



**MIXED METHODS APPROACH TO  
IDENTIFY FACTORS AND THE EXTENT TO  
WHICH THEY INFLUENCE  
MEDICAL/SURGICAL PRIME VENDOR USE**

THESIS

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AFIT-ENS-14-M-03

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**Wright-Patterson Air Force Base, Ohio**

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Degree of Master of Science in Logistics Management

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Captain, USAF

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## **Abstract**

This thesis employed a mixed methods approach to address the root causes of less than optimal use of the Medical/Surgical Prime Vendor program. Using techniques from qualitative research, in-person and telephonic interviews were conducted with subject matter experts to better understand the phenomena. A grounded theory approach was applied and content analysis performed to identify recurring themes within the transcript data. The identified themes led to the selection of five constructs that appear to influence Medical/Surgical Prime Vendor program use. Through the theoretical lenses of the Strategy, Structure, and Performance model as well as the Technology Acceptance Model, a theoretical model was developed. To measure the influence of these constructs on program use, a survey instrument was developed using existing, validated scales for each construct. Surveys were sent to all U.S. Air Force medical facilities, which included 71 locations and 993 medical logisticians. The survey was administered online using the Web Survey Information Retrieval System. The response rate was 11%.

Analysis of the data was performed using stepwise linear regression. The results of the analysis support a direct positive relationship between inter-organizational communication and Medical/Surgical Prime Vendor use. The findings are discussed as well as limitations and opportunities for further research.

*To my wonderful husband, your sacrifices, understanding, and patience did not go unnoticed, and I am forever indebted to you. Thank you for being my life partner. I thank Christ for His example and pray that we might follow in His steps...*

*For this you and I were called...1 Peter 2:21*

*Being confident of this very thing, that He which hath begun a good work in us will perform it until the day of Jesus Christ...Philippians 1:6*

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## Table of Contents

	Page
<b>Abstract</b> .....	iv
<b>Acknowledgments</b> .....	vi
<b>List of Figures</b> .....	xi
<b>List of Tables</b> .....	xii
<b>List of Equations</b> .....	xiv
<b>I. Introduction</b> .....	1
Background .....	1
Problem Statement .....	6
Research Objectives/Questions.....	8
Research Focus .....	8
Methodology .....	9
Assumptions/Limitations .....	10
Implications.....	11
Thesis Organization .....	12
<b>II. Literature Review</b> .....	13
Overview .....	13
Prime Vendor .....	13
Defense Medical Logistics Support System .....	14
Grounded Theory .....	15
Top Management Support.....	17
Inter-organizational Communication .....	18
Employee Training.....	19
Strategy-Structure-Performance .....	21
Perceived Ease of Use.....	23
Perceived Usefulness .....	24
Technology Acceptance Model .....	24
Proposed Conceptual Model .....	25
Summary .....	26



	Page
<b>III. Methodology</b> .....	27
Overview .....	27
Mixed Methods Approach .....	27
Institutional Approval .....	29
Phase 1: Qualitative Study .....	30
Research Design.....	30
Population. ....	31
Data Collection and Analysis.....	32
Content Analysis.....	32
Reliability, Validity, and Generalizability.....	33
Summary of Findings.....	33
Hypothesis Development .....	37
Top Management Support.....	37
Inter-organizational Communication.....	38
Employee Training.....	39
Perceived Ease of Use.....	39
Perceived Usefulness.....	40
Dependent Variable .....	41
Proposed Theoretical Model with Hypotheses .....	42
Phase 2: Quantitative Research.....	43
Research Design.....	43
Population. ....	44
Instrument Development.....	44
Pre-test. ....	51
Pilot-test.....	51
Data Collection. ....	52
Data Analysis.....	54
Assumptions and Limitations for Entire Analysis .....	54
Validity Threats .....	55
Common Method Bias.....	55
Non-Response Bias.....	56
Missing Data.....	57

	Page
Summary .....	58
<b>IV. Results and Analysis</b> .....	<b>59</b>
Overview .....	59
Census Demographics .....	59
Item-Level Descriptive Properties .....	61
Construct-Level Descriptive Properties .....	62
Multiple Linear Regression Analysis .....	69
Test of Assumptions .....	70
Normality. ....	70
Independence. ....	75
Homoscedasticity. ....	75
Outliers. ....	76
Linearity. ....	76
Results of Multiple Regression Analysis .....	78
Results of Hypothesis Tests .....	80
Results of Comment Content Analysis .....	81
Summary .....	82
<b>V. Conclusions and Recommendations</b> .....	<b>83</b>
Overview .....	83
Implications of Significant Factors .....	83
Implications of Non-Significant Factors .....	84
Strategy-Structure-Performance Factors .....	84
Technology Acceptance Model Factors .....	85
Implications for Practice .....	86
Limitations .....	87
Recommendations for Future Research .....	88
Conclusion of Research .....	89
Appendix A. Institutional Review Board Approval .....	91
Appendix B. Survey Cover Letter .....	92

	Page
Appendix C. Survey Instrument .....	93
References.....	101
Vita.....	108

## List of Figures

	Page
Figure 1. Med/Surg PV Service Regions (DMMonline, 2013) .....	3
Figure 2. Acquisitions Time/Motion Results by Procurement Method (CACI, 2009).....	6
Figure 3. Conceptual Model .....	26
Figure 4. Sequential Exploratory Design (Creswell, 2009) .....	28
Figure 5. Theoretical Model .....	42
Figure 6. Histograms of Each Variable.....	72
Figure 7: Histogram of Studentized Residuals .....	73
Figure 8. Histogram of Residuals (Post Transformation).....	74
Figure 9. Plot of Residuals against Predicted (Post Transformation) .....	75
Figure 10. Plots of Studentized Residuals against Independent Variables .....	77

## List of Tables

	Page
Table 1. Demographics Solicited.....	45
Table 2. Measures of Leadership Support .....	46
Table 3. Measures of Inter-organizational Communication .....	47
Table 4. Measures of Employee Training.....	48
Table 5. Measures of Perceived Ease of Use .....	49
Table 6. Measures of Perceived Usefulness .....	50
Table 7. Construct Descriptive Properties .....	52
Table 8. Unrotated: Variance Explained.....	56
Table 9. Independent Samples Test .....	57
Table 10. Participant Demographics.....	60
Table 11. MTF Demographics .....	61
Table 12: Item Level Statistics .....	61
Table 13. Construct Descriptive Properties .....	63
Table 14. Correlation Matrix of Independent Variables .....	64
Table 15. KMO and Bartlett's Test.....	65
Table 16. Skewness and Kurtosis Analysis .....	65
Table 17. Rotated Factor Loadings.....	67
Table 18. Rotated Factor Loadings .....	69
Table 19. Skewness and Kurtosis Analysis .....	72
Table 20. K-S Test for Normality .....	73

	Page
Table 21. K-S Test for Normality (Post Transformation).....	75
Table 22: Parameter Estimates (Full Model) .....	79
Table 23. Parameter Estimates (Reduced Model).....	80
Table 24. Summary of Hypotheses Results .....	81

## List of Equations

	Page
Equation 1. $\text{PVM Rate of Use} = \text{Total PVM Orders} / \text{Total Orders}$ .....	7
Equation 2. $\text{PVM Rate of Use} = \text{Total PVM Orders} / \text{Total Orders}$ .....	42
Equation 3. $\text{Transformed PVM Rate of Use} = \text{Log(PVM Use)} * 37.51$ .....	74

# MIXED METHODS APPROACH TO IDENTIFY FACTORS AND THE EXTENT TO WHICH THEY INFLUENCE MEDICAL/SURGICAL PRIME VENDOR USE

## I. Introduction

### Background

Our Airmen's ability to rethink the battle while incorporating new technologies will improve the varied ways our Air Force accomplishes its missions. Faced with fiscal challenges, we must make prudent choices to ensure that the Air Force is able to unleash the full potential of airpower.

Gen Mark Welsh,  
Chief of Staff of the Air Force (2013)

The United States (U.S.) and thereby the Department of Defense (DoD) are currently operating in an age of economic instability. The last U.S. approved budget bill was April of 2009. In the current political environment there is likely to be continued divisiveness regarding fiscal matters. On the other hand, there is little doubt that the DoD will witness shrinking budgets for the foreseeable future. In fact, the DoD expects \$500 billion in cuts in defense spending over the next decade (Air Force Personnel Center, 2013). The implementation of sequestration in addition to the Fiscal Year 2014 Force Reduction Management Programs will continue to reduce manpower across the Air Force (AF). These programs request active duty reductions of 1,860 personnel from Fiscal Year 2013 authorizations; thus, it is the responsibility of our AF to ensure we are efficiently using our manpower resources (Air Force Personnel Center, 2013). The effects of budget reductions as well as manpower cuts call for the Air Force Medical



Operations Agency (AFMOA) to develop new, cost effective strategies while fully utilizing strategies that have already proven to reduce costs. One proven strategy that reduces costs and workload is the Prime Vendor (PV) contract (Cardella, 1999).

The PV contract was initiated in March of 1992 to establish a single distributor of pharmaceutical, medical, and surgical supplies to a group of Medical Treatment Facilities (MTF) throughout the United States, Europe, and the Pacific Rim (Figure 1). The fourth generation (Gen IV) of the PV contract was released in December of 2011 and includes three regions, which are serviced by one of two distributors, Cardinal Health or Owens and Minor (Bollendorf, 2011). The current contract includes the Prime Vendor Pharmaceutical (PVP) program and the Prime Vendor Medical/Surgical (PVM) program, which offer the DoD contracted prices and a streamlined procurement process. The Defense Logistics Agency (DLA) (2011) states, “the PVM program is responsible for the logistical management of medical/surgical instruments, products, and disposable items including labware, dental, and optical items. Distribution and Pricing Agreements (DAPA) are established with PVM manufacturers and distributors to allow the PV to distribute their products to the MTF (DLA, 2011). If an item is available through the PV, medical logisticians can compare products and prices and then order the most suitable item at the best price (Cardella, 1999). Additionally, the streamlined procurement process requires fewer manpower hours. A Metrics and Workload Study conducted by the AFMOA has shown that PV requisitions require fewer manpower hours than other procurement methods (CACI, 2009). For instance, the average procurement time for the Government Purchase Card (GPC) is approximately 3 minutes; on the other hand, the average procurement time for PVM is 27 seconds (CACI, 2009).

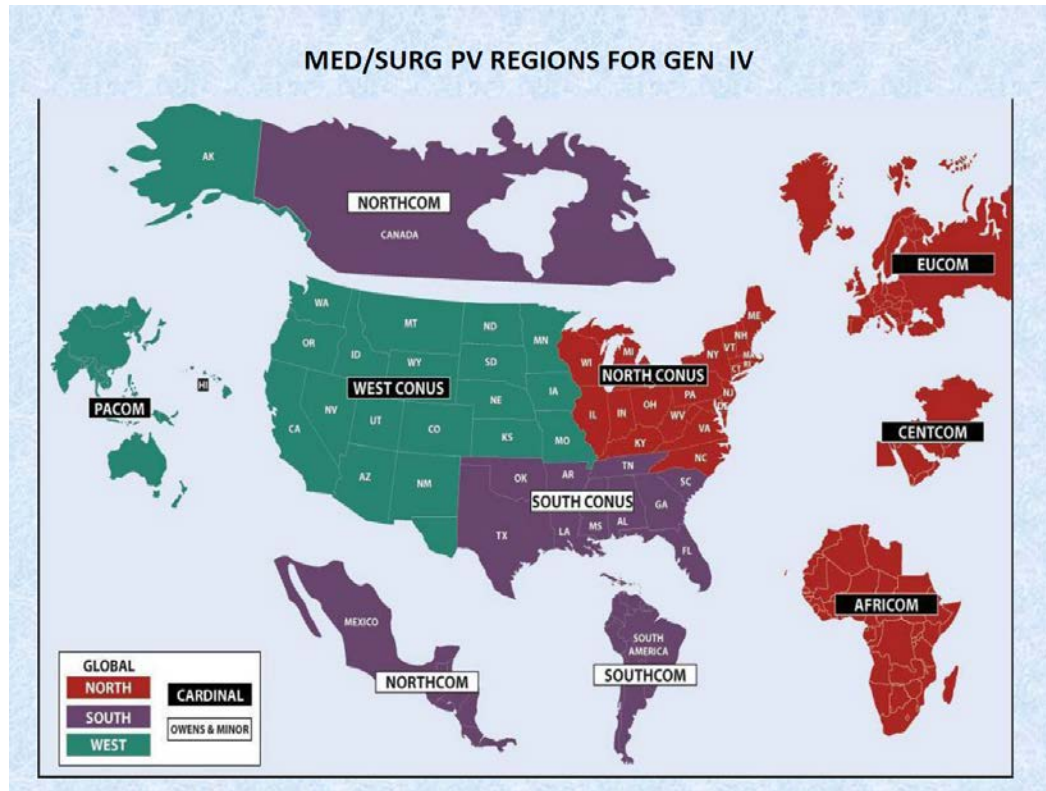


Figure 1. Med/Surg PV Service Regions (DMMonline, 2013)

Prior to the PV contracts, a typical MTF would experience average procurement and delivery lead times of 30 to 60 days (Benton, 2011). In addition, numerous sources of supply were utilized which resulted in excessive procurement costs, duplicated ordering efforts, and ineffective use of medical logisticians (Cardella, 1999). Over 20 years of evidence has shown that, as promised, the PV initiative streamlines medical logistics operations by reducing procurement times, cutting MTF inventories, increasing product fill rates, and redirecting materiel management efforts to direct healthcare support (Benton, 2011).

A proactive approach is necessary in order to capture the maximum benefits of the PVM program. The PVM program is not intuitive. It requires utilization of usage

lists, product data, and proper nomenclature. Each MTF must provide data to the PV for the items it expects to order and the quantities in the form of a usage list. Items submitted to the PV as part of the usage list and carried by the PV are considered usage items. This list is used by the PV supplier to gauge demand for PVM items for the MTF. Each account is responsible for submitting accurate initial usage lists in addition to item updates to the PV. Once usage data have been submitted, the PV has 30 days to make the item available for purchase through the PVM program, if PV is able to carry the item. If the PV is unable to carry an item, it is the responsibility of the medical logistics personnel and the PV representative to submit a request to the Defense Logistics Agency (DLA) for the item to be added to the PVM contract. In addition, an item must be ordered by an account a minimum of once per month for the PV to continue to carry the item (Air Force Instruction 41-209, 2013). PVM programs require a 90 percent PV fill rate of usage items. In this context, usage rates are defined by fill rate calculations based solely on items previously submitted to the PV as usage items. The PVM program fill rate is not the rate at which the customers receive goods, but the rate at which PV meets the terms of the contract (Air Force Instruction 41-209, 2013).

The process of placing orders for new items can be tedious. Procurement of new items through this program takes additional time and resources since all new item requests must be researched, utilizing the Defense Medical Logistics Standard Support (DMLSS) system. The research entails a search within the DMLSS system master catalogue based on National Stock Number (NSN) or proper nomenclature of the required item. The master catalogue is a compilation of previously ordered items. If an item is not found within the master catalogue, then a new record within the catalogue

must be established before an item can be processed through the system. Each account has a designated representative from PV who serves as a liaison between medical logistics personnel and the PV. Medical logistics personnel from each account must communicate frequently with the designated PV representative in order to add items to or remove items from its usage list. The PV representative assists with identifying appropriate substitutes when the PV does not or is unable to carry required items. Unfortunately, there are cases when the PV is unable to carry required items regardless of the efforts of medical logistics personnel and the PV representative.

If an item is not in the DAPA, then the PV is unable to carry the item. A DAPA is a contract between medical/surgical manufacturers and distributors that is established as part of the PVM program (Defense Logistics Agency, 2011). Under these agreements, the PV is able to distribute manufacturers' products to MTFs at the contracted price. In FY11, there were approximately 118,000 medical/surgical products in the DAPAs (Defense Logistics Agency, 2011). If an item is not in the DAPA, then a request to add the item to the current contract must be submitted through DLA Troop Support. The DLA Troop Support agency is the final approval authority of items to the DAPA. In the event the PV is unable to carry a PVM item, other methods of procurement are authorized.

In 2009, a Metrics and Workload Study conducted by the AFMOA rated purchases processed through the PVM program as the most efficient in terms of acquisition time compared to other methods of procuring medical/surgical items such as electronic catalogue (ECAT), GPC, and blanket purchase agreement (BPA) (CACI, 2009). The results of the study (Figure 2) display the average acquisition times based on

the procurement method utilized. The study concluded an overall shorter administrative burden involved with PVM use, if the item was available through the PV.

Despite this evidence, PVM rates of use are lower than expected. Research has shown that the one-on-one interaction with the supplier, increased numbers of purchases, receipts, and transactions [due to the tendency to purchase one or two items at a time] and manual entry of purchases into the online bank website multiplied the procurement time for the GPC by more than two orders of magnitude (CACI, 2009). For this reason, the GPC must only be used as a last resort to procure medical/surgical requirements.

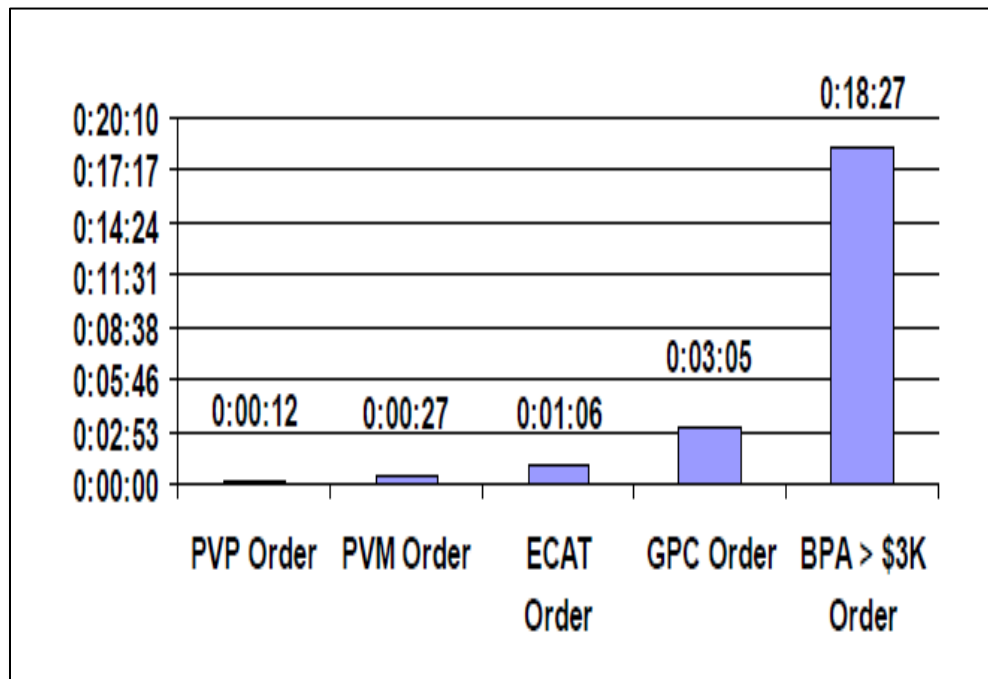


Figure 2. Acquisitions Time/Motion Results by Procurement Method (CACI, 2009)

### Problem Statement

Air Force medical logisticians operate in an ever-changing and fiscally burdened environment that necessitates the maximum use of programs that streamline the medical

supply procurement process. Recent budget cuts and force restructuring have required the Air Force Medical Service (AFMS) to do more with less. Because of this evolving nature, the maximization of the PVM program is essential to the success of the Air Force Medical Supply Chain and the DoD. The factors that influence use of the PVM program must be identified in order to devise a deliberate plan to successfully capture the full benefits of this program.

Despite the clear evidence that the PVM program requires fewer manpower hours than traditional procurement methods and is a successful cost reduction strategy, the AFMOA reports that actual use of the PVM program is less than expected. Despite not having a standard usage rate, AFMOA expects that all medical facilities obtain 100% of required medical/surgical items through the PVM program, provided they are available through the PV. Data extracted from the DMLSS system covered all supply durable medical and supply expendable medical items purchased by every MTF within the continental U.S. The data covers the period of January through December 2013. The PVM rate of use was 38.8% (Joint Medical Asset Repository, 2013). The PVM Usage Rate is formulated by:

$$PVM \text{ Rate of Use} = Total \text{ PVM Orders} / Total \text{ Med/Surg Orders} \quad (1)$$

These figures only include medical/surgical items and do not include pharmaceuticals, equipment, or non-medical supplies. While these percentages indicate low use of the PVM program, there is bias within the reported figures because they do not take into account items purchased via means other than the PV because these items were not in the DAPAs. The Strategic Sourcing Report, a Business Objects report, also suggests that the PVM program is not being used to its maximum potential. This report is run within the

DMLSS system and identifies all items procured via methods other than the PVM program that can be and should be purchased through the PV. When considering factors such as manpower cuts and heavy fiscal constraints, AFMOA recognizes the potential of the PVM program to meet the challenges of the ever-changing logistics landscape and recognizes that a push to increase PVM utilization is necessary for the program to reach its full potential. To do this, the AFMOA leadership must determine the factors that influence and the extent to which they influence PVM use.

### **Research Objectives/Questions**

Given the problem, the purpose of this study is to identify the factors and the extent to which they influence the use of the PVM program. The overall objective is to serve as a means to increase the awareness of the value added to the Air Force Medical Supply Chain from the PVM program and to enlighten users on its efficiency and effectiveness. To address the objective of this thesis, two investigative questions are posed:

1. Determine the most likely factors to influence PVM use?
2. What effect does each factor have on PVM use?

### **Research Focus**

This effort will focus on the factors that influence the use of the PVM program and ascertain which may be most critical in regard to increasing the use of the PVM program. This study does not include analysis of PVP use for pharmaceutical requirements. In addition, this project neither includes analysis of the success of the PVM program nor does it attempt to examine other methods of procurement. The

sponsor for this research is the AFMOA, which is responsible for establishing, preparing, training, and guaranteeing the effectiveness of AF medical logisticians.

## **Methodology**

A mixed methods approach was used to address the problem statement and answer the investigative questions. A mixed methods research design uses both qualitative and quantitative methods in a single study to better understand a research problem by capitalizing on the strengths of each research paradigm (Creswell, 2009). Phase 1 of the research used interviews with eight SMEs to better understand the factors that affect the use of the PVM program. SME experience included personnel from each job role within a medical logistics flight (officer, enlisted, and civilian), personnel from each MTF type (clinic, hospital, and medical center), and personnel with different military tenures within medical logistics. The interviews were transcribed and a grounded theory approach was used to analyze content and identify recurring themes within the data.

In Phase 2, the SME's inputs were used to develop a hypothetical model based on the factors identified in Phase 1 and to construct a web-based survey. The web-based survey was administered at every Air Force medical facility within the continental U.S. to determine the extent to which the aforementioned factors influence PVM use. A link to the survey accompanied with a message from the AFMOA encouraging participation was sent to 71 medical facilities within the continental U.S. The survey recipients were medical logisticians comprised of 65 Medical Service Corps (MSC) officers, 711 enlisted personnel, and 217 civilians. Using techniques from the quantitative research paradigm,



the survey was validated and the data gathered were statistically analyzed using stepwise linear regression to reveal the extent to which each factor influences PVM use.

### **Assumptions/Limitations**

The following assumptions and limitations were identified. It is assumed the interview respondents possess enough relevant experience to provide useful responses and opinions to the questions posed. All respondents were either MSC officers or enlisted medical logisticians who possessed experience with the PVM program. The second assumption is that interview respondents accurately and completely expressed their viewpoints. The third assumption is that interviewees as well as survey participants provided adequate coverage of the population of AF medical logisticians. Steps were taken to ensure adequate representation from each job role within a medical logistics flight (officer, enlisted, and civilian). Representation of each MTF type (clinic, hospital, and medical center) was met by purposively selecting individuals from each category. The participants consisted of SMEs with different experience levels, military tenures, and ranks. For the abovementioned efforts, it is assumed that adequate coverage of the opinions of all medical logisticians was captured.

In addition, the assumption is made that all data provided by the AFMOA and the DMLSS system are accurate. All data extracted from the DMLSS system accurately reflected only PVM items for MTFs within the continental U.S. Data were verified by the DMLSS Administrator at Wright-Patterson, AFB in Ohio.

There are limitations to this research. Procurement of equipment, War Reserve Materiel (WRM), Third Party Commercial Returns Program and Home Station Medical

Response (HSMR) to Chemical, Biological, Radiological, Nuclear and/or High-Yield Explosives (CBRNE) are outside the scope of this research. Only PVM items were considered for research; therefore, PVP items were not studied. Finally, this study will not attempt to predict current or future success of the PVM program. The focus of this study is on the factors and the degree to which they influence the use of the PVM program. The results of this study may not be directly applicable to other United States Air Force programs or civilian sector programs; however, an understanding may be gathered that can be useful in predicting the influence of factors on the use of other implemented programs.

### **Implications**

The research findings will be provided to the AFMOA who will provide recommendations based on these findings to the Air Force Surgeon General. Utilizing this evidence, the AFMOA can make more effective, fiscally responsible choices regarding the PVM program and help ensure AF medical logisticians possess the proper skills, guidance, and resources necessary to maximize use of the PVM contract.

In addition to the implications for the medical logistics community within the military, this study is pertinent to researchers interested in affecting human behavior within logistics and supply chain management in the civilian sector. The use of a preferred supplier is not isolated to the military and any understanding gained from the identification of factors that influence its use could be useful to civilian counterparts.

## **Thesis Organization**

This thesis is divided into five chapters. Chapter 2 provides a review of the literature relevant to the research questions posited in Chapter 1. The literature review details the material regarding grounded theory, the Strategy-Structure-Performance (SSP) model, as well as the Technology Acceptance Model (TAM). Five constructs: top management support, inter-organizational communication, employee training, end user perceived ease of use, and end user perceived usefulness are presented. Chapter 2 concludes with the presentation of the conceptual model. Chapter 3 describes the research design, population, and the mixed methods approach used. Using a grounded theory approach, the qualitative data gathered during the first phase of the research is analyzed for recurring themes. Five themes are identified as recurring and a review of the literature leads to the selection of five constructs that appear to have the greatest influence on PVM use. In the second phase, a survey instrument is developed and used to gather the data needed to test the hypothetical model. Chapter 4 presents the results and analysis of the data. Chapter 5 discusses findings, implications for researchers and practitioners, and limitations of the research.

## **II. Literature Review**

### **Overview**

This chapter provides a review of relevant literature. The PVM program is discussed in further detail to include its benefits in addition to the AF and DoD rationale for maximizing its use. An overview of the DMLSS system is provided to include discussion of its uses and end users. Grounded theory is briefly discussed in order to introduce the five constructs that were identified in Phase 1 of the study. A discussion of the first three constructs (top management support, inter-organizational communication, and employee training) is followed by the explication of the theoretical lens, strategy-structure-performance (SSP), through which they are viewed. Similarly, the discussion of the remaining two constructs (perceived ease of use and perceived usefulness) is followed by an explanation of the theoretical lens, the technology acceptance model (TAM), through which they are viewed. The five constructs were used to establish the conceptual model for Phase 2 of the study.

### **Prime Vendor**

According to the Defense Logistics Agency (DLA) (2011), the PVM program provides participating facilities with a “prime” supplier of medical and surgical products with the goal of a shorter logistics pipeline that is more efficient and reliable. Per Air Force Instruction 41-209 (2013), PV is the mandatory source for medical/surgical items and must be utilized before any other source is considered. The Gen IV contract of PVM splits the responsibility for all DoD medical and surgical supply needs between two distributors, Cardinal Health and Owens and Minor. The contract provides for

enhancements to the mission including next day delivery for usage items, electronic ordering and automated bill payment, guaranteed fill rates between 90 to 100%, one-stop shopping, lower inventory requirements, and a true partnership with the distributor (DMMonline, 2013). Evidence suggests that anything less than optimal use of the PV program does not leverage the added efficiencies and effectiveness of the program. In 1996, the Inspector General (IG) reviewed the effectiveness of the PV program and verified its overall benefits. The audit results conveyed that participating Army, Navy, and Air Force MTFs had successfully implemented a PV program that mirrors the commercial practices for the purchase of medical supplies (Inspector General, 1996). Additionally, in 2010 the IG found the terms and conditions for the PVM contract for coalition forces in Iraq and Afghanistan to be adequately developed to meet users' needs (Inspector General, 2010).

### **Defense Medical Logistics Support System**

A sound, effective information systems plan is important because it shapes and changes the way a company does business (Ang, Shaw, and Pavri, 1995). The DMLSS system is an essential tool for the placement of orders through the PVM program and is the single information system utilized by medical logisticians to process orders through the PVM program. Personnel must process all PV requirements, to include PVM, through the DMLSS system log order method (Air Force Instruction 41-209, 2013). The DMLSS system automates materiel management functions and capabilities such as acquisition, shipment, receipt, storage, distribution, and disposal of medical supplies. The DMLSS system is a "client/server system that supports logistics activities within

Military Health System (MHS) MTFs” (JITC, 2012). It is the primary support system for all military logistics functions associated with MTFs worldwide (JITC, 2012). For the purpose of this study, the procurement capabilities of the DMLSS system for the PVM program will be studied because the system is a facilitator of PVM use. Since the DMLSS system must be used by AF medical logisticians to process all routine PVM requirements, the system has the opportunity to advance organizational efficiencies and effectiveness. Data from the DMLSS system support PVM rate of use calculations used in this report.

### **Grounded Theory**

Before the discussion of the constructs, a brief explanation of the approach used to identify the constructs is provided. In a traditional model, a researcher chooses a theoretical lens and applies this model to the study (Allan, 2003; Creswell, 2008). Grounded theory, which is the discovery of theory from data methodically gathered from social examination (Glaser and Strauss, 1967), works in a reverse fashion from traditional research in that it does not begin with a particular theoretical framework in mind. For this reason, the theoretical lens applied to the study materializes from the data gathered. Given that grounded theory begins with data collection, the research is “grounded” in the data collected (Glaser and Strauss, 1967). This technique is useful when there is insufficient evidence and research about a particular occurrence (Allan, 2003; Creswell 2008). Grounded theory was applied to this study since there is insufficient justification for selecting constructs that may encourage or discourage PVM use.

This methodology is applicable when the focus of the study is to discover theory (Glaser and Strauss, 1967). Grounded theory is rooted in sociology, but it has been used to study many fields. Examples of its use include: the eating habits of children (Kime, 2008), the stress levels of workers who work in public service agencies (Skagert, Dellve, Eklof, Pousette, and Ahlborg, 2008), and the thoughts and feelings of students while engaged in classroom discussion (Do and Schaller, 2004). Data collection can be conducted by a myriad of methods (e.g. interviews, observations, documents, historical records, and videotapes) (Leedy and Ormod, 2010). Researchers must ensure data correctly reflect the attitudes and perspectives of the individuals being studied (Charmaz, 2002; Charmaz, 2006; Corbin and Strauss, 2008).

Grounded theory is used to discover concerns with the PVM program because it is able to go beyond assumption and notion to the primary source, SMEs. These results were used to develop the model for this study and the model was used to provide actionable information to the AFMOA (Desphande, 1983). Equipped with the results, the AFMOA is better informed and able to mediate concerns with assurance to facilitate resolutions of SME's main concerns (Glaser, 1978). The qualitative analysis that is discussed at length in Chapter 3 led to the selection of five constructs to investigate further. These constructs and the theoretical lenses through which they are tested are discussed next. The first three constructs (top management support, inter-organizational commitment, and employee training) are structural elements and are viewed through the theoretical lens of the SSP model. The remaining two constructs (perceived ease of use and perceived usefulness) are technological considerations and are viewed through the theoretical lens of the TAM.

## **Top Management Support**

TMS, with respect to an information system (IS), refers to the degree to which top management understands the importance of the IS function and the extent to which it is involved in IS activities (Ragu-Nathan et al., 2004). This study borrows from the IS studies of TMS and aligns TMS with the degree to which top management understands the importance of the PVM program and the extent to which it is involved in the PVM program. This is possible because TMS for IS refers to both system and process, and at its core, the PVM program is both a system (DMLSS) and a process implanted in the Air Force Instruction. In general, top management is comprised of the senior leadership of an organization (Armstrong and Sambamurthy, 1999). In this study, top management refers to the immediate supervisor of the respondent.

The need for TMS is essential and many studies have suggested it to be a critical factor of success for IS program implementation (Teo and Ang, 2001; Ifinedo, 2008; Dong et al., 2009). For example, Teo and Ang (2001) studied the major issues associated with launching a new IS program. These researchers collected data from senior IS executives via surveys and found that a majority of institutes that experienced major issues with IS usage attributed these issues to a lack of TMS. Young and Jordan (2008) claim that TMS is the most critical factor to IS implementation success. Additionally, Swink (2000) researched the value of TMS on new product developments and found that TMS is positively associated with better time-based performance, design quality, and financial performance on the whole of new product developments. The research of Dong et al. (2009) studied the importance of top management's role in the IS implementation process and investigated the supportive actions of top management as well as how these



actions affected IS implementation outcomes. The results suggest that top managers must adjust their level of support based on their desired outcomes (Dong et al., 2009). This study proposes that TMS is an element that can generate structure that facilitates positive PVM use.

### **Inter-organizational Communication**

Inter-organizational communication is defined as the collaboration between organizations to include the sharing of critical information and knowledge (Paulraj et al., 2008). In the context of this study, inter-organizational communication refers to the communication between the buyer (medical logisticians at the MTF) and the supplier (the designated PV representative). In order to develop an effective relationship between buyer and supplier, communication must be frequent, genuine, and include personal contact between buyer and supplier personnel (Carr and Pearson, 1999). Open and frequent communication assists the development of this relationship, which may create mutual benefits for parties involved (Kale, Singh, and Perlmutter, 2000). This level of communication allows both parties to exchange valuable information in an attempt to find solutions to product issues in a timely manner (Carr and Pearson, 1999).

In an attempt to promote communication between medical logisticians and the PV representative, each MTF is required to complete a Service Level Election Form (SLEF) annually that designates the type of support desired from the PV representative (Air Force Instruction 41-209, 2013). The SLEF allows MTFs to choose the type of communication it prefers to have with the PV representative to include: monthly or quarterly customer service visits, monthly or quarterly telephonic customer service

meetings, or a full-time on-site customer service representative (medical hospitals only) (DMMonline, 2013).

Lascelles and Dale (1989) found poor communication to be a fundamental weakness for the buyer-supplier relationship that lessens the performance of the supplier which leads to overall decreased levels of organizational performance for both parties. For this reason, inter-organizational communication is a necessity in order to build a successful relationship between buyer and supplier (Lascelles and Dale, 1989). This study proposes that buyer-supplier communication is a structural element that facilitates increased PVM use.

### **Employee Training**

Research has shown that employees add value when they are able to contribute to the organization (Huselid, 1995). Employee training is defined as a program dedicated to teaching a particular skill that targets performance improvement and increases to company effectiveness (Zacharatos, Barling, and Iverson, 2005). Extensive employee training programs have the potential to enhance employee ability and their contribution to the organization (Zacharatos et al., 2005). In the context of this study, employee training refers to training on the DMLSS system in regard to the PVM procurement process. Skills and knowledge increase employee productivity which in turn advances organizational performance (Huselid, 1995). Colligan and Cohen (2003) studied the effects of extensive occupational safety training on the number of work-related injuries. Their research suggests that employees who receive safety training suffer fewer work-related injuries than employees who were untrained (Colligan and Cohen, 2003).

According to Wexley and Latham (1981), on-the-job training (OJT) is a more prevalent method of training, because it allows immediate use of personnel as it imparts training in the real work environment. These researchers suggest a formal OJT program is advantageous because it increases employee productivity (Wexley and Latham, 1981). Bartel (1989) used corporate survey data to research determinants of the difference in formal training across businesses and the significance of training programs on labor productivity. The results suggest that a formal training program has a positive effect on employee productivity (Bartel, 1989). Furthermore, Bartel (1994) investigated the characteristics of manufacturing companies in order to measure the impact of formal training programs on labor productivity. The research found that organizations that experienced lower than expected productivity levels but implemented an employee training program experienced a significant increase in expected labor productivity (Bartel, 1994). Snell and Dean (1992) suggest the advantages of OJT may be most useful when basic skills are necessary. On the other hand, studies have shown that some employees require a more broad and advanced skill set. Specifically, Dean and Snell (1991) found that integrated manufacturing positions required an advanced skill set.

The PVM program is not intuitive. It requires utilization of usage lists, product data, and proper nomenclature; thus, medical logisticians require the proper skill set in order to effectively use the DMLSS system to procure items through the PVM program. It has been stated that people are the greatest organizational resource and the key to achieving outstanding organizational performance (Peters and Waterman, 1982). This study proposes that employee training is an element that can generate structure that

increases the skills and abilities of current employees, which facilitates increases to PVM use.

### **Strategy-Structure-Performance**

The SSP theory describes how the establishment of organizational structures that support organizational strategies can enhance organizational advantages (Chandler, 1962). Significant research has been conducted to confirm the relationship between organizational strategy and structure and increased organizational performance (Rumelt, 1974; Galbraith and Nathanson, 1978; Chow, Heaver, and Henriksson, 1995). The SSP model will be the theoretical lens used to determine whether AFMOA is better able to achieve its strategy of optimal PVM use by focusing on the structural elements top management support (TMS), inter-organizational communication, and employee training. Successful development of this link will serve as the springboard to increase organizational performance by way of optimal PVM use.

Chandler's (1962) and Williamson's (1970, 1975) research propose that an organization establishes strategy based on knowledge of opportunities and requirements that generate organizational challenges. The overarching strategy of the AFMOA is to ensure the greatest availability of mission essential medical/non-medical materiel while concurrently achieving the highest possible level of efficiency and effectiveness in the procurement process (Defense Health Agency, 2013). As mentioned before, the Metrics and Workload Study conducted in 2009 by the AFMOA suggested that the PVM program requires fewer manpower hours than other procurement methods (CACI, 2009). Despite the fact that the PV is the mandatory source for medical/surgical items and must be

utilized before any other source is considered (Air Force Instruction 41-209, 2013), there is significant room for improvement in regard to PVM rates of use. For this reason, one of the primary strategies of the AFMOA is to attain maximum use of the PVM program.

It is because of desired organizational objectives and identified challenges that organizational structures are created and enabled in an attempt to improve organizational performance (Chandler, 1962; Williamson, 1970, 1975; Bowersox, Closs, and Stank, 1999). Leveraging the use of the PVM program is beneficial to the AF as it increases the efficiency and effectiveness of medical logisticians (Benton, 2011). Overall, the PVM program promotes advancements in organizational performance by way of cost savings on medical supplies as well as reductions in the manpower hours required to procure these supplies (Cardella, 1999).

SSP has demonstrated in previous studies that it is helpful in illustrating how organizational experiences can be used to form structural elements in support of strategic objectives to enhance firm performance (Eisenhardt and Martin, 2000; Wiklund and Shepard, 2003). The PVM program has proven to enhance firm performance and the AFMOA desires to ensure that it has created the needed structural elements that promote its use (DMMonline, 2013). For this study, TMS, inter-organizational communication, and employee training on the DMLSS system for PVM requisitions will be applied to describe how the use of structural elements can increase PVM use. Leaders must understand the extent to which these factors influence PVM use and affect Air Force Medical Supply Chain performance. Once leadership has obtained this knowledge, it will be better equipped to refine the current structure to further promote increases in organizational performance.

There is a lack of evidence that specifically measures the structural elements that promote increased PVM use in medical logistics; consequently, this study expands SSP research into this new domain and proposes that TMS, inter-organizational communication, and employee training have the ability to positively influence PVM use in AF MTFs. This project provides a unique opportunity to examine these variables in the AF medical logistics setting, hence adding to SSP literature as well as medical logistics literature.

### **Perceived Ease of Use**

Davis (1989) defined perceived ease of use as prevalent when a person believes that using a particular system is free of physical and mental effort. The DMLSS system is utilized to process all medical logistics requisitions. For this study, perceived ease of use refers to the attitude of the user towards the DMLSS system for PVM requisitions. In the TAM, Davis (1989) advocated perceived ease of use as one of two important external variables on a user's beliefs and intentions about a system. Legris, Ingham, and Colletette (2003) reviewed literature in perceived ease of use and found the four most commonly used factors are: (1) learning to operate the (application) is easy for me; (2) I find it easy to get the (application) to do what I want it to do; (3) the (application) is rigid and inflexible to interact with; (4) overall, I find the (application) easy to use. The reviews of Legris et al. (2003) of studies utilizing the TAM validated that a reasonable degree on internal consistency was found. This study proposes that perceived ease of use is an element that can have a significant positive effect on the acceptance and use of the DMLSS system for PVM requisitions; thus, facilitates increases to PVM use.

## **Perceived Usefulness**

In the TAM, Davis (1989) advocated perceived usefulness as the other important external variable on a user's beliefs and intentions about a system. Davis (1989) defined perceived usefulness as established when an individual believes that using a particular system enhances his or her job performance. The DMLSS system is utilized to process all medical logistics requisitions. For this study, perceived usefulness refers to the attitude of the user towards the DMLSS system for filling PVM requisitions, as a medical logistician's performance depends on his/her ability to accurately fill requisitions in a timely manner. Legris et al. (2003) completed a critical review of the TAM and found four items most commonly used to study perceived usefulness: (1) using (application) increases my productivity; (2) using (application) increases my job performance; (3) using (application) enhances my effectiveness on the job; (4) overall, I find the (application) useful in my job. This study proposes that end user perceived usefulness is an element that can have a significant positive effect on the acceptance and use of the DMLSS system for PVM requisitions; thus, facilitates increases to PVM use.

## **Technology Acceptance Model**

In addition to the use of SSP as a theoretical lens for this study, the TAM is utilized to determine the impact of external variables, perceived ease of use and perceived usefulness, on actual PVM use. Lack of acceptance by system users has continued to be an issue with the success of new systems (Nickerson, 1981; Gould, Boies, and Lewis, 1991; McCarroll, 1991; Legris et al., 2003). Holden and Karsh (2010) studied the acceptance and use of IT in health care with the TAM. Their study suggests that the TAM is able to predict a substantial amount of the use or acceptance of IT within health

care (Holden and Karsh, 2010). The goal of most new system implementation is to increase organizational efficiency and effectiveness. A study of electronic banking technology suggested that perceived usefulness and perceived ease of use, assessed by information on the website, were main factors that influenced online-banking acceptance (Pikkarainen, 2004). According to Davis (1989), a system's design directly influences perceived ease of use and perceived usefulness. The analyses performed by Davis imply that these are two distinct constructs within the TAM. Specifically, they advocate that perceived ease of use and perceived usefulness are the two most important external variables on a user's beliefs and intentions about a system (Davis, 1989). The TAM, developed by Richard Bagozzi and Fred Davis (1992), is an extension of Ajzen and Fishbein's (1975, 1980) Theory of Reasoned Action (TRA). In the TAM, many of the TRA's measures are replaced with ease of use and usefulness; however, both theories, TAM and TRA, focus on behavioral elements and suggest that an individual forms an intention to take an action (Bagozzi, Davis, and Warshaw, 1992). As much as 10% of IS research has utilized the TAM (Holden and Karsh, 2010). Reviews of the TAM in its basic version suggest that it accounts for 30 to 40% of IT acceptance (Holden and Karsh, 2010). The TAM can be used to determine the effects of perceived ease of use and perceived usefulness of the DMLSS system in regard to PVM requisitions on PVM use within the Air Force Medical Supply Chain.

### **Proposed Conceptual Model**

This study proposes the following conceptual model (Figure 3) based on the review of the relevant literature. TMS, inter-organizational communication, employee



training, perceived ease of use, and perceived usefulness are independent variables that are believed to have a direct positive relationship with PVM use, the dependent variable.

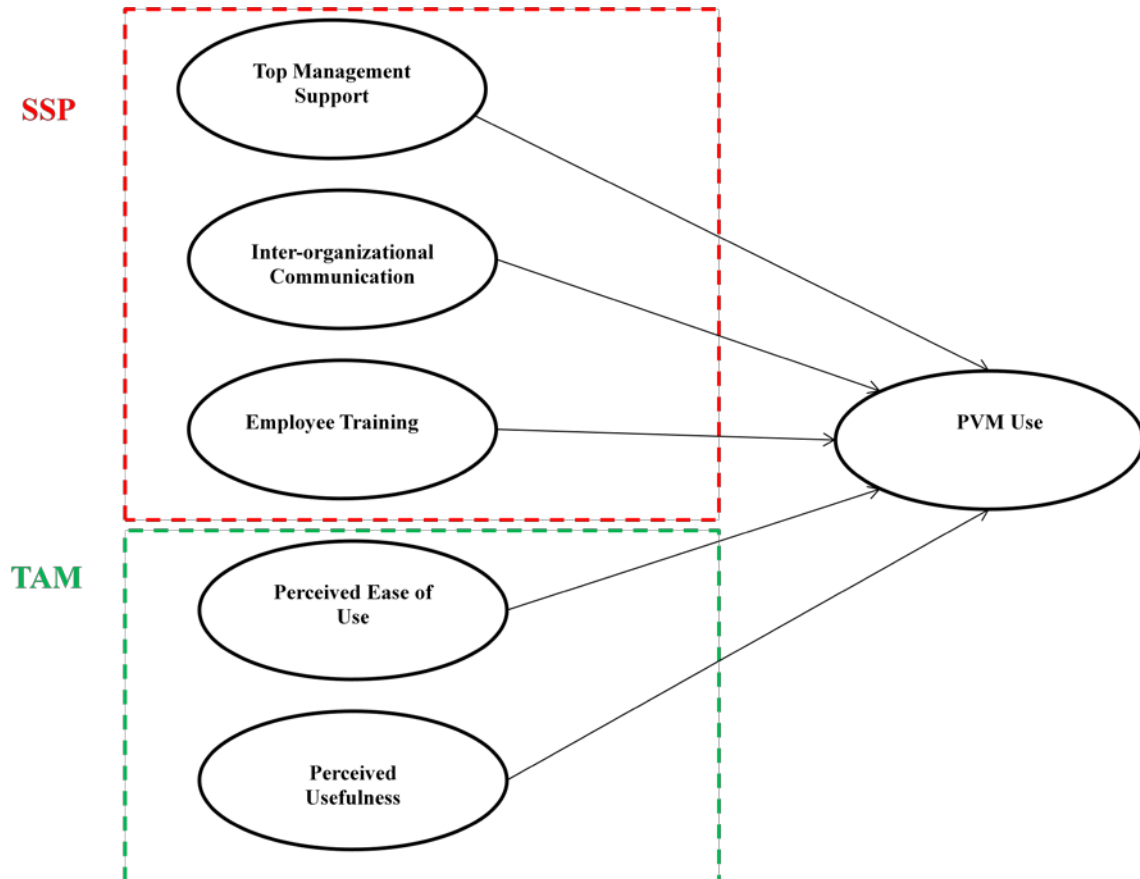


Figure 3. Conceptual Model

## Summary

Chapter 2 provided the review of the relevant literature and established the foundation for the presentation of the conceptual model. Five constructs were selected based on content analysis of transcribed interviews. Two theoretical lenses will be applied, five hypotheses will be developed, and the theoretical model will be presented in Chapter 3. The methodology for investigating these hypotheses will also be explained in Chapter 3.

### **III. Methodology**

#### **Overview**

This chapter outlines the mixed methods approach used in this study to include the steps taken to conduct both the qualitative (Phase 1) and quantitative (Phase 2) research. Both methods of data collection will be described in detail to include their design, population, and administration.

#### **Mixed Methods Approach**

In reference to the mixed methods approach, Johnson and Onwuegbuzie (2004) state, “the combination of qualitative and quantitative approaches provides a better understanding of research problems than either approach alone...[we can] combine the methods in a way that achieves complementary strengths and non-overlapping weaknesses” (p.18). This study uses a sequential exploratory strategy. According to Creswell (2009), sequential exploratory strategy “involves a first phase of qualitative data collection and analysis, followed by a second phase of quantitative data collection and analysis that builds on the results of the first qualitative phase” (p. 211). The design of this study is shown in Figure 4 and is adapted from Creswell (2009). The following notation is adapted from Morse (1991), Tashakkori and Teddlie (1998), and Creswell and Plano Clark (2007). An arrow indicates data collection is performed in a sequential form, with one form building upon the other form. The emphasis for this study is placed on the quantitative phase; thus, “QUAN” is capitalized. In this study, quantitative (QUAN) data builds upon qualitative (qual) data.

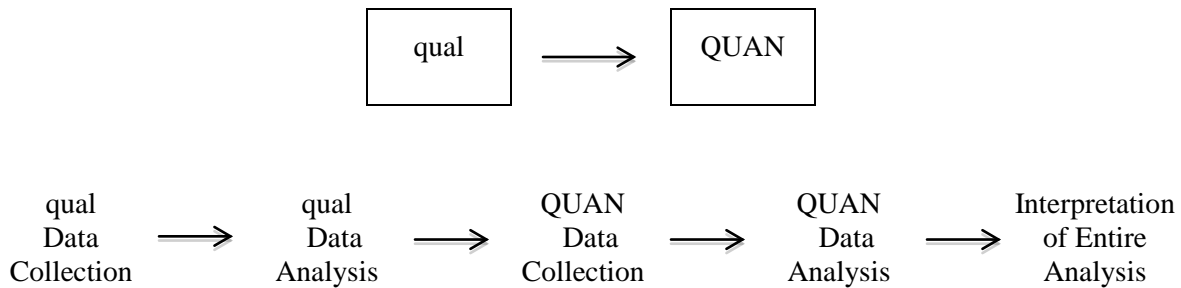


Figure 4. Sequential Exploratory Design (Creswell, 2009)

The sequential exploratory design is appropriate when testing an emergent theory resulting from the qualitative phase (Morgan, 1998). Creswell (2009) suggests this approach is advantageous when a researcher wants to explore a phenomenon in addition to build upon qualitative findings. He also states that this method is extremely valuable when it is used to develop an instrument. According to Creswell (2009),

In a sequential approach, obtain themes and specific statements from participants in an initial qualitative data collection. In the next phase, use these statements as specific items and themes for scales to create a survey instrument that is grounded in the views of the participants (p. 219).

Additionally, Desphande (1983) describes a two-phase approach where a researcher utilizes qualitative methodologies to gather data and examine it in order to generate theory (Phase 1) and utilizes quantitative methodologies to verify or test this theory through survey methods (Phase 2). Both qualitative and quantitative paradigms as well as their associated methods are appropriate because these paradigms have differentiating objectives (Desphande, 1983). For this reason, use of both paradigms is appropriate for research as long as they are not being applied to do the work of the other

(Desphande, 1983). According to Sieber (1973), qualitative fieldwork such as interviews and quantitative survey methods can be used to triangulate data. This method is beneficial because it provides a more comprehensive approach, is able to answer multiple research questions, encourages elaboration, and affords the opportunity to highlight opposing views (Bryman, 2006). The Chief of Staff of the Air Force noted the importance of capturing ideas from SMEs in his Air Force Vision Statement, “Every Airman should constantly look for smarter ways to do business. The person closest to the problem is often the one with the best solution. Leaders should empower Airmen to think creatively, find new solutions, and make decisions” (Welsh, 2013). This mixed methods study began with interviews of SMEs within the field of Air Force medical logistics that possessed experience with the PVM procurement process in order to develop a comprehensive list of factors that influence PVM use. This method posits challenges for the researcher because it requires extensive data collection, lengthy time requirements to analyze both qualitative and quantitative data, and familiarity with both, qualitative and quantitative, forms of research (Creswell, 2009). In addition, key decisions must be made by the researcher with respect to which findings from the qualitative phase to focus on in the subsequent quantitative phase (Creswell, 2009).

### **Institutional Approval**

The Institutional Review Board at the Air Force Institute of Technology granted approval for exemption request for human experimentation requirements under 32 CFR 219, DoDD 3216.2 and AFI 40-402 to conduct this study on 14 August 2013. A copy of the approval letter is located in Appendix A.

## **Phase 1: Qualitative Study**

To build a new theory, qualitative methods should be utilized (Desphande, 1983). For this reason, interviews, a technique from the qualitative research paradigm, were conducted with SMEs to better understand factors that influence PVM use. According to Sieber (1983), qualitative methodologies can make positive contributions to surveys to include the design, data compilation, and the examination of the data. Interviews aid in the development of the segments to be included in the survey, highlight areas of importance to respondents which yield valuable information in regards to data collection, and can be utilized to validate survey results (Sieber, 1983). Overall, the qualitative paradigm establishes the effective means of theory construction or generation (Desphande, 1983). For this reason, the research takes place in the field since the research results must be applied to base-level concerns. SMEs in PVM procurement within the field of medical logistics were interviewed in order to develop a comprehensive list of factors that influence PVM use. The interviews provided the opportunity to discover issues in greater detail because they allowed interviewees to expound on the factors believed to influence PVM use (Richey Jr, Roath, and Whipple, 2010). The criteria for this research fit well with the use of interviews, as the AFMOA was concerned with the factors that base-level medical logisticians believed to be influential to PVM use.

### ***Research Design.***

Data were collected through interviews. General guidelines for conducting interviews offered by qualitative research experts were followed (i.e., identify several questions in advance, consider how interviewees' experiences might influence their

answers, ensure participants represent the desired population, get permission, do not put words into respondents' mouths, and record responses verbatim) (Silverman, 1993; Creswell, 1998, 2009; Eisner, 1998; Shank, 2002).

A series of questions were identified in advance that allowed interviewees to discuss the PVM program without suggesting that they give a specific answer (Shank, 2002). Semi-structured personnel interviews were conducted with eight personnel at four different medical facilities. Four interviews were conducted in-person and four interviews were conducted telephonically. A detailed statement was read to all participants that explained the purpose of the study and stressed to participants their involvement was voluntary and their responses anonymous.

### ***Population.***

The population of interest is 65 MSC officers, 711 enlisted medical logisticians, and 217 civilian medical logisticians stationed at 71 Air Force MTFs throughout the continental U.S. A stratified sample was utilized to ensure the sample adequately represented the population of AF medical logisticians; as a result; the findings of this study can be applied to this population as a whole. Steps were taken to ensure adequate representation from each job role within a medical logistics flight (officer, enlisted, and civilian). Representation of each MTF type (clinic, hospital, and medical center) was met by purposively selecting individuals from each category. The interviewees consisted of SMEs of different experience levels, military tenures, and ranks. It is assumed these efforts provide adequate coverage of the opinions of all AF medical logisticians.

### ***Data Collection and Analysis.***

In qualitative analysis, data analysis is iterative as the researcher develops categories to classify data; for this reason, the process of data collection and data analysis are interdependent and occur simultaneously (Schram, 2003). Data examination drives the gathering of more data, because it suggests additional cases to include in the study (Schram, 2003). This method is referred to as constant comparison and involves continuous comparison of individuals, groups, places, events, and occurrences (Schram, 2003). The aforementioned technique was applied to this study as suggested in the relevant literature until the point of saturation was reached. Saturation occurs when the researcher has learned as much about each category as possible and there is no need for further collection (Schram, 2003). A total of eight interviews were conducted with an average duration of 43 minutes and a standard deviation of 18 minutes. All interviews were recorded and transcribed. The transcripts totaled approximately 120 pages. Participants' statements regarding PVM use were analyzed.

### ***Content Analysis.***

Hsieh and Shannon (2005) define qualitative content analysis as a “research method for the subjective interpretation of the context of text data through the systematic classification process of coding and identifying themes or patterns” (p. 1278). The researchers explain that conventional content analysis allows new insights to materialize from the data instead of preconceived notions of the coding categories. For this reason, open-ended questions were utilized in this study to ensure responses were unbiased. Each transcribed interview was reviewed for quality and conventional content analysis used to analyze responses. The constant comparison technique was utilized to code and

categorize the data (Glaser and Strauss, 1967; Glaser, 1978; Charmaz, 2006).

MAXQDA, a commercial software package for qualitative data analysis, was used to extract key points from the text of all transcripts and to group recurring themes. More specifically, MAXQDA provided counts that represent the frequency of occurrence for each of the themes (Sherif et al., 2006).

### ***Reliability, Validity, and Generalizability.***

Qualitative validity measures the accuracy of the findings (Gibbs, 2007). The researcher independently analyzed all eight transcripts and assigned codes based on similarity of intent. An external auditor reviewed the entire qualitative study and provided an objective assessment of the coding (Lincoln and Guba, 1985). The external auditor coded a stratified sample of 10% of the statements for each theme. The researcher and external auditor reviewed and discussed respective individual coding results. A comparison of the individually coded items by the researcher and the external auditor resulted in a confirmation rate of 96.7%. Member checking was an additional procedure utilized in this study to determine qualitative validity (Creswell, 2009). This procedure involved follow-up interviews with the most knowledgeable interviewees to discuss the face validity of the coding results. The qualitative findings were determined to be valid.

### ***Summary of Findings.***

SMEs were interviewed within the AF medical logistics discipline in order to develop a comprehensive list of factors that influence PVM use. Content analysis revealed top management support (TMS), inter-organizational communication, employee



training, perceived ease of use, and perceived usefulness as recurring themes throughout the transcribed interviews. Each theme is outlined in this section in order to discuss in detail the topics.

### **Theme 1: Top Management Support.**

The importance of TMS to the PVM program is widespread as a significant amount of participants' statements supported the need for TMS. TMS was mentioned 38 times throughout the transcribed interviews. In this study, top management referred to the immediate supervisor of the respondent. Teo and Ang (2001) found that a majority of major issues with the use of IS attributed these issues to a lack of TMS. Many participants conceded that TMS is a structural element that facilitates increased PVM use. Below are three illustrative statements regarding the importance of TMS.

- *I think that [leader involvement] would—I don't know how to say it the right way. That would make people more motivated to get a higher usage level.*
- *Leadership should be able to pull management reports, translate them and express what needs to happen.*
- *Whatever is important to the flight commander is going to get done one way or the other.*

### **Theme 2: Inter-organizational Communication.**

The significance of inter-organizational communication between medical logisticians and their designated PV representative is prevalent as it was mentioned 34 times throughout the transcribed interviews. Effective inter-organizational communication must be frequent, genuine, and include personal contact between buyer and supplier (Carr and Pearson, 1999). As shown in the textual segments below,

participants agreed that this level of communication is a structural element that facilitates increased PVM use.

- *She [PV representative] helped me. When we were with Owens & Minor, I could email our rep and she would do the same thing—email me some suggestions.*
- *There are a few things that I've actually had to order up. I'd call her and say, "Ma'am [PV representative], this is what I need. What can you guys help me with?" and she'd reply back to me with suggestions, and so that helps a lot.*
- *Most reps come weekly if they're not here full-time. The problems that you had or the issues—you didn't want to deal with either by email or a phone because it was harder. If the rep would come in, you would give them that information and they would do the research so you would know what to switch.*

### **Theme 3: Employee Training.**

The impact of employee training is essential as a majority amount of statements mentioned its importance. Training was mentioned 57 times throughout the transcribed interviews. Bish (2006) found in a human resource management study that higher levels of comprehensive employee training led to higher levels of task performance of employees. Participants indicated that employee training is a structural element that can facilitate increased PVM use. Exemplar statements are below.

- *I think that the background of this problem would be that the airmen don't understand the different products. Their catalog search functions that they're taught aren't really translating properly into their actual job performance. When a customer asks for a, let's just say a stethoscope, the airman doesn't know enough about each stethoscope or the fact that it's on a Prime Vendor contract, to make the push.*
- *There are things that you kind of understand by process of messing up, but it's not something that seems like it's really training, like there's not a very good training process in place, or on-the-job training.*

- *From what I'm told, they [new medical logisticians] are taught about Prime Vendor; because they're told before they do a credit card buy to look to see if we can get it through Prime Vendor. I don't think they've got the proper research skills to research and define an equivalent or another item that'll work that is on Prime Vendor [contract].*

#### **Theme 4: Perceived Ease of Use.**

The implication of perceived ease of use is evident as it was mentioned 35 times throughout the transcribed interviews. In the TAM, Davis (1989) advocated perceived ease of use as one of the most important external variables on a user's beliefs and intentions about a system. As indicated below, participants conceded that perceived ease of use of the DMLSS system for PVM requisitions can facilitate increases to PVM use.

- *Prime Vendor is easier because you're pushing a button [in DMLSS] to send it over, and then you've got to work the problems they send you. If some of the items got backordered, they're much easier to work. You almost go on automatic pilot after that. The system will work; it will tell you when to reorder. All you do is push that button every day; just send it to them [PV] and it'll come in the next day.*
- *Anything if it's easy. It happens. Make it easy for them [users].*
- *Loading new items [into DMLSS], I would have to say is difficult. Getting new items into the catalog is difficult. That product sourcing request is—it lacks feedback because basically they say no we can't do it, but that doesn't give you a response to say no, we'll get this instead.*

#### **Theme 5: Perceived Usefulness.**

The importance of perceived usefulness is apparent as it was mentioned 25 times throughout the transcribed interviews. In the TAM, Davis (1989) advocated perceived usefulness as one of the most important external variables on a user's beliefs and intentions about a system. A medical logistician's performance depends on his/her ability to accurately fill requisitions in a timely manner. As indicated in the statements

below, participants agreed that perceived usefulness of the DMLSS system from PVM requisitions can facilitate increased PVM use.

- *Well Gen IV [Generation IV of PV] also tells you whether it's in the MC [master catalogue], it's all linked. It'll tell you what's on contract or not already; it'll grey it out if it's not.*
- *Sometimes you're not sure what to search for, but if you pull up an item, it'll [a tool within DMLSS] tell you what the right ones are if you're not sure which item is on contract. It does help a lot.*
- *Maybe Gen IV [Generation IV of PV] is starting to do that [help us make better decisions]. It's a really good step in the right direction.*

### **Hypothesis Development**

This study examines the effects of TMS, inter-organizational communication, employee training, end user perceived ease of use, and end user perceived usefulness on PVM use. A review of relevant literature was used to develop the hypotheses presented in this section.

#### ***Top Management Support.***

Young and Jordan (2008) analyzed five cases within the context of IS projects and the results suggested that TMS was important in each and every case as well as provided a strong explanation as to why IS projects succeeded or failed. The results supported the conclusion that TMS was the number one critical success factor in each case. Sohal, Moss, and Ng (2001) recognized inadequate TMS as one of the largest concerns in regards to IT success. Sohal et al. (2001) proposed that the competitive advantage gained through the use of IS does not come from the IT assets but from the skilled management of these assets. For example, Weill (1992) found that strong TMS can lead to superior IS performance as well as improve the IS conversion efforts of

organizations. Additionally, Bajwa et al. (1998) noted that strong TMS influences the success of IS. Wilson and McDonald (1996) conducted a multi-case study which found TMS to be a key factor in successful implementation of support systems. The research of Choe (1996) supports the evidence of the positive impact of TMS on various IS implementation efforts. Moreover, the results of Ragu-Nathan, B. et al. (2004) support that TMS has a positive impact on IS performance. These studies suggest that TMS can be directly related to PVM use. This theoretical construct will measure TMS in regard to the PVM program. This study proposes that TMS is a structural element that facilitates increased PVM use.

H<sub>1</sub>: TMS of the PVM program is positively related to PVM use.

#### ***Inter-organizational Communication.***

The study of Paulraj et al. (2008) has provided evidence that inter-organizational communication has a significant positive impact on buyer and supplier relationships. Open and frequent communication promotes the development of this relationship, which may create mutual benefits for parties involved (Kale, Singh, and Perlmutter, 2000). Additionally, several research studies suggest that the use of two-way communication strategies may well deepen collaboration and trust and stimulate higher levels of benefits for both parties (Mohr and Nevin, 1990; Mohr and Spekman, 1994; Mohr, Fisher, and Nevin, 1996). It is possible for effective inter-organizational communication to be an important construct that promotes structure and the successful achievement of organization goals. This theoretical construct will measure inter-organizational communication between the buyer and the supplier. Consequently, this study proposes

that inter-organizational communication is a structural element that facilitates increased PVM use.

H<sub>2</sub>: Inter-organizational communication between medical logistics personnel and the PV representative is positively related to PVM use.

### ***Employee Training.***

Research has shown that computer training is widely recognized as a vital contributor to the productive use of computer systems within organizations (Compeau, 1995). Studies of systems implementation (Fuerst and Cheney, 1982; Leonard-Barton and Deschamps, 1988; Raymond, 1988) and end-user computing (Benson, 1983; Igbaria et al., 1989) have shown that training is positively related to implementation success. According to Compeau (1995), training is vital to effective use of IS. Additionally, Guidice (1990), Lewis (1990), and Tannenbaum (1990) all claimed training to be indispensable to the success of organizational computing. This theoretical construct will measure employee training on PVM procedures. For this reason, this study proposes that employee training is a structural element that increases the skills and abilities of current employees; thus facilitates increases to PVM use.

H<sub>3</sub>: Employee training on PVM procedures is positively related to PVM use.

### ***Perceived Ease of Use.***

The study of user acceptance of computer technology conducted by Davis et al. (1989) found that perceived ease of use had a significant impact on users' intentions of system use. Additionally, perceived ease of use has shown to have a significant direct effect on a system's perceived usefulness; hence, the addition of new capabilities to a

system or a simpler use of the existing system functions should increase perceived usefulness (Davis, 1989). A field study of 112 system users of two systems was conducted and ease of use provided a representation of the mechanisms by which system design choices influenced system acceptance by users (Davis, 1993). According to Chau (1996), ease of use had the largest influence on Computer-Aided Software Engineering (CASE) tools acceptance by systems developers. CASE tools are a means utilized by IS departments to ease software development and maintenance burdens (Chau, 1996). Moreover, the relationship between perceived ease of use and intention to use a system was significant in seven out of thirteen tests conducted on IT in healthcare (Holden and Karsh, 2010). This theoretical construct will measure perceived ease of use of the DMLSS system for PVM requisitions. This study suggests that perceived ease of use of the DLMSS system for PVM requisitions can have a significant positive effect on its use; thus facilitates increases to PVM use.

H<sub>4</sub>: Perceived ease of use of the DMLSS system for PVM requisitions is positively related to PVM use.

#### ***Perceived Usefulness.***

Perceived usefulness has shown to be positively related to attitudes toward use of technology systems in sales organizations (Robinson, Marshall, Stamps, 2005). Additionally, research suggests that salespersons have a limited amount of time on the job and are under pressure to use their time efficiently; for this reason, the perceived usefulness of a system is directly related to its use (Robinson et al., 2005). Additionally, perceived usefulness had a significant direct effect on use in a field study of 112 system

users of two end-user systems (Davis, 1993). Igbaria et al. (1997) found that perceived usefulness had a strong effect on system usage in a study of personal computing acceptance factors in small firms. Furthermore, a study of over 20 clinicians using health IT for patient care shown that the relationship between perceived usefulness and actual use of health IT or intention to use health IT as significant in every test (Holden and Karsh, 2010). This theoretical construct will measure perceived usefulness of the DMLSS system for PVM requisitions. This study proposes that end user perceived usefulness has a significant positive effect on the use of the DMLSS system for PVM requisitions and thereby facilitates increases to PVM use.

H<sub>5</sub>: Perceived usefulness of the DMLSS system for PVM requisitions is positively related to PVM use.

### **Dependent Variable**

The dependent variable for this study is PVM use. DeLone and McLean (1992) noted that 27 empirical studies on IS success have employed system use as at least one of their measures of success. According to DeLone and McLean (1992), “Of all measures identified, the system use variable is probably the most objective and the easiest to quantify, at least conceptually” (p. 68). There are different ways to measure use such as actual use as well as perceived use (DeLone and McLean, 1992). Some studies have calculated actual use of IS through hardware monitors which have quantified the amount of computer inquiries (King and Rodriguez, 1981), or traced the amount of connect time to the system (Ginzberg, 1981). Other studies utilized perceived measures of use by questioning users about their use of an IS (Raymond, 1985). Actual use is the choice of



measure for the dependent variable of this study since PVM use is regularly monitored exclusively at the organizational level and easily accessible from the DMLSS system (DeLone and McLean, 1992).

Data extracted from the DMLSS system covered all supply durable medical and supply expendable medical items purchased by every MTF within the continental U.S. The data covers the period of Jan through December 2013. The PVM rate of use was 38.8%. The PVM Rate of Use is formulated by:

$$PVM \text{ Rate of Use} = Total \text{ PVM Orders} / Total \text{ Orders} \quad (2)$$

### Proposed Theoretical Model with Hypotheses

Figure 5 displays the theoretical model along with the related hypotheses. All hypothesized relationships between the independent variables and the dependent variable are positive.

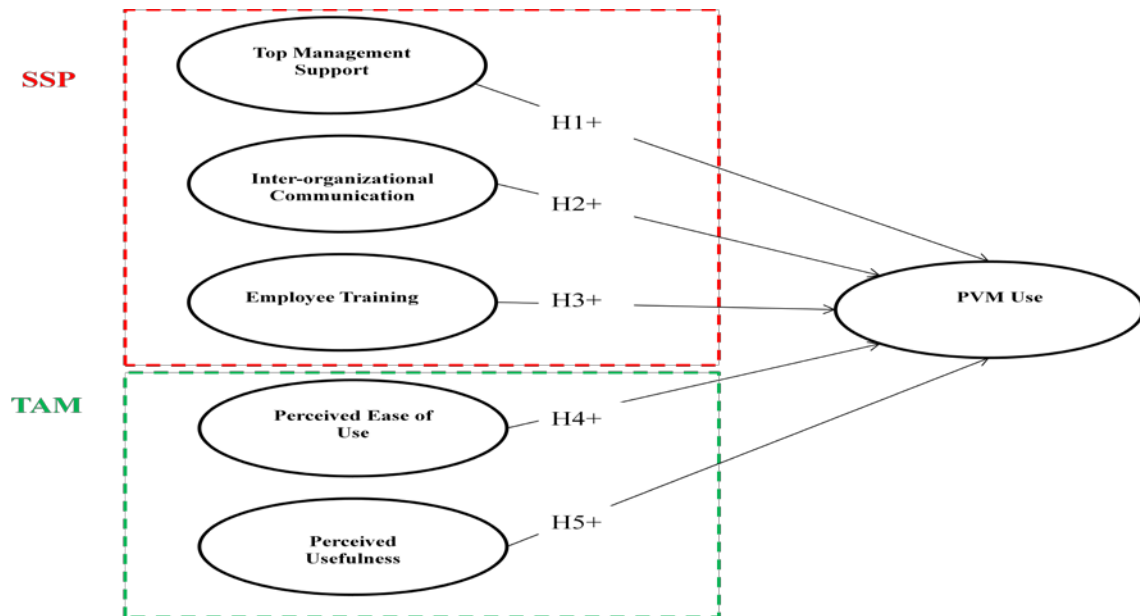


Figure 5. Theoretical Model

## **Phase 2: Quantitative Research**

SME input was used to develop a hypothetical model based on the factors identified and to construct a web-based survey that was administered to every Air Force medical facility within the continental U.S. to determine the extent to which the factors influence PVM use. Surveys are a way to ask questions related to people's beliefs and perspectives about the facts, feelings, motives, present and past behaviors, and conscious reasons for actions or feelings (Silverman, 1993). Using techniques from the quantitative research paradigm, the survey instrument was validated and the data were gathered and statistically analyzed using stepwise linear regression to reveal the extent to which the factors influence PVM use.

### ***Research Design.***

For the purpose of this step in the mixed methods procedures, data were collected via surveys. Surveys are the most common method of data collection for unobservable occurrences and are used to generalize from a sample to a population of interest (Dooley, 1995). A web-based survey was selected in place of a paper survey, since web-based surveys are easier to use, faster to complete, and are associated with a higher response rate (Griffis, Goldsby, and Cooper, 2003).

To measure the influence of these factors on PVM use, a 33-item survey instrument was developed using existing, validated scales for each previously identified construct. A detailed cover letter was included that explained the purpose of the study and stressed to participants their involvement was voluntary and their responses anonymous.

### ***Population.***

The population of interest is 65 MSC officers, 711 enlisted, and 217 civilian medical logisticians stationed at 71 Air Force MTFs throughout the continental U.S. All stateside medical logisticians were asked to complete the survey; thus, this represents a census of stateside medical logisticians utilizing the stateside PVM program. Consequently, a sample was not used in this study. The AFMOA disseminated the survey to all MTFs within the continental U.S. and encouraged population participation. It is assumed this census provides adequate coverage of the opinions of all MSC officers and enlisted medical logisticians.

### ***Instrument Development.***

Previously validated scales were adapted for each of the constructs identified in Phase 1 to create a 33-item survey instrument. The survey instrument and the cover letter can be found in Appendix B. The survey was developed by adapting existing measurement scales that have shown to be valid and reliable. The survey was administered via the Web Survey Information Retrieval System, a question editor survey tool licensed to the Air Force Institute of Technology and hosted on the university's web site.

Participants were asked to select their extent of agreement/disagreement with each statement based on a 7-point Likert scale for each construct. Additionally, several demographic questions were asked and are captured in Table 1. Preliminary questions regarding the participant's experience with PVM were asked in order to filter out potential participants who lacked experience with the PVM program. Participants were asked, (1) "Please indicate how much experience you have had with the PVM program."

A response of “none” terminated the survey. Lastly, participants were asked to provide comments, questions, or concerns in regard to the PVM program and its use.

**Table 1. Demographics Solicited**

Individual
Job title
Experience with PVM
Experience with PVM in the last 2 years
Tenure of current position
Location of base

TMS has shown to have a significant influence on the effectiveness of an IS utility in an organization (Dong, Neufeld, Higgins, 2009). Evidence suggests that top managers must adjust their level of support in order to achieve desired outcomes (Dong et al., 2009). Ragu-Nathan, B. et al. (2004) defined TMS as the level to which management comprehends the significance of the IS function and is involved in the IS activities. Their results support that TMS has a positive impact on IS performance. Skipper (2008) found a significant positive relationship between employee perception of TMS for contingency planning and organizational flexibility. The validated seven-item item Top Management Support scale (Ragu-Nathan, B. et al., 2004) was adapted (“PVM program” was substituted for “IS function”) to measure TMS. As shown in Table 2, TMS was measured on a 7-point Likert scale anchored with “Strongly Disagree” and “Strongly Agree.” For the purpose of this study, TMS refers to the immediate supervisor of the respondent.

**Table 2. Measures of Leadership Support**

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**Please indicate your extent of agreement with your immediate supervisor's support with respect to PVM. (Strongly Disagree, Disagree, Slightly Disagree, Neither Disagree nor Agree, Slightly Agree, Agree, Strongly Agree)**

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TMS1: Top management involvement with the PVM program is strong.

TMS2: Top management is interested in the PVM program.

TMS3: Top management understands the importance of the PVM program.

TMS4: Top management supports the PVM program.

TMS5: Top management considers the PVM program a strategic function.

TMS6: Top management understands the benefits of the PVM program.

TMS7: Top management keeps the pressure on personnel to procure items through the PVM program.

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Notes: Adapted from Ragu-Nathan, B. et al. (2004). Original Cronbach's alpha was .91.

Inter-organizational communication has shown to be a critical factor in promoting collaboration among supply chain management organizations. The research of Paulraj et al. (2008) suggests strong support of the idea of inter-organizational communication as a component that enhances buyers' and suppliers' organizational performance. The validated six-item inter-organizational scale (Paulraj et al., 2008) was adapted ("logistics personnel" and "PV representative" were substituted for "supplier" and "buyer," respectively) to measure inter-organizational communication with respect to the PVM program. One item was deemed inapplicable for this study (e.g., "we [the buyer and supplier] share sensitive information (financial, production, design, research, and/or competition)") and was dropped from the survey. As shown in Table 3, inter-

organizational communication was measured on a 7-point Likert scale anchored with “Strongly Disagree” and “Strongly Agree.”

**Table 3. Measures of Inter-organizational Communication**

<b>Please indicate your extent of agreement with <u>your organization’s communication with the PV representative</u>. (Strongly Disagree, Disagree, Slightly Disagree, Neither Disagree nor Agree, Slightly Agree, Agree, Strongly Agree)</b>
CO1: The PV representative provides us with any information that might help our organization.
CO2: We provide the PV representative with any information that might help its organization.
CO3: Exchange of information with the PV representative takes place in a timely manner.
CO4: Logistics personnel and the PV representative keep each other informed about events or changes that may affect the other party.
CO5: We have frequent face-to-face planning/communication with the PV representative.
CO6: We exchange performance feedback with the PV representative.
Notes: Adapted from Paulraj et al. (2008). Original Cronbach’s alpha was .86.

Bish (2006) found in a human resource management study that higher levels of comprehensive employee training led to higher levels of task performance. Additionally, substantial evidence has shown that investments in employee training are able to advance organizational performance (Russell, Terborg, and Powers, 1985; Bartel, 1994; Knoke and Kalleberg, 1994). The validated eight-item training scale was adapted (“PVM” was injected and “employees in our unit” was substituted for “members of our work unit”) to measure employee training programs with respect to the PVM program. Three items were deemed inapplicable for this study (e.g., “on average, how many hours of formal

training does a typical member of your work unit receive per year,” “how much money is spent on training individuals in your work unit” and “do you feel training is viewed as a cost or as an investment”) and were dropped from the survey. As shown in Table 4, employee training was measured on a 7-point Likert scale anchored with “Strongly Disagree” and “Strongly Agree.”

**Table 4. Measures of Employee Training**

---

**Please indicate your extent of agreement with your organization’s PVM training program. (Strongly Disagree, Disagree, Slightly Disagree, Neither Disagree nor Agree, Slightly Agree, Agree, Strongly Agree)**

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TR1: My organization has an extensive PVM training process for members of our work unit.

TR2: My organization places a great deal of priority on training employees in our unit on the PVM process.

TR3: My organization has a formal or structured PVM training process.

TR4: All acquisitions personnel have been trained on the PVM process this past year.

TR5: My organization offers multiple PVM training programs for members of our work unit to attend.

---

Notes: Adapted from (Bish, 2006). Original Cronbach’s alpha was .90.

Davis’s (1989) instrument has been tested for validity and reliability. Several studies that simulate Davis’s original study of the TAM model provide substantiation on the influence of usefulness and ease of use of a system on its use (Davis, 1989; Adams, Nelson, and Todd 1992; Hendrickson, Massey, and Cronan, 1993; Segars and Grover, 1993). Specifically, Adams et al. (1992) validated the measurement scales of Davis and extended the model to different settings and samples to demonstrate the internal

consistency and replication reliability of the scales for perceived usefulness and perceived ease of use.

Perceived ease of use has shown to be positively related to attitude toward use of technology systems in sales organizations (Robinson et al., 2005). Their research suggests that end user perceived ease of use can have an important influence on technology acceptance. The validated four-item perceived ease of use scale (Robinson et al., 2005) was adapted (“With respect to the PVM program, the DMLSS system” was substituted for “technology”) to measure end user perceived ease of use of the DMLSS system with respect to PVM requisitions. As shown in Table 5, end user perceived ease of use was measured on a 7-point Likert scale anchored with “Strongly Disagree” and “Strongly Agree.”

**Table 5. Measures of Perceived Ease of Use**

<b><u>Please indicate your extent of agreement with your perceived ease of use of the DMLSS system with respect to the PVM program. (Strongly Disagree, Disagree, Slightly Disagree, Neither Disagree nor Agree, Slightly Agree, Agree, Strongly Agree)</u></b>
PEOU1: With respect to the PVM program, learning to operate the DMLSS system is easy for me.
PEOU2: With respect to the PVM program, I find it easy to get the DMLSS system to do what I want it to do.
PEOU3: With respect to the PVM program, my interaction with the DMLSS system is clear and understandable.
PEOU4: With respect to the PVM program, I find the DMLSS system easy to use.
Notes: Adapted from (Robinson et al., 2005). Original Cronbach's alpha was .97.



Perceived usefulness has shown to be positively related to attitudes toward use of technology systems in sales organizations (Robinson et al., 2005). The study of Robinson et al. (2005) suggests salespersons have a limited amount of time on the job and are under pressure to use their time efficiently; for this reason, they propose salespeople determine which tools to use or not use based on the ability of the tool to increase productivity. The validated five-item perceived usefulness scale (Robinson et al., 2005) was adapted (“With respect to the PVM program, the DMLSS system” was substituted for “technology”) to measure end user perceived usefulness of the DMLSS system with respect to PVM requisitions. Two items were deemed inapplicable for this study (e.g., “using technology makes it easier to do my [the end user] job” and “overall, I [the end user] find technology useful in my job”) and were dropped from the survey. As shown in Table 6, end user perceived usefulness was measured on a 7-point Likert scale anchored with “Strongly Disagree” and “Strongly Agree.”

**Table 6. Measures of Perceived Usefulness**

<b><u>Please indicate your extent of agreement with your perceived usefulness of the DMLSS system with respect to the PVM program. (Strongly Disagree, Disagree, Slightly Disagree, Neither Disagree nor Agree, Slightly Agree, Agree, Strongly Agree)</u></b>
PU1: With respect to the PVM program, using the DMLSS system increases my productivity.
PU2: With respect to the PVM program, using the DMLSS system improves my job performance.
PU3: With respect to the PVM program, using the DMLSS system enhances my effectiveness on the job.
Notes: Adapted from (Robinson et al., 2005). Original Cronbach’s alpha was .89.

***Pre-test.***

A pre-test was conducted with nine participants. Colleagues from both academia and the medical logistics industry were invited to complete the survey. Each participant provided feedback in regards to the functionality and ease of use of the survey tool, the wording of the measurement questions to include clarity and completeness, and any other areas of concern. All necessary changes were made to the survey instrument before the pilot-test.

***Pilot-test.***

The information letter and the survey link (Appendix B) were emailed to medical logisticians with PVM experience in order to gather data for preliminary analysis. Emails were sent directly to 17 medical logisticians. Participants were asked to forward the survey link to other medical logisticians who possessed PVM experience. After two weeks, 40 responses were collected. From the 40 responses collected, 20 participants neglected to list their respective base, which made it impossible for the researcher to link the participant's responses with the appropriate dependent variable, base specific PVM rate of use. Additionally, 17 surveys exhibited noticeable patterns therefore were dropped from the response set. In conclusion, 37 surveys were removed from the response set and 12 surveys were deemed useable. These data were analyzed using various techniques to determine if the instrument was adequately developed. Exploratory Factor Analysis (EFA) was attempted and cross loading among the factors was identified; however, there were no questions deleted from the instrument because of the small size ( $N = 12$ ) of the response set. There were too few responses to conduct multiple linear regression. The reliability of each construct was checked. As shown in Table 7, a

Cronbach's alpha for each measurement scale was calculated to be greater than .88, which indicates adequate reliability (Cronbach, 1951). The calculated means and standard deviations for the 7-point Likert scale items signified no obvious issues. The largest standard deviation is 1.18 which suggests an adequate level of variance among the response set.

**Table 7. Construct Descriptive Properties**

<b>Construct</b>	<b>Number of Items</b>	<b>Cronbach's Alpha</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>TMS</b>	7	.97	5.42	1.8
<b>CO</b>	6	.88	5.89	.99
<b>TRNG</b>	5	.91	3.65	1.45
<b>PEOU</b>	4	.92	6.19	.64
<b>PU</b>	3	.98	6.47	.66

Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TRNG = Employee Training, PEOU = Perceived Ease of Use, PU = Perceived Usefulness. N = 12.

The pilot-test results indicate that the survey instrument is reliable. There was an insufficient amount of responses to test the validity and the relationship between the constructs. Ultimately, the pilot-test provided good feedback about the survey instrument. Based on the inputs of the participants there was a minor change made to the instrument to include the addition of a comments section. There were no major modifications made to the instrument thus the pilot-test results were combined with the results gathered from the primary collection effort and used in the final analysis.

#### ***Data Collection.***

A-priori power analysis indicated that a minimum of 91 participants are required to obtain a power of .80 for investigating the proposed research model, which includes 5

constructs, at the .05 level of significance, assuming a conservative model R square estimate of .15 (Soper, 2011). To obtain the minimum number of responses, the following data collection plan was employed. To determine the relationship between TMS, inter-organizational communication, employee training, perceived ease of use, and perceived usefulness, this study utilized a cross-sectional survey instrument to collect data from medical logisticians. The survey was disseminated by the AFMOA and administered to 65 MSC officers, 711 enlisted, and 217 civilian medical logisticians stationed at 71 Air Force MTFs throughout the continental U.S. The questionnaire consisted of 33-items and was administered online via the Web Survey Information Retrieval System. All responses were housed within the secure retrieval system and access to the responses was limited to the primary researcher. The data do not contain information that could link a response to a particular responder.

Data collection lasted for seven weeks. During this timeframe 167 surveys were collected. Of these 167 surveys, 69 were removed because of concerns with quality, such as neglecting to list base location, no variability in any of the response values, or taking a short amount of time to complete the survey such that questions were obviously not read and considered via satisficing (Krosnick, 1991; Hazen, 2012). In summary, the study yielded 98 usable responses out of the 993 initially implored for a response rate of 10%. These 98 responses were combined with the 12 useable pilot study responses for a total of 110 surveys for the primary analysis; thus, the minimum response set to obtain a power of .80 for investigating the proposed research model, which includes 5 constructs, at the .05 level of significance, assuming a conservative model R square estimate of .15 was met (Soper, 2011).

### ***Data Analysis.***

This study employed stepwise linear regression for data analysis. This technique was used to determine which independent variables are statistically related to the dependent variable, PVM use. JMP version 10.0 and SPSS version 18 software were utilized for data analysis. The results provide the basis for rejecting or failing to reject the study's hypotheses. The findings of this test are presented in Chapter 4.

### **Assumptions and Limitations for Entire Analysis**

The following assumptions and limitations were identified for the mixed methods procedures of this study. For Phase 1, it is assumed the interview respondents possess enough relevant experience to provide useful responses and opinions to the questions posed. All respondents were medical logisticians who possessed experience with the PVM program. The second assumption is that interview respondents accurately and completely expressed their viewpoints. The third assumption is that interviewees as well as survey participants provided adequate coverage of the population of AF medical logisticians. Adequate representation from each job role within a medical logistics flight (officer, enlisted, and civilian) was met by interviewing personnel from each position. Each MTF type (clinic, hospital, and medical center) was met by purposively selecting individuals from each MTF category. The participants consisted of SMEs of different experience levels, military tenures, and ranks. It is assumed these efforts provide adequate coverage of the opinions of all AF medical logisticians. A potential limitation to Phase 2 of the study is achieving an acceptable survey response rate. Tactics to increase the response rate include multiple emails from the AFMOA office and the researcher to the targeted population in an attempt to encourage participation.

Lastly, the assumption is made that all data provided by the AFMOA and from the DMLSS system are accurate.

### **Validity Threats**

There are several concerns that threaten the validity of a quantitative survey-method research effort. These validity threats include common method bias, non-response bias, and missing data bias. The measures taken to reduce these validity threats are described in detail.

#### ***Common Method Bias.***

Common method bias is a potential problem in behavioral research and is a concern for this study (Podsakoff, 2003). Common method bias is present when variance is attributable to the measurement method instead of to the constructs the measure characterizes which creates measurement error (Podsakoff, 2003). Control for common method bias was considered in the design of the data collection instrument. In an attempt to control common method bias, the independent and dependent variables were obtained through different sources (Podsakoff, 2003). Negatively worded items were not used in this study because use of these items has demonstrated to be a source of common method bias (Hazen, 2012). When possible, scales with fewer items were utilized in the design of the instrument (Skipper, 2008). Additionally, comprehensive pilot-testing of the survey instrument aided in reduction of the threat of common method bias by improving the clarity and readability of survey items and reducing survey item complexity and imprecision (Hazen, 2012).

Furthermore, Harman's single-factor test, a statistical remedy, was utilized to test for common method variance. Per Harman's test, one general factor should not account for the majority of the covariance among the measures (Podsakoff, 2003). EFA of the unrotated factor solution exhibited five factors which accounted for a total of 70.10 %. The results are listed in Table 8. Since a single factor did not account for more than 50% of the variance, common method bias is not a concern of this study (Podsakoff, 2003).

**Table 8. Unrotated: Variance Explained**

<b>Factor</b>	<b>% Variance</b>	<b>Cumulative %</b>
<b>1</b>	29.81	29.81
<b>2</b>	15.51	45.32
<b>3</b>	12.42	57.74
<b>4</b>	9.44	67.18
<b>5</b>	2.87	70.10

***Non-Response Bias.***

Non-response bias is a concern for this study. Non-response bias refers to the bias that exists when respondents' demographic or attitudinal variables to a survey are different from those who did not respond (Couper, 2000). Non-response bias occurs when individuals within the target population are unwilling or unable to complete the survey (Couper, 2000). Wave analysis was used to determine if it is prevalent within the study (Wagner and Kemmerling, 2010). The bias was evaluated by comparing responses between early and late respondents via two t-tests. Early respondents were those who had completed the survey within the initial 6-weeks, while late responders were those who completed the survey after the sixth week. Approximately 52% of the responses

were from early responders. No significant differences were found between the early and late respondent groups for perceived ease of use and perceived usefulness. On the other hand, significant differences were found in the responses for TMS, inter-organizational communication, and employee training; thus, there is evidence that non-response bias is a threat to the validity of this study (Rogelberg and Stanton, 2007). The results are found in Table 9. Further investigation revealed that late respondents did appear to be influenced by respective base. If persons who respond vary substantially from those who do not, the results do not directly allow one to say how the entire sample would have responded which is important in regard to the survey's results being generalized to the population (Armstrong and Overton, 1977).

**Table 9. Independent Samples Test**

<b>Factor</b>	<b>F Statistic</b>	<b>Significance</b>
<b>TMS</b>	.99	.32
<b>CO</b>	2.07	.15
<b>TRNG</b>	3.30	.07
<b>PEOU</b>	5.93	.02
<b>PU</b>	5.43	.02

Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TRNG = Employee Training, PEOU = Perceived Ease of Use, PU = Perceived Usefulness. N = 110.

#### ***Missing Data.***

There were 32 cases with missing data for the dependent variable; thus, these responses were deleted from the response set (Hair et al., 2006). There were five respondents who neglected to list their job title; however, these data were considered



ignorable missing data therefore do not require a remedy (Hair et al., 2006). All useable responses were analyzed for missing data utilizing the missing values analysis function within SPSS 18. Respondents who answered every question that dealt with the theoretical model and its associated variables were captured for this study thus missing data bias is not a threat to the validity of this study.

## **Summary**

Chapter 3 presented the mixed methods procedures of this study. Five hypotheses were developed based on the findings of the qualitative phase, Phase 1. These hypotheses were tested in the quantitative phase, Phase 2. The research required to complete both, Phase 1 and Phase 2, was explained. The interviews as well as the survey instrument development were discussed in detail. The data collection, pre-test, pilot-test, and assumptions were presented. Chapter 4 will discuss how stepwise linear regression will be utilized to analyze the data collected in Phase 2 in order to determine the extent to which the identified factors influence PVM use.

## **IV. Results and Analysis**

### **Overview**

This chapter summarizes the results from the analysis of the survey data. The individual-level demographics as well as the construct-level descriptives are presented and discussed. The statistical assumptions necessary for linear regression and the analyses utilized to test these assumptions are described. Each investigative question is addressed in the order it was presented and the results of the multiple regression applied are presented. These results serve as the support for rejecting or failing to reject each hypothesis.

### **Census Demographics**

The census respondents consisted of individuals with different experience levels, military tenures, and ranks. For example, participants' job titles ranged from "purchaser", a function responsible for purchasing supplies at the lowest level of the organization to "MSC officer", which is generally regarded as organizational-level senior management. Adequate representation from each job role within a medical logistics flight (officer, enlisted, and civilian) was met. Each MTF category (clinic, hospital, and medical center) was sufficiently represented. The study assumption that the census of all MTFs provides adequate coverage of the opinions of all AF medical logisticians hence increases the ability to generalize the results of this study. From the population of 993 medical logisticians, 110 responses were employed for analysis. All useable responses were analyzed. Table 10 provides the demographics for the participants of this study.

**Table 10. Participant Demographics**

<b>Demographic</b>	<b>Characteristic</b>	<b>Count</b>	<b>Percent</b>
<b>Job Title</b>	Purchaser	27	24.6%
	Materiel Manager	15	13.6%
	NCOIC	22	20.0%
	Flight Chief	11	10.0%
	MSC	11	10.0%
	Other	19	17.3%
	Neglected to Answer	5	4.5%
<b>Experience with PVM</b>	1-6 months	9	8.2%
	7-12 months	6	5.4%
	13-18 months	11	10.0%
	19-24 months	11	10.0%
	≥ 25 months	73	66.4%
<b>Experience with PVM in the last 2 years</b>	None	3	2.7%
	1-6 months	14	12.7%
	7-12 months	18	16.4%
	13-18 months	20	18.2%
	19-24 months	55	50.0%
<b>Tenure of Current Position</b>	≤ 6 months	17	15.5%
	7-12 months	26	23.6%
	13-18 months	21	19.1%
	19-24 months	15	13.6%
	≥ 25 months	31	28.2%

Notes: N = 110. PVM = Medical/Surgical Prime Vendor.

The base demographics are listed in Table 11. Of the potential 71 MTFs within the Air Force, 35 of 58 clinics are represented, 5 of 10 medical hospitals are represented, and all three medical centers are represented. MTFs are categorized (clinic, medical hospital, and medical center) based on the services rendered and the specialty care offered.

**Table 11. MTF Demographics**

<b>Demographic</b>	<b>Characteristic</b>	<b>Count</b>	<b>Percent</b>
<b>MTF Category</b>	Clinic	87	79.1%
	Hospital	12	10.9%
	Medical Center	11	10.0%

Notes: N = 110. MTF = Medical Treatment Facility.

### **Item-Level Descriptive Properties**

Table 12 displays the item-level statistics for all 110 responses which include the item, statement, mean, and standard deviation. The calculated means and standard deviations for the 7-point Likert scale items signified no obvious issues. The largest standard deviation is 1.96 which suggests an adequate level of variance among the response set (Jacobson and Truax, 1991).

**Table 12: Item Level Statistics**

<b>Item</b>	<b>Characteristic</b>	<b>Mean</b>	<b>S.D.</b>
<b>TMS1</b>	Top management involvement with the PVM program is strong.	5.95	1.32
<b>TMS2</b>	Top management is interested in the PVM program.	6.19	1.05
<b>TMS3</b>	Top management understands the importance of the PVM program.	6.31	.85
<b>TMS4</b>	Top management supports the PVM program.	6.17	1.05
<b>TMS5</b>	Top management considers the PVM program a strategic function.	6.30	.92
<b>TMS6</b>	Top management understands the benefits of the PVM program.	5.64	1.54
<b>TMS7</b>	Top management keeps the pressure on personnel to procure items through the PVM program.	5.46	1.53
<b>CO1</b>	The PV representative provides us with any information that might help our organization.	5.68	1.11
<b>CO2</b>	We provide the PV representative with any information that might help its organization.	5.76	1.00
<b>CO3</b>	Exchange of information with the PV representative takes place in a timely manner.	5.57	1.15

<b>CO4</b>	Logistics personnel and the PV representative keep each other informed about events or changes that may affect the other party.	5.78	.95
<b>CO5</b>	We have frequent face-to-face planning/communication with the PV representative.	4.23	1.96
<b>CO6</b>	We exchange performance feedback with the PV representative.	4.65	1.61
<b>TR1</b>	My organization has an extensive PVM training process for members of our work unit.	4.60	1.56
<b>TR2</b>	My organization places a great deal of priority on training employees in our unit on the PVM process.	4.84	1.54
<b>TR3</b>	My organization has a formal or structured PVM training process.	4.56	1.58
<b>TR4</b>	All acquisitions personnel have been trained on the PVM process this past year.	5.35	1.55
<b>TR5</b>	My organization offers multiple PVM training programs for members of our work unit to attend.	3.89	1.63
<b>PEOU1</b>	With respect to the PVM program, learning to operate the DMLSS system is easy for me.	6.03	1.14
<b>PEOU2</b>	With respect to the PVM program, I find it easy to get the DMLSS system to do what I want it to do.	5.63	1.34
<b>PEOU3</b>	With respect to the PVM program, my interaction with the DMLSS system is clear and understandable.	5.83	1.20
<b>PEOU4</b>	With respect to the PVM program, I find the DMLSS system easy to use.	5.78	1.33
<b>PU1</b>	With respect to the PVM program, using the DMLSS system increases my productivity.	5.95	1.15
<b>PU2</b>	With respect to the PVM program, using the DMLSS system improves my job performance.	5.95	1.15
<b>PU3</b>	With respect to the PVM program, using the DMLSS system enhances my effectiveness on the job.	5.95	1.21

Notes: N = 110. TMS = Top Management Support, CO = Inter-organizational Communication, TR = Employee Training, PEOU = Perceived Ease of Use, PU = Perceived Usefulness.

### **Construct-Level Descriptive Properties**

Table 13 displays the descriptive properties of each independent variable. Cronbach's alpha was utilized to measure the reliability of the measurement scales, also known as internal consistency, for each construct (Cronbach, 1951). Internal consistency is the extent to which items within a test measure the same construct. Thus Cronbach's

alpha relates to the inter-relatedness of the items within a construct (Tavakol and Dennick, 2011). A Cronbach's alpha for each measurement scale was calculated to be greater than .79, which indicates adequate reliability (Cronbach, 1951). The generally agreed upon lower limit of Cronbach's alpha is .7, although it may decrease to .6 in exploratory research (Robinson, 1991). The Cronbach's alpha for each scale suggests that the measures consistently represent the same latent construct; accordingly, there is no cause for concern of the reliability of the scales utilized. The calculated means and standard deviations for the 7-point Likert scale items signified no obvious issues. The largest standard deviation is 1.28 which suggests an adequate level of variance among the response set. Table 14 displays the correlation matrix between all independent study variables. A small negative correlation of - .06 is found between CO and TRNG. Although unanticipated, it does seem sensible that the more trained an employee is the less likely he/she is to require communication with the PV. A strong positive correlation of .77 is exhibited between PEOU and PU. It does seem reasonable that end user perceived ease of use and end user perceived usefulness of the DMLSS system, with respect to PVM use, would show positive correlation.

**Table 13. Construct Descriptive Properties**

<b>Construct</b>	<b>Number of Items</b>	<b>Cronbach's Alpha</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>TMS</b>	7	.94	6.00	1.03
<b>CO</b>	6	.79	5.28	.94
<b>TRNG</b>	5	.88	4.65	1.28
<b>PEOU</b>	4	.94	5.82	1.15
<b>PU</b>	3	.95	5.95	1.11

Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TRNG = Employee Training, PEOU = Perceived Ease of Use, PU = Perceived Usefulness. N = 110.

**Table 14. Correlation Matrix of Independent Variables**

<b>Construct</b>	<b>TMS</b>	<b>CO</b>	<b>TRNG</b>	<b>PEOU</b>	<b>PU</b>
<b>TMS</b>	1				
<b>CO</b>	.10	1			
<b>TRNG</b>	.26	-.06	1		
<b>PEOU</b>	.25	.14	.20	1	
<b>PU</b>	.24	.15	.17	.78	1

Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TRNG = Employee Training, PEOU = Perceived Ease of Use, PU = Perceived Usefulness. N = 110.

Exploratory Factor Analysis (EFA) was performed to determine construct validity and the underlying structure among the variables (Fabrigar et al., 1999). Hair et al. (2006) suggested that sample sizes be 100 or greater to perform EFA. Additionally, rules of thumb for sample to variable ratio range anywhere from 3:1, 6:1, 10:1 15:1 or 20:1 (Williams et al., 2010). Hogarty et al. (2005) investigated the sample to variable ratio recommendation and found that, “there was no minimum level of sample to variable ratio to achieve good factor recovery across conditions examined” (p. 222). The sample to variable ratio for this study is approximately 5 to 1. Prior to the extraction of factors, the Kaiser-Meyer-Olkin (KMO) measure of sampling and the Bartlett’s Test of Sphericity were utilized to assess the suitability of the respondent data for factor analysis (Williams et al., 2010). The KMO index ranges from 0 to 1, with .5 and above considered suitable for factor analysis (Williams et al., 2010). Additionally, the Bartlett’s Test of Sphericity should be significant ( $p < .05$ ) for factor analysis to be appropriate (Williams et al., 2010). The results of these tests are found in Table 15. The results suggest that the respondent data is suitable for factor analysis.

**Table 15. KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.83
Bartlett's Test of Sphericity	< .00

Notes: N = 110.

EFA is based on the common factor model (Fabrigar et al., 1999). Common factors are unobservable latent variables that influence more than one measured variable in a battery and are presumed to account for the correlations (covariances) among the measured variables (Fabrigar et al., 1999). Prior to EFA, the kurtosis and skew of the data were tested to determine if nonnormality is severe. The results are displayed in Table 16. West, Finch, & Curran (1995) constitute severe nonnormality as skew greater than 2 and kurtosis greater than 7.

**Table 16. Skewness and Kurtosis Analysis**

<b>Construct</b>	<b>TMS</b>	<b>CO</b>	<b>TRNG</b>	<b>PEOU</b>	<b>PU</b>
<b>Skewness</b>	-1.31	-.22	-.31	-1.32	-.96
<b>Kurtosis</b>	1.99	-.25	-.44	2.28	.13

Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TRNG = Employee Training, PEOU = Perceived Ease of Use, PU = Perceived Usefulness. N = 110.

The principal factors method, also known as Principal Axis Factoring (PAF), was utilized for extraction because the data though not severely nonnormal do appear to have a slight skew (Fabrigar et al., 1999). When the normality assumption is violated, PAF is the preferred method because it does not require a distributional assumption (Fabrigar et al., 1999). This technique allows for the need of parsimony as it determines the number of factors deemed most important (Fabrigar et al., 1999). The combination of Principal Component Analysis (PCA) and Maximum Likelihood (ML) was not utilized because a



potential limitation of this method is the strong assumption of multivariate normality (Fabrigar et al., 1999). According to Thompson (1996), the practical differences between PCA and PAF are often insignificant especially when variables exhibit high reliability. The preliminary EFA utilized was PAF without rotation. The results were complex and difficult to interpret because the construct structures did not load cleanly on their respective factors; thus, the structures were not clearly identifiable. For the abovementioned reasons, a rotation was applied.

Brown (2009) suggests rotation of the factor axes in order to obtain straightforward and interpretable factors. Factor rotation simplifies the structure through maximizing the significant loadings of a variable on one factor; accordingly, the variables most useful in defining each factor are able to be easily identified (Tavakol and Dennick, 2011). An oblique rotation, Promax, was utilized since the factors in the analysis are correlated (Fabrigar et al., 1999; Brown, 2009). An oblique rotation exhibits the extent to which each factor is correlated (Hair et al., 2006). According to Hair et al. (2006), “[oblique rotation methods] are best suited to the goal of obtaining several theoretically meaningful factors or constructs because, realistically, few constructs in the real world are uncorrelated” (p. 127). Fabrigar et al. (1999) found in three studies that an EFA with an oblique rotation provided simpler structures, more interpretable results, and more theoretically plausible representations of the data. The rotated factor loadings are listed in Table 17. Williams et al. (2010) suggest that variables should have factor loadings of greater than .5 in order to be retained in the analysis. Factor loadings of .5 or greater are highlighted. The results suggest that not all items loaded on their intended factor which could cause concern for convergent and discriminant validity.

**Table 17. Rotated Factor Loadings**

<b>Item</b>	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>	<b>Factor 4</b>	<b>Factor 5</b>
<b>TMS1</b>	-.08	<b>.89</b>	.06	-.10	-.11
<b>TMS2</b>	.06	<b>.89</b>	-.13	-.03	-.03
<b>TMS3</b>	.03	<b>.92</b>	-.07	-.04	-.01
<b>TMS4</b>	.05	<b>.83</b>	-.12	.09	.14
<b>TMS5</b>	.05	<b>.89</b>	-.05	.04	-.03
<b>TMS6</b>	-.03	<b>.77</b>	.18	.08	-.08
<b>TMS7</b>	-.07	<b>.84</b>	.18	.02	.05
<b>CO1</b>	-.13	.01	.05	<b>.84</b>	.11
<b>CO2</b>	.06	.09	-.01	<b>.68</b>	.13
<b>CO3</b>	.02	-.07	-.06	<b>.68</b>	.11
<b>CO4</b>	.13	.04	.01	<b>.66</b>	-.01
<b>CO5</b>	.00	-.09	-.03	.24	<b>.63</b>
<b>CO6</b>	-.02	-.03	.03	.31	<b>.51</b>
<b>TR1</b>	.03	.06	<b>.87</b>	.00	.10
<b>TR2</b>	.06	.15	<b>.82</b>	-.04	.10
<b>TR3</b>	-.01	.00	<b>.86</b>	-.01	-.03
<b>TR4</b>	.05	-.10	<b>.53</b>	-.01	-.35
<b>TR5</b>	-.04	-.11	<b>.78</b>	.05	-.08
<b>PEOU1</b>	<b>.78</b>	.04	.01	.13	-.23
<b>PEOU2</b>	<b>.87</b>	-.02	.05	-.06	-.07
<b>PEOU3</b>	<b>.83</b>	.02	-.02	.18	-.14
<b>PEOU4</b>	<b>.89</b>	-.06	.02	.09	-.06
<b>PU1</b>	<b>.84</b>	.05	.00	-.15	.18
<b>PU2</b>	<b>.88</b>	.00	.06	-.10	.24
<b>PU3</b>	<b>.95</b>	-.03	-.08	-.03	.05
<b>Eigenvalues</b>	7.63	4.1	3.45	2.67	1.14

Notes: N = 110. Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TR = Employee Training, PEOU = Perceived Ease of Use, PU = Perceived Usefulness. N = 110.

Construct validity refers to the extent to which a set of measures truly represent the construct of interest (Overstreet, 2012). Convergent validity is the degree to which two measures of the same concept show substantial relations (Watson et al., 1995). Discriminant validity is the degree to which two conceptually similar concepts are

weakly related (Watson et al., 1995). Items CO5 and CO6 are problematic and may need to be dropped from the final analysis. Furthermore, PEOU and PU loaded on the same factor. It does seem reasonable that end user perceived ease of use and end user perceived usefulness of the DMLSS system, with respect to PVM use, would load on the same factor since there was a strong positive correlation between the two factors previously identified. The basic objective of factor analysis is to group highly intercorrelated variables into distinct factors (Fabrigar et al., 1999). According to Williams et al., (2010) “the final step of EFA is interpretation which involves the researcher examining which variables are attributable to a factor, and giving that factor a name or theme” (p. 9). Henson and Roberts (2006) note, “the meaningfulness of a latent factor is ultimately dependent on researcher definition” (p. 396). An examination of the scree plot suggested four as a sufficient number of factors to extract (Cattell, 1966). It is of note that all factors have an eigenvalue greater than one. For the aforementioned reasons, the number of factors for the study is decreased from five to four with the consolidation of the PEOU and PU constructs to form the construct System Use (SU). EFA was performed again utilizing PAF and a Promax rotation with four factors. The results are listed in Table 18. The measurement items loaded well on their intended construct and did not load on any other construct; hence, convergent and discriminant validity is indicated. An alternative solution dropped items CO5 and CO6 but maintained five factors; however, it was not utilized since it did not provide a better structure than the use of four factors.

**Table 18. Rotated Factor Loadings**

<b>Item</b>	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>	<b>Factor 4</b>
<b>TMS1</b>	-.08	<b>.90</b>	.06	-.16
<b>TMS2</b>	.06	<b>.89</b>	-.14	-.06
<b>TMS3</b>	.03	<b>.92</b>	-.07	-.05
<b>TMS4</b>	.04	<b>.83</b>	-.12	.16
<b>TMS5</b>	.06	<b>.89</b>	-.06	.01
<b>TMS6</b>	-.02	<b>.77</b>	.18	.02
<b>TMS7</b>	-.08	<b>.83</b>	.18	.05
<b>CO1</b>	-.11	.03	.04	<b>.84</b>
<b>CO2</b>	.07	.10	-.02	<b>.70</b>
<b>CO3</b>	.04	-.06	-.07	<b>.69</b>
<b>CO4</b>	.15	.06	.00	<b>.60</b>
<b>CO5</b>	-.04	-.12	-.03	<b>.61</b>
<b>CO6</b>	-.05	-.04	.03	<b>.60</b>
<b>TR1</b>	.02	.05	<b>.87</b>	.08
<b>TR2</b>	.05	.14	<b>.83</b>	.04
<b>TR3</b>	-.01	.00	<b>.87</b>	-.01
<b>TR4</b>	.07	-.09	<b>.53</b>	-.22
<b>TR5</b>	-.04	-.11	<b>.78</b>	.01
<b>SU1</b>	<b>.81</b>	.06	.01	-.03
<b>SU2</b>	<b>.88</b>	-.02	.05	-.10
<b>SU3</b>	<b>.85</b>	.03	-.02	.08
<b>SU4</b>	<b>.90</b>	-.05	.02	.04
<b>SU5</b>	<b>.82</b>	.04	.01	-.03
<b>SU6</b>	<b>.86</b>	-.02	.07	.05
<b>SU7</b>	<b>.94</b>	-.03	-.07	-.01
<b>Eigenvalues</b>	7.63	4.05	3.45	2.67

Notes: N = 110. Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TRNG = Employee Training, SU = System Use.

### Multiple Linear Regression Analysis

Multiple linear regression is used to predict and explain the relationship between the independent variables and the dependent variable. Multiple regression has been used to determine the extent to which one or more independent variables are able to predict the dependent variable (Hair et al., 2006). Multiple regression has been utilized to examine

the regression coefficients of a study's independent variables in order to develop an explanation for the effects of the independent variables on the dependent variable (Kutner, Nachtsheim, Neter, and Li, 2005). According to Boone H. and Boone D. (2012), an instrument that includes a series of questions that when combined measure a particular factor is considered Likert scale data, and the use of means is appropriate to describe Likert scale data (Boone, H. and Boone, D., 2012). For this reason, items from each construct were averaged and a multiple linear regression model applied to establish the relationship between the four independent variables (TMS, inter-organizational communication, employee training, and system use) and the dependent variable (PVM use).

### **Test of Assumptions**

The assumptions of normality, independence, homoscedasticity (constant variance) of the error terms, as well as linearity of the phenomenon must be tested in the case of multiple linear regression (Kutner et al., 2005; Hair et al., 2006). If these assumptions are not met, then the tests of predictive significance for the model cannot be trusted to be valid (Hair et al., 2006). It is also appropriate to identify influential outliers that are substantially different in regard to the independent variables. Analyses of these assumptions are presented in the following sections.

#### ***Normality.***

The most frequent assumption violation encountered is nonnormality of the independent or dependent variables or both variables (Seber, G.A., 2004). A histogram of each independent variable and the dependent variable was checked for visual

approximation of normal distribution. Figure 6 illustrates these histograms with the normal curve overlaid. As demonstrated by the histograms displayed in Figure 6, none of the study variables grossly depart from normality.

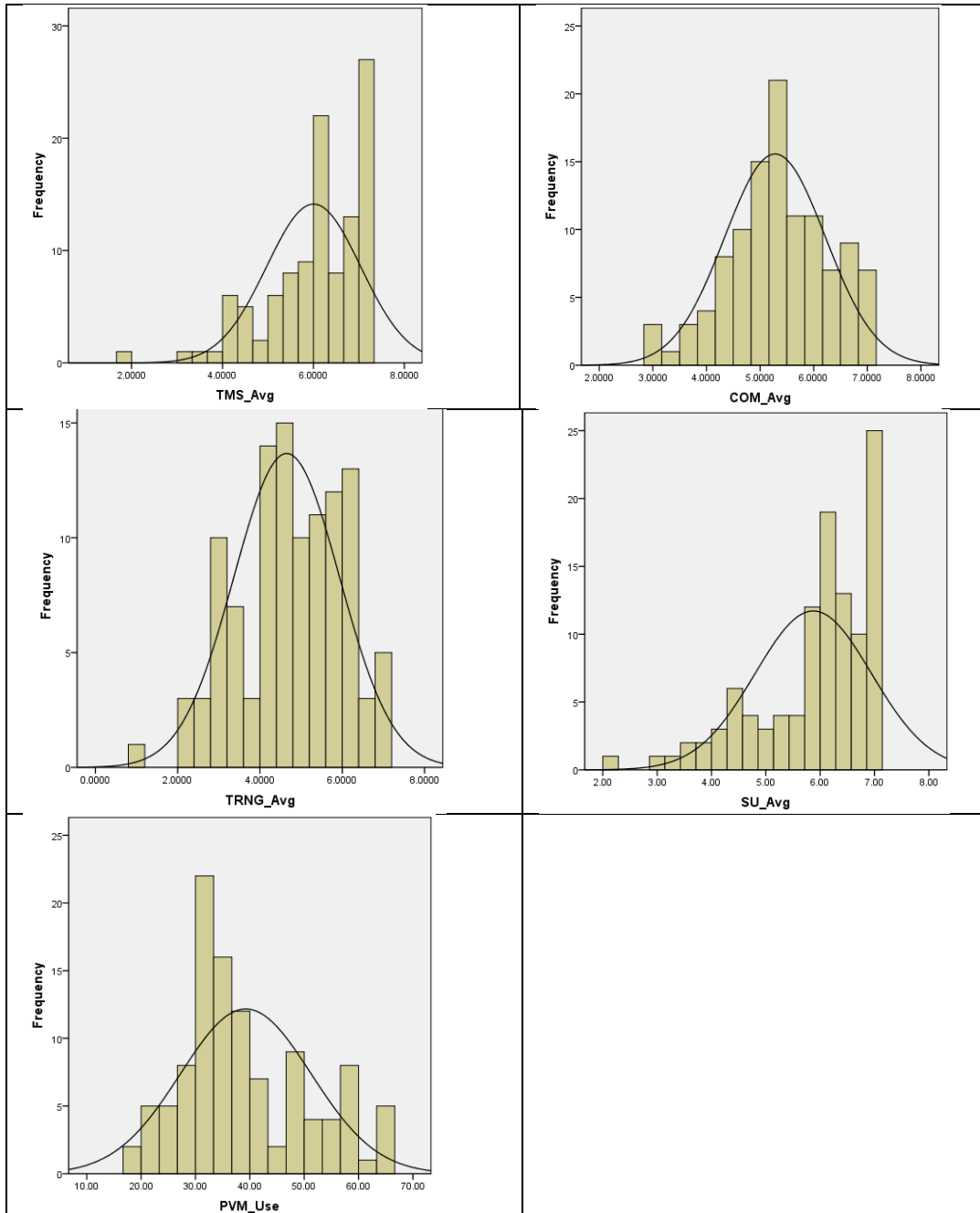


Figure 6. Histograms of Each Variable

An analysis of the skewness and kurtosis of each variable is displayed in Table 19. The results suggest that the data do not suffer from extreme skewness or kurtosis. West, Finch, & Curran (1995) constitute severe nonnormality as skew greater than 2 and kurtosis greater than 7. As such, these data plots and measures of skewness and kurtosis provide sufficient evidence of normality at the variable level and suggest that transformations for these variables are not required. Furthermore, textbooks of biostatistics commonly refer to linear regression exclusively in the perspective of normally distributed residuals (Altman, 1991; Fisher and van Belle, 1993; Kleinbaum et al., 1998).

**Table 19. Skewness and Kurtosis Analysis**

<b>Construct</b>	<b>TMS</b>	<b>CO</b>	<b>TR</b>	<b>SU</b>	<b>PVM</b>
<b>Skewness</b>	-1.31	-.22	-.31	-1.11	.64
<b>Kurtosis</b>	1.99	-.25	-.44	.87	-.50

Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TR = Employee Training, SU = System Use, PVM = Medical/Surgical Prime Vendor. N = 110.

A histogram of the studentized residuals with the normal curve overlaid is displayed in Figure 7. The studentized residual is the most widely used form of the residual and will be the standardized form used for this study to make the residuals directly comparable (Hair et al., 2006). As demonstrated by the histogram, the residuals do not appear to grossly depart from normality. Further assessment of normality of the residuals of the hypothesized model was performed with the Kolmogorov-Smirnov (K-S) goodness of fit test at the .05 significance level. The hypothesized model refers to the

full model and includes all four hypothesized predictors (TMS, CO, TRNG, and SU). The K-S test was performed within SPSS version 18. In this study, the K-S statistic was calculated to be .10 with a significance level of  $p < .009$ . The results can be found in Table 20 and suggest that the residuals of the hypothesized model are nonnormal.

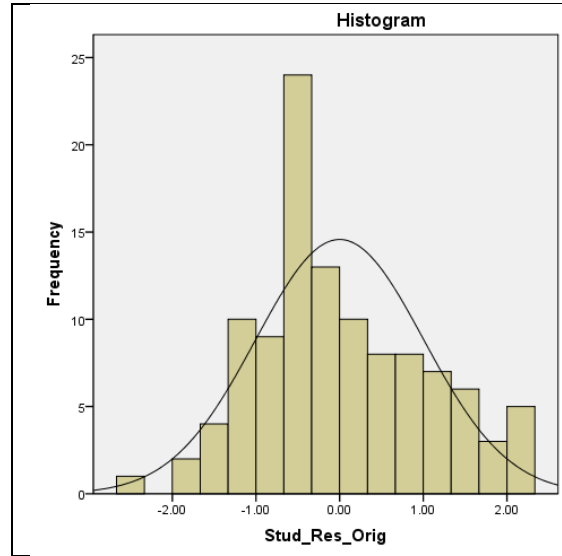


Figure 7: Histogram of Studentized Residuals

**Table 20. K-S Test for Normality**

Construct	Statistic	df	Significance
Residuals	.1	110	.009

Notes: df = degrees of freedom.

Kleinbaum et al., (1998) noted that normality is not necessary for the least-square fitting of the regression model and that only extreme departures of the distribution of the dependent variable from normality yield false results. A remedial measure for model



deficiency is a transformation to the response and/or predictor variables (Kutner et al., 2005). Specifically, transformations on the response variable may be helpful when the distribution of the error terms are nonnormal (Kutner et al., 2005). A Box-Cox Transformation was applied to the response variable in order to determine the appropriate power transformation required (Kutner et al., 2005). The Box-Cox Transformation provided by JMP version 10 is displayed in the formula below:

$$\text{Transformed PVM Rate of Use} = \text{Log}(\text{PVM Use}) * 37.51 \quad (3)$$

A histogram of the results can be found in Figure 8 and suggest that the residuals of the model, which include the independent variables and the transformed dependent variable, are normal. Furthermore, the K-S statistic was calculated to be .06 with a significance level of  $p < .2$ . The results can be found in Table 21 and suggest that the residuals of the hypothesized model are statistically normal.

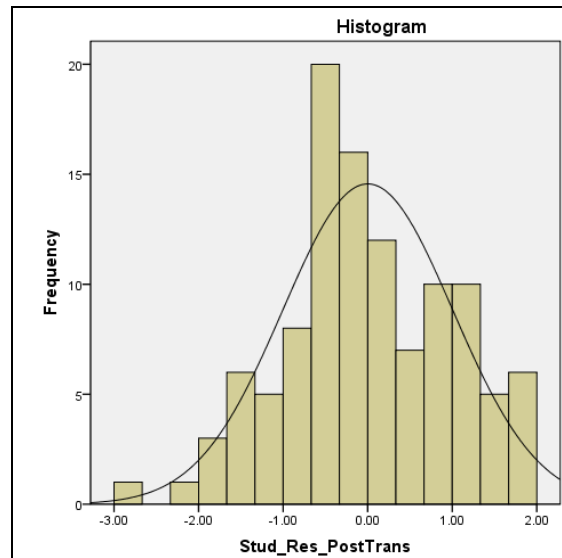


Figure 8. Histogram of Residuals (Post Transformation)

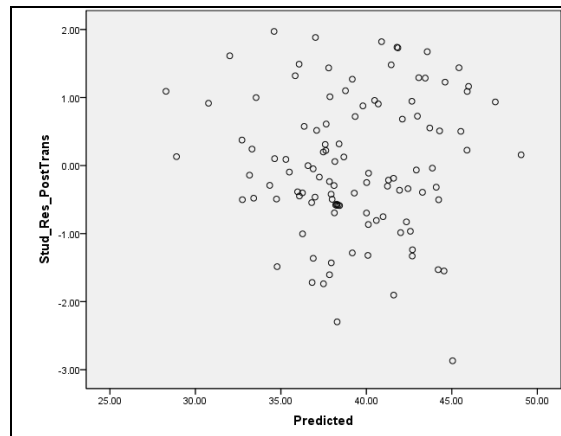
**Table 21. K-S Test for Normality (Post Transformation)**

Construct	Statistic	df	Significance
Residuals	.06	110	.2

Notes: df = Degrees of freedom.

***Independence.***

If the residuals are independent, then the plotting of the residuals against the predicted dependent values should appear completely random (Hair et al., 2006). The residuals are displayed in Figure 9 and appear random and without a consistent pattern. As such, this plot provides sufficient evidence of independence of the residuals and suggests that remedial measures for these variables are not required.



**Figure 9. Plot of Residuals against Predicted (Post Transformation)**

***Homoscedasticity.***

Homoscedasticity (equality of variance) is diagnosed with the use of residual plots or simple statistical tests (Hair et al., 2006). A plot of the residuals against the

predicted value displayed in Figure 9 displays no systematic pattern. Additionally, the Breusch-Pagan test, a large-sample test, is used to test for the constancy of error variance (Kutner et al., 2005). The test statistic was calculated to be 4.96, which provides evidence at the .05 level of significance to support the assumption of constancy of the error variance (Kutner, 2005).

### ***Outliers.***

The plot of the residuals against the predicted values depicted in Figure 9 is utilized to determine if outliers are present. Examination of this plot suggests the presence of some outliers. A more detailed analysis was performed and found that these cases do not appear to be a function of data entry error (Hair et al., 2006). Additionally, these cases appear normal and representative of any observation within the population (Hair et al., 2006). For these reasons, the outliers were retained in the study to ensure generalizability of the results to the entire population since there was no substantive reason for their removal from the data set (Hair et al., 2006). Furthermore, the influence of these outliers was measured with the Cook's distance (CD) measure (Kutner et al., 2005). A CD measure greater than one is considered large and deemed as an influential outlier (Stevens, 1984). The largest CD measure was calculated to be .06, which suggests that the previously identified cases are not considered to be influential outliers (Stevens, 1984).

### ***Linearity.***

The linearity of the relationship between the independent variables and the dependent variable can be examined with plots of the residuals against each independent

variable (Kutner et al., 2005; Hair et al., 2006). These plots are used to determine whether the relationship between the independent variables and the dependent variable is linear thus appropriate for multivariate linear regression (Kutner et al., 2005). Figure 10 depicts a plot of the studentized residuals against each independent variable. Nonlinearity is not present because there are no curvilinear patterns present (Hair et al., 2006). For this reason, the assumption of linearity is met therefore multivariate linear regression appears to be appropriate for this study (Kutner et al., 2005).

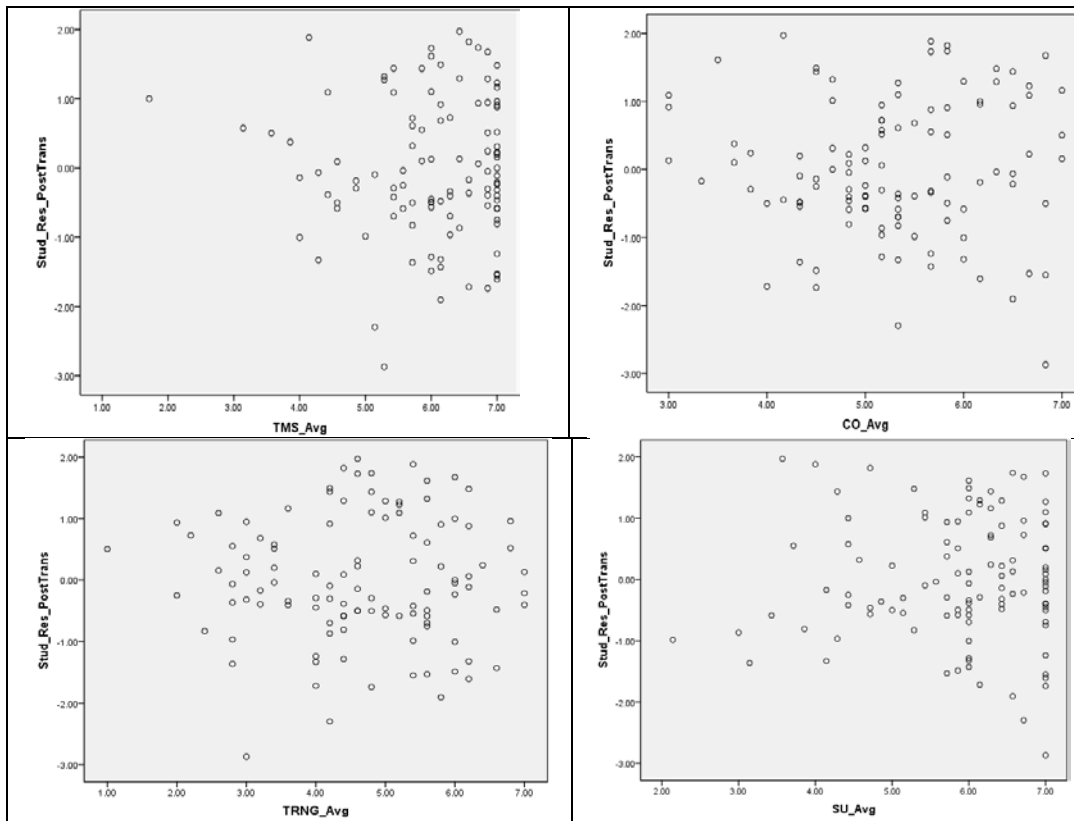


Figure 10. Plots of Studentized Residuals against Independent Variables

## Results of Multiple Regression Analysis

This study employed stepwise regression for data analysis. Data analysis was conducted via SPSS version 18 software. The independent variables were analyzed to determine which are statistically related to the dependent variable. First, the full model, which includes all four independent variables (TMS, TRNG, CO, and SU), must be analyzed in order to determine the statistical significance of each variable for hypothesis testing. Once the significant variables are identified, a reduced model based on parsimony is developed with the least amount of independent variables that explain the greatest amount of variance in the dependent variable (Hair et al., 2006; Hazen, 2012). To create the parsimonious model, a backwards elimination approach is applied. A .05 significance level was utilized for the parameters of interest as the threshold for an independent variable to remain in the model.

The full model captured all independent variables regressed against the transformed dependent variable. The results of this analysis are found in Table 22. The results suggest that the model is significant at the  $p < .05$  level ( $F_{110} = 2.55$ ;  $R^2 = .09$ ; Adjusted  $R^2 = .05$ ). The amount of variance explained by the full model,  $R^2$ , is a surprisingly low .09. The adjusted  $R^2$  value, .05, corrects the  $R^2$  value to account for the number of predictors thus is a more appropriate measure for this study (Hair et al., 2006). Inter-organizational communication is shown to be the sole significant predictor of PVM use at the .05 significance level. The Variance Inflation Factor (VIF) values of each independent variable suggest no cause for concern with multicollinearity since the largest value (1.14) is well below the general threshold of 10 (Hair et al., 2006).

**Table 22: Parameter Estimates (Full Model)**

<b>Term</b>	<b>Estimate</b>	<b>Std Error</b>	<b>T Ratio</b>	<b>Prob &gt;  t </b>	<b>VIF</b>
Intercept	121.74	9.23	13.18	<.0001	0
TMS Avg	1.64	1.09	1.51	0.13	1.14
CO Avg	2.52	1.14	2.20	0.03	1.04
TRNG Avg	-1.42	0.86	-1.64	0.10	1.10
SU Avg	-0.40	1.04	-0.38	0.70	1.12

Notes: TMS = Top Management Support, CO = Inter-organizational Communication, TRNG = Employee Training, SU = System Use. VIF = Variance Inflation Factor. N = 110.

The backward elimination approach of stepwise regression was applied in order to remove independent variables that do not contribute significantly from the model (Hair et al., 2006; Hazen, 2012). This systematic approach uses the level of significance of each variable based on results from the full model in order to determine the order to remove variables. The approach was applied within SPSS version 18. The results of the reduced model are illustrated in Table 23. The regression model is significant at the  $p < .016$  level ( $F_{110} = 5.93$ ;  $R^2 = .05$ ; Adjusted  $R^2 = .04$ ). Inter-organizational communication is shown to be the sole significant predictor of PVM use thus is the only factor retained in the reduced model. The adjusted  $R^2$  value, .04, is only slightly less than that of the full model which suggests that although much more parsimonious, the reduced model is just as useful to predict PVM use.

The statistical assumptions necessary for linear regression were assessed for the reduced model. Analysis of the studentized residuals of the reduced model, through graphical plots and statistical tests, verified the assumptions of normality, independence,

homoscedasticity, and linearity (Hair et al, 2006). Additionally, the residuals lacked the presence of any influential outliers. Based on these assumptions, the tests of predictive significance for the reduced model can be trusted to be valid (Hair et al, 2006).

**Table 23. Parameter Estimates (Reduced Model)**

<b>Term</b>	<b>Estimate</b>	<b>Std Error</b>	<b>T Ratio</b>	<b>Prob &gt;  t </b>
Intercept	121.48	6.05	20.09	<.0001
CO Avg	2.75	1.13	2.43	.02

Notes: CO = Inter-organizational Communication. N = 110.

### **Results of Hypothesis Tests**

The results of the multivariate linear regression, included above, provide the foundation for rejecting or failing to reject this study's hypotheses. The statistics gathered from the full model are used for the testing of the hypotheses; however, use of the reduced model would lead to the same conclusions in regard to hypothesis testing. Note that Hypothesis 4: Perceived ease of use of the DMLSS system for PVM requisitions is positively related to PVM use and Hypothesis 5: Perceived usefulness of the DMLSS system for PVM requisitions is positively related to PVM use have been combined to form one hypothesis since the two constructs were combined to form system use. The associated p-values for TMS, employee training, and system use are greater than the usual threshold of .05 for statistical significance; therefore, hypotheses 1, 3, and 4 are not supported. The associated p-value for inter-organizational communication is less than the usual threshold of .05 for statistical significance; thus, Hypothesis 2 is supported. The results are found in Table 24.

**Table 24. Summary of Hypotheses Results**

<b>Hypothesis No.</b>	<b>Hypotheses</b>	<b>Support</b>	<b>Sig.</b>
<b>1</b>	TMS of the PVM program is positively related to PVM use.	No	.13
<b>2</b>	Inter-organizational communication between medical logistics personnel and the PV representative is positively related to PVM use.	Yes	.03
<b>3</b>	Employee training on PVM procedures is positively related to PVM use.	No	.10
<b>4</b>	Perceived ease of use and perceived usefulness of the DMLSS system for PVM requisitions is positively related to PVM use.	No	.70

Notes: TMS = Top Management Support, DMLSS = Defense Medical Logistics Standard Support, and PVM = Medical/Surgical Prime Vendor. N = 110.

### **Results of Comment Content Analysis**

A summary of the content analysis applied to the 42 survey comments received is displayed in Table 25. Respondents' comments were content analyzed via MAXQDA software. Analysis revealed a comprehensive list of factors that influence PVM use. This research effort measured the extent to which top management support (TMS), inter-organizational communication, employee training, perceived ease of use, and perceived usefulness influence PVM use. Four of the five variables proposed were noted as recurring themes throughout the transcribed comments; however, TMS neglected to be mentioned. Inter-organizational communication was mentioned 16 times which supports the statistical finding of this research. This finding further supports the positive relationship between inter-organizational communication and PVM use. It is important to note that usefulness was mentioned on six occurrences. Lack of product availability, issues with the units of measure carried, and training were each mentioned five times. Each theme to include its number of occurrences is listed in Table 25.



**Table 25. Results of Comment Analysis**

<b>Theme No.</b>	<b>Theme</b>	<b>No. of Occurrences</b>
<b>1</b>	Inter-organizational communication	16
<b>2</b>	Usefulness	6
<b>3</b>	Availability	5
<b>4</b>	Unit of measure	5
<b>5</b>	Training	5
<b>6</b>	Ease of use	4
<b>7</b>	Standardization	2
<b>8</b>	Delivery Time	1
<b>9</b>	Cost	1

### **Summary**

This chapter presented the findings of this research effort. The individual-level demographics as well as the construct-level descriptives were presented and discussed. Reliability of each measure was verified via reporting of the Cronbach's alpha, mean, and standard deviation for each construct. The statistical assumptions necessary for linear regression and the analyses utilized to test these assumptions were described. Each investigative question was addressed in the order it was presented and the results of the multiple regression applied were presented. These results served as the support for rejecting or failing to reject each hypothesis. The results of the content analysis of the respondents' comments were presented.

## **V. Conclusions and Recommendations**

### **Overview**

This chapter provides the conclusions and recommendations for this research effort. Implications of the significant factor as well as implications of the non-significant factors are addressed to ensure that the requirements have been met by the research conclusion. The significance of the research is examined for its potential application and benefit to the Air Force Medical Supply Chain. Lastly, the limitations of the study are addressed and the opportunities for future research are discussed. The conclusion and recommendations are presented based on the findings from the data analysis.

### **Implications of Significant Factors**

The only factor found to be a significant predictor of PVM use is inter-organizational communication ( $\beta = 2.75$ ,  $t = 2.43$ ,  $p = .02$ ). Inter-organizational communication accounts for more than 4% of the variance in PVM use for the Air Force Medical Supply Chain. Inter-organizational communication is defined as the collaboration between organizations to include the sharing of critical information and knowledge (Paulraj et al., 2008). In the context of this study, inter-organizational communication refers to the communication between the buyer (medical logisticians at the MTF) and the supplier (the designated PV representative). Effective inter-organizational communication must be frequent, genuine, and include personal contact between buyer and supplier (Carr and Pearson, 1999).

The findings of this study suggest that inter-organizational communication between medical logistics personnel and the PV accounts for 4% of PVM use. This

finding corroborates previous research that demonstrated how open and frequent communication assists the development of the buyer-supplier relationship, which may create mutual benefits for both parties involved (Kale et al., 2000). Realization of these mutual benefits reinforces the importance of inter-organizational communication to increased use of the PVM program.

### **Implications of Non-Significant Factors**

Inter-organizational communication was found to be a significant predictor of PVM use; however, three variables addressed in this study were found to be non-significant predictors of PVM use. The findings defy the results of Phase 1 of the mixed methods approach applied to this study. Each construct that was hypothesized to be a significant predictor of PVM use but found to be non-significant is discussed. Closer examination of these variables reveals possible explanations for why some hypotheses of this study were not supported.

#### ***Strategy-Structure-Performance Factors.***

Only one of the three factors hypothesized to be a structural element that facilitates increased PVM use was found to be a significant predictor of PVM use. TMS ( $\beta = 1.64$ ,  $t = 1.51$ ,  $p = .13$ ) and employee training ( $\beta = -1.42$ ,  $t = -1.64$ ,  $p = .10$ ) were surprisingly found to be non-significant predictors of PVM use even though literature and theory supported their significance. Additional research is necessary to determine if these facts were non-significant because of the phenomenon being studied (PVM use) or the setting (Air Force Medical Supply Chain). More research is appropriate to determine if these factors are simply not predictors of PVM use. There may be additional mediators

of the relationship between these factors and PVM use that are yet to be discovered. This study is the first of its type to examine the factors and the extent to which they affect PVM use thus it is difficult to ascertain what mediator factors may be present. Extant literature suggests that TMS and employee training are critical to IS utility (Dong, Neufeld, Higgins, 2009) and to advancements in organizational performance (Russell, Terborg, and Powers, 1985; Bartel, 1994; Knoke and Kalleberg, 1994) hence additional consideration should be given to these factors in future research.

### ***Technology Acceptance Model Factors.***

None of the TAM factors, which consider how likely an organization's employees are to accept an innovation, was found to be significantly related to PVM use. Neither perceived ease of use nor perceived usefulness ( $\beta = -.4$ ,  $t = -.38$ ,  $p = .7$ ) was found to be significant predictors of PVM use. The results imply that just because an innovation is accepted by users does not ensure its regular use. The results are surprising since the literature and theory suggested they would support PVM use. Future research could examine potential mediating factors of the relationship between technology acceptance and use. Referring to Bagozzi, Davis, and Warshaw (1992), there are constraints to the intention to act. For example, an intention to use a system may be formed but actual use is inhibited by some external factor (Bagozzi et al., 1992). Furthermore, it may be that the effect of technology acceptance on PVM use is fully mediated by social influence processes and cognitive instrumental processes as suggested by the TAM 2 (Venkatesh and Davis, 2000).

## **Implications for Practice**

By identifying the factors and the extent to which they influence PVM use, this thesis provides insight for researchers interested in affecting human behavior in logistics and supply chain management within the civilian sector as well as the military community. Data from the AFMOA suggests that it is possible for Air Force medical logisticians to save the Air Force and DoD approximately \$425K annually with the conversion of 2.1K line items to the PVM program, based on previous twelve month purchase history (JMAR, 2013). These figures represent line items from 76 Air Force bases and do not include potential savings for Davis Monthan AFB or Kadena AFB. First, the AFMOA can use the findings of this study to determine where to focus its efforts to increase use of the PVM program in an attempt to capture these cost savings. To this end, it appears that ensuring inter-organizational communication between medical logisticians and the PV may be a sound first step toward increased rates of use for the PVM program. Within inter-organizational communication procedures, policies as well as expectations could be outlined to include frequency of communication (i.e., weekly, monthly, or quarterly) and type of communication (i.e., telecom or face-to-face). Finally, the AFMOA should promote and monitor use of inter-organizational communication with the PV throughout the Air Force Medical Supply Chain. The findings of this research effort suggest that establishment of such guidance and ensuring that medical logisticians adhere to such policies will have the greatest impact on PVM use.

Although only one of four variables in the model was found to be a significant predictor of PVM use in the Air Force Medical Supply Chain, all four variables may provide a research-based starting point in regard to factors that leadership can consider

when examining the factors that influence PVM use. The AFMOA as well as leadership at the base level can use these factors to employ organizational initiatives geared toward increasing PVM rates of use. Additionally, efforts can advocate for improvements to the existing PVM contract as well as updates to the DMLSS system which would help to facilitate increased PVM use.

### **Limitations**

Although a thorough study, there are limitations to this research that could impact the generalizability and the validity of the results. Generalizability of a study is limited by any research effort that utilizes a specific research setting in an attempt to make inferences about the target population (Hair et al., 2006; Hazen, 2012). In this research effort, the respondents were all representatives of medical logisticians within the Air Force Medical Supply Chain. While they did represent multiple job roles, MTF types, military tenures, and locations, they do ultimately belong to the same higher organization (Skipper, 2002). A wider range of respondents could make the results of this research effort more generalizable (Skipper, 2002). Though the PVM program is isolated to the military, the use of a preferred supplier is not. Any understanding gained from the identification of factors that influence preferred supplier use through our civilian counterparts could be useful.

Other limitations include biases associated with survey method research. This research effort utilized actual organizational PVM use as the response variable since PVM use is exclusively tracked at the organizational level. There are different ways to measure use such as actual use as well as perceived use (DeLone and McLean, 1992).

Studies have utilized perceived measures of use by questioning users about their use of an IS system (Raymond, 1985). The use of an organizational level response variable could threaten the validity of the conclusions formed about the relationships between measures. Finally, there is bias within the PVM rate of use calculation. These figures do not take into account items purchased via means other than the PV because the required items were not available through the PV. For example, individual preferences by physician providers may dictate required items at a particular MTF or there may be equipment compatibility issues.

### **Recommendations for Future Research**

Future research opportunities include the introduction of other constructs such as the themes identified in the content analysis of respondents' comments as well as the addition of mediator variables (Hazen, 2012). For example, research in the field of implementation of and compliance with standardization could prove to be advantageous. Standardization has the potential to improve availability and accuracy of materiel master data, reduce overall materiel costs, and reduce materiel variation. Additionally, capturing the deviation rationale from PVM use at the point of procurement will provide information on non-use. A waiver process for non-use of the PV for medical/surgical items could capture the information on non-use along with cost implications of not doing so. The data captured from the abovementioned strategies could serve as the springboard for future increases to PVM use. Furthermore, future efforts might include a longitudinal study to determine if the relationships of the variables change over time with PVM contract modifications or DMLSS system upgrades (Skipper, 2012). Additionally, an

alternate method of data analysis could be employed or an alternate response variable could be applied (Hazen, 2012). For example, a perceived measure of use could be utilized as the response variable which entails questioning users about their individual use of the PVM program (Raymond, 1985). Finally, the development of a metric that more accurately measures PVM use could prove to be beneficial. The current metric is biased because it does not take into account items purchased via means other than the PV, because required items were not in the DAPAs therefore unavailable through the PV.

### **Conclusion of Research**

Five hypotheses were initially proposed, of which, only one is supported. Inter-organizational communication is a significant predictor of PVM use. Inter-organizational communication with the PV accounts for 4% of the variance in PVM use in the Air Force Medical Supply Chain. This section described the implications of this finding. The factors deemed non-significant and the implications of these findings were also discussed.

This study has contributed on both a practical and a research level. For the AFMOA, this effort provides a better understanding of the factors that influence and the extent to which they influence PVM program use. In a time of fiscal uncertainty, budgetary constraints, and manpower reductions, this foundation might prove useful. The information garnered from this research should enable the AFMOA to focus its efforts on the elements of the PVM program which produce increases to PVM use. This academic research is the first of its type to have been applied to PVM use within the Air Force medical logistics setting hence establishes the framework for improvements to



PVM rates of use. There is, however, still much work to be done in the area of PVM use. For this reason, the AFMOA must continuously seek to identify the factors that influence PVM use and to develop methods to combat the impacts of these factors.

The application of Strategy-Structure-Performance (SSP) theory allows for the development of structural elements such as inter-organizational communication between medical logisticians and the PV to increase PVM program use. By applying SSP theory, and more specifically the inter-organizational communication element, this study establishes the theoretical framework for the importance of establishing an effective relationship between the buyer (medical logisticians) and the supplier (PV). Studies of inter-organizational communication demonstrate that communication must be frequent, genuine, and include personal contact between buyer and supplier personnel (Carr and Pearson, 1999). Furthermore, open and frequent communication assists the development of this relationship, which may create mutual benefits for both parties involved and produce solutions to product issues in a timely manner (Carr and Pearson, 1999; Kale et al., 2000).

## Appendix A. Institutional Review Board Approval



DEPARTMENT OF THE AIR FORCE  
AIR FORCE INSTITUTE OF TECHNOLOGY  
WRIGHT-PATTERSON AIR FORCE BASE OHIO

14 August 2013

MEMORANDUM FOR MAJ ROBERT E. OVERSTREET

FROM: Alan R. Heminger, Ph.D.  
AFIT IRB Research Reviewer  
2950 Hobson Way  
Wright-Patterson AFB, OH 45433-7765

SUBJECT: Approval for exemption request from human experimentation requirements (32 CFR 219, DoDD 3216.2 and AFI 40-402) for study on Prime Vendor Usage for Medical/Surgical Items.

1. Your request was based on the Code of Federal Regulations, title 32, part 219, section 101, paragraph (b) (2) Research activities that involve the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior unless: (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) Any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
2. Your study qualifies for this exemption because you are not collecting sensitive data, which could reasonably damage the subjects' financial standing, employability, or reputation. Further, the demographic data you are collecting and the way that you plan to report it cannot realistically be expected to map a given response to a specific subject.
3. This determination pertains only to the Federal, Department of Defense, and Air Force regulations that govern the use of human subjects in research. Further, if a subject's future response reasonably places them at risk of criminal or civil liability or is damaging to their financial standing, employability, or reputation, you are required to file an adverse event report with this office immediately.

  
ALAN R. HEMINGER, PH.D.  
AFIT Research Reviewer

cc Lori Kinder, ENR

## Appendix B. Survey Cover Letter



**DEPARTMENT OF THE AIR FORCE**  
AIR FORCE MEDICAL OPERATIONS AGENCY  
SAN ANTONIO TEXAS

15 January 2014

Air Force Medical Logistics  
693 Neiman Street  
Fort Detrick MD 21701

Fellow Log Dog,

The Air Force Medical Service operates in an ever-changing, fiscally-burdened environment that necessitates maximum use of programs that streamline the medical supply procurement process, such as the Medical/Surgical Prime Vendor (PVM) contract. Recent budget cuts and force restructuring have required the AFMS to do more with less, and as we evolve to respond to these changes, maximization of the PVM program is essential to the success of Air Force Medical Logistics.

Therefore, I have asked Capt Amber El-Amin, an MSC in the Logistics and Supply Chain Management Master Degree program at the Air Force Institute of Technology, to study the factors that influence utilization of the PVM program. Awareness of these issues will allow us to devise a deliberate plan to successfully capture the full benefits of this program and ultimately, increase its use.

As a log dog, you have been selected to participate in a survey that will aid Capt El-Amin in the identification of these factors. The results of this study will be critical to our PVM efforts going forward; and therefore, your participation is invaluable.

Please take approximately 10 minutes to complete the Prime Vendor Usage for Medical/Surgical Items Survey at <http://surveys.afit.edu/index.cfm?id=27&stid=2701>.

Direct any questions to Capt Amber El-Amin at [amber.el-amin@afit.edu](mailto:amber.el-amin@afit.edu).


Thank you for your assistance in this important endeavor.

Sincerely

A handwritten signature in black ink, reading "Duane M. Bragg".

DUANE M. BRAGG, Col, USAF, MSC, FACHE  
Chief, Medical Logistics Division

## Appendix C. Survey Instrument



# Vendor Usage for Med/Surg Items

AN AIR FORCE INSTITUTE OF TECHNOLOGY SURVEY

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**SCN: AF13-206SGA: 11/25/2013 - 12/31/2013**

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### Privacy Notice

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The following information is provided as required by the Privacy Act of 1974:

**Purpose:** The purpose of this study is to determine the factors that influence the usage of the medical/surgical Prime Vendor (PVM) contract at Air Force medical treatment facilities located in the continental United States. The results will be utilized to assist the Air Force Medical Operations Agency (AFMOA) in its effort to increase PVM contract usage.

**Participation:** Participation is strictly **VOLUNTARY**. You are not required to participate in this survey. Link to the list of Air Force approved surveys: <https://www.my.af.mil/gcss-af/USAF/ep/browse.do?programId=t2D8EB9D6297405FA012980243147010A&channelPageId=s5FDEA9F02134FFA70121351677C80048>.

**Confidentiality:** We would greatly appreciate your participation. **ALL ANSWERS WILL BE KEPT STRICTLY CONFIDENTIAL**. We cannot provide confidentiality to a participant regarding comments involving criminal activity/behavior, or statements that pose a threat to yourself or others. Do NOT discuss or comment on classified or operationally sensitive information.

---

### Instructions

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- Base your answers on your own thoughts and experiences.
- Please make your answers clear and concise when asked to answer in a response or when providing comments.
- Be sure to select the correct option button when asked.

---

### Contact information:

---

If you have any questions or comments about the survey, contact Amber El-Amin at the number, fax, mailing address, or e-mail address listed below.

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Capt Amber El-Amin  
Air Force Institute of Technology  
2950 Hobson Street WPAFB, OH 45433  
Phone: 785-3636 x4458  
Email: [amber.el-amin@afit.edu](mailto:amber.el-amin@afit.edu)

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START SURVEY

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**NOTICE & CONSENT BANNER:**  
*Use of this DoD computer system, authorized or unauthorized, constitutes consent to monitoring of this system. Unauthorized use may subject you to criminal prosecution. Evidence of unauthorized use collected during monitoring may be used for administrative, criminal, or other adverse action. Use of this system constitutes consent to monitoring for these purposes.*



## Vendor Usage for Med/Surg Items

AN AIR FORCE INSTITUTE OF TECHNOLOGY SURVEY

Page 1 of 7

	None	1-6 months	7-12 months	13-18 months	19-24 months	25 months or more
	1	2	3	4	5	6
1. Please indicate how much experience you have had with the PVM program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CONTINUE

Page 1 of 7



## Vendor Usage for Med/Surg Items

AN AIR FORCE INSTITUTE OF TECHNOLOGY SURVEY

### Page 2 of 7

With respect to the PVM program, please indicate your extent of agreement with your top management's (immediate supervisor) support.

	Strongly Disagree	Disagree	Slightly Disagree	Neither Disagree nor Agree	Slightly Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
2. Top management is interested in the PVM program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Top management understands the importance of the PVM program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Top management supports the PVM program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Top management considers the PVM program a strategic function.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Top management understands the benefits of the PVM program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Top management keeps the pressure on personnel to procure items through the PVM program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Top management involvement with the PVM program is strong.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CONTINUE

### Page 2 of 7



## Vendor Usage for Med/Surg Items

AN AIR FORCE INSTITUTE OF TECHNOLOGY SURVEY

Page 3 of 7

Please indicate your extent of agreement with your organization's communication with the PV.

		Strongly Disagree	Disagree	Slightly Disagree	Neither Disagree nor Agree	Slightly Agree	Agree	Strongly Agree
		1	2	3	4	5	6	7
9.	The PV provides us with any information that might help our organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10.	We provide the PV with any information that might help its organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.	Exchange of information takes place in a timely manner.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12.	Logistics personnel and the PV keep each other informed about events or changes that may affect the other party.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.	We have frequent face-to-face planning/communication with the PV.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.	We exchange performance feedback with the PV.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CONTINUE

Page 3 of 7



## Vendor Usage for Med/Surg Items

AN AIR FORCE INSTITUTE OF TECHNOLOGY SURVEY

### Page 4 of 7

Please indicate your extent of agreement with your organization's PVM training program.

	Strongly Disagree	Disagree	Slightly Disagree	Neither Disagree nor Agree	Slightly Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
15. My organization has an extensive PVM training process for employees in our unit.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. My organization places a great deal of priority on training employees in our unit on the PVM process.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. My organization has a formal or structured PVM training process.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. All acquisitions personnel have been trained on the PVM process this past year.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. My organization offers multiple PVM training programs for employees in our unit to attend.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CONTINUE

### Page 4 of 7





## Vendor Usage for Med/Surg Items

AN AIR FORCE INSTITUTE OF TECHNOLOGY SURVEY

### Page 5 of 7

Please indicate your extent of agreement with your perceived ease of use of the DMLSS system with respect to the PVM program.

		Strongly Disagree	Disagree	Slightly Disagree	Neither Disagree nor Agree	Slightly Agree	Agree	Strongly Agree
		1	2	3	4	5	6	7
20.	With respect to the PVM program, learning to operate the DMLSS system is easy for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21.	With respect to the PVM program, I find it easy to get the DMLSS system to do what I want it to do.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22.	With respect to the PVM program, my interaction with the DMLSS system is clear and understandable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23.	With respect to the PVM program, I find the DMLSS system easy to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CONTINUE

### Page 5 of 7



## Vendor Usage for Med/Surg Items

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### Page 6 of 7

Please indicate your extent of agreement with your perceived usefulness of the DMLSS system with respect to the PVM program.

		Strongly Disagree	Disagree	Slightly Disagree	Neither Disagree nor Agree	Slightly Agree	Agree	Strongly Agree
		1	2	3	4	5	6	7
24.	With respect to the PVM program, using the DMLSS system increases my productivity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25.	With respect to the PVM program, using the DMLSS system improves my job performance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26.	With respect to the PVM program, using the DMLSS system enhances my effectiveness on the job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CONTINUE

### Page 6 of 7



## Vendor Usage for Med/Surg Items

AN AIR FORCE INSTITUTE OF TECHNOLOGY SURVEY

Page 7 of 7

	None 1	1-6 months 2	7-12 months 3	13-18 months 4	19-24 months 5
27. Please indicate how much experience you have had with the PVM program in the last 24 months.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	6 months or less 1	7-12 months 2	13-18 months 3	19-24 months 4	25 months or more 5
28. How long have you held your current position?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

29. Please provide any comments, concerns, and/or recommendations on how to improve the PVM program.	<div></div>
30. Please select your job role within the medical logistics flight or select other.	<div></div>
31. If other was selected above, please enter your job role within the medical logistics flight.	<div></div>
32. Please select your base or select other. (Listed in alphabetical order)	<div></div>
33. If other was selected above, please enter your base.	<div></div>

FINISH

Page 7 of 7

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## Vita

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Her first assignment was to Wright-Patterson AFB, Ohio as a medical logistics intern in February 2009. In April 2010, she was assigned to the 14th Medical Support Squadron, Columbus AFB, MS where she served as Flight Commander for both the Medical Logistics and Medical Information Systems flights.

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14. ABSTRACT <p>This thesis employed a mixed methods approach to address the root causes of less than optimal use of the Medical/Surgical Prime Vendor program. Using techniques from qualitative research, interviews were conducted with subject matter experts to better understand the phenomena. A grounded theory approach was applied and content analysis performed to identify recurring themes within the transcript data. These data were used to select five constructs that appear to influence Medical/Surgical Prime Vendor contract use. Through the theoretical lenses of the Strategy, Structure, and Performance model as well as the Technology Acceptance Model, a theoretical model was developed. To measure the influence of these factors on contract use, a survey instrument was developed using existing, validated scales for each construct, and sent to all MTFs within the CONUS. Analysis of the data using regression disclosed that all hypotheses were supported. The amount of variance in contract use accounted for by the hypothesized model was XX%. The outcomes of this project maintain a direct positive relationship between top management support, inter-organizational communication, employee training, perceived ease of use, and perceived usefulness on Medical/Surgical Prime Vendor use. Suggestions of the research are discussed as well as limitations and opportunities for further research.</p>					
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