engage in faulty or unethical shortcuts, creates more mistakes, and think less effectively as people work harder by themselves and become unhealthily fatigued—still missing the mark of desired performance from the entire team of individuals rather than perhaps, one hero. This erodes capability over time, no matter how much is invested in increasing it, which further increases pressure to improve it. When fear is in the loop, inherent pressures inhibit good performance and the effects of “working smarter” are harder to realize. In this case, desired performance for each individual can become bounded by ideas like “just doing good enough to make it through the day” rather than engaging in the work so as to excel in it. Fear is arguably the root of many of the surface-level contributing factors discussed in Chapter 3 such as deferred maintenance and unplanned work. So what are alternative ways to exit this trap and motivate and experience healthy sustained desired good performance?

Mike Pearson’s work at Vigor offers real evidence that love, as previously defined, is a worthy and actionable alternative. He proclaims that "at the end of the day, it’s really all about love." In figure 6-3, the same place that fear was inserted, we replace
fear with love, shown in figure 6-5.

![Figure 6-5: Love Causal Loop](image)

In this loop, healthy unselfish love inspires trust, leading to transparency and less "cover-ups". Consequently, information flows more smoothly, increasing the knowledge of current reality and the ability to solve problems earlier and more effectively. Ideally, this decreases errors. However, when errors do occur, rather than finger-pointing, teaching occurs so that the person and anyone else can learn constructively and improve the next time around.

This reinforces perceptions that the individual is seen with dignity and valued enough to invest in intentional constructive feedback, which inspires more trust. In this case, because trust is reinforced, workers are encouraged to think creatively and take healthy risks that lead to innovation and contributing to more effective problem solving, yielding fewer errors. Fewer mistakes decrease rework, schedule delays and consequential cost overruns. Increased trust and greater information flow foster a safe space for workers to effectively collaborate and not just "work harder", but to "work smarter" and to achieve better overall performance.

This actionable and collaborative love draws upon the opportunities from what is available: time, money, quantity and quality of work and people who will benefit from the unselfish focus on higher purposes and goals. Love manifests itself in humility, team-mindset, generosity, grace, patience, and a commitment to projecting peace, among others. These actions encourage growth, welcome diverse being and thinking, and willingly going the extra mile rather than acting out of obligation. Increased
capability is encouraged and occurs as others are performing better. The pressures in this case are not seen with fear, but rather encourage workers to rise to the challenge to serve others in love. Subsequently, workers are more motivated toward greater excellence in their performance and the quality of desired performance can improve.

Because we are human, we will not get this perfect, but just like any other realm of improvement, the pursuit of perfection must allow us to begin where we are and work toward change.
Chapter 7

Conclusion

Overall, this thesis has outlined the stakeholders and processes involved in private shipyard surface ship repair. I have discussed views and perspectives from the Navy, public reports and interviewees about why this industry has been and is still facing challenges with on-time delivery, quality, productivity, performance and cost of ship repair projects, focusing mainly on CNO availabilities. I have also discussed other relevant literature that helps illuminate underlying reasons why organizations might struggle with the same issues of performance and excellence, and how they apply to the ship maintenance enterprise. I focused on two shipyards under one company whose personnel engaged in nontraditional ways of improving performance through the “whole-human” concept, rooted in mindfulness, awareness and love for the brilliance of other human beings that ignites a willingness to produce excellent work.

The primary objective of this thesis was to offer an impactful alternative approach to holistically address the issues faced by the Navy surface ship maintenance enterprise regarding performance, productivity, timeliness and cost. In the beginning I sought to explore four key questions and have gained the following insight:

- Why does Navy Surface Ship maintenance still face delays, under-productivity, and under-performance?

Many contributing factors were tied to the unsatisfactory schedule and contractual delays, productivity and performance. These factors as summarized mainly
in various GAO reports were decomposed into three ship phases: acquisition, operations and maintenance. These challenges were most attributable to factors such as deferred maintenance, unplanned work, resource scarcity, and ineffective or unreasonable requirements, to name a few. Other research points to the effectiveness of contract strategies, or overall poor communication amongst key stakeholder groups including the RMC and shipyard.

**How has the enterprise responded to improve this complex issue?**

Improvement efforts such as the P2P program and ST1 have been pivotal in leveraging data analytics to help identify and close performance gaps. One improvement that has resulted from such programs was the identification of how much advanced planning impacts the shipyard’s ability to subsequently plan and perform well. With this knowledge, the Navy was able to significantly shift the timeline for AWP requirements lock dates and contract award.

**What other factors should be considered further—or for the first time—in this complex challenge, and why?**

Interviews and relevant analysis of literature highlighted four major themes of other factors to consider when working towards greater performance. The first is that leaders should guide and steer with a transcendent purpose so that everyone can work hard for a cause that truly enables consistent, great and self-sacrificial performance. The second is that greater performance is better inspired through love-rooted actions rather than from fear-rooted ones—people are searching for greater meaning in their work; and for colleagues and managers to value all of who they are and champion their gifts that will evoke great contributions for team success, rather than individual achievement. The third point is that leaders must lead in holistic systems thinking; be aware of and understand the whole system to optimize desired outcomes. The system of surface ship repair is more than numbers, it deals with humanity, and these factors must be an integral part of the equation, rather than side-lined for occasional refreshment. Lastly, the interconnections that make the system function and
produce intended performance behavior are built from repeated acts of commu-
nication and coordination. Investing in improvement of these exchanges is hard,
maybe overwhelming, and certainly uncomfortable but necessary and possible,
as shown in the Vigor case.

- What assumptions underlie the choices being made?

Literature and interviews suggest that a few major assumptions underlie cur-
rent actions within this work enterprise. The first is that people desire to be
motivated to do good work primarily through incentives such as money or tan-
gible rewards. Otherwise, they can be incentivized through fear as the quickest
or most effective way to yield high productivity or greater performance.

The second is that high productivity is really the goal–get workers to gener-
ate more work completed faster–with good quality and within the budget con-
straints. This high-productivity mindset brings up the question of how “good
performance” is defined by each person and whether individual people or teams
are working toward different definitions of “good performance”.

The third assumption is that the natural human side of a person is not seen as
important enough to invest in at work, beyond one-time programs, mandatory
evaluations, or passing the responsibility over to Human Resource-like depart-
ments.

The last is assumption is that “love” for one another is understood as either in a
romantic context or expressing high regards for something like a favorite book–it
is rarely perceived as “unselfish benevolent concern for another”. It is assumed
that even the word, love, itself is not appropriate in jobs where “toughness”
and grit are also required. That love is simply an emotion that is too sensi-
tive for the workplace–especially in the military and labor-intensive industrial
jobs. We assume that love brings union to relationships only in families and
significant others rather than with connecting caring and trusting relationships
among people in the workplace. It is even assumed that love detracts from
people taking ownership and accountability of their actions and focusing on
doing their job well. These assumptions are deeply held and reinforced through daily repetition, and linked to the organization of work and the infrastructure of social institutions.

7.1 Recommendations

The following recommendations are rooted from this simple message and specifically geared toward Ships Force, Shipyards and RMCs as they are the stakeholders of focus in this thesis, who are truly the core of executing ship repair. These are broken down by the same four themes discussed throughout this thesis, are not all inclusive, and could certainly be applied anywhere. Resistance is expected, especially in the areas of perceived lack of time, money, and buy-in to a concept that seems trivial, already talked about enough, or already accomplished, perhaps. These are purposefully reflective in nature and combined with practical action steps. The goal of these suggestions are to help reduce the need for major all-hands calls and stand-downs when issues arise, by embedding these actions into the normal workflow.

7.1.1 Purpose & Vision

- Leadership from all stakeholder groups: based on the aforementioned insights, take intentional time in the Plan of the Day (POD) to provide a safe, non-rushed space to initially reflect on your own purpose, your organization’s purpose, your superior organization’s purpose, and your customer’s purpose.

  - Ask: how well do these align? What is at the root of the purpose? Do you understand the downstream effects of the purpose you are believing and working to fulfill? What vision does this purpose cast? Does what you say you believe align with your actions that people see and experience?
  
  - As in Vigor Ketchikan and Seattle’s case, it was helpful to have a professional leadership facilitator to provide constructive non-biased feedback.
• Invite all employees to reflect and offer perspective on these questions to bring awareness to any misalignment—make intentional time in the POD to discuss.

• After aligning on a substantive purpose, communicate it repeatedly. Get creative in how to repeat it and share the vision—not just in emails, on posters, or in one all-hands stand-down.

### 7.1.2 Motivation & Inspiration

• Leadership: as a start, take intentional time in the POD to give a safe non-rushed space to discuss what techniques are actually being used to motivate employees of all ranks and positions to do the desired work. Start with one-on-one conversations in order to build trust.

  – Ask: what is the root of my motivational techniques—fear or love? Do I think about how what I am saying actually affects the “whole person” I am seeking to motivate? What has been the fullness of downstream effects of how I have acted to produce intended behavior? Is what I am saying and doing on a daily basis actually building trust with the people I am counting on to perform well or diminishing it?

• Invite all employees to reflect and provide honest feedback from both perspectives of giving and receiving motivation. Welcome and listen to the feedback without blaming the messenger.

• Legitimately think about these questions so that motives are being held accountable before decisions and actions which cannot be reversed, are carried out.

### 7.1.3 Systems Thinking

• Leadership: Consider that there are parts of the system that have been neglected either purposefully or due to lack of knowledge. Consider the idea that the
fullness of a person must be part of this system picture, rather than seen as “extra.” Consider how you might be influencing this concept and accept that we each have room to improve. Ensure every employee grasps the impact of their service on various people and organizations.

- Challenge yourself to embrace the idea that each person is brilliant in their own way, and have a necessary contribution to the system—and treat each with dignity as such.

- Consider how your decisions and actions (not your intentions) actually affect every other stakeholder group in this maintenance enterprise.

- Avoid excessive auto-pilot hyper-productivity as this implies no thinking is occurring within theses interconnected complex tasks.

### 7.1.4 Communication & Coordination

- Leadership: Create and demonstrate a safe space of continuous humble, open and transparent communication among leaders and front-line workers and Sailors alike. Personally commit to lead in unselfish communication and coordination when talking with bosses, peers and employees: embody patience and embrace realistic time it takes to think and perform well. As a result of that thinking having grace in accepting natural and necessary delays rather than forced delays from reasons mentioned above. Actively listen and give and receive constructive feedback as a healthy outcome, be wise with navigating what information to share but weigh the costs of withholding or oversharing—not everything good is beneficial, speak encouraging words, openly ask for help and make space for others to bear witness and see that this is encouraged—and willingly voice when things get hard, and when you do not have it all together but that you need each of your people’s help. Embrace the discomfort and commit to push through.

  - Consider and practice these things so that others will do the same, connecting the many parts of the one system and enabling real success.
• RMC representatives: practice these actions when coordinating with the shipyard and Ship’s Force to form the AWP and supervise the execution of the availability you helped plan.

• Shipyard representatives and workers: practice these actions when collaborating with the RMC to plan the availability and with Ship’s Force to execute the maintenance.

• Ship’s Force: practice these actions within your own Ship, and when collaborating with the RMC and shipyard contractors during the availability to help complete the maintenance.

• All three Stakeholders:
  
  – Pre-CNO-Avail: intentionally add time during pre-arrival conference (similar to Vigor case study) for transparent conversation about intentions, concerns, expectations (from each stakeholder) and have space to begin breaking uncomfortable barriers so that all can work with a shared purpose, vision and plan. This should definitely include how to handle conflict when it arises. Important representatives for each division and department should know each other before the availability begins, and start the smaller internal cross-team building. Everyone should have a good grasp of the plan and shared goals, and opportunities to provide input, considering the commitment to practice the concepts above. Outline game-plan and intentions for all expected routine meetings. These meetings should begin with a reminder of purpose and the values/vision that serve as guardrails for everything to be discussed. Include all important workers/representatives and ensure they know how they are impacted and why.

  – During CNO-Avail: Execute, hold each other accountable, re-align, and continue executing.

  – Post CNO-Avail: Reflect, annotate, discuss, implement and commit to practicing lessons learned.
7.2 Future Research

Due to the complex nature of this topic, there are many areas of research I could not and did not cover. A few suggestions for investigation in future research are:

- Interview more people from various regions: Norfolk, Mayport, San Diego
- Interview a broader range of military members and civilians from all key stakeholder groups
- Interview a more diverse pool of people; varied by gender and ethnicity
- Examine the degree to which public shipyard maintenance challenges affect and are affected by private shipyard maintenance.
- Analyze the planning tools and tracking databases used by various RMCs and shipyards, and to what degree they affect maintenance performance. Interviewees mentioned the development of a few tools that are not yet widely supported, or used.
- Analyze the nature of relationships between 3PP with RMC and shipyard contractors and how their relationship and interests influence the work packages produced.
- Collect and analyze quantitative data on how contributing factors tie back to fear through random sampling surveys and/or interviews
- Test the recommendations to collect more extensive data on the effects of intentionally motivating through love rather than fear

7.3 Closing Comments

Although we cannot conquer everything, and certainly cannot tackle everything at once because we are only human, change must start somewhere. It begins by taking time to look within ourselves, becoming aware of what is there, acknowledge it, and
commit to moving forward not just for your own sake, but for our brothers and sisters we are working alongside with and serving. Change moves outward from someone willing to try something new, to others willing to take a chance, or those who have more trust in the innovators, or who are more dissatisfied with the current situation. Change advances through social contagion as new ways of behaving are rewarded with good results and positive feedback from peers and leaders. Trust is built in a virtuous cycle as we overcome obstacles together and share both good and disappointing results.

I conclude by returning to how I began, stating a simple message and overall recommendation: “use your freedom to serve others in love” and “love your neighbor as yourself [8].” In an industry that is so complex, we don’t need even more rules or added complexity, we need something simple and lasting to remember as we show up to work each day. When you serve others out of love, it does not guarantee that this work will be easy, but rather, it brings harmony and unity to the shared challenges that need to be addressed. I write this thesis from a place of personal experience—especially in this last year—that involves the messiness of exposing these deep and uncomfortable parts of myself, and overcoming selfishness and a trapped mindset. In this way, I can release good, sustainable works through true critical thinking as I seek to serve and honor others in all that I do, imperfectly, everyday. It takes time, courage, and persistence, and it is possible—within each individual for the good of the whole team.

“And we know that the richest experiences in our lives aren’t when we are clamoring for validation from others, but when we’re listening to our own voice—doing something that matters, doing it well, and doing it in the service of a cause larger than ourselves” [47, p. 145].
Appendix A

Interview Participants
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<tr>
<th>CIV,MIL,RET</th>
<th>Rank,Rate</th>
<th>M/F</th>
<th>Medium</th>
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<tr>
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<td>Vice President of Puget Sound Ship Repair and Navy Programs. Former lead Project Manager at Vigor Ketchikan and Seattle locations.</td>
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<td>Retired Navy CAPTAIN. Former Salvage Officer and Assistant Maintenance Officer. Engineering Professor at MIT.</td>
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<tr>
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<td>snowball</td>
<td>NAVSEA Contracting Officer. Retired Supply Officer. Served aboard 2 submarines during CNO avail. Worked with OPNAV N4 and ASN (RDA). Former NAVSUP contracting officer.</td>
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<tr>
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<td>email, phone, video</td>
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<td>Founding Partner at Three Tall Trees. Leadership Development Facilitator and Culture Change Facilitator. Partnered with Vigor Ketchikan and Seattle.</td>
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<td>Contracting Officer, Supervisory Contract Specialist at PSNS and IMF</td>
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Table A.1: List of Participants
Appendix B

Interview Questionnaires
1. Please describe your job and role in your organization, and role your organization plays in surface ship maintenance process.
2. How would you describe the maintenance process as experienced through any roles you’ve played that associate with surface ship maintenance; (pre, during and post our major maintenance avail)
   a. What were the necessary communication channels? (through Chain of Command and cross-organization)
      i. Who were the key stakeholders?
      ii. Were any of these channels presenting issues, or missing altogether?
      iii. What was your involvement level with our maintenance budget?
   b. Describe the working relationship between the ship, RMC and any private shipyards/companies involved. (With leadership and actual workforce)
      i. Was any organization particularly easier or harder to work with? Why?
   c. Through this process, describe your organizations…
      i. climate
      ii. efficiency/effectiveness
      iii. Were some departments or divisions noticeably hardspots, outliers, more effective? Why?
   d. Describe the planning process and how you saw that plan manifest (or not) in the execution phase.
      i. Short term planning, vs long term planning
      ii. Shipboard 3M process intertwined with the larger ship lifecycle maintenance needs
3. What have been the most memorable/important lessons learned from your experience with surface ship maintenance?
   a. What were the greatest challenges to overcome?
4. What other lessons learned have you gathered in regards to maintenance planning/execution, from your other positions in the Navy?
   a. How do you see COVID affecting this process in a new way, or highlighting and exacerbating deficiencies that were already present?
5. If we could improve the way the Navy plans and executes maintenance, what would you suggest, or advocate for the most? Why?

Figure B-1: Core list of interview questions
Bibliography


[34] Diana Maurer. GAO-20-225t: Services continue efforts to rebuild readiness, but recovery will take years and sustained management attention. Technical report, Government Accountability Office, December 2020.


