SHOP AROUND: AN EXPERIMENT ON AIR FORCE VEHICLE PARTS PROCUREMENT

THESIS

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Abstract

Current procurement processes for vehicle parts vary substantially across the Air Force. Many of these parts are “commercial off-the-shelf” items that are procured through local vendors via a government purchase card. Understanding what guidance dictates various purchasing processes and how that guidance affects the behavior of purchasers is unknown. A mixed method approach of semi-structured interviews of purchasers at multiple bases and an experimental survey testing different sets of guidance are used to understand the effects of guidance. as well as produce recommendations for action and future research for leaders at the local and headquarters levels.

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SHOP AROUND: AN EXPERIMENT ON AIR FORCE VEHICLE PARTS PROCUREMENT

I. Introduction

General Issue

The role of many business and marketing practitioners is to understand why consumers patron one business instead of another. In the private sector, businesses live and die based on their understanding of this dynamic. Buyer behavior has been studied through many lenses including satisfaction, loyalty, comparison of alternatives, expertise, and previous knowledge, just to name a few (Alba & Hutchinson, 1987; Bettman, Luce, & Payne, 1998; Dick & Basu, 1994). Typically, studies have focused on how to account for consumer behavior to enable better advertisement or product presentation resulting in more sales. The internet and evolving technology has renewed interest in the topic with more recent studies being performed to determine how potential customers make choices while considering different computer-based interfaces (Fagerstrom, Arntzen, & Foxall, 2011).

Interpreting this research based on consumers, private and public organizations have also sought to maximize performance of their purchasing of goods required for their operations. Research has been conducted exploring this side of the interaction regarding how purchasers can reduce risk and increase performance by strategically selecting suppliers (Kirilmaz & Erol, 2017). Businesses have sought more effective purchasing methods, such as purchasing groups, and measuring performance of those groups (Nollet, Beaulieu, & Fabbe-Costes, 2017). Some findings include that purchase agents need expertise, a level of professionalism, and collaboration to be successful (Erridge, 2000).

The priority of boosting buyer performance emerged more recently in the public sector than in private business, but has become the focus of more and more research of late. This aligns with the idea that the public sector lags behind the private sector in most areas of business. Generally, there have been differences in how government organizations procure supplies compared to their private counterparts (Arlbjørn & Freytag, 2012). Although this has been the case in the past, recent research has found that the difference in procurement processes between government and private business is closing (Soudek & Skuhrovec, 2016). Soudek and Skuhrovec (2016) did note that the remaining gap still results in fewer efficiencies in government purchasing methods. In an effort to close this gap, the State Department modernized their purchasing procedures, resulting in the use of government purchase cards (GPCs) to give purchasers flexibility (Colaianni, 2005). The use of GPC was ideal for the State Department based on the locations of purchasers scattered across the world and desires for decentralized execution. This layout resembles how Air Force bases are distributed so according to these findings the Air Force's shift to purchases via GPC makes sense. Colaianni (2005) stated that the other keys to the success of the State Department were standardization and centralization of purchasing planning and collaboration between purchasers and suppliers.

Similarly, the United States Air Force has shifted to the use of GPCs for some functions to increase effectiveness of purchasers. Historically, the Air Force and other branches of the Department of Defense have used an internal supply system to procure and store parts. Procurement in these cases is performed at command or headquarters levels with stocking and purchasing behaviors made by complex systems and experienced supply professionals. This method is still used for some functions within the

Air Force, such as aircraft maintenance. An alternative system uses a contractor to stock and supply required parts. The Air Force uses some of these suppliers, referred to as COPARS (Contractor Operated Part Stores) (Bras, 1988). As early as 1981, the Government Accountability Office (GAO) had concerns with the COPARS system. Bras (1998) validated their concerns by discovering flaws in the COPARS system that led to inaccurate cost studies, inappropriate decisions, and inadequate contract controls. He recommended shifts away from the COPARS system, which largely has occurred since his work was published by Air War College in 1988, but the practice still exists in some capacity and is addressed in Air Force Instruction (AFI) 24-302 (Department of the Air Force, 2016b). Nearly all Air Force locations use the GPC process for procuring parts from commercial off-the-shelf sources, as it was determined to be more effective and was championed by many leaders in the Air Force as high as the Chief of Staff (Medina, Conley, Wright, Bishop & Rogers, 1998). In 1997, Air Force Chief of Staff Gen Roger Fogleman encouraged the major commands to maximize use of GPCs and suggested that up to 90 percent of purchases could be made through the card, if eligible.

This shift to GPC is very evident in the procurement of replacement parts for unscheduled maintenance on Air Force owned vehicles (Department of the Air Force, 2016b). Scheduled maintenance is exactly that: scheduled. It is not difficult to forecast what parts are needed and when, especially when looking at one location with a small number of any vehicle type. This includes oil, tires, filters, and other similar parts. Many of the parts for scheduled maintenance are still stocked in the supply system, but can be purchased off the economy, as well (Department of the Air Force, 2016b). Tires are specifically mentioned as being tracked in the Green Procurement Program and are

logged so that tires in the supply system can be compared to tires purchased off the economy via GPC.

Unscheduled maintenance is a completely different story. Neither leaders nor purchasers can precisely predict when a part is going to be required for an unscheduled repair. When vehicles break down, Materiel Control Airmen are charged with procuring the replacement parts needed to return the vehicles to service. A mechanic approaches purchase agents within Materiel Control with a part number or a Technical Order with the part needed circled or highlighted. It is then the responsibility of the purchase agent to conduct further research, purchase, and either pick up or arrange for the part to be delivered based on a predesignated timeline. In many cases, these vehicles are on a list of high priority vehicles with a Minimum Essential Level (MEL) (Department of the Air Force, 2016b). These vehicles must quickly be returned to service so if the required parts are not available they must be purchased and either delivered or picked up quickly. In these cases specifically, using a GPC to immediately order or pick up the needed part is very advantageous.

Medina et al. (1998) documented the differences between a supply based system, COPARS, and purchasing via GPC. They outlined the instructions for an Airman purchasing via GPC as shown in Figure 1. Although dated, the process is similar to what is still used today. Medina et al. did caveat the list by stating this was assembled from one base, Offutt Air Force Base, and that there are many other ways to manage the process.

ORDERING PARTS THROUGH THE PURCHASE CARD

1. Before ordering part(s) with the card, each day check the available balance in the Purchase Card Account.

2. Each Cardholder is allowed to purchase up to a specified amount each month. If unsure of the available balance in your individual account, contact the Purchase Card Bank.

3. Before accepting the VMPR ensure it is filled out completely. (Atch.1)

4. Verify with the mechanic that excess vehicles/parts were checked.

5. Insure item to be purchased is not available through Base Supply.

6. Determine which vendor you are going to use. Materiel Control offers a list of suggested vendors.

7. When contacting a vendor remember to mention who you are, and where you're calling from.

8. Ask vendor if they take VISA. (Materiel control should already know which vendors take VISA).

9. Supply vendor with applicable information on the part(s) to be ordered. Ask vendor for part number, price and availability.

   *If the price is over $50.00, check two more vendors. (Local procedures may vary)
   *Compare the prices and availability of each vendor selected.

10. Once you've selected a vendor, attach a PR to the VMPR.

11. Ask the vendor if the item(s) you're ordering has a warranty. If the item(s) has a warranty, write the length of the warranty next to the item(s) on the PR.

12. Ask the vendor for estimated deliver date (EDD).

13. Notify vendor that the purchase is ***tax-exempt***.

14. Supply vendor with your credit card number and expiration date.

15. Supply vendor with shipping instructions for parts delivery.

16. After order is placed, fill all the blocks on the PR.

17. If the item is *VDP or DEF*, insure the Purchase Request is annotated. (Atch. 2)

18. If you know, when ordering the item, that you will not be available to sign the Visa receipt upon delivery, request that the Visa receipt be marked as *PHONE ORDER*.

19. **NEVER** SIGN A VISA RECEIPT THAT IS NOT YOUR OWN!!!

20. A VMPR may have multiple items which may not all be available from one specific contractor. In that case, make separate PRs for the different vendors.

21. Make a copy of the VMPR for each different vendor and attach to the PR.

Figure 1: GPC Purchasing Process (Medina et al., 1998)

Unfortunately, the current process within Materiel Control used to purchase these parts does not emphasize some of the keys to success found from the State Department: standardization, centralization, and collaboration. AFI 24-302 Vehicle Management (Department of the Air Force, 2016b) stated, “Innovations in information technology, worldwide commercial delivery and government reforms have made internet parts sourcing through commercial vendors with BPA and the Government Purchase Card (GPC) a viable alternative to traditional parts acquisition methods. Aggressive use will be made of commercial style transportation parts delivery alternatives” (p. 59). Additionally, the AFI requires that purchase agents “ensure the most economical parts are purchased,” as well as requirements to consider rebuilt parts as long as they meet original equipment manufacturer (OEM) specifications, but provides no guidance on specific methods of researching parts or prices (p. 59).

The open-endedness of the guidance from Headquarters Air Force has advantages and disadvantages in implementation. Air Force bases are scattered across the world and are managed by multiple commands, each with their own priorities and culture. Regardless if this was the intent of the instruction or not, the vague guidance has resulted in each base determining its own processes on the purchase of parts via GPC. In some cases, the flexibility of Air Force guidance will enable local units to procure parts more efficiently and effectively due to their knowledge of the local area. If guidance were too strict, it would be difficult, or out of compliance, for local purchase agents to realize potential savings. Whether the vagueness results in flexibility in the process or dissimilar, inefficient processes is worth studying.

However, the source of the guidance is only part of the question the research needs to address. The human element of the purchaser should be considered. Each purchaser enters the position with their own experiences and therefore biases. Section 5.1.4 of the Air Force Instruction acknowledged that personnel supervising Materiel Control may not have experience or exposure with supply procedures so they must develop a basic understanding of the job (Department of the Air Force, 2016b). The actual purchasers must go through training through multiple programs to include contracting, Green Procurement, and information technology systems to become qualified to make purchases. The Career Field Education and Training Plan (CFETP) for Fleet Management and Analysis Airmen, which are the Airmen that typically fill this position, lists a 5-skill level Journeyman as a typical materiel control supervisor (Department of the Air Force, 2016a). Neither the CFETP nor the AFI lists any other specific instructions on when or who should be hired into Materiel Control, leaving discretion up to supervisors that may not have purchasing experience assigning personnel with widely varied experiences into this position. Civilians can also be hired as purchase agents, each having their own varied experiences and opinions. Local assigning and hiring procedures likely have an effect on who is responsible for purchasing which could have an effect on purchaser performance.

With attention on the purchasing guidance itself, the effect of the guidance on purchasers, and purchaser value opinions, this research seeks to inform leaders on how each affects the mission of the Vehicle Management Flight within a Logistics Readiness Squadron.

Problem Statement

The Air Force process for procuring parts required for unscheduled vehicle maintenance differs by unit across the service, which could result in a high degree of variability in cost and effectiveness of parts. By studying the methods that purchase agents use, the guidance that dictates those methods, and how effective the guidance is at shaping behavior of varied purchasers, this research seeks to assist decision makers in achieving vehicle in-commission rate goals while conserving budgetary spending.

Research Question

What different processes of procuring commercially available vehicle parts for unscheduled maintenance exist across the Air Force and how does guidance regarding those processes affect the behavior of purchase agents?

Research Focus

The wide variety of procurement processes at various bases will be reviewed. The attention of this research will be on GPC purchases, not through the supply system, COPARS, or blanket purchase agreements (BPAs). Additionally, the focus will be on replacement vehicle parts, not any other uses of GPC purchasing. Exactly how varied these vehicle part purchase processes are and what results these processes produce are unknown. Furthermore, how the more specific, local guidance actually affects purchasers is unknown. It is possible that purchasers could spend more or less money, could purchase more or less effective products, or even be completed unaffected by the additional guidance. A study of purchasing guidance regarding vehicle parts and the effects that the guidance produces has not been studied by the United States Air Force.

Investigative Questions

IQ 1: What official guidance from Headquarters Air Force exists that dictates purchasing behavior?

IQ 2: What current local guidance have units created to guide Materiel Control purchase agents?

IQ 3: How closely do purchase agents follow provided guidance?

IQ 4: How much time do purchase agents spend researching prices of parts?

IQ 5: What sources do purchase agents check for availability of parts?

IQ 6: Why do purchase agents use their chosen sources?

IQ 7: How do purchase agents personal opinions of value affect purchasing decisions?

IQ 8: In what situations would additional guidance from higher headquarters help units save time and money on vehicle parts?

Methodology

The present research will first explore what differences exist in purchasing guidance across the Air Force and how purchase agents perceived and utilized that guidance. A set of interviews were performed to serve that function at five different Air Force bases located in North America. Using that information, an experiment was designed to test how different stimuli affected purchasing behavior to determine what guidance affects purchaser behavior.

Limitations

The experimental survey is an adapted form of what actual purchasers face in the real world. However, the shopping environment on the internet is extremely varied and

dynamic. Each site has their own layout, interface, and billing functions. Also, that interface could change any day, without warning to the shopper. Ultimately, it is important that the participants make decisions in the same manner and reacted to the stimuli in the same way that purchase agents would in the real world at Materiel Control sections around the world. Therefore, it is important to replicate the actual environment as much as possible. Seeking direction from research, design was inspired by previous studies, principally Fagerstrom et al.'s (2010) study.

Implications

The implications of the research include a review of existing policies and the effects that some of those policies have on the behavior or purchase agents. The interviews will be summarized and will lead to a discussion of the existing policies. The discussion itself could result in better understanding of the process across various levels of leadership. The experiment provides a deeper dive into how individuals react to different policies without being affected by other outside influences. If leaders can understand how these policies affect their Airmen, they can standardize guidance or present it in a specific way to make purchasers more effective and/or efficient.

II. Literature Review

Chapter Overview

The purpose of this chapter is to explore the literature discussing purchasing in both the commercial and public sectors, the behavior and motivations of purchasers, and methodology of past studies on purchaser behavior. With those subjects in mind, theory was sought that could focus these topics to aid analysis.

Description

Theory

Spina, Caniato, Luzzini and Ronchi (2015) found that across the field of purchasing and supply management the theoretical foundations of research were weak. Therefore, a goal of this research is to apply theory to the topic at hand to fill the existing gap in literature. The starting point for this research is *A Theory of Buyer Behavior* (Howard & Sheth, 1969) which described how motives, that are shaped by the needs of the buyer, are mediated by information from the environment when determining and deciding between alternate courses of action, or purchasing of different brands of parts. The motives of the buyer in this case of this research is usually a part number that a mechanic presents to a purchase agent that the mechanic needs to complete a repair. Decision mediators are formed from the environment that the purchaser operates within and includes information from both commercial and social sources. In the case of purchasers within the Air Force, this includes guidance from their superiors or Air Force instruction to information presented on a commercial website.

Using information and experience, purchasers select a course of action of which brand of product they purchase. This process is a cycle of a buyer storing relevant information and establishing a routine in the decision making process. The social environment is considered an input in Howard and Sheth's (1969) model that affect sensitivity to information, then perceptual bias, then decision mediators, followed by predisposition, then attitudes, and finally purchase behavior. Howard and Sheth's model is complicated, to describe it simply, so the focus of this research will be to investigate the effects of information and perception on purchasing behavior as explained in the model (Figure 2).

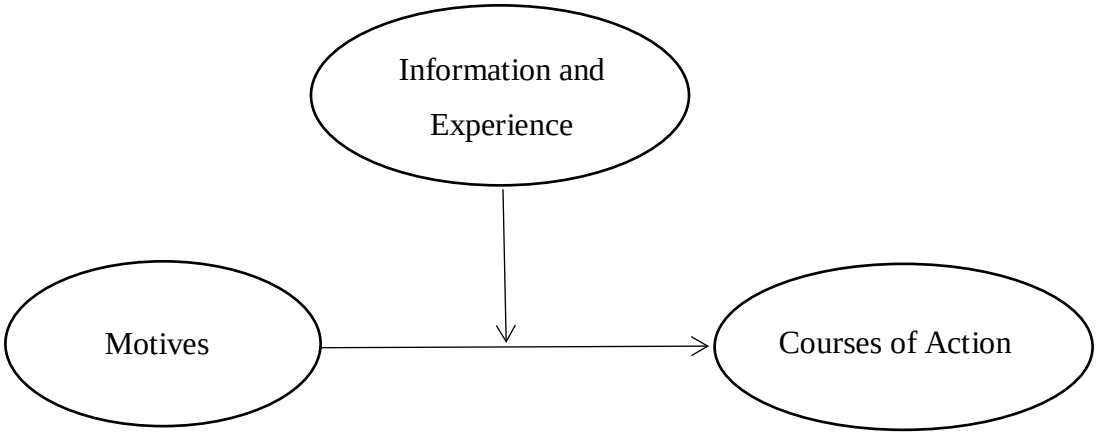


Figure 2: Motivation of Purchasers, adapted from Howard and Sheth (1969)

Howard and Sheth (1969) categorized their hypothetical constructs into the categories of information and perception based on Hull's learning theory, Osgood's cognitive theory, and Berlyne's theory of exploratory behavior (as cited in Howard & Sheth, 1969). The two frameworks for this research will each focus on one of their two hypothetical constructs.

This seminal work has guided many studies over the last few decades regarding the behavior of consumers. Although the purchase agents within Vehicle Management in

the Air Force are not consumers in the purest sense, they are buying commodities off of the commercial market, and may exhibit some of the same behaviors of consumers. This theory has led to a multitude of research of various methods to include surveys, case studies, and experiments (Nollet et al., 2017, Karimi, Papamichail, & Holland, 2015).

To more completely describe consumer behavior, Sheth, Newman, and Gross (1991) looked at consumption values to help understand why consumers make the choices they do regarding the purchasing of a specific product. Figure 3 lays out the five values influencing consumer choice. This research will focus on functional value as further explained by other researchers that expanded on Sheth et al.'s view.

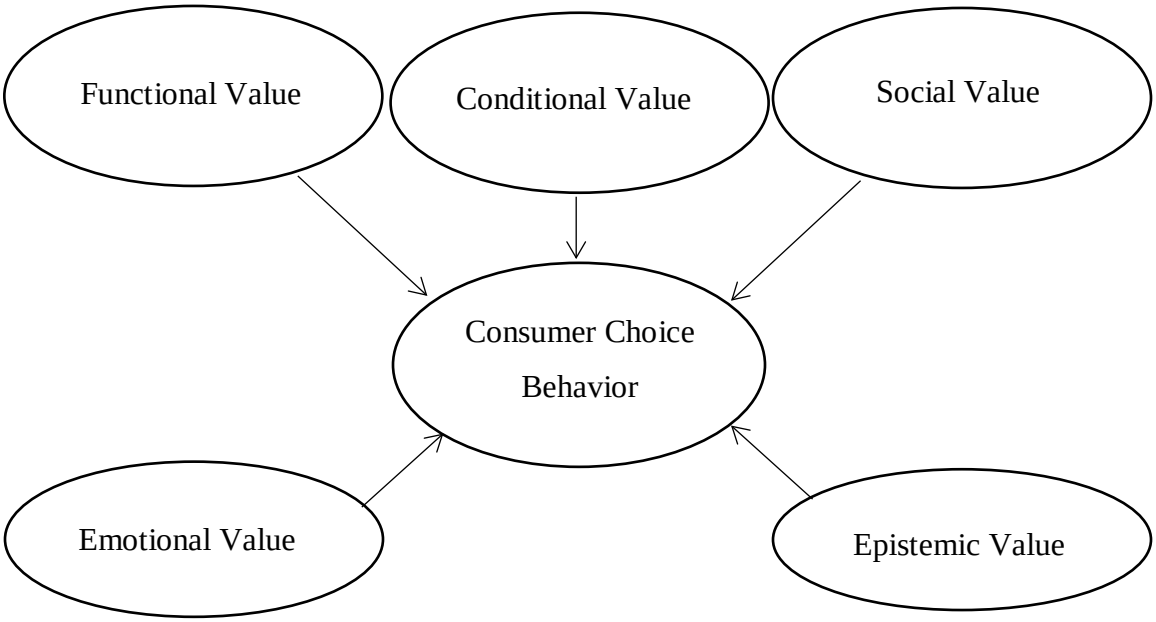


Figure 3: The Five Values Influencing Consumer Choice Adapted from Sheth et al. (1991)

Cronin, Brady, and Hult (2000) studied how quality, satisfaction, and value affected consumer choice when purchasing products. They verified that quality, satisfaction, and value are all directly related to behavioral intentions of purchasers, see

Figure 4. Their concept of service value emerged from another piece of research by Zeithamel (1998) in which she established service value as a kind of perceived value, or the overall assessment of the utility of a product based on consumer perceptions.

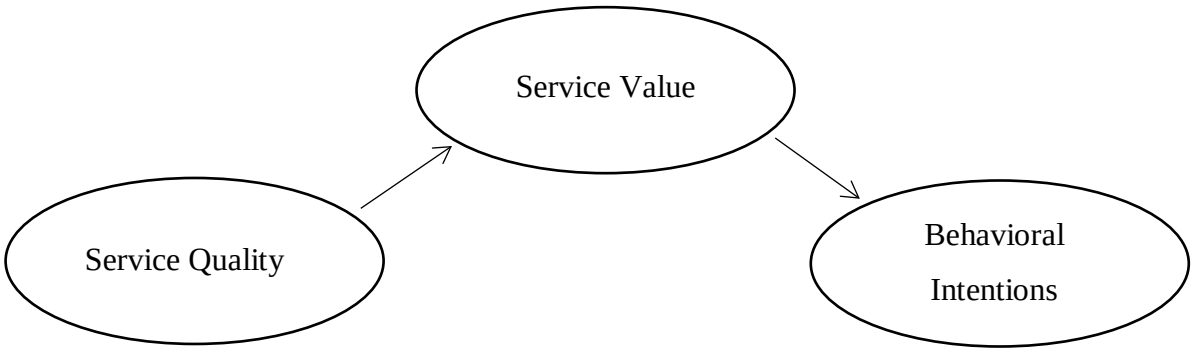


Figure 4: Results of Comprehensive Model Testing Adapted from Cronin et al. (2000)

With these studies in mind, a gap in literature exists in studying the behavior of purchase agents within the government, specifically within a military setting as in the current topic.

Relevant Research

As with many subject areas, there is a potential for there to be a difference in processes between how purchasing is performed in commercial versus public organizations. These differences could be expected based on the disparate goals and policies in commercial and public organizations. If organizations have different procurement processes, there is a possibility that the difference creates a different outcome in the success of a purchasing program. Arlbjørn and Freytag (2012) conducted a thorough review of literature in an attempt to discriminate between public procurement and private purchasing. They found that the different conditions that public and private organizations are subjected to force differences into their processes. Specifically, public

organizations are held to a different standard in transparency and competitive practices to encourage fair and open competition between commercial sources. Private organizations are not held to that same standard, and therefore has been able to innovate new purchasing relationships and realize efficiency and effectiveness improvements. Soudek and Skuhrovec (2016) also found different procedures used by public organizations and found the differences did affect effectiveness of procurement, mainly impacting price paid. However, Arlbjørn and Freytag (2012) identified a new trend that public organizations are becoming more like private organizations. Although their methods are still somewhat different regarding procurement of goods and services, the gap is closing. The assumption then, is that if public organizations are becoming more like private organizations, research and theory applied to private purchasing may be able to be applied to public procurement. This is advantageous since studies of government procurement are few in number, but if the aperture is opened to include studies of consumer or private companies the analysis may be more fruitful, especially with concern to purchaser behavior, which is discussed later.

Studies of public procurement are not non-existent, however. Colaianni (2005) investigated the State Department and distilled some best practices for government purchase card programs to be successful. Standardization, centralization, and collaboration were noted as being important for their success. Standardization of processes to include logging, practices and guidance were considered important. Centralizing management, but allowing for decentralized execution of the program was considered a best practice, as well. Finally, collaboration between purchasers, credit card associations, and finance personnel was a key to success.

It could be argued that the Air Force's system for parts procurement is weak in these three areas. Standardization of purchasing processes across bases is not monitored resulting in different locally determined processes. Some could protest that purchasing at different bases must be different to take advantage of different local circumstances, but the State Department has separated purchasing centers in the same way that the Air Force does. Collaboration between purchasers at bases is not occurring, either. In the case of collaboration, the need for standardization is essentially a prerequisite that the Air Force does not fulfill. Purchasers rotate through positions with only local training and little experience that is not shared between bases.

Erridge (2000) agreed that collaboration is important for organizations to reap the most benefits from their procurement processes. He also stated that expertise and professionalism were beneficial elements of purchasing operations for an organization. Air Force purchase agents within the vehicle management function receive little training and, as previously mentioned, are only temporarily assigned to the position. The Air Force used to have supply professionals assigned to perform this function, but then shifted to having Vehicle Management and Analysis Airmen fill the position. The experience of these incoming purchase agents likely affects their behavior, as well.

Purchaser Behavior and Motivations

Many factors influence purchaser behavior as explained by Howard and Sheth (1969). As briefly discussed earlier, their motives are based upon their needs for a given product. Given those motives, a set of rules called decision mediators are used to match motives with alternate course of action. In this case a motive would be a requirement for

a vehicle part that needed to be replaced. Howard and Sheth (1969) stated that information and experience are the two sources of learning within decision mediators that affect the selection behavior of purchasers. The implications from this work can influence how experience could affect the effectiveness and performance of purchase agents in the Air Force if a trend can be identified.

Alba and Hutchinson (1987) expanded on the concept of experience by separating the effects of familiarity and expertise. Over time experience leads to expertise so that purchasers can better solve problems and perform research versus novices. Even when novices find solutions that are as effective as experts, they tend to take longer to find that solution. Karimi, Papamichail, and Holland (2015) studied the effects of consumer decision making style and knowledge of product in an online environment and found that consumers with more information and knowledge of a product are better decision makers with research taking less time than those with little knowledge of a product. The same conclusion of buyers with experience finding solutions more quickly has been verified by other researchers, as well (Anderson, Engledow, & Becker, 1979; Moore & Lehmann, 1980).

However, other researchers have found the complete opposite conclusion, that experience makes it easier to process more information, which leads to more research (Johnson & Russo, 1984; Punj & Staelin, 1983). Brucks (1985) found that in complex usage situations that relationship held true, but not in simple situations.

Finally, even another relationship has been proposed in that an inverted-U shaped relationship exists based on prior knowledge and amount of searching for alternatives (Bettman & Park, 1980). This explains disagreements between the different studies, but

still has some detractors that could not find this relationship even when testing for it (Punj & Staelin, 1983).

Other research has examined the effects of information from the environment on behavior of purchasers. Bettman et al. (1998) studied how consumers cannot process all information in some purchasing situations and require a selectivity strategy. A selectivity strategy focuses the consumers attention on information perceived to be relevant to achieving their goals. The researchers explained that different strategies have advantages and disadvantages for different situations and can produce different results. The purchasing situation for vehicle parts could be considered to be an information rich environment that would likely requires some sort of selectivity strategy to find the best alternative for a needed part.

There has been disagreement between researchers on the effect of information rich environments (Keller & Staelin, 1989, Meyer & Johnson, 1989). To avoid this disagreement, Bettman et al. (1998) suggested the use of a framework that studies only how consumers become selective as information increased, or seeing if their shopping strategy changed as information changed. The strategy used by purchasers within the Air Force can either be dictated by their environment, as in supervisor preference or local policy, or left flexible as was defined in the Air Force Instruction.

Another influence of selective strategy is loyalty of a consumer. A purchaser can choose to frequent one business over another for many reasons (Dick & Basu, 1994). Some social or situational factors influence loyalty of consumers. Dick and Basu (1994) stated that these factors could change buyers' attitudes and result in variance in purchase behavior. An interpersonal influence could shift the preference of a buyer and result in a

different purchase that would be expected under their selective strategy. Specifically, if loyalty for a brand or specification exists, purchasers choose to spend less time searching for alternatives. This concept was verified by other researchers (Newman & Staelin, 1972). Understanding how loyalty of purchasers could affect purchasing behavior of parts within the Air Force is valuable to managers and policy makers. Clearly, explaining purchasing behavior has proven difficult, but creative methodology has been proposed to help obtain generalizable results.

Methodology of Past Studies on Purchaser Behavior

Brucks (1985) discussed how consumer behavior research studies focusing on knowledge of product have taken various forms to include self-rating and quizzing subjects. An important advance in consumer research, information display boards (IDBs) have been used to test consumers search processes more specifically than previous studies (Brucks, 1985). However, these studies are a simulation that presents solutions to purchasers more simply than the real world in which purchasers must form their own representation of solutions to brand choice problems. Brucks proposed using a computer that requires purchasers to search for alternatives using whichever attributes they please, which can be returned by the computer or a hidden experimenter. Brucks' method claimed greater external validity than previous IDB studies.

Fagerstrom et al. (2011) sought to understand how loyalty affected purchasing behavior of subjects. Like Brucks had more than 20 years earlier, they used computers to create an experiment to study purchase preference. Their use of a closed-setting

experiment allowed them to control reinforcement provided to subjects which limited interaction with researchers and allowed for detailed, accurate recording.

Wang and Hazen (2015) explored what could influence perceived value and therefore the purchase intentions of consumers. They focused on the difference between perceived value of remanufactured versus new products, a relevant topic to the current research. They found that providing quality knowledge affected perceived value of remanufactured parts with consumers, as shown in Figure 5.

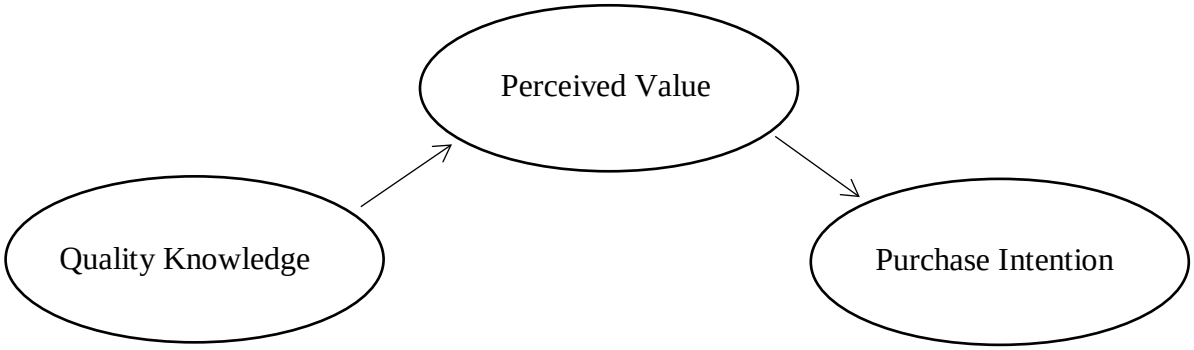


Figure 5: A Framework for Purchaser Behavior Adapted from Wang & Hazen (2015)

The work was an elaboration on previous work by Hazen, Overstreet, Jones-Farmer, and Field (2012) in which the researchers found that consumers are willing to pay for remanufactured products based on their perceived quality of those products. This relationship could be tested in an experimental survey setting to determine if this relationship holds.

Proposed Research

Figure 6 shows the first framework for the research. The independent variable to be studied is information available to purchasers, in the form of specificity of purchasing

guidance. The dependent variables include effectiveness of purchase behavior, in the form of purchase price, and loyalty, in the form of variability of vendor patronage.

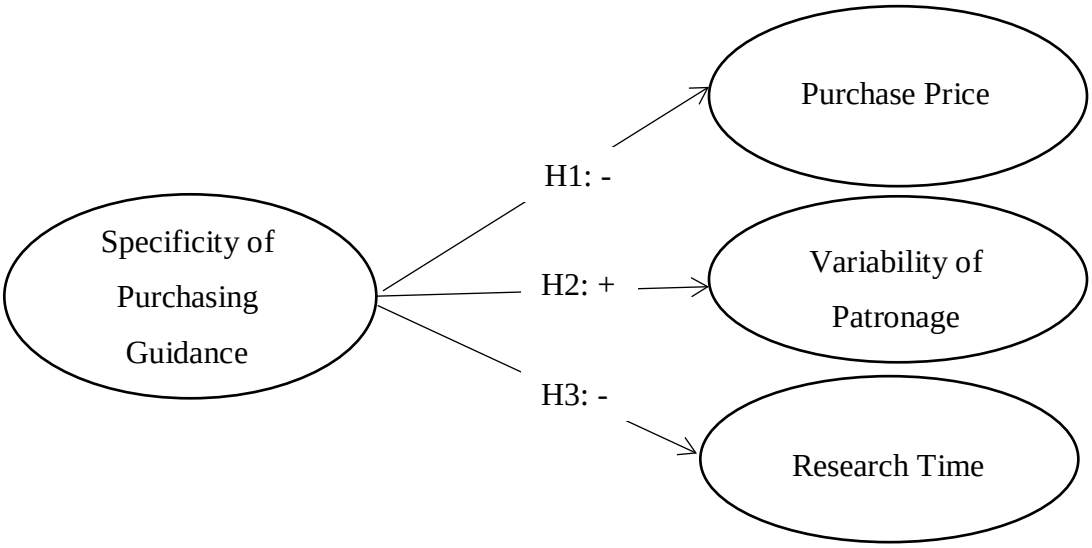


Figure 6: A Framework for Guidance and Purchaser Behavior

H1: Specificity of guidance inversely influences purchase price of goods

H2: Specificity of guidance positively influences the variability of stores patroned by purchasers

H3: Specificity of guidance inversely influences the amount of time purchasers spend on researching parts

A number of factors in Howard and Sheth's (1969) model were not examined based on difficulty experienced by other researchers or potential pitfalls in examining their effects in this case. Experience is difficult to study and has not been clearly established as having a consistent effect on behavior. A statistical control for experience will be performed, but it is difficult to find a varied and representative sample of experience relative to the population of purchase agents in Materiel Control.

Additionally, purchasers for the Air Force do not require any specialized experience before being selected to the position so a focus primarily on experience would not be as helpful as the information input of Howard and Sheth's model. However, experience data will be collected to check for any bias or effect.

The first framework would not explicitly determine how buyers would perceive value besides the actual decision to purchase an item. Marrying Howard and Sheth's (1969) Theory of Buyer Behavior, Cronin et al.'s (2000) concept of service and perceived value, and Hazen et al.'s (2012) findings on effects of consumer perception affecting , the fourth hypothesis focuses on if initial attitudes effect perceived value of products.

H4: People with positive initial attitudes toward new products have a higher perceived value of purchased new products than people without positive initial attitudes toward new products

III. Methodology

Chapter Overview

The purpose of this chapter is to define and explain the methodology used in this research. The research is of a mixed methods design (Creswell, 2009), with the first qualitative phase consisting of semi-structured interviews of purchase agents at different Air Force installations. The first segment of the research includes semi-structured interviews with actual purchasers within Materiel Control shops around the Air Force in an attempt to understand the different purchasing guidelines they follow and how that affects their behavior. Also during this segment, historical documents, or the written guidance that purchasers use, are collected and analyzed.

Using the first segment as a guide, the second, quantitative segment composed of an experimental survey will measure effects of two differing sets of guidance on purchasing behavior of participants. The goals of both phases is to better understand why purchasers make their purchasing decisions and what influences them in doing so.

Qualitative Phase

The first phase of the study was necessary to help define what guidance shapes behavior of actual purchase agents. The fact that written guidance exists does not necessarily mean the guidance is followed or that purchasing behavior isn't driven by another source. To understand the variety of sources of guidance that influences the decision making process of purchasing replacement parts, the purchase agents were asked a variety of questions to determine what was important to their decision making processes.

The interview questions, shown in Appendix A, primarily focused on exploring existing guidance at both the Air Force and local levels. Additionally, the interviews sought insight into purchase agent's methods and agent demographics. Relating the interview back to the theory at hand, the research was seeking to identify meditators of information and experience, as described by Howard and Sheth (1969). A better understanding of the mediators could help improve the design of the second phase of the research. The questions in the interview were open-ended to allow for a wide variety of potential responses that each purchase agent could have based on their different processes and experience.

The first group of questions focused on guidance pertaining to parts research and the purchase process. This included approval required for purchases, the guidance dictating approval, and how guidance affects price paid for parts. Finally, the last question in the first group asked about how records are kept, which could influence the learning function of purchasers. The second group of questions aimed to understand what levels of experience purchasers have, both inside and outside of Materiel Control, and how the individual could affect the purchasing process. The questions also attempted to discern if there are any rules or trends on how agents are assigned, how experienced they are prior to assignment, how personal preference affects purchasing, and how they actually perform the purchasing process.

In total, eight purchase agents at five different Air Force Bases all located within North America were selected to be interviewed. These locations were selected due to their purchasing processes fitting into the scope of this research and their willingness to participate in the research. Face-to-face interviews were conducted, when possible, in

accordance with Kvale's (2007) guidelines. When possible, at each location multiple purchase agents were interviewed individually to attempt to limit interaction between purchasers affecting responses. Three of the five locations offered more than one interviewee. Especially between junior purchasers, an unbiased response to the interview questions were desired, which could be threatened by having another purchaser or supervisor present. As the interviews progressed, the interview questions and methods were refined by the researcher to explore more details. In addition to interviews, historical documents were collected. These consisted of any local operating instructions (OIs) and any other documentation acted as guidance for GPC purchasing.

Interviews were recorded and the interviewer took detailed notes, an according to Cresswell's (2009) six step process. This was accomplished by organizing notes by source of information before being reviewed by the researchers to understand the data as a whole. The data is shown in Table 1, which summarizes the common areas addressed by OIs and interviews.

The categories used relate to the theories being used in the research. Warranty relates to functional value as defined by Sheth et al. (1991). He defined functional value as an item's capacity for functional, utilitarian, or physical performance. A total of 7 of the 13 sources described some sort of warranty guidance that they use to make purchasing decisions. Guidance on warranties varied from a simple "inquire about warranties" to one purchaser stating they would pay 15-20 percent more for a warranty if it was available.

Table 1: Interview/Document Review Results

Source	Warranty	Condition (New/Rebuilt)	Research Process	Vendor Rotation	Comparison Tools	Experience Required
OI 1	X			X		
Int 1-1			X		X	X
Int 1-2			X		X	X
OI 2	X	X	X		X	
Int 2-1		X			X	
OI 3	X	X	X	X	X	X
Int 3-1	X	X			X	X
OI 4	X		X	X	X	
Int 4-1	X				X	X
Int 4-2		X			X	X
OI 5					X	
Int 5-1	X		X		X	X
Int 5-2		X	X	X	X	
Total	7/13	6/13	7/13	4/13	12/13	8/13

The condition regarding new or rebuilt parts was noted by 6 of the 13 sources. It was surprising that two of the five OIs discussed this since it is already stated in the Air Force Instruction, making a reference in a local OI redundant. Guidance on the research process was relatively thin with 7 of the 13 sources mentioning it, but only 2 having substantial guidance. Two interviewees stated that they follow their leadership's general guidance, but there was no formal research process. Two OIs, on the other hand, had

significant instructions on how to research parts to include direction to conduct telephone surveys with store managers. Both of these OIs referenced using experience of supervisors and repair technicians. The rotation of vendors category related to guidance requiring the purchasing parts from varied stores and not continually buying from one source. This was cited by only 4 of the 13 sources, but it was mentioned that this is discussed in the GPC AFI provided by contracting, making references here redundant. However, it was interesting that purchasers didn't reference this more in the same fashion that part condition had a redundant reference.

The most consistent result was that 12 of the 13 sources cited some sort of tracking or comparison tool. These tools are used by purchase agents to help them understand how much parts have been purchased for or how much they should cost if purchased again. The tools ranged from using a simple purchase log to complex database application that can be used to search for previous purchase sources and prices. The interviewee that mentioned that program recommended a more centralized program would provide purchasers more information to make purchasing decisions and reduce research time for parts. Experience was noted by 7 of the 13 sources, but in a more complex way than just explaining the experience of the actual purchaser. All seven of the responses, to include one OI, noted that the purchaser didn't need any significant experience when entering into the position, but they should leverage the experience from supervisors, coworkers within Materiel Control, or mechanics on the shop floor.

Quantitative Phase

Design

After achieving saturation of information through the interview process, the quantitative phase of the experiment was designed using the results from the qualitative results. It was also designed to answer the investigative questions the qualitative phase could not and to test the hypotheses presented.

The experimental design was similar to the study by Fagerstrom et al. (2010) in which the researchers tested how loyalty affected customers purchase habits in an online shopping experiment. Their simulation consisted of two sets of 35 items to be researched and purchased which are presented either under the same circumstances, in this case a specific reward schedule, or with the second set being under a different set of circumstances, a different reward schedule, from the first.

To create a similar experiment, the researcher developed a macro-enabled Excel workbook to function as a self-contained survey for ease of administration. First, participants were asked about their attitude toward new or rebuilt parts, as shown in Appendix B. This was used to determine the respondents' initial attitudes about new and remanufactured processes to test hypothesis four. This question is asked at the beginning of the survey to limit the influence of quality knowledge on their responses to this question since Wang and Hazen (2015) determined that shift in value could occur.

Once the initial attitude question was answered, participants were randomly assigned to one of two groups using a random number generator function built into the software. The two groups included: a control group that received the guidance available from the AFI, and a treatment group that had more specific guidance. The concept of the

survey was to determine if these two sets of guidance induced different behaviors by purchasers; specifically, will respondents react according to the relationships established in the hypotheses of this research? After completing the survey, the participants completed a short survey asking what guidelines they used to purchase the items they chose to purchase, which was similar to the method used by Fagerstrom et al. (2010).

Crafting each set of guidance was important since details of each could potentially influence respondents could react and influence the results of the survey. The control guidance, shown in Figure 7, used a replacement AFI number, so that respondents did not feel a need to look up further entries in the instruction that could influence their decisions. Besides this alteration, the entries included are identical to those found in the actual AFI.

AFI 240-312

Chapter 5 – Materiel Control

Section 5.2 Responsibilities for Purchasers

…

5.2.18. Ensure the most economical parts are purchased. Order the least expensive part (including rebuilt items) when shop records do not show poor performance, less service life or reliability problems with rebuilt items.

5.2.19. Query parts dealers to ensure new, rebuilt or after-market parts for all vehicles and equipment meet or exceed original equipment manufacturer (OEM) specifications before ordering parts.

Figure 7: Control Guidance

The specific guidance was based on the responses from the qualitative portion of the research. The first addition was a simple entry stating that purchasers should rotate vendors, as shown in 5.2.20 of Figure 8. The text was copied from a local OI from the qualitative portion of the research. The second addition was created based on a purchase

database provided by an interviewee. The guidance was provided on each page of the survey so that participants were able to review the information at their leisure.

Chapter 5 – Materiel Control

Section 5.2 Responsibilities for Purchasers

…

5.2.18. Ensure the most economical parts are purchased. Order the least expensive part (including rebuilt items) when shop records do not show poor performance, less service life or reliability problems with rebuilt items.

> 5.2.18.1 Purchase agents will query the Purchased Parts Pricing Database (PPPD) to compare recent history of purchase prices of the part being researched to prices being asked by vendors. This information should help purchasers narrow down the range of potential cost.

5.2.19. Query parts dealers to ensure new, rebuilt or after-market parts for all vehicles and equipment meet or exceed original equipment manufacturer (OEM) specifications before ordering parts.

5.2.20 When feasible, sources shall be rotated. GPC buyers shall ensure they get the best price for government funds. A special effort should be made to solicit small and disadvantaged businesses

---

Application Screenshot

Purchased Parts Pricing Database					
Part No.	Name of Part	Vehicle Type	Most Recent Price Paid	2nd Most Recent	3rd Most Recent
ALG-4789	Alternator	Pickup 2WD	$94.00	$100.00	$98.00
HQF5433	Horn	Sedan	$43.00	$20.00	$36.00
L3JGS78	Water Pump	4WD Utility	$73.00	$75.00	$80.00
H-GT937	Intake Manifold	Pickup 2WD	$235.00	$241.00	$300.00
CH-2349	Starter	Sedan	$210.00	$215.00	$216.00
YUGL-246	Muffler	2WD Utility	$105.00	$94.00	$120.00
CMTL-8163	Compressor	Pickup 4WD	$195.00	$200.00	$193.00

Figure 8: Specific Guidance

Survey Items

Items were designed to have 4 sources for a part that a participant had to choose among to best serve their purpose as a purchaser. The sources were designed so that up to all the alternatives had different prices. However, the prices are not simply listed, calculations on how much shipping would cost needed to be made for purchasers to

determine which part was cheapest. The specifications of the parts were also different with some meeting original equipment manufacturer (OEM) specifications and others not. The design of all the store items was identical beside the name of the vendor and background color to emphasize that the stores were different. The stores were named as colors (green, red, blue, and yellow) to limit bias from participants being influenced by the name of a store. However, the stores were named to determine if purchasers were following a pattern, or loyalty, with purchasing from vendors as the experiment progressed.

After selecting a specific item, participants were asked which aspects influenced their choice and two questions regarding their perceived value of their purchased item, as shown in Figure 9. These questions were adapted from Cronin et al. (2000) with alterations to make them apply to the perceived value of the vehicle parts in this scenario.

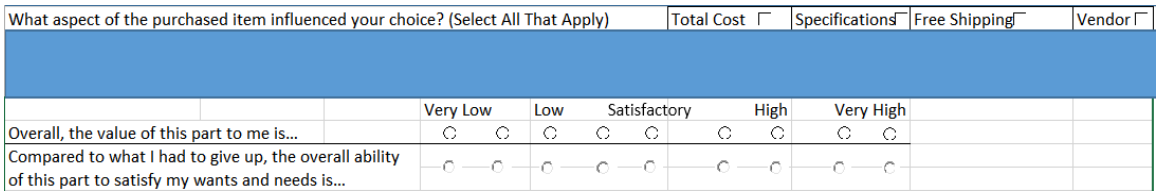


Figure 9: Post Selection Questions

Survey Sample

Relevant participants were sought that could effectively respond to stimuli and complete the exercise. Based on the findings of the interviews, no special experience was required for purchasers, so any Air Force personnel were selected as potential participants. The targeted population was students and faculty at the Air Force Institute of Technology (AFIT), members of the 441st Vehicle Supply Chain Operations Squadron,

and Air Force Logistics Readiness Officers of various ranks, ages and experience attending a course at AFIT. Although the targeted population is not the population that purchases vehicle parts, the targeted population is similar enough to draw conclusions about the influences of guidance. In some regards this group is a better sample due to the fact that they are not biased by existing guidance, as a field experiment with actual purchasers would be.

The population was sent email notifications regarding the survey asking for their participation. Participation in the experiment was voluntary and was conducted on either the participants' government or personal computers, at their choosing. There were no time limits applied to the survey so that respondents could take as long as they needed. Demographics of the targeted population were asked to be provided by the respondents to include age and years of experience, as shown in Appendix B. To limit influence by the researcher, no additional guidance or suggestions was provided to participants.

Analysis

Certain functions were built within the spreadsheet to aid in the analysis of each survey. Each page produced entries in the final page of the survey not visible to participants. This included research time for each item, purchase prices, effectiveness in selecting correct specifications, vendor selection, and responses on perceived value questions. The data was then analyzed using t tests to test the results of the two different groups across a range of criteria in accordance with the investigative questions and hypotheses.

IV. Analysis and Results

Chapter Overview

This chapter reviews the analysis and results from both phases of the research. Since the general information from the qualitative phase has been discussed, the general information about the survey will be addressed at the beginning of this chapter, then each investigative question will be reviewed. When necessary, information gleaned from both the qualitative, interview and quantitative, experimental survey segments of the research are used to answer the questions. Finally, additional post-hoc analyses are presented that provide some further insight into the behavior of purchasers and potential influences of their behavior.

Responses to Survey

The survey was administered between December and February of 2018 and was completed by 46 respondents. The data was collected from returned spreadsheets, assembled into one spreadsheet, formatted for ease of analysis, then analyzed. All analysis was performed in Microsoft Excel and JMP, and when necessary, used an alpha of 0.05. Full reports of the analysis are available in Appendix C.

The random number generator assigned 22 respondents to the control (generic guidance) group and 24 respondents to the treatment (specific guidance) group. The breakdown by assigned organization is shown in Table 2. Demographics such as age and self-rated experience of respondents are discussed in post-hoc analyses. These characteristics should be considered when reviewing the following investigative questions and related hypotheses.

Table 2: Assigned Organization by Guidance Type

Assigned Organization	Generic (0) / Specific (1)		
Count Total %	0	1	Total
AFIT	13 28.26	11 23.91	24 52.17
Other	8 17.39	9 19.57	17 36.96
VSCOS	1 2.17	4 8.70	5 10.87
Total	22 47.83	24 52.17	46

Investigative Question #1

What official guidance from Headquarters Air Force exists that dictates purchasing behavior?

This question was answered in the interview phase of the research. Official guidance includes AFI 24-302 Vehicle Management (Department of the Air Force, 2016b) and AFI 64-117 Air Force Government-Wide Purchase Card Program (Department of the Air Force, 2011). The former has been thoroughly discussed in this document, the latter has not. Interestingly, purchaser interviews revealed that AFI 64-117 guided their behavior as much as AFI 24-302. In fact, some purchasers said that AFI 64-117 guided their behavior more as it could result in more substantial consequences if not followed. As previously discussed, this guidance is vague in nature and leaves the actual research and purchasing processes up to Materiel Control sections or Vehicle Management flight leadership.

Investigative Question #2

What current local guidance have units created to guide Materiel Control purchase agents?

As determined in the interview phase of the research and discussed in Chapter III, units have created local OIs to pick up where Air Force guidance leaves off. All five bases had local OIs that were reviewed and discussed in the development of the experimental survey. The existence of these documents inspired the design of the specific, treatment guidance created for the survey portion of the research.

Investigative Question #3

How closely do purchase agents follow provided guidance?

This investigative question is the underlying subject of the tested hypotheses for this research. Interviews revealed that purchase agents follow the guidance provided to them, but their research is based on training provided by flight and section leadership. Uniformed Airmen cited strong influences from civilian employees' experience that shaped their purchasing habits. Four of the eight interviewees said that flight leadership influenced them most out of all the guidance available. Two others stated that AFIs influenced them most and one stated that their local OI was most important to them. One stated that none of the guidance really impacted how they researched parts. Understanding this dynamic is helpful in deciphering feelings that respondents to the survey could have in response to guidance provided to them.

In responses to the survey, relatively few of the purchasers followed guidance perfectly with 12 of the 46 total purchasing OEM specification parts at the lowest

available price, as required by both sets of guidance. Of course, this doesn't imply that an equivalent 25.5 percent of purchasers in the Air Force don't follow guidance. However, the findings may provide insight that the guidance itself does not provide motivation to follow the requirements. This agrees with findings from the interviews that flight and section leadership may influence them more than written guidance at either the Air Force or local levels.

Investigative Question #4

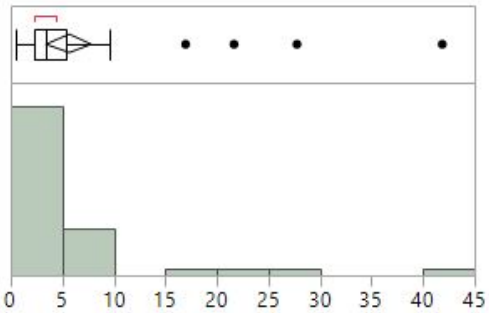
How much time do purchase agents spend researching prices of parts?

According to actual purchase agents' responses in interviews, research time is highly variable. Commonly used, well known parts can be quickly located on auto parts websites or through a quick phone call to a local vendor. However, the more rarely used or replaced parts can be extremely difficult to locate due to few or single source issues or poor documentation of part numbers. With this in mind interviewees were asked for minimum and maximum research times for parts. They reported an average minimum research time of 11 minutes and an average maximum research time of 62 minutes.

Respondents to the survey took much less time with an average of 1.46 minutes to research a part before purchasing, or a total research time for the survey of 5.62 minutes, as shown in Figure 10.

Distributions

Minute Duration



Quantiles

100.0%	maximum	41.86666667
99.5%		41.86666667
97.5%		39.39916667
90.0%		11.845000001
75.0%	quartile	5.40416666675
50.0%	median	3.491666667
25.0%	quartile	2.34166666675
10.0%		1.3933333331
2.5%		0.5175
0.5%		0.5
0.0%	minimum	0.5

Summary Statistics

Mean	5.626087
Std Dev	7.4859462
Std Err Mean	1.1037426
Upper 95% Mean	7.8491386
Lower 95% Mean	3.4030353
N	46

Figure 10: Minute Duration of Total Research Time by Respondents:

This is clearly a simulated environment with no delays due to website loading, data entry, scrolling, or even being placed on hold while waiting for a parts store employee to answer the phone. Due to this, the research time is not equivalent to the times cited by actual purchase agents. This does not totally discount the experiment, however. The simulated environment still reveals behavior from purchasers when presented various options, albeit in a quicker fashion than the manual searches completed in actuality. What this quicker research time shows is that if purchasers had purchase information readily available the potential for increasing efficiency of purchasers could

be vast. To elaborate, much of the research time by actual purchasers is likely consumed by the mechanics of searching and comparing alternatives. The implication of these results will be discussed in greater detail later in this research.

Investigative Question #5

What sources do purchase agents check for availability of parts?

Interviewees listed many sources for parts to include specialty shops, online retailers, brick and mortar retailers via telephone, catalogs, and sometimes even shopping at retail stores in-person. For some vehicles, like Hyster forklifts, the manufacturer stocks parts so those sources are solicited when parts are needed. Online retailers can be used, but are subject to more scrutiny as discussed in the following question.

The results largely show that every base typically looks at the same sources, just in different locations. Frequent calls, trips, or website visits are made by purchase agents to the same sources to determine which vendor to source parts from. At least some of this research time is repeatedly consumed by the mechanics of searching these sources.

Investigative Question #6

Why do purchase agents use their chosen sources?

Each interviewee was asked what sources they use and each had their own reasons why they frequent those retailers. The first reason is easy to understand: availability. If a retailer has a part, that makes the retailer an option for purchase. Quality is important to purchasers, as well. For example, more than one source stated that for online sources the quality of some of the parts comes into question when those parts are sold by a third party seller, not by the website owner. This is the case on Amazon.com in

which the retailer has set up a “marketplace” in which third parties can sell their goods alongside those offered by Amazon. In these cases, purchasers stated that a thorough review of the seller must be made before a purchase is made, since they have no previous evidence of quality for the seller.

In addition to availability, price was very important to interviewees. Purchases are driven by budgets that are all tracked at each unit. This is the main reason why purchasers shop around, to find the best price on a good, quality product that can be used to complete a repair. The interviewees said that online sources are typically more expensive than other options, so they are less commonly used than other, usually local, sources.

The final point interviewees made was how the actual part was to be received. There was a surprising amount of variability in this area. Answers ranged from 50 percent vendor delivery and 50 percent pick up to 10 percent vendor delivery, 50 percent pick up, 40 percent parcel delivery through carriers like FedEx or UPS. “Vendor delivery” and “pick up” were designated as the fasted sourcing options with receiving of the part occurring with receipt of the part within an hour of purchase. Especially for priority parts, the responsiveness of the source was of a principal concern for purchasers.

Exactly why each part is purchased could involve a complex weighing of these different priorities or is a simple decision based on being the only source available. The research modeled a similar decision situation in the experimental survey portion of the study. Respondents were asked what aspect of a selected part influenced their purchase decision. Specifically these reasons were: total cost, specifications, free shipping, and/or vendor. Price was by far the most influential aspect that influenced a purchase with 45 of the 46 respondents citing total cost as important for their purchase of an item at least

once. A total of 32 respondents stated that the total cost was influential on all items purchased. The next most influential aspect was the specification of the parts, followed by vendor, then free shipping. This order is telling, since total cost and specification are explicitly stated as important in the both sets of guidance and vendor being important in the more specific set of guidance. The final aspect, free shipping, is not noted as important in any of the guidance, so selection of that as a reason to purchase is not based on the effect of the guidance, but rather showed those individuals were making decisions based on what they value, not what they were instructed to value.

Table 3: Number of Times Aspects Selected as Influential by Purchaser

	Total Cost	**Specifications**	**Free Shipping**	**Vendor**
All Items	32	25	1	0
3 Items	6	4	1	2
2 Items	6	9	4	5
1 Item	1	4	6	12
Respondents selecting aspect at least once	45	42	12	19
Never used	1	4	34	27

Investigative Question #7

How do purchase agents personal opinions of value affect purchasing decisions?

Regarding vendors, interviewees all agreed on this: their opinions do not affect purchasing decisions. However, when they relayed which vendors they used they had made associations with those vendors for some reason. As mentioned before, some

interviewees had negative opinions of Amazon third party vendors, which made them wary about purchasing from them. Others had opinions of local vendors as reliable and fast. These “preferences” of purchasers do not imply that purchasers are not properly performing their duties, but rather quite the contrary; it is important that purchasers identify high quality and reliable sources to purchase parts from to maximize the likelihood that a purchase will fulfill the needs of the mechanic to return the broken vehicle to service.

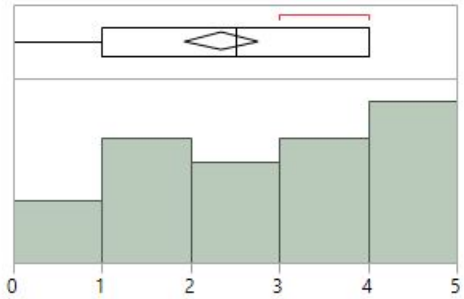
Regarding specifications of parts, interviewees were mostly on the same page. They agreed that OEM quality was necessary, and that lowest price was important. However, they disagreed on the value of warranty, with two interviewees stating that it was important to them and one saying it didn’t influence them much.

In the experiment, the opportunity for respondents to make decisions based on opinions was attempted to be controlled. For example, the options of vendors was carefully designed to only test the listed hypotheses. Each of the vendors were artificial and titled based on color, like “Store Blue”, so outside opinions wouldn’t influence their purchase decisions. Even with this organization, only 5 of the 46 respondents purchased from all four vendors, all of which had viable purchase options according to the guidance. This showed that there was likely some form of loyalty, or at least no aversion to forming loyalty, by respondents.

Another potential issue for opinions to influence purchasers, is their opinion of parts specifications, in this case meeting OEM specifications or not. Thirteen of the 46 bought all OEM specification parts, in accordance with both sets of guidance, and 5 didn’t purchase any OEM specification parts, as shown in Figure 11.

Distributions

OEM



Quantiles

100.0%	maximum	4
99.5%		4
97.5%		4
90.0%		4
75.0%	quartile	4
50.0%	median	2.5
25.0%	quartile	1
10.0%		0
2.5%		0
0.5%		0
0.0%	minimum	0

Summary Statistics

Mean	2.3478261
Std Dev	1.3859195
Std Err Mean	0.2043427
Upper 95% Mean	2.7593934
Lower 95% Mean	1.9362588
N	46

Figure 11: Number of Respondents' total OEM parts purchased (of four)

Also of interest to this investigative question is H4: People with positive initial attitudes toward new products have a higher perceived value of purchased new products than people without positive initial attitudes toward new products. This was tested using a t test to compare value ratings of respondents with initial attitudes preferring new products over those not preferring new products. The results of this test are shown in Table 4, in which the *p* value is 0.34, or not a significant result. This does not support the hypothesis, and therefore initial attitudes did not weaken the relationship between quality knowledge and perceived value of products.

Table 4: t Test Results for Hypothesis Four

Group	Mean Value of Purchased New Part	Standard Deviation	p-Value
Doesn't Prefer New Parts	13.03	3.06	0.34
Prefers New Parts	13.40	2.36	

Investigative Question #8

In what situations would additional guidance from higher headquarters help units save time and money on vehicle parts?

Most of the interviewees had no input on additional guidance, since their opinion is that guidance didn't affect their day to day purchasing process, anyway. One purchaser recommended that guidance be created establishing the use of a national purchase list, which is what inspired the "purchased parts database" addition in the specific guidance set of the survey. His idea was that a national database would help locate high quality and low priced replacement parts that other bases had already done the hard work of researching and finding. Another interviewee wanted a standard method of tracking past orders, since he noted that over the two bases in which he had experience, each had their own processes for doing so.

The survey recorded values to help answer this investigative question which also addresses the first three hypotheses of this research, as follows: H1: Specificity of guidance inversely influences purchase price of goods. A t test was performed comparing prices paid for purchased parts by those receiving the control guidance versus those receiving the treatment guidance. The total price paid for each purchaser was used to eliminate item bias and determine the aggregate effect of the guidance on the behavior of

the respondents. The results of the t test in Table 5 show a *p* value of 0.29, or not a significant result. This does not support the hypothesis, and therefore specificity of guidance did not inversely influence purchase price of goods.

Table 5: t Test Results for Hypothesis One

Group	Mean Total Price Paid	Standard Deviation	p-Value
Generic Guidance	561.36	11.77	0.29
Specific Guidance	559.17	15.30	

H2: Specificity of guidance positively influences the variability of stores used by purchasers. A t test was performed comparing rotation of vendors when vendors prices matched by participants receiving the control guidance versus those receiving the treatment guidance. The final two questions of the survey had two items that met all criteria for purchase for both sets of guidance. The treatment guidance dictated to rotate to a vendor that had not been purchased from, whereas the generic guidance did not dictate that rotation between vendors was necessary. The rates of this scenario occurring was incredibly low with only 10.8 percent of respondents switching vendors in this scenario. Unfortunately, the likelihood of finding a relationship is difficult with a rate this low with an already limited pool of respondents. Regardless, the results of the t test in Table 6 show a *p* value of 0.71, or not a significant result. This does not support the hypothesis, and therefore specificity of guidance did not positively influence the variability of vendors used for purchasing.

Table 6: t Test Results for Hypothesis Two

Group	Rate of Rotating Vendors on Price Match	Standard Deviation	p-Value
Generic Guidance	0.136	0.351	0.71
Specific Guidance	0.083	0.282	

H3: Specificity of guidance inversely influences the amount of time purchasers spend on researching parts. As Figure 12 shows, most of the participants completed the survey very quickly, with a median research time of 3.49 minutes. This likely had ramifications on the internal validity of this research since there was so little time spent researching parts by the majority of respondents. Regardless of this fact, analysis of the existing data was still performed.

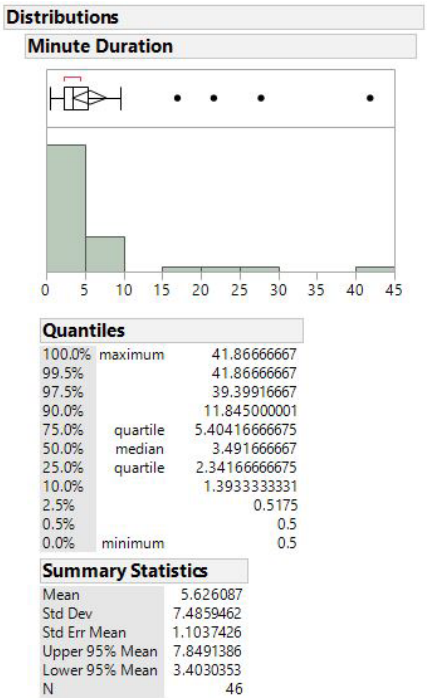


Figure 12: Duration of Time Spent Researching Parts by Participants

A t test was performed comparing time spent researching and purchasing parts by participants receiving the control guidance versus those receiving the treatment guidance. The means for the two groups were actually opposite of what the hypothesis predicted with a mean of just over 7 minutes for the treatment group and a mean of around 4 minutes for the control group. The analysis of the data in JMP produced the results of the t test in Table 7, which shows a *p* value of 0.92, or not a significant result. This does not support the hypothesis, and therefore specificity of guidance did not inversely influence the amount of time purchasers spent researching parts.

Table 7: t Test Results for Hypothesis Three

Group	**Mean Research Duration**	**Standard Deviation**	**p-Value**
Generic Guidance	4.03	3.36	0.92
Specific Guidance	7.09	9.72	

Post-Hoc Analyses

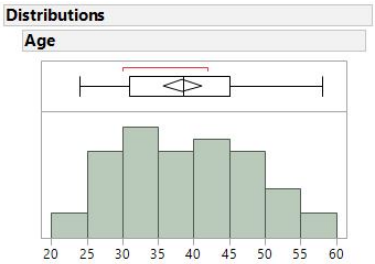
In order to better understand the behavior or purchasers, additional post-hoc analysis was performed on the survey response data. Since there was crossover between the self-rated purchase influence options, like a purchaser stating that vendor was important to their decision versus their actual vendor selection behavior, that relationship was examined. To determine this, the rate of vendor rotation was split into low and high categories, with the highest third of rotations rated as high and the rest as low. Evaluating this relationship via a t test resulted in a *p* value of 0.03, or a significant result (Table 8). This revealed that when users reported that they used vendor as a purchasing

consideration, they did in-fact rotate through vendors more than users that didn't consider vendor in their purchasing considerations.

Table 8: t Test Results for Vendor Consideration and Actual Choice

Group	Rate of "High" Vendor Rotation	Standard Deviation	p-Value
Didn't Consider Vendor in Choice	0.28	0.46	0.03
Considered Vendor in Choice	0.71	0.48	

Since age data was collected, investigating if any behavior was related to this demographic was of interest. To look into this relationship using a t test, participants had to be divided into age groups. Based on the distribution of ages of respondents shown in Figure 13, splitting the respondents into two groups based on the median, 38 years of age, appeared to be the most effective method of determining if any difference existed.



Quantiles

100.0%	maximum	58
99.5%		58
97.5%		57.825
90.0%		51.6
75.0%	quartile	45
50.0%	median	38.5
25.0%	quartile	31
10.0%		27
2.5%		24
0.5%		24
0.0%	minimum	24

Summary Statistics

Mean	38.434783
Std Dev	9.0373353
Std Err Mean	1.3324824
Upper 95% Mean	41.11854
Lower 95% Mean	35.751025
N	46

Figure 13: Distribution and Statistics on Ages of Participants

The t test was performed using this grouping and produced a *p* value of 0.03, as shown in Table 9. A Tukey HSD connecting letters report separated the two groups as different levels, verifying the findings of the t test. This showed that younger participants spent more time researching than older participants. However, this behavior did not translate into more effective purchasing. Both age groups had the same performance in purchasing. To ensure grouping was not hiding an effect, an additional division by age into 3 groups was performed with similar results that age did not influence effective purchasing.

Table 9: t Test Results for Age and Research Duration

Group	**Mean Research Duration**	**Standard Deviation**	**p-Value**
Age <38	7.9	10.25	0.03
Age >38	3.53	2.01	

Finally, respondents were asked to rate themselves as either experienced or inexperienced regarding the purchasing of automotive parts. A total of 13 of the 46 respondents rated themselves as experienced. A t test was performed based on self-rated experience and the amount of times that the vendor was selected as influential in a purchasing decision. The determination of whether vendor was influential or not was determined by the respondent on the survey. Self-rated inexperienced respondents considered vendor in their decision more often than participants that rated themselves as experience with a *p* value of 0.001, as shown in Table 10. Once again, a Tukey HSD

connecting letters report separated the two groups as different levels, verifying the findings of the t test.

Table 10: t Test Results for Experience and Vendors Chosen

Group	Mean Amount of Items Vendor Considered in Decision	Standard Deviation	p-Value
Inexperienced	0.78	0.92	0.001
Experienced	0.15	0.37	

A final test of the relationship between self-rated experience and the purchase of OEM specification parts was examined. The number of parts that met OEM specifications was totaled for each respondent and analyzed. A t test was performed, once again, which produced a *p* value of 0.05, showing that inexperienced respondents purchased OEM specification parts more often than those with more experience. Similar to the previous result, a Tukey HSD connecting letters report separated the two groups as different levels, verifying the findings of the t test.

Table 11: t Test Results for Experience and Purchase of OEM Specification Parts

Group	Mean Amount of OEM Specification Items Purchased	Standard Deviation	p-Value
Inexperienced	2.67	1.34	0.005
Experienced	1.54	1.19	

The last two tests show that, in effect, the less experienced respondents were following instructions more closely since they considered vendor in decision making and purchased OEM parts more often than their more experienced counterparts.

V. Conclusions and Recommendations

Chapter Overview

This chapter establishes conclusions based on the results and findings of this research. It also presents recommendations to decision makers and suggestions for future research, based on the results and analysis discussed. In effect, the findings should inform future decisions at both the Air Force and local levels on purchasing based on how certain actions could influence purchaser behavior. Furthermore, the findings vector future students to delve into this subject to advance the field of purchasing within Vehicle Management.

Discussion

The findings in the fourth chapter of this research were informing on current purchasing processes and how they impact purchasers. The qualitative phase of the research garnered interesting results that fed into the quantitative phase, but the results also stand on their own. The findings in the quantitative phase were more difficult to interpret, but were still somewhat insightful. A relatively small sample, 46 respondents, somewhat limited the ability to detect differences between guidance groups and experience groups. A self-paced and unmonitored survey that can be taken at the respondents' leisure, partnered with a small sample size, probably allowed for too much noise to exist. The respondents' research duration, both short and long, also stifled the potential difference that guidance could produce. A more bell-shaped curve would have made the data easier to analyze and create conclusions from. The shorter duration responses also begs the question the validity of their responses. If a user rushes through

the survey, how much attention did they pay to the guidance and what kinds of effects could it produce? Of the total 46 sets of guidance only 12 actually followed the guidance completely. It is difficult to discern whether the reason for few respondents correctly answering items was caused by sample issues, implementation problems, or that there was not a strong effect between guidance and behavior.

There are still implications from the results of the hypothesis tests, however. The first hypothesis, H1: Specificity of guidance inversely influences purchase price of goods, was not supported by the research. The results showed that either the items themselves, or the respondents' personal experience, likely led to similar spending on parts. Given that price was a priority for both sets of guidance, the difference was the price comparison page in the specific guidance. This tool didn't produce a difference regarding purchase price, as originally expected. Similarly, the third hypothesis, H3: Specificity of guidance inversely influences the amount of time purchasers spend on researching parts, was not supported, either. The tool was the difference in guidance in this case, as well. In addition to the very quick response times, the method of simulation of the purchasing environment may have influenced the possible effect the tool could produce. Overall, the potential for a comparison tool to improve performance in both price paid and research time still exists in the real world. Further study to better develop a flexible and useful tool by an expert in the field could result in a more successful study.

One difference in guidance, the requirement to rotate vendors in the treatment guidance, was created to influence the outcome of the second hypothesis, H2: Specificity of guidance positively influences the variability of stores patroned by purchasers. However, that influence did not occur in this case. Vendor rotation was similar for both

groups. Once again, the simplification of the purchasing environment could have limited impact of the guidance on respondents or they could have used prior experience to inform their decision to either stay with vendors they previously purchased from, or to rotate to a different vendor. The implication from this hypothesis is that guidance wasn't the predominant driver of this behavior.

The final hypothesis, H4: People with positive initial attitudes toward new products have a higher perceived value of purchased new products than people without positive initial attitudes toward new products, was not supported, either. The fact that an initial opinion existed about new products didn't lead to higher valuations during the survey. This showed that the quality knowledge provided by the guidance, which was to purchase either new or remanufactured parts, superseded respondents previous opinions on the products. This finding is encouraging for the field in that an opinion on specification doesn't limit a purchaser's ability to follow instructions, at least in this case.

Post hoc analyses led to some findings that could inform future decisions. First, the respondents that considered vendor in decisions did, in fact, rotate vendors more often. This shows a deliberate decision process on those purchaser's parts. This is positive for the field in that purchasers can analyze situations and make the correct decisions based on the comparison of products or services. Second, younger respondents spent more time researching than older respondents, almost twice as much time overall. This could be because of indecisiveness, increased patience in the process, extra consideration of alternatives, or more unfamiliarity with the activity of purchasing automotive parts. All kinds of speculation could be made here, and any real explanation would be ill-advised without a more thorough understanding of why those purchasers

took longer to research parts. Nevertheless, if extra thought was being put into the process by younger airmen that could be interpreted as helpful to the field, since purchase agents are usually junior Airmen or NCOs. Finally, respondents who rated themselves as inexperienced with auto parts rotated through vendors, and purchased OEM specification items, more often than those who rated themselves as experienced. This showed that they were following instructions more closely than experienced respondents. Even though this didn't produce a difference in price, time, or effectiveness of purchasing in this case, this is good news for the field, in that inexperienced purchasers, which are generally those selected as purchase agents, can follow directions and are not limited by their inexperience when compared to experienced purchasers. Ultimately, there are multiple explanations of the results, and what caused them, but none of the proposed hypotheses were supported by the results from the survey. However, some helpful information was still produced which will feed recommendations for action and future research.

Recommendations for Action

Guidance on Purchase Process

Guidance and effects from guidance on the purchasing process was the predominant focus of the research. As expected, guidance from the Air Force through AFIs and guidance from the local level through OIs affects the behavior of purchase agents. Both the Vehicle Management and GPC AFIs set rules on purchasing, but they both leave the majority of the purchase process up to the local leaders to determine. At the local level, some OIs do, in fact, dictate the purchase process, but surprisingly others do not. Interestingly, in the cases where the OI does not determine a process, the

interviewees discussed a standard purchasing process. This shows that even if guidance doesn't explicitly dictate how to perform purchasing activities, the activities are still somewhat standard by location, but is dictated more by experienced purchasers or leaders in the flight. Howard and Sheth's (1969) work may have an explanation for that.

Howard and Sheth (1969) listed two mediators in A Theory of Buyer Behavior between motives and courses of action: information and experience. Although not a principal focus of this research, experience did prove to be an influence. When information was lacking, either from the ambiguity of headquarters or local guidance, experience became the driving, mediating force. This was affirmed by the interviews and OI review in which it was found that purchasers should leverage support from supervisors, mechanics, or coworkers within Materiel Control if their experience was lacking in the area. Therefore, actual purchaser experience was not a priority for hiring by leadership, either, so long as they had someone with experience to lean on. Due to the experience and information dynamic and the limited, if any, influence additional written guidance had on respondents, additional written guidance dictating the actual purchase process at base levels is not suggested.

However, a common comparison tool to help purchasers make more informed decisions, in concert with their experience or the experience of their co-workers, could lead to quicker, more effective purchasing. If a tool could be developed that quickly provided options to purchase agents, research time could be vastly reduced. This could be designed in multiple ways from a simple multi-screen interface that displays the most common comparison sources for a given location with one search, similar to how a travel comparison site operates, to a comprehensive enterprise resource planning system that

tracks purchases across the Air Force by part number, vendor, price paid and even links to a purchase site to provide a good first step for purchase agents researching parts. The trend toward more vendors, with the proliferation of technology and increased globalization means that the potential for new sources is going to increase. A guide that helps share which sources are valid could save time and money by pooling research effort across bases. Again, the exact purchase process should not be dictated, but research into the development of this kind of tool could prove fruitful.

At the very least, a forum for discussion among purchasers and Materiel Control supervisors could help spread best practices that could be implemented based on the intricacies and unique circumstances that exist at different bases. Naturally, as Airmen are reassigned at different locations this information flow is occurring and leads to an understanding of some different methods, but a formal, moderated purchasing forum could help produce innovative, low-cost, and flexible solutions to part research problems. Exactly what kind of system would be a good fit for effectiveness and efficiency required in this field could certainly be studied.

Guidance on Purchase Agent Hiring/Selection

The findings of the research reaffirmed the existing hiring and selection process by leaders in the Vehicle Management Flight for purchase agents. Prior experience and age both did not hinder effective purchasing, and in fact proved better in the respects of vendor and specification requirements. Marrying the survey results with those from interviews, prerequisites should remain the same, given that experience from the field is available to lean on, when necessary. This was a major point of interviewees, which this research agrees with.

Recommendations for Future Research

The amount of unknown factors in this field leaves a multitude of options for future research:

-How do purchase agents located OCONUS conduct their purchase functions and how effective and efficient are those processes compared to those stateside?

-How do relationships between purchase agents and representatives from retailers affect choice of vendor?

-What kinds of tracking tools do different Materiel Control sections across the Air Force use and how effective are those tools?

-What goals and objectives do 441 VSCOS and HQ AF have for vehicle parts purchasing currently and for the future?

-What support for a service-level tool exists at local, MAJCOM, and HQ AF levels?

-How would centralizing purchasing for the Air Force affect purchasing flexibility and purchasing effectiveness?

Summary

The purchasing environment is dynamic and has proven difficult to emulate, but the potential for improvement in effectiveness and efficiency would reward future research. Purchasers cherish the flexibility that guidance has provided them, but further effort in researching and sharing productive purchase processes could help the Air Force realize widespread advances in this function. This remains true despite the few constructive findings generated by this work. Additionally, sharing of lessons learned by

purchase agents and vehicle management leaders around the globe is encouraged. Understanding how the process works currently, and what does and doesn't motivate purchasers, provides a step in the development and understanding of goals for purchasing programs around the globe.

Appendix A: Interview Script

2017 AFIT Effect of Guidance on Vehicle Parts Procurement Decision Making

Icebreaker/Introduction

Name:

Organization/Position:

Years of Experience (in AF/Vehicle Management/in current position):

In this research, we are examining guidance written for purchase agents within Materiel Control and how that guidance affects behavior of purchase agents. Guidance is provided to purchase agents at multiple levels to include headquarters via Air Force Instruction, from squadron and/or flight leadership via operating instruction, from supervisors or other co-workers via other written/verbal guidance.

Guidance can be executed using various methods which can produce different results in both price paid and effectiveness of purchasing. By studying the methods that purchase agents use, the guidance that dictates those methods, and how effective those methods are, this research seeks to assist decision makers in achieving vehicle in-commission rate goals while conserving budgetary spending.

Finally, the experience and attitudes of both leaders and purchase agents themselves may affect how they purchase parts. Examining how experience within the field and attitudes

toward purchasing affect behavior may help develop guidance that can produce desired results.

Existing Guidance

1. What guidance from headquarters affects how parts for unscheduled maintenance are purchased? Can you elaborate?

2. What guidance from the squadron or flight leadership affects how parts for unscheduled maintenance purchased? Can you elaborate?

3. What guidance from your supervisor or co-workers affects how parts for unscheduled maintenance purchased? Can you elaborate?

4. Which source of guidance has the most impact on purchasing methods? Can you elaborate?

5. What kind of approval is required for purchasing parts? Does it change based on price of part?

6. How does guidance affect researching possible vendors?

7. Does guidance affect the price paid for individual parts? How so?

8. Are Materiel Control sections supposed to keep records on how much parts have been/should be purchased for? Do they? How?

Purchasing Agents and Purchasing Methods/Process

1. How are purchase agents selected for their positions? Are there any pre-requisites?

2. What training do purchase agents received when assigned to Materiel Control?

3. How long are purchase agents assigned in Materiel Control?

4. How much experience with automotive parts do typical new purchase agents have? How much do they need?

5. How much experience with supply/purchasing do typical new purchase agents have? How much do they need?

6. How long should purchase agents spend on researching a part? How long do they research?

7. Does personal preference affect how purchase agents buy parts? How so?

8. What sources do purchase agents consider, such as online, catalog, or in person?

9. How much effect does the unit's current budget have on how/which parts are purchased?

10. Is there one predominant delivery method used/preferred by purchase agents such as pick up, delivery, or shipment?

Appendix B: Experimental Design Survey

Page 1

Instructions:

Thank you for taking part in this study. For this exercise, please imagine you are an employee of the US Air Force and have been assigned the task of purchasing replacement vehicle parts. Please take a few minutes per question to select the best vendor (Store) for the part based on the guidance/information that will be generated once you click the button below. Select the part by clicking on the button below the part and vendor you choose. Then, answer the questions below the parts to explain why you purchased that particular product. When finished, click the "Next Item" button. Always use the "Next Item" or "Previous Item" buttons, do not use the sheet selection buttons built into Excel. These instructions and guidance will be provided on each page of the survey.

First, please answer the question below, then open the guidance, then proceed to the first item

If parts are the same price, I rank my value of the following specifications as follows:

New parts are better than remanufactured parts	Remanufactured parts are better than new parts	I don't have a preference between new and remanufactured parts

Open Guidance/Information | Proceed to First Item

Page 2

Store Green	Part No.	Store Red	Part No.	Store Blue	Part No.	Store Yellow	Part No.
Alternator	ALG-4789	Alternator	ALG-4789	Alternator	ALG-4789	Alternator	ALG-4789
Item Price:	$95	Item Price:	$95	Item Price:	$70	Item Price:	$70
Shipping:	$15	Shipping:	Free	Shipping:	$20	Shipping:	$15
Specifications:	Remanufactured - Meets/Exceeds OEM Specs	Specifications:	New - Meets/Exceed s OEM Specs	Specifications:	New	Specifications:	Remanufactured

Pick One Item To Purchase

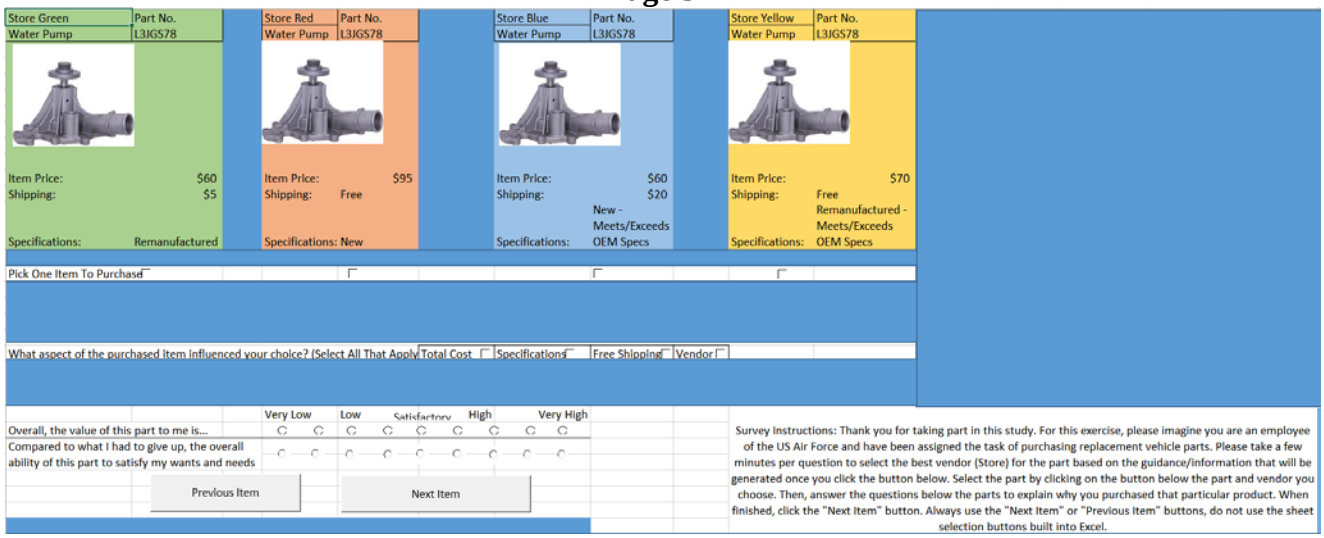
What aspect of the purchased item influenced your choice? (Select All That Apply) Total Cost | Specifications | Free Shipping | Vendor

	Very Low	Low	Satisfactory	High	Very High
Overall, the value of this part to me is...					
Compared to what I had to give up, the overall ability of this part to satisfy my wants and needs					

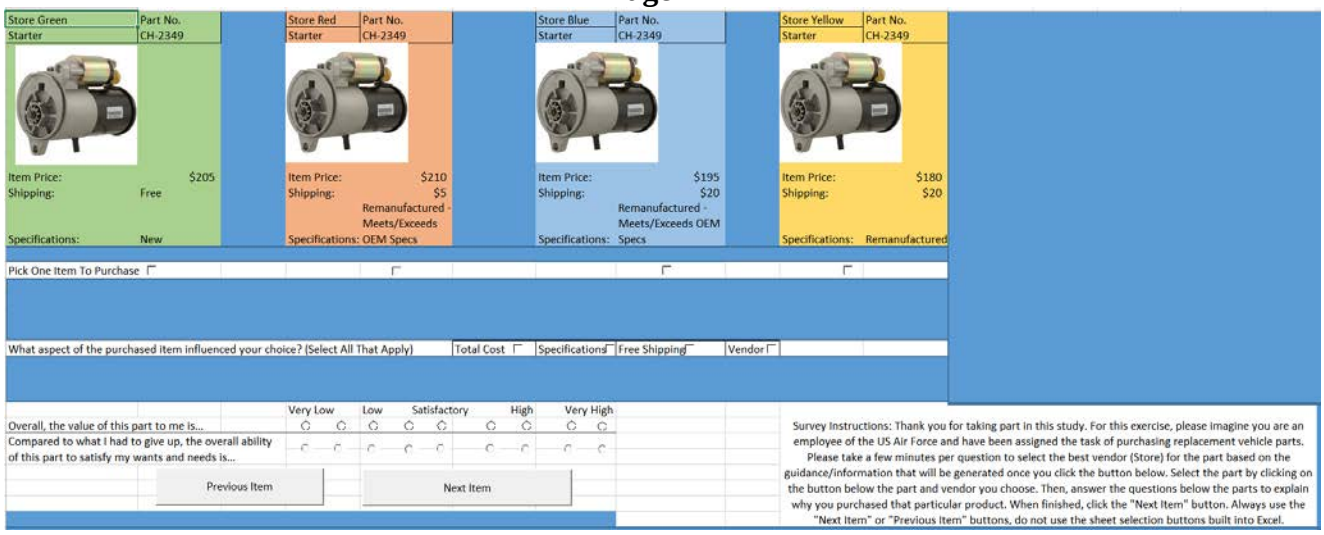
Previous Item | Next Item

Survey Instructions: Thank you for taking part in this study. For this exercise, please imagine you are an employee of the US Air Force and have been assigned the task of purchasing replacement vehicle parts. Please take a few minutes per question to select the best vendor (Store) for the part based on the guidance/information that will be generated once you click the button below. Select the part by clicking on the button below the part and vendor you choose. Then, answer the questions below the parts to explain why you purchased that particular product. When finished, click the "Next Item" button. Always use the "Next Item" or "Previous Item" buttons, do not use the sheet selection buttons built

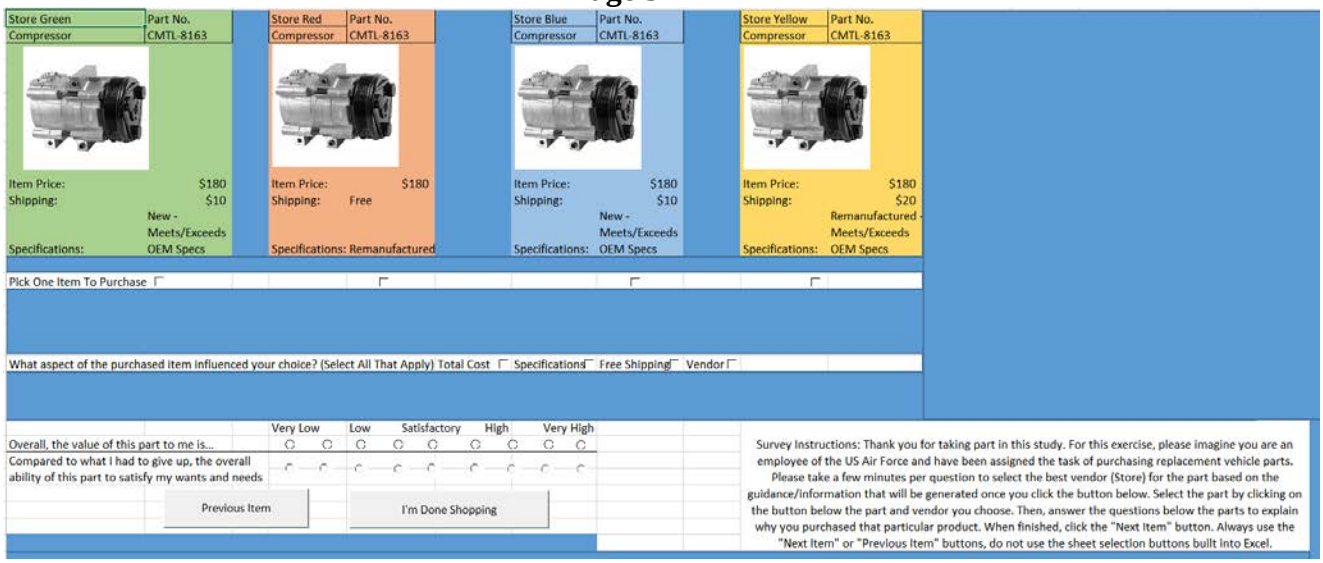
Page 3


Store Green
Water Pump
Part No.
L3JGS78
Item Price: $60
Shipping: $5
Specifications: Remanufactured
Store Red
Water Pump
Part No.
L3JGS78
Item Price: $95
Shipping: Free
Specifications: New
Store Blue
Water Pump
Part No.
L3JGS78
Item Price: $60
Shipping: $20
Specifications: New - Meets/Exceeds OEM Specs
Store Yellow
Water Pump
Part No.
L3JGS78
Item Price: $70
Shipping: Free
Specifications: Remanufactured - Meets/Exceeds OEM Specs
Pick One Item To Purchase
What aspect of the purchased item influenced your choice? (Select All That Apply
Total Cost
Specifications
Free Shipping
Vendor
Very Low
Low
Satisfactory
High
Very High
Overall, the value of this part to me is...
Compared to what I had to give up, the overall ability of this part to satisfy my wants and needs
Previous Item
Next Item
Survey Instructions: Thank you for taking part in this study. For this exercise, please imagine you are an employee of the US Air Force and have been assigned the task of purchasing replacement vehicle parts. Please take a few minutes per question to select the best vendor (Store) for the part based on the guidance/information that will be generated once you click the button below. Select the part by clicking on the button below the part and vendor you choose. Then, answer the questions below the parts to explain why you purchased that particular product. When finished, click the "Next Item" button. Always use the "Next Item" or "Previous Item" buttons, do not use the sheet selection buttons built into Excel.

Page 4


Store Green
Starter
Part No.
CH-2349
Item Price: $205
Shipping: Free
Specifications: New
Store Red
Starter
Part No.
CH-2349
Item Price: $210
Shipping: $5
Specifications: Remanufactured - Meets/Exceeds OEM Specs
Store Blue
Starter
Part No.
CH-2349
Item Price: $195
Shipping: $20
Specifications: Remanufactured - Meets/Exceeds OEM Specs
Store Yellow
Starter
Part No.
CH-2349
Item Price: $180
Shipping: $20
Specifications: Remanufactured
Pick One Item To Purchase
What aspect of the purchased item influenced your choice? (Select All That Apply)
Total Cost
Specifications
Free Shipping
Vendor
Very Low
Low
Satisfactory
High
Very High
Overall, the value of this part to me is...
Compared to what I had to give up, the overall ability of this part to satisfy my wants and needs is...
Previous Item
Next Item
Survey Instructions: Thank you for taking part in this study. For this exercise, please imagine you are an employee of the US Air Force and have been assigned the task of purchasing replacement vehicle parts. Please take a few minutes per question to select the best vendor (Store) for the part based on the guidance/information that will be generated once you click the button below. Select the part by clicking on the button below the part and vendor you choose. Then, answer the questions below the parts to explain why you purchased that particular product. When finished, click the "Next Item" button. Always use the "Next Item" or "Previous Item" buttons, do not use the sheet selection buttons built into Excel.

Page 5



Store Green	Part No.	Store Red	Part No.	Store Blue	Part No.	Store Yellow	Part No.
Compressor	CMTL-8163	Compressor	CMTL-8163	Compressor	CMTL-8163	Compressor	CMTL-8163
Item Price:	$180	Item Price:	$180	Item Price:	$180	Item Price:	$180
Shipping:	$10	Shipping:	Free	Shipping:	$10	Shipping:	$20
Specifications:	New - Meets/Exceeds OEM Specs	Specifications:	Remanufactured	Specifications:	New - Meets/Exceeds OEM Specs	Specifications:	Remanufactured - Meets/Exceeds OEM Specs

Pick One Item To Purchase

What aspect of the purchased item influenced your choice? (Select All That Apply) Total Cost Specifications Free Shipping Vendor

	Very Low	Low	Satisfactory	High	Very High
Overall, the value of this part to me is...					
Compared to what I had to give up, the overall ability of this part to satisfy my wants and needs					

Previous Item

I'm Done Shopping

Survey Instructions: Thank you for taking part in this study. For this exercise, please imagine you are an employee of the US Air Force and have been assigned the task of purchasing replacement vehicle parts. Please take a few minutes per question to select the best vendor (Store) for the part based on the guidance/information that will be generated once you click the button below. Select the part by clicking on the button below the part and vendor you choose. Then, answer the questions below the parts to explain why you purchased that particular product. When finished, click the "Next Item" button. Always use the "Next Item" or "Previous Item" buttons, do not use the sheet selection buttons built into Excel.

Page 6

Thank you for completing the survey. Please take a couple minutes to answer the following questions.

What influenced your choice of vendor?

Were you provided enough guidance to make the best purchasing decision? If not, what would have helped?

Yes, I had enough guidance ☐

No, I did not have enough guidance ☐

I would rate myself as _____ in my knowledge of auto parts

○ Experienced ○ Inexperienced

Assigned Organization/Position

Number of Years working for the Air Force

Age

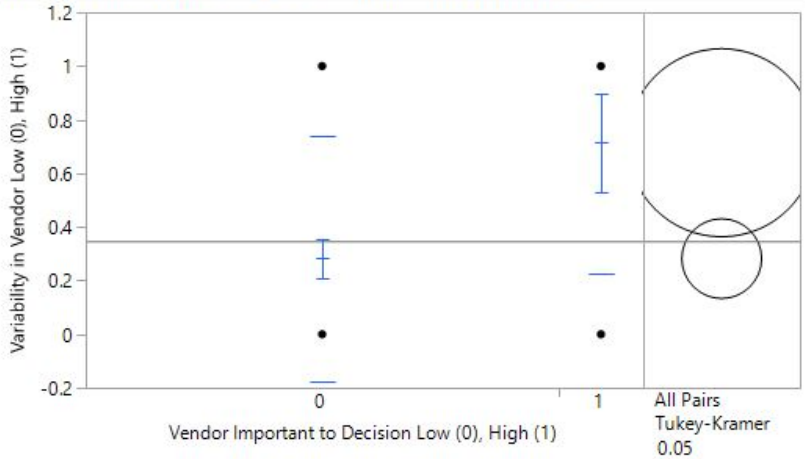
Do you have any final comments on the survey?

Please save the file and return it to SURVEYRETURN2018@GMAIL.COM

Thank you!

Appendix C: Analysis Reports

Oneway Analysis of Variability in Vendor Low (0), High (1) By Vendor Important to Decision Low (0), High (1)



Means and Std Deviations

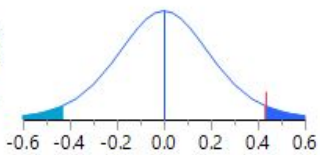
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	39	0.282051	0.455881	0.07300	0.13427	0.4298
1	7	0.714286	0.487950	0.18443	0.26301	1.1656

t Test

1-0

Assuming unequal variances

Difference	0.43223	t Ratio	2.179156
Std Err Dif	0.19835	DF	7.996319
Upper CL Dif	0.88967	Prob > |t|	0.0610
Lower CL Dif	-0.02520	Prob > t	0.0305*
Confidence	0.95	Prob < t	0.9695



Means Comparisons

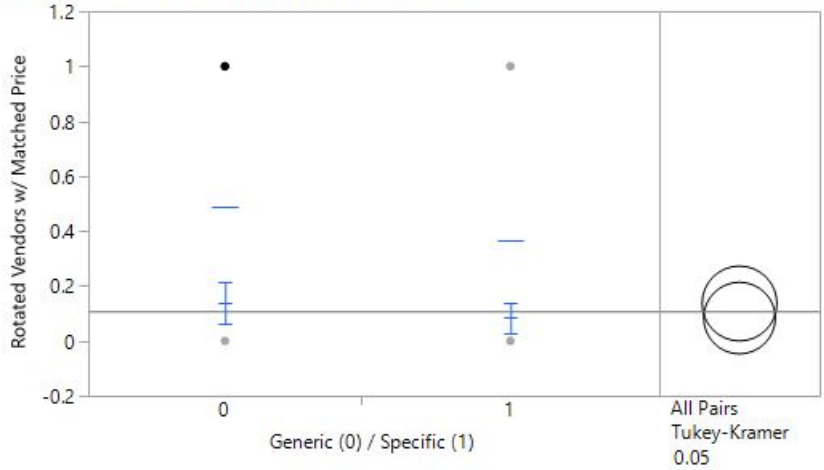
Comparisons for all pairs using Tukey-Kramer HSD

Connecting Letters Report

Level		Mean
1	A	0.71428571
0	B	0.28205128

Levels not connected by same letter are significantly different.

Oneway Analysis of Rotated Vendors w/ Matched Price By Generic (0) / Specific (1)



Means and Std Deviations

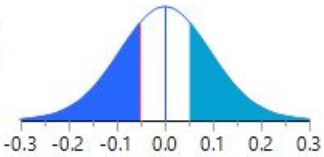
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	22	0.136364	0.351250	0.07489	-0.0194	0.29210
1	24	0.083333	0.282330	0.05763	-0.0359	0.20255

t Test

1-0

Assuming unequal variances

Difference	-0.05303	t Ratio	-0.5612
Std Err Dif	0.09449	DF	40.32545
Upper CL Dif	0.13790	Prob > |t|	0.5778
Lower CL Dif	-0.24396	Prob > t	0.7111
Confidence	0.95	Prob < t	0.2889



Means Comparisons

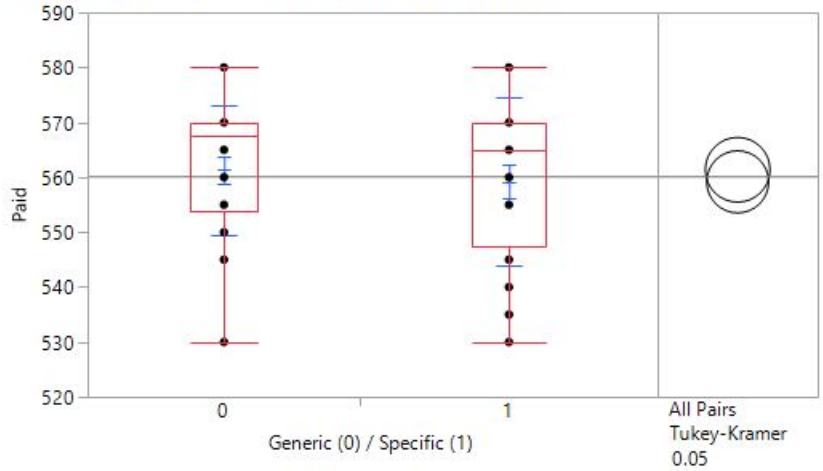
Comparisons for all pairs using Tukey-Kramer HSD

Connecting Letters Report

Level		Mean
0	A	0.13636364
1	A	0.08333333

Levels not connected by same letter are significantly different.

Oneway Analysis of Paid By Generic (0) / Specific (1)



Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
0	530	546.5	553.75	567.5	570	570	580
1	530	530	547.5	565	570	570	580

Means and Std Deviations

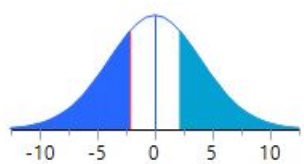
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	22	561.364	11.7698	2.5093	556.15	566.58
1	24	559.167	15.2990	3.1229	552.71	565.63

t Test

1-0

Assuming unequal variances

Difference	-2.197	t Ratio	-0.5484
Std Err Dif	4.006	DF	42.76355
Upper CL Dif	5.883	Prob > |t|	0.5863
Lower CL Dif	-10.277	Prob > t	0.7069
Confidence	0.95	Prob < t	0.2931



Means Comparisons

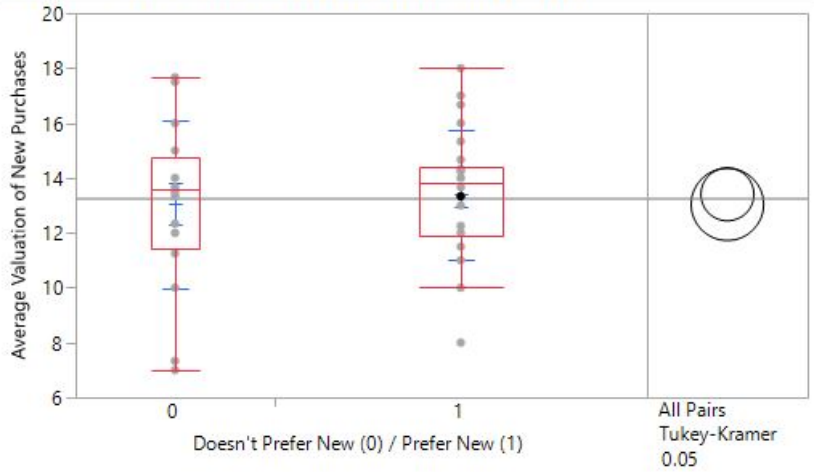
Comparisons for all pairs using Tukey-Kramer HSD

Connecting Letters Report

Level		Mean
0	A	561.36364
1	A	559.16667

Levels not connected by same letter are significantly different.

Oneway Analysis of Average Valuation of New Purchases By Doesn't Prefer New (0) / Prefer New (1)



Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
0	7	7.233333	11.4375	13.58333	14.75	17.55	17.66667
1	8	10	11.875	13.83333	14.41667	16.66667	18

Means and Std Deviations

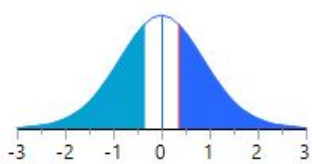
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	16	13.0365	3.05974	0.76493	11.406	14.667
1	30	13.4000	2.35960	0.43080	12.519	14.281

t Test

1-0

Assuming unequal variances

Difference	0.3635	t Ratio	0.414102
Std Err Dif	0.8779	DF	24.73725
Upper CL Dif	2.1726	Prob > |t|	0.6824
Lower CL Dif	-1.4455	Prob > t	0.3412
Confidence	0.95	Prob < t	0.6588



Means Comparisons

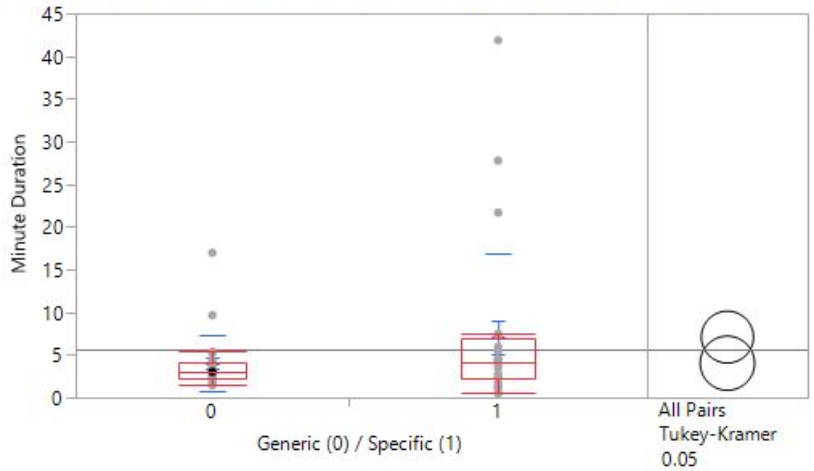
Comparisons for all pairs using Tukey-Kramer HSD

Connecting Letters Report

Level		Mean
1	A	13.400000
0	A	13.036458

Levels not connected by same letter are significantly different.

Oneway Analysis of Minute Duration By Generic (0) / Specific (1)



Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
0	1.433333	1.845	2.341667	2.983333	4.033333	8.375	16.96667
1	0.5	0.9	2.333333	4.166667	6.9	24.71667	41.86667

Means and Std Deviations

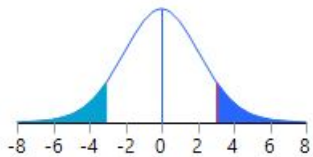
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	22	4.03030	3.36303	0.7170	2.5392	5.521
1	24	7.08889	9.72868	1.9859	2.9808	11.197

t Test

1-0

Assuming unequal variances

Difference	3.0586	t Ratio	1.448653
Std Err Dif	2.1113	DF	28.85042
Upper CL Dif	7.3777	Prob > |t|	0.1582
Lower CL Dif	-1.2605	Prob > t	0.0791
Confidence	0.95	Prob < t	0.9209



Means Comparisons

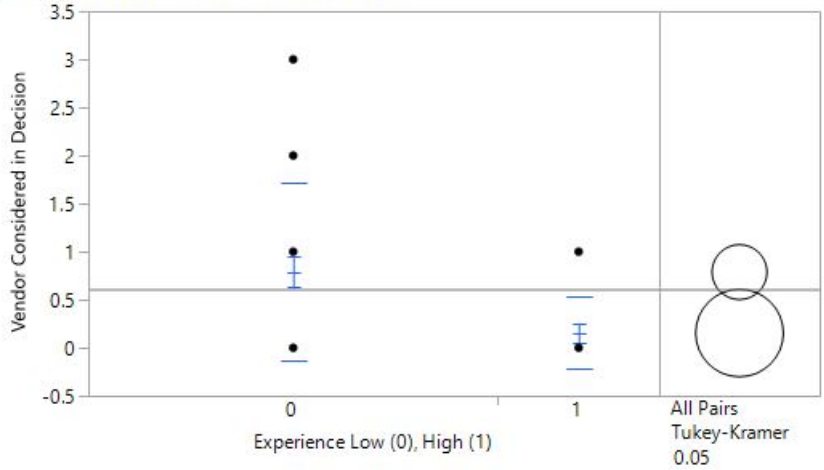
Comparisons for all pairs using Tukey-Kramer HSD

Connecting Letters Report

Level		Mean
1	A	7.0888889
0	A	4.0303030

Levels not connected by same letter are significantly different.

Oneway Analysis of Vendor Considered in Decision By Experience Low (0), High (1)



Means and Std Deviations

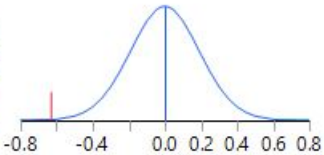
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	33	0.787879	0.927280	0.16142	0.4591	1.1167
1	13	0.153846	0.375534	0.10415	-0.0731	0.3808

t Test

1-0

Assuming unequal variances

Difference	-0.6340	t Ratio	-3.30046
Std Err Dif	0.1921	DF	43.90027
Upper CL Dif	-0.2468	Prob > |t|	0.0019*
Lower CL Dif	-1.0212	Prob > t	0.9990
Confidence	0.95	Prob < t	0.0010*



Means Comparisons

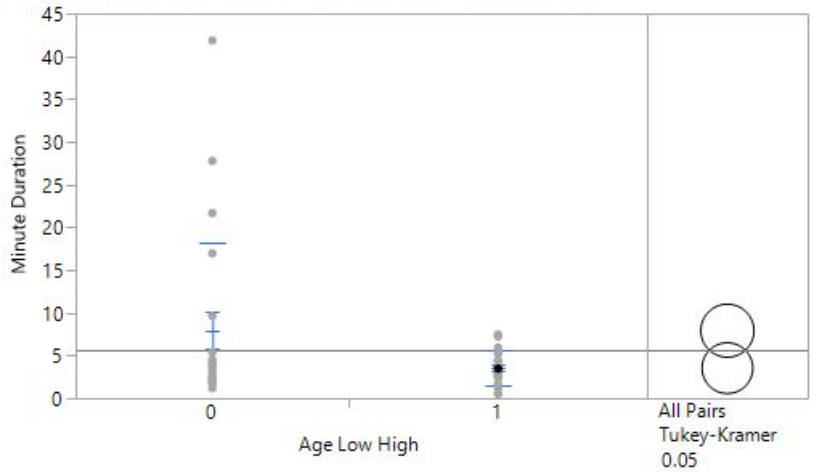
Comparisons for all pairs using Tukey-Kramer HSD

Connecting Letters Report

Level		Mean
0	A	0.78787879
1	B	0.15384615

Levels not connected by same letter are significantly different.

Oneway Analysis of Minute Duration By Age Low High



Means and Std Deviations

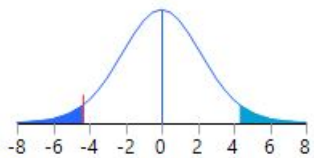
Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	22	7.90833	10.2556	2.1865	3.3613	12.455
1	24	3.53403	2.0155	0.4114	2.6829	4.385

t Test

1-0

Assuming unequal variances

Difference	-4.3743	t Ratio	-1.9661
Std Err Dif	2.2249	DF	22.48763
Upper CL Dif	0.2340	Prob > |t|	0.0618
Lower CL Dif	-8.9826	Prob > t	0.9691
Confidence	0.95	Prob < t	0.0309*



Means Comparisons

Comparisons for all pairs using Tukey-Kramer HSD

Connecting Letters Report

Level		Mean
0	A	7.9083333
1	B	3.5340278

Levels not connected by same letter are significantly different.

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14. ABSTRACT
Current procurement processes for vehicle parts vary substantially across the Air Force. Many of these parts are "commercial off-the-shelf" items that are procured through local vendors via a government purchase card. Understanding what guidance dictates various purchasing processes and how that guidance affects the behavior of purchasers is unknown. A mixed method approach of semi-structured interviews of purchasers at multiple bases and an experimental survey testing different sets of guidance are used to understand the effects of guidance. as well as produce recommendations for action and future research for leaders at the local and headquarters levels.

15. SUBJECT TERMS
Vehicle Parts, Government Purchase Card, Procurement, Guidance

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