Impact of B2B E-procurement Systems – A Summary Report

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1. Introduction

Business-to-business (B2B) e-Commerce technologies and electronic markets are emerging as the critical infrastructure of modern Web-enabled organizations. The Internet and the World Wide Web (WWW) provides a cost-effective mechanism for organizations to engage in search, negotiation, coordination, transactions and collaboration in their global supply chains. The WWW is increasingly being used to integrate and manage business processes across traditional firm boundaries to create an "extended enterprise" for the firm and its business partners. In this rapidly evolving e-commerce environment, one of the critical challenges facing supply chain managers is assessing the value and impact of B2B e-commerce systems on their organizations. Unlike traditional information technology systems, Web-based systems are *transformational and enabling infrastructures,* and understanding its role in organizational performance is important in developing effective e-commerce strategies. This paper presents the results of a national survey of B2B e-procurement practices conducted by the Department of Business Administration at the University of Illinois at Urbana-Champaign. The main focus of this research is to assess the impact of e-procurement on key operational and strategic measures of the procurement function and to understand the key drivers of e-procurement value.

2. Details of the study

2.1 Sample

Our sample focuses on organizations using e-procurement for indirect materials procurement in order to maximize the range of process characteristics available for analysis. Indirect materials procurement processes range from the very simple office supplies purchases to the most complex capital equipment purchases. Moreover, for any given type of indirect purchase, the process characteristics and procedures are not significantly different across different firms. A mailing list of purchasing managers was obtained from the Institute of Supply Management. The mailing list was constructed based on SIC industry codes representing manufacturing firms (SIC codes 20 through 39). Their purchases encompass a wide range of product types, including MRO items, industrial supplies, equipments, office products and supplies, and services.

The data for this study were obtained from the procurement manager or the most senior manager involved in procurement for a strategic business unit (SBU) within a firm. To insure informed judgments respondents should be fully knowledgeable about the procurement function and its performance, both before and after the implementation of e-procurement. Procurement managers are usually the most knowledgeable when it comes to the key performance metrics and the impact of e-procurement. To obtain more reliable responses, the procurement managers were asked to respond to the questions with regard to their strategic business unit, which was defined as a unit with its profit and loss responsibilities. Where it was not possible to identify a strategic business unit, the most senior procurement manager for the organization was selected. The returned questionnaires were screened based on whether the firm or strategic business unit used e-procurement.

The unit of analysis for this study is the purchase type or category. Organizations group purchases of products into similar categories, as it helps them to establish uniform procedures and business rules for a category, instead of for each product or transaction. Hence, for example, all office stationery, including paper clips, printing paper, and other stationery items, are grouped in a category called "office-supplies". We expect the impact of e-procurement to be similar for transactions within each category and different across categories. Using product category as the

unit of analysis also helps us understand the impact of e-procurement more precisely than aggregating the data for all purchases.

2.2 Survey and sample characteristics

A survey questionnaire was developed on a university Web server and the survey web-link was emailed to 4167 potential respondents inviting them to participate. Names of purchasing managers were obtained from the Institute of Supply Management. Based on the "undelivered" messages received, approximately 667 emails were considered as unreachable and eliminated from the distribution list. From the remaining respondents (N=3500), a total of 968 responses were received (27.6% response rate). Of these responses, 207 were incomplete with respect to most of the fields. The number of respondents who indicated that they do not have an e-procurement system was 350. The number who indicated that they have an e-procurement system was 410, which were the responses included in the analysis. The sample characteristics according to the business type, volume of non-production purchases and volume of production purchases are shown in figures 1 through 3.
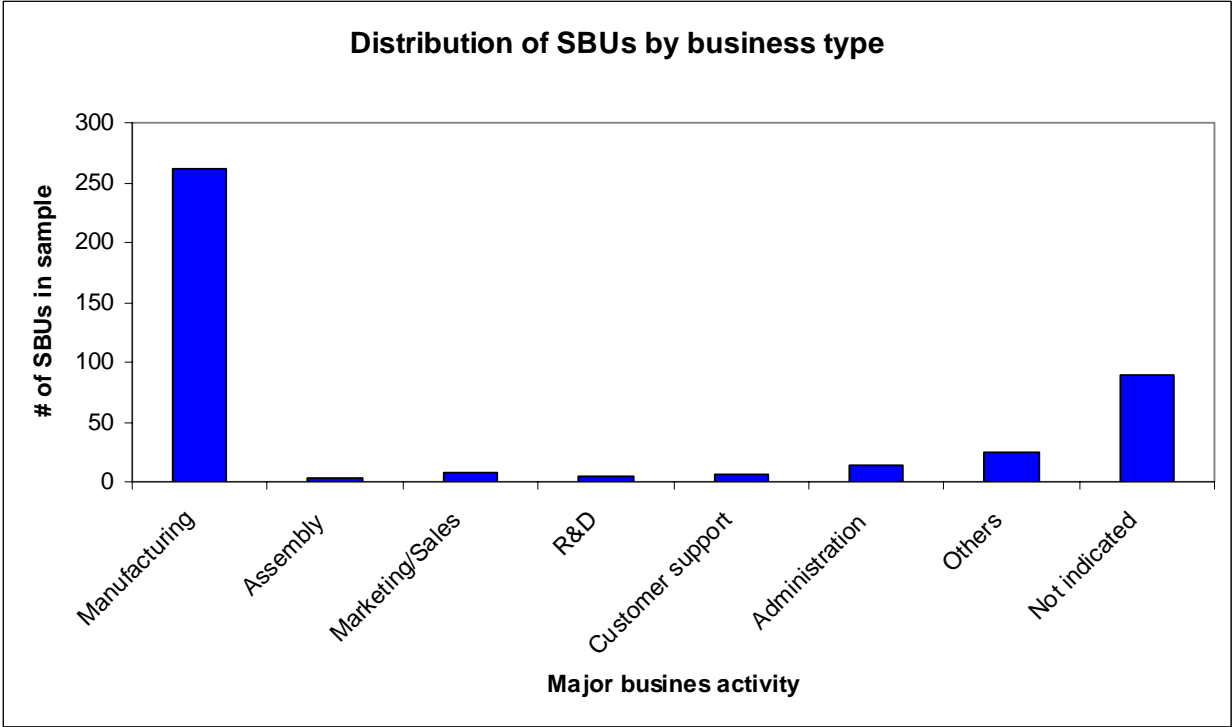

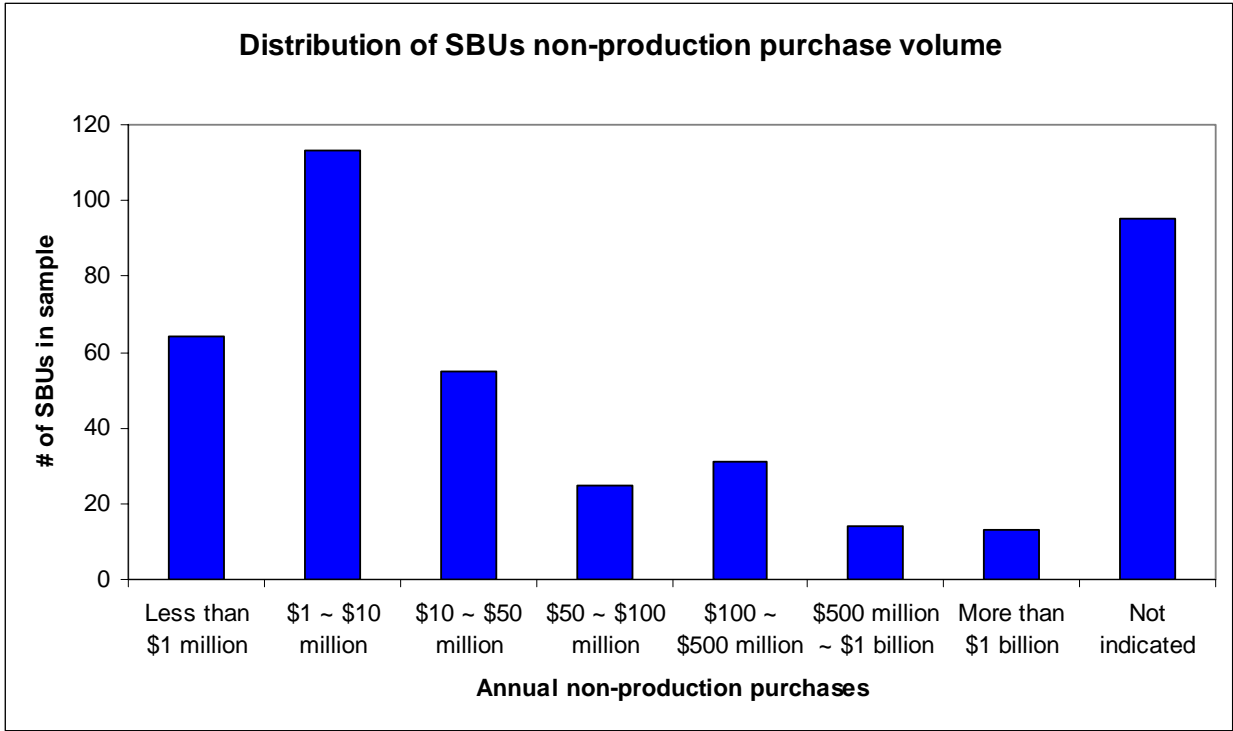Figure 1. Distribution of SBUs by major business activity

Figure 2. Distribution of SBUs by volume of non-production purchases
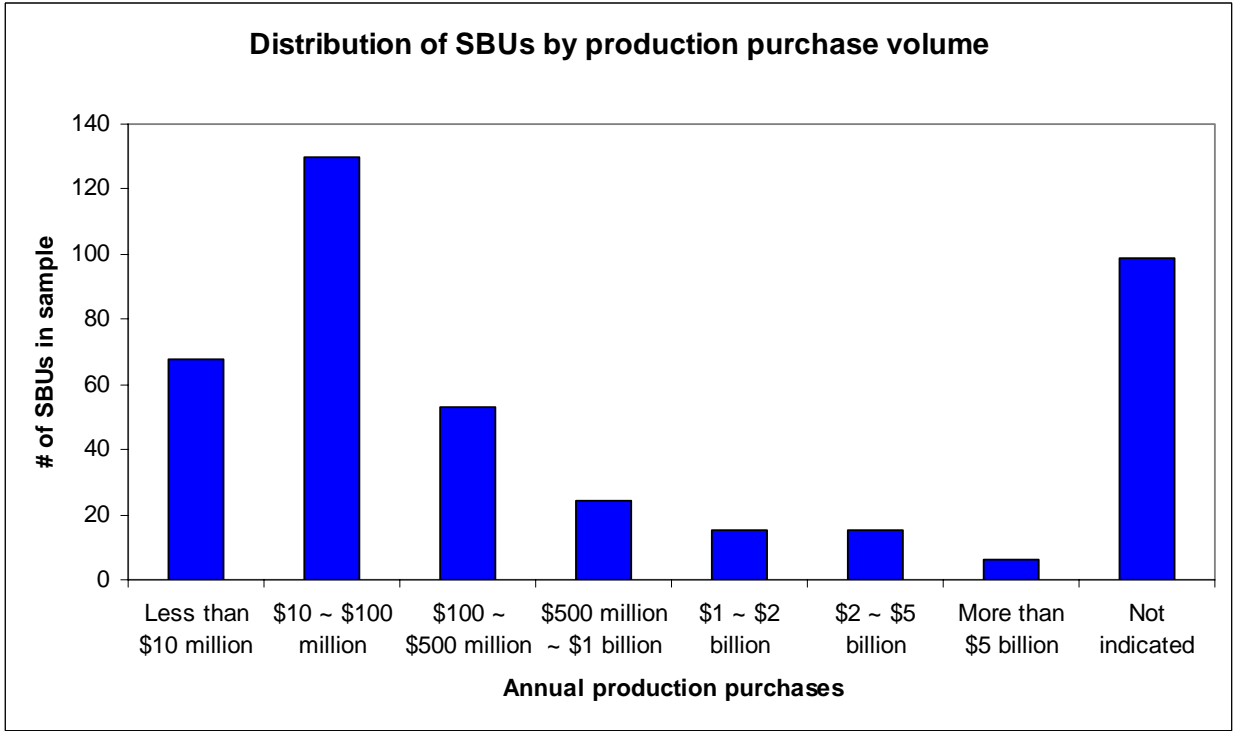

Figure 3. Distribution of SBUs by volume of production purchases

The distribution of SBUs in the sample indicates that most firms are classified as small to medium sized firms with respect to their procurement volume. To verify any bias in the sample using e-procurement systems, we compared their characteristics with the SBUs that do not have e-procurement systems, on the basis of the distribution of major business type, production purchase volume and non-production purchase volume. The statistical tests suggest that SBUs without e-procurement systems are similar to the group of SBUs with e-procurement system. *This is interesting as it shows that e-procurement implementation is not dependent on the size of the firm* as it is for other major IT projects, such as EDI. The current report focuses on SBUs with e-procurement systems.

Figure 4 shows the distribution of SBUs in our sample for which the procurement managers indicated the top purchase category. As we can see, office supplies form the top e-procurement purchase category for a large number of SBUs, a trend that has been observed in previous e-procurement studies. But, unlike the dominance of office supplies purchases found in earlier studies, our survey also shows that the categories of purchases are getting more evenly distributed among purchases types, reflecting the growing use of e-procurement system implementation for all indirect purchases.
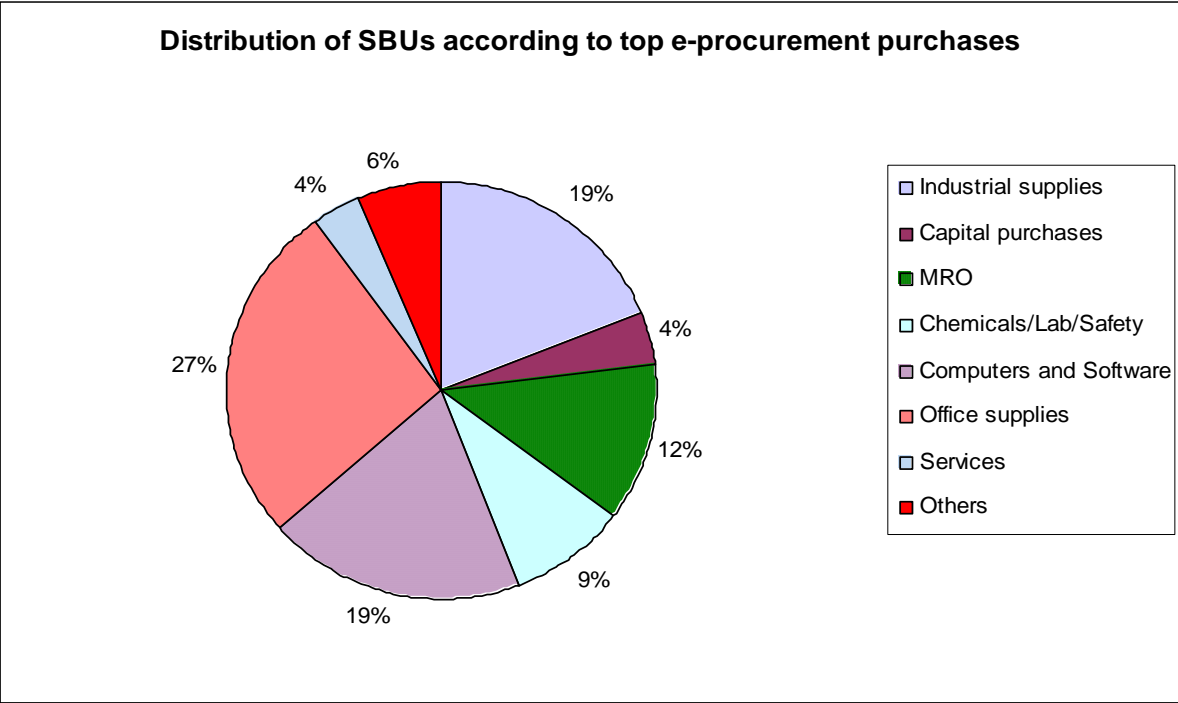

Figure 4. Distribution of SBUs according to top purchase type

3. Impact of e-procurement

In this section we will summarize the impact of e-procurement implementation on procurement operations and performance measures. We first present the results with respect to the participation of users and suppliers in e-procurement and the effect of e-procurement on centralization in the procurement function. Following this, we present the impact of e-procurement on operational and strategic performance measures.

3.1 Participation of users and suppliers

Organizations implementing e-procurement systems are concerned with the level of acceptance of the system both by the internal users and the suppliers. In e-procurement, without adequate number of users purchasing through the system, suppliers may not be motivated to offer more of their products online or provide better deals to corporations using e-procurement. On the other hand, without adequate participation by suppliers, users have no incentive to use the e-procurement system. The indicator of user participation is the percentage of users within the SBU who use e-procurement for their non-production purchases. The indicator of supplier participation is the percentage of the supplier's products that are made available through the e-procurement system. This could be done either through the supplier's online website or through the e-catalog maintained by the buyer organization. Figure 5 illustrates the level of user and supplier participation among the SBUs in the sample.
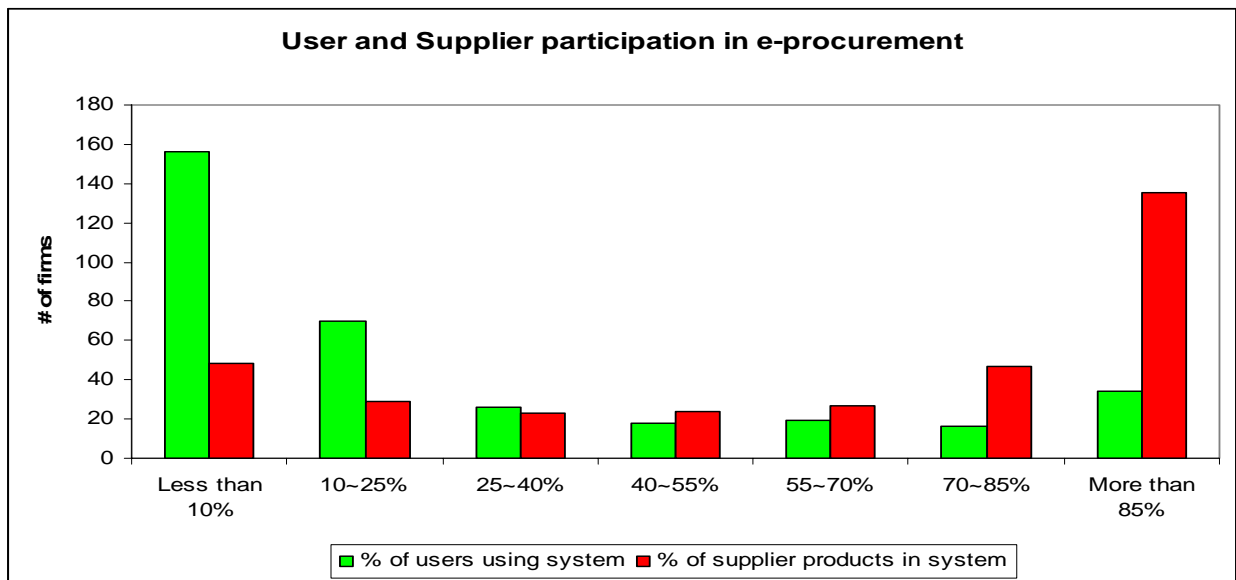

Figure 5. User and supplier participation in e-procurement

The survey results show an interesting contrast between the participation of users and suppliers. On average 55%~70% of the supplier's products are made available through the e-procurement systems in the SBUs, but only about 10~25% of users in the SBUs are using e-procurement for their purchases. Thus, while there is a critical mass of suppliers participating in e-procurement, there is still resistance from the buyers in using e-procurement. Our analysis shows that B2B managers should focus more on motivating more of their internal users to participate in e-procurement and maintain the current high level of participation of their suppliers.

3.2 Increase in centralization

A key objective of SBUs in moving to e-procurement is to consolidate and leverage organizational spending power and to rationalize supplier relationships. This is achieved by centralizing the procurement information and control, while giving the flexibility to end-users to find the product and supplier that best match their needs. However, there were no studies prior to this one that actually measured the increase in centralization and correlated it with e-procurement benefits. Figure 6 shows the level of centralization in the SBUs before and after e-procurement.
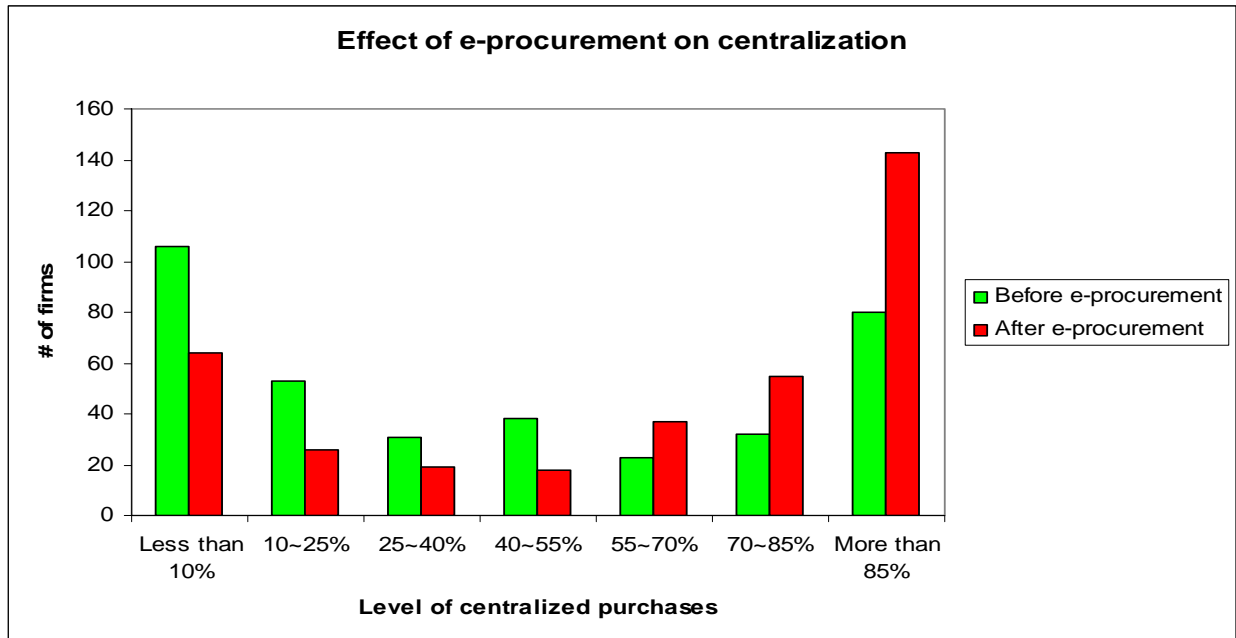

Figure 6. Effect of e-procurement on procurement centralization

We can see a general trend of increased centralization after use of e-procurement. Further, our analysis indicates that increase in centralization is directly related to the level of benefits from e-procurement system. Our results also suggest that the benefits of increased centralization are realized more by the SBUs that have used e-procurement for more than a year. It could be that SBUs need some time to consolidate their procurement information available through the e-procurement system in order to benefit from the centralized information.

3.3 Impact of e-procurement on operational measures

E-procurement systems provide both operational and strategic benefits. The operational benefits are related to improving the efficiency of the procurement process and thereby reducing the total costs of procurement. Several metrics are used in the current study to measure operational efficiency (cycle-time savings, errors savings, and staff savings. In addition, we measure the impact of e-procurement on inventory and on "maverick" buying[1]. Reduction in cycle time and the better availability of purchasing information through e-procurement system should help managers plan better and reduce their inventories. Also, the centralized control of purchase procedures through e-procurement system is expected to reduce the maverick buying. Figure 7 shows the impact on the five operational measures.
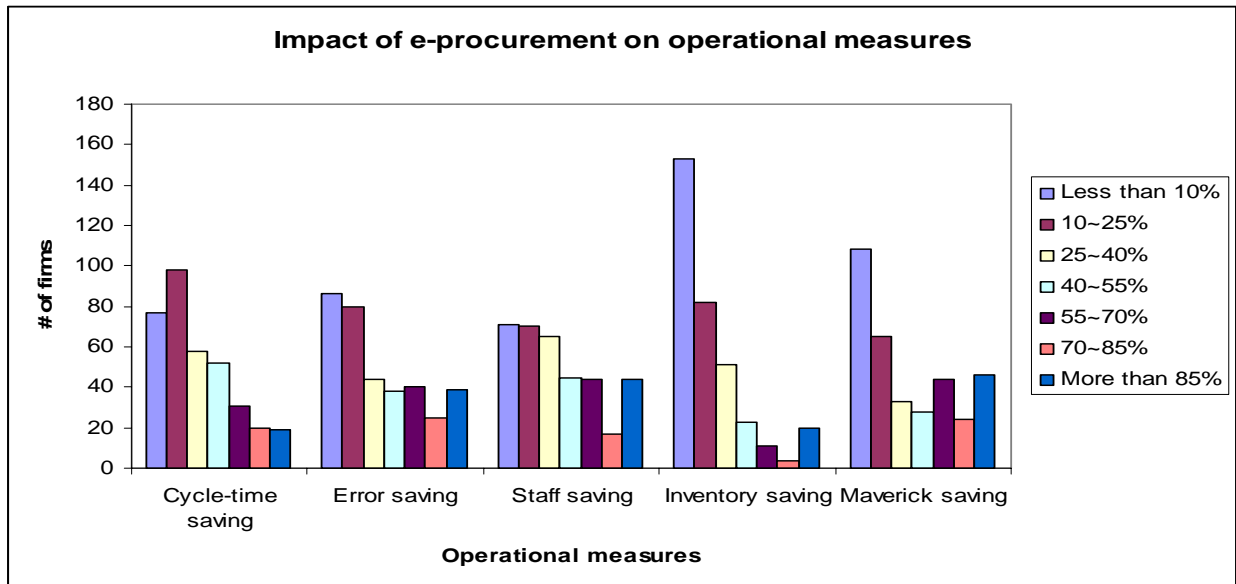

Figure 7. Impact of e-procurement on operational measures

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[1] Maverick buying, or "off-contract" buying refers to purchases made without a purchase order and outside of negotiated supplier contracts.

The top operational benefits in the sample of SBUs are the reduction in procurement errors and reduction in maverick purchases. About 33% of the respondents reported an average error reduction of 40% or more. Also, about 33% of respondents say that maverick purchases in their SBUs had reduced by 40% or more after implementing e-procurement. The percentage of SBUs who realized 70% or more reduction in errors and maverick purchases is about 15%, which is a significant achievement by the SBUs who have implemented e-procurement.

The other major operational benefit from e-procurement is the reduction in staff time required to process procurement transactions. About $1/3^{rd}$ of the respondents say that their SBUs realized a reduction of 40% or more in staff needs for procurement after implementing e-procurement, with about 15% SBUs realizing a reduction of 70% or more in staff needs.

The effect of e-procurement on reduction of indirect materials inventory has been less significant than that of other benefits. About 36% of the SBUs reported a reduction of less than 10% in the inventory of their top purchase category. One of the possible reasons could be that inventory policies are set by supply chain managers based on various other business factors, and that the cycle time reduction and process efficiency provided by e-procurement system are yet to be reflected in the inventory policies. Given that one of the anticipated impacts of e-procurement is inventory reduction, SBUs should look carefully at their inventory policies and leverage the centralized procurement information available through the e-procurement system.

3.4 Impact of e-procurement on strategic measures

Beyond the operational benefits, most supply chain managers are interested in the effect of e-procurement on the bottom-line, i.e., their SBUs' procurement performance. The major indicators of performance are procurement costs, product quality, supplier delivery performance, and user satisfaction. We measured the impact of e-procurement on these measures on an 8-point scale that included "negative impact", "no impact", "moderate impact", and "significant impact". In addition, a major anticipated benefit of e-procurement is the ability to achieve significant reduction in the price paid for the goods and services. Hence, we also measured the

extent of price reduction achieved by SBUs for their top purchase categories. The results are shown in figures 8 and 9.
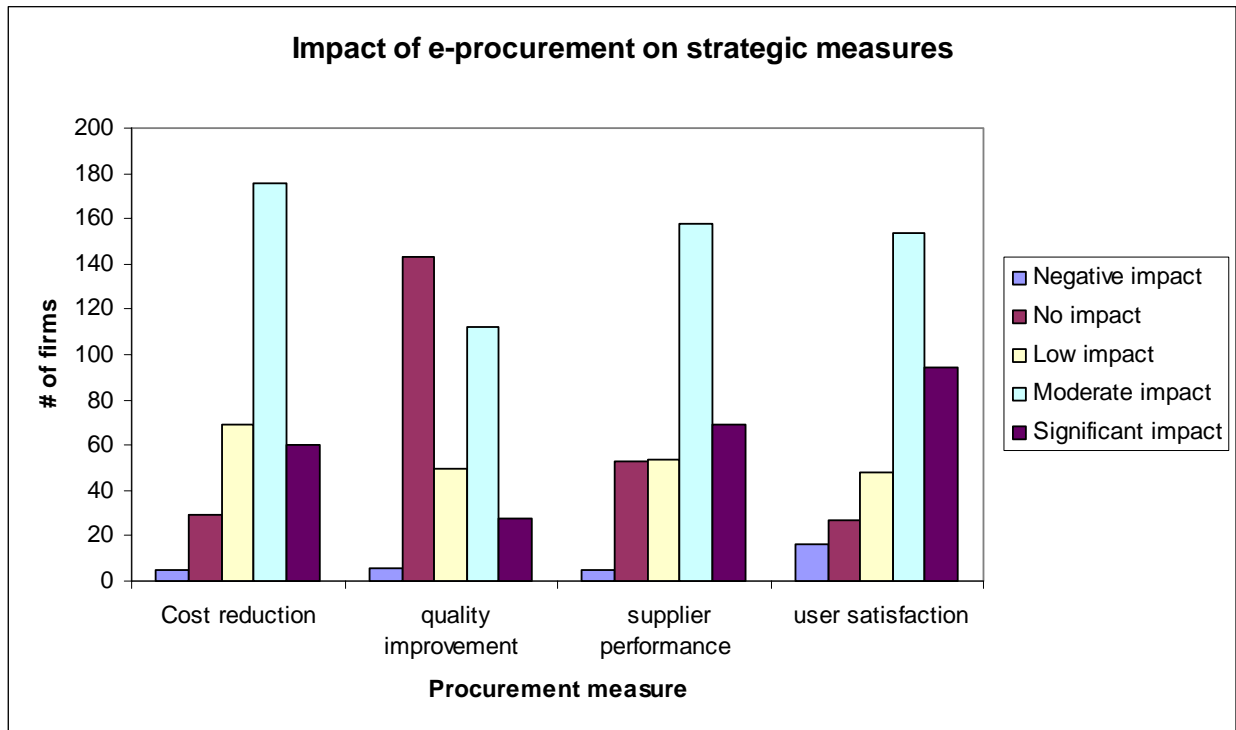

Figure 8. Impact of e-procurement on strategic measures

The impact of e-procurement on the strategic objectives is moderate as seen by the mean response for each strategic measure. User satisfaction is the most influential (mean of 4.25 on a 7-point scale, which translates to slightly above "moderate" impact), while the impact of product quality is least (mean of 2.75, which translates to "low" impact). About 58% of SBUs say that e-procurement has a moderate or significant impact on their user satisfaction, with about 22% reporting "significant" impact. Conversely, only about 32% of SBUs say that e-procurement had a moderate or significant impact on the quality of their top purchase category, with just 6.5% reporting "significant" impact. It is important to note that 33% of the SBUs say that e-procurement had "no" impact on the quality of their top purchase category, for which the data was collected in the survey.

A very encouraging sign for B2B managers implementing e-procurement systems is the very low percentage of SBUs that report any negative impact of e-procurement on their strategic

measures. Except for quality, other measures are positively impacted by e-procurement for the large majority of SBUs in our sample.

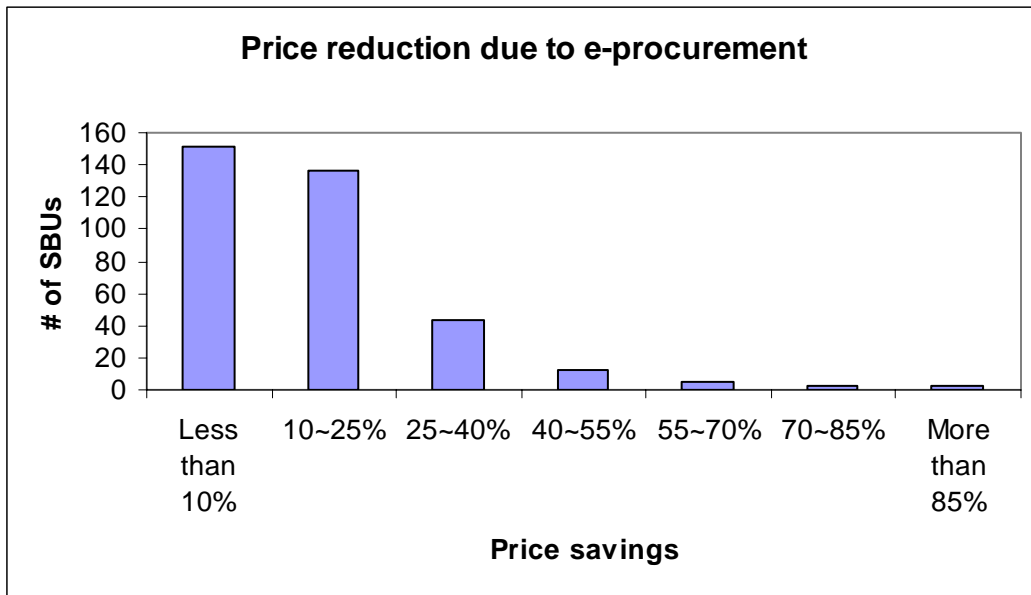**Price reduction due to e-procurement**

Figure 9. Average price savings realized from e-procurement

Firms using e-procurement expect to obtain price reductions in two ways by: (1) electronically consolidating their procurement information across several business units and negotiating better price and volume discounts, and (2) using e-markets and increasing price-competition among their suppliers. While in our study, we did not differentiate the means by which the price reduction was obtained, it is clear that most organizations have only realized small reductions in the price savings. About 67% of the SBUs achieved less than 25% reduction in item prices, with about 35% realizing less than 10% price reduction. Thus, our survey shows that very few firms have been able to get the spectacular price reductions reported in many of the trade literatures. However, we also find from our analysis that the length of time that e-procurement has been in use has an impact on price benefits. Among SBUs which had e-procurement for less than a year, only 13% of them realized price savings of 25% or more. But among SBUs which had e-procurement for more than a year, about 23% of them realized price savings of 25% or more, suggesting that SBUs which have been using e-procurement longer are likely to realize more price benefits.

It is important to note that the dollar volume of price savings achieved is also important and depends on the purchase volume of the SBU. Another important issue worth mentioning is that the price reductions are one-time benefits and organizations cannot expect to realize the same level of savings every cycle. Trying to increase competition among suppliers to unreasonable levels will drive out competent suppliers and leads to only poor quality suppliers in the field. Hence, organizations should focus on reducing the high price they are paying due to the inefficiencies in their demand management and not try to squeeze the suppliers out of the markets. Further, organizations must use e-procurement for better process management and process control.

4. Conclusion

Our study has shown that e-procurement has a positive impact on the procurement performance measures in most organizations. Among the operational measures, reduction in errors and maverick buying are most significantly affected by e-procurement. The strategic measure that is most impacted by e-procurement is user satisfaction. Given that the users in the SBUs have been dealing with inefficient and cumbersome manual systems, e-procurement has definitely made their purchasing easier. An interesting finding from our study is that e-procurement has resulted in an increase in purchase centralization for most SBUs. The impact of the increase in centralization on the operational and strategic measures will be an interesting issue to address in future research.