A Study to Determine Effective Supply Chain Management Strategies For Decentralized Parts Procurement At Boeing Commercial Airplanes in Everett, Washington

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Abstract

This paper provides an overview of a research project that determined effective supply chain tactics and purchasing strategies in support of the decentralized procurement of airplane parts at Boeing Commercial Airplanes (BCA) in Everett, Washington. A number of strategic decisions over the past decade have resulted in the delegation of the external purchasing function from a centralized procurement organization into separate supply chain management groups segregated by product or manufacturing division. Each of the current airplane manufacturing lines at the Everett site (747, 767, and 777) has a separate external purchasing group and management structure. This type of decentralized structure brings about challenges as well as opportunities to the procurement function. A challenge typical to any sort of decentralized effort is to ensure that processes, in this case supply chain and purchasing processes, are standardized across multiple divisions.

Certain tactics and approaches should lead to successful supply chain management performance within a decentralized organization structure. To discover these strategies, this research project reviews some of the existing literature on the subject and administers a survey to a group of procurement professionals within the BCA supply chain. The results of the survey are then discussed. Recommendations regarding supply chain management strategies, as well as suggested areas for further study, conclude the research paper.

Contents

Statement of Problem

Introduction

Successful organizations understand that the business environment is constantly changing. They recognize that the dynamic forces of the post-industrial, information-based, global economy interact in complex and often unpredictable ways. Organizations continuously balance a vast array of priorities, stakeholder expectations, and increasing social responsibilities. Many go beyond mere "profit maximization" and instead look to "value maximization." In the face of such invariable factors for change, there is tremendous pressure to be constantly improving products and processes. While traditional methods may have worked well in the past, today's environment effectively makes it unlikely that such methods will bring similar success in the future. Senge (1990) observes that if traditional organizations wish to survive, they need to move towards a culture that values innovation, empowerment, and trust, becoming a "learning organization." In response, many organizations completely reengineer how they conduct business operations, both internally and out in the marketplace.

During periods of organizational change and reengineering efforts, structure is impacted by the strategic decisions that are made. Boeing Commercial Airplanes (BCA) is one such company that has made a number of strategic process reengineering decisions and related restructuring decisions over the past decade. To shake off years of "legacy" systems and functional-based processes, an organization initiative that began in 1996 has led to a complete change in how the company controls the airplane build process. BCA has shifted to a strategy that is very similar to the Toyota lean production system, but applied on a much larger scale to customized airplane manufacturing. It is based upon improving efficiency, eliminating waste, and implementing lean manufacturing techniques that reduce cost. Specifically, organizational initiatives have focused on standardizing the airplane configuration and build process by investing in common

engineering systems, investing in enterprise resource planning (ERP) software, reducing process flow times, and encouraging the integration of separate disciplines into cross-functional product build teams that support manufacturing.

All of these strategic decisions over the past decade have resulted in the delegation of the external purchasing function from a centralized procurement organization into many separate supply chain management groups that are segregated by product or manufacturing division. Within BCA Everett, the trend towards increasing decentralization has placed supply chain management professionals into a new paradigm. Like many other large organizations, the procurement operations at BCA had been centralized for many years. This central organization had been responsible for the procurement of all airplane parts for all of the Puget Sound airplane manufacturing lines. As a result, all administrative work and logistics for purchasing activities had been combined under one organization. Economies of scale in purchasing activities had been leveraged in interactions with outside suppliers.

Now, however, each of the current airplane manufacturing lines at the Everett site (747, 767, and 777) has a separate external purchasing group and management structure. This new decentralized structure has given each airplane program the capability to control its own supplier management and purchasing activities. Atkinson (2005) observes that "today's procurement role is much more cross-functional and involves working with various parts of the enterprise in a much more project-based strategy" (np). In the same manner, the leadership role of procurement within each decentralized area at BCA Everett is rapidly increasing, and project management skills are more critical.

Research Issue

In light of the above background information, this research project seeks to determine effective supply chain tactics and purchasing strategies in support of the decentralized procurement of airplane parts at Boeing Commercial Airplanes (BCA) in Everett, Washington. As Gaither (1996) observes, "organizations tend to go through cycles of decentralization and centralization, and purchasing has been caught up in these cycles" (p. 569). The current cycle occurring at BCA is one of increasing decentralization, for the reasons noted above, and this strategic decision impacts the purchasing function.

A decentralized structure brings about new challenges to the procurement professionals involved. In such an environment, the purchasing personnel at Boeing often must satisfy different manufacturing requirements for different airplane programs. At the same time, they must strive to maintain overall consistency, control, and communication with the supply base. Some might say these are diametrically opposed activities and cannot be reconciled. In response, eight challenges are identified during this study as impacting the development of effective supply chain management strategies in a decentralized environment. Some of them are previously identified by earlier research; however, some are the creation of this author in specific relationship to BCA Everett. The eight disadvantages of decentralization identified in this study are as follows:

1. Economies of scale in purchasing activities and supplier management are lowered.
2. Standardization of the materials being purchased is decreased.
3. Standardization of the procurement processes being used is diminished.
4. Duplication in administrative work is increased.
5. Consistent and integrated communication with the supply base is more difficult.

6. Control over enterprise purchasing commitments is lessened.
7. Internal flow of information is more complex.
8. Increase in internal competition for organizational resources (personnel, capital, equipment, information and time) between business units.

These eight challenges are discussed in detail during the survey methodology, data analysis and findings, and recommendations that follow. It is appropriate to mention them now so that the full extent of the research problem and goals are defined for the reader.

Research Design

In order to address the research problem and accomplish the research goals stated above, the paper is organized into specific sections. Each section builds upon the prior one. Besides the preceding introduction and statement of problem, the paper consists of a review of existing literature regarding organization structure, decentralization and supply chain management. In addition, the paper describes a survey created by the author and administered to a sample population of procurement professionals. A survey methodology section discusses this data collection approach in detail, and captures both the structure and deployment process of the survey. In the data analysis and findings section, the survey results are condensed and an investigation is provided. The resulting synthesis with the literature review builds to a summary and recommendations about effective supply chain management strategies in a decentralized operational environment. Finally, areas for future study and action are identified and the research paper is concluded.

The steps of the survey design process for the paper are as follows:

1. Define population.
2. Identify sample.
3. Create instrument to measure data (survey).
4. Deploy survey.
5. Collect survey results.
6. Summarize results and provide recommendations.

More details of this process are captured below after the literature review section in the survey methodology section.

Literature Review

Definition of Supply Chain Management

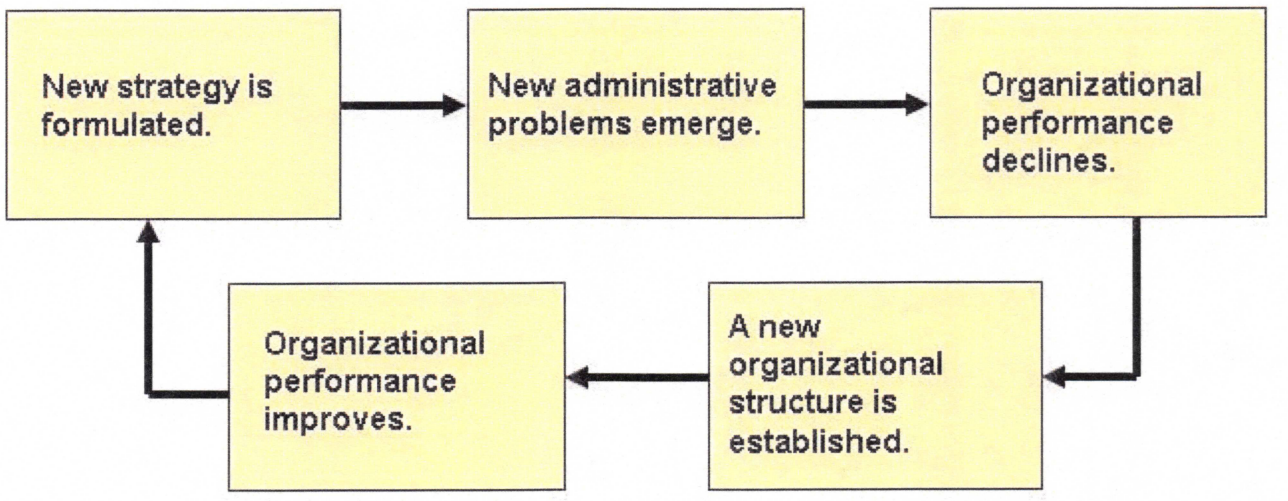
The functional discipline of purchasing has been known by many names over the history of modern enterprise. Terms such as buying, procurement, materials management, logistics management, and now supply chain management are used to describe the various interactions between a firm and its supply base. Smock (2002) provides some comments on the proliferation of titles among buyers in the U.S., confirming that the term "supply chain manager" is definitely the current industry title. All of these different descriptions illustrate that the traditional realm of purchasing and organizational buying activity has expanded into various technical job categories, with each playing a different role in the overall supplier management activities of a large business. For example, at BCA, the purchasing aspects of buying airplane parts are currently divided between two separate job roles, the Procurement Agent and the Supply Chain Analyst. A Procurement Agent handles contractual negotiations and overall supplier health management, while a Supply Chain Analyst is responsible for the daily ordering and scheduling of parts, transportation logistics, and shipment coordination and tracking.

Stanley (1993) links the purchasing department structure to purchasing performance, in the process defining supply chain management as "an integrative approach to dealing with the planning and control of material flows from suppliers to end users" (p. 211). Stanley also observes that modern purchasing, or supply chain management, needs a greater depth of involvement in strategic formulation. In fact, "purchasing can be seen in a boundary-spanning role, communicating with organizations involved in the supply chain and at the same time meeting the needs of other functions within the firm, their customers" (p. 211). This is a valuable description of the current role of supply chain management, and relates directly to questions of organization structure and the research topic of this paper.

Structure and Strategy in Relationship to Decentralization

Prior to discussing further specific supply chain management literature, it is beneficial to provide a short segment about the interaction between structure and strategy. As David (1997) observes, there are seven basic types of organizational structure: functional, divisional by geographic area, divisional by product, divisional by customer, divisional by process, strategic business unit, and matrix. All of these types are essentially a form of decentralization except for the first functional type. David (1997) also points out that "structure undeniably can and does influence strategy" (p. 223). David cites Chandler (1962), who previously demonstrates that certain sequences between different structural types are often repeated in modern enterprises as organizations grow and change strategy over time. Chandler begins his model with strategy dictating the structure, but then shows that it can loop back. A strategy and structure relationship diagram provided by David (Figure 1) is based upon Chandler's observations and illustrates this concept:

Figure 1: Chandler's Strategy-Structure Relationship



Clearly, strategy and structure are both affected by each other, although sometimes it may take awhile for changes in one to follow changes in the other. Strategy affects the direction of any organizational structural changes, particularly in regards to major decisions such as decentralization.

Many other large companies with multiple divisions and different products and services have gone through periods of decentralization at some point in their history. An example is General Motors in the 1920's (Crainer and Dearlove, 2003; Chandler, 1962). Boeing Commercial Airplanes (BCA) is no exception and has recently embarked on a series of strategic steps to structurally decentralize all support personnel, including supply chain management, by airplane product or manufacturing line. As Bauer (2003) observes in relationship to the information technology function, decentralization in an organization tends to create efficiencies in local business units and provide more control, better cost allocation, and faster, more flexible responses to needed changes. Even so, Bauer also observes that decentralization brings with it higher total procurement costs, accountability issues, and greater difficulty in presenting a unified presence to suppliers and outside organizations. Clearly, these structural observations from the information technology function also relate to supply chain management. As a result, Bauer's observations above are utilized in the formation of the survey elements discussed in detail below.

Stanley (1993) observes that there are specific dimensions of organization structure that can directly impact the performance of the firm and especially the purchasing function. These areas are the degree of centralization, the degree of formulation, and the organization size and complexity. As the topic of this paper involves identifying strategies for decentralized parts procurement at BCA Everett, the dimension of centralization discussed by Stanley is particularly

important. Stanley (1993) continues by listing the advantages of centralization of the buying decision process. Among these advantages are: economies of scale in combining order quantities, greater standardization over the materials being purchased, a decrease in administrative duplication, and increased control over purchase commitments.

In addition, Stanley (1993) provides some advantages of decentralized purchasing. Included in Stanley's list are: buyers are closer to the situation and understand the local needs of the community, the response time to manufacturing needs may be quicker and of higher quality, and the performance of a specific product or division can be better measured by the local procurement organization. This research from Stanley illustrates the specific effects of the organizational structure decision on the purchasing department.

Supply Chain Management and Decentralization

Before proceeding to the survey methodology and results, it is helpful to briefly discuss more of the literature that relates directly to the subject of decentralized supply chain management. While a significant amount of literature exists on the general subjects of structure and supply chain management, surprisingly little has been found that is focused solely on the specific topic of looking for strategic decentralized supply chain solutions that can minimize the inherent challenges present in such a structure. Because the paper is focused on discovering specific recommendations that will improve the coordination and collaboration of decentralized supply chain management groups at a particular company, the following perspectives from existing literature are identified. These are shared in this section to provide insight into the many challenges of decentralized purchasing, and to identify current research on this subject before proceeding to the survey methodology and results.

By using models and calculations, Chen (1999) proposes some solutions to the problem of information delays in decentralized supply chains. While reduced information sharing is common to any sort of decentralized organization structure, Chen considers the specific supply chain impact of such information delay upon inventory cost and accurate demand information. Chen proposes an incentive-based performance measurement scheme intended to encourage each department to make decisions that are in the best interests of the overall organization. In short, by aligning the cost interests and accounting measurement expectations of the various decentralized areas under one comprehensive organizational inventory plan, it may be possible to reduce "irrational behavior" by one member of the supply chain. Chen (1999) illustrates the value of standardizing and enforcing expectations when it comes to sharing information and aligning interests between decentralized purchasing departments.

Dawes, Dowling, and Lee (2000) take the information sharing and control issue in supply chain management a step further by examining the effect of decentralization, formalization, and spatial differentiation (that is, geographic distance) in complex technological purchasing situations. They look specifically at how much information control is available to individual buyer representatives within complex, decentralized supply chain networks. Among other variables, they observe that buyers in multiple decentralized organizations are more likely to communicate directly to one another than to use any kind of "focal individual" (p. 383). As the firm becomes more decentralized, individual buyers have greater autonomy, and "focal individuals," such as senior management, will have less informal information control. In respect to decentralized organizations, Dawes, et al. concludes that particular individuals in positions of power within the purchasing organization (e.g. management) will have greater difficulty in controlling the flow of information. The paths of communication are just too expansive. Rather than being controlled

by certain gatekeepers of information, communication among buyer center experts (e.g. supply chain professionals) in a decentralized environment is much more emergent and open, like a network or web.

The continued trend towards more information sharing of supply and demand information throughout modern organizations has led some researchers to ask whether this diffusion inherently calls for decentralized decision-making in all procurement efforts. Vagstad (2000) analyzes the connection between the degree of information dispersion in government procurement and the optimal decision structure (centralized or decentralized). If open communication is occurring, Vagstad points out, then an increased importance upon information sharing can actually be an argument for centralization, not decentralization, of purchasing decisions. Vagstad also observes that an overall alignment of objectives is essential for decentralization to be a viable organization form. Within this context, the ability of procurement representatives at BCA Everett to respond faster to local information provided by a particular airplane program or manufacturing area may not be enhanced by continued decentralization efforts. However, Vagstad (2000) does recognize that "the advantage of decentralized decision-making is not that local information is utilized – it may be used also under centralization – but that centralization may be too costly" (pp. 950-951).

Moline (2004) captures a particular view on the debate over the role and structure of purchasing in an interview with Shakeel Mozaffar, vice president for global procurement and logistics at ICI (see www.ici.com for company information). Mozaffar views procurement as "a strategic lever to drive the economic performance of the company" (paragraph 24). Procurement is a board-level agenda that is as important as revenue generation and new product introductions. Moline also asks Mozaffar what his position is on the centralization and decentralization issue.

Mozaffar's response is to blend the two in what he calls an "enlightened federalism." Mozaffar explains:

> "Those purchasing decisions that lend themselves to economies of scale should be made on a collective, consortium level. Travel and certain indirect expenses, such as office supplies, perfectly lend themselves to this kind of purchasing. Then you decentralize those procurement decisions that don't make sense on a macro level" (paragraph 6).

A matrix, or hybrid, organization structure like this one at ICI seeks to leverage the advantages of both centralization and decentralization.

An example of an organization that has recently returned to a centralized model of procurement is provided by Forrest (2005). Forrest discusses the actions of various organizational leaders at Dana Corporation to take charge of their spending by consolidating the purchasing and supply chain management function. This has allowed Dana to capture efficiencies of scale within their supply base and to make overall value-driven decisions during a time of increasing raw material prices (steel) and energy costs.

Prema (2005) interviews Robert Kane, director of supply chain management for three different business units at General Dynamics, a high-tech aerospace and defense contractor. In the article, Kane discusses how General Dynamics has established a blend of centralized and decentralized strategies. Overall spend analysis and sourcing collaboration is combined under a centralized model; however, individual purchasing and inventory decisions are decentralized to support the needs of different locations throughout the country. Prema also observes from Kane that the requirements for purchasing professionals are much different today than just five years ago. For example, there are higher standards for proven successes in supply chain management techniques and demonstrated leadership capabilities. Also, individual purchasing areas within a company

need to advertise their successes more and show them to the highest levels of management on a consistent basis. Most importantly, Prema captures that purchasing professionals and supply chain managers need to continue to face senior executives directly so that the executive leadership understands the value proposition of the purchasing organization.

Clearly, the literature review illustrates that there are many different challenges and issues relating to the subject of decentralized purchasing efforts. Supply chain management, in particular, is focused on the logistics and coordination efforts of purchasing within a particular supply chain. If one conclusion can be drawn from the current literature regarding decentralization and supply chain management, it is that different structures are appropriate for different strategies and industries. What is appropriate for the automotive industry, technology sector, or household goods trade may not necessarily be useful to large-scale commercial airplane manufacturing. Decentralization of the purchasing function is an executive structural decision, and in order to be successful, it needs to be consistent with the overall strategic direction and goals of the enterprise. What organizational priorities are given the greatest emphasis? Is improving the internal customer interface a top priority? Or, are "economies of scale" and standardization the most valued? To determine specific supply chain management strategies that are effective in a decentralized large commercial airplane manufacturing environment, a survey based upon the above review has been administered to a group of procurement professionals within the BCA supply chain. The literature is a solid foundation for this research study, and in the next section, the survey methods are outlined.

Survey Methodology

While there are many different methodologies for collecting data, the survey for this project is administered through a printed questionnaire that has been emailed directly to the population sample. The primary research type is descriptive. It utilizes a written survey that consists of eight questions with both an objective and a subjective element (Appendix A, pp. iii-vi). The seven objective questions are used to identify the respondents and to categorize the identified advantages and disadvantages of decentralized purchasing (pp. iii-v). The subjective element (question eight) consists of an open-ended question at the end of the survey that asks the respondent to comment on any procurement tactics or supply chain management strategies that could be used by BCA to address or solve the identified disadvantages (p. vi).

Because the survey is a reflection of the research topic, the purpose of the survey is to compliment the literature review and to assist in discovering new information that can be used to identify specific recommendations for decentralized parts procurement at BCA Everett. The survey elements and descriptions are outlined in detail in this section of the research paper.

At the beginning of the survey, general research project information and instructions are provided to each respondent (Appendix A, p. iii). The goal of the survey is to collect data regarding decentralized purchasing efforts from different organizations and purchasing professionals within BCA Everett, and to categorize this data into meaningful information relevant in determining effective decentralized supply chain management strategies. The data collected from the survey is used to categorize the population, identify the biggest advantages and disadvantages of a decentralized organization structure, and in the process capture any decentralized solutions that the procurement community at BCA might identify.

The written survey has been administered to a discrete population of thirty supply chain professionals from across the BCA Everett Site. These professionals are responsible for the

ordering and scheduling of various parts for BCA Everett airplane models from suppliers located throughout the world. They have been asked to respond to the survey within a two week timeframe that ended on January 27, 2006. Each member of the population is not aware of the other participants, and the information shared back to the researcher is kept anonymous for any given respondent. In order to obtain a representative sample, participants are identified from five different organizations within BCA Everett. These areas are as follows:

1) Airplane Programs Manufacturing Support (747, 767, and 777 Program)
2) Electrical Systems Responsibility Center
3) Interiors Responsibility Center
4) Global Partners
5) Technical Services

Each of these decentralized organizations maintains their own purchasing departments that interact with the same supply base. In addition, participants are asked to provide their job title and how long (in total) that they have worked in the purchasing or materials management discipline at BCA. Also, respondents identify the commercial airplane programs at Everett that they support, as well as the types of commercial airplane parts that they currently purchase. This demographic information is used to categorize the respondents, mainly to ensure that a representative sample is obtained; however, it also may be useful in evaluating the top perceived advantages and disadvantages of decentralization within each organization or product commodity.

The critical part of the survey consists of two different objective rankings, one concerning the advantages and one concerning the disadvantages of decentralized purchasing at BCA Everett.

The eight business advantages, as identified from the literature review and direct observation by the author, consist of the following:

1) Procurement representatives are closer to the manufacturing customer.
2) Procurement representatives understand the local needs of the particular airplane program or manufacturing area.
3) Response time to immediate internal customers, such as production control, is faster.
4) Response time to the final internal customer (airplane manufacturing) is faster.
5) Responses to the manufacturing line are of higher quality (i.e. "the right part is ordered for the right time and sent to the right place.")
6) Cost data and financial estimates for a given airplane program are more accurate.
7) Specific business units or airplane programs have more control over ordering decisions, scheduling parameters, and inventory levels.
8) Procurement professionals have more individual autonomy in making purchasing or scheduling decisions on a given package.

The second selection is a list of eight business disadvantages, or challenges, that directly relate to decentralized purchasing efforts at BCA. As these eight disadvantages are already provided in the statement of problem section at the beginning of this paper, they are not repeated again here (pp. 3-4; also Appendix A, p. v). In both cases, participants are asked to categorize the advantages and disadvantages on a scale of one to eight. The ranking data is then analyzed using a simple modal and median comparison to identify the top four "most-selected" statements in each category. The top four disadvantages are then further evaluated using the subjective comments obtained in the last survey question.

At the very end of the survey, a subjective question is asked. It is purposefully left open-ended, so that respondents are given the opportunity to think further about the purpose of the survey and to offer some specific suggestions (Appendix A, p. vi). Along with this subjective question asked at the end of the survey, the overall data analysis and review of the responses provides insight into recommendations for effective supply chain management strategies in the current decentralized environment. An analysis of the results from the survey and related findings are discussed in the next section.

Data Analysis and Findings

Respondent Demographics

As noted above, thirty procurement professionals at BCA Everett comprise the sample population for the survey. Of the thirty survey members invited to participate, twelve responses are received and comprise the results of the survey. The following tables reflect the distribution of the respondents in terms of their organization (Table 1), job title (Table 2), purchasing experience (Table 3), program or manufacturing line supporting (Table 4), and type of airplane parts purchased (Table 5).

Table 1: Respondents by Organization

Organization	**Percentage of Respondents**
Airplane Programs Manufacturing Support (747, 767, 777)	58.3%
Electrical Systems Responsibility Center	8.3%
Interiors Responsibility Center	0.0%
Global Partners (Central Contracting)	25.0%
Technical Services	8.3%

Table 2: Respondents by Job Title

Job Title	**Percentage of Respondents**
Supply Chain Management Analyst	75%
Logistical Specialist	0%
Procurement Agent	25%
Procurement Analyst	0%
Manager	0%

Table 3: Distribution of Purchasing Experience

Purchasing Experience	**Percentage of Respondents**
Less than 1 Year	0%
1-5 Years	0%
6-10 Years	58.3%
11-15 Years	8.3%
16-20 Years	33.3%
21+ Years	0%

Table 4: Distribution of Programs Supported

Programs Supported	Percentage of Respondents
747 Program	36%
747 Special Freighter or Large Cargo Freighter Program	12%
767 Program	28%
777 Program	24%
787 Program	0%
Spares	0%
None of the Above	0%

Table 5: Distribution of Airplane Hardware Purchased

Type of Airplane Parts Purchased	Percentage of Respondents
Composites	0.0%
Interiors	0.0%
Electrical Systems	7.1%
Major Structures (body sections)	21.4%
Purchased Outside Production	50.0%
Propulsion	0.0%
Raw Material	0.0%
Standards (bolts, nuts, fasteners)	7.1%
Systems & Equipment	7.1%
Other (placards and decals)	7.1%

Based upon the demographic data above, Table 6 below lists the highest percentage of respondents within each category:

Table 6: Highest Number of Respondents by Category

Category	Response	Percentage of Category
Organization	Airplane Programs Manufacturing Support	58.3%
Job Title	Supply Chain Management Analyst	75.0%
Purchasing Experience	6-10 Years	58.3%
Programs Supported	747 Program	36.0%
Airplane Parts	Purchased Outside Production	50.0%

The following five generalizations can be made about the respondent population. First, the majority of respondents are from the Manufacturing Support organization that is responsible for

providing direct purchasing support for the 747, 767, and 777 manufacturing lines at BCA Everett. Second, the majority of respondents are Supply Chain Management (purchasing) professionals, rather than Procurement Agent (contracting) professionals. Third, most respondents have had 6-10 years experience working in purchasing at BCA. Fourth, although the 747 program has the highest number of respondents (36%), it is clear that the respondent population is almost evenly decentralized among the three current Everett airplane programs (see Table 4). Finally, half of the respondents (50%) are responsible for "Purchased Outside Production" hardware. While it is not relevant to the results of this study, "Purchased Outside Production" (or POP) hardware consists of various machined details and assemblies that are used for aircraft assembly. These specialized airplane parts are built from various aluminum, steel, and titanium alloys, and are purchased from outside suppliers from all over the world rather than built in-house.

Identified Advantages of Decentralization

Participants are asked to rank the eight advantages on a scale of one through eight. Table 7 summarizes the top four advantages of decentralized purchasing at BCA Everett, as identified by the survey respondents in their ranking.

Table 7: Identified Highest Advantages

	Top Four Identified Advantages	Most Selected (Modal) Ranking	Average (Mean) Ranking
1	Specific business units or airplane programs have more control over ordering decisions, scheduling parameters, and inventory levels.	1	4.0
2	Procurement representatives are closer to the manufacturing customer.	1	4.5
3	Response time to the final internal customer (airplane manufacturing line and airplane delivery center) is faster.	2	4.1
4	Responses to the manufacturing line are of higher quality.	5	4.4

Identified Disadvantages of Decentralization

Participants are also asked to rank the eight disadvantages on a scale of one through eight. Table 8 summarizes the top four disadvantages of decentralized purchasing at BCA Everett, as identified by the survey respondents in their ranking.

Table 8: Identified Highest Disadvantages

	Top Four Identified Disadvantages	Most Selected (Modal) Ranking	Average (Mean) Ranking
1	Consistent and integrated communication with the supply base is more difficult.	1	2.4
2	Internal flow of information is more complex.	2	4.1
3	"Economies of scale" in purchasing activities and supplier management are lowered.	3	4.5
4	Duplication in administrative work is increased.	4	4.6

Subjective Portion of Survey

Of the twelve surveys returned, nine respondents provided additional information by answering the last question. As this last question asks for specific supply chain management strategies and tactics that could be used by BCA to address, minimize, or solve the disadvantages to decentralized purchasing, these subjective responses are particularly useful. Surprisingly, even though those responding to the subjective question did not always pick them first in their ranking, most of the comments relate in some fashion to three of the top four objectively identified disadvantages above (Table 8). As well, a significant portion of the subjective comments also relate to the fifth ranking disadvantage: "standardization of the procurement processes being used is diminished" (not shown in tables).

For example, one respondent suggests that "representatives from the BCA sites should get together on a regular basis to ensure there is a common voice to the supplier." This speaks to the identified disadvantage 1) above in Table 8 ("consistent and integrated communication with the

supply base is more difficult"). Two other respondents stated that "standardization of [supply chain] processes should be a stated goal for all procurement organizations within BCA" and "a core [supply chain] team with representation from each organization should be in place to standardize current processes and to approve proposed changes." These statements are relevant to the fifth ranking disadvantage: "standardization of the procurement processes being used is diminished." A somewhat frustrated respondent (indicated by previous comments made in response to the subjective question) ends by saying "the duplication of administrative efforts cannot be solved." This is a severe disadvantage to decentralization that may not have an easy solution.

The next section presents the summary and recommendations resulting from the above data analysis. It is a further discussion of these findings, citing more of the specific comments made in response to the last question of the survey, and building to three strategic recommendations in support of decentralized supply chain management at BCA Everett.

Summary and Recommendations

A copy of Table 8 is provided again here to support the summary and recommendations that are identified within this section:

Table 8: Identified Highest Disadvantages

	Top Four Identified Disadvantages	Most Selected (Modal) Ranking	Average (Mean) Ranking
1	Consistent and integrated communication with the supply base is more difficult.	1	2.4
2	Internal flow of information is more complex.	2	4.1
3	"Economies of scale" in purchasing activities and supplier management are lowered.	3	4.5
4	Duplication in administrative work is increased.	4	4.6

Survey results in Table 8 above demonstrate that the top two issues that hinder decentralization efforts at BCA Everett are: 1) Consistent and integrated communication with the supply base; and 2) The complicated flow of internal information between purchasing organizations. The literature review supports the contention that it is certainly more difficult to maintain consistent and integrated communication with the supply base (and between internal divisions) in a decentralized purchasing environment. As Chen (1999) proves, decentralization in supply chain management can complicate, and usually delay, the internal flow of information. One of the respondents shared that the supplier is often caught in the middle of conflicting directions from different airplane programs and purchasing organizations at BCA Everett, and an integrated strategy for each supplier that applies to all purchasing groups is needed. Given the amount of information technology and communication tools available, it seems that some type of solution to this can be found. Therefore, the first recommendation from an analysis of the survey results is as follows:

Implement a regular (at least bi-weekly) electronic meeting for each major supplier (defined as having at least 50 active parts contracted or on order with BCA Everett).

This meeting would be coordinated and led by the Procurement Agent (Global Partners organization) and be attended by supply chain representatives from all of the decentralized purchasing organizations at the BCA Everett site that do business with the given supplier.

Communication requirements should be written into the specific job roles and responsibilities of the Procurement Agent in contracting and the Supply Chain Analyst in the programs, and enforced in performance evaluations. Additionally, the workload for both job roles should be examined to ensure that adequate time capacity is given to the procurement professionals to lead and attend these "supply chain coordination" meetings. Of course, this requires management buy-in from all of the purchasing organizations and divisions involved.

If participants are unable to attend in person (which is a likely scenario based upon the physical size of the Everett site), then there are numerous electronic tools, such as email, instant messaging, Web Ex, and Net Meeting that can be used as communication platforms for such a meeting. As well, company database systems and other front-end tools such as Excel and Access can be used to track all of the decentralized areas that order from a given supplier, and to identify the individual supply chain management professionals within each manufacturing line or area that conduct business with the supplier.

The third and fourth identified disadvantages on Table 8 above are: 3) Economies of scale in purchasing activities and supplier management are lowered; and 4) Duplication in administrative work is increased. Both are very difficult to overcome in a decentralized organization structure. Decentralization, at its very nature, reduces "economies of scale" in purchasing efforts and inherently duplicates supply chain functional work within a particular department or product line. When more and more individual areas are responsible for the purchasing of hardware from

the same supply base, it becomes much more difficult to control the overall total cost of the aggregate purchases. As an illustration of this concept, instead of one buyer placing one purchase order with a supplier for all of BCA Everett's airplane requirements, there now exists multiple supply chain analysts placing multiple purchase orders for the same part used in different manufacturing areas.

As a result, economies of scale and duplication of effort challenges may not be solvable in a decentralized environment. In relationship to this topic, one respondent observed that "when different organizations have different goals, one will be achieved at the expense of the other." Another respondent stated that "there are many efficiencies [of scale] that are lost as the work packages are constantly redistributed [i.e. decentralized]." Perhaps the best way to address this particular disadvantage is to minimize it as much as possible by focusing on improving communication and standardization between the various decentralized areas of BCA Everett.

In response to the identified issues above that the "internal flow of information is more complex" and that the "standardization of the procurement processes being used is diminished," it is critical that the right tools and training are provided to the supply chain management community at BCA Everett. Therefore, the second specific recommendation for an effective supply chain management strategy in the current decentralized environment is as follows:

> *Create a formalized training plan for BCA Everett supply chain management and procurement professionals that is relevant to the new re-engineered systems and processes that are now being used in the decentralized purchasing organizations.*

Many of the survey comments relate directly to this recommendation. For example, one respondent observed that the lack of ongoing, formal training is creating more and more "tribal knowledge" that is lost when certain individuals leave the organization. Another remarked that

the "standardization of processes should be a stated goal for all procurement organizations within BCA." One way to achieve this, another person observed, is to create a "core [purchasing] team with representation from each organization in place to standardize current processes and to approve proposed changes." Perhaps a hybrid organizational structure, where elements of decentralization are combined with elements of centralization, is necessary to support adequate training requirements. As another respondent recognized, perhaps this means that BCA should "centralize the procurement specialists for optimum support of defined strategic initiatives, and decentralize the customer interface via [appropriate supply chain] representatives." Yet another asserted:

> "Processes should be very clear about who is responsible for communicating what to the supply base. If roles are adequately understood and followed, this shouldn't be as big of a problem as I think it currently is. Perhaps better training of employees and more consistent communication between procurement organizations [within BCA] could lessen this problem." (emphasis added)

Although this statement applies equally to the first communication recommendation above, it also speaks to the need for a formalized training plan that captures all of the complexities of the current supply chain management role at BCA Everett.

Current research supports the idea that some of this formalized training for procurement professionals should include cross-functional project management. For example, Atkinson (2005) provides specific project management strategies for procurement that are critical to supply chain management success in a decentralized cross-functional work environment. These are:

1) Create top-to-bottom consistency (senior management direction and support that is driven down to the procurement or supply chain project manager, who then drives it down to the individuals on the team managing the tasks).
2) Identify the stakeholder departments for the project (gather as many internal resources as possible to drive the cross-functional team impact).
3) Identify the right individuals to participate (ask individual functional or organizational managers who the person is in their department who has the right skills and knowledge).
4) Make sure the project plan is tied to overall business objectives.
5) Create a project process (risk identification, mitigation, timelines, and contingencies).
6) Assign roles and responsibilities on the team to the individuals, based on their expertise and interest.
7) Identify useful project management tools to keep projects on track (e.g. Microsoft Project).

In order to support these activities, it requires that leadership of all of the various decentralized organizations get together and discuss the overall vision and strategy of supply chain operations at the BCA Everett site. This should be done on a regular basis, and involve at least two or three procurement and supply chain experts in attendance as well. As one respondent stated in answer to the last survey question, BCA Everett needs "top management of all affected organizations speaking with a single vision and being specific enough to communicate what that means to all of the players."

Lee and Whang (1999) support this contention, by observing that decentralized supply chains require both information sharing plans and incentive plans. They state specifically that: "Decentralized implementation of supply chains requires the development of performance

measurement schemes to align the incentives and interests of the multiple managers in the supply chain" (pp. 637-638). Rudzki, et. al. (2005) also observes that the most important question for a supply chain leader to ponder is: "What is your level of personal commitment to achieving improved corporate performance through a best-in-class purchasing organization?" (paragraph 19, emphasis added). One of the survey respondents states the leadership challenges of decentralization very well: "Don't let the individual employees make sense out of competing ideas/visions/ways of doing business from the multiple organizations that they support." Improving corporate purchasing competitiveness means coming together across organizational boundaries to find a common vision and strategy for procurement operations at the BCA Everett site. Fortunately, Lewis (2002) offers a useful framework for this concept, capturing project management principles from BCA President and CEO Alan Mulally and the previous successes of the 777 development program. These 12 principles are:

1) Working Together
2) Compelling Vision
3) Clear Performance Goals
4) One Plan
5) Everyone Is Included
6) The Data Sets Us Free
7) You Can't Manage a Secret
8) Whining is Okay…Occasionally
9) Propose a Plan, Find a Way
10) Listen to Each Other and Help Each Other
11) Emotional Resilience

12) Have Fun…Enjoy the Journey and Each Other

Consequently, the third recommendation for supporting decentralized supply chain management strategies is for the leadership of the various purchasing organizations at BCA Everett to meet on a regular basis with expert representatives to discuss the deployment of a consistent and integrated site supply chain strategy.

This requires that leadership take the initiative to understand the new complexities of the supply chain management function, and then discuss how it fits into overall airplane manufacturing operations at the Everett site. A hybrid communication structure with accountability built in can leverage the strengths of the centralized "supplier interfaced" contracting organization (Global Partners) with the strengths of the decentralized "customer interfaced" inventory management organizations (Manufacturing Support, Technical Services, Electrical Systems, Interiors, Propulsion, etc.). This should be combined with a commitment by the leadership for collaboration and for improving internal processes, not just between the internal purchasing organizations, but also across other functional boundaries (e.g. engineering, planning, quality, and manufacturing).

Directions for Future Studies

One possible future study that could be pursued is to increase the population sample and ask respondents to rate each of the eight identified advantages and eight identified disadvantages individually on a Likert scale. For example, asking supply chain management professionals to identify how much they actually agree or disagree with the survey statements may result in additional data that could be used to refine the discovered supply chain management strategies. Another approach may be to take the results from this research and present them to the top management of the respective organizations to discover additional practical steps that could be taken to implement some, or all, of the recommendations.

Additionally, Simatupang and Sridharan (2005) provide an example of a specific supply chain collaboration framework that could potentially be applied at the BCA Everett site. Simatupang and Sridharan identify five core elements that make up a collaborative supply chain framework:

1) A collaborative performance system.
2) Decision synchronization efforts.
3) Integrated supply chain processes.
4) Incentive alignment.
5) Committed and documented information sharing practices.

Even if some of these elements are not immediately feasible within the decentralized BCA Everett supply chain, the integrated aspects of this framework are certainly in line with current strategic direction and need to be further pursued.

Conclusion

This research project has discussed the decentralized procurement of airplane parts at Boeing Commercial Airplanes in Everett, Washington. The intricate and dependent relationship between organizational strategy and organizational structure has been analyzed in the context of a particular aerospace company during a particular period of re-structuring and decentralization. Current literature regarding supply chain management and views on decentralization in the purchasing function has been reviewed. A survey of a sample population of supply chain management and purchasing professionals has provided some effective supply chain strategies for managing decentralized parts procurement at BCA. The ensuing recommendations above are based on the results of the survey, and are presented as possible solutions to some of the current challenges in decentralized purchasing efforts. Naturally, as business conditions change over time, further research at a later date may identify better answers. In the meantime, it is hoped that the recommendations presented above can be reviewed and possibly implemented at some point in the near future.

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Appendix A

Appendix A: Survey Form

Written Survey Hackwith Graduate Research Project

General Information:

This survey is being administered in support of a graduate research study being conducted in partial fulfillment of a Masters of Business Administration degree from Northwest University (see Abstract below for additional information). Any information provided will be used anonymously to support research efforts; however, please do not provide any specific company proprietary or limited information in your response (e.g. cost information). Please return either via email or regular mail to the following individual by **no later than January 27, 2006**:

Brian K. Hackwith
The Boeing Company
P.O. Box 3707 MC 0M-CF
Seattle, WA 98124-2207
brian.k.hackwith@boeing.com
425-342-1936 (desk)
425-971-0136 (cell)

Thank you in advance for your time and effort!

Abstract of Research Project:

This research project seeks to determine effective supply chain tactics and purchasing strategies in support of the decentralized procurement of airplane parts at Boeing Commercial Airplanes (BCA) in Everett, Washington. A number of strategic decisions over the past decade have resulted in the delegation of the external purchasing function from a centralized procurement organization into separate supply chain management groups segregated by product or manufacturing division. For example, each of the current airplane manufacturing lines at the Everett site (747, 767, and 777) has a separate external purchasing group and management structure. This type of decentralized structure brings about challenges as well as opportunities to the procurement function. A challenge typical to any sort of decentralized effort is to ensure that processes, in this case supply chain and purchasing processes, are standardized across multiple divisions. One possible opportunity might be the increased reaction time in support of manufacturing customer requirements. Certain tactics and approaches should lead to successful supply chain management performance within a decentralized organization structure. To discover these strategies, this research project reviews some of the existing literature on the subject and administers a survey to a group of procurement professionals and managers within the BCA supply chain. The results of the survey are then discussed. Recommendations regarding supply chain management strategies, as well as suggested areas for further study, conclude the research paper.

Eight Survey Questions Follow on Pages 2 – 4 of this document:

Written Survey Hackwith Graduate Research Project

1) Please select your Organization:

- ☐ Airplane Programs Manufacturing Support
- ☐ Electrical Systems Responsibility Center
- ☐ Interiors Responsibility Center
- ☐ Global Partners
- ☐ Technical Services

2) Please select your Job Title:

- ☐ Supply Chain Analyst / Supply Chain Management Analyst
- ☐ Logistical Specialist
- ☐ Procurement Agent
- ☐ Procurement Analyst
- ☐ Manager

3) How long (in total) have you worked in the purchasing or materials management disciplines at Boeing Commercial Airplanes?

- ☐ Less than 1 year
- ☐ 1 – 5 years
- ☐ 6 – 10 years
- ☐ 11 – 15 years
- ☐ 16 – 20 years
- ☐ 21+ years

4) What commercial airplane program(s) at Boeing Everett do you currently support? Please check all that apply:

- ☐ 747 Program
- ☐ 747 Special Freighter or Large Cargo Freighter Program
- ☐ 767 Program
- ☐ 777 Program
- ☐ 787 Program
- ☐ Commercial Aviation Services (Spares)
- ☐ I do not support any Everett programs

5) From the list below, please select the type(s) of commercial airplane parts that you currently purchase or manage. Please check all that apply:

- ☐ Composites
- ☐ Interiors
- ☐ Electrical Systems
- ☐ Major Structures
- ☐ Purchased Outside Production (machined details and assemblies, etc.)
- ☐ Propulsion
- ☐ Raw Material
- ☐ Standards
- ☐ Systems & Equipment
- ☐ Other (please specify): ☐

Written Survey Hackwith Graduate Research Project

6) The following are some identified business advantages of decentralized purchasing. In the boxes below on the left, please categorize the corresponding advantages on a scale of 1 though 8 (in your opinion), with 1 being the most advantageous and 8 being the least advantageous to BCA performance:

☐ *Procurement representatives are closer to the manufacturing customer.*

☐ *Procurement representatives understand the local needs of the particular airplane program or manufacturing area that they support.*

☐ *Response times to immediate internal customers, such as production control or warehousing, are faster.*

☐ *Overall response time to the final internal customer (airplane manufacturing or delivery center) is faster.*

☐ *Responses to the manufacturing line are of higher quality (i.e. "the right part is ordered for the right time and sent to the right place").*

☐ *Cost data and financial estimates for a given airplane program are more accurate.*

☐ *Specific business units or airplane programs have more control over ordering decisions, scheduling parameters, and inventory levels.*

☐ *Procurement professionals have more individual autonomy in making purchasing or scheduling decisions on a given package.*

7) The following are some identified "opportunities for improvement" inherent to decentralized purchasing efforts. In the boxes below on the left, please categorize the corresponding challenges on a scale of 1 through 8 (in your opinion), with 1 being the most challenging and 8 being the least challenging to BCA performance:

☐ *"Economies of scale" in purchasing activities and supplier management are lowered.*

☐ *Standardization of the materials being purchased is decreased.*

☐ *Standardization of the procurement processes being used is diminished.*

☐ *Duplication in administrative work is increased.*

☐ *Consistent and integrated communication with the supply base is more difficult.*

☐ *Control over enterprise purchasing commitments is lessened.*

☐ *Internal flow of information is more complex.*

☐ *Increase in internal competition for organizational resources (personnel, capital, equipment, information, and time) between business units.*

8) Think about the top two challenges (1 and 2) that you identified above in Question 7. Can you think of any procurement tactics or supply chain management strategies that could be used by BCA to address, minimize, or solve one or both of these challenges (without changing the current decentralized organization structure)? This could be a method or practice that you have adopted to manage your current production or procurement responsibilities. Please list and discuss any ideas that come to mind, either general or specific: