Trends in Electronic Procurement and Electronic Commerce and Their Impact on Small Business

by

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Executive Summary

Since the early 1990s legislation has focused on ensuring that the federal government uses the most efficient and cost-effective means to purchase the $200 billion of goods and services that it requires each year. Since 1997, many have envisioned using electronic commerce to streamline the cumbersome procurement process, but the progression has been mired down in inefficiencies stemming from the federal government's indecision regarding a single mode of electronic commerce and slow movement toward a single interface for businesses seeking opportunities to sell to the government. Legislators and the Small Business Administration have raised concerns that, despite attempts to help small businesses, these reforms and changes in the procedures for procurement have created new barriers for small businesses. Little research has been done in the last several years about how much procurement is actually taking place using these new technologies, and whether the transition to electronic commerce has helped or handicapped small businesses in obtaining at least a 23 percent share of federal purchases each year (the legislative goal). In this report, Innovation & Information Consultants, Inc. (IIC, Inc.) focuses on whether small businesses in industries which successfully adopt e-commerce have an advantage in competing for procurement dollars, and how much evidence exists to document the implementation of electronic procurement in these industries.

The research methodology we have employed in this study included a review of the relevant literature on the state of e-commerce generally, trends in e-procurement, costs and benefits of the electronic marketplace, and potential barriers to the adoption of e-commerce and e-procurement. In addition, we have collected and analyzed data from three sources relating to the rate of adoption of e-commerce, procurement trends, and market structure. We have "married" three large databases (U.S. Census Bureau E-Stats data and Census of Manufacturers, and Federal Procurement Data System procurement database) using North American Industry Classification System (NAICS) industry codes as the common denominator that permits us to look at trends in specific industry areas, characterized by specific structural features (large versus small firms, high concentration versus low concentration, rapid rate of adoption of e-commerce versus slow rate of adoption, large number of procurement dollars versus smaller levels of procurement money, etc.). Finally we have also conducted a limited number of interviews to illuminate and expand upon some of the findings from the data analysis and literature review.

We first identified specific industry areas that either led or lagged in their rate of adoption of e-commerce, using three different measures of e-commerce activity. Next we examined the extent to which small firms played an important role in these industries by evaluating data on market structure. We then analyzed procurement trends in those industry areas we had selected in the first step. We analyzed the level of procurement dollars and activity on an absolute basis and measured the extent to which small firms received procurement dollars relative to other firms. Then, relying on contract action information contained in the FPDC database, we estimated the extent to which simplified acquisition tools (including e-procurement) were used on a dollar value and action basis, across all procurements as well as for the specific industries and by type of firm (small versus large).

Based on these data analyses we generated several conclusions including the following:

- Certain barriers do appear to exist that may prevent small business from embracing e-commerce, however, the data do not suggest any significant lag in the actual adoption of e-commerce by small business.

- In industries where small businesses obtain a significant share of federal procurement dollars (i.e., greater than 25 percent of the total), both large and small firms were more likely to use simplified acquisition tools (including e-procurement) than in other industry areas.

- For those industries which the data identify as leaders in the adoption of e-commerce, we found that e-procurement tools (as measured by those procurements that employ Simplified Acquisition Procedures) are used more frequently than the average level across all procurements by a significant margin. Of the industry areas classified as lagging in the adoption of e-commerce, we found that these industries also lagged in their use of simplified acquisition tools.

- Small firms appear to rely much more heavily on e-procurement tools than do large firms. Using the "simplified acquisition procedure" as a proxy for use of e-procurement tools, we found that in FY00 only about 2 percent of all small business procurement dollars were obtained through e-procurement. However, the number increased to 6.3 percent in FY01 and to 6.5 percent in FY02. Large business, on the other hand, only obtained about 1 percent of procurement dollars through simplified acquisition procedures in FY00 and that has remained relatively constant over the three-year period we analyzed.

Our research leads us to recommend that policy makers ensure that the federal government acts with certainty in implementing changes in its procurement policy, including moving decisively toward a single interface and a single point of registration for small businesses who wish to do business with the federal government. Policy makers should continue to work with trade industry groups to provide training, support, and networking opportunities for small businesses as they learn how to use the new e-commerce and e-procurement tools successfully. Finally, priority should be given to training federal employees in the benefits of true implementation of electronic commerce, so that their work habits can foster more rapid adoption of electronic commerce.

Chapter 1
Introduction and Conclusions

The federal government spends over $200 billion each year purchasing goods and services, primarily from private industry. Several legislative acts of the 1990s attempted to ensure that federal procurement was achieving efficiency by using the latest technology, including "e-commerce," and streamlining the procurement process for a reduced federal work force, while other legislation set a goal that 23 percent of these expenditures would be purchased from small businesses.[1] Legislators and the U.S. Small Business Administration have raised concerns that, despite attempts to help small businesses, these reforms and changes in the procedures for procurement have created new barriers for small businesses. The small business share of the federal procurement dollars has fluctuated in the 1990s: between fiscal years 1993 and 1997 the small business share was between 24 and 25 percent, while in fiscal years 1998 through 2002 the share has fallen to about 23 percent. Congressional hearings have focused in the last several years on various issues related to procurement. Yet little prior work has illuminated whether small businesses are able to compete for procurement opportunities as a result of increasing reliance on electronic procurement mechanisms, and whether small firms face critical barriers as they compete in the electronic marketplace for federal procurement dollars. In this report, Innovation & Information Consultants, Inc. (IIC, Inc.) provides the first analytical treatment of these issues, focusing on whether e-commerce and, in particular, e-procurement tools, have assisted or harmed small business in its effort to compete for procurement dollars.

We define electronic commerce to include all aspects of buying and selling electronically, including marketing, end-to-end transactions with consumers, and on-line auctions. It is transacted through a variety of technologies, including electronic data interchange (EDI), electronic mail, electronic funds transfer, and Web-based (Internet) applications. The federal government has adopted many of these facets of e-commerce in its procurement activities, and policy directives indicate an even stronger emphasis on e-procurement in the future. Critical research questions in this study include:

- Are small firms more or less likely than large firms to adopt e-commerce as a way of doing business?
- Is there a correlation between the use of e-commerce and e-procurement tools and do the benefits of e-commerce extend to e-procurement?
- Has the move to more intensive use of e-procurement by the federal government been embraced by small business?
- Has small business benefited or been harmed by the government's move to e-procurement?
- How extensively has the federal government embraced electronic procurement as a means of doing business?

[1] See GAO (2001a) for an overview of three legislative initiatives: Federal Acquisition Streamlining Act of 1994, Clinger-Cohen Act of 1996, and Small Business Reauthorization Act of 1997.

Answers to these research questions will enhance the general state of knowledge regarding e-commerce in defined industry areas and provide some indication of the relative rates of adoption of such technologies. It also provides insight into the share of procurement dollars flowing to small businesses where e-procurement is more readily available and used. Our research also provides some early answers to whether the move to an electronic marketplace by the federal government has been beneficial or detrimental to small businesses and their ability to participate in these opportunities. This research also provides important information to the Small Business Administration Office of Advocacy and other policymakers regarding programs and initiatives that might improve access of small businesses to the opportunities afforded by electronic procurement with the federal government.

The research methodology we have employed in this study has included a review of the relevant literature on the state of e-commerce generally, including trends in e-procurement, costs and benefits of the electronic marketplace and potential barriers to the adoption of e-commerce and e-procurement. In addition, we have collected and analyzed data from three sources relating to the rate of adoption of e-commerce, procurement trends, and market structure. We have linked three large databases (described below) using North American Industry Classification System (NAICS) industry codes as the common denominator that permits us to look at trends in specific industry areas, characterized by specific structural features (large versus small firms, high concentration versus low concentration, rapid rate of adoption of e-commerce versus slow rate of adoption, large number of procurement dollars versus smaller levels, etc.). Analysis of these data sets allows us to generate initial findings and conclusions regarding the research hypotheses described above. Finally we have also conducted a limited number of interviews to illuminate and enhance some of the findings from the data analysis and literature review.

We obtained the data sets that we have relied upon from the U.S. Department of Commerce, U.S. Census Bureau, and the Federal Procurement Data Center (FPDC). The Census Bureau compiles data on the dollar value of e-commerce across manufacturing, wholesale, retail and service industries into what it terms its "E-Stats" database.[2] This database is published annually with quarterly updates on certain specific indicators. We used this database as a means of identifying industry groupings that displayed both rapid and slow rates of adoption of e-commerce in terms of value of shipments or sales. The second data set we used from the Census Bureau was the Census of Manufacturers, which provided data by NAICS code on firm concentration by industry, Herfindahl indices, and employment size of firms to provide a measure of the extent to which small firms were a significant or relatively minor factor in each of the industries we examined. With two exceptions, all of the industries we examined included a relatively robust small business sector.

The Federal Procurement Data Center collects information about the federal government purchases of goods and services, and this database is the third one that we relied upon. The database contains individual procurement actions reported by 65 U.S. government, Executive Branch, departments, bureaus, agencies, and commissions.[3] The database for fiscal year 2001 contains all transactions by Executive Branch that are greater than $25,000, and many smaller transactions for both Executive Branch agencies and civilian agencies. The FPDC collects 50 different data elements including information about the contracting agency, the contractor name and

[2] The Census Bureau defines e-commerce to include the value of goods and services sold online whether over open networks such as the Internet or over proprietary networks running systems such as EDI.
[3] Neither the U.S. Postal Service nor the legislative or judicial branches are required to report their purchases.

address, the amount and type of procurement transaction, the type of product or service purchased and its applicable NAICS code, place of performance, and more.

As discussed in more detail in Chapter 3, our analysis of the data proceeded in two steps. First, we identified specific industry areas that either led or lagged in their rate of adoption of e-commerce, using three different measures of e-commerce activity. Next we examined the extent to which small firms played an important role in these industries by evaluating data on market structure. We then analyzed procurement trends in those industry areas we had selected in the first step. We analyzed the level of procurement dollars and activity on an absolute basis and measured the extent to which small firms received procurement dollars relative to other firms. Then, relying on contract action information contained in the FPDC database, we estimated the extent to which simplified acquisition tools (including e-procurement) were used on a dollar value and action basis, across all procurements as well as for the specific industries and by type of firm (small versus large).

Based on these data analyses we generated several initial conclusions, which are tentative as they are based on only one year's data on procurement trends and an inexact proxy measure for e-procurement activity. Using two types of contract actions as proxies for the use of electronic procurement, we found evidence that in those industries where electronic commerce is a significant part of the business, small businesses were as successful as large businesses in obtaining business from the federal government using simplified acquisition and electronic procurement tools and techniques. These conclusions do suggest that small business may have adopted e-procurement tools and techniques at least as rapidly if not more so than large firms.

To provide a further test for these conclusions, we conducted six interviews with industry and government representatives to validate and expand upon these conclusions. Our interviews illuminated some issues that had not been evident in our data analysis. We found that some of the businesses that have been most successful in obtaining business with the federal government are large small businesses. Some small businesses continue to stumble over the electronic threshold that has been established by the federal government, and need very basic training in how to locate opportunities with the federal government. These businesses are frustrated by the number of different points of registration and number of web sites that must be navigated to find the opportunities to sell to the government that they are seeking. This is especially true for very small businesses, and those businesses in industries that are not technologically savvy. Other small businesses have found a niche by mastering the technology and using that to their advantage. Throughout the interviews, interviewees expressed the opinion that while small businesses may need some training to master the technology, employees at many of the contracting agencies equally needed to be trained in how to work with electronic commerce tools. We were provided with many examples where the procurement is being advertised electronically (via FedBizOpps or GSA Advantage, for example), but the actual contracting is being done with paper and fax, in much the same way that business has been conducted for many years.

Policy Implications

Based on our analyses of the three databases described above, as well as our extensive literature review and interviews with small businesses that have been successful in establishing procurement relationships with the federal government, we have developed the following preliminary policy recommendations for the Small Business Administration.

1. Small businesses have limited resources (time, technology infrastructure, capital) with which to conduct their businesses and to develop new business. Successful selling to the federal government must begin with certainty about how the federal government intends to purchase products and services from potential (small) suppliers. The federal government has altered its course many times over the last decade, beginning with EDI, moving toward Internet-based postings via numerous individual portals, and finally arriving at a single interface (FedBizOpps) that intends to post all opportunities in one location that is accessible to all via the Internet.

2. Central registration needs to become a reality. There continue to be numerous places where a small business needs to register in order to obtain information about potential opportunities to sell to the federal government. Small businesses would be willing to register themselves at SBA PRO-Net or SUB-Net if that meant that this information would be used to populate other databases with individual agencies, DOD supply centers, or prime contractors. Similarly, the Central Contractor Registration process should be used to populate these other databases as well, so that a small business would not need to visit each of these sites if it is interested in obtaining business with the federal government.

3. Small businesses, especially those that do not regularly use electronic commerce for the conduct of their business, need training, support, and networking opportunities in order to successfully use these tools to obtain business with the federal government. The Small Business Administration can play an important role in providing training opportunities and facilitating networking events for small businesses.

4. We found that specific industries are more inclined to be proficient in electronic commerce. Therefore, the Small Business Administration should target those industries where e-commerce lags and work with existing trade groups to offer support and training to small businesses within that industry's purview.

5. The current initiatives being undertaken by E-gov must include substantial training for federal government procurement officers to use the electronic commerce tools to their full potential.

6. Some of the initiatives being implemented as part of the Integrated Acquisition Environment and e-Gov programs may impede the ability of small business to compete. Some initiatives such as the use of the Central Contractor Registration to develop one comprehensive list of suppliers (that can be used for payments, as well) will strengthen the equal access of small businesses. However, we would encourage the Small Business Administration to closely monitor the e-catalog initiative, for example, to ensure that small businesses are not overlooked in favor of the larger businesses that already have the contracts.

7. While the increased role of FedBizOpps arguably means that every procurement transaction now involves "electronic procurement," hard data would better define the extent to which e-commerce tools are being used in the procurement process. Tracking the implementation of electronic commerce would be much improved if the Federal Procurement Data Center were required to collect information about which contracts were procured electronically.

Chapter 2
Literature Review

This chapter summarizes the literature we have reviewed regarding trends in e-commerce and e-procurement, specifically government acquisition of goods and services. We review trends in e-commerce, including small business use of e-commerce, and the state of government e-procurement. We then identify the economic costs and benefits associated with e-commerce and finally we discuss barriers to the adoption of e-commerce and e-procurement.

Trends in E-Commerce

Use of the Internet and other forms of electronic commerce has been growing at an astounding rate in recent years. Earlier literature affirmed that over one-quarter of all businesses will be "on-line" by 2003 and e-commerce in its broadest form is expected to continue to grow at an annual average rate of 33 percent per year for the foreseeable future (BCG 2000; Pratt 2002).[4] Business to business purchasing using the Internet has also increased significantly in recent years with larger firms leading the way. Approximately 20 percent of all companies purchase on-line (Forrester 2001) and approximately three-quarters of all companies now have web sites (Keough 2001).

While in general e-commerce has gained in popularity in recent years, recent data and reports suggest that small firms may be lagging somewhat in the adoption of e-commerce. Pratt (2002) in a recent study for the Small Business Administration (SBA) found that although the Internet offers significant opportunities for small firms to expand, it is large firms that have moved more quickly in adopting web-based business practices. Pratt notes that 77 percent of larger firms have a web site compared to 58 percent for firms with less than 10 employees. Web sites provide small firms the ability to reach new customers, improve their competitive positions, and increase sales. Further, many small firms who do not currently have a web site intend to implement one in the near future.

Pratt concludes, however, that small business sells primarily to Internet consumers as opposed to other business. Less than 10 percent of online sales by small firms is in the area of so-called business to business (B2B) commerce, whereas larger firms are much more heavily involved in B2B e-commerce.[5] As we shall discuss later this may prove to be a barrier to small firms moving into government e-procurement. Keough (2001) notes, for example, that large size distributors of manufactured products are much more willing to do business electronically than are small distributors, and larger firms are more willing to integrate their operations electronically with retailers. Some of this may be a residual impact of EDI which generally was adopted more quickly by larger firms and had higher up-front costs (IIC 1995). Pratt also recognizes that small businesses face other challenges such as organizational and strategic change as they increase the scope of their business and expand into the realm of e-commerce.

Nevertheless, small firms are focused on e-business as a way to compete. Small firms that utilize the Internet for marketing or procurement have higher revenues, and many small firms are

[4] The latest data from E-Stats suggest that this trend has slowed, perhaps due to the general economic downturn.

[5] It is also widely believed that business to business commerce offers the greatest potential for cost savings and efficiencies from implementing e-commerce.

using the Internet as a means to expand their customer base (SBA 1999c). For example, online retail marketing has expanded at an astronomical rate. E-commerce expands small business's ability to exchange information with potential customers, and the ability to use web-based applications means that e-commerce is within reach of all small business (SBA 2000a).

A recent study by the U.S. Department of Commerce (Buckley and Montes 2002) examined the extent to which small and medium-sized enterprises (SMEs) are investing in information technology, participating in on-line activities, and assisting their employees with use of computers. The study found that SMEs invest less than their larger counterparts on a per employee basis in two categories of IT investment: computers and communications. In 1998, firms with more than 500 employees invested $8,700 per employee, firms with 100-499 employees invested $3,700 per employee, and firms with less than 100 employees invested less than $2,500. The study also found that SMEs were less likely than larger firms to buy and sell using the Internet, and that their employees were less likely than their counterparts at larger firms to use a computer as part of their daily work.

Various studies have pointed to the fact that inefficient purchasing of goods and services cost companies billions of dollars each year (Attaran and Attaran 2002). The average cost of paper-based procurement is between $50 and $200 per transaction. This process involves purchase orders being routed through various levels of authorization, bookkeeping entries, and payment via check. Reduction of paperwork and better inventory control can reduce costs significantly as businesses move to e-commerce (Moozakis 2001). Recent estimates indicate that a mid-size organization can save as much as $2 million per year with the use of e-procurement. Another source indicated that Massachusetts reduced the costs per procurement transaction from $100-150 per purchase order to $20.[6] Use of the Internet as the basic e-commerce tool is generally accepted now, but processes to integrate and automate the entire buying capability are emerging as the next challenge for e-commerce.

> Companies are trying to add such steps as contract negotiation, supply analysis, and consolidation of all of the supplies data within a single platform. As companies emphasize cost savings, investments in e-procurement technology are rising faster than investment in any other software category (Attaran and Attaran 2002).

Companies are currently spending almost $2 billion per year on e-procurement software (Moozakis 2001). Automating the entire supply chain is the primary focus and is seen as having great benefits by reducing paperwork and increasing "visibility" of inventory. The extent to which small firms will be able to realize these savings will depend on their ability to work with suppliers and customers as well as reengineering their organization.

[6] Terry (2001).

Trends in Government Procurement

The federal procurement process is enormously complex and often quite intimidating to small firms, especially to firms that are new to selling to the government. The federal acquisition regulations (FAR) and other rules and regulations pertaining to procurement activities are complicated enough without having to deal with the many changes that have taken place in recent years as the government embarks on an ambitious program to bring federal procurement into cyberspace. Making government procurement more accessible through electronic links will certainly help in the long run, but for the moment, e-business with the government is not for the faint of heart (Welch 2000).

By 2005 electronic commerce by the government is expected to reach $6.5 billion, up from less than $2 billion in 2001 (Senia 2001). Solution-providers have entered the market and are expected in the short run to play an increasingly important role (Senia 2001). Third-party intermediaries who provide information regarding procurement opportunities will assist small (and larger) firms who may lag in the adoption and use of electronic procurement tools. Nevertheless, the government has already made a substantial investment in moving to e-procurement, and will continue this trend.

Considerable discussion has focused in recent years on the role of small business in the procurement process and whether small firms are receiving an equitable share of federal procurement dollars. The SBA's *State of Small Business* reports annually on the flow of procurement money to small business. In the latest report, the SBA (2001a) notes that the federal government spends over $200 billion per year on the procurement of goods and services, and small firms account for about 20 percent of all prime contract money and receive another 10-14 percent of subcontract money.[7] This report reiterates that federal procurement is changing at a very rapid pace both as a result of changes in the law as well as changes in the market, including the advent of e-procurement.

The GAO report on *Electronic Commerce* (GAO 2001b) reviewed procurements issued through three selected on-line programs: the Defense Logistics Agency's Defense Medical Logistics Standard Support E-CAT program (DLA/DMLSS E-CAT), the General Services Administration's *GSA Advantage!* program, and the GSA Information Technology Solutions Shop (ITSS) program. The study found that the share of procurement dollars flowing to small businesses from these three distinct on-line procurement programs significantly exceeded the government goal of a 23 percent share in fiscal year 2000: DLA/DMLSS awarded 61 percent of its procurement dollars to small businesses, *GSA Advantage!* awarded 51 percent to small businesses, and ITSS' share to small businesses was 39 percent. However, the study also documented the barriers identified by numerous small business groups that prevent small businesses from fully participating in on-line procurement. These obstacles were divided into two general categories: those that pertained to "general electronic commerce readiness" and those that related to "conducting electronic procurements with the government."

A recent GAO report (GAO 2003a) found that the *GSA Advantage!* program has had only limited success as an on-line procurement tool. Sales through this program have never exceeded

[7] The *State of Small Business* notes that in FY99 small business received 34.5 percent of the total $200.8 billion in total federal contract awards, including subcontracted amounts.

one half of one percent of total system schedule contracts, which is the contract mechanism it was intended to replace. GAO found that the GSA has lacked a coherent business strategy for this program, and has failed to assess whether other alternatives might provide a better return on investment.

Another GAO report in 2001 examined the trends in federal procurement and impacts on small business. GAO (2001a) found that various legislative changes enacted in the 1990s had the potential to impact small business both positively and negatively. GAO found that the government had met a legislatively mandated goal of 23 percent of total federal contract expenditures flowing to small firms.

Significant legislative reforms have included the General Acquisition Streamlining Act of 1994 (FASA), the Federal Acquisition Reform Act of 1996 (FARA, also known as Clinger-Cohen Act), and the Small Business Reauthorization Act of 1997. FASA increased the small purchase threshold from $25,000 to a new threshold of $100,000 and reserved these opportunities where possible to small firms. This has streamlined the acquisition process for many contracting opportunities and has benefited small firms (SBA 2000). It also introduced the concept of "micropurchases" of up to $2,500, which were no longer reserved for small firms, could be made without obtaining competitive quotes, and need not be subject to the Buy-America Act. FASA codified the use of multiple award contracts, often termed task-order contracts (GAO 2001a).

Perhaps more important to this study, FASA began the implementation of a government-wide electronic commerce system. The law established the Federal Acquisition Computer Network (FACNET) to ensure that the paper-based procurement system would evolve to a form of electronic data interchange. The purpose of FACNET was to electronically inform the public about contracting opportunities, permit electronic submission of bids and proposals, and to facilitate responses to questions about solicitations (SBA 2000b). FASA also attempted to promote uniformity in the procurement system between the Defense Department and other government agencies and established a 5 percent government-wide goal for women-owned business.

The Federal Acquisition Reform Act (FARA) contained less dramatic changes to the procurement laws, but had some important features for small business. Contracting officers were given more authority to control the number of proposals after an initial evaluation and FARA also simplified procedures for the purchase of commercial items, broadened the definition of commercial items, and exempted these contracts from certain other contracting laws (SBA 2000b). FARA also authorized a greater number of government employees to have authority to make purchases of up to $2,500.

Perhaps the greatest impact of FARA has been on the way the government purchases information technology (GAO 2001a). FARA eliminated the authority of the GSA for all information technology purchases, giving such authority to individual government agencies (SBA 2000b). It encouraged agencies to break IT acquisitions into small components, and encouraged the use of multi-agency contracts for such acquisitions. Some have raised concerns that these changes might harm the ability of some small businesses to compete for federal contracts since such opportunities may be consolidated or bundled (GAO 2001a).

Finally the Small Business Reauthorization Act of 1997 (SBRA) increased the small business contracting goal from 20 percent to 23 percent. The 20 percent goal had originally been established

by the Business Opportunity Development Reform Act of 1988 for prime contract awards. The SBRA increased this goal to 23 percent and was designed to encourage additional purchases from small business by all government agencies. The Act also addressed the issue of contract "bundling." Bundling is the combination or consolidation of two or more procurement requirements for goods or services into a single contract. SBRA requires each agency to promote participation of small business by structuring contracts to facilitate competition among small firms and also to avoid unnecessary bundling of contracts (GAO 2001a).

In addition to these legislative initiatives, other factors have also influenced trends in procurement. The federal government has generally decreased the dollar amount spent on procurement (although this is now changing again), and the government has downsized significantly the workforce involved in the procurement process (GAO 2001a). In addition, the government seems to have focused more on "best value practices" as opposed to simply the lowest price as the basis for awarding contracts (SBA 2000a). This shift in focus, combined with the government's mandate to spend less and be more efficient, should help those small firms that can best meet the government's needs.

One of the first critical obstacles facing the federal government in trying to update its procurement activities and its migration to e-commerce was to replace its existing, antiquated and often incompatible financial accounting systems with new systems. These new systems would integrate procurement with accounting, and provide a single electronic data feed regarding purchase orders, payment, and accounting (Robinson and Wittman 2001). The GSA was an early innovator in automating its on-line procurement, but also had to automate and integrate other aspects of its business to make e-procurement work. In addition business processes have had to become more integrated with accounting and procurement groups seeking greater coordination.

A critical assessment of the government's move to e-procurement in 2001 (Enos 2001) indicated that many hurdles still existed before the government would be truly ready to use e-procurement. This study noted that only between 1 and 2 percent of government procurement occurred online in 2000-2001; lack of funding, technology issues, and lack of standardization were hampering efforts to get government procurement on-line.

GSA has now implemented "E-Buy," an online Request for Quotes mechanism. E-Buy, part of *GSA Advantage!,* allows vendors to review electronically Requests for Quotations (RFQs) and other contracting opportunities for more than 3 million products and services (Repsher 2002). E-Buy offers an opportunity for small business to participate in the procurement process and is expected to greatly enhance efficiency in overall contracting by reducing contracting officers' time to put out RFQs. GSA revamped the program to provide greater standardization of products and classification of vendors, which facilitates the matching of vendors to contracting opportunities (Repsher 2002).

FedBizOpps.com is now the primary vehicle of e-procurement and was fully implemented in early 2002. FedBizOpps replaced the paper and electronic versions of the Commerce Business Daily (CBD) which had been the mainstay of government RFQs and RFPs for many years. Every government agency is required to post procurement notices on FedBizOpps. Contractors may register to receive tailored e-mails regarding opportunities from specific agencies or product/services categories. It is believed that FedBizOpps will save contractors and contracting officers' time, and will enhance competition by providing easier, more widespread access to

procurement opportunities (Harris 2002a). FedBizOpps is already in widespread use, although individual agencies still use specialized notification systems, and post notices on FedBizOpps as well.

In late 2002, the federal government announced the Business Partner Network (BPN). The BPN reflects an expansion of the Department of Defense's Central Contractor Registration system and will be used by all agencies as a means to register those seeking to do business with the federal government. The BPN then will provide web-enabled sources for identifying federal and industry trading partners and will provide information about compliance checks, size status, and past performance evaluations (Forman 2002).

Another part of the e-government initiative is the Integrated Acquisition Environment (IAE). This initiative focuses on defining common acquisition functions and needs across government agencies, including the ability to search for suppliers and manage them as shared services. The goal is to reduce costs and enhance efficiency of the procurement process. IAE is being developed under the direction of the GSA and includes five "modules: the BPN; Intra-government transactions; the Federal Procurement Data system; e-Catalogs; and Standard e-Transactions" (JFMIP News 2003; Zapfel et al. 2003).

Another innovation that has gained in popularity in government contracting is the use of "reverse auctions" (Harris 2002b). Reverse auctions allow vendors to bid against one another online for an agency's business. Outside contractors provide the auction services online, and several agencies have extolled the virtues of reverse auctions, particularly in terms of receiving low prices (Harris 2002b). Some companies have complained that the competition is so fierce that prices fall dramatically, often so that no profit is made on such sales.

The Defense Department, as noted above, accounts for the largest portion of the procurement pie. The DoD has led the way in using technology to expedite procurement, but a plethora of portals and too many points of access has made e-procurement sometimes seem less than friendly to potential vendors. The DoD has been accused of "dragging its feet" when it comes to making e-procurement easy, often without direct links to procurement opportunities on its web pages. For a considerable period of time, the various military web sites did not have a link to FedBizOpps, and procurement with DoD did not have a single point of entry or contact (Gordon-Murnane 2001). The Defense Department has improved its point of contact through merging its DoD Business Opportunities Web (DoDBusOpps) site into FedBizOpps. Additionally, DoD provides some helpful guidance for small business with the Office of Small and Disadvantaged Business Utilization (SADBU) and the Procurement Technology Assistance Centers (PTACs). These programs help small firms trying to sell to the Defense Department, and the DoD has recently indicated a stronger commitment to small business in terms of supporting its transformation, e-government, and homeland security initiatives (Lawlor 2002). E-government, including e-procurement, is helping DoD to engage small business, with solicitations reaching a broader group more quickly. Given the complexity and large scale of defense systems, it is not always easy for small business to work with the DoD, but e-procurement is one way in which it should become easier (Lawlor 2002).

The government, including SBA, has anticipated many benefits as e-procurement is completely implemented. These benefits include: expedited processing, quicker and broader information dissemination regarding potential opportunities, increased competition which should lead to lower prices and better value to the government (SBA 2000b). Another advantage frequently

cited is the ability to track agency spending and purchases which gives procurement officials greater confidence in responding to legislative requests on an agency's spending (Harris 2002b).

Economic Benefits of E-Commerce

E-commerce provides economic benefits by reducing search costs, transmitting information more quickly and completely to a broader group of buyers and sellers, and broadening the scope of a particular market or exchange of goods or services (Bakos 2001; Huston and Spencer 2002). These changes effect the environment in which firms compete and lead to efficiencies such as reduced transaction costs and the consolidation of supply and demand (Bornstein and Saloner 2001). E-commerce provides buyers with better information about price, quality and the terms of trade; suppliers have better information about their buyers and lower costs by automating transactions. Buyers also benefit because e-commerce tends to expand markets and competition, leading to lower prices and improved quality (Lucking-Reilly and Spulber 2001).

Firms adopting e-commerce also recognize that to benefit optimally, they must make synergistic investments in their business processes and organizational structure. Firms that have invested not just in information technology (IT) but in "e-business practices" have realized much larger returns on investment (Barua et al. 2001). The need for organizational and process changes points to a strategic dilemma many firms face when adopting e-commerce. The rate of adoption of e-commerce is driven by both opportunities (technical expertise) as well as the organizational and strategic adaptability of the business. Some small businesses have created a niche for themselves by leading the way toward e-commerce. One such example is QRS Corporation, which has increased annual revenues and profits by more than 30 percent over a five-year period by specializing in electronic commerce services for the retail industry.[8] As a result it has gained a tremendous competitive advantage. The first-mover advantages a firm can gain from early adoption of e-commerce are numerous: cost savings, organizational efficiencies including distribution and marketing,[9] reputation effects, standards-setting, and transactional efficiencies (Barua et al. 2001). Yet despite these benefits, many firms are slow to adopt e-commerce due to the organizational and strategic changes that are also required.[10] Given the continually evolving nature of e-commerce and continued diffusion of the technology, it is surprising that the rate of adoption has been so slow (Greenstein 1999).

In the long term, e-commerce will lead to an overall reduction in the costs of doing business in at least four ways:

1. Automation of transactions,

2. Emergence of new market intermediaries and less vertical integration,

[8] Stanford University (1999).

[9] This includes the ability to maintain a smaller sales force, to process less paperwork, and to provide better inventory control and management.

[10] Or in the case of many firms that make investments in IT only without making the business process changes, the benefits do not outweigh the apparent costs.

3. Consolidation of supply and demand (broader markets),

4. Greater competition.

Small business is likely to benefit at least as much if not more in the long run with the advent of e-commerce. This is because of the market broadening aspects of e-commerce that improves small businesses' ability to identify market niches and improve their customer search process (Bakos 2001). Also small firms, especially retailers, may be better able to differentiate their products and can increase the variety of product offerings without being limited by shelf space or other constraints. Others have also commented on the fact that by overcoming geographical barriers to trade, e-commerce will benefit small firms more than larger firms (Barua et al. 2002).

The benefits of applying electronic commerce tools to government procurement are similar. The introduction of FedBizOpps as a central place to search for business opportunities reduces search costs for those selling to the government and reduces the costs of printing for those government agencies who are interested in buying. Rather than a RFQ or RFP being distributed to those who the government buyer knows are interested, the request is instantly transmitted to a large universe of potential vendors of a particular product. The GSA Schedule is an excellent example of how government buyers are provided with better information about prices and quality, and those vendors interested in selling to the government have more information about what their buyers are interested in purchasing, as well as the offerings and prices of their competitors. Analysts (Emery 2003) believe that the move to e-government for procurement and other aspects of business have the following benefits:

- Reduced costs and enhanced revenue collection;
- Consolidation and integration of government systems including procurement;
- Improved service to citizens;
- Free flow of information.

One article focused on the direct benefits of e-procurement and rated various government agencies on their move to electronic business (Nunn 2000). Cost savings and efficiency to the government were cited as primary benefits. DoD, GSA, and Health and Human Services were cited as the three most prolific agencies at the time in terms of e-procurement activity.

Barriers to Adoption of E-Commerce and E-Procurement

In the course of our review, we have identified various potential barriers to the adoption of e-commerce and e-procurement. The purpose of the identification and analysis of these barriers is to determine whether small firms in particular are differentially affected in their adoption of this technology. We have categorized the barriers into four broad subject areas including:[11]

[11] The E-Government Task Force established a different categorization scheme in identifying barriers to success in e-commerce with the government. The barriers they identified were categorized according to the following areas: culture,

- Technological barriers
- Market barriers
- Regulatory (government) barriers
- Barriers unique to firm size

Technological Barriers

Technological barriers represent obstacles to the adoption of e-procurement due to technological factors such as lack of high-speed connections and software incompatibility, for example. As with market barriers, these barriers are an element of the environment in which firms compete. The most frequently cited technological barriers include problems of integrating e-procurement with internal solutions and difficulties encountered in obtaining high speed access and download capabilities.

Some companies maintain dedicated high-speed (broadband) Internet access whereas other firms use much slower dial-up connections to the Internet. This can have a profound effect on a firm's ability to search various business and contracting opportunities as well as download, in a timely manner, all available information about a potential procurement. Both cost and availability have a direct impact on a small firm's choice of access mode. The cost of a dedicated broadband connection is a minor budgetary element for large firms whereas such cost can be much more significant to a small firm. Also small firms may be less likely to be located in large metropolitan areas where broadband access is available and thus simply do not yet have access to high speed Internet access.[12] As broadband technology becomes more widespread and less expensive, it is likely that it will be more widely adopted and will encourage greater, more efficient use of the Internet by small business.

E-commerce has been around for a considerable period of time and started with electronic data interchange (EDI) technology and the use of private hubs and vendors. Small firms that invested heavily in such technology have now found that the Internet has become the "hub" of e-commerce and although EDI remains a viable technology choice, more and more business and transactions are conducted via the Internet. Indeed EDI was used as a procurement tool for several years and has now been largely phased out. As the technology continues to change and evolve, there is continued reluctance on behalf of some firms to adopt these technologies, especially for firms that invested heavily in EDI and failed to realize any return on that investment due to technological change. The same may be true for managing upgrades of existing technology. Once small firms have made the investment to enable e-commerce, they may move more slowly in making upgrades and may lack the technical expertise to implement upgrades.

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architecture, trust, resources, and stakeholder resistance. Careful review of these areas suggests considerable commonality with our proposed categorization scheme. See Executive Office of the President (2002).

[12] This is obviously the case for the many small businesses located in the home.

Market Barriers

Market barriers include those barriers that are external to the firm, and are driven by market forces (supply and demand) as opposed to other entities such as the government. Recently, the downturn in the economy has been cited as one barrier to the adoption of e-procurement and more generally e-commerce. Less money is available to many firms for such "discretionary" spending and therefore the rate of adoption of e-procurement has slowed. It may be that given the relatively small budgets allocated by small business to such activities, this problem is particularly acute for small firms. As discussed below, small firms view the potential benefits relative to the cost of investing in this technology as being modest, and in difficult economic times, the expected economic payout may not justify this investment.

Another market-driven barrier is the high degree of concentration and high barriers to entry in certain markets in which the government makes purchases. In markets where concentration is high, small firms will be at a disadvantage in competing for e-procurement business with the government. In such markets it is likely that small firms are at a competitive disadvantage regardless of whether e-commerce is being used or not, but such concentration may counteract the competitive benefit of low entry barriers that e-commerce often brings.

Regulatory Barriers

Regulatory barriers include barriers created by governmental action or intervention in the market or action directly affecting electronic commerce including procurement. Since our focus is government procurement activity, it is likely that government action has had some negative (as well as positive) impact on the adoption of e-commerce and e-procurement. For example, one barrier to the adoption and use of e-procurement is the existence of multiple government procurement web sites. This causes confusion and adds a layer of complexity to doing business with the government. To some extent this barrier may have been eliminated with the adoption of a single point of contact for most federal contracting, i.e., Fedbizopps. However, for certain contracting opportunities, multiple sites still exist and various agencies maintain individual listings of opportunities, especially for awards of less than $25,000. Multiple sites create difficulties for firms to monitor and identify business opportunities. The Department of Defense continues to struggle to surmount this problem, as it tries to gather together its various supply centers and agencies, multiple systems, and different web sites, and funnel them into a single point of entry, available through Fedbizopps. Small firms in particular do not have the resources to deal with such a complex system and simply give up (DiGiacomo 2002).

Different agencies often have different requirements for on-line business, which compounds the problem of various web sites. This includes differences in formats and procedures. For example, different agencies have different processes for posting listings. Also companies that want to do business with multiple government agencies must register multiple times in order to conduct business. As noted above the Defense Department implemented the Central Contractor Registration (CCR) system to try to alleviate this problem for defense contractors and subcontractors, and this system is now being implemented across all government agencies through the BPN. While it is currently a requirement to register with CCR to receive payment, obtaining business with the federal government continues to require registration and searching of various sites

sponsored by individual agencies and major players among the prime contractors in the defense industry. Also the SBA's PRO-NET and SUB-NET databases maintain a large listing of small firms, which federal agencies can use to find small firms in specific business areas, or which prime contractors can search to locate small businesses with which to subcontract.[13]

Given the evolving state of technology and models for e-commerce, there remains considerable uncertainty about the government's electronic procurement strategy. As long as different agencies pursue different strategies to implement e-procurement, small firms will remain uncertain about the potential benefits of e-procurement and be less likely to make the investments in a particular e-commerce system.

Business also has concerns regarding security and privacy in dealing with e-commerce and e-procurement. The government must be able to ensure privacy for any personal information it obtains in dealing with business partners. Small, privately-held businesses are also concerned about the risk of inappropriate disclosure of proprietary business information. Security in terms of access and dealing with the government,[14] especially in commercially sensitive areas, is also a concern as is the need for security in various areas of procurement activity and for the Defense Department in particular. For example, one of the initiatives of the Integrated Acquisition Environment includes a pilot for FedTeDs (Federal Technical Data Solutions), which provides for the online dissemination of "sensitive but unclassified" acquisition related information, such as drawings and specifications that might be required for those preparing bids (Cliff 2003). Similarly, future endeavors are expected to include secure servers to protect the confidential business information provided to the government by bidders, as part of the procurement process.

Finally, the government has turned increasingly to the use of credit cards for small purchases (less than $5,000), and many small firms do not have the capability or desire to handle credit card transactions. This may limit small firms to some extent in their ability to compete for business in an area (small purchases) in which small business has traditionally held an advantage (GAO 2001a).

Barriers Unique to Firm Size

Barriers also exist that are unique or relate specifically to the size of the firm. For example, some small firms have concerns that the high cost of investing in e-commerce and e-procurement will prevent them from competing for such business. This "cost" is not necessarily large in absolute terms, but it is relative to any perceived benefits that small firms expect they will receive. The issue of cost also transcends up-front investment cost, and includes the cost to maintain e-commerce sites (Clark 2000). Small firms tend to spend less per employee on e-commerce than larger firms,[15] and

[13] Effective January 1, 2004, the Small Business Administration has integrated its PRO-Net database with the Central Contractor Registration database. Small businesses can now register once with CCR, rather than having to register with both PRO-Net and CCR. Government vendors will use the CCR to identify small business providers of the goods and services they require.

[14] Some small firms fear bidding on-line because they do not believe it is secure, and that such information might fall into the hands of their larger competitors.

[15] See Buckley and Montes (2002, p. iv; 10). This report found that small and medium sized firms were less likely to undertake certain e-commerce activities such as buying and selling on-line.

frequently see smaller cost savings and a lower return on their investment.[16] As a result small firms are reluctant to invest in this new technology until it is well-proven and thus they are unable to capture any first-mover advantages.[17] Another reason small firms may invest less in the tools of e-commerce is their ability to outsource that activity. Some small firms find it more cost-effective to outsource this activity rather than investing in the capital (both hardware and human) to perform these activities in-house.

Another barrier facing small firms is the need and consequent cost of human capital development to become e-commerce "ready." The training and technical expertise required, although modest, is an additional cost many small firms must incur that, because of economies of scope, large firms do not face. Large firms typically have an IT staff whereas small firms do not. Small firms' lack of technical expertise is considered a leading barrier to the adoption of e-commerce generally in small firms and has likely slowed their adoption of e-procurement as well.[18] In addition few resources exist to provide needed training and technical advice that would allow small firms to become "electronically enabled" (Erwin 2002). Finally, the lack of time that small business can devote to becoming e-commerce ready and to maintaining an e-commerce capability is a problem. Unlike large firms, small firms often do not have redundancy in personnel, so training becomes more difficult.

Summary and Next Step

Our review found that the literature was mixed in terms of whether small firms were adopting e-commerce at the same rate as larger firms, although small firms clearly see the competitive necessity of using e-commerce as a business tool. We also learned that in recent years the government has continued its push to use e-commerce generally and e-procurement specifically, but found that there was little written about the extent to which electronic procurement has been implemented by the federal government and to what extent small businesses are participating. Finally, the literature indicated a significant number of potential benefits as well as potential barriers to small firms adopting e-commerce.

From the literature, we concluded the following:

1. Small firms are lagging somewhat in adopting e-commerce.

2. The government needs to simplify procurement, including e-procurement, and to fully embrace e-commerce.

[16] Ironically one reason small business may see smaller savings is that they already operate more efficiently and many of the "advertised" savings of e-commerce are in fact savings primarily achieved by larger firms through the organizational changes brought about by the adoption of e-commerce.

[17] In fact small firms have greater potential to achieve competitive advantages with e-commerce than do larger firms, simply by the fact that e-commerce greatly expands the size of the market to whom a small firm is able to sell.

[18] The government and private organizations are beginning to offer on-line training to create new levels of expertise among both contractors and government agency employees (Executive Office of the President 2002).

3. There are many potential benefits from using e-commerce, but they are not yet realized on a full scale by businesses or by the government. Small firms understand that they need to adopt e-commerce to be competitive.

4. There are barriers for small businesses in implementing e-commerce.

In the next step of our research, we used data analysis to answer some of our questions regarding which industries use electronic commerce most extensively, and whether small businesses in those industries participated more vigorously in federal government procurement. We also wanted to collect data about how extensively the federal government is using electronic procurement. Based on our review of the literature we developed several research questions regarding e-commerce, e-procurement and firm size. These questions include:

- Are small firms more or less likely than large firms to adopt e-commerce as a way of doing business? The literature suggests that small firms are somewhat lagging in the adoption of e-commerce.

- Is there a correlation between the use of e-commerce and e-procurement tools, and do the benefits of e-commerce extend to e-procurement?

- Has the move to more intensive use of e-procurement by the federal government been embraced by small business?

- Has small business benefited or been harmed by the move to e-procurement?

In the next chapters, we explain how our data analysis and interviews with industry and government officials helped to answer these questions.

Chapter 3
Data Analysis and Initial Findings

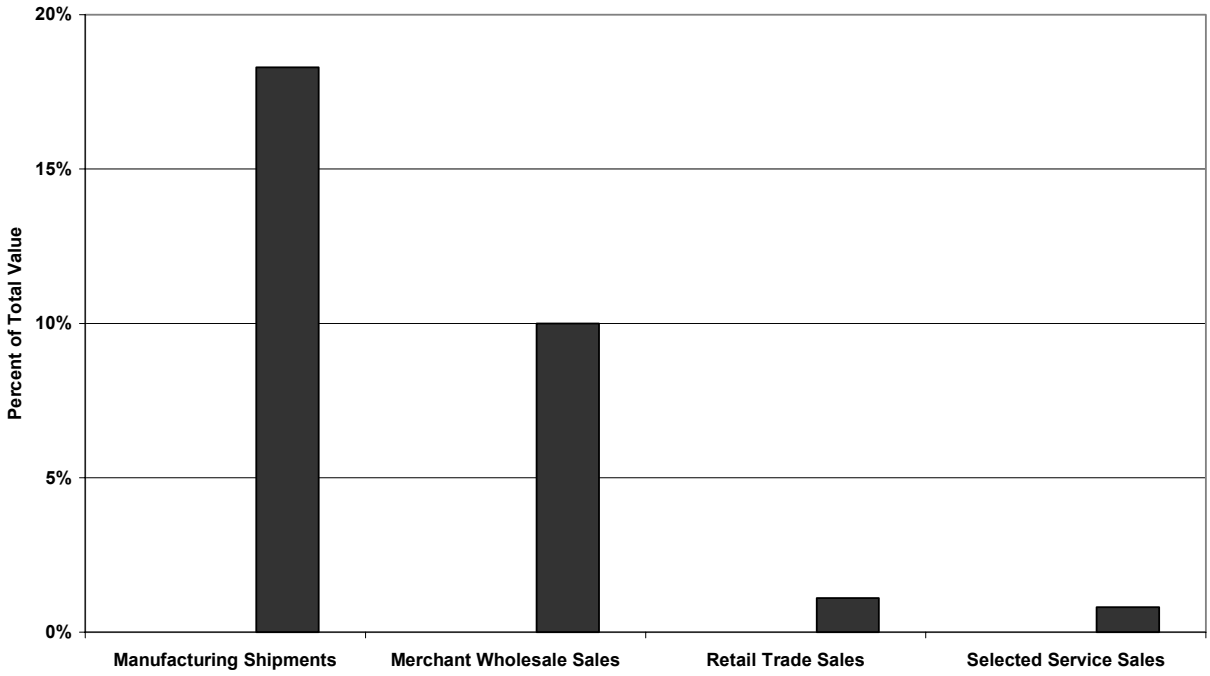
To answer the questions arising from the literature review, as well as to examine general trends in e-commerce and e-procurement, we relied on data contained in three separate, large databases and our analysis followed three discrete steps. First, we identified specific industry areas that either led or lagged in their rate of adoption of e-commerce, using three different measures of e-commerce activity. Second, we assessed market structure characteristics of these industries. Third, we analyzed procurement trends in those industry areas we had selected in the first step. We analyzed the level of procurement dollars and activity on an absolute basis and measured the extent to which small firms received procurement dollars relative to other firms. Then, relying on contract action information contained in the FPDC database, we estimated the extent to which e-procurement tools were used on a dollar value and action basis, across all procurements as well as for the specific industries and by type of firm (small versus large).

E-Stats Data

The first database we used is the E-Stats data, which is published annually with selective quarterly updates by the U.S. Census Bureau of the U.S. Department of Commerce.[19] E-Stats compiles data from four separate economic surveys on the value of shipments and sales revenues for manufacturing industries, wholesale trade, retail trade, and selected services industries. E-commerce is defined by the Census Bureau to include the value of goods and services sold online whether over open networks, such as the Internet, or over private networks running systems, such as electronic data interchange (EDI). The Census Bureau publishes data on the total value of shipments or sales by NAICS industry (three and four digit codes) and the subtotal moving via e-commerce. It also provides data on those industries that lead in terms of value moving via e-commerce. Figure 3-1, for example, indicates the percentage of total sales or shipment value accounted for by e-commerce in 2001 in the four major industry groups.

[19] Available at www.census.gov/estats.

Figure 3-1
E-Commerce as a Percent of Total Value
2001



Source: U.S. Census Bureau, E-Stats.

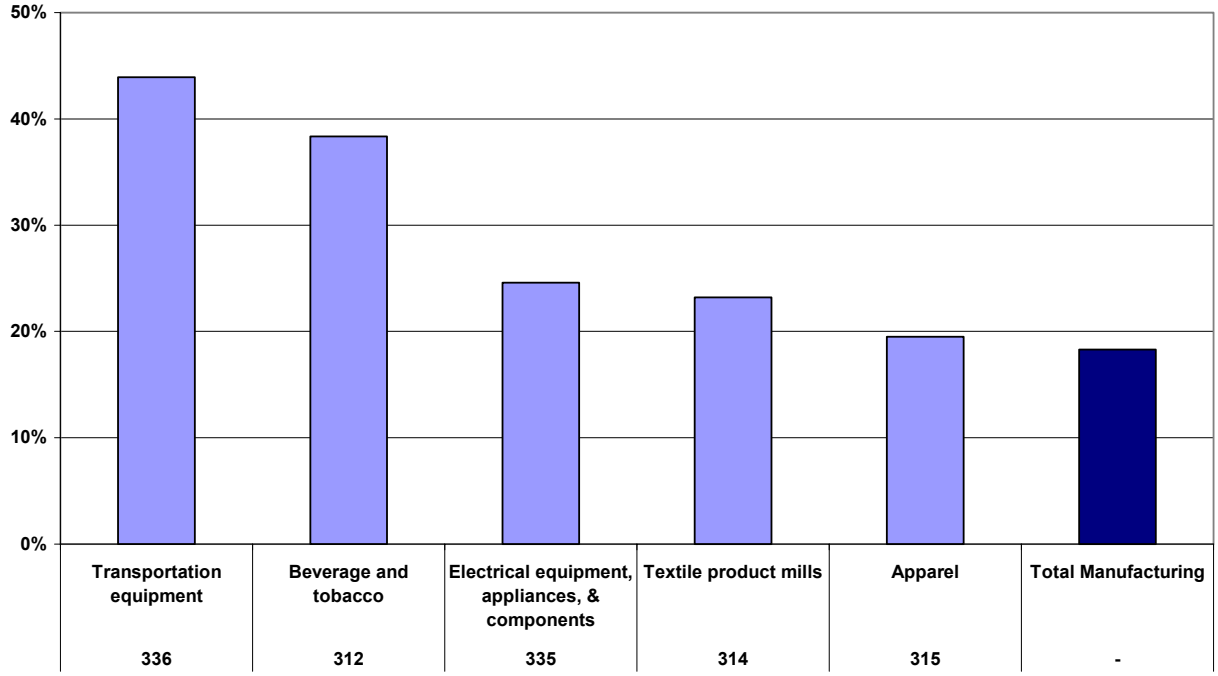
As can be seen, manufacturing industries lead all industry sectors with 18.3 percent of the value of all shipments moving via e-commerce. Sixty-eight percent of all e-commerce shipments occur in five industry groups with transportation industries (NAICS 336) accounting for more than half of these shipments. Other leading industries within the manufacturing sector are computers and electronics, beverage and tobacco, food products and chemicals. We reviewed data for three years (1999-2001) and found that this trend was relatively consistent across all three years with the most significant growth in e-commerce occurring in the wholesale area.

This figure also shows that manufacturing industries utilize e-commerce to a much greater degree than service, retail or wholesale industries. This indicates another trend, namely that e-commerce represents a much larger share of total economic activity in sectors that sell primarily to other businesses, so-called business to business (B2B) e-commerce. The dominant position of B2B e-commerce reflects the longstanding use of EDI in manufacturing and to a lesser extent wholesale trade. The E-Stats data tracks EDI sales separately beginning with the 2000 Surveys. In 2001, EDI sales accounted for 87 percent of e-commerce sales in the manufacturing sector. This percentage was also relatively constant from 2000 and 1999.

Wholesale trade was the only industry sector that actually increased its use of e-commerce between 2000 and 2001 as a percent of total sales, increasing from 8.8 to 10 percent of total sales. As with manufacturing, wholesale e-sales occur predominantly through EDI networks as opposed to retail sales which rely much more heavily in the Internet.

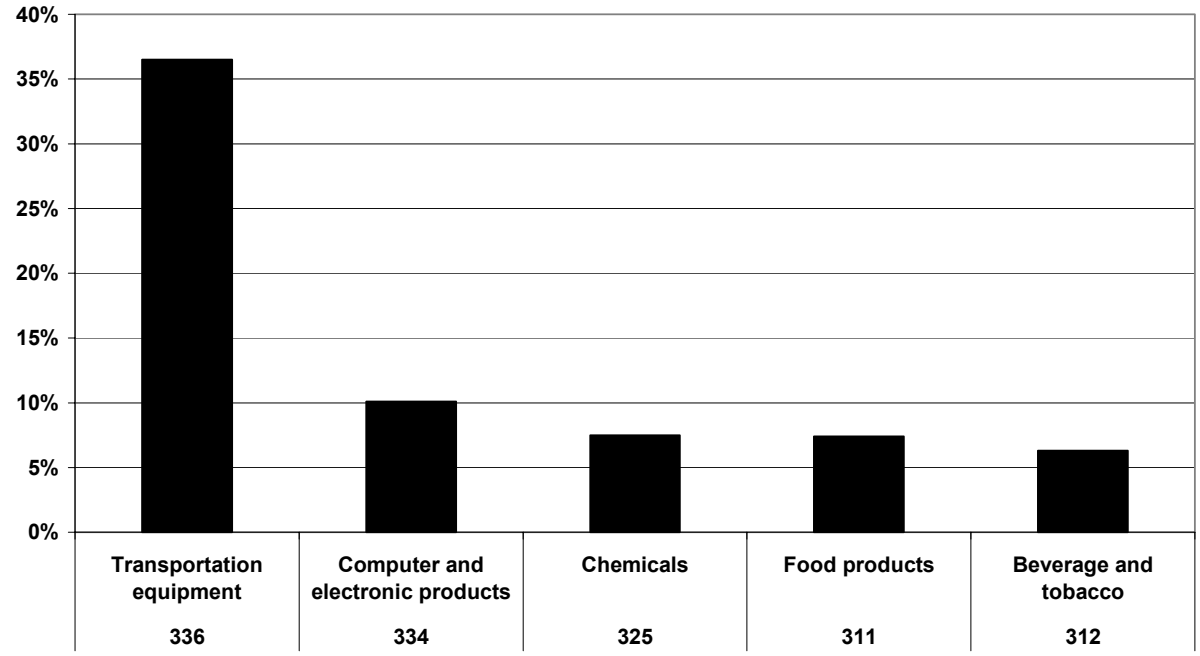
The purpose of our analysis of the E-Stats data was to identify those industries (manufacturing, wholesale, retail and services) that have adopted e-commerce more rapidly as a method for doing business. We have used three measures in this process and examined data for all three years for which data are available, concentrating on 2001. The first measure examines within an industry the extent to which sales (or shipments) are based on e-commerce. The second measure identifies across all industries those industries that account for the largest share of e-commerce sales or shipments. And the third measure examines the rate of growth in the adoption of e-commerce over the last three years. Based on these three measures as shown in Figures 3-2 through 3-4 for all manufacturing industries, we have identified several industries that are leaders in the use of e-commerce in manufacturing. We performed similar analyses for wholesale trade and selected service industries, and the results of these analyses are shown in Figures 3-5 through 3-10.

Figure 3-2
E-Commerce Share of Total Shipments by Industry
2001



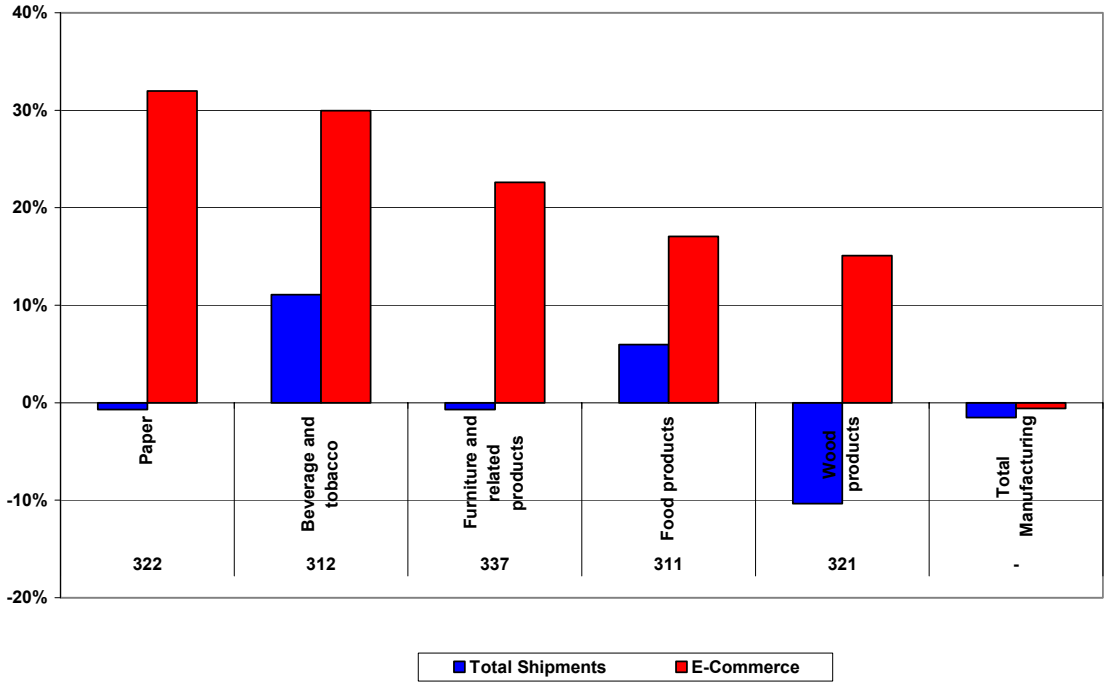
Source: U.S. Census Bureau, E-Stats.

Figure 3-3
Distribution of Total E-Commerce Shipments by Manufacturing Industry
2001



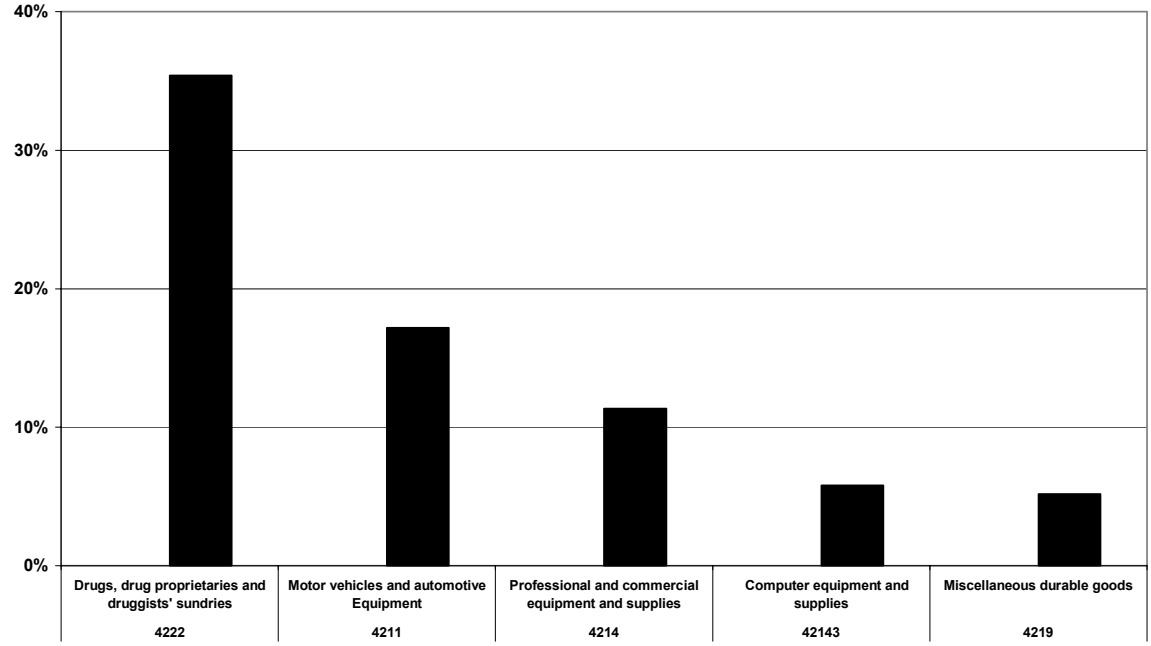
Source: U.S. Census Bureau, E-Stats.

Figure 3-4
Growth in E-Commerce Shipments vs. Total Shipments
1999-2001



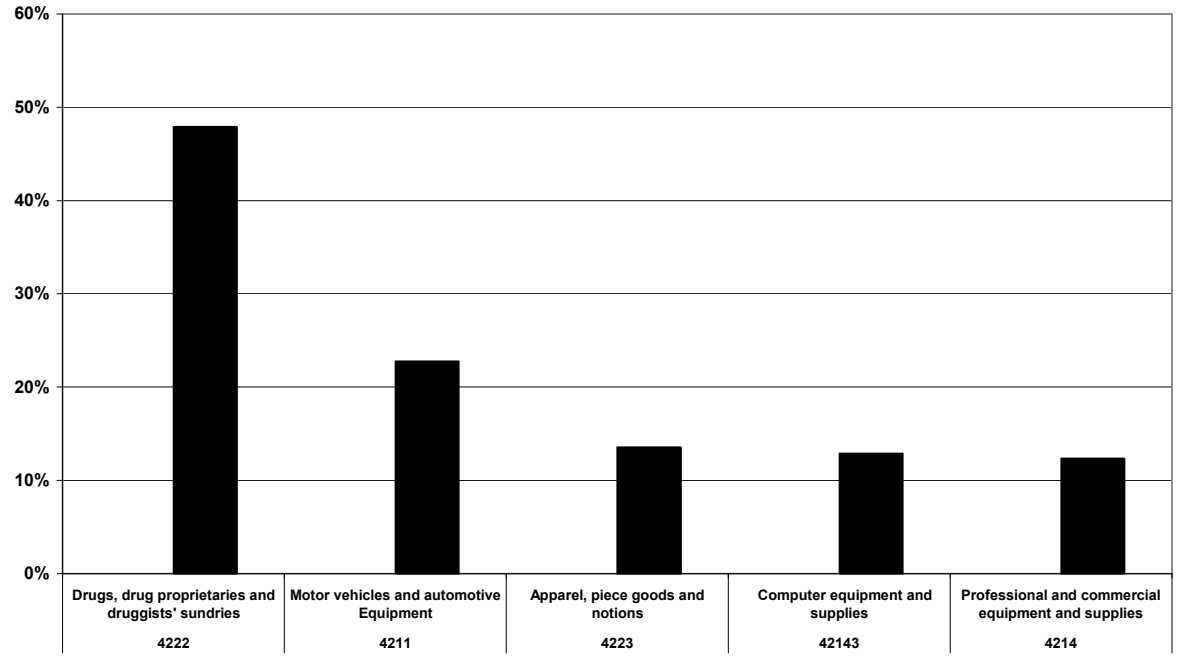
Source: U.S. Census Bureau, E-Stats.

Figure 3-5
Percent Distribution of Wholesale Sales by NAICS Industry Using E-Commerce
2001



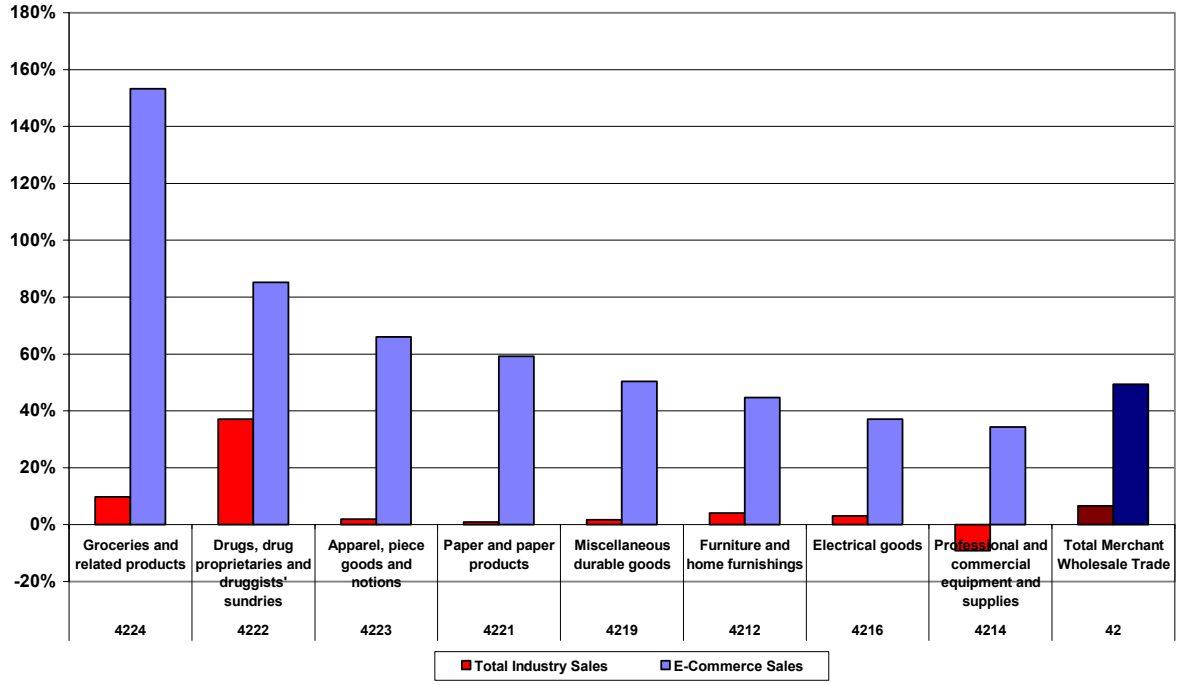
Source: U.S. Census Bureau, E-Stats.

Figure 3-6
E-Commerce as a Percent of Total Sales by Wholesale Industry
2001



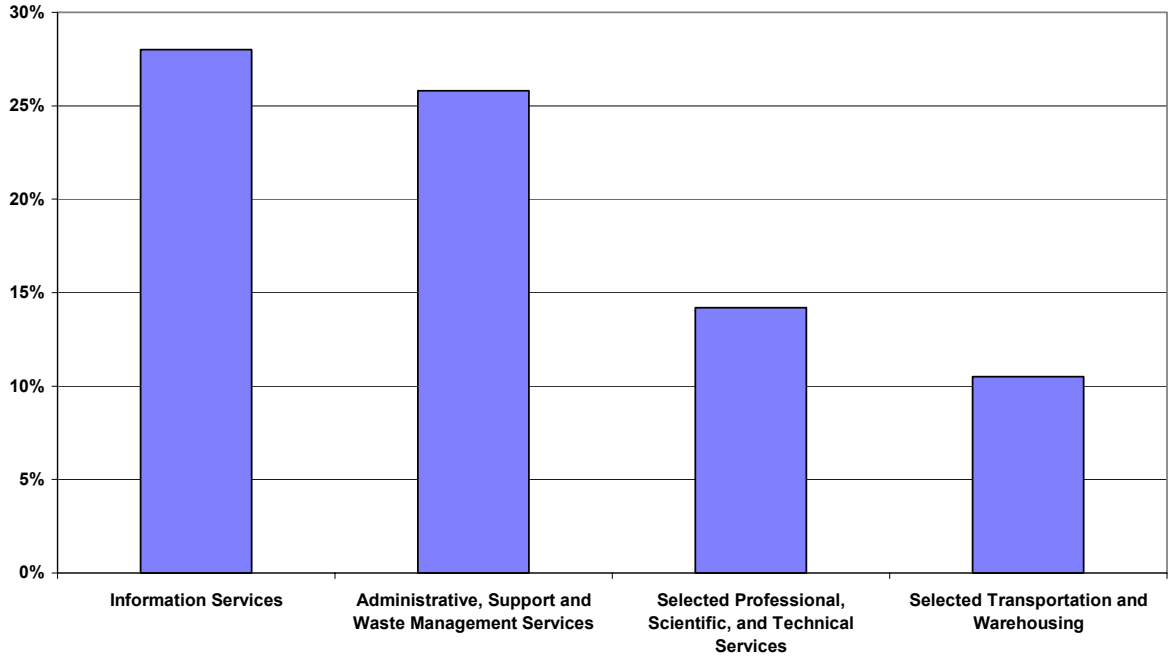
Source: U.S. Census Bureau, E-Stats.

Figure 3-7
Growth in E-Commerce Sales vs. Total Industry Sales Growth
Wholesale Industries
1999-2001



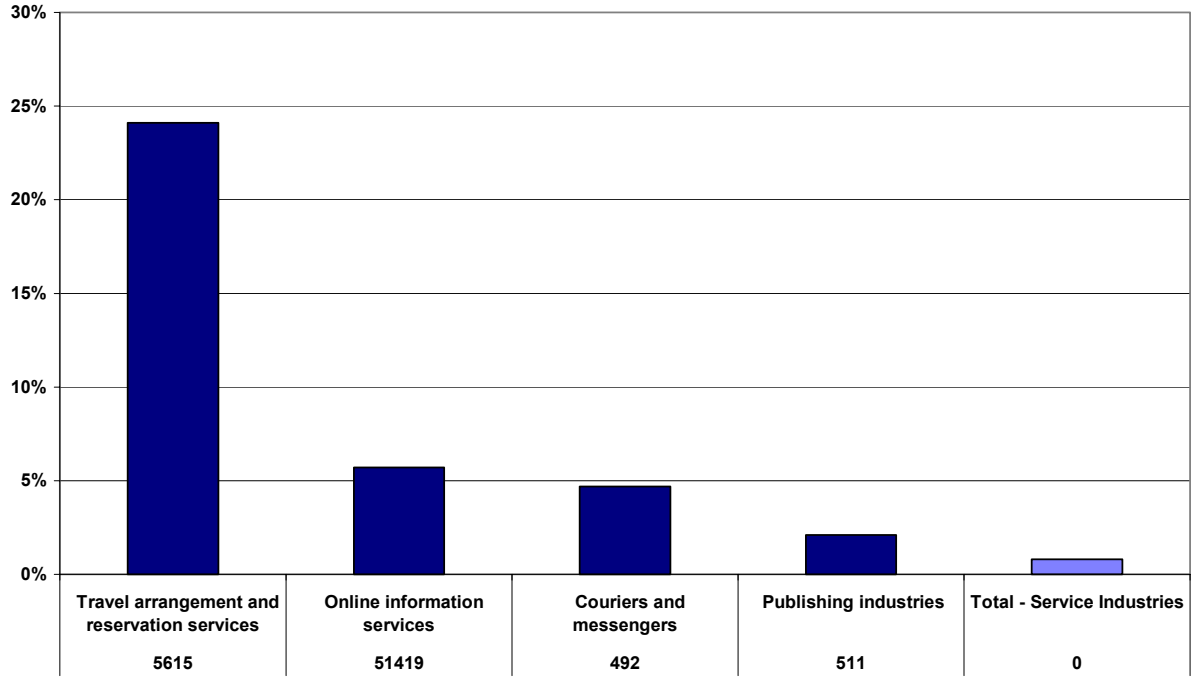
Source: U.S. Census Bureau, E-Stats.

Figure 3-8
Percent Distribution of E-Commerce Sales for Service Industries
2001



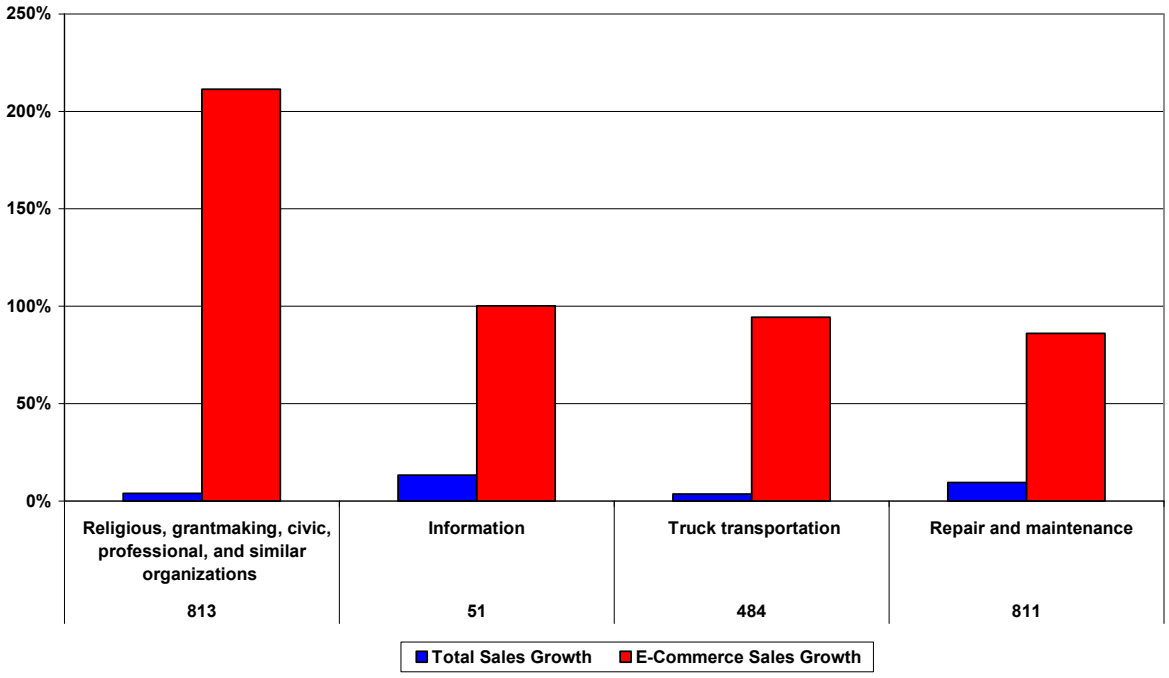
Source: U.S. Census Bureau, E-Stats.

Figure 3-9
E-Commerce as a Percent of Total Revenue for Service Industries
2001



Source: U.S. Census Bureau, E-Stats.

Figure 3-10
Growth in Total Sales vs. E-Commerce Sales - Services Industries
1999-2001



Source: U.S. Census Bureau, E-Stats.

These three measures allowed us to identify a number of industry areas that are leaders in the rate of adoption of e-commerce. In the retail sector, which is not a large supplier to the federal government, we found that one area, "Non-store retailers," accounted for over 75 percent of retail e-sales. This category is composed primarily of electronic shopping and mail order retailers; these are sectors that do not sell much directly to the federal government. Therefore we concentrated our analysis on the manufacturing, wholesale and services industries that we identified above and are summarized in Table 3-1 below.

Table 3-1

Industry Areas Identified as Adopters or Laggers in E-Commerce and Associated Market Structure Characteristics

	Adopter (A) or Lagger (L)	Percent of Industry Sales Accounted for by Firms with less than 100 Employees	Percent of Industry Establishments with Sales less than $5M	Four-Firm Concentration Ratio
Wholesale Industries				
4211 Motor vehicles/supplies	A	74.3%	80.1%	47.2%
4212 Furniture	A	79.0%	79.2%	11.5%
4214 Computer equipment	A	56.4%	68.2%	14.4%
4216 Electronic goods	A	76.2%	69.2%	13.4%
4218 Machinery	L	87.2%	80.3%	7.9%
4221 Paper & paper goods	L	74.0%	77.9%	16.7%
4222 Drugs & druggists sundries	A	40.6%	62.6%	26.3%
4223 Apparel	A	74.1%	78.2%	9.2%
4224 Groceries & related products	A	55.0%	56.7%	8.9%
Services Industries				
492 Courier services	A	35.7%	86.4%	75.2%

		Four-Firm Concentration Ratio	HHI
Manufacturing Industries			
311 Food manufacturing	A	14.3%	91
312 Beverage & tobacco	A	45.1%	777
314 Textile manufacturing	A	22.8%	186
315 Apparel	A	17.6%	101
321 Wood products manufacturing	L	10.5%	53
322 Paper	A	18.5%	173
323 Printing	L	9.6%	38
324 Petroleum & coal	L	26.0%	350
325 Chemicals	A	11.9%	77
327 Non-metallic mineral products	L	9.1%	52
334 Computer & electronic products	A	19.1%	137
335 Electronic equipment	A	14.8%	106
336 Transportation equipment	A	49.7%	798
337 Furniture	A	11.2%	56

Source: U.S. Census Bureau, 1997 Economic Census.

We also defined a few selected industry segments that appear to lag in the adoption of e-commerce, again based on the E-Stats data. To provide a basis of comparison in evaluating trends in procurement, we defined those industries that also reflected low rates of adoption of e-commerce. This would enable us to determine whether these trends extended into the procurement area, including whether industries that lagged in the use of e-commerce also lagged in using e-procurement tools. These industry codes are indicated in Table 3-1.

Economic Census Data

Table 3-1 also includes data from our second dataset – the Census of Manufacturers. We have relied on data from the *1997 Census of Manufacturers*, published by the U.S. Census Bureau, to measure the relative market structure of each of the NAICS industry areas identified from the E-Stats data. The purpose of this analysis was to determine the extent to which small firms were an important factor in each industry area and whether one could determine whether small firms were any more or less likely than large firms to adopt e-commerce as a way of doing business. In the manufacturing sector, data are only available on industry concentration, an indication of the extent to which large firms dominate the industry. We used both the four-firm concentration ratio and the Herfindahl-Hirschmann index (HHI)[20] to measure the predominance of large firms. In the wholesale and service sectors, additional data were available that allowed us to compute the extent to which firms with less than 100 employees or firms with sales of less than $5 million predominate.[21]

As can be seen, with only a few exceptions these industry areas are relatively unconcentrated. A significant volume of industry sales is accounted for by firms with less than $5 million in sales. The only possible exceptions are Beverage & Tobacco (312), Transportation Equipment (336), Drugs and Druggists Sundries (4222), and Courier Services (492). These four industries exhibit higher levels of industry concentration, and concentration of sales in large establishments. Nonetheless, there does not seem to be any correlation between industries with higher or lower levels of concentration and greater or lesser degree of use of e-commerce.[22] Thus one cannot conclude based on these data that market structure or the prevalence of large or small firms has any significant relationship to the rate of adoption of e-commerce and thus in spite of the existence of certain barriers, the data do not suggest any significant lag in the actual adoption of e-commerce by small business.

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[20] The Herfindahl-Hirschmann Index (HHI) and the four-firm concentration ratio are the two most frequently used measures of industrial concentration. Concentration is a function of the number of firms in a market. The Justice Department and the Federal Trade Commission use these measures to evaluate the effects of mergers on industry concentration, and whether a merger is likely to have an anticompetitive effect. We use these measures in this report to provide an estimate of the degree to which small firms play an important or unimportant role in a particular industry. The HHI is measured by summing the squares of each company's market share. Markets with an HHI of 1000-1800 are considered moderately concentrated and markets with an HHI in excess of 1800 are considered highly concentrated. The four-firm concentration ratio measures the percentage of sales or shipments (or some other measure of the value or capacity of the goods or services produced) that is controlled by the four largest firms in an industry. The HHI reflects both the distribution of the market shares of the top four firms as well as the composition of the market outside the top four firms and also gives proportionately greater weight to the market shares of the larger firms.

[21] These represent two of the size standards the SBA has used in defining small business.

[22] We applied tests of correlation to determine whether highly concentrated industries were correlated to either early adopters or laggards of e-commerce (and applied similar tests to industries with low concentration) and found no significant correlation.

Federal Procurement Data

Having performed these analyses relating to e-commerce use and market structure, we turned to the federal procurement data to examine trends in procurement practices in these NAICS industry areas, and to analyze the degree of e-procurement activity in these various industry areas.

The third database comprises data published annually by the Federal Procurement Data Center (FPDC). The FPDC collects statistical data regarding U.S. Government Executive Branch procurement transactions and disseminates the data in two formats: summary Annual Reports and a detailed database containing full transaction data (available on a CD-ROM). We analyzed data contained in the Federal Procurement Reports[23] for 1999-2002, and the detailed database records for fiscal years 2000 through 2002.

The FPDC annually publishes the Federal Procurement Report, which contains various statistics on the purchases of more than 60 federal agencies. The annual report provides three different "views" of the data, and is divided into three sections: Total Federal, Geographic, and Agency. The Legislative and Judicial Branches, as well as the U.S. Postal Service do not report their procurement activities to the FPDC, and have thus been excluded from our analysis. The three distinct sections within the Federal Procurement Report contain data useful to analyze the impact of congressional and presidential initiatives in socio-economic areas, particularly by firm size. The Total Federal section provides summary data, ranging from annual breakdowns of the amounts and percentages of contract actions and dollars by Executive Department and Agency, as well as the North American Industry Classification System (NAICS) Code. The Geographic section contains procurement data for all 50 states. Finally, the Agency section contains detailed procurement data on each of more than 60 federal agencies, including the methods of solicitation, the amount of contract actions and dollars awarded by contractor type, and the products or services purchased.

The detailed database contains detailed information for the approximately 500,000 per year individual procurement transactions (e.g., name and address of contractor, place of performance, type of contract action, type of contractor, contracting competition, product or service provided, NAICS code for the relevant industry), and also tracks a contractor's participation in certain small business set-aside programs. The FPDC defines a procurement contract as "a contract to buy something" and a transaction as "any of a number of documented legal interactions between the government and a contractor including 'contract award,' . . . a 'modification,' . . . an 'order,' or some other rather arcane legal things."[24]

Our analysis of the data contained in the database focused on the fields that identified the Contracting Agency, Contractor Name and DUNS number, the product or service provided, the appropriate NAICS code for the service being provided, the amount of each contract action (expressed as dollars being obligated or de-obligated by the contract action), and the type of contract action. The Federal Procurement Data System database uses twelve different types of contract action. We analyzed the data several different ways, including by type of contractor, by NAICS codes, and by type of contract action. One of the types of contract actions that we analyzed

[23] Available at http://www.fpdc.gov/fpdc/fpr02.htm
[24] FPDC Frequently Asked Questions; http://www.fpdc.gov/fpdc/custfaq.htm

extensively was the group of transactions that were identified as "Simp Acq Proc" (meaning that they were awarded under the Simplified Acquisition Procedures as defined by the Federal Acquisition Streamlining Act of 1997, described above, which includes many different aspects to expedite federal procurement, including the increased use of electronic means). We have used these contract actions as a proxy to analyze the extent to which electronic procurement is being implemented by federal contracting agencies, but in actuality this measure includes other simplified procedures, such as reducing administrative costs, improving opportunities for small business to obtain a fair proportion of government contracts, promote efficiency and economy in contracting, and avoid unnecessary burdens for agencies and contractors. The Simplified Acquisition Threshold allows for small purchases to be made in certain circumstances between $2,500 and $100,000. Nevertheless, lacking any other measure of e-procurement activity, we believe this measure provides some insight into the use of e-procurement by the federal government.

Federal contracting agencies have been unhappy with the reporting mechanisms for the Federal Procurement Data System; they have complained that the proprietary system is cumbersome and requires re-keying of data for many of the agencies, which in turn has led to inaccuracies in the data.[25] Those who rely on the data are concerned that the data are not available in a more timely fashion. General Services Administration has contracted with Global Computer Enterprises to develop a prototype for a web-based procurement information system, which was implemented in October 2003.

Our analysis discovered several discrepancies between the Federal Procurement Annual Reports and the detailed transactions contained in the database. We relied on the data reported in the Agency section due to its greater detail and breakout by business size. The data in the Agency section is disaggregated by eleven subcategories, ranging from type of contract to contractor firm size, whereas the Total Federal section only presented total values for each Government Agency. Thus, we relied upon 557,102 contract actions with a total contract value of $209,363,247 as the total values for Federal Procurement Activities by Executive Department and Agency in fiscal year 2001, as opposed to 563,014 contract actions with a total contract value of $215,661,426 that is reported in the Total Federal section of the 2001 Federal Procurement Report.

The data contained in the fiscal year 2001 FPDC CD-ROM enabled us to analyze procurement activities by NAICS codes and type of contract action. We sorted the approximately 500,000 individual records on the CD-ROM by several different criteria, including contracting agency, contract action, dollars, product or service, NAICS code, contractor name, and contractor type. In doing so we discovered several omissions in the data contained within the CD-ROM. First, there were several unidentified contracting agencies, contractor names, and contractor types contained in the CD-ROM data. The corresponding data for unidentifiable contracting agencies, contractor names, and contractor types were included only for the purposes of calculating the total number of contract actions and dollar value of contract actions for the entire corresponding NAICS code.

Our NAICS code analysis and that of simplified acquisition contract actions was largely based on the data contained on the CD-ROM. The CD-ROM contained detailed data on each individual contract action by individual government agency and contractor in terms of business size, whereas the 2001 FPDC Annual Report only presented simplified acquisition contract action total

[25] See, for example, Miller (2003) and Hardy (2003).

figures for the entire federal government procurement activities. The CD-ROM and 2001 FPDC Annual Report contains data broken out by NAICS codes in a similar format. There was a discrepancy in the reported number of simplified acquisition procedures in the CD-ROM compared to the 2001 Federal Procurement Report. We determined the CD-ROM contained 76,087 simplified contract actions with a total value of $4,604,834.[26] These figures differ from those reported in the Agency section of the FPDC Fiscal Year 2001 Annual Report, which reports 76,436 total simplified contract actions with a total value of $4,650,997. We relied on the data contained in the CD-ROM for the same reasons in selecting data from the Agency section for the number of contract actions and corresponding dollar value for the entire Executive Department and Agencies: its greater detail and breakout by business size. The data in the Agency section of the Fiscal Year 2001 FPDC Annual Report only presents total values for the number of simplified contract actions and the corresponding dollar value, whereas the simplified contract action data contained in the CD-ROM is disaggregated by eleven subcategories, specifically by contractor name, government agency, and business size. However, we excluded from our analysis 915 of the 76,087 simplified acquisition contract actions and the corresponding value of $60,883 because there was no identifiable contractor type.

We examined and analyzed the procurement data for FY01 on two levels. First we summarized some of the data across the entire database, and second we performed more detailed analyses of the specific industry (NAICS code) areas identified from the E-Stats data. The summary data analysis established certain trends, permitted comparisons with prior year's data, and most importantly, provided benchmarks with which the more detailed data broken out by NAICS code could be compared.

Summary Data from FPDC

Table 3-2 presents a summary of the procurement data for FY01 indicating the dollar value of contracts and the number of contract actions by major government agency flowing to large and small business. Several conclusions flow from these data. Small firms received more contract actions than large firms, but the average dollar value per contract action is significantly lower for small firms, suggesting that the average dollar value per contract is small for small firms. Small firms received 22.81 percent of total procurement dollars, but received 45.8 percent of all contract actions. The average dollar value per contract action was $167,000 for small business, but $541,000 for large firms, a very significant difference.

[26] The dollar value of these transactions designated as Simplified Acquisition Procedures is approximately 2 percent of the total contract dollars. This 2 percent is consistent with the estimate by Enos (2001) regarding the amount of electronic procurement during 2000-2001.

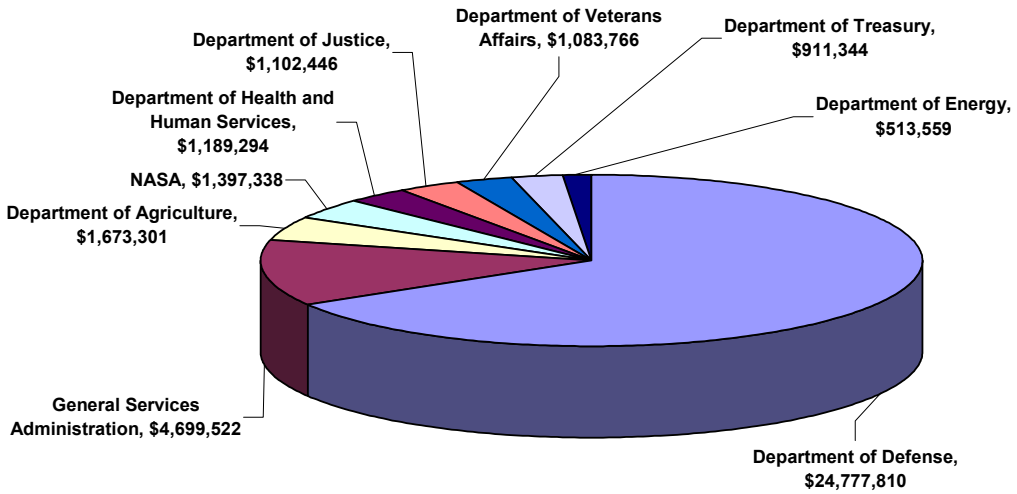
Table 3-2
FEDERAL PROCUREMENT DOLLARS AND CONTRACT ACTIONS: FISCAL YEAR 2001

	Number of Contract Actions					Total Dollars (000)					Average Dollar Value per Contract Action (000)			
Contracting Agency	**Small Business**	**Large Business**	**Other Business**	**Total**	**SM BUS Percent of Contract Actions**	**Small Business**	**Large Business**	**Other Business**	**Total**	**SM BUS Percent of Dollars**	**Small Business**	**Large Business**	**Other Business**	**All**
Top 25 Government Agencies in Total Procurement Dollars														
Department of Defense	131,628	157,297	25,764	314,689	41.83%	$24,777,810	$100,527,848	$10,785,275	$142,383,946	17.40%	$188	$639	$419	$452
Department of Energy	2,548	2,764	583	5,895	43.22%	$513,559	$11,460,279	$6,598,644	$18,572,482	2.77%	$202	$4,146	$11,318	$3,151
General Services Administration	29,267	26,481	1,360	57,108	51.25%	$4,699,522	$6,969,956	$205,130	$11,874,608	39.58%	$161	$263	$151	$208
National Aeronautics and Space	7,364	6,387	1,908	15,659	47.03%	$1,397,338	$6,960,076	$2,061,588	$10,419,002	13.41%	$190	$1,090	$1,080	$665
Department of Veterans Affairs	8,804	12,047	2,331	23,182	37.98%	$1,083,766	$2,972,051	$239,177	$4,294,994	25.23%	$123	$247	$103	$185
Department of Health and Human Services	5,227	3,852	2,522	11,601	45.06%	$1,189,294	$1,829,865	$1,013,972	$4,033,131	29.49%	$228	$475	$402	$348
Department of Justice	14,596	13,819	751	29,166	50.04%	$1,102,446	$2,530,753	$146,432	$3,779,631	29.17%	$76	$183	$195	$130
Department of Agriculture	11,030	6,566	284	17,880	61.69%	$1,673,301	$1,796,576	$54,352	$3,524,229	47.48%	$152	$274	$191	$197
Department of Treasury	5,300	5,960	361	11,621	45.61%	$911,344	$2,100,597	$79,848	$3,091,789	29.48%	$172	$352	$221	$266
Department of Transportation	8,966	5,133	543	14,642	61.23%	$1,103,266	$977,531	$121,369	$2,202,166	50.10%	$123	$190	$224	$150
Department of Interior	11,627	5,514	980	18,121	64.16%	$1,139,177	$832,599	$62,728	$2,034,504	55.99%	$98	$151	$64	$112
Department of State	2,770	2,174	1,528	6,472	42.80%	$510,845	$1,039,935	$191,647	$1,742,427	29.32%	$184	$478	$125	$269
Department of Labor	1,384	1,281	190	2,855	48.48%	$368,532	$859,540	$135,024	$1,363,096	27.04%	$266	$671	$711	$477
Department of Commerce	3,538	1,784	382	5,704	62.03%	$522,160	$511,358	$59,161	$1,092,679	47.79%	$148	$287	$155	$192
Environmental Protection Agency	2,123	3,512	420	6,055	35.06%	$243,266	$672,794	$50,871	$966,931	25.16%	$115	$192	$121	$160
Department of Education	326	548	101	975	33.44%	$104,232	$708,133	$95,123	$907,488	11.49%	$320	$1,292	$942	$931
Department of Housing and Urban Development	1,073	721	79	1,873	57.29%	$260,333	$497,046	$15,443	$772,822	33.69%	$243	$689	$195	$413
Agency for Intl Development	981	115	438	1,534	63.95%	$439,206	$157,828	$134,781	$731,815	60.02%	$448	$1,372	$308	$477
Social Security Administration	2,426	1,106	289	3,821	63.49%	$168,531	$289,060	$35,815	$493,406	34.16%	$69	$261	$124	$129
Federal Emergency Management Agency	445	787	43	1,275	34.90%	$60,296	$233,326	$11,198	$304,820	19.78%	$135	$296	$260	$239
Office of Personnel Management	1,753	1,353	16	3,122	56.15%	$177,557	$96,494	$428	$274,479	64.69%	$101	$71	$27	$88
National Science Foundation	138	87	49	274	50.36%	$13,023	$17,958	$140,214	$171,195	7.61%	$94	$206	$2,862	$625
Smithsonian Institution	272	138	19	429	63.40%	$37,428	$43,289	$2,461	$83,178	45.00%	$138	$314	$130	$194
Nuclear Regulatory Commission	322	207	73	602	53.49%	$32,010	$23,029	$19,437	$74,476	42.98%	$99	$111	$266	$124
Small Business Administration	164	65	14	243	67.49%	$49,282	$16,274	$1,631	$67,187	73.35%	$301	$250	$117	$276
TOTAL SF279	**255,266**	**260,424**	**41,397**	**563,014**	**45.34%**	**$42,701,428**	**$144,274,681**	**$22,321,299**	**$215,661,526**	**19.81%**	**$167**	**$554**	**$539**	**$383**
TOTAL SF281	**4,780,122**			**10,847,855**		**$7,387,497**			**$19,217,539**					
GRAND TOTAL FROM FPDC Summary	**5,035,388**			**11,410,869**		**$50,088,925**			**$234,879,065**	**22.81%**				

Source: IIC, Inc. analysis based on FPDC data, 2001.

Certain government agencies acquire more goods and services from small business than others. The Department of Defense (DoD) leads all government agencies in total spending, accounting for $136 billion out of about $210 billion in total procurement dollars or approximately 65 percent of the total. Small firms received a total of $25 billion from DoD, by far and away the largest dollar amount of any government agency. Figure 3-11 summarizes the nine government agencies that provided the largest dollar amount to small business in FY01.

Figure 3-11
Government Agencies Awarding $1 Billion or More to Small Business
2001
($000)



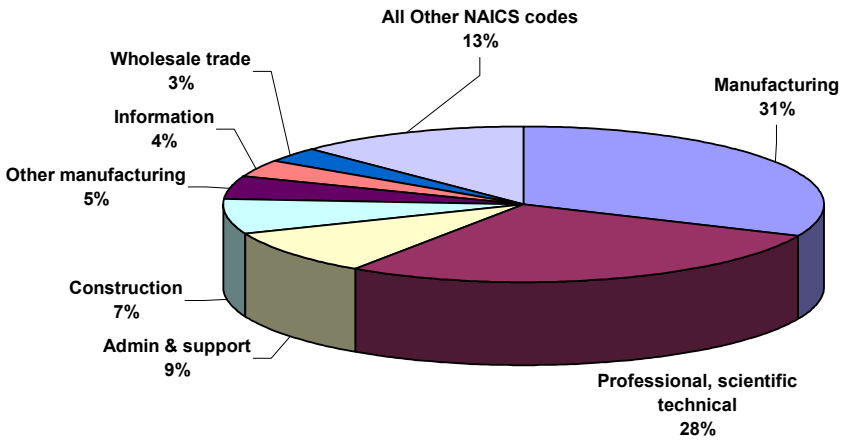
Source: IIC, Inc. Analysis based on Federal Procurement Data Center data, FY2001.

Also a number of government agencies dedicate a substantial portion of their total procurement dollars to small business. For example, of those agencies funding more than $10 million in total procurements in FY01, eight agencies (led by the SBA, FCC, and FERC) provided over 50 percent of their procurement dollars to small business.

We also examined summary procurement data on the basis of NAICS codes and by type of contract action, focusing on use of Simplified Acquisition procedures as a proxy measure for electronic procurement activity. The purpose of these analyses was to develop benchmarks by which we could then compare the more detailed NAICS code data, especially in terms of use of tools of e-procurement and the dollar value of procurement activity flowing to small business.

The NAICS code industries that account for the largest shares of federal procurement as shown in Figure 3-12 include manufacturing (NAICS 33) (metals, machinery computers, electrical and furniture), professional, scientific and technical services (NAICS 54), construction (NAICS 23), and administrative and support services (NAICS 56).

Figure 3-12
Breakout of Federal Procurement Dollars by NAICS Code
2001



Source: IIC, Inc. Analysis based on Federal Procurement Data Center data, FY2001.

Our detailed analysis focused on a number of subcategories found in the 2-digit NAICS industries. In this way we have tried to capture a cross section of industries, while nevertheless focusing on those industries that the E-Stats data indicate are early adopters of e-business or those that appear to lag in the use of the tools of e-commerce.

We also examined the extent to which the procurement data could give some indication of the extent to which e-procurement tools were being utilized. Because the data collected by the Federal Procurement Data Center do not include any indication of whether the contract involved electronic procurement or not, we honed in on two particular categories of contract actions, where we believed electronic procurement would be represented: those contract actions which were designated as Simplified Acquisition Procedures, and those contract actions designated as an Order Under Federal Supply Schedule. In particular, as discussed above, we used the simplified acquisition procedure entry as a proxy for e-procurement. Although this is not a direct indication of whether the contract action was electronically consummated, it does appear to represent the use of such contracting mechanisms among other things.

The data for FY01 indicate that simplified acquisitions represent only about 2 percent of total federal procurement actions in terms of dollar value.[27] As shown below in Table 3-3, the procurement dollars resulting from simplified acquisition procedures grew from $2.5 billion (1.3 percent of the total procurement dollars) in FY2000 to $5.6 billion in 2002 (or 2.4 percent of the total). Of that $3.1 billion increase in dollars flowing from simplified acquisition procedures, small

[27] This is consistent with other published data indicating federal e-procurement accounted for between $2 and $5 billion in 2001.

businesses received $2.3 billion, while large businesses received $600 million. The growth demonstrated in simplified acquisition procedures supports our use of this type of contract action as a proxy for electronic procurement. Changes in procurement that utilized electronic methods began to be introduced during FY1999 and FY2000, and have become more significant during the subsequent years.

Our analysis demonstrates that small firms rely more heavily on simplified acquisitions than do large firms, again as measured in dollar value terms. In FY2001, small business received approximately $2.7 billion in procurement dollars via simplified procurement, representing over 6 percent of total procurement dollars flowing to small business. In FY2002, the small business share increased to 6.5 percent, or $2.9 billion. Large firms on the other hand, accounted for less than 1 percent of their procurement funding via simplified acquisition procedure. In FY2000, small businesses captured 27 percent of the dollars flowing via simplified acquisition procedures; by FY2002, the small business share of these transactions had increased to 53.6 percent.

Table 3-3
Simplified Acquisition Procedure
Contract Action Dollars by Business Size
($000)

Firm Size	Dollar Value of Simplified Acquisition Procedures	*% of Total Simplified Acquisition Procedures*	Total Dollars	Simplified Acquisition as Percent of Total
Small Business	$676,512	27.36%	$38,255,188	1.8%
Large Business	$1,398,536	56.55%	$135,569,400	1.0%
Other	$397,866	16.09%	$21,018,712	1.9%
TOTAL FY2000	***$2,472,914***	100.00%	***$194,843,300***	***1.3%***
Small Business	$2,698,400	59.38%	$42,701,428	6.3%
Large Business	$1,383,390	30.44%	$144,274,681	1.0%
Other	$462,161	10.17%	$22,321,299	2.1%
TOTAL FY2001	***$4,543,951***	100.00%	***$209,297,408***	***2.2%***
Small Business	$2,992,263	53.60%	$46,391,576	6.5%
Large Business	$1,964,338	35.19%	$158,863,050	1.2%
Other	$626,181	11.22%	$23,234,259	2.7%
TOTAL FY2002	***$5,582,782***	100.00%	***$228,488,885***	***2.4%***

Source: IIC, Inc. analysis based on Federal Procurement Data Center data.

The top three government agencies using simplified acquisition procedures in buying from small business were DoD (72 percent), the Department of the Interior (5.1 percent), and the General Services Administration (3.4 percent). These three agencies accounted for about 80 percent of the dollars flowing to small business via simplified acquisition actions. For large firms, the three

largest government agencies in terms of dollar value of simplified acquisition procedures were DoD (71.9 percent), Department of the Treasury (5.5 percent), and Department of the Interior (3.8 percent). These three agencies accounted for over 80 percent of the dollars flowing to large business via simplified acquisition actions.

Table 3-4 compares the government agencies that were most prolific in terms of total procurement dollars and compares this with the dollar amount of contracts moving via simplified acquisition procedure. As can be seen, certain agencies such as the Defense Department, Health and Human Services, Treasury, and Interior have on average used the simplified acquisition contract action for a larger proportion of procurement dollars, whereas other agencies such as Energy, GSA, and NASA in particular have utilized other contract vehicles more frequently.[28] GSA ranks fairly high in terms of small business procurements via simplified acquisition, but not large firms. These data also indicate that DoD appears to be a leader in the use of Simplified Acquisition Procedures, along with the Department of Interior, and the Treasury.

Table 3-4

Comparison of Total Dollar by Major Government Agency and Dollar Value Moving via Simplified Acquisition Procedure

Government Agency	Agency Percent of Total	Agency's Share as Percent of Total Simplified Acquisition Procedure Dollars
Department of Defense	65.0%	72.0%
Department of Energy	8.9%	0.5%
General Services Administration	5.7%	3.2%
NASA	5.0%	1.5%
Department of Veterans Affairs	2.1%	2.1%
Department of Health and Human Services	1.9%	2.9%
Department of Justice	1.8%	1.0%
Department of Agriculture	1.7%	1.7%
Department of Treasury	1.5%	3.8%
Department of Transportation	1.1%	0.5%
Department of Interior	1.0%	5.1%

Source: IIC, Inc. Analysis based on Federal Procurement Data Center data.

We also reviewed those contract actions that were designated as Order Under Federal Supply Schedule. According to the FPDC Annual Reports, the vast majority of these actions originated from the GSA Schedule, and a small number of them originate with the Department of

[28] This table compares the percentage of total procurement dollars flowing out of each agency with the percentage of total simplified acquisition procedure dollars flowing out of each agency. Where the percentage is higher for simplified acquisition procedure than the total, this demonstrates a greater reliance on this contract action. These are indicated in bold.

Veterans Affairs.[29] The General Services Administration has been striving to move more of its procurements via the GSA schedule to electronic procurement using its *GSA Advantage!* Program, and we examined what the trends were using this contracting vehicle.[30] Unlike the Simplified Acquisition Procedures, however, the GSA schedules do not include the whole breadth of NAICS codes, but only focus on technology, building services, and service purchases, so the analysis is less comprehensive.

As summarized in Table 3-5 below, Orders Under Federal Supply Schedule represented 5.2 percent of the total procurement dollars in FY2000 and grew to 7 percent by FY2002. Between FY2000 and FY2002, $5.8 billion more was procured using federal supply schedules. Of that amount, small businesses received slightly less than $2 billion, while large businesses received $3.8 billion. The majority of contract actions and procurement dollars both continued to flow to large businesses during these three fiscal years. Not surprisingly, those federal agencies represented most strongly in this category of contract action are Department of Defense (which disperses 45.4 percent of the total dollars in this category), General Services Administration (30.4 percent), and Department of Veterans Affairs (4.42 percent).

[29] According to the 2001 Annual Report, 61,303 of the Order Under Federal Supply Schedule relate to the GSA Schedules, for a total value of $13,842,937, as compared with 2,098 actions related to "other" federal supply schedules that total $277,281.

[30] However, GAO (2003a) points out that "sales through Advantage have never exceeded one-half of 1 percent of overall schedule sales."

Table 3-5
Federal Supply Schedule
Contract Action Dollars by Business Size
($000)

Firm Size	Dollar Value of Federal Supply Schedule Orders	*Percent of Total Federal Supply Schedule Orders*	Total Dollars	Federal Supply Schedule Orders as Percent of Total
Small Business	$3,919,027	38.78%	$38,255,188	10.2%
Large Business	$6,068,070	60.05%	$135,569,400	4.5%
Other	$118,619	1.17%	$21,018,712	0.6%
TOTAL FY2000	***$10,105,716***	100.00%	***$194,843,300***	***5.2%***
Small Business	$4,717,471	33.76%	$42,701,428	11.0%
Large Business	$9,104,362	65.16%	$144,274,681	6.3%
Other	$150,852	1.08%	$22,321,299	0.7%
TOTAL FY2001	***$13,972,685***	100.00%	***$209,297,408***	***6.7%***
Small Business	$5,874,650	36.92%	$46,391,576	12.7%
Large Business	$9,915,253	62.32%	$158,863,050	6.2%
Other	$121,435	0.76%	$23,234,259	0.5%
TOTAL FY2002	***$15,911,338***	100.00%	***$228,488,885***	***7.0%***

Source: IIC, Inc. analysis based on Federal Procurement Data Center data.

Detailed FDPC Data by NAICS Code

We turn now to the detailed analysis of various specific industries which we categorized as being either leaders or trailers in terms of adopting e-commerce generally. As federal procurement moves more toward an electronic medium, we believed it was important to analyze whether those industries that generally have used the tools of e-commerce are more adept at obtaining federal procurement dollars (using e-procurement tools), and whether small business tends to lead or lag vis-à-vis large firms.

As shown in Table 3-1, we identified twenty industry areas[31] based on the E-Stats data that indicated industries that either were early adopters or lagged in the use of e-commerce. From that set of industries, we selected fifteen industries for detailed analysis of procurement trends. These fifteen industries comprise 41 percent of total federal procurement dollars in FY01, and reflect a cross-section of products and services being sold as well as represent a broad range of different government contracting agencies that are making purchases in these areas. Of the fifteen industries

[31] In addition to the 19 industries shown on Table 3-1, we also identified NAICS code 51, information services as being an early adopter of e-commerce. Census data was not available at the two-digit level, however, to present market concentration data as shown in Table 3-1. For purposes of analyzing procurement trends, however, we did examine NAICS code 51.

we examined in detail, three were considered relatively concentrated, i.e., had a relatively small proportion of small business, whereas the others included a large number of small businesses. Also five of the fifteen industries were ones we had classified from the E-Stats data as lagging in the adoption of e-commerce and the remaining 10 industries were all considered leaders in the adoption of e-commerce

We have also analyzed the distribution of government procurement business that goes to small firms according to NAICS code. For each NAICS code we analyzed, we measured the share of government business going to small firms accounted for by the five and ten largest small firms. The results of this analysis are presented in Table 3-6.

Table 3-6
Share of Small Business Procurement
Going to Top 5 and Top 10 Small Firms

NAICS	Top 5 Share	Top 10 Share	Total Dollars to Small Business
Manufacturing:			
334 - Computer and electronic products	16.9%	22.7%	$2.4M
335 - Electrical equip/components	20.9%	27.0%	$0.3M
336 - Transportation equip.	15.2%	23.2%	$1.7M
324 - Petroleum	62.1%	88.3%	$0.6M
312 - Beverage & tobacco	52.0%	78.1%	$0.01M
327 - Non-metallic mineral products	44.3%	54.8%	$0.04M
323 - Printing	50.3%	67.9%	$0.02M
321 - Wood products	37.8%	47.7%	$0.03M
Wholesale:			
4211 - Motor vehicles & equip.	40.3%	55.5%	$0.01M
4214 - Computer equipment & supplies	40.5%	48.8%	$0.3M
4222 - Drugs & pharmaceuticals	95.3%	99.6%	$0.01M
4218 - Machinery	34.4%	52.8%	$0.1M
Retail:			
454 - Non-store retail	48.5%	60.7%	$0.1M
Services:			
492 - Courier services	75.6%	85.6%	$0.001M
51 - Information svcs	15.8%	23.0%	$1.6M
561 - Admin & Support Svcs	24.1%	29.3%	$3.9M

Source: IIC, Inc. Analyses of FPDC database

As can be seen in several industries, a relatively limited number of small firms account for the majority of the procurement activity flowing to small business. In NAICS codes 4222 (drugs and druggists sundries), 492 (courier services), and 324 (petroleum), five small firms accounted for over 60 percent of all government business in these industries. With the exception of petroleum, these industries accounted for a very small volume of government dollars going to small business,

and in industries in which larger dollar flows were observed (e.g., NAICS 561, 334, and 336), the distribution of dollars flowing to small firms was considerably more evenly spread. In none of these industries does one observe more than 30 percent of government business going to the 10 largest small firms.

In analyzing the detailed procurement data, we performed several different analyses. First, we summarized the data for each NAICS code in terms of total dollar value and total number of contract actions as well as the breakout of dollars and contract actions going to small business. We examined the percentage of dollars flowing to small business as well as identified the dollar value and number of actions using simplified acquisition procedures. Next we identified both the ten largest contractors fitting the small business definition and the ten largest contracting agencies, again both in terms of number of contract actions and total dollar value. Here we were interested in identifying possible interview candidates as well as to determine the breadth of government agencies involved in each industry area. Then we turned to our analysis of contract actions to determine the role played by simplified acquisition procedures relative to all other contract actions. Finally we divided the simplified acquisition procedure actions by contractor and contracting agency. Appendix B to this report provides a sample of the data analyses we performed for one NAICS code, *334 – Computers and electronic products*.

Our analysis of these data indicates, not surprisingly, that the Defense Department accounts for the largest share of total procurement dollars (and contract actions) as well as the largest share of simplified acquisition procedure actions. Other agencies that account for sizeable shares within these NAICS categories include the General Services Administration (GSA), NASA, Department of Interior, Department of Agriculture, Department of Veterans Affairs, Department of Justice, and the Department of Health and Human Services. This is consistent with the data shown in Table 3-2 indicating the top government agencies in terms of total procurement dollars spent in FY01. Those government agencies leading in terms of the use of the simplified acquisition procedure contract action vehicle in these industries categories included DoD, GSA, Interior, and Health and Human Services. Again this is consistent with the data shown in Table 3-4, and further indicates that our sample is representative.

Table 3-7 presents summary information about the fifteen industries we examined in detail, including the total dollar amount of procurement activity in each industry area, and the dollar volume and number of contract actions going to small business in each industry. As can be seen certain industry areas are much more important than others in terms of total dollar value. NAICS codes 336 (Transportation Equipment), 561 (Administration and Support), and 334 (Computer and Electronic Products) are the three largest.

Table 3-7
Summary of NAICS Detailed Procurement Data

NAICS Code	Percent of Dollars to Small Business	Percent of Contract Actions to Small Business	Total Dollars ($Millions)	Percent of Small Business Dollars from Simplified Acquisition	Percent of Large Business Dollars from Simplified Acquisition
Manufacturing:					
312 - Beverage & tobacco	11.7%	9.8%	68.9	23.7%	23.5%
321 - Wood products	72.6%	70.5%	46.1	33.5%	17.7%
323 - Printing	4.6%	46.5%	381.1	0.6%	0.3%
324 - Petroleum	16.2%	47.2%	3,654.4	1.3%	0.1%
327 - Non-metallic mineral products	58.3%	47.1%	62.4	20.7%	16.9%
334 - Computer and electronic products	18.5%	40.0%	12,965.2	14.5%	NA
335 - Electrical equip/components	28.1%	44.2%	959.2	32.3%	NA
336 - Transportation equip.	4.3%	21.2%	38,556.3	14.2%	NA
Wholesale:					
4211 - Motor vehicles & equip.	30.6%	39.9%	25.5	48.2%	37.4%
4214 - Computer equipment & supplies	12.8%	34.8%	2,284.3	21.8%	4.6%
4218 - Machinery	83.0%	63.4%	124.2	19.7%	50.8%
4222 - Drugs & pharmaceuticals	5.1%	0.9%	1,078.2	6.0%	0.8%
Services:					
51 - Information services	19.4%	33.6%	8,052.1	5.3%	NA
492 - Courier services	27.0%	32.8%	18.9	12.8%	NA
561 - Admin & Support Svcs	21.5%	51.1%	18,260.9	2.7%	NA

Shaded areas denote an industry not ranked high in terms of use of e-commerce by E-Stats data.

Source: IIC, Inc. Analysis based on Federal Procurement Data Center data, FY01.

We next identified those industries in which small firms played a significant role in obtaining procurement dollars. We defined as "significant" any industry in which small business captured more than 23 percent of the total procurement dollars going to that industry. We selected 23 percent as it is the overall contracting target for small business as established by Congress in the Small Business Reauthorization Act of 1997. Table 3-8 shows that six industries fell into that category. It is interesting to note that three of the six industries shown in Table 3-8 are considered lagging in terms of e-commerce activity, yet small firms have been very successful in obtaining procurement money in these areas. Further, these small firms have relied very heavily on simplified acquisition procedure as the mechanism for obtaining these federal funds. In each industry, the percentage amount obtained in this manner was more than double the average across all industries for small business.

Table 3-8
Industries Where Small Firms Obtained More Than 23% of Total Dollars

NAICS Code	Percent of Dollars to Small Business	Percent of Contract Actions to Small Business	Total Dollars ($Millions)
321 - Wood products	72.6%	70.5%	46.1
327 - Non-metallic mineral products	58.3%	47.1%	62.4
335 - Electrical equip/components	28.1%	44.2%	959.2
4211 - Motor vehicles & equip.	30.6%	39.9%	25.5
4218 - Machinery	83.0%	63.4%	2,284.3
492 - Courier services	27.0%	32.8%	18.9

Shaded areas denote an industry not ranked high in terms of use of e-commerce by E-Stats data.

Source: IIC, Inc. Analysis based on Federal Procurement Data Center data, FY01.

Next we identified those industries that the E-Stats database indicated were leading adopters of e-commerce as a business tool and analyzed whether they also used the simplified acquisition procedure more frequently than the norm to test whether being e-commerce savvy has any impact on the use of e-procurement tools. The results of this analysis are shown in Table 3-9 and indicate some degree of correlation between use of e-commerce as a business tool and the successful obtaining of procurements using simplified acquisition procedure. Of the ten industries identified as being leaders in e-commerce, all but three greatly exceeded the average in terms of use of the simplified acquisition procedure. The benchmark across all industries was 6 percent for small firms and as can be seen in several of these industries, small firms obtained between 12 and 48 percent of their procurement money through this contract action vehicle. Large firms were somewhat less likely to use this procedure consistent with the general, overall trend, but nevertheless exceeding the average for all industries. Overall on a dollar weighted basis, small firms in these industries obtained over 11 percent of their procurement dollars using this contract action form which is almost double the average for small firms across all industries. This is an important finding as it suggests that firms that have adopted the tools of e-commerce may be more likely to use the tools of e-procurement. Also of the ten industries shown on this table, small business received a higher than average percentage of procurement funding in only four industries and the dollar weighted average (12.4 percent) was significantly below the average going to small business for all industries (20.4 percent).[32]

[32] The weighted dollar average is heavily influenced by one industry, NAICS 336 – Transportation equipment, which accounts for nearly half of the total dollar value, and small business received a very small proportion of total procurement dollars in this category.

Table 3-9
Significance of Simplified Acquisition Procedures in Industries Defined as E-Commerce Leaders

NAICS Code	Percent of Dollars to Small Business	Percent of Contract Actions to Small Business	Total Dollars ($Millions)	Percent of Small Business Dollars from Simplified Acquisition	Percent of Large Business Dollars from Simplified Acquisition
312 - Beverage & tobacco	11.7%	9.8%	68.9	23.7%	23.5%
334 - Computer and electronic products	18.5%	40.0%	12,965.2	14.5%	NA
335 - Electrical equip/components	28.1%	44.2%	959.2	32.3%	NA
336 - Transportation equip.	4.3%	21.2%	38,556.3	14.2%	NA
4211 - Motor vehicles & equip.	30.6%	39.9%	25.5	48.2%	37.4%
4214 - Computer equipment & supplies	12.8%	34.8%	2,284.3	21.8%	4.6%
4222 - Drugs & pharmaceuticals	5.1%	0.9%	1,078.2	6.0%	0.8%
51 - Information svcs	19.4%	33.6%	8,052.1	5.3%	NA
492 - Courier services	27.0%	32.8%	18.9	12.8%	NA
561 - Admin & support services	21.5%	51.1%	18,260.9	2.7%	NA
Weighted Average (weighted by dollars)	**12.4%**	**32.4%**	**82,269.5**	**11.2%**	**NA**

Source: IIC, Inc. Analysis based on Federal Procurement Data Center data, FY01.

Finally we also examined the five industries that were lagging in their use of e-commerce to see if their use of simplified acquisition procedures dropped off appreciably. These results are mixed and are probably more indicative of a relatively small sample than of any significant trends. As Table 3-10 shows, two of the industries do clearly lag in the use of simplified acquisition procedures and they account for a large proportion of the total dollars going to these industries. Printing and petroleum indicate minimal use of this contracting type, whereas the other three industries show an above-average use. As can be seen, however, in these three industries, small business accounts for an extraordinarily high proportion of total procurement dollars (all above 50 percent), which may help the significant use of the simplified acquisition contract action. Nevertheless, on a dollar weighted basis, these five industries indicate a below-average use of simplified acquisition procedure tools by small firms (2.4 percent versus the total average of 6 percent), although large firms do show a slightly higher than average use. Also small business received a lower share than the total industry average on a dollar weighted basis, although this figure (18.3 percent) was much closer to the average than shown for the sample on Table 3-7.

Table 3-10
Significance of Simplified Acquisition Procedures in Industries Defined as E-Commerce Laggards

NAICS Code	Percent of Dollars to Small Business	Percent of Contract Actions to Small Business	Total Dollars ($Millions)	Percent of Small Business Dollars from Simplified Acquisition	Percent of Large Business Dollars from Simplified Acquisition
321 - Wood products	72.6%	70.5%	46.1	33.5%	17.7%
323 - Printing	4.6%	46.5%	381.1	0.6%	0.3%
324 - Petroleum	16.2%	47.1%	3,654.4	1.3%	0.1%
327 - Non-metallic mineral products	58.3%	47.1%	62.4	20.7%	16.9%
4218 - Machinery	83.0%	63.4%	124.2	19.7%	50.8%
Weighted Average (weighted by dollars)	**18.3%**	**47.8%**	**4,268.2**	**2.4%**	**2.0%**

Source: IIC, Inc. Analysis based on Federal Procurement Data Center data, FY01.

Conclusions from Data Analysis

We initially posed several research questions that we sought to answer first through examination of the literature, then data analysis and finally through interviews. Based on the data analyses discussed above as well as our review of the literature we have generated several initial conclusions including the following:

- Certain barriers do appear to exist that may prevent small business from embracing e-commerce as rapidly, however, the data do not suggest any significant lag in the actual adoption of e-commerce by small business.

- In industries where small businesses obtain a significant share of federal procurement dollars (i.e., greater than 25 percent of the total), both large and small firms were more likely to use simplified acquisition procedure tools than in other industry areas. To the extent this procedure is a good proxy for e-procurement, then this suggest in these industries all firm sizes were more likely to use the tools of e-procurement.

- For those industries which the data identify as leaders in the adoption of e-commerce, we found that simplified acquisition procedure tools are used more frequently than the average level across all procurements by a significant margin.

- Of the industry areas classified as lagging in the adoption of e-commerce, we found that these industries also lagged in their adoption of e-procurement tools.

- Small firms appear to rely much more heavily on simplified acquisition procedure tools than do large firms. Overall, about 6 percent of all small business procurement dollars in FY01 were obtained through simplified acquisition procedures whereas only about 1 percent of procurement dollars going to large business in FY01 were obtained in this way. Again, to the extent that simplified acquisition procedure is a good proxy for e-procurement activity, then this finding suggests that small business does not appear to be harmed competitively by the government's push to utilize e-procurement.

Our analysis shows that small businesses in industries that use electronic commerce as part of their everyday business compete successfully for contract actions that are designated as Simplified Acquisition Procedures, and we believe that is a reasonable proxy for the use of e-procurement tools. However, we wanted to collect some anecdotal information from small businesses that have been successful in obtaining contracts with the federal government and selling their goods and services to the federal government about their experiences with electronic procurement in the federal venue. We now turn to the results of our industry interviews, which we used to corroborate the results from our data analysis and review of literature.

Chapter 4
Interviews

We have used the results of the data analysis and literature review as steps to guide the selection of firms and individuals to interview as a mean to corroborate our initial findings and to learn first-hand how small business views and uses the tools of e-commerce and e-procurement. These interviews, therefore, represent a qualitative measure of whether barriers to e-commerce exist and identification of the role of e-procurement for small business. In addition we viewed this step as a way to refine policy recommendations or suggest needed services for small businesses to enable them to fully participate in the electronic marketplace.[33]

Selection Process

We used the FPDC database as the starting point for identifying potential interview candidates. The criteria we used were as follows:

1. The firm must account for a significant share of small business dollars and a significant number of different contract actions in a particular NAICS industry.

2. We must have a sample of firms across different NAICS industries.

3. The firm must have used the simplified acquisition procedure contract action.

4. The firm should qualify as a small firm under procurement regulations.

5. The firm must offer multiple products or services for sale to the government.

6. The firm or its representatives must be willing to talk with us about their experience with e-commerce and e-procurement.

We selected an initial list that fit these criteria, and made preliminary contacts. We collected information from five businesses. Some businesses that we contacted did not wish to be interviewed for a variety of reasons. Some stated that they did not have any experience with electronic commerce. Some firms, which were classified as small businesses according to the FPDC data, insisted that they were not small firms. Many business owners stated that they were simply too busy to take time for this effort. Additionally, we contacted several Procurement Technical Assistance Centers, and interviewed one of the procurement specialists.[34] We believe that the insights gleaned from these interviews are valuable to our understanding of the state of electronic procurement with the federal government at this time.

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[33] In accordance with the requirements of this project, not more than nine individuals or organizations were contacted and interviewed.

[34] The Procurement Technical Assistance Centers (PTACs), funded by the Department of Defense, provide workshops and one-on-one consulting expertise to small businesses who wish to sell their goods and services to the federal government and require assistance navigating the federal procurement process. The PTACs are located throughout the 50 states.

Attached as Appendix C is the set of interview questions we used in discussion with various industry participants. We made an initial contact and then conducted a detailed telephone interview that lasted between 20 and 60 minutes.

The businesses that we spoke with included very small to medium-size small businesses, and one that was both a small disadvantaged business and woman-owned. The number of employees ranged from 12 to approximately 500. The businesses provided products and services to a variety of government agencies, and covered a number of our key NAICS industry areas, as shown below in Table 4-1. Several themes emerged from our interviews, and these are expanded below.

Table 4-1
Sample of Interviewees' NAICS Industry Codes and Products/Services

NAICS Industry Description	Product/Service
Automobile and Other Motor Vehicle	Fiber optic cables ADP support equipment
Other Aircraft Parts and Auxiliary	Operation training devices Maintenance-repair of training aid-devices Education services
All Other Motor Vehicle Parts Manufacturing	Miscellaneous vehicular components
Aircraft Engine and Engine Parts	Gas turbines & jet engines aircraft
Other Aircraft Parts and Auxiliary	Hardware weapon system Bearings, antifriction, unmounted Bearings, plain, unmounted Aircraft hydraulic vacuum de-icing Vehicle brake steering axle wheel component
Packaging and Labeling Services	Lubrication & fuel dispensing equipment
Other Measuring and Controlling Devices	Miscellaneous alarm, signal, security systems
Irradiation Apparatus Manufacturing	Maintenance-rep of miscellaneous equipment Chemical analysis instruments
Other Measuring and Controlling Devices	Optical instruments Hazard-detecting instruments & apparatus Chemical analysis instruments Kitchen equipment and appliances
Search, Detection, Navigation	Miscellaneous alarm, signal, security systems
Irradiation Apparatus Manufacturing	Maintenance-rep of instruments & lab equipment
Irradiation Apparatus Manufacturing	Hazard-detecting instruments & apparatus
Facilities Support Services	Other management support services Engineering and technical services R&D manufacturing technology operations development

Source: FPDC Data, 2001.

Many Small Businesses Lack Basic Skills to Effectively Use E-Procurement Tools

Our analysis focused on those industries where the E-Stats data indicate that electronic commerce is part of the everyday way of doing business. Our interviews collected information that many businesses lack the very basic level of technical knowledge to effectively use the Internet, use e-mail, conduct searches, etc. One interviewee stated that small businesses are not as sophisticated

as one might think, adding that there are many small businesses that do not even own computers yet.

Our conversation with the Procurement Specialist from the Procurement Technical Assistance Center was particularly illuminating. He described typical work with a variety of small businesses. The majority of businesses who come to PTAC want to know "how do I sell to the government?" These businesses typically are not savvy electronically, and their questions are very basic. There is a level of sophistication required to register a company with the Central Contractor Registration (CCR) or with SBA's PRO-Net that many small businesses simply do not possess. For example, PTAC assisted a business owner in completing the necessary filings to be certified as an 8a (small disadvantaged) business, and signed up for the e-mail notification of business opportunities. However, the business owner continues to struggle with how to use his e-mail to read the opportunities that are being sent. In the short run, PTAC is printing out the e-mail notifications for him, but obviously he is not finding or pursuing these opportunities electronically.

Many of these small businesses are lacking in very basic knowledge that is necessary to get off the ground with electronic procurement. Clients need to be trained not only in the use of the computer, but even with how to think about how to look for the opportunities. For example, think about a hypothetical small machine shop that wants to know "how do I sell to the government?" If a PTAC representative asks the business owner what products does he sell that he thinks the federal government would like to buy, the client would respond and say that he does milling, turning, etc. If together they search FedBizOpps for "milling" or "turning," there would be few or no responses. If, however, they can teach the business to be very specific about what type of bolt they could produce, there are more opportunities listed than the business could deal with. In this example, it might be necessary for PTAC to design a Boolean search for the business and to create a profile that will pre-match on these criteria for FedBizOpps; these results would then be e-mailed each day to the business. The business still needs to respond to these opportunities, and sometimes this requires additional skills that the business owner does not have. For example, the business opportunity may require that the business download a large file of specifications and read these. The PTAC would need to teach the business how to download the file, print out the specifications and read them, even though they might be in a slightly different format than what they're accustomed to, and in a slightly different format each time.

PTAC tries to train businesses that the Internet can be used to find opportunities and to research the competition. But many "old-style manufacturers" might not want to accept this. Sometimes these businesses recognize that they need to acquire some technology expertise, and they hire a recent college graduate, who can work with them and use the computer; sometimes the business just gives up or finds another way to do business with the government. Obviously as the federal government continues to push e-procurement this is likely to lead to greater frustration among small firms.

Some Small Businesses Lack the Resources to Effectively Enter the E-Commerce Market

While most of our interviewees seemed to be e-commerce ready, they provided anecdotal information about some of the barriers they had faced in attaining this goal. The literature cites barriers that relate to both capital investment and human capital availability. From our interviews, we obtained information about both. Our interviewees who had made a successful adoption of e-

commerce pointed to fairly regular investments in capital over several years, including such items as networking infrastructure, high speed Internet access (DSL), additional computers, printers, etc. More significant was the fact that these infrastructure improvements had necessitated the hiring of additional personnel to keep the technology effective, safe and well-maintained, e.g., network administrators. Even with these improvements, one firm gave specific information that their average investment in information technology was approximately $2,000 per employee using IT and $1,000 per employee over the entire firm.

Interviewees pointed to the difficulties that small businesses face when trying to attract and sustain employees. Whereas larger organizations can hire individuals for very specific job functions (such as sales, operations managers, financial managers, information technology managers, etc.), small businesses often need to find individuals who can be trained to be "jack of all trades." Once a small firm makes the investment in such an individual, it is easy to lose these employees when a larger firm lures them away with more attractive salary and benefits packages, more refined job duties, or less hectic work schedules.

Even those interviewees who believed that they had been quicker than many companies of comparable size believed that their implementation of e-commerce still was far behind that of larger companies.

Federal E-Procurement Still Lacks a Single Interface and United Direction

As we found with the literature review, all interviewees were unanimous that the federal government has vacillated in its commitment and direction for electronic procurement over the last decade. One interviewee was quite vocal in his single message, that the federal government first indicated that it would use electronic data interchange (EDI) as the primary means of conducting procurement, and then switched directions to reject EDI and embrace the Internet. Others indicated their disappointment that there continues to be many points of entry to the federal procurement opportunities. FedBizOpps has been touted as the single portal for posting all procurement opportunities with the federal government, and Central Contractor Registration (CCR) has been proclaimed to be the single point of registration for those who wish to do business with the federal government. Those who do business with the federal government insist, however, that there continue to be multiple sites where a business needs to register in order to compete for opportunities. For example, not only do individual agencies, supply centers, and bases within the Department of Defense have their own sites for posting and contracting for business, but many of the major prime contractors (e.g., Raytheon or Northrup Grumman) host sites where prospective subcontractors need to register. One interviewee stated that these prime contractors "use these web sites like a shield," and refuse to speak with a potential subcontractor until they have registered. Additionally, the Small Business Administration recommends that small businesses who wish to do business with the federal government or who desire to be hired as subcontractors should register on the SBA-sponsored sites, PRO-Net and SUB-Net. The General Services Administration requires businesses to complete an electronic submission to be placed on one of the many schedules that are used to fill orders from numerous federal agencies.

Several changes have been implemented since we conducted our interviews that have moved the federal government more toward a single interface (e.g., merging of SBA PRO-Net registration with the CCR registration, merging of DoDBusOpps with FedBizOpps). However, to the extent to

which there continue to be multiple interfaces between small businesses and the federal government buyers, it has caused much confusion among small businesses, which may lack the depth of staffing required to follow and master these developments. Some small businesses have successfully developed a working relationship with one agency, and then chosen to ignore other methods of interacting with the government that are no longer relevant. Other small businesses have given up.

Doing Business with the Federal Government May Be Unpredictable

Some interviewees felt that doing business with the federal government led to uncertainty in their own businesses. Some of this uncertainty stems from the discussion above that the federal government has changed directions too many times in its path to use electronic procurement as a means to reform the procurement process. One was frustrated by the amount of time required to complete the filings to be placed on the GSA Schedule, for example, and then not receiving any business as a result of those efforts. Another firm believed that the GSA Schedule was the "real bread and butter" of his company's federal business.

Another point raised by one interviewee was that the federal budget is complicated, with each government agency having different priorities and varying budgets from year to year. He also explained the challenge of waiting for government receivables, whereby small businesses may be forced to make a big investment initially to pay employee salaries and maintain the overhead in the business. As with any small business, it is difficult to retain key personnel and needed infrastructure for the business while waiting several months to be paid by the government.[35]

Other interviewees felt that the move toward electronic commerce had made their business very predictable. Two interviewees who had been successful in obtaining business through the GSA Schedules felt that the contracting and payment were expeditious, and believed that having complete information about competitors' prices made it very each to monitor and make adjustments in their own pricing. Another interviewee stated that some agencies with specific web site and procurement procedures (e.g., the Supply Centers sponsored by the Defense Logistics Agency) are easier to work with than other agencies within the Department of Defense. Even though a newcomer may feel that these multiple interfaces are confusing, for those who have mastered the system it is an advantage rather than a disadvantage.

Reality of Electronic Procurement is Still Elusive

Several interviewees discussed the disparity between the perception of electronic commerce and the reality. The federal government has taken many public steps toward electronic procurement. However, the businesses that have been successful in doing business with the federal government believe that while initial contact and dissemination of information about contracts may occur electronically (via Internet posting, such as FedBizOpps), the actual contracting still requires paper transmission either via mail/courier or possibly via fax transmission. Even those businesses that have successfully used the GSA Schedule process to generate business with the federal

[35] It is expected that the government's move to electronic payments may smooth out some of these difficulties with payment.

government state that they have concerns about how the GSA Schedules are being used by federal buyers. Some believe that the GSA Schedule is being used as a catalog to see what is available, but then the buyers go to the vendors that they want to do business with, and use the other businesses on the schedule to justify their decisions. Some interviewees stated that while the submission for the GSA Schedule is done electronically, once a contracting opportunity arises, most contracting agencies proceed in the same way they have always done: using paper and fax to actually conduct the contract. This is not electronic procurement in the purest sense of the word.

Most interviewees believed that part of the reason why electronic procurement has not made more rapid progress is as much due to the lack of training among federal government personnel, as the lack of technological sophistication among businesses. Some expressed the opinion that training was needed not only among the businesses and federal employees, but that there needed to be some re-design of the business processes that comprise procurement in the federal government. One interviewee believes there are too many government employees that are confused and often times know little about electronic procurement tools. Educating these government employees would eliminate the additional confusion for many small businesses with electronic procurement that is created when federal employees give misinformation.

One of our interviewees, who primarily contracts with the Department of Defense, indicated that his business does not engage in electronic procurement because of the complex nature of the products and services that the business sells to the federal government. For this business, it is more practical and useful to work with hard copies of the diagrams and code-specific manuals that are required for this business.

For Those Who Successfully Engage in E-Procurement, Benefits are Evident

Businesses who successfully engage in electronic procurement believe that there are obvious benefits for them. One small business owner has found e-mail to be the best form of communication with the federal government. Due to the large size of the federal government, this business owner has found letters and phone calls to government agencies too often pass by without a reply. His experience has taught him that e-mail obtains a response more quickly than other methods.

Benefits of electronic procurement include that it is not only cheaper but accelerates all aspects of the procurement process. The Internet can make all of the information required for preparing a bid available at once (drawings, solicitation, specifications, price history). This complete information helps to be on-time and get contracts more quickly. One interviewee stated that he believes that electronic procurement could actually help small businesses reduce their operating costs in the long run. Electronic procurement, according to this interviewee, eliminates many general and administrative costs (i.e., paper, photocopying) and the need to hire additional employees that might otherwise require if all federal sales were paper-based. Other businesses pointed to the GSA Schedule, indicating that this has enabled them to do business with many agencies within the federal government through the one submission.

One firm cited the benefit of electronic funds transfer (EFT), whereby the federal government pays invoices by transferring the money directly to the vendor's bank account. This enables the business to improve and predict cash flow, and cuts down postage time and costs.

One of the disadvantages cited by a business (which is obviously a benefit from the federal government perspective) is that other competitor contractors know their prices as well. This has increased competition and driven prices down for products.

Chapter 5
Policy Recommendations

Our work with reviewing the literature, analyzing and combining the data from three different databases, and conducting interviews with business and government representatives has led us to develop the following policy recommendations.

1. Small businesses have limited resources (time, technology infrastructure, capital) with which to conduct their businesses and to develop new business. Successful selling to the federal government must begin with certainty about how the federal government intends to purchase products and services from potential (small) suppliers. The federal government has altered its course many times over the last decade, beginning with EDI, moving toward Internet-based postings via numerous individual portals, and finally arriving at a single interface (FedBizOpps) that intends to post all opportunities in one location that is accessible to all via the Internet.

2. Central registration needs to become a reality. There continue to be numerous places where a small business needs to register in order to obtain information about potential business opportunities with the federal government. The recent merging of the Central Contractor Registration database with SBA PRO-Net is a welcome change, as is the merging of DoDBusOpps with FedBizOpps. Other federal agencies should emulate these example and merge any existing registrations into CCR. The Central Contractor Registration process should be used to populate databases with individual agencies, DOD supply centers, or prime contractors databases, so that a small business would not need to visit each of these sites if it is interested in obtaining business with the federal government.

3. Small businesses, especially those that do not regularly use electronic commerce for the conduct of their business, need training, support, and networking in order to successfully use these tools to obtain business with the federal government. Policy makers should encourage such training opportunities and facilitate networking events for small businesses.

4. The current initiatives being undertaken by E-gov must include substantial training for procurement officers and employees, so that e-commerce tools will be used to their full potential.

5. Because one of our findings is that specific industries are more inclined to be proficient in electronic commerce, policy makers should consider targeting those industries where e-commerce lags and work with existing trade groups to offer support and training to small businesses within that industry's purview.

6. Some of the initiatives being implemented as part of the Integrated Acquisition Environment and e-Gov programs may impede the ability of small business to compete. Some initiatives such as the use of the Central Contractor Registration to develop one comprehensive list of suppliers (that can be used for payments, as well) will strengthen the equal access of small businesses. However, we would encourage policy makers to closely monitor these initiatives to ensure that small businesses are not overlooked in favor of the larger businesses that already have contracts.

Appendix A
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Appendix B
Sample Data Analysis
NAICS Code 334, Computer & Electronics

NAICS Code 334, Computer & Electronics: Basic Summary Table

Number of Govt Agencies (Small Business Only):	245
Number of Contractors (Small Business Only):	4,260
Number of Small Business Contract Actions:	16,231
Small Business Contract Actions % of Total	40.00%
Total Small Business Dollar Sum for all Small Business Contract Actions (000)	$2,398,087
NAICS Code 334 Small Business Dollars (000) % of Total	18.50%

	Number of Contract Actions	**Total Dollars (000)**	**% of SM BUS NAICS Code 334 Total Dollars**
Number of Contractors with >$800,000 (Small Business Only)	463	$1,922,734	80.18%
Number of Govt Agencies with >$800,000 (Small Business Only)	109	$2,385,991	99.50%

	Number of Contract Actions	**Total Dollars (000)**	**% of SM BUS NAICS Code 334 Total Dollars**	**% of NAICS (ALL BUS) Total Number of Dollars**
Number of Small Business Contractor Names with SIMP ACQ PROC	2,878	$348,315	14.52%	2.69%
Number of Small BusinessGovt. Agencies with SIMP ACQ PROC	131	$348,765	14.54%	2.69%

NAICS Total (All Business) Number of Contract Actions	40,575
NAICS Total (All Businesses) Number of Dollars (000)	$12,965,170

NAICS Code 334, Computer & Electronics: Top Ten Small Business Contractors in terms of Total Dollars

Contractor Name	Number of Contract Actions	Total Dollars (000)	% of SM BUS NAICS Code 334 Total Dollars	% of NAICS (ALL BUS) Total Number of Dollars	Avg. Dollars (000)
WORLD WIDE TECHNOLOGY, INC	428	$132,573	5.53%	1.02%	$310
GTSI CORP	639	$110,976	4.63%	0.86%	$174
FORCE 3 INC	319	$62,515	2.61%	0.48%	$196
SMS DATA PRODUCTS GROUP, INC	15	$62,379	2.60%	0.48%	$4,159
PLANETGOV INC	179	$35,862	1.50%	0.28%	$200
PEI ELECTRONICS, INC	21	$33,865	1.41%	0.26%	$1,613
M A FEDERAL, INC	189	$28,700	1.20%	0.22%	$152
INTELLIGENT DECISIONS, INC	199	$28,391	1.18%	0.22%	$143
INNOVATIVE SOLUTIONS & SUPPORT	1	$24,427	1.02%	0.19%	$24,427
CAMBER CORPORATION	5	$24,274	1.01%	0.19%	$4,855
TOP 10 SUBTOTAL	**1,995**	**$543,962**	**22.68%**	**4.20%**	**$3,623**

NAICS Code 334, Computer & Electronics: Top Ten Small Business Govt. Agencies in terms of Total Dollars

Contracting Agency	Number of Contract Actions	Total Dollars (000)	% of SM BUS NAICS Code 334 Total Dollars	% of NAICS (ALL BUS) Total Number of Dollars	Avg. Dollars (000)
DOD/DEPARTMENT OF THE NAVY	3,001	$540,518	22.54%	4.17%	$180
DOD/DEPARTMENT OF THE AIR FORCE	1,566	$384,903	16.05%	2.97%	$246
DOD/DEPARTMENT OF THE ARMY	1,966	$326,913	13.63%	2.52%	$166
DOD/DEFENSE LOGISTICS AGENCY	2,711	$195,080	8.13%	1.50%	$72
GSA/FTS ACQUISITION SERVICES DIVISION	659	$118,351	4.94%	0.91%	$180
DISA NATIONAL CAPITAL REGION	40	$50,013	2.09%	0.39%	$1,250
DEPT OF TREAS/INTERNAL REVENUE SERVICE	244	$43,539	1.82%	0.34%	$178
DEPT OF TREAS/U.S. CUSTOMS SERVICE	220	$38,767	1.62%	0.30%	$176
DEPT OF COMM/NAT OCEAN AND ATMOS ADMIN	230	$38,057	1.59%	0.29%	$165
DEPT OF JUST/DRUG ENFORCEMENT ADMIN	79	$37,577	1.57%	0.29%	$476
TOP 10 SUBTOTAL	**10,716**	**1,773,718**	**73.96%**	**13.68%**	**$309**
Total NAICS Code 334 Dollar Sum for all Contract Actions (000)					$2,398,087
NAICS Total (All Businesses) Number of Dollars (000)					$12,965,170

NAICS Code 334, Computer & Electronics: Contractor Summary (Contractors with >$800,000)

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
WORLD WIDE TECHNOLOGY, INC	428	$132,573	1	$310
GTSI CORP	639	$110,976	2	$174
FORCE 3 INC	319	$62,515	3	$196
SMS DATA PRODUCTS GROUP, INC	15	$62,379	4	$4,159
PLANETGOV INC	179	$35,862	5	$200
PEI ELECTRONICS, INC	21	$33,865	6	$1,613
M A FEDERAL, INC	189	$28,700	7	$152
INTELLIGENT DECISIONS, INC	199	$28,391	8	$143
INNOVATIVE SOLUTIONS & SUPPORT	1	$24,427	9	$24,427
CAMBER CORPORATION	5	$24,274	10	$4,855
GETRONICS GOVERNMENT SOLUTIONS	3	$23,871	11	$7,957
WESTWOOD COMPUTER CORP	202	$22,031	12	$109
SCIENTECH, INC	3	$21,698	13	$7,233
IMPACT INNOVATIONS GROUP LLC	52	$21,268	14	$409
EER SYSTEMS, INC	24	$18,624	15	$776
F E L CORPORATION	19	$18,466	16	$972
ASPECT COMMUNICATIONS CORPORAT	125	$17,699	17	$142
VIASAT, INC	20	$17,210	18	$861
GOVERNMENT ACQUISITIONS INC	79	$14,974	19	$190
USATREX INTERNATIONAL, INC	32	$14,416	20	$451
GLOBAL SATCOM TECHNOLOGY INC	6	$14,409	21	$2,402
SYLVEST MANAGEMENT SYSTEM CORP	53	$13,843	22	$261
SIPPICAN INC	42	$13,055	23	$311
COMTECH MOBILE DATACOM CORPORA	31	$12,796	24	$413
MYKOTRONX, INC	8	$12,211	25	$1,526
AMERICAN SCIENCE AND ENGINEERI	42	$11,796	26	$281
RED RIVER COMPUTER CO INC	79	$11,560	27	$146
TRANDES CORPORATION	86	$11,062	28	$129
COMPAQ COMPUTER CORPORATION	59	$11,061	29	$187
SECHAN ELECTRONICS, INC	11	$11,013	30	$1,001
SPECTRAL SYSTEMS INC	5	$10,749	31	$2,150
INFORMATION MANUFACTURING CORP	5	$10,536	32	$2,107
SNADER, R E & ASSOCIATES, INC	41	$10,371	33	$253
ADVANTOR CORPORATION	26	$10,174	34	$391
ORI SERVICES CORPORATION	5	$10,155	35	$2,031
DATALINE, INC	38	$10,038	36	$264
SCIENCE & TECHNOLOGY RESEARCH	4	$9,264	37	$2,316
FLIR SYSTEMS INC	26	$9,251	38	$356
CUSTOM MANUFACTURING & ENGINEE	4	$9,222	39	$2,306
TIMING SOLUTIONS CORPORATION	1	$8,994	40	$8,994

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
CONDOR PACIFIC INDUSTRIES, INC	19	$8,563	41	$451
LOGIS-TECH (INC)	6	$8,407	42	$1,401
RADIAN INC	75	$8,315	43	$111
SYTEL, INC	17	$8,105	44	$477
ION TRACK INSTRUMENTS, LLC	31	$8,084	45	$261
INTERNATIONAL BUSINESS MACHINE	3	$8,031	46	$2,677
BURLE INDUSTRIES, INC	15	$7,986	47	$532
B D SYSTEMS INC	17	$7,953	48	$468
FEDERAL TECHNOLOGY SOLUTIONS I	29	$7,710	49	$266
LAGUNA INDUSTRIES INC	12	$7,526	50	$627
EMERGENT TECHNOLOGIES INC	20	$7,453	51	$373
NAVCOM DEFENSE ELECTRONICS INC	23	$7,389	52	$321
ADVANCED COUNTERMEASURE SYSTEM	13	$7,351	53	$565
A C TECHNOLOGY INC	30	$7,341	54	$245
DYNAMIC SYSTEMS, INC	51	$7,312	55	$143
DOVALA, URBANCSIK & LARSON LLC	52	$7,215	56	$139
AMHERST SYSTEMS, INC	1	$6,949	57	$6,949
COMARK GOVERNMENT AND EDUCATIO	68	$6,826	58	$100
LAU ACQUISITION CORP	9	$6,787	59	$754
ZEL TECHNOLOGIES, L.L.C.	2	$6,683	60	$3,342
ANADAC, INC	16	$6,597	61	$412
GOVERNMENT TELECOMMUNICATIONS	44	$6,592	62	$150
COMTEQ FEDERAL, INC	51	$6,483	63	$127
PROMIA INC	1	$6,254	64	$6,254
CEW, INC.	78	$6,247	65	$80
TESTEK INC	6	$6,121	66	$1,020
SCIENTIFIC RESEARCH CORP	10	$6,089	67	$609
FUENTEZ SYSTEMS CONCEPTS INC	25	$6,021	68	$241
HERLEY INDUSTRIES, INC	39	$5,997	69	$154
BEYOND.COM	28	$5,949	70	$212
APPLERA CORPORATION	51	$5,842	71	$115
CHOCTAW MANUFACTURING & DEVELO	1	$5,741	72	$5,741
TRW INC	6	$5,738	73	$956
SIGCOM INC	14	$5,736	74	$410
TEC-MASTERS INC	34	$5,609	75	$165
COMMUNICATIONS SUPPLY CORPORAT	98	$5,578	76	$57
INTEGRATED CONSULTING SERVICES	2	$5,525	77	$2,763
SYMETRICS INDUSTRIES, INC.	6	$5,414	78	$902
INFORMATION SYSTEMS SUPPORT, I	47	$5,346	79	$114
DELTA SCIENTIFIC CORP	49	$5,145	80	$105
PRESIDIO CORPORATION, THE	32	$5,029	81	$157
MAXIMUS INC	14	$4,967	82	$355
GOVERNMENT MICRO RESOURCES INC	41	$4,965	83	$121
ADVANCED PROCESSING LABORATORI	4	$4,726	84	$1,182

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
SOFTMART, INC	37	$4,689	85	$127
CORNET TECHNOLOGY INC.	26	$4,633	86	$178
TRITON SERVICES INC	32	$4,616	87	$144
KEYLOGIC SYSTEMS INC	6	$4,545	88	$758
EDGE SYSTEMS, INC	38	$4,540	89	$119
DELTA INTERNATIONAL, INC	4	$4,481	90	$1,120
FLIR SYSTEMS BOSTON INC	46	$4,450	91	$97
WESCAM SONOMA INC	3	$4,338	92	$1,446
PHAOSTRON INSTRUMENT & ELECTRO	26	$4,311	93	$166
COMTECH COMPUTER & DATA SYSTEM	3	$4,268	94	$1,423
FIELDWORKS INC	4	$4,205	95	$1,051
BARRINGER INSTRUMENTS INC	34	$4,156	96	$122
IDENTIX PUBLIC SECTOR INC	29	$4,150	97	$143
HERLEY CHICAGO	1	$4,143	98	$4,143
COMPUTER EQUIPMENT WAREHOUSE,	51	$4,112	99	$81
DALET DIGITAL MEDIA SYSTEMS US	6	$4,085	100	$681
BRADLEY BROADCAST SALES INC	3	$4,056	101	$1,352
SYMVIONICS, INC	3	$4,036	102	$1,345
TRIVEC-AVANT CORPORATION	11	$3,988	103	$363
LYME COMPUTER SYSTEMS, INC	55	$3,927	104	$71
PALOMAR PRODUCTS, INC	7	$3,859	105	$551
DATANAMICS INC	2	$3,850	106	$1,925
CONDOR SYSTEMS INC	22	$3,828	107	$174
DARLINGTON INCORPORATED	6	$3,795	108	$633
TRIDENT SYSTEMS INCORPORATED	4	$3,777	109	$944
COASTAL ENVIRONMENTAL SYSTEMS	4	$3,774	110	$944
KOR ELECTRONICS INC	5	$3,753	111	$751
GEMINI ASSOCIATES INC	10	$3,696	112	$370
ELECTRONIC WARFARE ASSOCIATES	1	$3,646	113	$3,646
NLX CORPORATION	4	$3,570	114	$893
MARIPRO, INC	2	$3,567	115	$1,784
MANTECH SYSTEMS ENGINEERING CO	4	$3,552	116	$888
LEGEND MICRO, INC	4	$3,490	117	$873
POWER ENGINEERING & MANUFACTUR	1	$3,480	118	$3,480
MEGABYTE INTERNATIONAL CORPORA	50	$3,425	119	$69
S M F SYSTEMS CORPORATION	28	$3,424	120	$122
KAMPI COMPONENTS CO INC	83	$3,404	121	$41
CENTROID, INC	41	$3,335	122	$81
EXECUTIVE INFORMATION SYSTEMS,	39	$3,268	123	$84
M P D, INC	18	$3,237	124	$180
DRS COMMUNICATIONS CO LLC	13	$3,229	125	$248
M & A TECHNOLOGY INC	3	$3,215	126	$1,072
FDC TECHNOLOGIES, INC.	11	$3,211	127	$292
BLACK BOX CORPORATION OF PENNS	42	$3,142	128	$75
CIPRICO INC	11	$3,142	128	$286

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
G C MICRO CORPORATION	58	$3,073	130	$53
LEXEL IMAGING SYSTEMS INC	9	$3,056	131	$340
U C R-OHIO, INC	12	$3,056	131	$255
RODELCO ELECTRONICS CORP	33	$3,044	133	$92
JULLIEN ENTERPRISES LTD INC	21	$3,000	134	$143
METRICA INC	19	$3,000	134	$158
TALLA-COM TALLAHASSEE COMMUNIC	1	$2,996	136	$2,996
ATIR U S INC	4	$2,944	137	$736
ORODAY INC	15	$2,937	138	$196
RAYTHEON COMPANY INC	5	$2,907	139	$581
PROGRESSIVE SYSTEMS, LLC	1	$2,829	140	$2,829
SUNAIR ELECTRONICS INC	21	$2,796	141	$133
DIGITAL SYSTEM RESOURCES INC	8	$2,792	142	$349
MCBRIDE AND ASSOCIATES, INC	38	$2,746	143	$72
DYNALEC CORP	27	$2,724	144	$101
PERIPHONICS CORPORATION	11	$2,698	145	$245
EN-NET SERVICES, L.L.C.	27	$2,690	146	$100
INTERNATIONAL ENTERPRISES INC	10	$2,683	147	$268
ASSURANCE TECHNOLOGY CORP	2	$2,677	148	$1,339
RIX INDUSTRIES INC	7	$2,658	149	$380
SOFTMART GOVERNMENT SERVICES,	19	$2,657	150	$140
RADARSAT INTERNATIONAL INC.	4	$2,620	151	$655
FCN INC	19	$2,609	152	$137
KLUNE INDUSTRIES INC	5	$2,589	153	$518
STARMET CORPORATION	6	$2,584	154	$431
CAMPBELL PRECISION PRODUCTS CO	17	$2,563	155	$151
LEASING TECHNOLOGIES, INC	23	$2,549	156	$111
THOMAS ELECTRONICS INC	28	$2,540	157	$91
JORGE SCIENTIFIC CORPORATION	8	$2,538	158	$317
VARIAN MEDICAL SYSTEMS, INC	7	$2,537	159	$362
No data from ,	9	$2,527	160	$281
GENERAL MICROWAVE CORPORATION	6	$2,511	161	$419
PATRIOT TECHNOLOGIES INC	31	$2,466	162	$80
PROFESSIONAL PRODUCTS INC	30	$2,433	163	$81
TFAB HUNTSVILLE, LLC	4	$2,425	164	$606
MET ONE INSTRUMENTS INC	9	$2,421	165	$269
MEGA-TECH INCORPORATED	11	$2,416	166	$220
MILPOWER (INC)	5	$2,392	167	$478
MISSION RESEARCH CORPORATION	10	$2,374	168	$237
SUTRON CORPORATION	18	$2,364	169	$131
KAYSAM WORLDWIDE, INC.	11	$2,355	170	$214
CFSP INC	27	$2,331	171	$86
CRV INC	2	$2,312	172	$1,156
MICRO SYSTEMS INC	14	$2,311	173	$165
GENERAL NUCLEONICS, INC	5	$2,281	174	$456

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
FRONTLINE COMPUTER SYSTEMS INC	18	$2,259	175	$126
COMMONWEALTH TRADING PARTNERS	60	$2,216	176	$37
ITT INDUSTRIES, INC	5	$2,205	177	$441
ARMR SERVICES CORP	4	$2,201	178	$550
ADVANCED TESTING TECHNOLOGIES	8	$2,200	179	$275
DELL COMPUTER CORPORATION	16	$2,190	180	$137
NATIVE AMERICAN SYSTEMS, INC	14	$2,188	181	$156
ADVANCED PROGRAMING CONCEPTS,	6	$2,148	182	$358
OMNI TECH CORPORATION	18	$2,143	183	$119
TECHNICA CORPORATION	4	$2,139	184	$535
JESKELL INCORPORATED	14	$2,123	185	$152
DTC COMMUNICATIONS	20	$2,109	186	$105
QUALITY PERFORMANCE INC	6	$2,103	187	$351
SER SOLUTIONS, INC	1	$2,100	188	$2,100
NEW HEIGHTS INC	4	$2,077	189	$519
TREADWELL CORPORATION	20	$2,075	190	$104
FIBERTEK INC	6	$2,055	191	$343
HIGH PERFORMANCE TECHNOLOGIES,	3	$2,046	192	$682
COMMERCIAL DATA SYSTEMS INC	18	$2,037	193	$113
LOCKHEED MARTIN CORPORATION	5	$2,037	193	$407
GLOBAL MANAGEMENT SYSTEMS, INC	6	$2,032	195	$339
DIGITAL SYSTEMS GROUP, INC	3	$2,025	196	$675
AMPHENOL CORPORATION	19	$2,022	197	$106
MACKAY COMMUNICATIONS INC	18	$2,022	197	$112
AEGIS TECHNOLOGIES GROUP, INC.	6	$2,018	199	$336
CHESAPEAKE SCIENCES CORPORATIO	2	$2,017	200	$1,009
SCIPAR INCORPORATED	11	$2,009	201	$183
MONACO ENTERPRISES, INC	23	$2,005	202	$87
JARRETT TECHNOLOGY SOLUTIONS I	15	$1,999	203	$133
MICROWAVE ENGINEERING CORPORAT	27	$1,998	204	$74
P S I INTERNATIONAL INC	2	$1,967	205	$984
COMMUNICATION SYSTEMS TECHNOLO	5	$1,957	206	$391
SCIENCE AND ENGINEERING SERVIC	6	$1,948	207	$325
ENGINEERING SYSTEMS SOLUTIONS	8	$1,944	208	$243
TREASURY, UNITED STATES DEPT O	7	$1,939	209	$277
MADAH-COM, INC	6	$1,932	210	$322
DEUTSCH ENGINEERED CONNECTING	30	$1,918	211	$64
G & H TECHNOLOGY INC	10	$1,911	212	$191
U S DYNAMICS CORP	10	$1,909	213	$191
ARTEL INC	8	$1,901	214	$238
JATOM SYSTEMS INC	14	$1,885	215	$135
BENTHOS, INC	16	$1,883	216	$118
ALL-SOURCE PROCESSING INC	1	$1,871	217	$1,871
THOMCAST RADIO SYSTEM INC	1	$1,867	218	$1,867
TOTAL UPGRADE SOLUTIONS INC	11	$1,859	219	$169

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
ELECTROSONIC SYSTEMS, INC.	9	$1,852	220	$206
ANDREA ELECTRONICS CORPORATION	15	$1,849	221	$123
WESTELL, INC.	6	$1,848	222	$308
HOWELL INSTRUMENTS, INC	16	$1,834	223	$115
KULITE SEMICONDUCTOR PRODUCTS,	22	$1,814	224	$82
THERMOCONTROL INC	16	$1,810	225	$113
SONETRONICS INC	20	$1,786	226	$89
VISTA TECHNOLOGY SERVICES, INC	27	$1,783	227	$66
3D MARKETING LLC	1	$1,781	228	$1,781
WIRE ONE TECHNOLOGIES INC	22	$1,781	228	$81
FAX PLUS INC	22	$1,779	230	$81
OSBORNE, ALLEN ASSOCIATES INC	1	$1,769	231	$1,769
COMMUNICATIONS & POWER ENGINEE	4	$1,767	232	$442
PLANAR ADVANCE, INC	3	$1,760	233	$587
QUALITY TECHNOLOGY INC	1	$1,750	234	$1,750
DCX-CHOL ENTERPRISES, INC	9	$1,748	235	$194
PROGRESSIVE TECHNOLOGY FEDERAL	12	$1,748	235	$146
DATACOMM MANAGEMENT SCIENCES,	8	$1,742	237	$218
SIERRA NEVADA CORPORATION	2	$1,737	238	$869
NORTHERN NEF, INC	16	$1,731	239	$108
ABBA TECHNOLOGIES INC	18	$1,729	240	$96
EARTH SATELLITE CORPORATION	9	$1,700	241	$189
LOGISTICS ENGINEERING & ENVIRO	2	$1,689	242	$845
MULTIMAX INC	11	$1,664	243	$151
CAMMENGA & ASSOCIATES INC	3	$1,661	244	$554
X-COM, INC.	8	$1,652	245	$207
COMMUNICATIONS RESOURCE INC	18	$1,651	246	$92
JOHNSON, E.F. COMPANY	4	$1,651	246	$413
OCENCO INCORPORATED	4	$1,646	248	$412
FEDERAL NETWORK SERVICES INC	11	$1,623	249	$148
SPECPRO INC	7	$1,610	250	$230
LANDSEA SYSTEMS, INC	24	$1,600	251	$67
VIDEO DISPLAY CORPORATION	14	$1,588	252	$113
SOFTWARE HOUSE INTERNATIONAL,	19	$1,580	253	$83
OC INCORPORATED	5	$1,570	254	$314
ORMOND, INC	1	$1,570	254	$1,570
KING COMMUNICATIONS USA, INC	1	$1,566	256	$1,566
AUTODYNE MANUFACTURING CO INC	20	$1,555	257	$78
SECUREINFO CORP	12	$1,537	258	$128
VION CORPORATION	11	$1,535	259	$140
PHOTOTELESIS CORPORATION	4	$1,534	260	$384
FORTRAN CORPORATION	16	$1,524	261	$95
REX SYSTEMS INCORPORATED	26	$1,522	262	$59
CHENEGA TECHNOLOGY SERVICES CO	1	$1,519	263	$1,519
DIEZ SOFTWARE SERVICES, INC	19	$1,516	264	$80

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
SENSOR TECHNOLOGIES & SYSTEMS	3	$1,515	265	$505
OCEANTRONICS INC	17	$1,514	266	$89
CRITICOM INC	26	$1,511	267	$58
DATA VOICE INC	3	$1,500	268	$500
FEDERAL DATA CORPORATION	7	$1,500	268	$214
AVR ENTERPRISES, INC.	30	$1,499	270	$50
L.A. SYSTEMS, INC	10	$1,498	271	$150
TECH COMM INC	1	$1,487	272	$1,487
QSYSTEM COMPUTERS, INC.	15	$1,475	273	$98
WEST ELECTRONICS, INC	4	$1,467	274	$367
EDAC SYSTEMS INC	6	$1,463	275	$244
OSI FEDERAL TECHNOLOGIES	8	$1,455	276	$182
MARTEK COMMUNICATIONS INC	1	$1,452	277	$1,452
WILLIAMS ELECTRIC CO INC	11	$1,452	277	$132
ATLAS AERO CORPORATION, THE	15	$1,445	279	$96
WATERS CORPORATION	19	$1,445	279	$76
LOGICON INC	5	$1,442	281	$288
SILOSMASHERS, INC	9	$1,440	282	$160
GOLDEN ENGINEERING CO INC	4	$1,439	283	$360
ADAPTIVE DIGITAL SYSTEMS, INC	11	$1,437	284	$131
FORMATION INC	3	$1,432	285	$477
SENSOR TECHNOLOGY ENGINEERING,	2	$1,428	286	$714
DELA TECHNOLOGY CORPORATION	28	$1,424	287	$51
PHOTO-SONICS, INC	2	$1,423	288	$712
ECONCO BROADCAST SERVICE INC	9	$1,419	289	$158
ASTRO-MED INC	11	$1,416	290	$129
AERO INTERNATIONAL INC	19	$1,414	291	$74
SEA-BIRD ELECTRONICS INC	8	$1,407	292	$176
BIONETICS CORPORATION, THE	4	$1,392	293	$348
MICRO WAREHOUSE INC	11	$1,363	294	$124
AMETEK INC	12	$1,346	295	$112
CROWN INTERNATIONAL INC	2	$1,342	296	$671
H6 SYSTEMS INCORPORATED	1	$1,340	297	$1,340
AUDIOPACK TECHNOLOGIES INC	4	$1,338	298	$335
UNITED ELECTRIC SUPPLY CO INC	19	$1,330	299	$70
APPLIED ANALYSIS INC	5	$1,324	300	$265
CMA INC.	2	$1,294	301	$647
LEVIN PROFESSIONAL SERVICES, I	28	$1,289	302	$46
TEL-INSTRUMENT ELECTRONICS COR	4	$1,289	302	$322
LOGISTIC SERVICES INTERNATIONA	21	$1,287	304	$61
SUMMIT INDUSTRIES INC	19	$1,285	305	$68
JEMTEC ELECTRONIC CORPORATION	16	$1,283	306	$80
END TO END, INC	6	$1,279	307	$213
WINDERMERE INFORMATION TECHNOL	5	$1,267	308	$253
INLINE CORPORATION	12	$1,263	309	$105

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
DIGICON CORPORATION	12	$1,261	310	$105
MULTIPLEX INC	1	$1,261	310	$1,261
S S P SOLUTIONS, INC	12	$1,260	312	$105
PRAGMA SYSTEMS CORPORATION	9	$1,256	313	$140
AMRON INTERNATIONAL DIVING SUP	9	$1,253	314	$139
TELTRON TECHNOLOGIES INC	13	$1,248	315	$96
ROANWELL CORP	8	$1,234	316	$154
IMPACT SCIENCE & TECHNOLOGY	1	$1,231	317	$1,231
ROTHENBUHLER ENGINEERING CO IN	2	$1,229	318	$615
STG INC	5	$1,222	319	$244
ENVIRONMENTAL TECHNOLOGIES GRO	4	$1,218	320	$305
ARROWHEAD SPACE AND TELECOMMUN	1	$1,208	321	$1,208
BETTERTYPE RIBBONS INC.	9	$1,207	322	$134
ASTROCOM ELECTRONICS INC	15	$1,201	323	$80
OFUS INTERNATIONAL CORP	11	$1,198	324	$109
SPECTRO INC	9	$1,197	325	$133
TTK ASSOCIATES (INC)	3	$1,186	326	$395
LAB PRODUCTS INC	16	$1,180	327	$74
NEW ERA CONTRACT SALES INC	25	$1,179	328	$47
SOBRAN INCORPORATED	15	$1,178	329	$79
PROFESSIONAL SYSTEMS ASSOCIATE	14	$1,170	330	$84
SBC DATACOMM, INC	4	$1,169	331	$292
COMMUNICATIONS PRODUCTS INC	6	$1,157	332	$193
3-G INTERNATIONAL INC	6	$1,153	333	$192
VISIONICS CORPORATION	4	$1,153	333	$288
UNITEC SYSTEMS INC	9	$1,151	335	$128
BURNS REALCORP	2	$1,150	336	$575
STAR DYNAMIC CORP	5	$1,144	337	$229
SKC, INC.	4	$1,142	338	$286
VALWESTTECHNOLOGIES INC	5	$1,138	339	$228
CUBIC CORPORATION	13	$1,137	340	$87
BUNKER ELECTRONICS	6	$1,135	341	$189
APPLIED QUALITY COMMUNICATIONS	8	$1,131	342	$141
MILLER, R A INDUSTRIES INC	10	$1,131	342	$113
INTERNATIONAL TRANSDUCER CORP	8	$1,129	344	$141
CHADWICK-HELMUTH CO INC	5	$1,128	345	$226
ADVANCED COMPUTER CONCEPTS INC	23	$1,113	346	$48
BECKMAN COULTER INC	19	$1,113	346	$59
PACIFIC ELECTRONIC ENTERPRISES	12	$1,111	348	$93
CAMERON RUN GROUP INC	3	$1,104	349	$368
COMPUBAHN, INC	1	$1,101	350	$1,101
HARRIS ACOUSTIC PRODUCTS CORP	7	$1,097	351	$157
DIGITAL RECEIVER TECHNOLOGY IN	7	$1,096	352	$157
VISICOM LABORATORIES, INC	1	$1,096	352	$1,096
GOVERNMENT SCIENTIFIC SOURCE I	19	$1,092	354	$57

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
No data from D and B,	9	$1,092	354	$121
BLUE WAVE SYSTEMS INC	1	$1,091	356	$1,091
HICKLIN ENGINEERING LC	2	$1,091	356	$546
SECURE SYSTEMS, INC	2	$1,089	358	$545
VMIC, INC	12	$1,089	358	$91
HORIZONS TECHNOLOGY INC	5	$1,085	360	$217
GTAA. LLC	5	$1,082	361	$216
PILKINGTON OPTRONICS INCORPORA	1	$1,075	362	$1,075
HAMILTON ASSOCIATES INC	4	$1,072	363	$268
MKC ELECTRONICS INC	17	$1,072	363	$63
COMPUTER WORD PROCESSING SYSTE	22	$1,071	365	$49
RAITH USA, INC	1	$1,069	366	$1,069
DIGITAL ACCESS CORP	1	$1,062	367	$1,062
V & A INC	7	$1,062	367	$152
NEWS SPORTS MICROWAVE RENTAL I	13	$1,060	369	$82
LEKTRON INC	4	$1,059	370	$265
HYDRA-ELECTRIC COMPANY INC	16	$1,057	371	$66
REMEC INC	4	$1,052	372	$263
AMERICAN INDUSTRIAL X-RAY, INC	5	$1,050	373	$210
RUPPRECHT & PATASHNICK CO INC	5	$1,047	374	$209
KING NUTRONICS CORPORATION	10	$1,039	375	$104
FRONTIER ELECTRONIC SYSTEMS CO	8	$1,037	376	$130
SPEEDRING, INC	1	$1,030	377	$1,030
ASCHBACHER & ASSOCIATES, INC	19	$1,018	378	$54
ELECTRONIC SYSTEMS INC	15	$1,012	379	$67
METRATEK INC	2	$1,000	380	$500
SUPPORT SYSTEMS ASSOCIATES INC	10	$998	381	$100
MARSHALL COMMUNICATIONS CORP	9	$997	382	$111
NORTHROP GRUMMAN TECHNICAL SER	3	$989	383	$330
CAMPBELL SCIENTIFIC INC	16	$982	384	$61
GLOBAL MICROWAVE SYSTEMS INC	4	$982	384	$246
AEROSONIC CORPORATION	16	$978	386	$61
INTERCOMP CO INC	18	$974	387	$54
GIGA-TRONICS INCORPORATED	5	$968	388	$194
ERGOVIEW TECHNOLOGIES CORP	22	$967	389	$44
RAD PARTNERS LTD	14	$965	390	$69
DH INSTRUMENTS, INC	8	$964	391	$121
RICHARD MANUFACTURING CO INC	7	$961	392	$137
RUTA SUPPLIES INC	16	$954	393	$60
COALESCENT TECHNOLOGIES CORPOR	4	$950	394	$238
DRS PRECISION ECHO, INC	1	$950	394	$950
ARAMSCO, INC	6	$947	396	$158

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
MICRON GOVERNMENT COMPUTER SYS	21	$944	397	$45
ROWE DEINES INSTRUMENTS, INC	13	$944	397	$73
SBS TECHNOLOGIES INC	13	$944	397	$73
YORK TELECOM CORPORATION	10	$942	400	$94
LAVI SYSTEM INC	18	$941	401	$52
R F PRODUCTS, INC.	3	$939	402	$313
UNITED ELECTRIC CONTROLS COMPA	11	$938	403	$85
TGA TECHNOLOGIES INC	3	$934	404	$311
AV MARKETPLACE INC	5	$932	405	$186
HOFFMAN VIDEO SYSTEMS INC	12	$929	406	$77
T-CLARK AND ASSOCIATES LLC	6	$928	407	$155
FASTECH INC	12	$923	408	$77
SYRACUSE INTERNATIONAL TRADING	18	$923	408	$51
WOLF COACH INC	3	$923	408	$308
JAYCOR INC	4	$920	411	$230
MICROMASS INC	2	$919	412	$460
SEA CON PHOENIX, INC	7	$919	412	$131
MARINE SONIC TECHNOLOGY LTD (I	4	$918	414	$230
NEXTIRA FEDERAL LLC	10	$918	414	$92
Q E D INC	12	$918	414	$77
TRITON ELICS INTERNATIONAL	9	$917	417	$102
PACIFIC INSTRUMENTS INC	12	$915	418	$76
TRIMAN INDUSTRIES INC	20	$913	419	$46
SUNTURN	2	$911	420	$456
SEMITRONICS CORP	10	$905	421	$91
STARWIN INDUSTRIES INC	13	$905	421	$70
APPLIED SIGNAL TECHNOLOGY INC	8	$904	423	$113
KONTRON MOBILE COMPUTING	5	$897	424	$179
DALY COMPUTERS, INC	9	$895	425	$99
DATAMETRICS CORPORATION	6	$895	425	$149
CONCURRENT COMPUTER CORPORATIO	7	$892	427	$127
POWER PARAGON INC	10	$892	427	$89
INSIGHT TECHNOLOGY INC	11	$886	429	$81
TAFT BROADCASTING COMPANY, L L	3	$876	430	$292
OAI ELECTRONICS INC	13	$873	431	$67
VARIAN INC	14	$872	432	$62
CONTROL SCREENING L.L.C.	10	$871	433	$87
ENGINEERING & PROFESSIONAL SER	1	$871	433	$871
LECO CORPORATION	12	$868	435	$72
MISSION CRITICAL SOFTWARE, INC	5	$868	435	$174
COLUMBINE CABLE COMPANY INC	3	$864	437	$288
AIL SYSTEMS INC.	5	$858	438	$172
ORBIT INTERNATIONAL CORP	7	$858	438	$123
PERKINELMER INSTRUMENTS	2	$854	440	$427

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
HUNTRON INSTRUMENTS INC	8	$853	441	$107
MAST DISTRIBUTORS INC	1	$852	442	$852
VOSS SCIENTIFIC	3	$850	443	$283
WYANDOTTE TRIBAL PETROLEUM INC	2	$850	443	$425
DIGATRON, INC	3	$849	445	$283
SLYE, ROBERT ELECTRONICS INC	1	$845	446	$845
DRS PHOTRONICS, INC	1	$842	447	$842
KVH INDUSTRIES INC	5	$842	447	$168
PIONEER INDUSTRIES INC	19	$839	449	$44
MERCURY COMPUTER SYSTEMS INC	10	$835	450	$84
B T G, INC	4	$822	451	$206
COMPTECH CORPORATION OF MARYLA	17	$822	451	$48
OECO, LLC	11	$817	453	$74
CODEM SYSTEMS INC	4	$812	454	$203
DIAGNOSYS SYSTEMS INC	10	$812	454	$81
BUSINESS COMMUNICATION DISTRIB	12	$811	456	$68
PACIFIC STAR COMMUNICATIONS IN	12	$810	457	$68
AEROASTRO INC	5	$808	458	$162
BRIMAR INC	6	$808	458	$135
BOWMAR INSTRUMENT CORPORATION	7	$807	460	$115
AUDIO-VISUAL ASSOCIATES INC	12	$805	461	$67
KENDRO LABORATORY PRODUCTS	11	$804	462	$73
SABTECH INDUSTRIES INC	11	$801	463	$73
GRAND TOTAL	**8,569**	**$1,922,734**		**$582**

NAICS Code 334, Computer & Electronics: Govt Agency Summary (Govt Agency with >$800,000)

Contracting Agency	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
DOD/DEPARTMENT OF THE NAVY	3,001	$540,518	1	$180
DOD/DEPARTMENT OF THE AIR FORCE	1,566	$384,903	2	$246
DOD/DEPARTMENT OF THE ARMY	1,966	$326,913	3	$166
DOD/DEFENSE LOGISTICS AGENCY	2,711	$195,080	4	$72
GSA/FTS ACQUISITION SERVICES DIVISION	659	$118,351	5	$180
DISA NATIONAL CAPITAL REGION	40	$50,013	6	$1,250
DEPT OF TREAS/INTERNAL REVENUE SERVICE	244	$43,539	7	$178
DEPT OF TREAS/U.S. CUSTOMS SERVICE	220	$38,767	8	$176
DEPT OF COMM/NAT OCEAN AND ATMOS ADMIN	230	$38,057	9	$165
DEPT OF JUST/DRUG ENFORCEMENT ADMIN	79	$37,577	10	$476
OFFICE OF ACQUISITION MANAGEMENT	221	$36,315	11	$164
NATIONAL AERONAUTICS AND SPACE ADMIN	404	$27,254	12	$67
DEPT OF JUST/IMMIGRATION AND NATURAL. SVC	127	$24,833	13	$196
DEPT OF TRANS/COAST GUARD	214	$24,535	14	$115
DEPT OF JUST/FEDERAL BUREAU OF INVESTIGATION	168	$24,374	15	$145
GSA/FTS ACQUISITION TEAM	157	$22,587	16	$144
DEPT OF VETERANS AFFAIRS	226	$22,388	17	$99
SOCIAL SECURITY ADMINISTRATION	109	$19,376	18	$178
GSA/FTS CONTRACTING STAFF	133	$16,673	19	$125
DOD/AMERICAN FORCES INFORMATION SERVICE	167	$16,361	20	$98
NBC/ACQUISITION SERVICES DIVISION, SOUTHWEST	90	$16,135	21	$179
DOD/U.S. ARMY CORPS OF ENGINEERS (CIVIL)	255	$15,609	22	$61
DEPT OF JUST/FEDERAL PRISON SYSTEM	281	$15,030	23	$53
GSA/FTS TECHNICAL SERVICES DIVISION	101	$14,473	24	$143
DEPT OF COMM/PATENT AND TRADEMARK OFFICE	94	$12,189	25	$130
ADMINISTRATIVE SERVICES DIVISION	15	$12,124	26	$808
US ARY ROBERT MORRIS ACQUISTION CTR	53	$12,089	27	$228
DOD/U.S. SPECIAL OPERATIONS COMMAND	21	$11,776	28	$561
GSA/FTS TELECOM SERVICES DIVISON	29	$11,469	29	$395
DEPT OT TREAS/BUR ALCHOHOL, TOBACCO AND FIRE	62	$10,317	30	$166
NAVAL AIR WARFARE CENTER	28	$10,247	31	$366
DEPT OF HHS/NATIONAL INSTITUTE OF HEALTH	136	$9,875	32	$73
DEPT OF HHS/FOOD AND DRUG ADMINISTRATION	96	$9,811	33	$102
DEPARTMENT OF VETERANS AFFAIRS	72	$8,758	34	$122
DEPT OF COMM/OFFICE OF THE SECRETARY	7	$8,272	35	$1,182

Contracting Agency	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
OO-ALC/PKHC/LHKC	23	$8,028	36	$349
DEPT OF LABOR/EMPLOY AND TRAINING ADMIN	28	$7,614	37	$272
OFFICE OF CONTRACTS	16	$7,071	38	$442
DEPT OF JUST	59	$6,972	39	$118
DEPT OF AGRIC/OFFICE OF OPERATIONS	32	$6,424	40	$201
GSA/FTS FEDERAL SYSTEMS INTEGRATION CTR	25	$6,100	41	$244
DOD/DEFENSE MAPPING AGENCY	52	$5,521	42	$106
DEPT OF ENERGY	64	$5,235	43	$82
GSA/FTS CONTRACTING STAFF - ATLANTA	47	$4,968	44	$106
DEPT OF COMM/NAT INST STAND AND TECHNOL	57	$4,807	45	$84
INTERIOR FRANCHISE FUND	31	$4,737	46	$153
LS/ILC	44	$4,306	47	$98
IT ACQUISITION SERVICE CENTER	8	$3,948	48	$494
DEPT OF INTER/GEOLOGICAL SURVEY	65	$3,825	49	$59
DEPT OF HHS/HEALTH CARE FINANCING ADMIN	33	$3,783	50	$115
DEPT OF LABOR/PENSION AND WELF BENEF ADMIN	17	$3,693	51	$217
US ENVIRONMENTAL PROTECTION AGENCY	20	$3,577	52	$179
DEPT OF AGRIC/AGRIC STABILIZ AND CONS SVC	18	$3,566	53	$198
DEPT OF INTER/BUREAU OF LAND MANAGEMENT	46	$3,505	54	$76
DEPT OF AGRIC/FOREST SERVICE	48	$3,468	55	$72
DEPT OF AGRIC/AGRICULTURAL RESEARCH SERVICE	49	$3,457	56	$71
DEPT OF LABOR/MINE SAFETY AND HEALTH ADMIN	20	$3,314	57	$166
GSA/FTS OFFICE OF INFORMATION SECURITY	32	$3,245	58	$101
OFFICE OF INDIAN EDUCATION PROGRAMS	3	$3,171	59	$1,057
DOD/OFF OF SECRETARY OF DEF (EXC MIL DEPTS)	30	$3,129	60	$104
Contracting Office Name and Address	31	$3,126	61	$101
DEPT OF STATE	53	$3,018	62	$57
GSA/PUBLIC BUILDINGS SERVICE	39	$3,011	63	$77
DEPT OF LABOR/OCCUP SAFETY AND HEALTH ADMIN	19	$2,878	64	$151
DEPT OF TREAS/IMMED OFFICE OF THE SECRETARY	9	$2,873	65	$319
DEPT OF COMM/BUREAU OF THE CENSUS	42	$2,852	66	$68
DEPT OF TREAS/U.S. SECRET SERVICE	25	$2,824	67	$113
DEPT OF TREAS/FINANCIAL MANAGEMENT SERVICE	19	$2,740	68	$144
CONTRACTS AND PURCHASING OPERATION	23	$2,592	69	$113
DEPT OF JUST/OFFICE OF JUSTICE PRGMS	17	$2,583	70	$152
DEPT OF TREAS/BUREAU OF THE PUBLIC DEBT	34	$2,418	71	$71

Contracting Agency	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
DOD/DEFENSE THREAT REDUCTION AGENCY	16	$2,279	72	$142
FEDERAL CORRECTIONAL INSTITUTION OTISVILLE	2	$2,205	73	$1,103
ER ACQUISITION & GRANTS BRANCH	18	$2,204	74	$122
DEPT OF AGRIC/FARMERS HOME ADMINISTRATION	10	$2,011	75	$201
US ARMY ROBERT MORRIS ACQUISTION CTR	27	$1,998	76	$74
GSA/FSS GENERAL PRODUCTS ACQUISITION CTR	26	$1,952	77	$75
DOD/DEPENDENTS SCHOOLS	21	$1,932	78	$92
PROCUREMENT & SUPPORT SERVICES DIV./FEDSIM	11	$1,849	79	$168
DEPT OF INTER/US FISH AND WILDLIFE SERVICE	33	$1,765	80	$53
EXECUTIVE OFFICE OF THE PRESIDENT	17	$1,747	81	$103
DEPT OF AGRIC/OFF OF FINANCE AND MANAGEMENT	12	$1,656	82	$138
FEMA	25	$1,565	83	$63
GSA/FSS OFC SUP CTR - OFFICE EQUIPMENT	22	$1,451	84	$66
DEPT OF LABOR/BUREAU OF LABOR STATS	9	$1,412	85	$157
FEDERAL CORRECTIONAL INSTITUTION LA TUNA	1	$1,399	86	$1,399
MSC NAVY FLEET AUZILIARY FORCE	6	$1,366	87	$228
DEPT OF INTER/MINERALS MANAGEMENT SERVICE	7	$1,300	88	$186
NUCLEAR REGULATORY COMMISSION	11	$1,263	89	$115
OFFICE OF PERSONNEL MANAGEMENT	14	$1,230	90	$88
DEPT OF INTER/BUREAU OF INDIAN AFFAIRS	8	$1,220	91	$153
UNITED STATES PENITENTIARY TERRE HAUTE	1	$1,213	92	$1,213
DEPT OF TRANS/FEDERAL HIGHWAY ADMIN	18	$1,158	93	$64
FARM SERVICES AGENCY	2	$1,116	94	$558
BUREAU OF INT'L NARCOTICS & LAW ENFORCEMENT	10	$1,084	95	$108
DEPT OF LABOR/OFF ASST SEC ADMIN AND MGMT	7	$1,056	96	$151
DEFENSE FINANCE & ACCOUNTING SVC, CLEVELAND	4	$1,049	97	$262
SECURITIES AND EXCHANGE COMMISSION	11	$1,024	98	$93
DEPT OF TRANS/RESEAR AND SPEC PRGMS ADMIN	18	$972	99	$54
NASA	21	$923	100	$44
DEPT OF INTER/BUREAU OF RECLAMATION	26	$918	101	$35
MID-ATLANTIC REGIONAL CONTRACTING OFFICE	6	$888	102	$148
DEPT OF AGRIC/FOOD AND NUTRITION SVC	3	$865	103	$288
SOUTH EAST REGIONAL CONTRACTING OFFICE	3	$849	104	$283

Contracting Agency	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
CENTRAL REGION ADMINISTRATIVE CENTER, DALLAS	9	$840	105	$93
PENTAGON RENOVATION MANAGMENT	4	$824	106	$206
NIFC/PURCHASING&CONTRACTING	7	$820	107	$117
OFFICE OF INFORMATION SERVICE CENTER	6	$817	108	$136
GSA/FSS FURNITURE SYSTEMS MGT DIV	13	$804	109	$62
GRAND TOTAL	**15,625**	**$2,385,991**		**$24,162**

NAICS Code 334: Contract Action Summary

Contract Action	Number of Contract Actions	% of Small Business Contract Actions (NAICS Code 334)	Total Dollars (000)	% of Total Small Business Dollars (NAICS Code 334)	Avg. Dollars (000)
ORDER UN FSC	4,818	29.68%	$803,716	33.51%	$167
ORDER UN IDC	2,860	17.62%	$536,624	22.38%	$188
SIMP ACQ PROC	5,747	35.41%	$348,765	14.54%	$61
NEW DEF CONT	743	4.58%	$262,814	10.96%	$354
MODIFICATION	1,070	6.59%	$259,436	10.82%	$242
ORDER UN MAC	708	4.36%	$144,595	6.03%	$204
ORDER UN BOA	242	1.49%	$41,115	1.71%	$170
INIT LTR CONT	21	0.13%	$10,406	0.43%	$496
DEF LTR CONT	5	0.03%	$2,085	0.09%	$417
TERM FOR DEF	1	0.01%	$128	0.01%	$128
TERM FOR CONV	16	0.10%	-$11,597	-0.48%	-$725
GRAND TOTAL	**16,231**		**$2,398,087**		**$1,207,159**

NAICS Code 334, Computer & Electronics:
SIMP ACQ PROC Contract Action by Contractor with >$800,000

Contractor Name	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
GTSI CORP	101	$11,384	1	$113
KEYLOGIC SYSTEMS INC	6	$4,545	2	$758
AMERICAN SCIENCE AND ENGINEERI	4	$3,601	3	$900
KAMPI COMPONENTS CO INC	82	$3,373	4	$41
CEW, INC.	59	$3,111	5	$53
TALLA-COM TALLAHASSEE COMMUNIC	1	$2,996	6	$2,996
FORCE 3 INC	23	$2,970	7	$129
M & A TECHNOLOGY INC	2	$2,843	8	$1,422
COMTEQ FEDERAL, INC	16	$2,705	9	$169
SER SOLUTIONS, INC	1	$2,100	10	$2,100
COMPUTER EQUIPMENT WAREHOUSE,	42	$1,923	11	$46
JOHNSON, E.F. COMPANY	2	$1,641	12	$821
MARTEK COMMUNICATIONS INC	1	$1,452	13	$1,452
LOGICON INC	4	$1,407	14	$352
DYNALEC CORP	20	$1,309	15	$65
CENTROID, INC	27	$1,231	16	$46
DELA TECHNOLOGY CORPORATION	26	$1,206	17	$46
NEW ERA CONTRACT SALES INC	25	$1,179	18	$47
REX SYSTEMS INCORPORATED	20	$1,133	19	$57
SBC DATACOMM, INC	3	$1,104	20	$368
HERLEY INDUSTRIES, INC	21	$1,097	21	$52
WORLD WIDE TECHNOLOGY, INC	16	$1,072	22	$67
SONETRONICS INC	14	$1,029	23	$74
ASCHBACHER & ASSOCIATES, INC	19	$1,018	24	$54
HOWELL INSTRUMENTS, INC	11	$1,010	25	$92
UNITEC SYSTEMS INC	8	$993	26	$124
RODELCO ELECTRONICS CORP	16	$992	27	$62
MICROWAVE ENGINEERING CORPORAT	17	$976	28	$57
RED RIVER COMPUTER CO INC	15	$964	29	$64
COMMERCIAL DATA SYSTEMS INC	9	$947	30	$105
MARINE SONIC TECHNOLOGY LTD (I	4	$918	31	$230
TRIMAN INDUSTRIES INC	20	$913	32	$46
SUNTURN	2	$911	33	$456
SUMMIT INDUSTRIES INC	17	$904	34	$53
SYRACUSE INTERNATIONAL TRADING	17	$881	35	$52
PIONEER INDUSTRIES INC	19	$839	36	$44
LAVI SYSTEM INC	16	$833	37	$52
M A FEDERAL, INC	9	$819	38	$91
GRAND Total	**715**	**$70,329**		**$362**

Note: The codes of Contract Action in this table are all "'SIMP ACQ PROC".

NAICS Code 334, Computer & Electronics: SIMP ACQ PROC Contract Action by Govt. Agency with >$800,000

Contracting Agency	Number of Contract Actions	Total Dollars (000)	Total Dollars RANK	Avg. Dollars (000)
DOD/DEFENSE LOGISTICS AGENCY	1,863	$91,739	1	$49
DOD/DEPARTMENT OF THE NAVY	1,218	$73,688	2	$60
DOD/DEPARTMENT OF THE ARMY	720	$48,120	3	$67
DOD/DEPARTMENT OF THE AIR FORCE	420	$28,566	4	$68
NATIONAL AERONAUTICS AND SPACE ADMIN	180	$10,798	5	$60
NBC/ACQUISITION SERVICES DIVISION, SOUTHWEST	35	$10,278	6	$294
GSA/FTS ACQUISITION SERVICES DIVISION	141	$7,161	7	$51
DOD/U.S. ARMY CORPS OF ENGINEERS (CIVIL)	137	$5,552	8	$41
DEPT OF TRANS/COAST GUARD	48	$5,246	9	$109
DEPT OF TREAS/U.S. CUSTOMS SERVICE	17	$4,080	10	$240
DEPT OF HHS/NATIONAL INSTITUTE OF HEALTH	73	$3,936	11	$54
US ARY ROBERT MORRIS ACQUISTION CTR	23	$2,758	12	$120
DEPT OF COMM/NAT INST STAND AND TECHNOL	35	$2,394	13	$68
DOD/DEFENSE INFORMATION SYSTEMS AGENCY	14	$2,091	14	$149
DEPT OF HHS/FOOD AND DRUG ADMINISTRATION	34	$2,010	15	$59
INTERIOR FRANCHISE FUND	11	$1,949	16	$177
PROCUREMENT & SUPPORT SERVICES DIV./FEDSIM	11	$1,849	17	$168
DISA NATIONAL CAPITAL REGION	10	$1,834	18	$183
DEPT OF COMM/NAT OCEAN AND ATMOS ADMIN	37	$1,805	19	$49
DEPT OF VETERANS AFFAIRS	44	$1,749	20	$40
DEPT OF JUST/FEDERAL BUREAU OF INVESTIGATION	36	$1,716	21	$48
DEPT OF STATE	36	$1,687	22	$47
DEPT OT TREAS/BUR ALCHOHOL, TOBACCO AND FIRE	23	$1,646	23	$72
OFFICE OF INDIAN EDUCATION PROGRAMS	2	$1,605	24	$803
LS/ILC	24	$1,463	25	$61
DEPT OF ENERGY	24	$1,451	26	$60
DEPT OF AGRIC/FOREST SERVICE	15	$1,356	27	$90
DOD/DEFENSE MAPPING AGENCY	9	$1,328	28	$148
DOD/AMERICAN FORCES INFORMATION SERVICE	29	$1,310	29	$45
DEPT OF HHS/HEALTH CARE FINANCING ADMIN	15	$1,292	30	$86
US ARMY ROBERT MORRIS ACQUISTION CTR	18	$1,243	31	$69
DEPT OF COMM/PATENT AND TRADEMARK OFFICE	16	$1,200	32	$75
DEPT OF TREAS/U.S. SECRET SERVICE	8	$1,176	33	$147
DEPT OF INTER/GEOLOGICAL SURVEY	22	$1,116	34	$51
DOD/OFF OF SECRETARY OF DEF (EXC MIL DEPTS)	12	$1,038	35	$87
DEPT OF INTER/BUREAU OF LAND MANAGEMENT	20	$1,021	36	$51
OFFICE OF ACQUISITION MANAGEMENT	16	$970	37	$61
DEPT OF AGRIC/AGRICULTURAL RESEARCH SERVICE	20	$937	38	$47
NAVAL AIR WARFARE CENTER	18	$896	39	$50
DEPT OF INTER/US FISH AND WILDLIFE SERVICE	16	$823	40	$51
GRAND TOTAL	**5,450**	**$332,877**		**$169,164**

Appendix C
Interview Guidelines

I. Overview

1. Please discuss the volume of business you do annually with the federal government. Dollar value? Growth?

2. What percentage of your total business does this represent?

3. How many different government agencies do you sell to?

4. Please describe generally the different products or services that you sell to the federal government.

5. When did your firm start selling to the federal government?

6. To what extent do you rely on the tools of e-business in selling to the federal government?

   i. What volume of sales to the federal government do you do via e-procurement vs. paper-based procurement?

   ii. What volume do you do via simplified acquisition procedure?

7. What is the average dollar value of contracts you currently have with the federal government?

8. How many contracts does your firm typically have at one time with the federal government?

9. To what extent do you engage in e-commerce with other customers or suppliers?

10. Did you do business with other firms electronically first before doing business with the government electronically?

11. What products or services does your firm sell in addition to what you sell to the federal government?

II. E-Commerce

1. What tools of e-commerce do you use on a routine basis?

   EDI
   EFT
   JIT inventory processes

Ordering on line
Selling on-line
Auctions
Others

2. Describe the advantages of doing business electronically.

3. Can you place a value on these benefits? Do they outweigh the costs?

4. Describe the disadvantage of doing business electronically.

5. What investments in technology have you made in order to do business electronically?

6. What was the cost of those investments?

7. Did it include staff costs?

8. What is your average IT investment per employee?

9. Do you view this investment as having had a better, average or worse return than a typical investment made by your firm?

III. E-Procurement

1. Do you or someone in your firm regularly monitor Fed Bizops? Do you or someone in your firm monitor any other on-line information source regarding federal procurement opportunities? Which ones?

2. Have you had to make any investments in technology specifically to engage in electronic procurement with the federal government? What was the approximate cost? Was it worth the investment?

3. Please describe the benefits of engaging in e-procurement? What are the three greatest benefits of using e-procurement?

4. Does e-procurement enhance your ability to compete for government business? How?

   i. Has it helped you automate the transaction process of selling to the federal government?

   ii. Has it allowed you to broaden your markets, i.e., to sell to others to whom you could not previously sell?

5. Do you know who your primary competitors are in selling to the government?

6. Are they large firms or small firms?

7. Has your firm participated in any reverse auctions held by government agencies?

   i. If yes, describe your experience with them.

8. Has your firm participated in any of the "trial" on-line procurement programs such as GSA Advantage, ITSS, or DLA/DMLSS?

   i. If yes, describe your experience with these programs.

9. Are you aware of any of the recent legislative changes affecting the federal procurement regulations?

   i. FARA - Are you aware of FACNET?

   ii. FASA

   iii. Others, e.g., SBRA goal of 23% of federal business to small firms

   iv. Please discuss these changes and how they have affected your firm's ability to compete for federal acquisition dollars.

10. Do you believe the federal government is more efficient in how it conducts its acquisition business today as compared with 5 years ago?

11. Please explain why your firm is classified as a small business for contracting purposes.

   i. Has your firm ever qualified as both a large and small business during the same fiscal year with the federal government?

   ii. If yes, please describe when and why your firm qualified as different size entities with the federal government during the same fiscal year?

   iii. If you answered yes to question 11 (ii) above, what percentage of your business with the federal government is conducted as a small business? A large business?

   iv. If you answered yes to question 11 (ii), please describe the advantages and disadvantages of qualifying as either a small or large business when doing business with the federal government?

IV. Barriers

1. Does your firm face any technological challenges to doing business electronically with the federal government?

    i. If yes, please describe these challenges.

    ii. How do you access the Internet?

2. Do you believe the federal acquisition regulations are too complex, easy to understand, or too simple?

3. Are certain government agencies easier to work with than others? Why?

4. Has doing business electronically made the procurement process easier for your firm?

    i. How and why (yes or no)?

5. Does your firm face any constraints in the marketplace to doing business with the federal government?

6. Do you believe other firms have adopted e-commerce processes more rapidly than your firm? If yes, why?

7. Have you had to make organizational or strategic changes in your business as a result of engaging in e-procurement or e-commerce?

    i. Please describe those changes.

8. Has the recent economic downturn affected your ability to compete for federal procurement dollars?

9. Does your firm have any concerns regarding security or privacy in doing business over the Internet?