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Electronic Reverse Auctions in the Federal Government

15 December 2007

by

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Abstract

In light of the limited recognition of electronic reverse auctions (e-RA) in the acquisition field, the purpose of this research paper is to further examine the use of e-RAs throughout the federal government and the Department of Defense (DoD). By exploring a multitude of auction types and designs that have been or are currently being used in the private sector, the authors found that past practices set a basis for researching the auction types being used in the public sector. This paper further explores the regulations guiding the use of e-RAs and investigates the federal government's application of reverse auctions through studies, reports, and interviews with users of e-RAs. Details as to what attributes are prevalent in these e-RAs, what features are best suited for e-RAs, and what benefits have been derived from the use of e-RAs in the federal government are also included. Finally, the researchers found that e-RAs have increased transparency, cost savings, and efficiencies in the acquisition process. Although reverse auctions are being used effectively, the researchers found that there are still opportunities for improvement, including incorporating a fully functional best-value tool into e-RA technology and developing more thorough federal guidance on e-RAs as an alternative pricing method.

Keywords: Reverse Auctions, e-RA, Electronic Reverse Auctions, DoD, Federal Government, Procurement, Acquisition, Pricing, Auction Theory



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List of Abbreviations and Acronyms

<i>BAA</i>	<i>Buy American Act</i>
BPA	Blanket Purchase Agreement
CBE	Competitive Bidding Event
CCR	Central Contractor Registration
CECOM	Communications and Electronics Command
<i>CICA</i>	<i>Competition in Contracting Act</i>
CO	Contracting Officer
CPRG	Contract Pricing Reference Guide
DAU	Defense Acquisition University
	<i>Defense Federal Acquisition Regulation</i>
<i>DFARS</i>	<i>Supplement</i>
DoD	Department of Defense
e-RA	Electronic Reverse Auction
FAQ	Frequently Asked Questions
<i>FAR</i>	<i>Federal Acquisition Regulation</i>
FBO	Federal Business Opportunities
FFP	Firm Fixed Price
GAO	Government Accountability Office
HST	Hawaiian Standard Time
	Department of Housing and Urban
HUD	Development
IGE	Independent Government Estimate
LPTA	Lowest Price Technically Acceptable
NAICS	North American Industry Classification System
OFPP	Office of Federal Procurement Policy
<i>PIA</i>	<i>Procurement Integrity Act</i>
RA	Reverse Auction
RFP	Request for Proposal
SBA	Small Business Administration



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I. Introduction

A. Background and Purpose

Over the past century, economists have studied auctions in an effort to characterize game theory, competitive markets, and pricing mechanisms when bidding and contracting processes are involved. Unfortunately, procurement experts cannot look at these theories and determine whether auctions are, or are not, a viable option for sourcing materials and services for their organizations. When developing auction policy, the federal government must not only take economic theory into account, but also give due consideration to the effects that other disciplines such as accounting, engineering, information technology, and the law may have on procurement auctioning. “When the government is on one side of the market and only two or three domestic bidders or contractors are available [...], then the realities of both the bureaucratic or organizational structure and the constraints of the political environment must be taken into account” (Shubik, 1983, pp. 10-11).

For many years, governments have extensively utilized traditional ascending auction theory for the sale or disposal of anything from surplus stock to bandwidth frequencies. Then they began conducting vendor competitions for purchasing commodities using a type of descending auction, the sealed-bid contract (Shubik, 1983, pp. 4-5). Sealed-bid contracts have been used for anything from constructing playgrounds, to buying ammunition, to developing helicopters. A more recent development in federal acquisition policy, following corporate industry’s example, is the integration of auction theory for purchasing basic commodities and services. This newer method of purchasing uses reverse auction methodology for procurements that feature one buyer (government) and many suppliers (vendors).

Electronic reverse auctioning is an internet-based pricing tool that uses traditional auction principles. This tool can be employed by procurement personnel to procure goods and services in a competitive environment (Defense Acquisition



University, n.d., p. 3). Beginning in 1997, the *Federal Acquisition Regulation (FAR)* promoted the use of electronic commerce and deleted verbiage that prohibited the use of reverse auctions. However, research found that the federal government is still in its infancy when it comes to the use of electronic Reverse Auctions (e-RAs). Currently, e-RAs are being conducted by many different agencies within the federal government—such as the Department of State, the Department of Homeland Security, the Department of Defense and others. Procurement offices within these agencies have seen a multitude of benefits, but reverse auctioning has not been embraced by everyone in the procurement field. Indeed, research shows there are only two major reverse auction sites being employed by the federal government.

In light of the limited recognition of e-RAs in the acquisition field, the purpose of this research paper is to further examine the use of e-RAs throughout the federal government and the Department of Defense (DoD). This paper first explores auction theory through a multitude of auction types and designs. It then delves into the regulations guiding the use of e-RAs and analyzes the increased transparency and efficiencies experienced by agencies employing e-RAs as a pricing tool. The following questions are the basis of this research paper and are examined throughout. Answers to the questions have been assimilated through qualitative research and are provided in the Conclusion.

B. Research Questions

1. What existing auction theories apply to electronic reverse auctions as utilized within the federal government?
2. What are the rules and regulations governing reverse auctions in the federal government, and more specifically, in the Department of Defense?
3. What are the past experiences of the federal government in using reverse auctions?
4. Have electronic reverse auctions in the federal government been used in the most effective manner; or are there opportunities for improvement?



C. Methodology

The methodology used in this research project took many forms. The first part of the research focused on reviewing available literature on many different types of auctions, including reverse auctions and the use of information technology in reverse auctions (otherwise known as electronic reverse auctions). After researching the types of auctions that have been or are currently utilized in the private sector, research was conducted on the types of auctions being used in the public sector. More specifically, information was gathered relating to the use of e-RAs throughout the federal government. Research concentrated in areas such as: (1) the federal regulations guiding the use of e-RAs, (2) the incorporation of socio-economic factors in e-RAs, (3) potential cost savings, and (4) potential personnel and process efficiencies.

In order to gather data relating to the use of electronic reverse auctions in the federal government, the researchers sent requests for information to the providers and administrators of the electronic reverse auction websites used by the federal government. Multiple sites responded to the request, but only two were willing or able to provide data. Different types of data were available from these providers due to their differing e-RA techniques.

After data was received, the researchers conducted interviews with each of the providers and with representatives from the different federal agencies that use either of the services to procure items for their agency. The agencies that participated in the interviews were: the Army Contracting Agency, Department of State, Department of Homeland Security, US Navy, General Services Administration, and Transportation Security Administration. The data were used to determine what attributes are prevalent in the e-RAs, what attributes are best suited for e-RAs in the federal government and what benefits are derived from the use of e-RAs.



D. Reverse Auction Tool Overview

The two e-RA services used by the federal government that were able to provide data were FedBid, Inc. (FedBid) and the US Army Auction and Valuation Engine (USAAVE). The latter was developed by MOAI CompleteSource, and is used by the Army Communications and Electronics Command (CECOM) Acquisition Center. The most significant distinction between the two e-RA sites is the user model. FedBid is a private firm that provides and operates a fully functional online marketplace for commodity purchases, providing comprehensive marketplace services throughout the procurement process and collecting a fee (0%-3% of the total selling price)¹ from the winner (selected seller) of the contract. Each seller who submits a bid will put his or her selling price into the FedBid system; however, the price that the buyer sees incorporates the selling price and the associated fee so the buyer can immediately determine net savings. CECOM has a blanket enterprise license agreement through which it pays an annual fee for the USAAVE license to operate MOAI CompleteSource software; CECOM provides any additional services required to support the reverse auction events.

The second noteworthy distinction is the auction process employed by each site. FedBid uses a web-based system that is accessible through any web browser. To start the process, a buyer will issue a solicitation through the FedBid site. This, in turn, sends a notification e-mail to all vendors informing them that a solicitation was issued that matches their company profile. A notification will also be sent to any vendors specified by the buyer. If applicable, the FedBid system will automatically post the solicitation on the Federal Business Opportunities (FBO) website (FedBid, 2007b).

¹ “FedBid receives a transactional fee, consisting of not more than three (3) percent of the transaction, but only if the buyer: 1) determines that the reverse auction has met the competition, savings and other buyer generated criteria for the procurement and 2) selects a winning seller” (FedBid, p. 22). Further information and examples of how the fee is applied can be found in the Seller’s section on FedBid’s website at <http://www.fedbid.com/sellers/procedures/>



Any seller who decides to submit a bid in response to the solicitation does so through the FedBid website. The seller is only able to see whether or not he or she is in a “lead” or “lag” position relative to the other sellers. The seller can re-bid as many times as he or she wants until the e-RA ends. The seller can also use an automatic re-bid function that allows the computer to automatically re-bid according to the parameters set by the seller. Research showed that during the e-RA process, buyers might periodically observe what is happening, but would continue to work on other contracts during this time. Because the marketplace and underlying services automate the notification, competition and documentation phases of the procurement, there is no limit on the number of e-RAs a single buyer can have going simultaneously. Once the e-RA is over, the buyer will choose a winner based on the evaluation criteria listed in the solicitation or, if the buyer is not satisfied with the results, he or she can choose not to award the contract. If this happens, the buyer would either cancel the solicitation altogether or re-post/re-open the solicitation and use a more traditional pricing method.

The Army-CECOM Acquisition Center’s reverse auction tool (USAAVE) is also a web-based tool that can be accessed from any web-browser. Users of this system do not initiate the solicitation through the reverse auction site; instead, they post it through the FBO website and give notice on that solicitation that an e-RA will be used. Or, if a FBO posting is not required, the buyer notifies the sellers via e-mail or telephone. The solicitation or notice provides the time and date of the auction, as well as contact information for the buyer. The seller then has to contact the buyer to be given a username and password. This user name and password only allows access to the specific e-RA in the solicitation (Meinert, 2007).

Once the e-RA starts, each seller can submit its bid and has the chance to re-bid if needed. Each seller is able to see the other seller’s actual price; however, a name is not associated with that price. The e-RA ends when there is no activity (bids or re-bids) for a period of five minutes. During the e-RA process, the buyer is required to constantly monitor the situation; it cannot be working on other contracts



at the same time. Once the e-RA is finished, the buyer chooses a winner in accordance with the evaluation factors set forth in the solicitation. If the buyer is not satisfied with the e-RA results, the buyer can cancel the solicitation or re-solicit and use more traditional pricing methods. Both sites allow the buyer to award to one seller or multiple sellers so long as that approach is stated in the solicitation (Meinert, 2007); however, most users of the FedBid site award to single sellers only in order to maximize efficiencies and balance the financial interests of the parties (Tupponce, 2007). Many of the characteristics listed above, as well as others, will be discussed further in Chapter V.

E. Limitations

This research project is limited in scope and breadth due to the availability of both quantitative and qualitative data for e-RAs in the federal government. The research also uses limited data to make broad generalizations regarding e-RAs in the federal government. Quantitative data was available only as far back as 2000 for the USAAVE and 2002 for FedBid. Furthermore, both types of data were only available from two sources, and, although personal interviews were conducted, the sample size was narrow and limited. Moreover, FedBid users who were interviewed were selected by the service provider, although it is important to note that FedBid was not involved in, or present at, any of the interviews. Additionally, the researchers interviewed only one USAAVE user, CECOM's Chief of the Acquisition Business Process Systems Enhancements and Initiatives Sector, and did not contact MOAI CompleteSource. Lastly, the data collected differed by service provider. Thus, the researchers were unable to directly compare results.



II. Auction Theory

A. Common Auction Types

As a sub-discipline of economics and a tool used in the procurement of both commodities and services, auction theory has been explored in depth by a host of economists, lawyers, and procurement policy officials. Both traditional ascending auctions and less-traditional descending, reverse auctions are utilized by the federal government. As an introduction to the exploration of reverse auctions in the federal government, the following literature review serves as a basic overview of auction theory and highlights the specific idiosyncrasies of reverse auctions.

1. English

The English auction is the auction that most people envision when remembering auctions they have seen for art, jewelry, or antiques. Research by Kambil and van Heck (2002) explains that the English auction has been around since 500 BC and is commonly used by famous auction houses such as Sotheby's and Christie's (p. 75). English auctions have one seller, or auctioneer, who is trying to get the highest price possible for an item. Multiple buyers, or bidders, compete by shouting out prices in succession until there is one bidder left bidding the highest price he is willing to pay. Campbell (2006) reports that if it is an internet auction, such as the most popular of all—eBay—then the bids are submitted electronically rather than being shouted. The item is then sold to the highest bidder at the last bid price (p. 349). During English auctions, the number of buyers bidding is typically known by all for the duration of the auction (Carter, 2004, p. 231). The length of the auction is determined by the auctioneer or seller, and time is not usually a determining function of the outcome—unless the auction is performed online. For instance, e-Bay employs a fixed-time function which pressures bidders to play against the clock and each other in order to determine a winner.



The most common version of the reverse auction uses the same concept as the English auction, but backwards. There is one buyer and multiple suppliers “who submit successively decreasing bids until no other bidder will announce a lower bid” (Alper & Boning, 2003, p. 11). The last bidder is the winning supplier who sells his item to the buyer or is awarded the contract for that lowest bid price. Many of the electronic reverse auctions held today descend from the English auction. A popular software solution for commercial businesses conducting these reverse auctions is Freemarkets. In the public sector, some federal government agencies use Fedbid, an internet-based reverse auction site.

2. Japanese

Alper and Boning (2003) presented an interesting variant of the English auction in their research of reverse auctions. This unique type may prove to be a viable option for the government’s reverse auction methodology.

A variant on the English auction is the Japanese (also called English descending-clock or open-exit) auction. In the reverse auction version, the auctioneer announces successively decreasing prices. All vendors are initially in the auction. As the price falls, bidders must choose the price at which to withdraw (publicly) from the auction. The last vendor remaining is the winner, and the contract price is the price at which the next-to-last bidder withdrew. (p. 11)

3. Dutch

Another type of auction is the Dutch auction. First used in Holland to sell tulips, the auctioneer would start the price unrealistically high and then incrementally lower the price “until a buyer signals to the auctioneer that he or she will take the goods at the current price” (Kambil & van Heck, 2002, p. 75). Shubik (1983) describes one method for bidding as: the “participants watch the price on a price clock gradually decrease. The auction ends when someone presses a button and stops the clock” (p. 4). This was the price that the bidder would pay for that bunch of tulips. Kambil and van Heck (2002) point out that the Dutch auction can also be performed electronically, but due to bandwidth and other online delays that may



delay bids, “a fast Dutch auction is difficult to run over the Internet today” (p. 79). One aspect that makes the Dutch auction more complicated for the bidder than the English auction is that “the bidder must choose how high to bid without knowing the other bidders’ valuations or interests in the good” (Kambil & van Heck, 2002, p. 76).

Due to the lack of literature on reverse Dutch auctions, it stands to reason that they are not very common; but Alper and Boning (2003) describe the process as follows: “The buyer/auctioneer initiates the auction by announcing successively increasing prices until some provider/bidder stops the bidding. The winning bidder is the first one to stop the auctioneer, and the price paid is the last price announced” (p. 11).

4. Sealed-bid, First-price

In a sealed-bid auction, bidders submit private “sealed” bids to a selling agency by a specified date and time. In a first-price auction, “The bids are then opened and compared and the item [...] is awarded according to some previously specified convention. [...] Usually award is] to the highest bidder” (Shubik, 1983, p. 5). Kambil and van Heck (2002) assert that in terms of bidders’ knowledge, sealed-bid auctions are very similar to Dutch auctions since “a bidder must decide how high to bid without knowing the bids of his competitors” (p. 76).

The sealed-bid, first-price reverse auction is the traditional sealed-bid solicitation method used in government procurement. There is only a single round of bidding and “the winning bidder is the one who submits the lowest bid, and the contract price is the amount of the winning (lowest) bid” (Alper & Boning, 2003, p. 11). Until recently, this was the preferred method of procuring items or services that were well-served by a lowest-price, technically acceptable solution.

5. Vickrey

Another variation of the sealed-bid auction is the second-price auction. This type is commonly referred to as the Vickrey auction, “named after William Vickrey, a



Nobel laureate in economics, 1996” (Kambil & van Heck, 2002, p. 76). In this auction, sealed bids are submitted, and the highest bid wins. However, the winning bidder pays only the second-highest bid price (Carter, 2004, p. 231). As reported by Kambil and van Heck (2002), the Vickrey auction is used by “Antebellum Covers [...] to auction manuscripts and ephemera such as Civil War papers, small war relics, and eighteenth- and nineteenth-century war-related letters and documents” (p. 76). Other uses of this method include the auctioning of collectable stamps and US Treasury securities. “The elegance of the Vickrey auction is that it is designed in such a way that “truth telling”—bidding the true value of the auctioned product—is the best bidding strategy” (Kambil & van Heck, 2002, p. 76). This is confirmed by Campbell (2006), who explains through economic strategy that “submitting a bid equal to your reservation value is a dominant strategy for the Vickrey auction [regardless] of whatever you know about the bids of others” (p. 335).

Reverse auctioning in this format is very similar to the Japanese auction in that it awards the lowest bidder the contract at a price equal to the amount of the second-lowest bid. Since this structure provides more revenue for the winning organization than if it was awarded the contract at its bid price, this process may be a practical option through which the government could combat common feelings of buyer-opportunism and stimulate trust with the bidders. Although each type of auction has its own characteristics, there are similarities in the outcomes of these auctions.

B. Comparison of Outcome

In his book *Incentives: Motivation and the Economics of Information* (2006), Campbell significantly addresses the outcome equivalence of auctions. He defines outcome equivalence as: “two auction mechanisms are outcome equivalent if, however many bidders there are and whatever their reservation values, the same individual would be awarded the asset with either mechanism, and at the same price” (p. 351). Campbell’s work involves hypothesizing and proving mathematically



that the Vickrey and English auctions outcomes are equivalent—as are the Dutch and First-price auctions (p. 352).

Although their formats are extremely different, when Campbell compares the Vickrey and English auctions, their outcomes are equal. He writes that in a Vickrey auction, “even if you knew what every other participant was going to bid, you could not do better than bidding your own reservation value” (p. 351). And in the “English auction, neither the seller nor the auctioneer will find out how high the winner was prepared to go” (p. 351). Confirming that these two theories come out equal is beyond the scope of this paper, but does follow logically.

Campbell then hypothesizes that Dutch and First-price auctions result in equal outcomes, as well. He offers this explanation:

In short, the bidders have more information in a Dutch auction than in a first-price auction, but by the time they get that information it is no longer of value. With either auction, the bidder has to decide the price at which he or she will buy the asset, should that bidder be the high bidder, and he or she has to do it before the bidding starts. (p. 352)

His proof gets quite complex when he begins to turn the Dutch auction into a First-price auction and vice versa. However, it does provide thought-provoking insight into auction design.

Consistent with Campbell, Carter et al. (2004) consolidate theory from a variety of sources and summarize that “the anticipated price paid under all four auctions is equal with risk-neutral bidders” (p. 231). These authors point out, however, that the experimental literature “has not been as conclusive” and that the theoretical outcome equivalence of various auction types does not always hold in laboratory simulations. Carter et al. (2004) observe that “these results could be due to the type of experimental design employed, a lack of planning and [other] errors” (p. 231). To the extent that the fundamental auction type does not, in fact, affect the outcome of an auction, then variations that facilitate the type of commodity or services being auctioned must be considered next.



C. Variations

The following are descriptions of some variations to the auctions described above. Alper and Boning (2003), and Kambil and van Heck (2002) portray all variations in reverse auction format; therefore, the descriptions for the multiple-item, multi-attribute, and combinatorial auctions will primarily be written for reverse-auction application. Hybrid auction designs will also be addressed as a variation of common auction types, but due to their complexity, they will be described in an easier-to-explain ascending auction format.

1. Multiple-item Auctions

According to Alper and Boning (2003), often the object being auctioned is actually a bundle or grouping of items sold as a single unit. “However, in some instances, an auctioneer may want to purchase identical items from several different vendors, and if so the auction rules must specify how the multiple vendors are to be selected, the price each vendor will receive, and the quantity each vendor will provide” (p. 12).

a. Multiple-price Auctions

Alper and Boning (2003) describe an alternative for a multiple-item auction in which the sellers submit bids for a set of items, specifying the quantity and price. When the auction is finished, the auctioneer places the bids in order by lowest price first, awards the seller-specified quantity to the lowest bidder, and continues to award successive quantities to the next lowest bidders until the full quantity has been allocated (p. 12). Egghead has used this multiple-price, multiple-unit method for ascending-price auctions when selling cameras or other electronic goods. Also referred to as a “Yankee” auction, this method allows each winning bidder to pay different prices for the same good (Kambil & van Heck, 2002, p. 87).

b. Single-price Auctions

Based on the same concept as the second-price auction, Alper and Boning (2003) report that the single-price, multiple-item auction is awarded to all bidders at



the same price. As in the multiple-price auction, the sellers submit bids for a set of items specifying the quantity and price. Again, the auctioneer places the bids in order by lowest price first. However, the awarded price is determined by “the highest bid price that provides any of the good” or “the lowest of any vendor not winning a quantity” (p. 13). All qualifying sellers are paid the same price for the amount of items they bid until the full quantity has been allocated (p. 13).

2. Multi-attribute Auctions

A highly advanced variation of reverse auctions, multi-attribute auctions provide a variety of options for the buyer. Differing degrees of requirements can be set in such areas as delivery, schedule, quality, price, and quantity. Buyers searching for products can specify the various attributes they prefer in rank order. Then, sellers place bids offering their products with multi-attribute specifications. Otto Koppius, assistant professor at the Rotterdam School of Management, performed the following study:

[S]uppliers were bidding to provide a chemical product to a buyer. The chemical could vary in quality, delivery schedule, or offer-price in the auction. The auction was conducted in multiple rounds with four competing suppliers. At the end of each round the buyer would either indicate the rank order of preferences for different bidders' offers, or estimate how close (in terms of utility) the bidder was to the buyer's preferred configuration at that point in time. (as cited in Kambil & van Heck, 2002, p. 82)

A promising variation of reverse auctions, the multi-attribute auction is not yet widely used. The complexity of its configuration limits the buyers and sellers, but with the assistance of websites such as “perfect.com [...which] provides multi-attribute negotiation and auction software to various industries” (Kambil & van Heck, 2002, p. 82), the market may soon see a surge in this auctioning technique.

3. Combinatorial Auctions

As its name implies, combinatorial auctions involve a combination of items, rather than a single quantity or type of item. Alper and Boning (2003) believe that



“there may be economies of scale or scope (synergies) that can be realized by grouping items together” (p. 72). Combinatorial auctions are the mirror-image of multi-attribute auctions. Multi-attribute auctions are reverse auctions in which suppliers submit multi-dimensional bids, while combinatorial auctions are forward auctions in which buyers submit monetary bids for multi-dimensional items. In either case, what is being sold has multiple elements or components. Although complex, combinatorial auctions can solve resource allocation problems that can not be solved with previously discussed auction formats. Kambil and van Heck (2002) discuss some of the applications that combinatorial auctions have been used for—including Federal Communications Commission’s broadcast spectrum auctions, and transportation carrier contracts such as those used by Home Depot for carrier capacity (p. 83).

4. Hybrid Designs

There are an unknown number of hybrid design solutions for auctions. Some of the possibilities include combining two basic auction types. Campbell (2006) describes just such a partnership in the English-Vickrey internet auction, which provides a surrogate bidding solution commonly referred to as proxy bidding. In order to provide a way for bidders to continue bidding without constantly being near a computer, “the software [...] now allows a bidder to enter the maximum that the bidder is willing to pay. The algorithm then raises the bids submitted by others as long as the maximum has not been reached” (p. 351).

Another hybrid auction which solves the problem of choosing between the English and Dutch auction formats is the hybrid coined “Anglo-Dutch” by Klemperer in 1998.

In an Anglo-Dutch auction, the auctioneer begins by running an ascending auction in which price is raised continuously until all but two bidders have dropped out. The two remaining bidders are then each required to make a final sealed-bid offer that is not lower than the current asking price, and the winner pays his bid. (as cited by Klemperer, 2004, p. 116)



Because the auction combines the advantages of both auction formats, the resulting benefit to the seller should be higher. The visibility of the value of the item to other bidders in the English auction portion induces higher bids, whereas the sealed-bid portion captures a higher price due to the bidders' risk aversion (Klemperer, 2002, p. 182).² A hybrid design may be appropriate for the desired auction result; however, there are many additional rules that must be considered for optimal auction design.

D. Additional Rules

Some of the additional rules of auction format include setting reserve prices and minimum bids, as well as determining the speed at which the auction runs and the length of the auction. Another important factor of auction design is the type of feedback the bidder receives during the auction—whether anonymous bidding is desired or a rank-order bidding feature is selected. All of these additional rules can impact not only the outcome of the auction, but also the participation and satisfaction levels of the participants.

1. Reserve Prices and Minimum Bids

Kambil and van Heck (2002) claim that in ascending auctions, the seller may set a minimum bid. This can discourage potential bidders if too high, but also protect the seller if the bidders do not value the item as much as the seller. The seller “may also set a reserve price level, which is a kind of undisclosed minimum bid” (p. 94). Unless the reserve price is met, the seller can refuse to complete the transaction. Until the reserve price is met, it acts like an additional bidder and tends to increase the final auction price (p. 94).

² Although Klemperer utilizes the terms Dutch and sealed-bid interchangeably, this paper doesn't define those two types of auctions as such. Indeed, the hybrid may be better described as an “English (open-exit) - Sealed-bid” auction, however cumbersome that title may seem.



In a reverse auction, “reserve prices can be used to establish a ceiling [...], above which the auctioneer will not purchase the good from any bidder” (Alper & Boning, 2003, p. 13). By enacting this rule in reverse auction procurements, the federal government should protect itself from paying more than what it would in a traditional procurement action.

2. Auction Speed

The speed with which an auction takes place relies on many elements and can have an affect on price. Some of the more common elements are described by Kambil and van Heck (2002), including auctioneer pacing and price intervals (p. 93); Alper and Boning (2003) suggest that minimum bid increments influence speed (p. 13).

a. Auctioneer Pacing

In traditional English auctions, the auctioneer can control the pace of the auction by responding to bids quickly or slowly. This can either encourage or discourage competition, depending on the bidders’ level of risk-aversion. Internet bandwidth can have the same effect on electronic auctions. Fortunately, with technological advances, this is quickly becoming a non-issue (Kambil & van Heck, 2002, p. 93).

b. Price Intervals

The overall speed of the Dutch auction, which uses the speed of the clock and a price interval set for each clock “tick” control, is determined by both the tempo and tick price. A faster tick or a higher price interval has a tendency to “lower the average auction price” (p. 92) and is beneficial to the buyer.

c. Minimum-bid Increments

In open auctions, in which the bidders see each other’s bids, a minimum bid increment requirement can be established by the auctioneer. By eliminating small bid increments, such as pennies on the dollar, or dollars on the thousands, the



bidding process can be sped up by forcing bidders to “exceed the current best bid by at least the minimum increment” (Alper & Boning, 2003, p. 13).

3. Auction Periods and Timing

Consideration of the length and timing of an auction is an important element of auction design. According to Kambil and van Heck (2002) business-to-business (B2B) auctions should be conducted on the weekdays, with enough time allowed for proper pricing and risk-assessment by the company. In contrast, sellers on eBay may decide to run their auctions for any length of time between three and ten days and will do better if they time the closing of their auctions for the weekend. “In general, longer English auctions on the Internet tend to attract more bidders and earn higher prices” (p. 91). The advantages of weekend closing for consumers versus weekday closing of auctions for businesses is a rule that hasn’t changed in fifty years, regardless of the advent of online auctioning (p. 92).

4. Feedback to the Bidder

Feedback from the auction to the bidder can be given a multitude of levels. The bidders’ identities, bid prices, and bid rankings are some of the information pieces that must be considered during auction design.

a. Anonymous Bidding

As noted by Kambil & van Heck (2002), anonymous bidding has always been inherent to sealed bidding and is also incorporated into many internet auction formats. Bidders may be more inclined to bid aggressively if their competitors do not know their identity. This may be paired with rank-order bidding for maximum participation in a competitive market (p. 96).

b. Rank-order Bidding

In rank-order bidding, bidders only know how their own bids rank relative to others’, not what the other bidders’ prices are. This feedback mechanism may prove to be valuable since it provides invisibility for the bidders and encourages them to



participate in the auction more aggressively. Alper and Boning (2003) state that rank-order bidding is being experimented with by many online auction sites (p. 13). In examining how to increase competition in reverse auctions, Carter et al. (2004) developed a hypothesis about rank-order bidding that states: “rank-based auctions tend to be more successful than price-based auctions” (p. 246). Their findings include that “a rank-visible auction may also be beneficial when buyers want to minimize transparency, such as in the case of rising markets” (Carter et al., 2004, p. 246).

E. Other Considerations of Auction Design

After determining the basic type of auction that will potentially produce the desired effect for an agency’s procurement, auction designers must address many other factors. These include the variations and rules previously discussed; however, designing a successful auction does not stop there. Other factors to consider are the specific buyer (i.e., Department of Defense), the rules and regulations governing procurement for that buyer, the desired outcome of the auction in accordance with agency policies, and selection of the e-RA tool that best suits the organization. These other considerations of auction design are addressed in the following chapters of this paper.



III. Regulations

As a pricing tool used in the acquisition process, reverse auctioning must satisfy all applicable rules and regulations as dictated by the federal government. The primary document regulating the acquisition process is the *Federal Acquisition Regulation (FAR)*. Supplements to the *FAR* include the *Defense Federal Acquisition Regulation Supplement (DFARS)*, other agency *FAR* supplements and individual agency regulations. These supplements are used in conjunction with the *FAR* and typically place further restrictions or requirements on the Acquisition Team.³

Prior to 1997, *FAR* Part 15.610(e)(2) prohibited:

Auction techniques such as—

- i. Indicating to an offeror a cost that it must meet to obtain further consideration;
- ii. Advising an offeror of its price standing relative to another offeror (however it is permissible to inform and offer that its cost or price is considered by the Government to be too high or unrealistic); and otherwise furnishing information about other offerors' prices.

However, in 1997, the *FAR* rewrite removed the wording that prohibited the use of auctions. Procurement personnel now view the language of *FAR* Part 1.102 (d) and *FAR* Part 4.502 (a) as authorization to use auctioning techniques. These *FAR* sections state:

FAR 1.102 (d): In exercising initiative, Government members of the Acquisition Team may assume if a specific strategy, practice, policy or procedure is in the best interests of the Government and is not addressed in the *FAR*, nor prohibited by law (statute or case law), Executive order or other regulation, that the strategy, practice, policy or procedure is a permissible exercise of authority.

³ *FAR* 1.102-3 defines the acquisition team as: "...beginning with the customer and ending with the contractor of the product or service."



FAR 4.502 (a): The Federal Government shall use electronic commerce whenever practicable or cost-effective.

Other regulations that must be considered by the contracting officer when using reverse auctions are the *Buy American Act*, *Procurement Integrity Act* and acts relating to the utilization of small businesses.

A. *Buy American Act*

Even if a buyer employs e-RAs to determine the price of an item, the regulations such as the *Buy American Act (BAA)* still apply to the procurement. The *BAA* restricts the purchase of supplies or construction materials that are not domestic end-products; it applies to all purchases that exceed the micro purchase threshold (*FAR 25.1-25.2*). An online electronic reverse auction makes it easier for foreign businesses to participate in government procurements because of the world-wide access of the internet.

Although it is acceptable for foreign businesses to participate, the materials they use must comply with the *BAA*. One could argue that because they are foreign businesses, they may not be as familiar with the *BAA* and could have a greater propensity to supply foreign items. Since the *BAA* provision and clause are in all solicitations and contracts, the contractor will be held responsible for any violations. Along the same lines, the contracting officer must do his or her part to ensure the products supplied for construction and commodities adhere to the *Buy American Act*.

B. *Procurement Integrity Act*

Although reverse auctions are now considered legal, there are still regulations that procurement personnel must adhere to when using them. Steven Kelman, the administrator of the Office of Federal Procurement Policy (OFPP) from 1993 to 1997, states that the *Procurement Integrity Act (PIA)* may also inhibit the use of reverse auctions because it “prohibits the disclosure of proposal information to competitors although clearly this was not the intent of the legislation” (Kelman, 1999, para. 4). Procurement personnel should ensure they are not violating *PIA* and are



also following *FAR* 15.306(e)(3), which provides guidance on source selections and states that the government may not “reveal an offeror’s price without that offeror’s permission.” Procurement personnel can obtain the offeror’s permission by having the vendors agree to use reverse auctioning techniques prior to the start of the reverse auction. One way to obtain permission is by having the offeror sign a statement acknowledging that he is aware that his bid will be shared anonymously with all other auction participants (DAU, n.d., Process/Procedures Lessons Learned section).

An article published by Turley (2002) found that the Navy put language in its solicitations that said, “submission of a proposal in response to the solicitation will be considered consent by the Offeror to participate in the CBE [competitive bidding event] and to reveal their prices in anonymity during the CBE” (Section III A, para. 14). According to her research, no regulatory guidance says whether or not “consent implied by participation is sufficient” (2002, Section III A, para 15). She also questions whether “consent required for participation is freely and voluntarily given” (2002, Section III A, para. 14) in this solicitation format.

Research by Giampietro and Emiliani (2007) found that some incumbent suppliers find reverse auctions in the private sector to be coercive in nature and that the reverse auction process includes “patterns of behavior that are tantamount to intentional, well-orchestrated psychological and economic coercion resulting in price harassment” (p. 79). For instance, if an incumbent supplier wants to maintain his supplier relationship with a company, he has to participate in whatever process the company has to award contracts. In Giampietro and Emiliani’s (2007) study, one incumbent supplier was told that if he didn’t participate in the reverse auction, he would be dropped as a supplier and as an approved source. Another was reminded during the reverse auction process that his bid was not the low bid, and he could potentially lose business if he did not lower his price (p. 78). Although the scope of this paper does not delve into whether or not e-RAs are coercive in nature for incumbents or whether competition itself is the coercive factor in Giampietro and



Emiliani's study, it is important to note that federal government procurement, particularly for commodity procurements, requires competition and that commodity procurements typically do not involve an incumbent supplier dynamic. The need for, and effect of competition for a given type of procurement is something the federal government should consider when deciding whether or not to use e-RAs as a procurement tool and what type of e-RA to use.

C. Socio-Economic Concerns

In addition to the following the *BAA* and *PIA*, contracting officers must also take socio-economic regulations into consideration. Congress believes that "the security and well-being [of the nation] cannot be realized unless the actual and potential capacity of small businesses is encouraged and developed" (15 USC 631, 2006). To promote the use of small businesses within the federal procurement arena, the *Small Business Act*, *Armed Services Procurement Act*, *Federal Property and Administrative Services Act*, section 7102 of the *Federal Acquisition Streamlining Act* of 1994, and *Executive Order 12138*, May 18, 1979, all incorporate guidance regarding the use of small businesses (*FAR* 19.000). Congress felt so confident in the ability of small businesses to promote and sustain the economic well-being of the nation that it further stated:

The essence of the American economic system of private enterprise is free competition. The preservation and expansion of such competition is basic not only to the economic well-being but to the security of this Nation...It is the declared policy of the Congress that the Government should... insure that a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government...be placed with small-business enterprises. (15 USC 632, 2006)

D. Seeking out the Small Business

In order for federal contracting officers to award a contract to a small business, the small business must know about the small business opportunities that are available and be willing to do business with the federal government. *FAR* 19



addresses these issues in a multitude of ways. First, *FAR* 19 (referencing Section K of the *Small Business Act*) requires that each contracting agency establish an Office of Small and Disadvantaged Business Utilization with a director who is appointed by the agency head. Among many other tasks, the director is responsible for ensuring that small businesses are aware of the opportunities available within each agency.

To accomplish this task, many agencies hold or attend industry days that are specifically dedicated to small business concerns. At these conferences, small businesses are educated as to what is involved in federal contracting. They will learn what processes must be followed prior to competing for an award—such as registration in the Central Contractor Registration (CCR) database, completion of the Online Representations and Certifications Application, as well as where business opportunities are advertised, such as the Federal Business Opportunities (FBO) website. Other ways the small businesses can find out about the federal business opportunities is by registering with their local Small Business Administration (SBA) office. If a director cannot find responsible small businesses to participate in the contracting process through normal market research, the director is required by law to contact the local SBA office for sources.

Other ways the director can encourage the participation of small businesses is by dividing the requirement of supplies or services into several smaller portions to better accommodate the abilities of a small business. This is different from “splitting requirements” and is authorized by *FAR* 19.202-19(a). The director can also give advance notice of a requirement to the SBA or do 100% set-asides for small business concerns. This option is addressed further in the next section.

E. The Small Business Set-Aside

To help contracting officers achieve the goal of a “fair proportion” of contracts being awarded to small businesses, the *FAR* provides further instruction on the use of small businesses in federal contracting. *FAR* 19.5—Set-asides for Small Business— mandates that the Small Business Specialist at each contracting location



ensure the contracting officers set aside all requirements for supplies or services between \$3,000 and \$100,000 specifically for small businesses, unless there is not a reasonable expectation of two or more responsible small businesses. It further states that any requirements for supplies or services over \$100,000 should also be set aside for small businesses if there is a reasonable expectation of two or more responsible small businesses. In other words, if the contracting office is awarding a contract using *FAR* 13—Simplified Acquisition Procedures—and market research indicates there are at least two responsible small businesses that can provide the required supplies or services, the contract needs to be set aside for a small business.⁴

The use of electronic reverse auctions to promote and perhaps increase the number of contracts awarded to small businesses is not as cut-and-dry as one might assume. Some argue that even though the acquisitions still have to be set-aside for small businesses, the small businesses won't participate in the e-RA because the investment in technology and the expertise needed to participate are so daunting. In such cases, the small business will simply choose not to participate (Turley, 2002, Section IV G, para. 1).

Technologically, the only investment a small or large business needs to make to participate in an e-RA is a computer and an internet connection. If, by some chance, a business does not have either a computer or an internet connection, its personnel can go to their local cyber café and rent a computer and internet connection for the duration of the auction. The Economics and Statistics Administration's Digital Economy 2000 report says that e-commerce will "level the playing field between large and small businesses" (p. V). Further, it states that the

⁴ Other socio-economic concerns that fall under the Small Business category are: service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns (*FAR* 19.202-5). Contracting officers also have the ability to do a sole-source award to small business concerns that fall under the HUBZone, service-disabled veteran-owned, or the 8(a) program without regard to other small business concerns, unless there are multiple vendors within that same category (*FAR* 19).



internet “[makes] it easier and cheaper for all businesses to transact business and exchange information” (2000, p. V).

Language in the latest *DFARS* now suggests that the federal government expects all businesses to have access to a computer and the internet. For example, *DFARS 252.232-7003, Electronic Submission of Payment Requests—March 2007*, states that all contractors must submit their invoices electronically, via any one of the multiple internet/web-based invoicing systems such as Wide Area Work Flow. Since this *DFARS* clause already requires the contractor to have access to a computer and internet connection to submit invoices, the government is not requiring a business to acquire more technology to participate in e-RAs.

In regards to the expertise needed to participate in reverse auctions, training is available to both the contracting officer and the contractor. The Defense Acquisition University (DAU) has a reverse auction continuous learning module (CLC 031: Reverse Auctions) that educates the user on what reverse auctions are and how they should be used. Those agencies that already use reverse auctions also have training available on their websites. The General Services Administration (GSA) has a 22-page *Reverse Auction User’s Guide* available on the internet (2002). The US Army Communications-Electronics Command (CECOM) has a reverse auction website that includes a mock auction, training video and training presentation (n.d.). The US Air Force has a website with some basic policy guidance on reverse auctions (2006). The US Navy’s Naval Supply Systems Command (NAVSUP) also has a website for auctions that provides an overview, a FAQ (Frequently Asked Questions) section and links to training on reverse auctions provided by Procuri (n.d.).

Other reverse auction sites which are used by the federal government, such as FedBid, also include guides to using their reverse auction sites. As long as a small business, or any business, is willing to dedicate some time to reading the guides and the readily available literature on reverse auctions, it should be able to participate in the reverse auctions. In addition, as part of its marketplace services,



FedBid provides training upon request not only for buyers, but also for sellers; however, FedBid reports that, because their marketplace was built for ease-of-use, most of their more than 22,000 active seller agents have required no training (Tupponce, 2007).

F. Reverse Auctions and Small Business—In Action

Two reverse auction providers were able to provide information regarding the amount of contracts awarded to small businesses. The first company is FedBid. In the case of FedBid, the reverse auction site allows the user to designate whether or not the requirement is set aside for any socio-economic concerns such as small businesses, service-disabled veteran-owned small business, 8(a), etc. This allows the user to only solicit responses from those vendors that meet the criteria. Once the set-aside is entered into the solicitation and finalized, it is sent to every qualified socio-economic concern that is registered for the type of product or service being solicited (FedBid, 2007b). This provides the vendor more interaction in the small-business arena than if a contract specialist had to take the time to call each business. It also increases the chances of a contracting officer finding a socio-economic qualified vendor to satisfy the requirement. Another way FedBid is able to increase the user's ability to award to the socio-economic concern is by searching out and doing additional market research to find qualified vendors if not enough vendors answer the solicitation. This service is provided by FedBid at no additional cost to the customer. Despite the set-aside capability on FedBid, it is important to note that approximately 80% of the dollars awarded through FedBid have been awarded on a non-set-aside basis. Accordingly, increased small business participation on FedBid appears to be a result of the lower-value commodity-type items being purchased and the active notification and engagement of small businesses that enables them to compete on the same basis as large businesses (Tupponce, 2007).

The table below demonstrates the high amount of awards made to small businesses through FedBid from FY 2002-2007 versus the SBA's FY 2007 small



business goals. It is important to note, however, that the 2007 SBA goals (column 4) are based on the agencies' total contract awards to small businesses—whereas the third column represents only the percentage of contracts awarded to small businesses that used reverse auctions. The percentage is not representative of the agencies' total small business awards.

Government Agency	Sm. Bus. No. of Awards FY 02-07	Sm. Bus. Pct Count FY 02-07	Small Business Goals FY 2007
Department of the Army	2,477	80%	23%
Department of the Air Force	245	78%	23%
Department of the Navy	1,391	81%	23%
Other DoD Agencies	654	81%	23%
Department of Commerce	495	81%	48%
Department of Homeland Security	1,136	91%	30%
Department of Human Health Services	148	69%	30%
Department of Interior	15	83%	56%
Department of Justice	223	87%	32%
Department of State	6,120	79%	36%
Department of the Treasury	535	94%	26%
Department of Transportation	43	83%	35%
Department of Veteran Affairs	151	79%	28%
Environment Protection Agency	558	88%	36%
General Services Administration	72	65%	45%
Social Security Administration	152	86%	34%

Table 1. Small Business Statistics
(Adapted from Lee, 2007)

CECOM also provided information regarding the impact USAAVE has had on its socio-economic set-aside goals. Although CECOM has continued to meet or exceed its socio-economic goals, it has not seen any noticeable improvement or



decline in its set-asides with the use of reverse auctions. For the most part, this consistency can be attributed to the way in which the USAAVE reverse auction tool works in contrast to the FedBid marketplace. USAAVE is more of a “pull” technology than FedBid. If the requirement needs to be advertised on FBO, CECOM posts it and explains in the solicitation that a reverse auction will be used to determine contract award. Only if a vendor positively responds to the solicitation via FBO will it then receive a username and password for the reverse auction system. Since the solicitation is not being pushed to the vendor as it is by FedBid, the requirement may not be as widely disbursed among small businesses. CECOM and the other users of USAAVE have not received any negative feedback from vendors on the technology needed to use e-RAs, nor have they experienced any detrimental effects on their socio-economic goals. Although the use of e-RAs has not improved these users’ numbers, it has not hurt them either.

G. Vendor Concerns

The use of e-RAs increases savings in areas such as cycle-time and price, but it also makes the government more vulnerable to protests by vendors who see some aspect of the use of e-RAs as unfair. Research⁵ has shown that although a majority of the vendors who use e-RAs have not voiced concerns to the government, a few have. One concern was that when the e-RA has a fee associated with its use, it makes the price higher. In this case, the buyer found that while the price may, in fact, include a mark-up, the price the government paid is still less than what it would have paid without the use of the e-RA. The government agency also found that because the same fee was assessed to all vendors and was transparent to the buy, it was not unfair to the one vendor (Ward, 2007). A second concern from vendors was that Basic Purchasing Agreements (BPA) or Government-wide Acquisition Contracts were already written, and the government should be using those prices as

⁵ Multiple government agencies that use electronic reverse auctions were interviewed. The researchers garnered information from them in regards to what their vendors have said about the use of reverse auctions. No interviews were done directly with the vendors.



opposed to driving the price down further with the use of e-RAs (Stever, 2007). A third concern mentioned during the research was that e-RAs force the price of the item too low and are decreasing the profit available to small businesses. Although there are some valid concerns by vendors over the use of e-RAs, the majority of vendors have not experienced significant enough issues to refuse to participate in e-RAs or to file a protest with the Government Accountability Office (GAO).

H. PROTESTS WITH GAO

Research has shown that to date, only three protests involving reverse auctions have been filed with the GAO. The researchers did not gather information on how many protests were filed with the individual agencies (i.e., US Air Force, US Navy, US Army or other federal agencies). Two protests have been filed with the GAO against the Navy, and the most recent protest was filed against the Department of Housing and Urban Development (HUD). The protest filed against HUD was a result of a vendor's concern over the fact that his prices were revealed to other vendors during the e-RA, while the two protests filed against the Navy involved the use of revised proposals and time extensions during the e-RA process. The two protests filed against the Navy were originally filed with the Navy and then escalated to the GAO. The following information was taken from the respective GAO reports and details the sections of each protest that are relevant to the reverse auction aspect of the request for proposal (RFP) and the basis of the GAO decision.

1. **MTB Group, Inc.**

The most recent reverse auction protest filed with the GAO was protest B-295463, MTB Group, Inc. This protest, dated February 23, 2005, was filed against the Department of Housing and Urban Development, Real Estate Assessment Center. MTB Group, Inc., protested that "a reverse auction [...] for housing inspection services is improper because it requires the disclosure of vendors' prices during the auction" (GAO 2005, p. 1).



HUD issued a notice to potential vendors that they would be conducting a reverse auction using *FAR* Part 13, Simplified Acquisition Procedures, to contract for inspection services in Georgia and Pennsylvania. HUD later notified the potential participants of the time and duration of the auction and that those who participate would have to submit quotations to the auction website. HUD further stated that although the website would show the current low quote, it would not display any identifying information, so the vendor submitting the low quote would remain anonymous. After the close of the reverse auction, the participating vendors would be able to see all the submitted quotes, but only the winning quote would have its identity revealed (GAO, 2005, p. 2).

MTB cited that HUD violated the Office of Federal Procurement Policy Act 41 USC 423 (a) (2000) and *FAR* 3.104-3 and 3.104-4. The GAO denied the protest and stated that although its office had not previously considered the appropriateness of revealing participants' offers during the auction, it found that the MTB's argument did not establish that revealing the quote was improper (p. 2). The GAO further stated that HUD had accurately followed *FAR* Part 13 and *FAR* 1.102(d), which state that if a procedure is not expressly prohibited by the *FAR* or other regulations, then it is allowed (p. 2). In that vein, since reverse auctions are not expressly prohibited or even mentioned in the *FAR*, it is legal to use them.

However, that information does not answer the question of whether or not the reverse auction violates the Act by revealing vendor's quotes to competitors. To answer that question, the GAO quotes the *Act*: "[the Act] does not restrict a contractor from disclosing its own quote or proposal information or the recipient from receiving that information" (41 USC 423 (h)(2), 2005). Since the contractor was the one to disclose the quote by participating in the reverse auction, the GAO found that HUD had not violated the act (p. 3). The GAO also took into consideration that even though the reverse auction was a condition for competing for the contract and:

[E]ven if the price disclosure were considered to be by government officials due to its nature as a precondition to a vendor's competing,



the disclosure is pursuant, and integral, to the reverse auction procurement procedures established by the agency; we thus would view the disclosure as being to persons authorized by agency procedures to receive the information, consistent with the exception language. (p. 3)

After all due consideration, the GAO denied the protest.

2. Royal Hawaiian Movers, Inc.

The second protest filed with the GAO on reverse auctions was protest B-288653, filed by Royal Hawaiian Movers, Inc. This protest, dated October 31, 2001, was filed against the Department of the Navy. Royal Hawaiian Movers, Inc., protested on the basis that it believed it was entitled to the contract for drayage services because it had the low price during the reverse auction prior to the Navy requesting revised proposals (GAO, 2001b, p. 1).

The RFP was for drayage services between places on Oahu, Hawaii, and was a 100% small-business set-aside. This firm-fixed-price (FFP) contract was for one base year with four option years, and award was to be based on the lowest priced, technically acceptable proposal. The RFP stated that after the initial price proposals were submitted, there would be a reverse auction. The procedures that would be followed during the reverse auction were also issued in detail and included a “Bidder’s Guide” (GAO, 2001b, p.1). Part of the instructions stated:

[P]rice revisions could be made only during the reverse auction, which would last for 60 minutes [... and that...] the receipt of a revised offer within the last five minutes of the auction would extend the auction for an additional five minutes. [This] would continue until no revised offer was received during the last five minutes of the auction as extended or all the extensions were exhausted. (as cited in GAO, 2001a, p. 2)

The maximum amount of extensions to be granted was 50, and the auction would start at 9 am Hawaiian Standard Time (HST) and last until 2 pm HST. However, if all 50 extensions were used, the auction would not end until 2:10 pm HST. Finally, the RFP stated that “conduct of the reverse auction constituted discussions with the offerors” (GAO, 2001b, p.2).



The Navy received five proposals from offerors, four of whom actually attended the required reverse auction training that was given by the Navy and participated in the auction. Every time an extension was given, the offerors received a message. Periodically, they also received a message indicating how many extensions were left. As the auction was coming to a close, the Navy received an offer that started the final time extension. During this last five minutes, three offers were received—one by Royal Hawaiian, the other two by Pacific Express and an unnamed company. According to the Navy, Royal Hawaiian had submitted the lowest priced, technically acceptable offer; this offer was submitted at 2:09:49 pm HST during the last extension. However, Pacific Express contends that its offer, submitted at 1:52 pm HST, was the lowest price offer because those offers submitted after 2:00 pm should not have been considered since the RFP stated that the auction would end by 2:00 pm HST (GAO, 2001b, p. 2).

After Pacific Express submitted its complaint to the Navy, the Navy determined that due to the ambiguity in the RFP as to the closing time, the competition should be reopened. The GAO agreed with the Navy's reasoning and stated that "Pacific Express could reasonably believe that at 2 pm the Navy would close the auction, despite the fact that there were remaining extensions that had not yet been triggered" (GAO, 2001b, p. 3). The GAO further stated:

The [Navy] reasonably believed that offerors may have formulated differing auction strategies based upon different understandings as to when the auction would end. Given [that] concern, the Navy reasonably concluded that it needed to take corrective action to ensure that offerors were competing on an equal basis. (GAO, 2001b, p. 4)

Due to this last finding that the Navy acted properly in requesting revised proposals, the GAO denied Royal Hawaiian's protest.

3. Pacific Island Movers

The first protest for a reverse auction was submitted by Pacific Island Movers on July 19, 2001. This protest, B-287643.2, was filed with the GAO against the



Navy. Pacific Island Movers believed it should have been awarded the contract for packing and crating services because it was the low price during the reverse auction, prior to the request for revised proposals (GAO, 2001a, p. 1).

The RFP for the packing and crating services was a total small business set-aside to be competed under *FAR* Part 12. The contract would be awarded as a FFP contract with a six-month base period and four option years. The original RFP stated the evaluation factors for award were technical acceptability, past performance and price; technical acceptability and past performance together were significantly more important than price. However, at a pre-proposal conference, the Navy stated that award of the contract would be based on low price, technically acceptable proposal. Once the Navy became aware of the contradiction, it revised the RFP to state that technical acceptability and past performance together were equal to price. Furthermore, the new weight factors on the evaluation criteria still suggested a tradeoff between price and technical acceptability (GAO, 2001a, p. 2).

The RFP further stated that a reverse auction would take place; the Navy issued detailed instructions for how the reverse auction would proceed. To ensure it followed *PIA* and that the release of offerors' prices was legal, the Navy wrote into the RFP that an offer in response to the RFP would be considered consent to release the prices anonymously to other offerors. Included in the instructions was that offerors could make price revisions to any and all of the contract line-items, but only during the auction. Further, the instructions stated that the auction would last for 60 minutes, but if an offeror submitted an offer within the last five minutes of the auction, the auction would extend for 15 more minutes (GAO, 2001a, p. 2).

Only two companies, Pacific Island Movers and Dewitt Transportation Services of Guam, responded to the RFP. Both were found technically acceptable. During the reverse auction process, the Navy found the auction took much longer than the 60 minutes it had stated in the RFP. Thus, it issued Amendment No. 4 to the RFP at 2 pm HST the day following the start of the auction. This amendment stated that it would end in one hour—at 3 pm HST. At 3 pm HST, the auction



concluded, and Pacific Island Movers had submitted the low price (GAO, 2001a, p. 2).

Seven days after the close of the auction, Dewitt protested to the GAO. The company argued that the offerors did not have real-time access to competitors' prices (as promised in the RFP) due to a software malfunction, that the amendment to the RFP arbitrarily ended the auction, and that even though Pacific Island Movers had the low price, the RFP stated that low price was not to be the sole basis of the award. The Navy was very aware that the continuous changes made to the award criteria caused a lot of ambiguity. To address Dewitt's concerns and clarify the ambiguity, it decided to revert to a negotiated competition and request final proposal revisions. Because of this decision by the Navy, the GAO dismissed Dewitt's protest (GAO, 2001a, p. 3).

The request for final revisions was issued under Amendment No. 5 to the RFP. After receiving amendment No. 5, Pacific Island Mover's submitted a protest to the GAO on the basis that:

[They] were entitled to award based on the reverse auction. Specifically, Pacific asserts that Dewitt acted in bad faith by subverting and unreasonably extending the reverse auction, that Dewitt's protest of the reverse auction lacked merit, and that the Navy should have accepted the reverse auction results. Pacific also challenges as unreasonable the Navy's stated bases for amending the RFP and requesting price revisions. (GAO, 2001a, p. 3)

The GAO, however, used previous GAO decisions as precedents and stated that an agency is able to take corrective action when it determines the action is necessary. In addition, the agency can do that even if it doesn't believe the protest would be validated. The GAO felt the Navy's decision put the competitors on equal footing (2001a, p. 3).

More specifically, Pacific felt that the request for final price revisions was unfair since it had already revealed its price to the competitors. However, the GAO found that "under the unique circumstances of a reverse auction, we fail to see how



the disclosure of the offerors' prices was unfair" since participating in the reverse auction was consent to release the prices (2001a, p. 5). Moreover, since all the prices were revealed, the competitors were in the same situation. Since the GAO agreed with all the corrective actions taken by the Navy, the GAO denied Pacific's protest (2001a, p. 5).



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IV. Highlights

A. Transparency

Transparency throughout the procurement process is vital to government contracting. Historically, Congress and the American public have faulted federal procurement offices for the lack of credible documentation, unclear audit trails, and the appearance of favoritism in vendor selection. As Honorable Sue Payton, SAF/AQC, stated in an interview with Editor Harrison Donnelly of Military Information Technology (Online Edition):

Transparency is critical in building credibility with Congress, industry and all of our customers. Accountability is also a principle that is in the forefront. If we place people in a role of being responsible and accountable then we also must give them the authority to complete the mission. Those are some of the guiding principles—integrity, transparency and accountability. (Donnelly, 2006, para. 13)

Fortunately, the advent of e-RAs has increased transparency in procurement. Recent litigation is forcing action to increase price visibility—not only for buyers and vendors, but for the public as well. Audit trails must account for full and open competition, ascertaining fair and reasonable prices, proving cost savings, and best value determinations—all of which will be discussed in the next few sections.

1. Recent Litigation

Recently, Congress passed the *Federal Funding Accountability and Transparency Act of 2006*. This Act requires a publicly accessible web-based database to be established no later than January 1, 2008, for:

[Each] federal award of federal financial assistance and expenditures (excluding individual transactions below \$25,000 and credit card transactions before October 1, 2008): (1) the amount; (2) information including transaction type, funding agency, the North American Industry Classification System code or Catalog of Federal Domestic Assistance number, program source, and an award title descriptive of



the purpose of each funding action; (3) the name and location of the recipient and the primary location of performance. (Coburn, 2006, p. 1)

This Act intends to give the private citizen visibility into federal funding by providing information on the funding agency, program source, and descriptions of the purpose of each funding action. In order to put the law into action by July 1, 2007, higher thresholds were established, and a pilot program focused only on large subcontracts is to be available to the public (Whitney, 2006, p. 7). In the meantime, since this type of public insight must be prepared for, procurement officials should get ready for the transparency of this data and assure the public that the federal government is spending public funds wisely. The man-hours required to log this information into the required database may be prohibitive, but there is a possibility that those acquisitions done by e-RAs may be easily and automatically filtered into a web-based database with relatively few adjustments.

2. Price Visibility

Through the use of e-RAs, buyers can “gain insight into price levels, market prices, price elasticity (as related to various volumes), and price rigidity (from powerful oligopolies) from suppliers that participate in the [competitions]” (Beall et al., 2003, p. 27). The advertising of the solicitations on FBO, the instantaneous price posting during the auction process, and the subsequent award to the lowest-priced qualified bidder all increase the acceptance of e-RAs as a legitimate pricing tool in the federal procurement arena. While an e-RA will not guarantee the buyer that the winning bid is the true market price, e-RAs do provide more insight into market prices than traditional market research and sealed bidding.

3. Audit Trail

One benefit of FedBid is the extensive reporting options available through the website after an auction has finished. A listing of details for all competing bids, including the names of bidders, prices of their bids, the quantity of bidders, the number of vendors contacted, and the number of vendors choosing not to bid, is available for inclusion in the contract administrator’s pricing memo. These reports



create a clear audit trail and can be supplemented by narratives explaining any extenuating circumstances as to why the lowest bidder was or was not selected for award. Additionally, organizational-level reports are available in a comprehensive and customizable reporting feature. This enables the organization to track metrics for compliance issues (such as small business set-aside requirements) and to determine that adequate competition was sought for purchases. Reports generating statistics such as savings realized through e-RAs, quantity, type and size of solicitations and NAICS-classification of procurements are customizable to the agencies' needs as well. The report features of an e-RA tool improve the ability of agencies to adhere to inspection or regulatory requirements as well as provide insight into the operations of buying organizations.

4. Full and Open Competition

In 1984, the *Competition in Contracting Act (CICA)* (41 USC 253, 2005) established that all contracting agencies “shall obtain full and open competition through the use of competitive procedures [...] in accordance with the FAR” (41 USC 253, 2005). According to the *FAR*, full and open competition means “all responsible sources are permitted to compete” (*FAR* 2.101). However, *FAR* 6.203 allows a contracting officer to use full and open competition after exclusion of sources and to modify the full and open competition to be full and open only to small business concerns. This allows contracting officers to satisfy the requirements found not only in *CICA* but also in the *Small Business Act* discussed in Chapter III(C).

The Office of Federal Procurement Policy (OFPP) released a memo in May 2004 that stated, “Applying electronic technologies [including reverse auctions] to the acquisition of commercial items generally results in [...] broader supplier participation” and “enhances opportunities for small businesses by increasing their awareness of, and access to, federal procurement opportunities” (Burton, 2004, May 12, p. 1). To see an example of how a reverse auction can increase awareness of and access to federal procurement opportunities, one only needs to examine the results published by FedBid in Table 2.



Government Agency	Number of Awards	Ave. No. of Sellers Bidding	Ave. No. of Bids per Auction	Ave. No. of "No bids" per Auction	Ave. No. of Sellers Notified	Ave. Savings in Dollars
FEDERAL GOVERNMENT	18,401	5.9	13.6	44.6	836.5	\$8,178.44
DEPARTMENT OF DEFENSE	5,932	4.7	10.2	55.7	1,012.9	\$5,181.24
Department of the Army	3,101	4.1	8.9	59.6	1048.2	\$4,361.21
Department of the Air Force	316	3.7	8.7	58.8	1027.7	\$14,695.88
Department of the Navy	1,710	5.7	11.9	48.3	971.5	\$3,696.98
Other DoD Agencies	805	4.8	12.1	55	958.8	\$7,758.06
CIVILIAN AGENCIES	12,166	6.5	15.3	39.0	738.9	\$9,792.04
Department of Commerce	612	6.8	18.6	41	744.3	\$7,675.68
Department of Homeland Security	1,251	5.9	14	35.5	628.2	\$39,002.51
Department of Human Health Services	213	3.9	8.3	63.9	1079.6	\$47,450.27
Department of Interior	18	8.8	21.2	42.3	728.5	\$2,116.61
Department of Justice	255	5.4	12.8	53.2	1078.2	\$19,755.16
Department of State	7,747	6.4	14.8	38.1	734.5	\$5,487.09
Department of the Treasury	570	7.2	19.9	22.1	440.5	\$3,775.86
Department of Transportation	52	14	36.3	54.7	995.2	\$4,195.92
Department of Veteran Affairs	192	5.2	11.2	44.7	832.9	\$1,397.96
Environment Protection Agency	631	8.5	17.7	36.7	721.8	\$1,181.51
General Services Administration	111	6.8	15.4	17.6	269.2	\$18,607.33
Independent Agencies / Government Corporations	227	6.7	14.8	100	1949.2	\$5,778.68
Other Civilian Agencies	111	6.3	16.1	12.6	179.8	\$3,309.97
Social Security Administration	176	6.6	18.5	44.8	737.3	\$4,660.43

Table 2. FedBid Results
(Adapted from Tupponce, 2007)

In the 2006 Hearing on Federal Contracting in Disaster Preparedness and Response House Committee on Government Reform, FedBid testified that it provides “direct access to over 400,000 sellers in the government’s seller database [the Central Contractor Registration]” (Fox, 2006, p. 6). Throughout the federal government, procurement offices follow *FAR* 7.102 guidelines to compete to the maximum extent practicable. This typically requires soliciting, but not necessarily obtaining, quotes from three to five vendors. The small number of quotes obtained is typically due to the heavy workload and time needed to acquire and process all of the quotes. Table 2 illustrates that hundreds of vendors are notified for each requirement, and although the average number of vendors who respond with bids is



only six, competition has been promoted. Indeed, the effects of competition can be seen in the amount of cost savings realized⁶—as shown in the column “Ave. Savings in Dollars.”

Through the use of some e-RA tools, contract specialists are not as heavily constrained by the time needed to evaluate the offers as they are with traditional pricing methods because offers can be automatically evaluated by the reverse auction software. Contract specialists now only need to review the output to ensure accuracy and to do their due diligence.

5. Determining the Price is Fair and Reasonable

The *FAR* dictates that a contracting officer may only award a contract for supplies or services if the price can be determined fair and reasonable (*FAR* 15.402). In order to determine if the price is fair and reasonable, a contracting officer must ensure the price is fair to both the seller and the buyer (Government). The *Contract Pricing Reference Guide (CPRG)* acknowledges that competition is the best way to “encourage firms to offer a quality product at a reasonable price” and that “competitive prices are one of the best bases to use in evaluating [price] reasonableness” (2005, Vol 1, Chap 2). Under simplified acquisition procedures, *FAR* 13.601-3(a)(1) states that the contracting officer may “base price reasonableness on competitive quotations or offers.” This is where e-RAs may be very useful.

The use of reverse auctions fully supports the use of competitive forces to determine the price is fair and reasonable, because reverse auctions are based on the premise that competitive forces will cause the sellers to lower their bids until their true value is revealed. This, in turn, allows the buyer to procure an item at the best, most competitive price available in the market. Some sellers and buyers alike may

⁶ Average savings calculation is discussed further in Section 6, Cost Savings.



worry about the seller underbidding because he or she fails to correctly value the item.

The government should ensure the seller is not buying-in or unknowingly bidding a price that is unfair to the seller. One federal agency that uses reverse auctions does this by flagging any bids that look suspect and then confirms with the seller that it is actually able to satisfy the requirement at that cost and does not consider it an unfair price (Meinert, 2007). Other ways to confirm that a price is fair and reasonable is by comparing the bid with the independent government estimate (IGE), published prices, historical prices, and prices other buyers have paid for the same or similar item. If there are large discrepancies between the bid and the prices revealed during market research, the seller must determine if there are any special circumstances that were taken into consideration by the vendor. This same agency that flags any suspect bids has also run into instances in which the vendor had left over supplies from prior contracts (not necessarily government contracts) that allow the company to sell the supplies to the government at a lower price than other competitors (Meinert, 2007).

6. Cost Savings

One metric that gauges the success of an e-RA is the amount of cost savings realized. The most obvious measurement comes from the delta between the Independent Government Estimate (IGE) and the price generated by the e-RA. In general, a buyer will start the procurement process by developing an IGE through market research. Depending on various factors—such as how long it has been since the commodity or service was last purchased, what the market volatility in that industry is like, or if common catalog pricing is available—the buyer enters an IGE (also referred to as a reserve price for reverse auctions) into the e-RA program. The buyer then determines whether or not to have that price set as an active reserve price during the auction. An active reserve price acts as a safeguard for the government and prevents the bidders from “leading” the auction until their bid price drops below it. As mentioned above, this reserve price is also utilized for calculating



cost savings realized by the e-RA. During fiscal year 2007, DoD agencies using FedBid have experienced a cost savings of 8.8%, while other federal agencies have found 14.4% cost savings with FedBid. This equates to \$150,491,548 net savings over 18,401 awards (Refer to Appendix A). Although CECOM does not set a reserve price when using USAAVE, it does utilize the IGE to calculate savings and has had extraordinary results over the past seven years, with a total average savings of 32%.⁷ This equates to \$48,651,682 in savings over 188 awards (Refer to Appendix B).

7. Best Value

When deciding to procure an item or service using best value, the Contracting Officer (CO) must also determine to what extent the competition shall be based on price, past performance and technical factors—depending on the needs and preferences of the customer.⁸ In the solicitation, the buyer states whether the award will be made to the lowest priced technically acceptable (LPTA) vendor, or will be based on a best-value approach. Depending on the size and complexity of the procurement, specific weighting procedures as to the price, technical proposal, timeliness, and/or past performance are provided. Currently, the most common factors used by the agencies are price, delivery time, and past performance. If a product is classified as an urgent requirement and is needed as soon as possible, the company that can deliver the item the fastest (and whose price may not be the lowest) can be awarded the contract. Or, if a company bids the lowest price in the

⁷ The large discrepancy between FedBid's and USAAVE's total average savings is addressed later in Chapter V(F).

⁸ FAR 13.106-2(4): For acquisitions conducted using[...] a method that permits electronic response to the solicitation, the contracting officer may—(i)[...] identify from all[...] offers received one that is suitable to the user, such as the lowest priced brand name product, and quickly screen all lower priced quotations or offers based on readily discernible value indicators, such as past performance, warranty conditions, and maintenance availability; or (ii) Where an evaluation is based only on price and past performance, make an award based on whether the lowest priced of the quotations or offers having the highest past performance rating possible represents the best value when compared to any lower priced quotation or offer.



auction, but because of negative past performance is considered a riskier vendor, the award may go to the next lowest bidder.

CECOM uses USAAVE to assist the contracting officer in making a best-value determination. In two-step sealed-bidding, the sellers are required to submit their technical proposal first with all other required information (such as company qualifications and past performance information), so that the buyer may determine if that vendor is a qualified supplier. For the two-step process, a respondent from CECOM said that, "Once the evaluation was completed that these [vendors] are technically acceptable they would be put in a pool then be invited to go ahead and partake in the reverse auction" (Meinert, 2007). USAAVE also has a weighted value function that is particularly useful in determining a best-value award. Non-price factors are evaluated and assigned a subjective adjectival grade in accordance with a grading scale determined by the buyer and CO prior to the auction. After the adjectival rating is assigned to the factors in the vendor's bid, an overall weighting is calculated and posted with the vendor's bid on the site (Refer to Figure 1). Both the buyer and the vendor who submitted the subject bid are able to see these weightings. And according to one source, the agency believes this visibility helps to prevent protests (Meinert, 2007). This best-value weighting system is still being finessed, and the users are looking forward to improvements in the effectiveness of the best-value functions.



Best Value Sample Refresh Rate: [Broadband Users](#) | [Modem Users](#) | [Manual](#)

Time Remaining: 00:19:52
 Status: Open
 Open Time: 10/16/03 1:47 PM
 Bidding Stop Time: 10/16/03 2:43:00 PM
 Format: Weighted Scoring (Offering to buy)
 Max Extensions: Unlimited
 Grace Period (Minutes): 4
 Extend Interval (Minutes): 5
 Poster: tester,
 Related Documents: (None)
 Starting Price: \$100,000.00
 Next Available Bid Price: \$100,000.00
 Bid Decrement: \$500.00
 Description: Template created as sample best value reverse auction

[Send a message](#)

[Refresh](#)

Bid History											
Bidder	Overall Weighted Score	Bid Time	Status	Submit Price	Assigned Price	Requested Quantity	Assigned Quantity	Warranty Period	Hard Drive	Resolution	RAM
Test-vendor2	63.33 %	10/16/03 1:50:40 PM	Winning	\$90,000.00	\$90,000.00	1	1	180 - 1.0	100	1200 X 2400 - 3.0	1,000
Test-vendor1	21.85 %	10/16/03 1:49:49 PM	Losing	\$100,000.00	\$100,000.00	1	0	90 - 3.0	20	1800 X 3600 - 2.0	800
Bid 1-2 (2 total)											

Figure 1. Best-value Sample
(Meinert, 2006, p. 9)

Because it is primarily used for competing price-driven commodities in a simplified acquisition scenario, FedBid has deactivated its automated best-value weighting tool within its website; instead enabling the buyer to award an offer based on other than LPTA factors if instructions are placed in the solicitation. For instance, most of the federal agencies interviewed placed emphasis on delivery time if they were considering a best-value acquisition. They encouraged multiple bids by vendors in which the bids may be lower for slower delivery times and higher for faster delivery times. Although more often than not, the lowest bidder will be selected for award, one clear reason for not awarding to the lowest bidder is the presence of best-value criteria or an unfavorable past performance report in



FedBid's Activity Card® feature. The Performance Alert⁹ feature in FedBid's Activity Card® provides a supplemental forum in which to evaluate the bidder's past performance. The buyer then evaluates and selects the winning bidder on a trade-off basis as accounted for in the solicitation. The winning bidder may or may not be the "leading" bidder at the conclusion of the auction, depending on the best-value determination of the contracting officer.

B. Efficiency

In recent years, the trend of having to do "more with less" has necessitated the exploration of innovative solutions in every field (FedBid, 2007, p. 9). Contracting is not alone in this pursuit of time-savings. With 50% of federal government acquisition personnel eligible to retire within the next five years (DoD AT&L, 2007), directives to enact efficiency into day-to-day processes are common throughout the government. As a result, contracting personnel are searching for ways to save time and energy while doing their job. Many federal agencies have found that one very effective method for saving time is by using FedBid's e-RA as a pricing tool.

1. Time Savings

The introduction of the e-RA as a pricing tool has created unanticipated efficiency in many federal agencies. The Army Contracting Agency has discovered that FedBid saves its buyers time in a multitude of areas: posting synopses to both FBO and the Army Single Face to Industry, writing pricing memos, writings abstracts, and collecting proposals from vendors (Ward, 2007).

⁹ "Because the seller's performance is always assumed to be acceptable unless otherwise noted, the ActivityCard highlights only materially problematic issues by allowing buyers to submit 'performance alerts'. The performance alert is designed to ensure sellers are aware of issues while also providing buyers with another source of data for due diligence. It contains no subjective content and simply provides the contact information of the buyer who submitted the performance alert to other buyers performing due diligence on the subject seller" (FedBid, 2007, p. 24).



One of FedBid's features is its single point of entry for posting synopses on its website. This feature offers a checkbox option for immediate posting of the same synopsis/solicitation to FBO. This feature saves an estimated 5-25 minutes over performing a separate action in FBO.

After the e-RA is done, FedBid consolidates all bidding data into a single report containing the "seller name, time, date, amount, and other detail for [all] bids and [all] acknowledgements from sellers who reviewed the specification but actively declined to bid" (FedBid, 2007, p. 8). This data report facilitates the buyer's requirements to write pricing memos and abstracts. One agency official reported that the automated report from FedBid is utilized in whole as an attachment for pricing abstracts, and only supplemental information is provided by the buyer in the main pricing document (Ward, 2007). There is no specific estimate of time-savings for this process, but one can appreciate the simplicity introduced by FedBid reports at those steps in the procurement process.

One of the most significant comments the researchers received from an agency was regarding the time their buyers admitted to saving by not having to manually gather a list of qualified vendors, call or e-mail those vendors to request quotes, and then assimilate the results of the submitted quotes into a report before selecting the winner. Instead, the e-RA tool performs all of these steps without the buyer's interaction—which allows the buyer to work on other tasks or contracts during the time originally allotted to the now electronic procurement. When asked, this agency did not know just how much time was being saved due to the difficulty of measuring this sort of time-savings; however, one official admitted the agency had not had to increase its staff in four years, but was able to get about 20% more work done because of the e-RAs (Stever, 2007).

2. Cycle-time

Another aspect of process efficiency realized by e-RAs is the cycle-time required to go from solicitation to contractor selection. In a commercial acquisition, a



buyer can post a solicitation online, begin the auction and close it within three hours, if necessary. Many of the agencies we interviewed run a majority of their auctions for anywhere between five hours and five days, depending upon the required turn-around time for that procurement. By utilizing an e-RA, the buyer may either watch the progress of the bids or utilize that time to take care of other tasks. Regardless, the reduced cycle-time e-RAs require—to get from the input of requirements and specifications to the summary report of bids and selection of vendor for award—enables the buyer to decrease the amount of time required for procurement and increase its productivity.



V. Practical Application

A. Commercial Procurement

The vast majority of items and services acquired through e-RAs in the federal government are classified as commercial items and include a few non-developmental items. Some types of commercial items that are auctioned include: computer software or hardware; office supplies; field warfare supplies such as tents, batteries, flashlights, and flak vests; trailers; refrigerators and dishwashers; and, plasma televisions. A few of the agencies have begun to venture into auctioning services as well. Commercial services that have been successfully auctioned include: hotel room and conferencing services; copier maintenance; training; and services incidental to commodity purchases such as installation of office furniture or the building and installation of a playground. As federal buyers become more comfortable with e-RAs, the potential for use substantially increases. Federal agencies have a variety of policies for utilizing e-RAs. Primarily, the potential acquisition must be commercial and within simplified acquisition thresholds; however, USAAVE has procured bulk items with a contract value of up to nine million dollars through reverse auctioning. A few agencies require FedBid be utilized for all commodity purchases, regardless of size, unless a waiver is granted by the CO for exceptional circumstances (Sahakian, 2007). Many agencies have already determined that FedBid.com and other e-RA methods are tools that have almost unlimited potential for providing a competitive pricing environment and easing manpower restraints.

B. Number of Vendors

By electronically posting a solicitation in FBO, a buyer has the potential to reach an untold number of vendors. Through FedBid, the buyer can simultaneously post its solicitation in FBO and the e-RA site with the click of a button. Seeing that FAR Part 13.104(b) directs the buyer to “solicit [...] at least three sources to promote competition to the maximum extent practicable,” this tool conveniently serves a



multi-functional purpose. Since FedBid has thousands of vendors in its database and adds up to 100 vendor sales agents each day during peak buying cycles, the number of vendors contacted by a single buyer is quite large (FedBid, interview with authors, September 19, 2007). Each auction that occurs on FedBid not only records the number and identity of bidders that are bidding and how many times they placed bids, but also documents the number of vendors that decided not to compete in that specific auction and which respond with a “no bid”; buyers may use this as part of their sole-source justification (Refer to Table 2). FedBid also records the identity of those vendors that were contacted, and whether or not those vendors decided to compete.

In an e-RA, the number of vendors that decide to place bids depends on a number of factors. First and foremost, the commodity or service being bid on drives the competition. For instance, the economy, the commercial versus governmental market for the item, the number of contractors that offers those products or services, any set-aside requirements, and the method of advertising for the procurement (i.e., FBO or direct buyer contact) are all competition drivers. There is also the trust and training that a vendor has in the e-RA process. While many vendors are beginning to embrace the electronic age, some still prefer the personal contact that the more traditional paper or telecommunicated request for proposal and proposal submission processes require. This factor is still a hindrance to full e-RA participation and probably will be for some time to come.

Optimally, the number of vendors in an e-RA is at least three; however, the maximum number is still to be determined. Regardless of how many vendors participate, the results are consistent in that savings for the buyer is the result of competition.

C. Minimum Bid Increments

Bid increments can be set by all explored software and web-based e-RA products. There is a wide variation in the preference and methodology for setting a



bid increment. Some agencies prefer not to utilize the minimum bid increment feature in the software, but others have found it useful. One agency official commented on how members of his agency learned about determining the best bid increment: when they first started, increments were just a dollar, and “people were bidding by pennies [compared to the dollar value of the whole purchase...] there were just games, games, games. So, now it depends on the dollar value of the whole thing. It goes by ten dollars, maybe twenty dollars and fifty dollars, depending on the value” (Steuer, 2007). Another agency official said, “I just put ten-dollar [bid increment,] which is the minimum, and then it’s up to them. Let them compete” (Guzman, 2007). As buyers get more accustomed to setting a bid increment, “they make a business judgment on what...is a good pace, where it’s fair for the contractors” (Meinert, 2007). For the most part, in the spirit of trying to create an efficient auction, a minimum bid increment is set in direct proportion to the size of the acquisition.

D. Reserve Prices

Throughout this investigation, the researchers found that organizations that set reserve prices were generally risk-averse and had performed a considerable amount of market research prior to posting their solicitation. The maximum price the government is willing to pay for an item is generally determined from market research such as catalog pricing, blanket purchase agreements, past purchases, and internet searches. By setting a reserve price in the e-RA, the buyer is protecting the organization from potentially paying more than the IGE. In FedBid, the vendor never sees the reserve price, but is notified if its bid lags behind, or in other words, is significantly above this price. Once a vendor’s bid is entered below the reserve price, then that vendor is notified of being in the lead until another bidder beats its price. If no bids are received lower than the reserve price, then the e-RA is cancelled, and a determination as to the necessity of the requirement is made by the purchasing and user organizations. Or the requirement is re-solicited, and a more traditional approach to contracting is pursued.



E. Length

There is a huge variance in the length of e-RAs conducted throughout the federal government. For urgent and compelling requirements, some e-RAs have been posted on FBO and run for three hours before concluding. The vast majority of buyers conduct e-RAs for three to five days, according to FedBid. The e-RA end-time is posted in the solicitation and is firm with no extensions. Since there is no lead-time required for posting the solicitations in FedBid, the auction can start simultaneously with the combined synopsis/solicitation posting in FBO.¹⁰ This may drastically shorten the lead-time required for receiving qualified proposals in the procurement cycle.

USAAVE's system works differently; CECOM generally posts a solicitation in FBO for 30 days before running the e-RA. During this time, it pre-screens interested offerors and determines which are going to be eligible to participate in the e-RA. When the e-RA begins, it then runs as long as there are new bids. Every time there is a new bid made by a vendor, the time clock starts counting down five minutes. Another vendor can bid within those five minutes, and the time clock is reset to run for five minutes again. Once there are no new bids within five minutes, the auction stops. This process usually takes anywhere from one hour to nine hours (Meinert, 2007).

Although the two processes are completely different, they both have successful outcomes. During the FedBid auction, FedBid provides support services such as managing seller feedback, and notifying the buyer with seller questions and potential bid issues requiring buyer action (Tupponce, 2007). The buyer can take care of other business and doesn't have to continuously monitor the progress of the

¹⁰ In accordance with *FAR* 12.603, "combined synopsis/solicitation procedures" are authorized to reduce the lead time for a commercial procurement. *FAR* 5.203(b) also authorizes the "contracting officer to establish a solicitation response time that will afford potential offerors a reasonable opportunity to respond to each proposed contract action[...] The contracting officer should consider the circumstances of the individual acquisition, such as the complexity, commerciality, availability, and urgency, when establishing the solicitation response time."



auction. Once the auction is done, the buyer analyzes the results and makes a determination for award (Guzman, 2007). In USAAVE's process, the buyer must monitor the auction throughout its run-time; however, this monitoring enables interaction between the buyer and potential offerors during the process. For instance, if a bid is suspiciously low, the buyer can call the offeror and find out if the bid was a mistake or if there are extenuating circumstances allowing the offeror to make such a low bid. The interactivity required during USAAVE's e-RA ensures that once the auction is closed, the price is set, and the award can be made to the pre-qualified vendor (Meinert, 2007).

F. Lag/Lead or Rank-Order Bidding

As previously discussed in the chapter on auction theory, rank-order bidding increases competition in RAs. USAAVE successfully uses rank-order bidding in its e-RAs, as shown by its price-saving results. On average, USAAVE saves 32% from historical and market research based on IGEs (Refer to Appendix B). This may be a result of the vendors being able to bid more aggressively because of the attributes of rank-order bidding. The vendor sees all bid prices during the auction. Other bidders are identified as "n/a;" this anonymity allows the vendor to see how its bid is ranked in order with other bids, but not how many other bidders are participating, or which competitor has bid which price (Refer to Figure 2). This not only discourages collusion between the vendors, but also encourages competition since they are not able to positively identify each other.



Bidding Example – Currently Losing an Auction

Current Winning Bid				
Bidder	Bid Time	Submit Price	Requested Quantity	Extended Price
n/a	1/23/06 2:08:52 PM	\$989,000.00	1	\$989,000.00

Your Current Bid				
Bidder	Bid Time	Submit Price	Requested Quantity	
test-vendor9	1/23/06 2:08:19 PM	\$990,000.00	1	<input type="button" value="Place Bid"/>

Bid History (up to the 5 most recent bids)				
Time	Bidder	Price	Quantity	
1/23/06 2:06:19 PM	n/a	\$999,000.00	1	
1/23/06 2:06:49 PM	test-vendor9	\$998,000.00	1	
1/23/06 2:08:03 PM	n/a	\$995,000.00	1	
1/23/06 2:08:19 PM	test-vendor9	\$990,000.00	1	
1/23/06 2:08:52 PM	n/a	\$989,000.00	1	

Click [here](#) to see the full bid history.

- Items to note:
 - The current winning bidder is displayed as "n/a" for anonymity
 - In "Your Current Bid" Section, information on *my* previous bid is displayed
 - The Place Bid button is displayed since I am not currently winning the bid.

Figure 2. USAAVE Bidding Example
(CECOM, n.d.)

FedBid utilizes a different anonymous bidding method in which the bidder is only informed that its price is in either a "lag" or "lead" position. The vendor does not see any competitor's identity nor does it know how many bidders are bidding (Refer to Figure 3).



1.877.9.FEDBID | [Privacy](#) | [Terms of Use](#) | [Help](#) | [Contact Us](#) | [Logout](#)

Home Opportunities **Active Bids** Bid Results Profile

Bids | No Bids

Currently Showing 1 - 1 of 1 Buys

ACTIVE BIDS						
Buy No.	Bid Description	Buyer	Buy End Date	Bid Received	Status	Countdown
57096	Adobe software	Environmental Protection Agency	10/22/2007	2007-10-19 15:06:02	Lead	70hrs 19mins 54secs ReBid

Results per Page: [25](#) [50](#) [75](#) [100](#) Page 1 of 1 [1](#) [<<](#) [<](#) [1](#) [>](#) [>>](#) [>|](#)

[Back](#)

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Figure 3. FedBid Bidding Example
(Tupponce, 2007)

Additionally, vendors may choose convenient options to facilitate their participation and potential winning of the e-RA. For instance, a vendor may choose to have the program automatically re-submit bids in order to gain an advantage in the auction without having to physically monitor the e-RA's progress (as seen in Figure 4 below). This allows the bidder to enter a minimum "willing to charge" price, and the software continues to automatically place bids for the bidder to maintain the "lead" until the set minimum price has been reached. (FedBid, 2007, p. 16). By establishing a minimum bidding price, the bidder protects itself from placing an unrealistically low bid in order to win the e-RA.



View Details

Bid Terms

Bid Line Items

Review and Submit

REBID LINE ITEMS FOR BUY 57096

Buy Description: Software
Bid Decrement: N/A

STATUS OF BID 2254633

Current System Time: 05:41:48 (ET)
Time Remaining: 70:18:12
Your Last Bid Received: 10/19/2007

Initial Bid (w/o fee): \$5,695.52
Current Bid (w/o fee): \$5,695.52
Minimum Price (w/o fee): \$5,513.52

Bid Status: **Lead**

[Refresh Time and Bid Status](#)

LINE ITEM(S)

Item No.	Description	Qty	Unit	Unit Price	Stop Auto Rebid At
001	MFG 23102427DG, Adobe Media Kit Photoshop CS3 10 WIN ADOBE	1	EA	10.78	\$ 9.78
	<input type="checkbox"/> Included in another line item.				
002	MFG 54022238GS, PhotoShop CS3 10 Win 4.5 Level S 650 pts ADOBE	9	EA	315.22	\$ 305.22
	<input type="checkbox"/> Included in another line item.				
003	MFG 16404844, Microsoft MLF Publisher 2007 Media Microsoft Licensing	1	EA	10.78	\$ 9.78
	<input type="checkbox"/> Included in another line item.				
004	MFG 16404764, Microsoft Sel Publisher 2007 License Only Level D	9	EA	315.22	\$ 305.22
	<input type="checkbox"/> Included in another line item.				

[Cancel](#)

Reconfirmation of Bid Terms

[View Bid Terms](#)

[Back](#)

[Continue](#)

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Figure 4. FedBid Re-bid Example
(Tupponce, 2007)



VI. Conclusion and Recommendations

A. Answers to Research Questions—Conclusion

1. **What Existing Auction Theories Apply to Reverse Auctions as Utilized Within the Federal Government?**

When analyzing information garnered from the two primary reverse auction providers, the researchers found it readily apparent that the English auction is the predominant auction design. The researchers noted that after multiple bids are posted by vendors, the lowest bid at the end of the auction usually determined both the price and the winner—unless best-value techniques were employed. Quite often, in order to facilitate economies of scale, the government solicits a variety of items through a combinatorial auction. Additionally, USAAVE employs a methodology similar to two-step sealed bidding for its auctions. In this process, it evaluates the technical acceptability and qualifications of the vendors prior to enacting the pricing mechanism by conducting a reverse auction. USAAVE also employs a multi-attribute auction mechanism in which non-price factors, such as past performance and delivery time, can be scored and weighted and combined with price to determine the auction winner.

One hybrid auction design that FedBid uses is the English-Vickrey internet auction surrogate bidding solution. FedBid provides an “Auto Re-Bid” mechanism for proxy bidding. This allows the bidder to enter a minimum “willing to charge” price, and the software continues to automatically place bids for the bidder to maintain the “lead” until the set minimum price has been reached. Although there are other theories and attributes the government may eventually explore, the above-mentioned statements compile the existing auction theories being practiced in the federal government.



2. What are the Rules and Regulations Governing Electronic Reverse Auctions in the Federal Government, and More Specifically, in the Department of Defense?

In 1997, the rewrite of Parts 15, 1 and 4 of the *FAR* removed the language that prohibited the use of reverse auctions, allowed contracting officers to use any techniques that were not expressly prohibited in the *FAR*, and promoted the use of e-commerce, respectively. E-RAs are strictly considered a pricing technique and are not considered a procurement method such as Sealed Bidding, Simplified Acquisition Procedures, or Contracting by Negotiation. As a pricing technique, the rules and regulations governing reverse auctions in the federal government and the DoD are the same rules and regulations that govern all federal government acquisitions. These can be found in the *FAR*, *DFARS* and other *FAR* supplements. As with all contracts, the contracting officer must ensure that they can determine the price is fair and reasonable and that they have followed all applicable laws such as the *Competition in Contracting Act*, *Small Business Act* and the *Procurement Integrity Act*.

3. What are the Past Experiences of the Federal Government in Using Electronic Reverse Auctions?

The federal government has used e-RAs to procure many different types of items—from installation services to live animals. Appendix C lists the items, by NAICS code, procured through FedBid. The majority of the e-RAs have been used to purchase commodities and, to a lesser extent, simple services. Overall, research shows that procurement offices may at first be hesitant to employ e-RAs. However, once they have participated in a few e-RAs, acceptance of this pricing tool will come more easily, and the offices will enjoy many benefits—such as significant cost savings, increased worker productivity and meeting or exceeding small business goals.



4. Have Electronic Reverse Auctions in the Federal Government been used in the Most Effective Manner; or are there Opportunities for Improvement?

Although reverse auctioning has been around for quite some time, electronic reverse auctions are new. The data collected show that e-RAs have only been in use in the federal government since 2000. For the most part, the total contract dollar value of items being procured has fallen within the limits of the Simplified Acquisition Threshold, which allows a contracting officer to procure items using simplified acquisition procedures.

Typically, these procedures are used for less-complex commodities and services that can generally be awarded based on the lowest price, technically acceptable proposal.

Both of the reverse auction sites researched for this paper have automated best-value capability, but this feature has only been used on a limited basis. CECOM is continuing to work with users to determine how and to what extent the best-value function should be incorporated into the e-RA process; whereas, FedBid has deactivated its automated best value tool. Relying on buyer feedback and its own experience with a best-value tool, FedBid believes that algorithmic best-value calculations are of limited value to buyers under the simplified acquisition scenarios for which they overwhelmingly use the FedBid marketplace (Tupponce, 2007).

One opportunity for improvement is the development of federal guidance encouraging the use of e-RAs. In 1997, the *FAR* deleted verbiage that prohibited the use of reverse auctions; however, ten years later, reverse auctions are still not widely used in the federal government. As only two major reverse auction sites are currently used, there doesn't appear to be a top-level advocate promoting the use of e-RAs as an alternative pricing method

The reverse auctions that have taken place in the federal government have had good and even great results, but these e-RAs are only taking place within a small subset of the procurement organizations. The majority of e-RAs are currently



awarded based on the lowest price, technically acceptable proposal. For contracting officers to use e-RAs more effectively for non-simplified acquisitions, the e-RA technology is going to have to incorporate a fully functioning best-value tool. Additionally, procurement organizations will need to accept e-RAs as a valid pricing tool and incorporate it into their acquisition strategies.

B. Areas for Further Research

1. **Cost-benefit Analysis of the Effect Reverse Auctions Have on the Buyer-supplier Relationship**

The federal government has transitioned from a hands-off approach with contractors to one in which the federal government procurement officials and contractors act as a team striving for the same goal. As a result, this team approach helps the government establish long-term relationships with the contractors. However, research has shown that reverse auctioning does not lend itself to establishing teaming relationships. One area for further research is to perform a cost-benefit analysis of the effects reverse auctions have on the buyer-supplier relationship.

2. **Total Cost of Different Reverse Auction Licensing Methods**

The reverse auction sites featured in this research paper have different licensing methods. One operates as a fully functional online marketplace with comprehensive support services, but assesses a transactional fee for each auction event (the fee is ultimately incorporated into the selling price for each reverse auction). The other has a flat annual universal software license paid for by the managing organization, but requires the buying agency to establish its own support services to monitor and manage each reverse auction event. An area of further research is to analyze the effect each method has on the total cost the federal government pays, and whether one method should be used over the other.



3. Optimal Commodity and Service Types for Electronic Reverse Auctions

Various types of commodities and services have used reverse auctions to determine pricing. Research needs to be done to establish whether or not there is an optimal type of commodity or service that should utilize reverse auctions. Researchers could conduct this analysis by collecting competition, cost-savings and efficiency data on items procured using reverse auctions and by proposing a subset of commodities and/or services that appear to be ideal for pricing through the e-RA process.

4. Reverse Auctions in the Non-commercial Market

Literature shows that reverse auctions in the private sector are typically used in a market where there is one buyer and many sellers. The federal government, however, is using reverse auctions to buy commercial items where there are many buyers and many sellers in the market. The reason reverse auctions are not typically used when there are many buyers and many sellers is because there are normally well-established market prices, and the effects of competition can already be seen in the price. Although the federal government is one of many buyers when procuring commercial items, it is also a very unique buyer due to the extremely large amount of expenditures it has. This characteristic allows it to act like a single buyer in the marketplace and effectively use reverse auctions. Additional research should be done to explore whether or not the federal government can further exploit its use of reverse auctions for non-commercial items (i.e., spare missile parts) where there are many sellers and the federal government is the only buyer.

5. Electronic Reverse Auction's Role in Commodity Council Operations

The Air Force is re-organizing the acquisition force and developing commodity councils as an avenue for strategic sourcing solutions for the Department. Since the future commodity-council model involves strategic bulk purchasing as well as developing buyer-supplier relationships, do e-RAs have a place in the commodity-council model?



6. Implications of Electronic Reverse Auctions Interfacing with e-Procurement Software

One of the repeated requests for improvements to e-RAs is the eventual ability for the software to interface with current e-Procurement software, such as SAP or SPS. If the federal government adopts an e-RA solution for interfacing with its procurement software, will this lead to a sole-source, or even monopolistic, environment for reverse auction software?

7. Confirming Whether Reverse Auctions are Coercive

Research by Giampetro and Emiliani (2007) repeatedly suggests that reverse auctions are coercive in nature for incumbent providers. Although it is unclear whether a broad category of competition tools can be considered coercive or whether the competition requirement itself and/or the use of a particular type of e-RA tool is coercive, further research needs to be completed to assess their findings and to establish whether or not their research applies to the use of reverse auctions in the federal government, particularly for commodity-type procurements that typically do not involve an incumbent supplier.



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Appendix A. FedBid Cost Savings

FedBid Cost Savings by Federal Agency					
Government Agency	Number of Awards	Independent Government Estimate	Final Award Price	NET Savings in Dollars	NET Savings in Percentage
FEDERAL GOVERNMENT	18,401	\$1,187,932,046	\$1,037,440,499	\$150,491,548	12.7%
DEPARTMENT OF DEFENSE	5,932	\$351,179,597	\$320,444,507	\$30,735,089	8.8%
Department of the Army	3,101	\$146,222,796	\$132,698,678	\$13,524,119	9.2%
Department of the Air Force	316	\$58,553,765	\$53,909,867	\$4,643,898	7.9%
Department of the Navy	1,710	\$70,127,231	\$63,805,400	\$6,321,831	9.0%
Other DoD Agencies	805	\$76,275,804	\$70,030,563	\$6,245,241	8.2%
CIVILIAN AGENCIES	12,166	\$829,655,257	\$710,525,334	\$119,129,923	14.4%
Department of Commerce	612	\$48,030,428	\$43,332,910	\$4,697,519	9.8%
Department of Homeland Security	1,251	\$253,431,462	\$204,639,316	\$48,792,146	19.3%
Department of Human Health Services	213	\$46,662,044	\$36,555,135	\$10,106,908	21.7%
Department of Interior	18	\$340,395	\$302,297	\$38,099	11.2%
Department of Justice	255	\$32,715,574	\$27,678,009	\$5,037,565	15.4%
Department of State	7,747	\$385,240,840	\$342,732,342	\$42,508,498	11.0%
Department of the Treasury	570	\$11,704,722	\$9,552,478	\$2,152,243	18.4%
Department of Transportation	52	\$2,802,799	\$2,584,612	\$218,188	7.8%
Department of Veteran Affairs	192	\$4,377,255	\$4,108,847	\$268,408	6.1%
Environment Protection Agency	631	\$9,389,259	\$8,643,728	\$745,532	7.9%
General Services Administration	111	\$8,122,875	\$6,057,461	\$2,065,414	25.4%
Independent Agencies/Government Corporations	227	\$16,360,791	\$15,049,029	\$1,311,761	8.0%
Other Civilian Agencies	111	\$5,669,301	\$5,301,894	\$367,407	6.5%
Social Security Administration	176	\$4,807,512	\$3,987,276	\$820,235	17.1%
PRIME CONTRACTORS	303	\$7,097,193	\$6,470,657	\$626,536	8.8%

(Adapted from Tupponce, 2007)



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Appendix B. USAAVE Reverse Auction Savings

USAAVE REVERSE AUCTION SAVINGS: FY00 - FY07					
(QTY) PRODUCT/ITEM	IGE	TOTAL CONTRACT PRICE	% SVGS	TOTAL SAVINGS	# VENDORS
(1) Ricoh Secure Fax System	\$6,891.00	\$5,511.00	20.03%	\$1,380.00	2
(2) IBM Thinkpads	\$14,000.00	\$6,560.00	53.14%	\$7,440.00	3
(5) IntelliFAX-2750	\$2,500.00	\$2,200.00	12.00%	\$300.00	2
(100) Connector plugs	\$118,000.00	\$78,000.00	33.90%	\$40,000.00	2
(20) Pentium computers/items	\$46,000.00	\$37,000.00	19.57%	\$9,000.00	5
(10) Pentium servers	\$41,000.00	\$24,900.00	39.27%	\$16,100.00	6
(135) Pentium computers/items	\$256,500.00	\$175,500.00	31.58%	\$81,000.00	5
(140) Pentium minitowers/items	\$266,000.00	\$205,800.00	22.63%	\$60,200.00	4
(40) Pentium computers/items	\$60,000.00	\$53,600.00	10.67%	\$6,400.00	4
(1) Photo-workshop	\$7,000.00	\$7,000.00	0.00%	\$0.00	1
(520) Pentium servers	\$806,000.00	\$582,400.00	27.74%	\$223,600.00	6
(40) Pentium computers/items	\$76,000.00	\$58,800.00	22.63%	\$17,200.00	5
(1) Lot Lumber	\$17,000.00	\$15,400.00	9.41%	\$1,600.00	3
(100) Caprines (Goats/Livestock)	\$13,000.00	\$10,000.00	23.08%	\$3,000.00	5
(1) Lexar PC Card Type II	\$12,200.00	\$7,600.00	37.70%	\$4,600.00	5
(1) Lot Dishwasher (100 each)	\$22,000.00	\$15,700.00	28.64%	\$6,300.00	14
(1) Lot Waterheater (100 each)	\$20,000.00	\$12,200.00	39.00%	\$7,800.00	6
(140) Brake shoe 2530-00-602-5783	\$114,100.00	\$98,000.00	14.11%	\$16,100.00	3
(308) Hydraulic Wrench	\$434,280.00	\$434,280.00	0.00%	\$0.00	1
(35 - 1 Lot) Collar Assembly Part	\$145,425.00	\$121,500.00	16.45%	\$23,925.00	7
(200 - 1 Lot) Office Supplies	\$10,000.00	\$6,000.00	40.00%	\$4,000.00	9
(1) Lot SUN equipment	\$500,000.00	\$368,007.00	26.40%	\$131,993.00	16
(40) Laptop computers	\$186,000.00	\$108,000.00	41.94%	\$78,000.00	3
(1) Lot SUN equipment/Msg Sys	\$230,000.00	\$138,850.00	39.63%	\$91,150.00	3
(1) Lot Appliances (Washer/Dryer)	\$42,000.00	\$33,600.00	20.00%	\$8,400.00	8
(109 - 1 Lot) Desktop Computers	\$197,000.00	\$115,000.00	41.62%	\$82,000.00	4
(1) Lot Paper	\$43,000.00	\$37,328.00	13.19%	\$5,672.00	22
(1) Lot Sun Equipment & Services	\$1,847,000.00	\$1,717,500.00	7.01%	\$129,500.00	9
(1) Lot Sun Equipment & Services	\$1,052,000.00	\$959,000.00	8.84%	\$93,000.00	4
(1) Lot Eyepiece Assembly	\$550,000.00	\$261,500.00	52.45%	\$288,500.00	2
(1) Lot Modular Office Furniture	\$24,000.00	\$17,400.00	27.50%	\$6,600.00	3
(1) Lot Computer Systems	\$149,000.00	\$149,000.00	0.00%	\$0.00	4
(1) Lot Wood Chips	\$29,000.00	\$25,000.00	13.79%	\$4,000.00	4
(1) Lot Modular Office Furniture	\$91,300.00	\$69,500.00	23.88%	\$21,800.00	4
(1) Lot Refrigeration Equipment	\$36,000.00	\$27,433.32	23.80%	\$8,566.68	5
(1) Lot Pump Assembly	\$522,750.00	\$425,850.00	18.54%	\$96,900.00	6
(370) Desktop PCs—Energy Dept	\$592,370.00	\$388,500.00	34.42%	\$203,870.00	4



(1) Lot Dual-line Phones	\$19,500.00	\$17,100.00	12.31%	\$2,400.00	5
(1) Lot Metal Desks	\$53,000.00	\$36,900.00	30.38%	\$16,100.00	2
(6) HAZMAT Storage Buildings	\$42,000.00	\$28,770.00	31.50%	\$13,230.00	5
(1) Lot Projectors, Screens, etc.	\$34,000.00	\$28,550.00	16.03%	\$5,450.00	5
(62) Monitors	\$99,200.00	\$85,250.00	14.06%	\$13,950.00	9
(1) Lot Desktop Computers	\$2,200,000.00	\$1,800,000.00	18.18%	\$400,000.00	4
(154) Desktop Pentium III	\$211,971.76	\$160,160.00	24.44%	\$51,811.76	9
(137) Antennas, AS-3244/TS	\$164,400.00	\$164,400.00	0.00%	\$0.00	3
(1) Lot Eyepiece Assembly	\$421,000.00	\$421,000.00	0.00%	\$0.00	2
(6000) Hose Clamps	\$25,500.00	\$21,000.00	17.65%	\$4,500.00	4
(50) Contract Closeout Services	\$10,000.00	\$4,450.00	55.50%	\$5,550.00	5
(1) Lot Desktop/Laptop Computers	\$389,000.00	\$353,000.00	9.25%	\$36,000.00	6
(1) Lot Desktop Computers	\$95,200.00	\$83,500.00	12.29%	\$11,700.00	3
(1) Lot Objective Mount Assembly	\$228,000.00	\$228,000.00	0.00%	\$0.00	2
(1) Lot Battery Chargers	\$263,500.00	\$160,000.00	39.28%	\$103,500.00	5
(100) Contract Closeout Services	\$25,000.00	\$8,000.00	68.00%	\$17,000.00	8
(1) Lot Objective Mount Assembly	\$497,500.00	\$497,500.00	0.00%	\$0.00	2
(1) Lot Water Safety Promo Items	\$36,000.00	\$36,000.00	0.00%	\$0.00	6
(1) Lot Leveling Jacks	\$159,600.00	\$159,600.00	0.00%	\$0.00	3
(1) Lot Appliances	\$330,000.00	\$270,000.00	18.18%	\$60,000.00	6
(1) Lot Loudspeakers	\$1,863,190.00	\$963,190.00	48.30%	\$900,000.00	4
(1) Lot Hydraulic Components	\$630,000.00	\$305,000.00	51.59%	\$325,000.00	6
(1) Lot Floor Polish	\$7,500.00	\$5,000.00	33.33%	\$2,500.00	6
(1) Lot Vapor Protective Suits	\$8,100.00	\$5,300.00	34.57%	\$2,800.00	4
(1) Lot Vinson Test Set	\$355,000.00	\$203,000.00	42.82%	\$152,000.00	5
(1) Lot Camera Components	\$15,000.00	\$10,900.00	27.33%	\$4,100.00	4
(1) Lot Notebooks, CPUs & Monitors	\$61,648.00	\$47,748.00	22.55%	\$13,900.00	5
(1) Lot HP Laser Printers 1200N	\$17,250.00	\$16,050.00	6.96%	\$1,200.00	2
(1600) Desktop computers	\$1,920,000.00	\$1,440,000.00	25.00%	\$480,000.00	6
(200) Computer Monitors	\$25,000.00	\$22,000.00	12.00%	\$3,000.00	6
(1) Lot Adapter Antenna	\$191,100.00	\$118,100.00	38.20%	\$73,000.00	5
(1) Lot CPUs and Notebooks	\$1,881,059.00	\$1,084,059.00	42.37%	\$797,000.00	8
(1) Lot Transformer Assembly	\$420,000.00	\$195,000.00	53.57%	\$225,000.00	4
(381) Mounting Bracket Assembly	\$156,210.00	\$53,340.00	65.85%	\$102,870.00	4
(1) Lot Removable Canopy	\$1,320,000.00	\$1,100,000.00	16.67%	\$220,000.00	5
(179) 2KW Diesel Engines	\$250,600.00	\$232,700.00	7.14%	\$17,900.00	4
(53) 3KW Diesel Engines	\$79,500.00	\$60,950.00	23.33%	\$18,550.00	4
(1) Lot Intermediate Power Assembly	\$337,280.00	\$150,280.00	55.44%	\$187,000.00	4
(1) Lot Computers	\$140,000.00	\$95,000.00	32.14%	\$45,000.00	2
(2465) PIN	\$3,327.75	\$2,218.50	33.33%	\$1,109.25	4
(1) Lot Removable Canopy	\$240,000.00	\$195,000.00	18.75%	\$45,000.00	4
(1600) Antenna Adapter	\$160,000.00	\$104,000.00	35.00%	\$56,000.00	4
(1) Lot Transformer Assembly	\$55,000.00	\$38,000.00	30.91%	\$17,000.00	4
(57) Mark 124 Warheads	\$114,000.00	\$113,430.00	0.50%	\$570.00	2



(1) Lot Notebooks/Laser Printers	\$875,000.00	\$515,000.00	41.14%	\$360,000.00	8
(1600) Antenna Adapter	\$160,000.00	\$88,000.00	45.00%	\$72,000.00	4
(235) Displacement Gyroscopes	\$1,903,500.00	\$1,257,250.00	33.95%	\$646,250.00	3
(1) Lot Cable Switch Assembly	\$200,000.00	\$127,500.00	36.25%	\$72,500.00	2
(1) Lot Coupler, Rotary Radio	\$690,000.00	\$680,000.00	1.45%	\$10,000.00	2
(1) Lot Aluminum Benches	\$10,000.00	\$4,800.00	52.00%	\$5,200.00	4
(1) Lot Patriot Missile Spares	\$2,500,000.00	\$1,568,000.00	37.28%	\$932,000.00	3
(1) Lot Lawn Mowers	\$19,000.00	\$19,000.00	0.00%	\$0.00	6
(1) Lot Vacuum Cleaners	\$27,500.00	\$20,500.00	25.45%	\$7,000.00	5
(1) Lot Pagers	\$2,500.00	\$800.00	68.00%	\$1,700.00	3
(1) Lot Circuit Card Assembly	\$36,000.00	\$11,400.00	68.33%	\$24,600.00	4
(1) Lot Quick Erect Antenna Mast	\$4,500,000.00	\$2,205,000.00	51.00%	\$2,295,000.00	5
(1) Lot Generator Air Coolers	\$120,000.00	\$90,000.00	25.00%	\$30,000.00	5
(1) Lot PC/Notebooks	\$65,600.00	\$65,600.00	0.00%	\$0.00	12
(1) Lot Telephone Circuit Trunk Jack	\$90,000.00	\$90,000.00	0.00%	\$0.00	2
(1) Lot Refrigerators	\$52,000.00	\$44,600.00	14.23%	\$7,400.00	3
(100) ea 3KW Diesel Engines	\$120,000.00	\$120,000.00	0.00%	\$0.00	4
(1) Lot Circuit Card Assembly	\$93,400.00	\$82,000.00	12.21%	\$11,400.00	4
(1) Lot Intercomm Set Control	\$112,500.00	\$95,700.00	14.93%	\$16,800.00	3
(1) Lot PCs/Notebooks/Monitors	\$300,000.00	\$235,000.00	21.67%	\$65,000.00	12
(100) ea 3KW Diesel Engines	\$140,000.00	\$140,000.00	0.00%	\$0.00	4
(1) Lot Circuit Card Assembly	\$400,000.00	\$220,000.00	45.00%	\$180,000.00	5
(1) Lot Movable Canopy	\$1,165,000.00	\$870,000.00	25.32%	\$295,000.00	4
(1) Lot Desktop PC/Notebooks	\$1,500,000.00	\$1,089,000.00	27.40%	\$411,000.00	12
(1) Lot Desktop PC/Notebooks	\$1,001,150.00	\$671,150.00	32.96%	\$330,000.00	11
(1) Lot Computer HW/SW & Furniture	\$498,782.00	\$264,782.00	46.91%	\$234,000.00	9
(300) ea 3KW Diesel Engines	\$450,000.00	\$435,000.00	3.33%	\$15,000.00	4
(160) ea 2KW Diesel Engines	\$264,000.00	\$230,400.00	12.73%	\$33,600.00	4
Desktop/Notebooks	\$241,500.00	\$220,000.00	8.90%	\$21,500.00	12
(295) ea 2KW Diesel Engines	\$501,500.00	\$445,450.00	11.18%	\$56,050.00	4
(270) ea 3KW Diesel Engines	\$405,000.00	\$402,300.00	0.67%	\$2,700.00	4
(1) Lot RF Tray Assembly	\$1,675,000.00	\$1,025,000.00	38.81%	\$650,000.00	3
(1) Lot Circuit Card Assembly	\$76,850.00	\$38,100.00	50.42%	\$38,750.00	9
(1) Lot Integrated Computer System	\$50,950.00	\$50,500.00	0.88%	\$450.00	6
(1) Lot Patriot Missile Spares	\$1,115,000.00	\$1,102,500.00	1.12%	\$12,500.00	2
(1) Lot Battery Housing Assembly	\$2,000,000.00	\$1,280,000.00	36.00%	\$720,000.00	5
(1) Lot Transformer Assembly	\$406,000.00	\$384,500.00	5.30%	\$21,500.00	2
(1) Lot Locking Device	\$20,925.00	\$19,725.00	5.73%	\$1,200.00	3
(1) Lot NTRD Cables	\$88,000.00	\$60,100.00	31.70%	\$27,900.00	2
(1) Lot Mounting Brackets	\$500,000.00	\$280,000.00	44.00%	\$220,000.00	5
(200) ea 2KW Diesel Engine	\$360,000.00	\$294,000.00	18.33%	\$66,000.00	4
(200) ea 3KW Diesel Engine	\$340,000.00	\$319,000.00	6.18%	\$21,000.00	4
(1) Lot Monitors	\$395,800.00	\$395,800.00	0.00%	\$0.00	2
(1) Lot Telephone Line Jacks	\$1,929,350.00	\$1,524,097.00	21.00%	\$405,253.00	3



(500) ea Desktop Computers	\$700,000.00	\$605,000.00	13.57%	\$95,000.00	4
(48) ea Laptop Computers	\$105,600.00	\$71,520.00	32.27%	\$34,080.00	4
(1) Lot Enhanced Power Adapter	\$1,920,000.00	\$1,790,000.00	6.77%	\$130,000.00	4
(1) Lot TA312 Telephone	\$139,000.00	\$113,200.00	18.56%	\$25,800.00	4
(1) Lot Bracket Assembly	\$145,000.00	\$90,000.00	37.93%	\$55,000.00	5
(1) Lot Desktops/Notebooks	\$392,000.00	\$335,000.00	14.54%	\$57,000.00	12
(1) Lot Desktops/Notebooks	\$1,053,000.00	\$825,000.00	21.65%	\$228,000.00	12
(1) Lot Circuit Card Assembly	\$120,000.00	\$48,750.00	59.38%	\$71,250.00	5
(1) Lot J10077 Distribution Box	\$864,000.00	\$310,000.00	64.12%	\$554,000.00	6
(1) Lot Circuit Card Assembly	\$2,815,000.00	\$310,000.00	88.99%	\$2,505,000.00	9
(1) Lot Spares for Countermeasure	\$20,000,000.00	\$9,013,988.00	54.93%	\$10,986,012.00	3
(1) Lot Spares for Countermeasure	\$4,000,000.00	\$3,999,999.00	0.00%	\$1.00	2
(1) Lot M-172 Boom Microphone	\$503,000.00	\$319,000.00	36.58%	\$184,000.00	3
(1) Lot Ft Mon Construction	\$675,000.00	\$562,000.00	16.74%	\$113,000.00	11
(1) Lot Mechanical Scanners	\$250,000.00	\$249,500.00	0.20%	\$500.00	2
(1) Lot Telephone Circuit Trunk Jack	\$307,000.00	\$140,800.00	54.14%	\$166,200.00	3
(1) Lot TA-1/PT Telephone Set	\$1,631,708.00	\$1,070,000.00	34.42%	\$561,708.00	2
(1) Lot Circuit Card Assembly	\$285,500.00	\$172,000.00	39.75%	\$113,500.00	4
(1) Lot Radio Set Control Assembly	\$2,450,000.00	\$2,450,000.00	0.00%	\$0.00	3
(1) Lot PL1408 Circuit Card Assembly	\$1,925,000.00	\$1,199,000.00	37.71%	\$726,000.00	16
(1) Lot PL1403 Circuit Card Assembly	\$1,800,000.00	\$689,000.00	61.72%	\$1,111,000.00	15
(1) Lot Signal Scanner	\$420,000.00	\$270,000.00	35.71%	\$150,000.00	3
(1) Lot NVD CID Tape	\$857,500.00	\$500,500.00	41.63%	\$357,000.00	2
(108) ea 2 KW Diesel Engine	\$183,600.00	\$160,920.00	12.35%	\$22,680.00	2
(1) Lot Patriot Spares	\$572,000.00	\$572,000.00	0.00%	\$0.00	2
(166) ea 3 KW Diesel Engine	\$282,200.00	\$272,240.00	3.53%	\$9,960.00	2
(1) Lot Electrical Arrester	\$500,000.00	\$402,800.00	19.44%	\$97,200.00	5
(1) Lot M175A, Microphone Capacitor	\$1,520,000.00	\$1,190,000.00	21.71%	\$330,000.00	2
(1) Lot Building 603 Warehouse	\$1,250,000.00	\$1,250,000.00	0.00%	\$0.00	8
(115) ea 2KW Diesel Engines	\$195,500.00	\$171,350.00	12.35%	\$24,150.00	2
(1) Lot Feed-horn Assembly	\$250,000.00	\$193,700.00	22.52%	\$56,300.00	4
(1) Lot Desktop/Notebooks	\$1,633,000.00	\$1,360,000.00	16.72%	\$273,000.00	17
(1) Lot Bldg 907 Warehouse	\$700,000.00	\$697,000.00	0.43%	\$3,000.00	5
(204) ea 3 KW Diesel Engines	\$357,000.00	\$334,560.00	6.29%	\$22,440.00	2
(1) Lot Power Supply	\$2,902,000.00	\$2,138,000.00	26.33%	\$764,000.00	7
(1) Lot J10077 Distribution Box	\$564,000.00	\$469,000.00	16.84%	\$95,000.00	7
(1) Lot Motor, Alternating	\$100,000.00	\$77,000.00	23.00%	\$23,000.00	2
(1) Lot Power Supply Repair	\$33,000.00	\$5,000.00	84.85%	\$28,000.00	7
(1) Lot Power Supply	\$107,000.00	\$47,000.00	56.07%	\$60,000.00	6
(1) Lot Digital Topographical Spt Equip	\$410,000.00	\$405,500.00	1.10%	\$4,500.00	3
(1) Lot Telephone Sets	\$3,311,000.00	\$2,686,000.00	18.88%	\$625,000.00	5
(115) ea Diesel Engines	\$189,750.00	\$171,350.00	9.70%	\$18,400.00	2



(451) ea Diesel Engines	\$789,250.00	\$739,640.00	6.29%	\$49,610.00	2
(1) Lot Cable Assemblies, CX11230A/G	\$11,250,000.00	\$8,250,000.00	26.67%	\$3,000,000.00	4
(1) Lot Cable Assemblies, CX-13404	\$70,000.00	\$49,000.00	30.00%	\$21,000.00	6
(1) Lot AN/ARN-98B Amplifier	\$335,400.00	\$173,400.00	48.30%	\$162,000.00	8
(1) Lot Amplifier Mixer Module	\$687,000.00	\$479,000.00	30.28%	\$208,000.00	8
(1) Lot CISCO Computer Equip Repair	\$6,200,000.00	\$5,740,000.00	7.42%	\$460,000.00	9
(1) Lot Fuel Pumps	\$390,000.00	\$330,000.00	15.38%	\$60,000.00	3
(1) Lot Starter Engines	\$80,000.00	\$69,750.00	12.81%	\$10,250.00	4
(1) Lot Amplifier Mixer Module	\$119,000.00	\$94,000.00	21.01%	\$25,000.00	4
(1) Lot Radiators, 10KW Generator Set	\$520,000.00	\$495,000.00	4.81%	\$25,000.00	5
(1) Lot Alternator/Engine—Electrical	\$1,850,000.00	\$780,000.00	57.84%	\$1,070,000.00	4
(1) Lot Telephone Cable Assembly	\$2,850,000.00	\$1,214,100.00	57.40%	\$1,635,900.00	18
(1) Lot SU-121/UA Optical Imagers	\$801,500.00	\$800,500.00	0.12%	\$1,000.00	4
(1) Lot TK-17/G Tool Kit	\$4,562,000.00	\$4,405,000.00	3.44%	\$157,000.00	6
(1) Lot Alternating Current Motors	\$184,800.00	\$149,800.00	18.94%	\$35,000.00	2
(1) Lot John Deere Engine Starters	\$300,000.00	\$200,000.00	33.33%	\$100,000.00	2
Grounding Kits	\$1,100,000.00	\$896,000.00	18.55%	\$204,000.00	8
Antenna to Antenna Base Adapter	\$14,000.00	\$14,000.00	0.00%	\$0.00	3
Post Amplifier Control Driver	\$2,700,000.00	\$630,000.00	76.67%	\$2,070,000.00	9
Distribution Boxes	\$60,200.00	\$49,800.00	17.28%	\$10,400.00	3
Tool Kit 105 A/G	\$9,048,109.00	\$4,913,109.00	45.70%	\$4,135,000.00	4
TOTALS:			31.62%	\$48,651,681.69	

(Adapted from Meinert, 2007)



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Appendix C. FedBid Auction Results By NAICS Code

NAICS Code	Total \$ Value	# of Auctions
10—Weapons	\$554,200	17
12—Firing/Targeting Control Equipment	\$2,099,228	17
13—Ammunition and Explosives	\$34,651,901	506
15—Aircraft and Airframe Structural Components	\$8,763	2
16—Aircraft Components and Accessories	\$368,422	11
17—Aircraft Launching, Landing, and Ground Handling Equipment	\$83,563	4
18—Space Vehicles	\$250,098	10
19—Ships, Small Craft, Pontoons, and Floating Docks	\$44,968	2
20—Ship and Marine Equipment	\$2,788,571	121
23—Ground Effect Vehicles, Motor Vehicles, Trailers, and Cycles	\$37,087,642	82
24—Tractors	\$585,789	9
25—Vehicular Equipment Components	\$2,399,645	92
26—Tires and Tubes	\$3,707	1
28—Engines, Turbines, and Components	\$93,321	3
29—Engine Accessories	\$13,109	3
30—Mechanical Power Transmission Equipment	\$53,183	5
31—Bearings	\$9,760	1
32—Woodworking Machinery and Equipment	\$102,318	8
34—Metalworking Machinery	\$362,799	32
35—Service and Trade Equipment	\$847,296	71
36—Special Industry Machinery	\$1,810,460	146
37—Agricultural Machinery and Equipment	\$190,192	6
38—Construction, Mining, Excavating, and Highway Maintenance Equipment	\$2,463,516	25
39—Materials Handling Equipment	\$2,109,289	46
40—Rope, Cable, Chain, and Fittings	\$26,757	2
41—Refrigeration, Air Conditioning, and Air Circulating Equipment	\$20,223,969	1148
42—Fire Fighting, Rescue, and Safety Equipment; and Environmental Protection Equipment and Materials	\$3,509,469	145
43—Pumps and Compressors	\$115,786	9
44—Furnace, Steam Plant, and Drying Equipment	\$232,686	6
45—Plumbing, Heating, and Waste Disposal Equipment	\$332,227	18
46—Water Purification and Sewage Treatment Equipment	\$800,384	10
47—Pipe, Tubing, Hose, and Fittings	\$30,201	4
48—Valves	\$21,934	3
49—Maintenance and Repair Shop Equipment	\$292,149	19
51—Hand Tools	\$688,410	61
52—Measuring Tools	\$35,892	6



53—Hardware and Abrasives	\$566,725	25
54—Prefabricated Structures and Scaffolding	\$2,198,937	17
55—Lumber, Millwork, Plywood, and Veneer	\$426,995	8
56—Construction and Building Materials	\$724,450	30
58—Communication, Detection, and Coherent Radiation Equipment	\$55,748,663	1060
59—Electrical and Electronic Equipment Components	\$1,803,555	86
60—Fiber Optics Materials, Components, Assemblies, and Accessories	\$445,751	16
61—Electric Wire, and Power and Distribution Equipment	\$1,481,774	58
62—Lighting Fixtures and Lamps	\$632,231	29
3—Alarm, Signal and Security Detection Systems	\$11,826,216	296
65—Medical, Dental, and Veterinary Equipment and Supplies	\$7,277,606	374
66—Instruments and Laboratory Equipment	\$31,457,032	396
67—Photographic Equipment	\$2,928,020	221
68—Chemicals and Chemical Products	\$3,509,048	9
69—Training Aids and Devices	\$1,089,371	31
70—Information Technology (ADP) Equipment (Including Firmware), Software, Supplies and Support Equipment	\$532,692,444	9079
71—Furniture	\$8,270,443	433
72—Household and Commercial Furnishings and Appliances	\$3,342,412	157
73—Food Preparation and Serving Equipment	\$1,264,194	35
74—Office Machines, Text Processing Systems and Visible Record Equipment	\$8,679,210	434
75—Office Supplies and Devices	\$19,296,494	865
76—Books, Maps, and Other Publications	\$359,569	31
77—Musical Instruments, Phonographs, and Home-type Radios	\$823,596	36
78—Recreational and Athletic Equipment	\$445,603	22
79—Cleaning Equipment and Supplies	\$68,041	10
80—Brushes, Paints, Sealers, and Adhesives	\$40,943	4
81—Containers, Packaging, and Packing Supplies	\$1,397,181	54
83—Textiles, Leather, Furs, Apparel and Shoe Findings, Tents and Flags	\$1,091,170	67
84—Clothing, Individual Equipment, and Insignia	\$9,153,946	105
85—Toiletries	\$20,751	2
87—Agricultural Supplies	\$107,918	1
88—Live Animals	\$423,628	9
89—Subsistence	\$2,031,537	6
91—Fuels, Lubricants, Oils, and Waxes	\$42,255	1
93—Nonmetallic Fabricated Materials	\$127,501	5
95—Metal Bars, Sheets, and Shapes	\$298,327	7
96—Ores, Minerals, and Their Primary Products	\$19,407	1
99—Miscellaneous	\$4,400,679	162
B—Special Studies and Analyses	\$19,931	1
C—Architect and Engineering Services—Construction	\$23,718	2
D—Information Technology (IT/ADP) and Telecommunication Services	\$5,340,822	26



Directed Buys—Direct Buys for Individual Buyers	\$189,965,843	1302
F—Natural Resources Management	\$2,335,218	3
H—Quality Control, Testing and Inspection Services	\$5,016	2
J—Maintenance, Repair, and Rebuilding of Equipment	\$427,208	16
M—Operation of Government-owned Facility	\$786,779	39
N—Installation Equipment	\$1,667,932	30
Q—Medical Services	\$24,869	4
R4—Professional Service	\$297,939	6
R6—Administrative Support Service	\$31,098	1
R7—Management Support Service	\$278,173	16
S1—Utilities	\$256,295	4
S2—Housekeeping Services	\$462,948	8
T—Photographic, Mapping, Printing, and Publication Services	\$240,184	4
U—Education and Training Services	\$1,658,763	45
V—Transportation, Travel and Relocation Services	\$45,609	6
W—Lease or Rental of Equipment	\$636,115	8
X—Lease or Rental of Facilities	\$29,870	1
Y—Construction of Structures and Facilities	\$1,100,939	44
TOTAL	\$1,037,440,499	18,401

(Lee, 2007)



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- Navy Contract Writing Guide
- Commodity Sourcing Strategies
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- Army LOG MOD
- PBL (4)
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- Strategic Sourcing
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- Analysis of LAV Depot Maintenance
- Diffusion/Variability on Vendor Performance Evaluation
- Optimizing CIWS Life Cycle Support (LCS)

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- Building Collaborative Capacity
- Knowledge, Responsibilities and Decision Rights in MDAPs
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