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THESIS

REDUCING THE WASTE AND ADMINISTRATIVE BURDEN OF THE DEFENSE TRAVEL SYSTEM THROUGH A PROCESS IMPROVEMENT APPROACH

by

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December 2018

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13. ABSTRACT (maximum 200 words)

The Defense Travel System (DTS) was established with the intent of streamlining the Department of Defense's (DoD) travel claims and reimbursement process for users. The DTS has fallen short of expectations, far exceeds budgetary estimates, and perpetuates a culture of rigid rules and cumbersome administrative processes that burden the warfighter. The research presented here outlines the background and current process of the DTS, and examines leading process improvement techniques including Lean Six Sigma and the Theory of Constraints. This thesis theorizes that a paradigm shift in the DoD's culture to a focus on human integration and process improvement will result in decreased costs, increased savings, and improved user satisfaction. In an effort to address the research question, "How can we reduce the administrative burden of the DTS on the warfighter?" this research concludes that the removal of the administrative voucher approval requirement coupled with an online chat capability will significantly enhance the overall efficiency of the system.

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The Defense Travel System (DTS) was established with the intent of streamlining the Department of Defense's (DoD) travel claims and reimbursement process for users. The DTS has fallen short of expectations, far exceeds budgetary estimates, and perpetuates a culture of rigid rules and cumbersome administrative processes that burden the warfighter. The research presented here outlines the background and current process of the DTS, and examines leading process improvement techniques including Lean Six Sigma and the Theory of Constraints. This thesis theorizes that a paradigm shift in the DoD's culture to a focus on human integration and process improvement will result in decreased costs, increased savings, and improved user satisfaction. In an effort to address the research question, "How can we reduce the administrative burden of the DTS on the warfighter?" this research concludes that the removal of the administrative voucher approval requirement coupled with an online chat capability will significantly enhance the overall efficiency of the system.

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TABLE OF CONTENTS

LIST OF FIGURES

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LIST OF TABLES

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LIST OF ACRONYMS AND ABBREVIATIONS

CAGW	Citizens Against Government Waste
CPI	continuous process improvement
DFAS	Defense Finance and Accounting Service
DoD	Department of Defense
DTMO	Defense Travel Management Office
DTS	Defense Travel System
GAO	Government Accountability Office
GE	General Electric
GTCC	Government Travel Charge Card
JTR	Joint Travel Regulations
MCAAT	Marine Corps Administrative Analysis Team
NCAD	Naval Cost Analysis Division
NPS	Naval Postgraduate School
RDO-E	Regional Disbursing Office – East
TANUM	travel authorization number
TOC	Theory of Constraints

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I. INTRODUCTION

A. BACKGROUND

As our peer military competitors continue to close the gap on military capability and technological advances, it is becoming increasingly more important for the United States military to reflect and adapt current military processes. Over time, bureaucratic policies and procedures have accumulated and significantly degraded efficiency and productivity of military units. Consequently, Secretary Mattis and other senior military leaders are trying to identify opportunities to reduce administrative distractions. (Woody, 2017, para. 2).

The Undersecretary for Personnel and Readiness, Robert Wilkie, has been quoted as saying,

> All too often when we bring things up inside the Beltway, it immediately devolves to material and programs and technology, (but) we don't want this to just be an acquisition program, we want this to be a catalyst for a transformation of a level of war that has received so little attention….What we hope comes out of this is not just new machines but new ways of thinking about warfare at the tactical level. (Freedberg, 2018, para. 1)

Wilkie goes on to speak about six different problems that his task force wants to fix. One of these problems is referred to as "stop peeling potatoes." What he points out as the particular problem is that military personnel are oftentimes spending valuable time on mundane requirements. His task force is working on a program called "workforce rationalization plan," which aims to reduce administrative burdens on the warfighter (Freedberg, 2018, para. 2).

The DoD spends upward of $9 billion a year on travel with 70 percent of that being temporary duty (Defense Travel Management Office [DTMO], 2018). This is clearly an area that could become administratively cumbersome on military units if the travel processing system is not efficient. In order to ensure this system is functioning at optimal efficiency, proven process improvement techniques should be studied and applied to the Defense Travel System (DTS) procedures.

In fall of 2018, the Defense Travel Management Office (DTMO) released plans to completely overhaul the existing DTS, stating, "In addition to reducing overall costs, the new capability must reduce process and workflow complexity, decreasing the time and effort spent by travelers, authorizing officials, and administrators planning travel and reimbursing travel expenses" (DTMO, 2018). The new travel system prototype is not scheduled to come online for at least two more years. However, this thesis provides compelling evidence to support a process change that could be immediately implemented and also incorporated into the new travel system (DTMO, 2018).

B. DTS VOUCHER PROCESS MODIFICATION

When a DTS voucher is submitted by the traveler, it processes through the administrative command and then through the disbursing office. If the voucher is rejected by disbursing or the administrative command, it is returned to the traveler for resubmission. Once the traveler resubmits the voucher, it must be processed through the administrative command again and then to disbursing for final approval. This process is iterative until the voucher is ultimately liquidated, as depicted in Figure 1. Thus, the administrative command is responsible for approving the authorization and then approving the voucher for something that was already authorized. If a step does not provide value to the customer, then it should be removed from the process. Consequently, we contend that the administrative check point could be eliminated or modified.

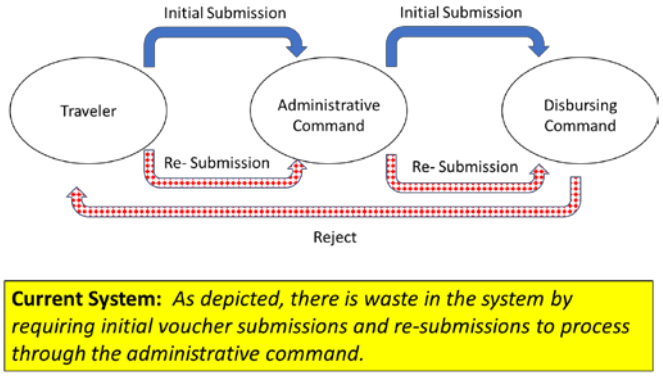


Figure 1. Current DTS Voucher Submission Process

When travel is initially authorized, a legally binding agreement is created, also known as an "obligation." However, the authorization does not reflect exactly what expenses the traveler will incur during the trip. Only after the orders have been executed are all travel expenses realized. The amount obligated will not be updated until disbursing certifies the voucher. This amount could be lesser or greater than the original estimate.

The time it takes for a voucher to be processed adds to the overall time it takes for the financial transaction to complete its lifecycle. The shorter the lifecycle, the quicker a command can analyze the actual travel costs incurred. If the initial obligation for travel was higher than the actual cost of the trip, then additional funds would become available for other command priorities. A more efficient voucher process enhances the operational command's ability to optimally employ financial resources.

If a traveler executed their orders in accordance with the original authorization, there should be no requirement to process a voucher through the administrative command for an additional approval. The voucher could simply go directly from the traveler to disbursing for approval, as depicted in Figure 2. If changes to the original authorization are required, then they should be approved by administrative command prior to voucher submission.

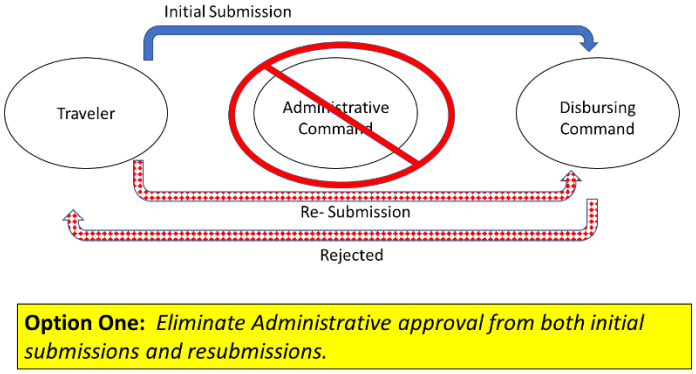
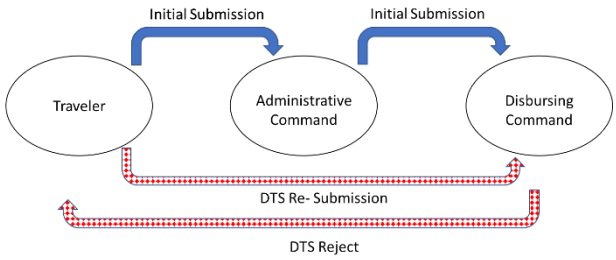


Figure 2. DTS Voucher Submission Process—Option One

Another option, if the administrative command must remain in the voucher approval process, would be to eliminate the administrative command approval of all

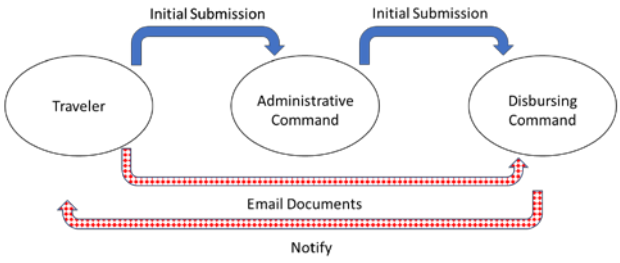
voucher re-submissions, as depicted in Figure 3. If disbursing identifies an error in the voucher, they could send it back to the traveler to provide corrections. The traveler could then re-submit directly back to disbursing, bypassing the administrative command.



Option Two: *Eliminate Administrative approval from resubmissions only.*

Figure 3. DTS Voucher Submission Process—Option Two

A final option would be for the disbursing command to hold the voucher in suspense and work directly with traveler to correct the discrepancy, as depicted in Figure 4. The traveler could then email the disbursing office directly with required documentation. This option reduces the amount of time required for the traveler to access the DTS interface and enables them to utilize email to correct their discrepancy.



Option Three: *Hold rejection in queue at disbursing and notify traveler. This eliminates traveler requirement to resubmit through DTS. Traveler simply emails required documentation to disbursing.*

Figure 4. DTS Voucher Submission Process—Option Three

In order for us to provide evidence that this process change would enhance the overall efficiency of the DTS voucher process, we collected time-stamp data from 100 random voucher submissions. We collected 100 samples from the Marine Corps, which utilizes the double approval system of an administrative command approval and disbursing approval. We were then able to extrapolate how much time could be saved by introducing this process change and eliminating the redundant step. We collected the following data from the Marine Corps:

1. The number of vouchers processed annually and quarterly.

2. Of those vouchers processed, how many were returned to traveler for "re-submission" (i.e., no receipt or other discrepancy)?

3. Of those vouchers re-submitted, we randomly selected 100 vouchers to determine the following:

    - Date-time stamp of when initially submitted by traveler or traveler representative.
    - Date-time stamp of when returned to traveler by administrative unit or disbursing.
    - Date-time stamp of when traveler resubmitted.
    - Date-time stamp of when ultimately approved by disbursing.

C. AREA OF RESEARCH

With increasing focus on financial auditability and reducing unnecessary spending, the Department of Defense has a responsibility to efficiently utilize resources. These resources include the significant human capital in the DoD; both uniformed and civilian personnel. The primary focus of the human systems integration should be on operational requirements while limiting administrative burdens. The DoD has already implemented polices that reduce the administrative burden placed on annual training requirements. This

research explores opportunities to reduce the administrative burden DTS has placed on the DoD.

D. RESEARCH QUESTIONS

Primary: How can we reduce the administrative burden of the Defense Travel System on the operational unit through Lean Six Sigma and other process improvement approaches?

Secondary: In the current voucher process, how much time elapses between the traveler, administrative unit, and disbursing?

E. SCOPE OF THESIS

This thesis provides an overview of the current DTS process, a literature review on Lean Six Sigma and other process improvement approaches, and a detailed analysis on the amount of time required to process a DTS voucher. Finally, this research will provide recommendations to streamline the current DTS process in order to reduce the administrative burden on the warfighter.

F. METHODOLOGY

This research employs the following methodology:

1. **Literature review**: This research contains a literature review of the background of the DTS, the current DTS process, DTS literature, Continuous Process Improvement, Lean Six Sigma, Theory of Constraints, the DoD's approach to process improvement, and an analysis of process improvement approaches.

2. **Data**: Historical data from the United States Marine Corps' Camp Lejeune Regional Disbursing Office-East (RDO-E) was analyzed to estimate the amount of time travelers, administrative units, and disbursing spend on processing a DTS voucher.

G. BENEFITS OF THE STUDY

This study identified areas to improve within the DTS process by applying process improvement techniques. These techniques have identified areas of improvement for both immediate and future implementation. Based on our process improvement approach, we believe removing the administrative voucher approval requirement coupled with an online chat capability will significantly enhance the overall efficiency of the system. Although the DoD has recently announced a travel system to replace DTS, our recommendations for process improvement are applicable to the new system.

H. CHAPTER OUTLINE

Chapter I is the introduction and provides an overview of why the DoD can benefit from process improvement in DTS. Chapter II covers a literature review of DTS and process improvement methods. Chapter III covers the data collection process utilized for this research. Chapter IV provides an in-depth analysis on the data collected. Chapter V covers recommendations based on our analysis. Chapter VI is the conclusion.

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II. LITERATURE REVIEW

This literature review examines the Department of Defense's business processes, specifically as they relate to the Defense Travel System. These business practices and processes within the Defense Travel System lack substantial academic attention and research like their industry counterparts, which are featured in case studies, peer reviewed journals, and academic texts. The following literature review attempts to highlight this disparity while examining the methods of process improvement utilized within industry today.

A. BACKGROUND ON DEPARTMENT OF DEFENSE (DOD) DEFENSE TRAVEL SYSTEM

The Defense Travel System (DTS), first deployed in August 2001 at Elsworth Air Force Base and subsequently deployed across over 11,000 locations by 2006, was designed in response to a report issued by the Department of Defense (DoD) Task Force that identified the original DoD travel system as ineffective and cumbersome at best (Government Accountability Office, 2006). While significant efforts and costs, approximately $474 million in government contracts within the first decade, have been invested into addressing the issues outlined by the DoD Task Force, the resulting DTS system has fallen short of expectations, and remains a critical area of focus for improvement (GAO, 2008). The shortcomings of DTS have caught the attention of senior lawmakers, as evidenced by the Fiscal Year 2010 National Defense Authorization Act, which directed the Department of Defense to develop a comprehensive plan to again simplify defense travel (Simplifying Defense Travel, 2010). Pamela Mitchell, Director of the Defense Travel Management Office (DTMO), stated that "DTS is both affected by and reflective of the complex defense travel policy environment" in her statements during the Congressional Hearing on Simplifying Defense Travel on April 27, 2010 (Simplifying Defense Travel, p. 3).

There is sparse literature on the subject. This can be attributed to a number of factors, most of which center on its relation and affiliation to the military and Department

of Defense business practices, which tend to be less researched than their industry counterparts. It is precisely for this reason that we are focusing our efforts on this area of study, which is lacking in extensive academic research, case studies, and published works addressing its inequities. This particular report will review the relevant literature that is available on the DTS administrative and compliance procedures and attempt to synthesize these by drawing recommendations based upon reliable methods in process improvement, specifically Six Sigma, Lean Thinking, and the Theory of Constraints. The literature included in this review that focuses on DTS includes reports by the Government Accountability Office (GAO), congressional hearings, and graduate level theses on the topic. This research tends to be focused more in the context of fiscal implications, practice and historical trends, and less in theory. Meanwhile, the literature included in this review addressing methods of process improvement is abundant. These sources are often rooted in theory and research and supported by case studies and industry applications. It is our intention to combine these literatures into a coherent whole, whereby making recommendations on how to reduce the administrative burden of the DTS on the warfighter.

B. CURRENT DTS PROCESS

For the purposes of this review, it is necessary to provide an overview of the current DTS process, as depicted in Figure 5. DTS encompasses and automates all three travel processes, including authorization, reservations, and payments to the traveler. The GAO report on Business Transformation summarizes this process well:

> The three essential players in the processing of a travel authorization and related payment are the traveler, the CTO, and the AO. The traveler generates a travel authorization and enters the appropriate information into DTS, such as travel dates, departure and arrival airports, and hotel and rental car arrangements. When the traveler is finished, DTS sends a prebuilt passenger name record to the CTO. If possible, requested arrangements will automatically book without CTO intervention. In cases where the travel arrangements do not automatically book, the CTO must intervene and take additional steps to book the requested arrangements. Next, the traveler's AO receives an email notification from DTS stating that there is a travel authorization awaiting review and approval. The AO is a key internal control point in the travel authorization process. AO responsibilities include

reviewing the travel authorization for compliance with travel laws, regulations, and policies; determining if the trip is mission essential and funds are available; assigning the proper line of accounting prior to authorization; reviewing all policy exceptions, and approving or rejecting the travel authorization as appropriate. When the AO approves a travel authorization by electronically signing the document in DTS, DTS routes the approved travel authorization to the CTO for ticketing, sends an obligation transaction to the appropriate accounting system and notifies the traveler via email that the travel authorization has been approved. When the trip is complete, the traveler creates a travel voucher for reimbursable travel-related expenses from the travel authorization data stored in DTS, and electronically signs the voucher. DTS electronically routes the travel voucher to the AO for approval. An AO is then responsible for certifying a travel voucher for payment by electronically signing the document. DTS submits the certified travel voucher to DFAS for payment through electronic interfaces, which records the information in the appropriate accounting and disbursing systems. (GAO, 2006, p. 9)

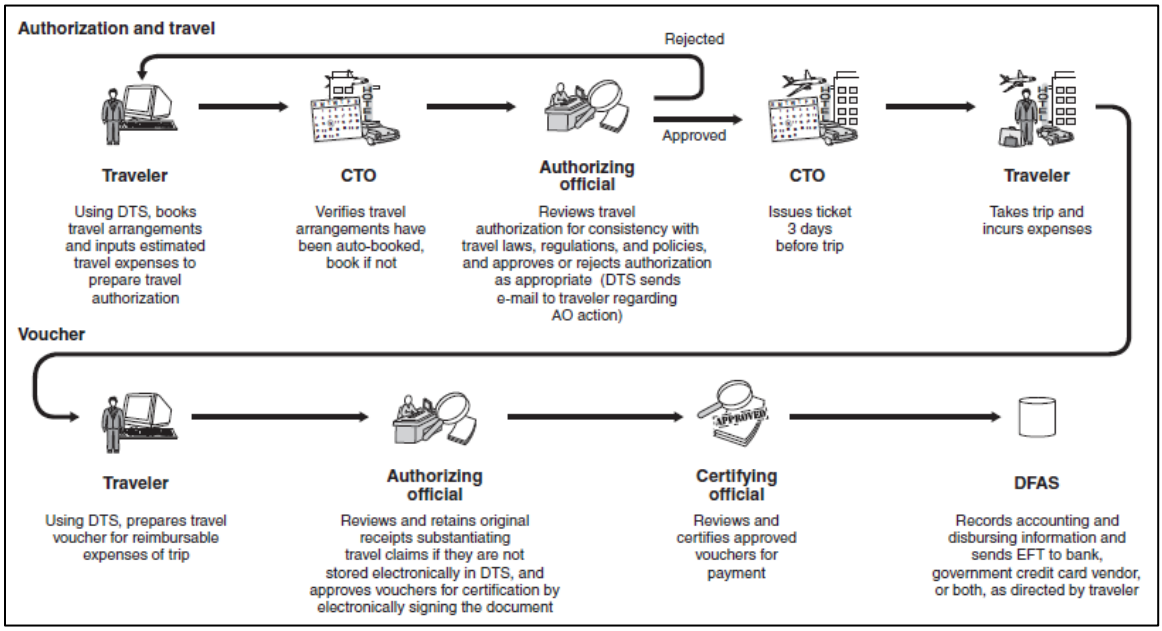

Figure 5. Defense Travel System Authorization Process. Source: GAO (2006).

The previously mentioned DoD task force concluded in its 1995 report on DTS that the system focused heavily on "compliance with rigid rules rather than on performance of the mission" (GAO, 2006, p. 31). This environment and focus on rigid rules have the effect

of increasing administrative processes and tends to discourage the use of common sense for approving adjustments to a travel claim that do not introduce any further risk. This report from the GAO, while relevant and thorough in describing the DTS process and noting shortcomings, is a technical report that merely reports results. It provides few recommendations, and fails to examine possible alternatives, or draw upon practical applications in industry. In Pamela Mitchells' candid statement during the congressional hearing, she acknowledges that the above excerpt from the GAO summarizes a complex and cumbersome process: "Simplification of policy and process is not only critical to improving user friendliness for the traveler, leveraging capabilities of industry, and reducing outlays for the Department, but it is equally critical for improving DTS" (Simplifying Defense Travel, 2010, p. 4).

The GAO report provided a simplified authorization and voucher process for DTS in Figure 6. The voucher process shows a linear process from traveler, to authorizing official, to certifying official, and finally to the Defense Finance and Accounting Service (DFAS) for payment. Although the figure does indicate the authorizing official may reject an authorization from the traveler, no such indication is given in the voucher process. In reality, and common knowledge for anyone involved in the DTS routing process, many vouchers are returned to the traveler from either the authorizing official, certifying official, or both.

We created a more accurate representation of the DTS voucher process in Figure 6. The simplified flow chart displays many instances in which a voucher for payment would be returned to the traveler. The traveler has a voucher returned whenever errors are found throughout the routing process: from the authorizing official and the certifying official. Common errors may include missing documentation, inaccurate lines of accounting, erroneous computations for reimbursement, or claims for unauthorized expenses.

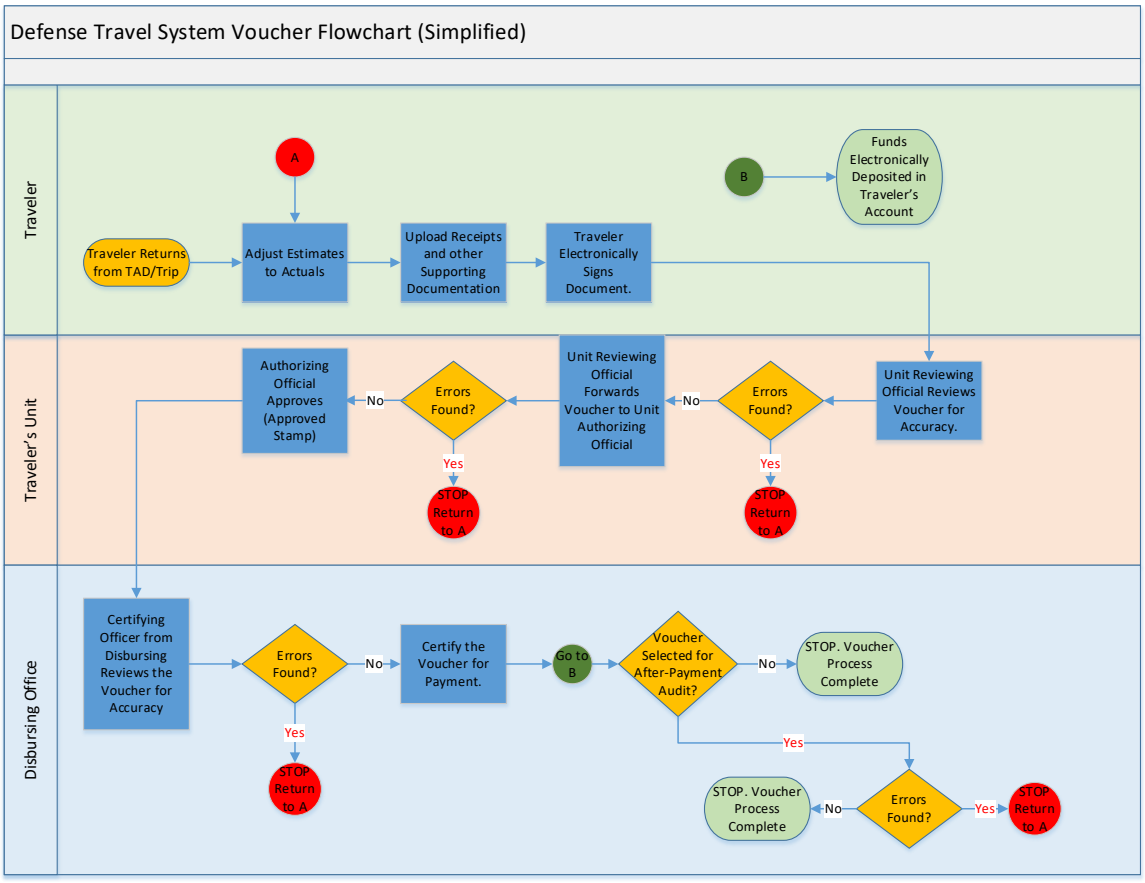

Figure 6. Simplified DTS Voucher Flowchart

C. ANALYSES OF DTS LITERATURE

In reviewing the publications and literature that are available on the DTS, a common trend has emerged: technical reviews with a focus on historical background and fiscal ramifications. Interestingly, the feedback in these reports reflects negative feedback in both qualitative and quantitative measures; however, the sources lack credibility due to unsound research methods and unclear results. For example, McCoy Williams, Director of Financial Management and Assurance responded to a question from Senator Coburn regarding projected DTS annual savings estimates that were subsequently never realized. The GAO reported that of the $24.2 million in personnel savings the DTS was expected to produce, the "Army and Navy have not had, and are not expecting to produce any savings through decreased personnel through the implementation of DTS" (Williams, 2006, p. 1). Furthermore, Williams noted that "the Naval Cost Analysis Division (NCAD) October

2003 report on the economic analysis noted that it could not validate approximately 40 percent of the Navy's total costs, including personnel costs, in the DTS life-cycle cost estimates because credible supporting documentation was lacking. The report also noted that the PMO-DTS used unsound methodologies in preparing the DTS economic analysis" (Williams, 2006, p. 2). This appears to be a common trend among resources published on government financial statuses, and the DTS in particular. Due to the lack of scholarly research, case studies, or academic attention to government business practices, there is little credible documentation and qualitative analyses on the subject. Furthermore, the few published reports that do examine the outcomes of DTS tend to be rooted in unsound methodologies, thus reducing their credibility.

The common element in all publications on the DTS is that they shed light on the fiscal ramifications and budgetary shortfalls of the system yet fail to explore the administrative and time costs of the system. We examined several GAO reports, Congressional Hearings, special reports, and testimonies—all of which echo the same findings in wasteful spending, inaccuracies in travel reimbursements, and fraudulent purchases by DTS abusers that slipped under the radar within the system. Mr. Thomas Schatz, President of the Citizens against Government Waste (CAGW), a nonprofit organization and government "watchdog" dedicated to increasing transparency in governmental spending, presented these fiscal concerns to the Committee on Homeland Security and Government Affairs on September 29, 2005. He noted that the most recent GAO report at the time, released in March 2005, concluded that the total DTS implementation cost would exceed $4.3 billion. Schatz quantifies this estimate for the subcommittee by clarifying that the figure is "$4.13 billion, or 1,565 percent more than the original 1998 figure of $263.7 million" (Testimony of Schatz, 2005, p. 45). This obsessive focus on fiscal implications is evidenced again by Senator Coleman's request on August 11, 2005, to the Office of the Inspector General to "undertake a full, complete and independent performance and cost benefit evaluation of the Defense Travel System to determine if it is the most cost-effective solution to the Department's travel needs" (Testimony of Gimble, 2005, p. 64). In short, the commonality in all published materials on the DTS is a focus on the negative financial implications to the taxpayer and wasteful

spending perpetuated by the DTS; however, more importantly, this focus on fiscal costs contributes to the overall shortcoming in our knowledge and understanding of the actual processes and administrative burdens of the DTS, which have the most direct and apparent impact on the actual user of the system—the warfighter.

D. CONTINUOUS PROCESS IMPROVEMENT

Process Improvement is heavily researched and practiced within industry and focuses primarily on improving the actual process performance of a business, service, or industry, while resulting in increased customer satisfaction. The ultimate goal of nearly all process improvement approaches is to reduce waste and increase the bottom line, or profit. In light of our prior criticism of the DTS literature analyzed for this review, we find it necessary to call particular attention to the methodologies in which process improvement techniques attempt to reduce cost and waste, and how they differ from the traditional DoD approach, and more specifically the DTS. For the purposes of this review, we will focus on the most widely accepted process improvement approaches: Lean, Six Sigma, and the Theory of Constraints.

E. LEAN SIX SIGMA

Lean Six Sigma, designed in the 1980s, was developed and implemented initially in Motorola, and founded by engineer Bill Smith. The approach had early success within Motorola and was quickly adopted by General Electric (GE). From there, it spread quickly within business and industry on a global scale. Through its evolution, the Six Sigma approach was coupled with lean manufacturing in the early 2000s, resulting in the coined term "Lean Six Sigma," which is industry's most widely used improvement approach today (Snee, 2010).

The Lean Six Sigma approach focuses primarily and specifically on process performance and leadership development. This is significant because of its inherent focus on personnel and the development of competent and effective leaders. The Lean Six Sigma approach relies on investing in human resources to result in actualized savings and increased profits. This approach has been so successful precisely because of its effective integration of human and process performance improvement (Snee, 2010). It is important

to note that while Six Sigma is a system to implement comprehensive culture change within an organization, its methods are highly reliable and supported by statistics-based analytics, trends, and data. There is a high degree of credibility behind it due to its history and implementation in 21st century business success.

Motorola is often considered the “birthplace” of Six Sigma and is also one of its most profound success stories. As a result of Six Sigma technique implementation, as depicted in Figure 7, Motorola saw a five-fold sales growth, and an annual profit margin increase of 20 percent per year. Motorola attributes cumulative savings of more than $14 billion between 1987 and 1997 to the implementation of Six Sigma (Pande, Neuman, & Cavanaugh, 2000). Peter Pande, Robert Neuman, and Rowland Cavanaugh describe a case study of a telecommunications company that saw $1 million in realized savings within a 6-month process and, more importantly, increased customer satisfaction after the Six Sigma approach streamlined an internal process that allowed the organization to transmit messages between departments faster and cheaper. Prior to the implementation of Six Sigma, every customer request had to be routed through a number of levels of review before becoming eligible for approval (Pande et al., 2000). This process wasted an unnecessary amount of time and resources for both the customer and the company. We find this latter example to be particularly evident due to its striking similarity to the redundancies in the current DTS process.

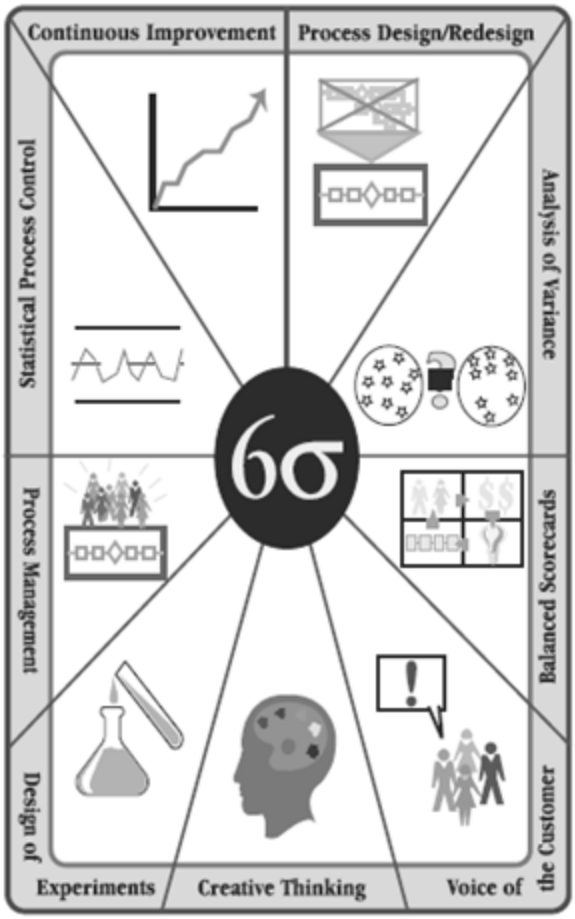

Figure 7. Six Sigma Critical Methods.
Source: Pande et al. (2000).

An organization cannot simply rely upon its opinion of what the problem is or where the inefficiency resides. It must utilize a proven problem-solving methodology. This requires data, facts, and an experienced team to analyze the information and identify solutions to improve the process and increase customer satisfaction (George, Rowlands, & Kastle, 2004). We utilized primarily a Lean Six Sigma approach to analyze the current travel system, as depicted in Figure 8.

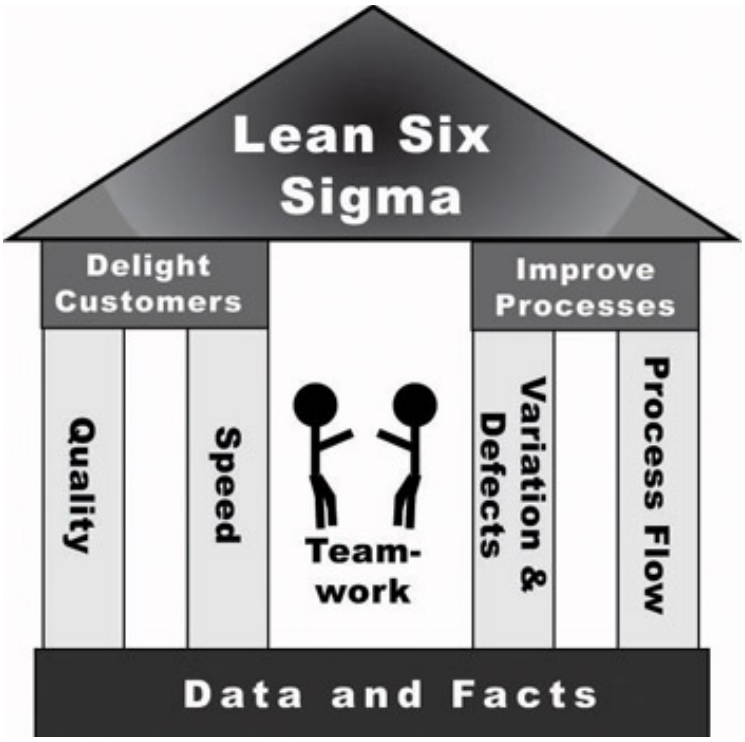

Figure 8. The Keys to Lean Six Sigma.
Source: George et al. (2004).

In DTS, there are two customers—the American tax payer and the traveler/staff responsible for processing travel authorizations and vouchers. On one hand, we must provide auditable processes to ensure taxpayer money is appropriately allocated. On the other hand, we must ensure the operational command is not overburdened by the administrative requirements enabling their forces to travel on government orders.

In Lean Six Sigma, a process should be quick (speed), produce little or no errors (quality), and at a low price (cost). All of these goals must be achieved in concert with each other as they are all interrelated. If a process produces a lot of errors, it will not reach its greatest speed potential as re-work requirements will slow the overall process down. If you want to produce the highest quality, you must have a process that eliminates delays or minimizes "waiting" time (George et al., 2004). In the case of the military, the more time someone is spending on DTS related requirements, the less time they are focused on their actual job. If the intent is to have warfighters focused on warfighting, then DTS

administrative procedures must be consistently fast. Additionally, the process must ensure accuracy and appropriate accountability of taxpayer dollars.

In the Lean Six Sigma process, the customer focus is a key ingredient and requires significant thought and awareness. It involves the idea and understanding that customer satisfaction should drive your process. Administrative processes should continuously be scrutinized and refined to ensure maximum enduring customer satisfaction (George et al., 2004). In the military, this equates to more time spent preparing for the mission and combat readiness. If this approach is applied collectively to all administrative requirements, it adds up to increased efficiency and enhanced morale. Most importantly, it equates to more time dedicated to specific mission requirements vice administrative burdens.

Once you understand what the customer requires, the next step is identifying opportunities to improve your process and better satisfy your customer needs. Historically, it has been stated that the majority of problems and inefficiency reside in the process and not in the employees themselves (George et al., 2004). This is precisely why we took a close look at the DTS process in order to identify opportunities where it could be refined. We wanted to find ways to enhance customer satisfaction through speed, functionality and repeatability. Most process improvement methods serve two purposes: Eliminate variation and improve process flow and speed.

After analyzing the current DTS voucher processing system, we identified a time-consuming step that could potentially be eliminated. If this step were eliminated, it would enhance overall DTS speed and flow as well as decrease time variation in voucher liquidation. Both of which would increase customer satisfaction, increase process efficiency, and, most importantly, reduce administrative burdens on the operational element.

It is common knowledge that speed in a process can vary. Some days the process may move fast and other days it may move slower. However, the key is to reduce the variation as much as possible. This idea is what led to the term “six sigma.” Sigma is a Greek word utilized in statistics to describe the amount of variation in a process. The objective is to ensure a process that is repeatedly fast and meets customer expectations

every time (George et al., 2004). With respect to DTS, this means ensuring the process provides accurate accountability to the tax payer and is fast and easy for the traveler and approval staff to utilize. If we can improve a process, we can enhance our sigma levels and thereby increase customer satisfaction.

The other common source of problems identified in a process is how the work actually flows through the process—the transfer of work between people and workstations. "One of the best ways to speed up a process is to eliminate process steps that aren't really necessary—meaning they don't meet a customer need. Another way is to redesign how work flows in the workspace" (George et al., 2004, p. 26). Teams involved in an improvement process must examine every step and determine "Is this step necessary? What value does it add to our customers?" In Lean Six Sigma, a key concept that must be embraced is that you are not looking at who to blame for process waste but to identify aspects of the process itself that could serve as the genesis for the waste (George et al., 2004).

Another key area of focus in the Lean Six Sigma process is fostering an environment that encourages teamwork and open dialogue regarding break downs in process. It is not an environment that identifies process problems and then utilizes those problems as fuel to attack other members (George et al., 2004). This a crucial concept when it comes to DTS because there are so many stakeholders involved when processing an authorization or voucher. Different people in the routing procedures are responsible for different things and accountable for different things. However, it takes every member in the process to execute in accordance with federal law to ensure appropriate allocation of taxpayer dollars. Consequently, travelers, authorizing officials and certifying officers must all work together to ensure an accurate and efficient process.

When an organization utilizes Lean Six Sigma methodology, they must understand that decisions must be based on facts and data. Without data, an organization can quickly maneuver toward a decision that may be grossly inaccurate (George et al., 2004). For example, a utility company once made the decision to vector a significant amount of money toward a marketing campaign to target new customers. They believed they were having trouble retaining new customers, and that was the reason why they were losing money.

However, after analyzing the appropriate data, they quickly discovered that new customers only accounted for 4 percent of their total customers. Consequently, they had made a decision to spend thousands and thousands of dollars to solve only 4 percent of the problem. If they had first analyzed the data, they would have determined that 96 percent of their customer base was long-term customers and that this was where they should target their marketing campaign (George et al., 2004).

When conducting process improvement, an organization should understand what kind of data they must have in order to move forward with the decision-making process. Generally, data collected will fall into two categories:

1. **Result measures**—reflect the outcome of a process or procedure. These quantify how the service actually turned out.

2. **Process measures**—these quantify exactly what transpired to produce the process result.

A perfect example of this is a baseball game, the final score is the "result" measure and the statistics (strikes, walks, errors, hits, etc.) of the game would be the "process" measures (George et al., 2004, p. 36). "But the only way to improve a result is to change the process, and you'll need process measures to tell you what has to change and how" (George et al., 2004, p. 37).

There are four types of data that are typically utilized for process improvement teams to analyze:

1. **Customer satisfaction**—this is data gathered through surveys or interviews on what customers think about the service.

2. **Financial outcomes**—this is data that describes the impact of the quality or problems identified have on revenue, expenses and cost.

3. **Speed/lead time**—Data on how fast or slow the process is.

4. **Quality/defects**—this is data that describes how many errors were made.

Once we have the data, we can ask ourselves the question "what does the data tell us?" Then, and only then, will we be able to effectively make decisions regarding process improvement (George et al., 2004).

F. THEORY OF CONSTRAINTS

The Theory of Constraints (TOC) (Goldratt & Cox, 2004) is a complement to the Lean Six Sigma approach in the process improvement realm. Also noteworthy of the TOC is the mere observation of its name: The *Theory* of Constraints. This term "theory" is one that is rarely mentioned within the DoD and governmental literature, again due a lack of academic and scholarly attention. The TOC, much like Lean Six Sigma, has been adopted by industry and business in an effort to cut costs and increase profits. There is, notably, a focus on the fiscal bottom line; however, like its process improvement counterparts, the TOC places a significant focus on the processes with a business, and particularly those processes that are impacted by human performance and leadership. Within the TOC, "a constraint is defined as anything that limits a system's higher performance relative to its purpose" (Scheinkopf, 1999, p. 15). In short, the TOC views anything that interferes with an increased profit as a constraint.

The TOC encourages each organization to reflect upon its individual mission and purpose, bearing in mind that not all organizations share the same goal of making money, or realizing gains and profits. Because government agencies, like the Department of Defense, are not in the business of making money, the TOC is particularly relevant because of this acknowledgement. The TOC does acknowledge that the primary mission of every for-profit organization is to make money, or increase profitability, and similarly, the mission of not-for-profit organizations (like government agencies) is to reduce waste and spending.

The TOC, as implied by its name, suggests that constraints on organizations are the very obstacles that hinder profitability. This theory places a significant focus on identifying and concentrating improvement efforts on the most critical issues and processes within an organization or system (Trojanowska & Dostatni, 2017). Similar to Six Sigma, the TOC is rooted in statistical analyses, trends, data, and success stories—all of which contribute to

its credibility in the process improvement field. The TOC is methodical in its approach, and follows a strict 5 step plan, identified in Figure 9, to help organizations to identify and address the constraints that hinder their effectiveness and success.

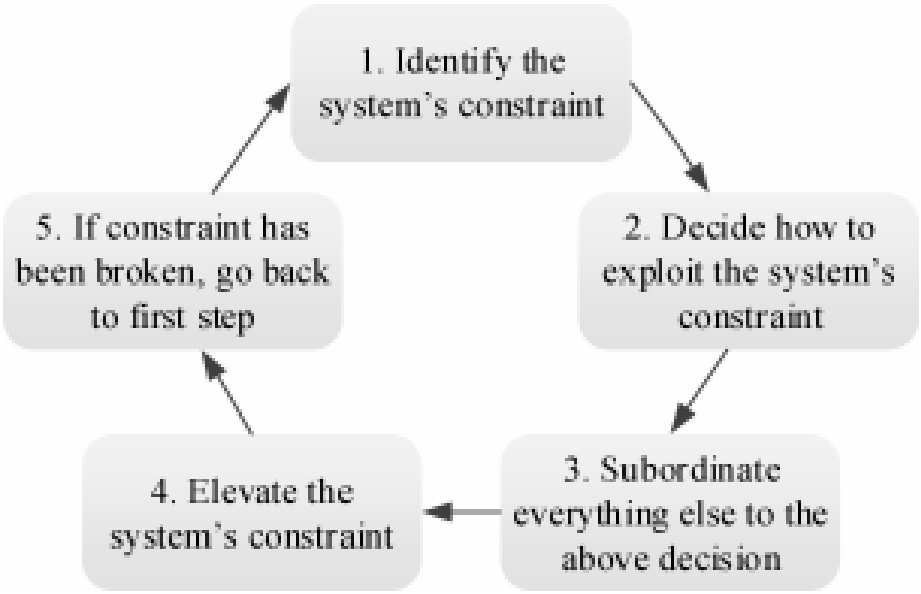

Figure 9. Theory of Constraints 5 Step Process.
Source: Trojanowska and Dostatni (2017).

The TOC acknowledges a common constraint that results directly from poor human integration called "Necessary Condition Thinking." This thinking pattern refers to an individual's habit of thinking in terms of specific requirements. "Terms such as must, must not, cannot, need, and have are indicators of necessary condition thinking" (Scheinkopf, 1999, p. 69). This constraint is common within government and bureaucratic agencies. Author of *Thinking for a Change*, Lisa Schienkopf, describes necessary thinking as "rules, policies, or laws, that provide the limitations, or boundaries within which we believe we are allowed to pursue goals and objectives. Conformance with a necessary condition does not guarantee that a goal will be achieved, but we usually believe that if we don't have the perceived necessary condition in place, we will certainly be unable to attain that goal" (Scheinkopf, 1999, p. 69). This conformity and reliance on unnecessary rules and policies

is a significant contributing factor to the financial waste of the DTS, and more importantly, the administrative burden the DTS places on the warfighter. Frustratingly, however, the current discussions and dialogue taking place among policymakers and the Government Accountability Office (GAO), do not acknowledge this environment of necessary thinking as a root cause of the problem.

G. DOD'S APPROACH TO PROCESS IMPROVEMENT

While the primary focus of most dialogue surrounding the DTS has been fiscally and financially centered, the department has made efforts to embrace continuous process improvement (CPI). The successes of process improvement methodologies, most notably Lean Six Sigma, have caught the attention of senior military leadership within the DoD, and as a result, the DoD has officially endorsed Lean Six Sigma since 2008 (Lavery & Spracklin, 2016).

Lavery and Spracklin (2016) have focused their thesis and research at the Naval Postgraduate School (NPS), in Monterey, CA, on the implementation of process improvement within the DoD. They effectively outline a number of Lean Six Sigma successes specifically within in the DoD:

> The Air Force applied CPI to reduce the repair cycle time for C-5 aircraft by 33 percent with an eventual goal to reduce total repair cycle time by over 50 percent. The Navy's Surface Warfare Center carried out LSS projects in administrative, manufacturing, and research and development functions to net nearly $9 million in savings over 3 fiscal years. The Army received tremendous payback because of LSS, saving $30 million on its HMMWV line. The benefit was not only in cost savings, but also in the number of vehicles delivered to the soldiers who needed them. The Defense Logistics Agency (DLA) reduced interest payments and administrative lead times on a major support contract by 10 percent through lean and Six Sigma techniques. DLA is currently applying these techniques to improve Common Access Card (CAC) issuance rates. These successes, and many others like them, demonstrate the DoD's ability to apply world-class, best-of-breed practices to meet a wide range of operational requirements. (Lavery & Spracklin, 2016, p. 19)

The DoD takes a specific approach to process improvement, and adheres to the DMAIC process: *Define, Measure, Analyze, Improve, Control*. Since 2008, the DoD has

been investing in its own personnel and processes through implementation of Lean Six Sigma, and the department admittedly recognizes that its successes rely heavily on its agility, as noted in Figure 10.

Figure 10. DoD Process Improvement. Source: Silicia (2008), qtd in Lavery (2016).

H. ANALYSIS OF PROCESS IMPROVEMENT APPROACHES

Much unlike the literature on the DTS examined for this review, sources on process improvement were plentiful and varied, ranging from books, to journal articles, to case studies and interviews. By mere fact of its abundant presence within the academic and scholarly realm, there is a level of credibility to the literature that was difficult to find on the topic of DTS. Unlike the topic of DoD business practices, more specifically the DTS, the process improvement subject has been heavily researched, tested, and analyzed.

Regardless of the approach, the literature on process improvement shares a significant focus on the *process*, specifically human integration and interaction. Interestingly, the goal of all process improvement reports is to decrease waste and excessive expenses—similar to the recommendations reported by the GAO, Congressional Hearings, and testimonies reviewed previously on DTS; however, they differ in their

approach on the subject of financial savings. The literature sources originating from the government focus only on the *effects* of poor processes (i.e., waste), while the sources on process improvement focus primarily on the *causes* of waste.

Lean, Six Sigma, and the TOC share a number of similarities, most notable, all are focused on reducing waste, identifying problems, and streamlining processes. These approaches vary in their assumptions and their application guidelines, as illustrated in Figure 11.

TABLE 2 Comparison of Improvement Programs

Program	Six Sigma	Lean thinking	Theory of constraints
Theory	Reduce variation	Remove waste	Manage constraints
Application guidelines	1. Define. 2. Measure. 3. Analyze. 4. Improve. 5. Control.	1. Identify value. 2. Identify value stream. 3. Flow. 4. Pull. 5. Perfection.	1. Identify constraint. 2. Exploit constraint. 3. Subordinate processes. 4. Elevate constraint. 5. Repeat cycle.
Focus	Problem focused	Flow focused	System constraints
Assumptions	A problem exists. Figures and numbers are valued. System output improves if variation in all processes is reduced.	Waste removal will improve business performance. Many small improvements are better than systems analysis.	Emphasis on speed and volume. Uses existing systems. Process interdependence.
Primary effect	Uniform process output	Reduced flow time	Fast throughput
Secondary effects	Less waste. Fast throughput. Less inventory. Fluctuation—performance measures for managers. Improved quality.	Less variation. Uniform output. Less inventory. New accounting system. Flow—performance measure for managers. Improved quality.	Less inventory/waste. Throughput cost accounting. Throughput—performance measurement system. Improved quality.
Criticisms	System interaction not considered. Processes improved independently.	Statistical or system analysis not valued.	Minimal worker input. Data analysis not valued.

Figure 11. Comparison of Improvement Programs.
Source: Nave (2002).

Most importantly, all of these process improvement techniques take a process-driven approach to addressing waste, constraints, and problems. In Six Sigma, the second and third steps in the processes are to measure and analyze, respectively. This signifies a focus on a data-based approach. It is during the analysis phase that this raw data is translated into information that provides insights into the fundamental flaws and problems that the organization is facing (Nave, 2002).

Similarly, the TOC places a great deal of significance on a step-based approach, and relies on metrics as well; however, data analysis is less valued in the TOC. In this case, the primary focus of the approach is to increase the speed at which a product is manufactured or developed, or the increase the speech at which a "service travels through a system" (Nave, 2002, p. 74). This approach is particularly relevant to the processes and procedures within the Department of Defense, and specifically the DTS.

For the sake of credible and unbiased research, it is relevant to note that there are notable criticisms with each of these techniques, as none are perfect or guaranteed to produce results. That being said, there are a number of case studies, academic reports, and historical evidence to suggest that these processes are reliable in improving business processes, but not perfecting them. The Six Sigma approach is favorable because of its significant focus on leadership development, and the role that the human being plays in the process, as well as a data-based approach. Six Sigma is thorough in addressing the issues and problems within each part of a process; however, this approach attempts to improve each of the systems independently and results in a less cohesive system interaction. Like Six Sigma, the TOC is limited by its lack of significant focus on data—which is in direct contrast to Six Sigma. The TOC also places less significance on the role of the human being than Six Sigma does (Nave, 2002).

I. SUMMARY

Government travel practices are not widely researched and documented within the academic sector and there are very few scholarly sources that capture data and recommendations for improvement. However, there are some relevant publications generated through the GAO, congressional hearings, testimonies, and technical

government reports. These existing sources highlight a common trend and focus on the financial burden and fiscal impact of poor processes within the DTS. However, they fail to address, in great detail, the causes of these poor processes or offer solutions to address them.

In a recent GAO report investigating DTS processes, the DoD acknowledged that despite significant financial contributions and process redesigns, there are still many areas requiring improvement. The DoD Task Force, GAO, and senior lawmakers have endeavored to identify and address the budgetary and regulatory issues that currently plague the DTS. The DoD has acknowledged, through the GAO, that the current DTS places too much focus on rigid rules and compliance with procedures, and neglects to focus on the success of the overall mission (GAO, 2006). This culture has resulted in excessive administrative burden to military personnel and command travel processing efficiency.

In a solutions-based approach, an examination of industry business practices suggests that the DoD, and DTS in particular, could benefit from a process improvement overhaul utilizing the techniques of Lean Six Sigma. Lean Six Sigma focuses on a holistic approach of identifying problems within the processes, removing waste and constraints, and increasing profitability and speed within the processes. These theories are supported by strong evidence and plentiful research within both industry and academia, illustrating positive results, increased profit margins, and reduced waste (Snee, 2010; Scheinkopf, 1999; Trojanowska & Dostatni, 2017). We applied these techniques in order to properly examine the current DTS voucher process, identify waste areas, and provide recommendations for improvement.

III. DATA COLLECTION

A. COLLECTION PROCESS

In order to evaluate the effectiveness of the current DTS process, we needed to capture data that clearly identified how much time was actually required to completely process a travel voucher. The scope of our research was limited only to vouchers that were not fully processed for final liquidation during their initial submission. We utilized DTS data from the Marine Corps because the Marine Corps' DTS process includes the administrative unit of the traveler as an intermediary approval check point between the traveler and the disbursing certifying official. The analysis and conclusions predicated on this data were sufficient to answer our research questions.

We were able analyze all vouchers submitted from January to March of 2018. In this quarter, there were a total of 25,887 vouchers submitted to the disbursing office for ultimate voucher liquidation. Of these vouchers, 5,355 were returned to traveler for corrections. These voucher re-submissions were the focus of our analysis. The data analyzed included the entirety of vouchers requiring more than one submission. However, since we had no interest in local vouchers for this research paper, we removed the local vouchers from our data population, leaving us with 4,979 vouchers.

Utilizing Microsoft Excel's random number generator function, we assigned random numbers to each regular voucher. We then sorted the claims by their random number, from smallest to largest. We determined that a sample size of 100 vouchers would be sufficient for our research purposes and selected the first 100 vouchers from the sorted list. Our data analysis was conducted on this 100-voucher sample.

Capturing the total time actually spent in the DTS system at each processing level is not feasible because we cannot accurately assess the actual amount of time spent within the system. What we can capture, however, is the amount of time that elapses from one step to the next. We find this to be a more useful metric as the actual total amount of time a voucher takes from submission to liquidation should be the determining factor when evaluating the efficiency of the current voucher process.

We received Read-Only access to DTS in order to view and record the date and time stamps allocated to each of the vouchers in our sample. As disclosed previously, each of the vouchers in this sample were returned to the traveler a minimum of one time. This equates to a minimum number of two submissions per voucher. The maximum number of submissions was seven.

Next, we recorded the date-time stamp data for each of these 100 voucher submissions. Once we captured this data, we calculated the number of hours elapsed between traveler submission, administrative command approval or rejection, and disbursing approval or rejection. It is important to note that traveler data does not exist in the first submission as the submission by the traveler to the administrative unit is considered the starting point of that submission. Only subsequent submissions include the time a voucher resides with the traveler and it is calculated from the time it is returned to traveler by either administrative command or disbursing and when the traveler re-submits. By capturing the voucher dwell time at the administrative unit and disbursing unit, various statistics were generated and analyzed. Table 1 is a depiction of the raw data captured from the first 10 vouchers for submission two. The Appendix shows the raw data in greater detail.

Table 1. Depiction of Raw Data

	Submission TWO			*Time in Hours*		
Number	Traveler Submission	Admin Auth/Return	Disb Approve/Reject	Time with Traveler	Time in Admin	Time in Disbursing
1	11/21/17 9:49 AM	11/27/17 11:53 AM	11/29/17 3:53 PM	142.92	146.07	52.00
2	2/27/18 6:55 PM	2/28/18 12:22 PM	3/1/18 9:31 AM	0.30	17.45	21.15
3	2/26/18 10:19 AM	2/26/18 2:26 PM	2/27/18 8:47 AM	72.02	4.12	18.35
4	3/19/18 6:58 AM	3/19/18 12:13 PM		57.30	5.25	-
5	3/20/18 6:55 AM	3/20/18 8:28 AM		111.87	1.55	-
6	2/22/18 11:59 AM	2/26/18 2:14 PM	2/28/18 3:21 PM	21.58	98.25	49.12
7	12/1/17 8:32 AM	1/10/18 2:29 PM	1/11/18 11:03 AM	21.40	965.95	20.57
8	4/23/18 1:20 PM	4/24/18 4:54 PM	4/25/18 8:53 AM	748.17	27.57	15.98
9	1/26/18 3:43 PM	1/29/18 2:51 PM	1/30/18 1:22 PM	7.00	71.13	22.52
10	3/12/18 8:33 AM	3/15/18 8:57 AM	3/16/18 9:53 AM	118.28	72.40	24.93

B. COLLECTION PROCESS LIMITATIONS

DTS does not have the functionality to export the data that was required for this thesis. Therefore, we had to manually input data from DTS into Excel. This process carries inherent risk of human error in the following areas:

- Incorrectly matching date-time stamps with the appropriate entity (i.e., traveler, administrative unit, disbursing). We mitigated these errors by viewing the level 30 permissions in DTS, which are reserved for disbursing officials. This enabled us to differentiate administrative unit and disbursing.

- Erroneous entry into the text field (i.e., 2:00pm versus 3:00pm). We mitigated this by utilizing a formula in Excel that allowed us to compare time elapsed between initial submission and final approval by disbursing with the summation of time elapsed between each entity.

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IV. DATA ANALYSIS

A. DTS VOUCHER PROCESSING TIMES

The main objective of our analysis was to determine exactly how much time was required to completely process a voucher through the current DTS system. We wanted to understand how much time was required at each checkpoint in the voucher liquidation process. Ultimately, we wanted to quantify exactly how much time was required through each step and also attempt to quantify what value each step was providing. A completely processed voucher is defined as a voucher that has been submitted by the traveler, or on the traveler's behalf, also known as T-entered, and certified by disbursing for liquidation by DFAS.

Our analysis began by gaining an understanding of how much time was spent at each processing point in the system. We conducted this analysis by looking at all 100 vouchers and their total times at each processing point. We then analyzed the breakdown of each submission.

As depicted in Table 2, all 100 vouchers required a total of 55,566 hours processing in DTS prior to ultimate liquidation. The vouchers required, on average, 250 hours or 45 percent of total processing time with the traveler, 216 hours or 39 percent of the total processing time with the administrative unit, and 90 hours or 16 percent of the total processing time with disbursing.

Table 2. Total Hours, Average Hours, and Percentage of Time Spent at Each Level

	Time with Traveler	Time with Admin	Time with Disbursing	Total
SUM	24,957.80	21,614.55	8,993.67	55,566.02
AVERAGE	249.58	216.15	89.94	555.66
PERCENTAGE	44.92%	38.90%	16.19%	100.00%

Considering the same data, but excluding time with traveler, Table 3 shows that the sample vouchers spent a total of 30,608 hours between the administrative unit and disbursing. Between these two entities, the vouchers spent, on average, 71 percent of the time with the administrative unit and 29 percent of the time with disbursing.

Table 3. Total Hours, Average Hours, and Percentage of Time Spent at Admin and Disbursing

	Time with Admin	**Time with Disbursing**	**Total**
SUM	21,614.55	8,993.67	30,608.22
AVERAGE	216.15	89.94	306.08
PERCENTAGE	70.62%	29.38%	100.00%

Our 100 DTS voucher sample was all rework. Our analysis finds the average DTS voucher that required rework took approximately 23 days from initial submission to final liquidation. Table 4 details our findings.

Table 4. Time Elapsed from Submission to Liquidation

Time Elapsed from Submission to Liquidation			
	Total Hours	Total Days (Total Hours/24)	Days per Claim (Days/100 Claims)
Time with Traveler	24,957.80	1,039.91	10.40
Time with Administrative Unit	21,614.55	900.61	9.01
Time with Disbursing	8,993.67	374.74	3.75
Total	**55,566.02**	**2,315.25**	**23.15**

We further analyzed the total time at each processing point by running Excel's descriptive statistics function for all 100 vouchers. The results are shown in Table 5.

Table 5. Descriptive Statistics of Total Time with Each Level

Time with Traveler		*Time with Admin*		*Time with Disbursing*	
Mean	249.578	Mean	216.15	Mean	89.94
Standard Error	55.4965212	Standard Error	28.08	Standard Error	6.42
Median	98.3	Median	146.05	Median	71.44
Mode	1.916666667	Mode	#N/A	Mode	48.63
Standard Deviation	554.965212	Standard Deviation	280.76	Standard Deviation	64.24
Sample Variance	307986.3865	Sample Variance	78828.08	Sample Variance	4127.20
Kurtosis	36.13745159	Kurtosis	24.91	Kurtosis	4.94
Skewness	5.400914383	Skewness	4.36	Skewness	2.03
Range	4483.5	Range	2102.87	Range	334.43
Minimum	0	Minimum	2.40	Minimum	16.00
Maximum	4483.5	Maximum	2105.27	Maximum	350.43
Sum	24957.8	Sum	21614.55	Sum	8993.67
Count	100	Count	100.00	Count	100.00

The standard deviation and range are of particular interest. The standard deviation indicates a high level of dispersion in the data points. The standard deviation for "Time with Traveler" is 555 hours, 281 hours for "Time with Admin," and 64 hours for "Time with Disbursing." This indicates that variation in processing times with the administrative unit is significantly larger than the disbursing unit. Similarly, the data points for how long each voucher was with the traveler were significantly more dispersed than how long each voucher was with the administrative unit. This observation is further highlighted by comparing the ranges. The range of 4,483 hours for "Time with Traveler" is more than double the range of 2,103 hours for "Time with Admin," and this range is more than six times the range of 334 hours for "Time with Disbursing."

Figure 12 demonstrates the total hours required for voucher processing at each level of the DTS hierarchy. Disbursing certified the vast majority of vouchers by the end of submission three. Submissions four through seven were all under 4,000 total hours for the100-voucher sample.

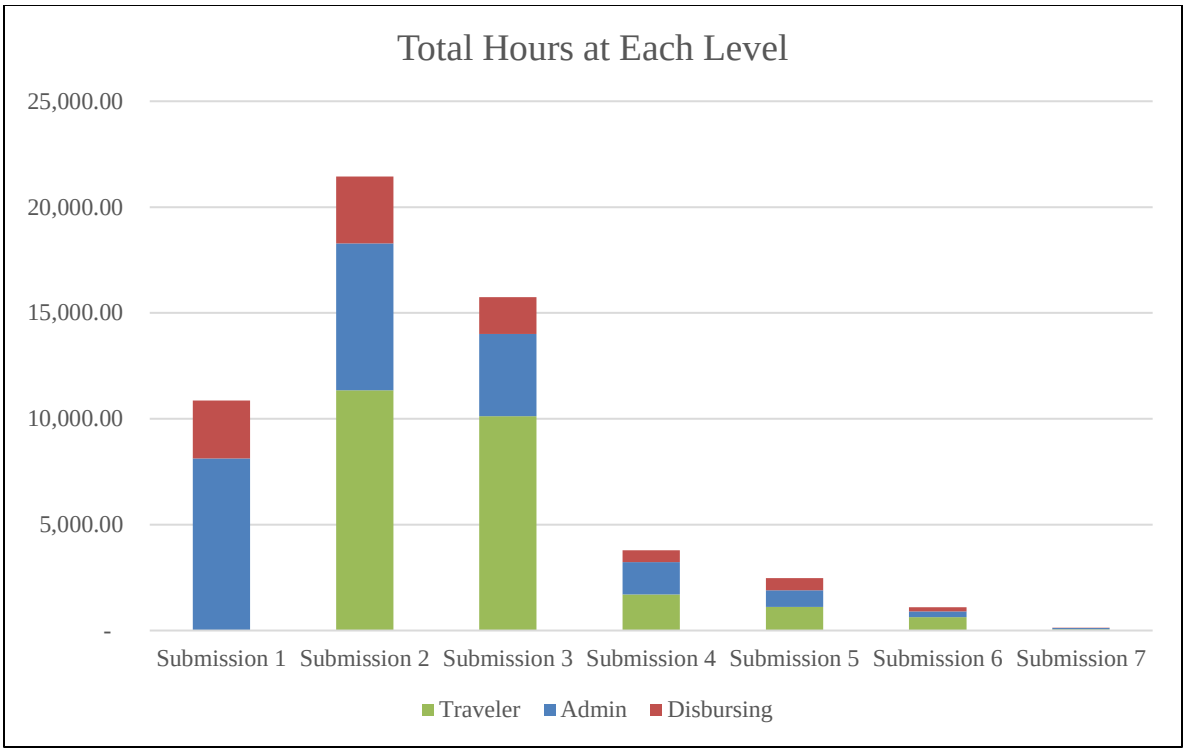

Figure 12. Total Hours at Each Level for Each Submission

As shown in Figure 13, and with the exception of one submission, on average it took the traveler the greatest amount of time to process a voucher. The administrative unit required the second greatest amount of time and the disbursing unit required the smallest amount of time to process a voucher. Furthermore, the administrative unit, on average, took longer than disbursing to process all vouchers in every submission.

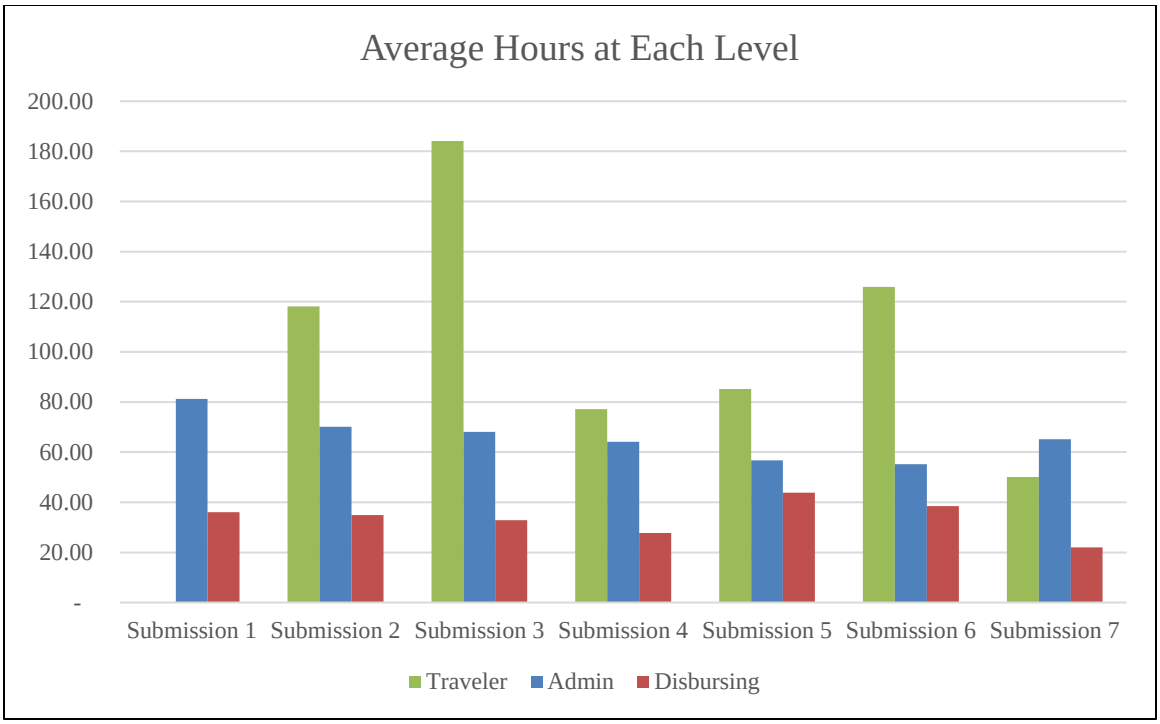

Figure 13. Average Hours at Each Level for Each Submission

B. NON-BUSINESS HOUR SUBMISSIONS

As previously discussed, we utilized the date-time stamps on each voucher to calculate the amount of time the traveler, administrative unit, and disbursing utilized to process each voucher. However, it is important to note that the total hours calculated included weekend and non-business hours. We did not eliminate weekend and after business hour submissions for the following primary reasons:

1. **Consistency and verification.** We were granted Read Only Access to DTS to view United States Marine Corps travel vouchers. We entered the documents Travel Authorization Number (TANUM) in Traveler Lookup, went to the Digital Signature section, and reviewed the Document History. The timestamps resident in DTS are displayed based on the individual user's profile and does not guarantee the traveler updated their profile. Keeping the timestamps uniform across all calculations enabled us to provide consistent data that could be easily verifiable by outside entities.

2. **Relevancy.** The total processing time spent in DTS is more relevant to our study than the amount of time each specific stakeholder spends in DTS. Excluding weekend and non-business hour submissions would be more applicable for an entity's internal process improvement aspirations or workload management tracking. Furthermore, the Government Travel Charge Card (GTCC) late payment computations and interest charges are only relevant to the total processing time, from submission to final certification.

3. **No significant disparity.** The amount of DTS submissions that occurred on a Friday, Saturday, or Sunday were relatively consistent among the traveler, administrative unit, and disbursing. Table 6 details our findings.

Table 6. Weekend DTS Voucher Submissions

	Traveler	**Administrative Unit**	**Disbursing**	**Totals**
Total Friday Submissions	43	51	58	**152**
Total Saturday Submissions	4	3	1	**8**
Total Sunday Submissions	5	5	0	**10**
Total Friday + Weekend	52	59	59	**170**
Total Submissions (any day of week)	**294**	**301**	**259**	**854**
% Submitted on Friday or Weekend	17.69%	19.60%	22.78%	**19.91%**

Of the 100 DTS vouchers analyzed, the traveler submitted to the administrative unit a total of 294 times, the administrative unit submitted to disbursing 301 times, and the disbursing unit submitted to DFAS 259 times. Of the 294 traveler submissions, 52 occurred on a Friday, Saturday, or Sunday. Of the 301 administrative submissions, 59 occurred on a Friday, Saturday, or Sunday. Of the 259 disbursing submissions, 59 occurred on a Friday, Saturday, or Sunday. Of note, it is important to highlight the submission difference between traveler and administrative unit of 294 and the administrative to disbursing unit of 301. The differences between the traveler submissions and administrative unit submissions is

attributable to three DTS vouchers, which had a total of seven submissions initiated on behalf of the traveler, also known as T-entered.

C. ADMINISTRATIVE UNIT VALUE ADDED

We conducted an analysis to quantify what value the administrative approval requirement in the voucher liquidation process was actually providing. In order to do so, we analyzed the administrative value through each required submission. By doing so, we were able to quantify exactly what value the administrative routing requirement was actually providing through each iteration of travel voucher submission. Overall, the administrative routing requirement identified a discrepancy 13.95 percent of the time.

For our study, a round was defined as any time the traveler submitted a voucher for liquidation and it was ultimately returned to traveler for corrections or approved. It could have been returned by the administrative command or disbursing. Once a submission was returned to traveler or approved, the round was considered over. A submission was defined as any time the traveler, or representative, submitted a voucher for liquidation and it arrived in the administrative command DTS inbox for approval. In our 100-voucher sample, 100 vouchers required at least two rounds, 57 required three rounds, 24 required four rounds, 14 required five rounds, five required six rounds, and one required seven rounds. Overall, seven rounds were required with 301 total submissions.

If the administrative command identified a discrepancy and returned it to the traveler prior to forwarding on to disbursing for final approval, we considered this value added. However, if the submission routed directly through the administrative command to disbursing for approval, then we did not consider this adding any value to the process.

We calculated how many submissions were actually required to achieve final liquidation. We calculated how many times the administrative function actually discovered a mistake and returned it to the traveler prior to sending it forward to disbursing. We calculated the percentage of submissions that the administrative function actually discovered a mistake. Finally, we calculated the percentage the administrative function discovered a mistake by round as well as cumulative effects over multiple rounds.

As depicted in Table 7, the administrative command discovered 24 discrepancies out of 100 vouchers in round one. This means out of 100 vouchers submitted, 24 were returned to traveler for corrections prior to sending it forward to disbursing for final approval. Overall, the administrative command returned vouchers 24 percent of the time during the first submission of a travel voucher. However, as submissions progress, the overall percentage of vouchers returned by the administrative unit began to decrease. This is depicted in Figure 14.

Our sample of 100 vouchers ultimately required a total of 301 submissions to achieve final liquidation. Of these 301 submissions, the administrative unit only identified 42 discrepancies, which means that the administrative unit only returned the voucher to the traveler 13.95 percent of the time.

Table 7. Vouchers Returned by Admin in Rounds 1–7

Round	# of Submissions in Round	Total # of Submissions (Cumulative)	# Returned to Traveler (Per Round)	# Returned to Traveler (Cumulative)	% of Round	% of Total Submissions
1	100	100	24	24	24.00%	24.00%
2	100	200	9	33	9.00%	16.50%
3	57	257	4	37	7.02%	14.40%
4	24	281	4	41	16.67%	14.59%
5	14	295	1	42	7.14%	14.24%
6	5	300	0	42	0.00%	14.00%
7	1	301	0	42	0.00%	13.95%

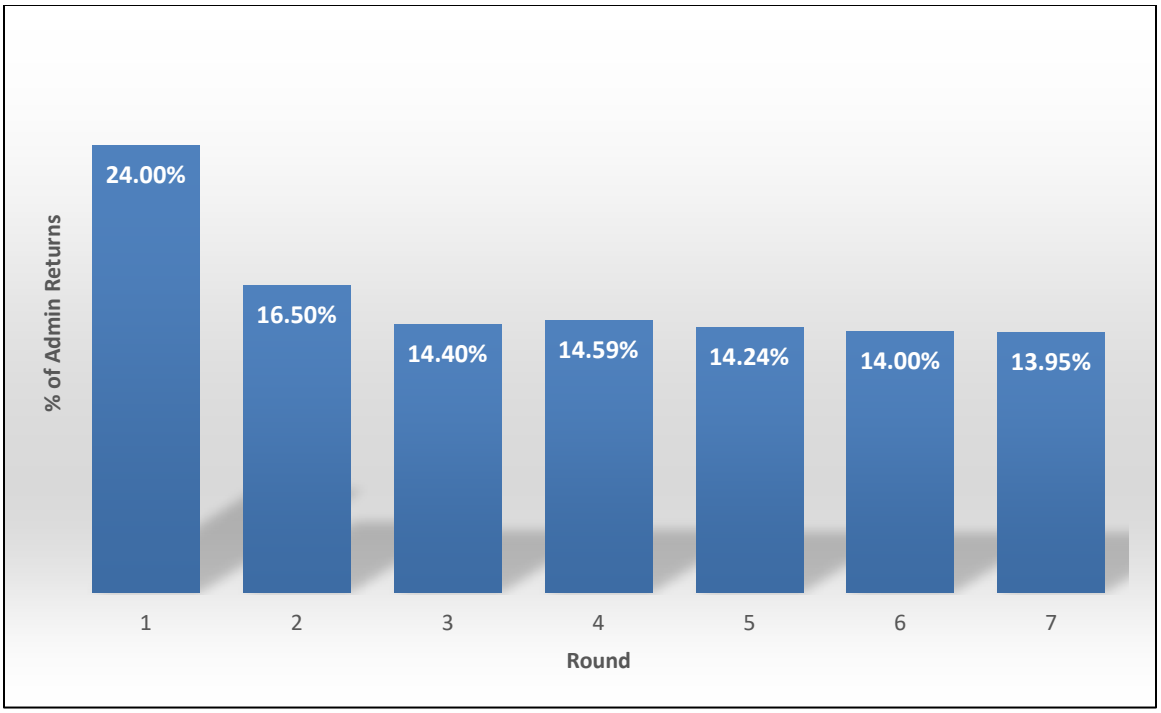

Figure 14. Cumulative Percentage of Admin Returns by Round

We also analyzed the data to determine what the administrative value would be if we took out the initial submission portion and only concentrated solely on subsequent submissions. The objective of this analysis was to separate the value of the administrative function in initial submission from the required subsequent submissions. What we determined in this analysis was that out of 100 vouchers there were 201 additional submissions required after the initial submission. Of these 201 additional submissions, the administrative unit discovered 18 discrepancies. This calculates to 8.96 percent of vouchers returned to traveler prior to being forwarded to disbursing for final approval. This data is depicted in Table 8 and Figure 15.

Table 8. Vouchers Returned by Admin in Rounds 2–7

Round	# of Submissions in Round	Total # of Submissions (Cumulative)	# Returned to Traveler (Per Round)	# Returned to Traveler (Cumulative)	% of Round	% of Total Submissions
2	100	100	9	9	9.00%	9.00%
3	57	157	4	13	7.02%	8.28%
4	24	181	4	17	16.67%	9.39%
5	14	195	1	18	7.14%	9.23%
6	5	200	0	18	0.00%	9.00%
7	1	201	0	18	0.00%	8.96%

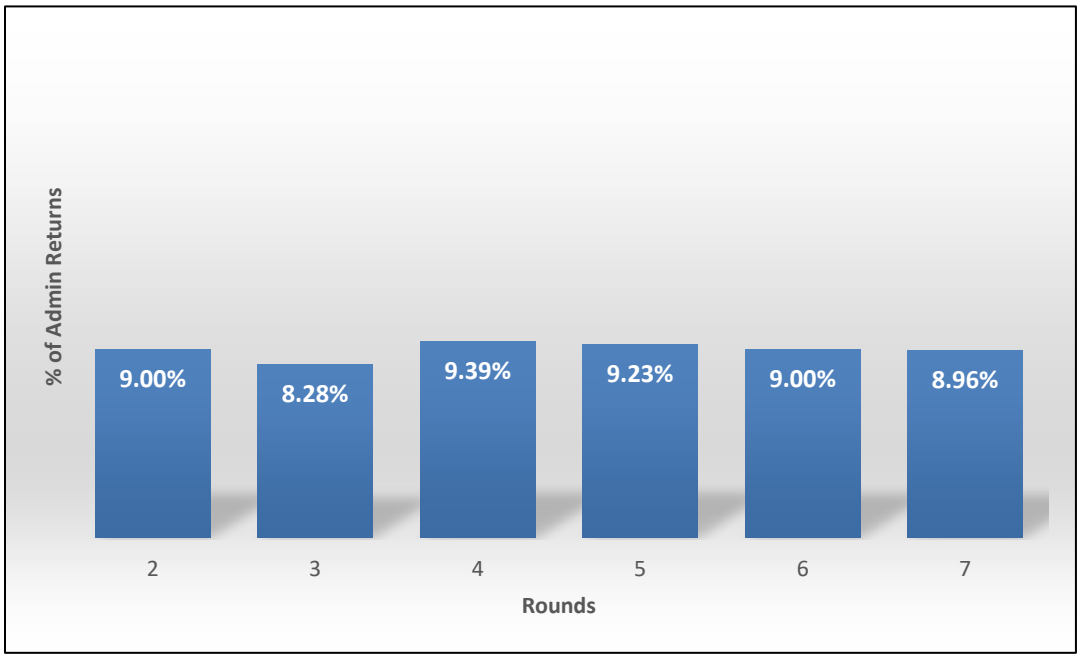

Figure 15. Cumulative Percentage of Admin Returns in Rounds 2–7

D. REGIONAL DISBURSING OFFICE—EAST POPULATION DATA

The Marine Corps disbursing unit analyzed in this thesis, RDO-East, processed 25,887 vouchers from January 2018 to March 2018. During this same time period, 5,355 vouchers were returned to the traveler for rework. This data is depicted in Figure 16.

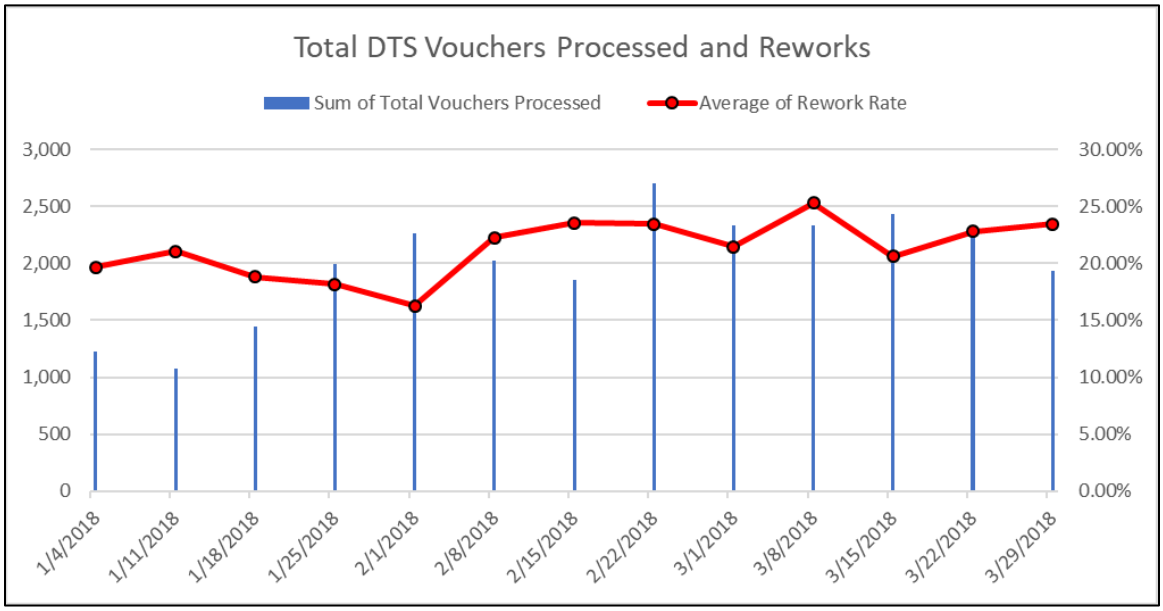

Figure 16. Total DTS Vouchers Processed and Reworks. According to RDO-East Analytics Dashboard (email to author, October 5, 2018).

Given that RDO-East processes approximately 2,000 vouchers per week, this translates to an average of 2.69 weeks spent on defective work in any 13-week period at the disbursing level alone. In Lean Six Sigma, reworks are considered waste, or non-value-added steps. A rework in the voucher approval process takes away from disbursing's ability to process another voucher. Reworks are subject to an even greater amount of waste in additional processing time at the administrative unit and traveler level.

E. ANALYSIS SUMMARY

This analysis focused on all non-local vouchers rejected by the disbursing unit from January to March 2018. Of the 25,887 submitted, 5,355, approximately 20 percent, were

returned to traveler. Of those vouchers returned, we randomly selected 100 vouchers to analyze. Our analysis of this 100-voucher sample revealed that the range of time a voucher spent with the administrative unit was far greater than that of the disbursing unit. Further, the standard deviation for the administrative unit was much larger than the disbursing unit. This indicates that the disbursing unit processed vouchers much more quickly and consistently than the administrative unit. We also determined that weekend submissions were approximately equal between entities and did not skew our data.

This analysis also revealed that the administrative unit consumed approximately 70 percent of the voucher approval time required after traveler submission. However, they only identified discrepancies 24 percent of the time during initial submission and only 14 percent of the time across all seven submissions. Moreover, it took approximately 23 days, on average, for a voucher in this sample to fully process. This lack of added value, coupled with the wide range and inconsistency of processing times by the administrative unit, highlights issues with the current DTS voucher approval process.

V. RECOMMENDATIONS

This thesis supports three options that could be immediately implemented to remove waste from the current DTS voucher approval process, reduce the administrative burden on the operational element, and provide commands with greater situational awareness of obligated funds. We also contend that this process change should be incorporated into the newly designed travel system scheduled for initial release in 2020.

A. OPTION ONE

Option one completely removes the administrative unit from the voucher submission process, as depicted in Figure 17. Consequently, this option provides the greatest value to the operational unit, enabling additional focus towards other priorities. That is why we recommend implementing this option over the other two.

After a voucher is submitted by the traveler, it spends approximately 70 percent of additional processing time with the administrative approver and only 30 percent with disbursing. The administrative unit accounts for roughly 40 percent of the overall voucher processing time (see Tables 2 and 3). The administrative unit identified discrepancies 24 percent of the time during initial voucher submission but only 14 percent overall (see Table 7 and Figure 14).

If we eliminate this step, it would remove this opportunity to identify a mistake. However, it is important to note that although the administrative unit identified discrepancies 24 percent of the time during initial submission, these vouchers were ultimately returned to traveler by disbursing for other discrepancies. If the voucher had bypassed the administrative unit initially, disbursing would have returned it to traveler quicker, reducing the overall processing time.

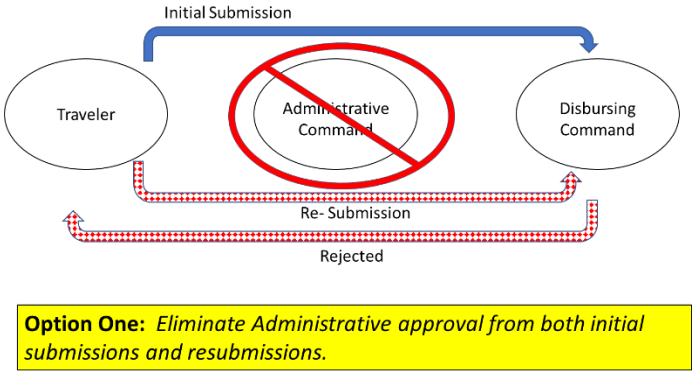

Figure 17. DTS Voucher Submission Process—Option One

One potential drawback to eliminating the administrative unit from the voucher process is DTS lines of accounting with insufficient budgets to process vouchers. With the administrative unit included in the process, DTS conducts a funds check on the lines of accounting included on a voucher. If funds are insufficient to process a voucher, the administrative unit could then immediately contact the comptroller's office to request an increase in the budget associated with those lines of accounting. With the administrative unit removed from this process, the disbursing office will now have an increased burden to notify the administrative unit when funds are insufficient. This may or may not be a significant burden, but would be an increased responsibility for disbursing, nonetheless.

B. OPTION TWO

Option two retains the administrative unit approval during initial submission and removes it during all subsequent submissions, as shown in Figure 18. This option reduces some of the administrative burden on the operational element and provides an opportunity for the administrative unit to identify and facilitate corrective action of a discrepancy prior to sending it to disbursing. However, this requires additional time for the traveler and administrative approver to focus on resolving voucher discrepancies. Our analysis indicates that the administrative unit only identified discrepancies approximately nine percent of the time during subsequent voucher submissions. (see Table 8 and Figure 15).

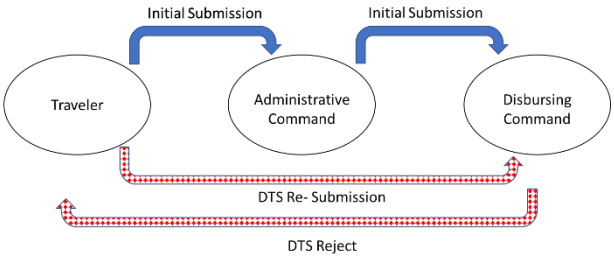

Figure 18. DTS Voucher Submission Process—Option Two

C. OPTION THREE

Option three retains the administrative unit in the initial voucher approval and removes subsequent voucher submissions altogether, as depicted in Figure 19. Instead, if disbursing identifies additional discrepancies, they simply place the voucher in a "hold" status and communicate directly with the traveler to resolve discrepancies. This option places additional requirements on the disbursing unit but alleviates the administrative burden on the operational staff. As noted in option two, the administrative unit only identified discrepancies roughly nine percent of the time during subsequent voucher submissions.

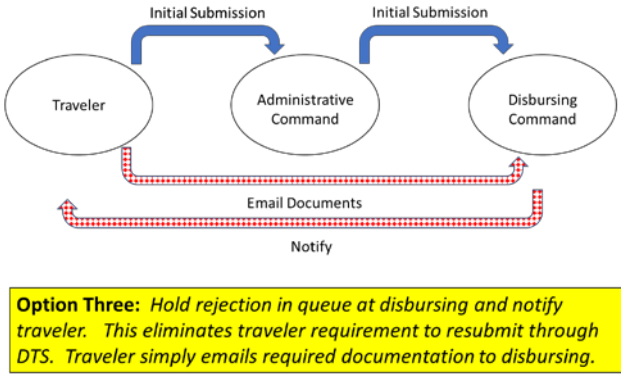

Figure 19. DTS Voucher Submission Process—Option Three

D. TRAVELER TRAINING

Since we are recommending the removal/modification of the administrative unit from the voucher approval process, we recommend providing additional voucher training during the command check-in process for each traveler. If done effectively, this small investment up front could provide significant benefit in the long term. This initial investment of training time will pale in comparison to the amount of time required to retain the current administrative approval requirement in the voucher submission process.

E. ONLINE CHAT CAPABILITY

We recommend designing and implementing an easier venue for both disbursing and the traveler to communicate during the voucher approval process. We believe an online chat tool capability would be an excellent venue to enable responsive communication between the traveler and disbursing to rectify voucher discrepancies. This venue has the ability to facilitate discrepancy resolution through ease of dialogue and document uploads. The traveler will no longer be required to log into DTS in order to resubmit paperwork.

F. PILOT PROGRAM

This process modification should be implemented in a trial phase to quantify time savings and measure the true impact of the process modification. These trial phases should be conducted with various types of units as well as all military service components. These trial phases would confirm or deny administrative burden reductions for tested operational units. If the trial phase proves to be successful, this modification should be fully implemented across the DoD.

VI. CONCLUSION

Our analysis concludes that it requires an average of 23 days to reach final approval of any voucher requiring resubmission. This number is incredibly high and must be reduced. If the DoD endeavors to remove as much of the administrative burden from the warfighter as possible, then the DoD must continuously improve their travel system. To this end, it is imperative that the current voucher process be scrutinized and modified to streamline the voucher approval process.

This thesis set out to effectively analyze the current travel system and identify opportunities to remove waste and reduce the overall administrative burden on the warfighter. After a thorough analysis of time requirements and value added, we recommend completely eliminating the administrative unit from the voucher approval process. Since the administrative unit is responsible for authorizing the travel initially, there should be no requirement to have them in the voucher approval process. This portion of the travel process requires a robust knowledge of the Joint Travel Regulations (JTR). Certifying officials in disbursing are subject matter experts in JTR compliance.

Certifying officials in disbursing process DTS vouchers as their primary duty, unlike individuals in administrative units who are assigned DTS roles as a collateral duty. Disbursing personnel are properly trained to accurately and efficiently certify vouchers in DTS. The disbursing office utilized for this study was evaluated by the Marine Corps Administrative Analysis Team (MCAAT) in February 2018, scoring an impressive 95 percent accuracy rating on a sample size of 240 vouchers (RDO-East Internal Controls, email to author, November 14, 2018).

Based on process improvement methodology, we believe removing the administrative voucher approval requirement coupled with an online chat capability will significantly enhance the overall efficiency of the system. Creating a direct connection between the traveler and expert processing personnel will alleviate multiple resubmissions and associated lag time. Additionally, it will remove significant administrative requirements from the operational staff.

Any of our three recommended options would provide significant relief to the traveler and staff of the operational unit. This is precisely the area for which administrative reductions should be tailored. Reducing the administrative burden on the operational unit provides additional capacity to be applied against other mission priorities. Time is a resource that cannot be recreated. The elimination or modification of the administrative unit approval requirement will allow operational units to reallocate this precious resource of time against other, more impactful, priorities.

APPENDIX. SAMPLE OF RAW DATA

	Submission ONE			Submission TWO			Submission THREE			Submission FOUR		
Number	Traveler Submission	Admin Auth/Return	Disb Approve/Reject	Traveler Submission	Admin Auth/Return	Disb Approve/Reject	Traveler Submission	Admin Auth/Return	Disb Approve/Reject	Traveler Submission	Admin Auth/Return	Disb Approve/Reject
1	11/11/17 9:11 AM	11/14/17 8:18 PM	11/15/17 10:54 AM	11/21/17 9:49 AM	11/27/17 11:53 AM	11/29/17 3:53 PM	12/12/17 11:16 AM	12/13/17 11:47 AM	12/14/17 8:22 AM	1/10/18 10:09 AM	1/11/18 9:39 AM	
2	2/27/18 6:16 PM	2/27/18 6:37 PM		2/27/18 6:55 PM	2/28/18 12:22 PM	3/1/18 9:31 AM	3/1/18 4:17 PM	3/3/18 12:06 PM		3/3/18 12:20 PM	3/5/18 8:20 PM	3/6/18 9:12 AM
3	2/15/18 11:20 AM	2/22/18 11:41 AM	2/23/18 10:18 AM	2/26/18 10:19 AM	2/26/18 2:26 PM	2/27/18 8:47 AM						
4	3/13/18 11:36 AM	3/16/18 9:40 PM		3/19/18 6:58 AM	3/19/18 12:13 PM		3/19/18 1:56 PM	3/22/18 3:00 PM	3/23/18 9:13 AM	3/23/18 4:06 PM	3/26/18 10:26 PM	3/27/18 3:05 PM
5	3/14/18 1:42 PM	3/15/18 3:03 PM		3/20/18 6:55 AM	3/20/18 8:28 AM		3/20/18 1:59 PM	3/21/18 7:31 AM	3/22/18 10:10 AM	3/22/18 1:47 PM	3/22/18 3:34 PM	3/23/18 3:23 PM
6	2/11/18 1:24 PM	2/20/18 11:44 AM	2/21/18 2:24 PM	2/22/18 11:59 AM	2/26/18 2:14 PM	2/28/18 3:21 PM						
7	11/13/17 2:27 PM	11/30/17 11:08 AM		12/1/17 8:32 AM	1/10/18 2:29 PM	1/11/18 11:03 AM	1/17/18 1:36 PM	1/25/18 1:38 PM	1/26/18 2:28 PM			
8	3/21/18 12:11 PM	3/22/18 1:40 PM	3/23/18 9:10 AM	4/23/18 1:20 PM	4/24/18 4:54 PM	4/25/18 8:53 AM						
9	1/24/18 1:40 PM	1/25/18 5:01 PM	1/26/18 8:43 AM	1/26/18 3:43 PM	1/29/18 2:51 PM	1/30/18 1:22 PM	1/30/18 1:39 PM	2/1/18 3:37 PM	2/2/18 4:09 PM	2/6/18 1:39 PM	2/8/18 2:25 PM	2/9/18 3:00 PM
10	3/1/18 6:41 PM	3/6/18 12:22 PM	3/7/18 10:16 AM	3/12/18 8:33 AM	3/15/18 8:57 AM	3/16/18 9:53 AM						

	Submission FIVE			Submission SIX			Submission SEVEN			Totals			
Number	Traveler Submission	Admin Auth/Return	Disb Approve/Reject	Traveler Submission	Admin Auth/Return	Disb Approve/Reject	Traveler Submission	Admin Auth/Return	Disb Approve/Reject	Time with Traveler	Time in Admin	Time in Disbursing	Total
1	1/11/2018 16:10	1/11/18 5:23 PM	1/12/18 9:36 AM	1/16/18 2:59 PM	1/16/18 5:13 PM	1/17/18 2:32 PM	1/19/18 4:39 PM	1/22/18 9:49 AM	1/23/18 7:49 AM	1,258.10	345.82	146.72	1,750.63
2										7.30	117.62	34.02	158.93
3										72.02	172.47	40.97	285.45
4	4/3/18 7:28 AM	4/4/18 11:52 AM	4/5/18 11:50 AM							226.28	267.12	58.83	552.23
5	3/26/18 9:09 AM	3/27/18 8:57 AM	3/28/18 9:25 AM							186.77	70.02	74.93	331.72
6										21.58	312.58	75.78	409.95
7										167.95	1,562.67	45.40	1,776.02
8										748.17	53.05	35.48	836.70
9										100.78	197.22	87.33	385.33
10										118.28	186.08	46.83	351.20

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LIST OF REFERENCES

Business systems modernization strategy for evolving DoD's business enterprise architecture offers a conceptual approach, but execution details are needed: Report to Congressional Committees. (2007). Retrieved from https://www.gpo.gov/fdsys/pkg/GAOREPORTS-GAO-07-451/pdf/GAOREPORTS-GAO-07-451.pdf

DoD business transformation Defense Travel System continues to face implementation challenges: Report to Congressional addressees. (2006). Retrieved from https://www.gpo.gov/fdsys/pkg/GAOREPORTS-GAO-06-18/pdf/GAOREPORTS-GAO-06-18.pdf

Defense Travel Management Office. (2008). *Defense Travel Dispatch, XI*(2), 1–12. Retrieved from: https://www.defensetravel.dod.mil/Docs/Dispatch/Defense-Travel-Dispatch-Fall-2018.pdf

The Defense Travel System: Boon or boondoggle?: Hearing before the Permanent Subcommittee on Investigations of the Committee on Homeland Security and Governmental Affairs, One Hundred Ninth Cong. (2005a). (Statement of Thomas F. Gimble).

The Defense Travel System: Boon or boondoggle?: Hearing before the Permanent Subcommittee on Investigations of the Committee on Homeland Security and Governmental Affairs, One Hundred Ninth Cong. (2005b). (testimony of Thomas Schatz).

The Defense Travel System: Boon or boondoggle?: Hearing before the Permanent Subcommittee on Investigations of the Committee on Homeland Security and Governmental Affairs (2006). Retrieved from https://nps.primo.exlibrisgroup com/discovery/fulldisplay?docid=alma991001935339703791&context=L&vid=01NPS_INST:01NPS&lang=en&search_scope=MyInst_and_CI&adaptor=Local%20Search%20Engine&tab=Everything&query=any,contains,The%20Defense%20Travel%20System%E2%80%AF:%20boon%20or%20boondoggle%3F&offset=0

Freedberg Jr, S. (2018, April 13). Stop wasting infantry's time: Mattis Task Force. Retrieved from https://breakingdefense.com/2018/04/stop-wasting-infantrys-time-mattis-task-force/

George, M., Rowlands, D., & Kastle, B. (2004). *What is Lean Six Sigma?* New York: McGraw-Hill.

Goldratt, E., & Cox, J. (2004). *The goal: A process of ongoing improvement* (3rd rev. ed., 20th anniversary ed.). Great Barrington, MA: North River Press.

Lavery, J., & Spracklin, R. (2016). *Lean Six Sigma analysis of shipboard audit readiness on a U.S. Navy destroyer* (Master's thesis). Retrieved from https://calhoun.nps.edu/bitstream/handle/10945/51565/16Dec_Lavery_Spracklin.pdf?sequence=1&isAllowed=y.

Nave, D. (2002). How to compare Six Sigma, Lean and the Theory of Constraints. *Quality Progress, 35*(3), 73–78. Retrieved from http://libproxy.nps.edu/login?url=https://search-proquest-com.libproxy.nps.edu/docview/214744799?accountid=12702

Pande, P., Neuman, R., & Cavanagh, R. (2000). *The Six Sigma way: How GE, Motorola, and other top companies are honing their performance*. Retrieved from http://www.premiumcoaching.be/uploads/images/The%20six%20sigma%20way.pdf

Rempfer, K. (2018). Pentagon finally plans Defense Travel System reforms. Retrieved from https://www.militarytimes.com/news/your-military/2018/08/17/pentagon-finally-plans-defense-travel-system-reforms/

Scheinkopf, L. (1999). *Thinking for a change: Putting the TOC thinking process to use*. Retrieved from https://www-taylorfrancis-com.libproxy.nps.edu/books/9781420049046

Simplifying Defense travel reviewing progress on improving the Defense travel system for the user: Hearing before the Oversight and Investigations Subcommittee of the Committee on Armed Services, House of Representatives, 111th Cong. 2 (2010). Retrieved from https://www.gpo.gov/fdsys/pkg/CHRG-111hhrg57665/pdf/CHRG-111hhrg57665.pdf

Snee, R. D. (2010). Lean Six Sigma—Getting better all the time. *International Journal of Lean Six Sigma, 1*(1), 9–29. https://doi.org/10.1108/20401461011033130

Trojanowska, J., & Dostatni, E. (2017). Application of the Theory of Constraints for project management. *Management and Production Engineering Review, 8*(3), 87–95. doi: https://doi.org/10.1515/mper-2017-0031

Williams, M. (2006). *Response to a posthearing question related to GAO's November 16, 2006 testimony on the Defense travel system* (GAO-07-287R). Retrieved from https://www.gpo.gov/fdsys/pkg/GAOREPORTS-GAO-07-287R/pdf/GAOREPORTS-GAO-07-287R.pdf

Woody, C. (2017, July 26). Mattis and U.S. military leaders are trying to get rid of the worst parts of the military service. Retrieved from https://www.businessinsider.com/mattis-military-leaders-to-reduce-training-and-administrative-duties-2017-7

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