

3-23-2017

Supply Base Reduction Efforts Regarding Laboratory Reagents within Hospital Networks

Kelsie L. Hughes

Follow this and additional works at: <https://scholar.afit.edu/etd>

Part of the [Operations and Supply Chain Management Commons](#)

Recommended Citation

Hughes, Kelsie L., "Supply Base Reduction Efforts Regarding Laboratory Reagents within Hospital Networks" (2017). *Theses and Dissertations*. 1642.

<https://scholar.afit.edu/etd/1642>

This Thesis is brought to you for free and open access by the Student Graduate Works at AFIT Scholar. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of AFIT Scholar. For more information, please contact richard.mansfield@afit.edu.



SUPPLY BASE REDUCTION EFFORTS REGARDING LABORATORY REAGENTS
WITHIN HOSPITAL NETWORKS

THESIS

Kelsie L. Hughes, Captain, USAF

AFIT-ENS-MS-17-M-134

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

DISTRIBUTION STATEMENT A. APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.

The views expressed in this thesis are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the United States Government.

AFIT-ENS-MS-17-M-134

SUPPLY BASE REDUCTION EFFORTS REGARDING LABORATORY REAGENTS
WITHIN HOSPITAL NETWORKS

THESIS

Presented to the Faculty

Department of Operational Sciences

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Logistics and Supply Chain Management

Kelsie L. Hughes, BS

Captain, USAF

March 2017

DISTRIBUTION STATEMENT A. APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.

AFIT-ENS-MS-17-M-134

SUPPLY BASE REDUCTION EFFORTS REGARDING LABORATORY REAGENTS
WITHIN HOSPITAL NETWORKS

Kelsie L. Hughes, BS
Captain, USAF

Committee Membership:

Dr. Jeffrey Ogden, PhD
Chair

Randall G. Ivall
Lt Col, USAF
Reader

Abstract

The Air Force Medical Operations Agency currently procures laboratory reagents at approximately 75 Air Force medical treatment facilities; however, each medical facility has a separate means used to procure these reagents. AFMOA wants to know how other hospital networks are purchasing their reagents and see if it could be applied to the Air Force. The goal of this research was to use the case study methodology to showcase how other hospital networks applied supply base reduction to laboratory reagent purchases. We examine what drove the organizations to begin supply base reduction, how they transitioned to a smaller supply base, the barriers and success factors of the process and what advantages and disadvantages were seen once the process was complete.

To my husband and sons, for their support and understanding through this entire process.

Table of Contents

	Page
Dedication.....	v
Table of Contents.....	vi
List of Figures.....	viii
List of Tables.....	ix
I. Introduction.....	1
Background.....	1
Problem Statement.....	2
Research Objectives and Questions.....	3
Research Focus.....	3
Assumptions/Limitations.....	4
Implications.....	4
II. Literature Review.....	6
Chapter Overview.....	6
Why Supply Base Reduction?.....	6
How to Reduce the Supply Base.....	11
Barriers to Accomplishing Supply Base Reduction.....	12
Critical Success Factors.....	12
Advantages of Supply Base Reduction.....	13
Disadvantages of Supply Base Reduction.....	18
Supply Base Performance Factors.....	20
Conclusion.....	22
III. Methodology.....	23
Overview.....	23
Case Study Decision.....	23
Multiple Case Study Design.....	24
Ensuring Quality of Research Design.....	24
Collecting Data.....	25
Unit of Analysis.....	26
Case Selection.....	26
Conclusion.....	27

IV. Results.....	29
Reasons for Supply Base Reduction	29
Supply Base Reduction Process	32
Critical Success Factors	38
Advantages of Supply Base Reduction	40
Disadvantages of Supply Base Reduction.....	43
Summary	45
V. Discussion	47
Research Questions Answered.....	47
Limitations	52
Recommendations for Future Research	52
Summary	53
Appendix A: IRB Exemption Approval	54
Appendix B: Interview Questionnaire	55
Appendix C: Coding Scheme.....	55
Appendix D: Titles of Individuals Interviewed at Case Study Organizations	65
Bibliography	67

List of Figures

	Page
Figure 1: Unit of Analysis.....	26
Figure 2: Strategic Importance vs Percentage of Total Spend.....	32
Figure 3: Supply Base Reduction Process	38

List of Tables

	Page
Table 1. Supply Base Performance Factors	21
Table 2. List of Organizations	27
Table 3. Drivers for Supply Base Reduction	30
Table 4. Characteristics of Products Selected for Supply Base Reduction Efforts	33
Table 5. Goals and Objectives of Specific Supply Base Reduction Projects	35
Table 6. Type of Supply Base Reduction Process Utilized	36
Table 7. Number of Suppliers within Organization.....	37
Table 8. Supply Base Reduction Critical Success Factors	38
Table 9. Advantages of Supply Base Reduction Efforts.....	40
Table 10. Disadvantages of Supply Base Reduction Efforts	44
Table 11. Most Influential Drivers of Supply Base Reduction Efforts.....	47
Table 12. Summary of Advantages Achieved by Case Study Organizations.....	50

SUPPLY BASE REDUCTION EFFORTS REGARDING LABORATORY REAGENTS WITHIN HOSPITAL NETWORKS

I. Introduction

Background

Within the Air Force Medical Service (AFMS) there is a requirement at each medical facility for chemical reagents to perform laboratory tests. Each medical facility has a separate means used to procure these reagents, typically with a contract to purchase the reagents with the analysis equipment included at no cost via a lease or they purchase the equipment outright and procure the reagents through the Medical Electronic Catalog (ECAT) offered through the Defense Logistics Agency. While the Air Force Medical Operations Agency (AFMOA), a branch of the Air Force Medical Service, does a centralized review of the contracts, it does not have centralized contract procurement. In regards to the purchase of the analyzer equipment, if more than one clinic is purchasing the equipment, AFMOA will do a central buy. However, this is not scheduled and happens purely by coincidence.

Dr. Jeffrey Ogden in 2003 conducted research exploring the drivers of supply base reduction efforts and the various processes that can be used to reduce the supply base as well as critical success factors. The research looked at ten organizations from various industries and studied how each completed the supply base reduction process for a particular product or service. Dr. Ogden identified 20 critical factors which allowed the companies to successfully transition from a large to a small supply base. The research also showed the common steps taken by the case study organizations to complete the

process of supply base reduction. Our research narrows this study to a single industry and product and examines how supply base reduction works in a specific setting.

The cost and time saving potential of supply base reduction is exciting to the Air Force Medical Operations Agency, with specific attention given to laboratory reagents. In this research, we examine what drove the organizations to begin supply base reduction, how they transitioned to a smaller supply base, the barriers and success factors of the process and what advantages and disadvantages were seen once the process was complete. Knowing this information would enable the Air Force Medical Operations Agency to determine if supply base reduction is a potential way forward.

Problem Statement

AFMOA is currently procuring laboratory reagents at approximately 75 Air Force medical treatment facilities. At Wright-Patterson Air Force Base alone, a single five year laboratory reagent contract costs the medical group \$370,000. Despite the fact that each medical facility within the AFMS has a laboratory, there is not a centralized purchasing process. Each facility is responsible for determining what brand of equipment they will use, within AF guidelines, and which reagents will be purchased.

It is possible that the Air Force Medical Service may realize potential benefits by developing regional or even a single contract to procure necessary laboratory reagents. Possible benefits to organizations are cost effectiveness, higher quality of supplier coordination, improved delivery performance, and a desire for continuous improvement and innovation by the supplier (Nam and others, 2011).

Research Objectives and Questions

There are two objectives with our research. The first objective looks at the background of supply base reduction and how it is implemented in an organization. The second objective looks at the specific benefits of supply base reduction and how they occur in an organization as well as if they are able to be applied to the AFMS.

Research Question 1: Why did the organizations determine a need for a supply base reduction regarding chemical laboratory reagents?

Research Question 2: How did the organizations transition from a large supply base and how were issues managed?

Research Question 3: What benefits have the organizations received from supply base reduction efforts in terms of the supply base performance factors and how do these benefits occur?

Research Question 4: How does the US Air Force Medical Operations Agency (AFMOA) compare in structure to the case study organizations?

Research Question 5: What aspects of a supply base reduction approach would be applicable to the AFMOA?

Research Focus

Our research focus is to identify factors that prompted health care organizations to initiate supply base reduction on laboratory reagents. We narrowed our research to hospital networks that had undergone supply base reduction within the last five years. The goal of our research is to identify possible advantages and critical success factors of supply base reduction. The research method being used is a case study. Six hospital

networks in multiple regions, and of varying size, have been selected in order to provide multiple viewpoints.

Assumptions/Limitations

Potential limitations that have been identified are the case studies will be entirely from the health care sector. These organizations do not have some of the buying restrictions that government organizations face and it may come about that there is not a way to correlate the two. A second limitation is all the organizations being studied are all healthcare networks. Other organizations utilize chemical laboratory reagents, such as forensic analysis and independent laboratories, and these organizations may have a different structure and priorities which would change the manner in which supply base reduction takes place.

Implications

This research will allow AFMOA to see the potential benefits and drawbacks of seeking a supply base reduction regarding the chemical reagents required for laboratory analysis. If pursued, AFMOA could gain many benefits in regards to cost reduction, increased supplier leverage and quality including an equipment formulary that would mandate the use of specific reagents and equipment; but it may also place itself at risk for supply chain interruption due to the limited amount of suppliers. The next possible step would be to create a cross functional team and discuss the possibility of applying supply base reduction to a test area. If successful, the opportunities arise for supply base

reduction to be implemented in other healthcare areas such as surgical or dental instruments.

II. Literature Review

Chapter Overview

The review of literature for this study included a background of why organizations would choose supply base reduction, the process of how supply base reduction occurs, barriers and success factors, advantages and disadvantages to supply base reduction and supply base performance factors. This review will begin with why organizations would choose to go forward with supply base reduction and the supply base reduction process. It will then cover the barriers and success factors to implementing supply base reduction and the advantages and disadvantages the organizations may see. Finally, supply base performance factors will be discussed.

Why Supply Base Reduction?

The literature offered many different reasons an organization would decide to go forward with supply base reduction. These can be broken down into ten different areas: desire to form partnerships with suppliers, desire to reduce costs, complexity of purchasing, financial importance of the product, standardization, desire to implement other purchasing strategies, relationship-specific investment, desire for increased leverage, frequency of transaction, and centralization.

Desire to form partnerships with suppliers

Many authors agree that forming a partnership with suppliers is a driving factor for pursuing supply base reduction (Ogden, 2003; Cousins, 1999: 146; Trent and Monczka, 1998: 9; Chen and Paulraj, 2004: 138; Ates and others, 2015: 205; Sarkar and Mohapatra, 2006: 149; Goffin and others, 1997: 423). While most agree that the desire to

form the partnerships is the reason for supply base reduction, others state that the partnerships are a benefit of the supply base reduction rather than a driving factor. “The main effect of a reduced supplier base is that it leaves the buyer more time to develop closer relationships with the remaining suppliers” (Goffin and others, 1997). This leads a reader to believe the relationships are a byproduct rather than a reason to pursue supply base reduction. On the other hand, Sarkar and Mohapatra cite three reason for supply base reduction, the second being close and workable relationships (2006).

Overall, long term relationships can benefit both the buyer and supplier. These relationships allow collaboration and a reduction of fears about opportunistic behavior (Ates and others, 2015) and have a positive impact on supplier performance. Additionally, long term transaction costs decline as safeguards, which were put into place at the beginning of the partnership, control opportunism (Chen and Paulraj, 2004: 139).

Desire to decrease costs

In a hospital, supplies can make up 25 to 30 percent of the total operating costs, with 25 percent of those expenses tied to administration, overhead and logistics (Toba and others, 2008). This places the desire to decrease costs at a high priority. Savings are particularly important, in some cases, a saving of one percent on purchasing costs can have the same effect on profit as an eight to ten percent increase in sales (Goffin and others, 1997: 423). Reducing administration or transaction costs and cost savings gained from larger purchases were generally agreed upon as the major motivation for supply base reduction. In Cousins’ 1999 survey, 80 percent of respondents stated that their rationale for supplier reduction was to reduce transaction costs, while 60 percent stated they were looking for a general cost savings.

Complexity of purchasing

“The increase [in suppliers] makes the decision more complex and so the time spent by the managers for taking a decision also goes up” (Sakar and Mohapatra, 2009: 124). With supply base reduction, purchaser are looking to remove inefficient business process to create more effective and efficient resource utilization (Cousins, 1999: 146). The greater the number of suppliers, the greater the variation and thus the complexity of the supply base. This places a greater operational load on the organization (Choi and Krause, 2006: 639). By reducing the number of suppliers, an organization can hopefully reduce the amount of complexity in the supply chain.

Financial importance of the product

Past research has shown the more financially important a product is to an organization, the more it will use a larger number of suppliers (Homburg and Kuester, 2001:23). This is done to reduce the risks which may arise with shortages or capacity constraints. However, Ogden states the greater the strategic importance of the product or service, the more likely the buying organization may be to utilize fewer suppliers and form closer relationships with those suppliers (2003: 17). Additionally, an increased number of suppliers would increase the probability of unreliable delivery due to the organization having difficulty in controlling all of the suppliers (Choi and Krause, 2006: 645). So, while it may seem like a good idea to have multiple suppliers for a financially important item, it may be better for the organization to actually reduce the number of suppliers and work on strengthening relationships.

Standardization

Within the study conducted by Goffin, Szwejcowski and New in 1995, standardization was cited as the main driver for supply base reduction for one of four organizations. The organization made the decision to purchase only from suppliers with ISO 9000 registration, thus standardizing their supplier selection criteria. (Goffin and others, 1997: 429).

Desire to implement other purchasing strategies

“A prerequisite for developing a stronger buyer-supplier relationship is to have a small number of suppliers” (Sarkar and Mohapatra, 2006: 148). Supply base reduction is most frequently seen in literature along with strategic sourcing and is typically a precursor to forming the strategic relationships as “one of the natural consequences of supply base reduction is the focal company’s increased reliance on remaining suppliers” (Choi and Krause, 2006: 640). Further, the reduction in suppliers frees up buyers for other purchasing strategies such as supplier partnering, supplier development and fewer suppliers allows for Just in Time (JIT) delivery systems (Ogden, 2003: 19).

Relationship-specific investment

As firms move to concentrating on their core competencies, they begin to buy rather than make and seek to outsource their needs. If the organization is able to find a good supplier, they are able to assist in the development of new products and processes (Goffin and others., 1997: 423). Additionally, supply base reduction allows the organization to develop suppliers to meet their needs, an example is provided by Choi and Krause where some companies promoted consolidation of smaller suppliers into one large integrated supplier with higher production capacity and added capability such as

product development (2006: 640). As organizations increase the utilization of the remaining suppliers it makes them more willing to create relationship-specific investments.

Desire for increased leverage

The desire for increased leverage might be the overall driver for supply base reduction (Ogden, 2003: 21). The increase in order volume leads to a price reduction due to the increased leverage the buying organization has. Additionally, the buying organization has leverage to negotiate price due to the economies of scale the supplying organization can use in regards to manufacturing and transportation. Because of the increased business, the buying organization has leverage to make requests of the supplying organization such as increased service level or changes to the product/packaging. A prime example would be Wal-Mart, who requires their suppliers to use Electronic Data Interchange (EDI) (Johnson and others, 2011: 105).

Frequency of transaction

Ogden states that the number of suppliers that an organization utilizes and the type of relationship that the organization has with its suppliers is partially determined by the frequency of the transactions (2003: 22). This thought is reinforced by Cousins who states that “most of the higher value-added activity takes place among first-tier suppliers. These are the firms who are likely to share the benefits of partnership sourcing,” (1999: 144). The reason for this may be that the more often an item is purchased, the organization may look to see if supply base reduction applies and form a strategic partnership with a supplier.

Centralization

Having a centralized purchasing process tends to necessitate supply base reduction as one agency is making purchases for all departments versus multiple departments making their own purchases (Ogden, 2003: 22). Centralization ties back to leverage and price in that if one agency is making purchases they can leverage the increased volume of supplies to lower price.

How to Reduce the Supply Base

Three main approaches are listed in the literature for reducing the number of suppliers in the supply base: systematic elimination, tiering, and standardization (Ogden, 2003: 25). Systematic elimination can be simple or complicated. It can be as easy as the removal of suppliers from the organizations database which have not been used within a specific time frame. Or it may involve a lengthier process of reviewing all suppliers and removing the ones which do not meet specific criteria such as price, quality and delivery (Chen and Paulraj, 2004; Goffin and others, 1997). The second approach, tiering, involves delegating control of areas to the organizations first-tier suppliers thereby reducing the number of suppliers the organization deals with directly. This was seen in Cousins' 1999 survey where organizations claimed to have reduced the number of suppliers in the supply base but rather just delegated them to the first-tier suppliers to act as an assembler or integrator (147). Finally, standardization, which can relate to the types of supplies or parts being used or the criteria being used to select suppliers. It can be done by reducing the number of equivalent products used or simplifying a product, service or process. This is an area where most hospitals are deficient as there is a lack of

standardized nomenclature/coding for medical products and commodities (McKone-Sweet and others, 2005: 5). This makes it difficult for purchasers to determine if products are equivalent.

Barriers to Accomplishing Supply Base Reduction

Four reasons are typically given for not implementing supply base reduction: (1) fear of stultifying rather than enhancing competition among suppliers; (2) the need to formalize systems for evaluating supplier performance; (3) time needed to build consensus and to break down cultural barriers among corporate functions and divisions; and (4) time needed to develop design standards as a means of minimizing future proliferation of the supply base (as cited in Ogden, 2006: 30). While specific barriers do not exist for supply base reduction in healthcare, four barriers do exist in regards to supply chain practices, which can in turn be loosely applied to supply base reduction. In interviews done by McKone-Sweet, Hamilton and Willis the four barriers mentioned were (1) lack of executive support, (2) misaligned incentives within the organization and supply chain; (3) lack of education, both at the materials management and executive levels; and (4) data collection and measurement (2004: 7).

Critical Success Factors

Ogden lists six critical success factors: good information systems; cross-functional teams; choosing the right supplier; good project communications; establishing win-win relationships; and key management support. These factors were determined

through interviews of 53 logistics and purchasing personnel at organizations which had recently conducted supply base reduction (Ogden, 2006).

Advantages of Supply Base Reduction

There are many advantages available to organizations that complete supply base reduction. Fourteen advantages, as described by Ogden (2003: 28), are: better relationships with suppliers, increased leverage, better communication and information sharing, decreased unit cost or price, increased flexibility and responsiveness, better access to technology and innovations, improved delivery performance, decreased inventories, decreased supplier management or transaction costs, increased quality, improved speed or time, decreased risk or uncertainty, improved service, and increased dependability. These advantages were compiled from various resources and are explained in more detail below.

Better relationships with suppliers

Several articles state that supply base reduction must occur before a better relationship can be developed with suppliers. Only when the suppliers are reduced does the organization have the resources available to devote to developing their supplier relationships. Sarkar and Mohapatra state that “A prerequisite for developing a strong buyer-supplier relationship is to have a small number of suppliers” (2006:148). Once a relationship is developed it has been shown to have a positive impact on supplier performance and increases the intensity of buyer-supplier coordination (Chen and Paulraj, 2004: 138). Additionally, relationships encourage suppliers to take more responsibility for the products or services they provide (Goffin and others, 1997: 432).

Increased leverage

In this case, leverage is defined as the “ability to force or persuade either the buyer or the supplier to make concessions it would not make under different circumstances” (Ogden, 2003:29). By limiting purchases to fewer suppliers, the organization increase their importance, and their leverage, to those suppliers. This can result in lower costs, higher quality, better coordination and innovation (Goffin and others, 1997; Nam and others, 2009; Ates and others, 2015).

Better communication and information sharing

As partnerships develop, suppliers provide more information regarding processes, quality performance and cost structure (Chen and Paulraj, 2004: 138). Better communication helps alleviate fears regarding opportunistic behaviors and increases the sharing of innovative ideas (Ates and others, 2015: 205). In Cousins’ 1999 survey, 20 percent of respondents stated the reason they went forward with supply base reduction was to facilitate the implementation of EDI. It would be more difficult to implement EDI with a large number of suppliers rather than a small amount.

Decreased unit cost or price

As stated earlier, a saving of one percent on purchasing costs can have the same effect on profit as an eight to ten percent increase in sales (Goffin and others, 1997: 423). By reducing suppliers, the organization is funneling a larger volume of orders to the remaining supplier(s) which can reduce costs through economies of scale and volume discounts. Additionally, suppliers have the ability to increase their capacity utilization which can, in turn, lower their production costs and thus the price (Ogden, 2003: 32).

Increased flexibility and responsiveness

Flexibility is an area where there is both positive and negative aspects. With the closer relationship between buyer and supplier, the buyer has greater flexibility in requesting design changes due to the increased communication between the two organizations (Ogden, 2003: 22). However, the organization can lose flexibility in avoiding supply disruptions and acquiring new technologies or innovations by limiting their number of suppliers (Ates and others, 2015: 206).

Better access to technology and innovations

Choi and Krause found supplier innovation to be one of the four key areas of managerial focus when managing a supply base and that when organization reduced the number of suppliers in their supply base they were able to focus on developing or sharing technology (2006: 640-643). Also, as the supply base reduces, organizations become more dependent on their suppliers' technical skills and development ability (Holmen and Pederson, 2007: 178). Multiple sources also state that the technological capability of the supplier needs to be part of supplier selection criteria (Goffin and others, 1997: 424; Sarkar and Mohapatra, 2006: 152). Additionally, the increase in business for remaining suppliers may increase their motivation and desire to invest in new technologies and product development (Ates and others, 2015: 205).

Improved delivery performance

Improved delivery performance was cited throughout the literature as a benefit of supply base reduction. Chen and Paulraj list improved performance in the top ten benefits of supply base reduction (2004: 138), while Goffin and others state "good suppliers can provide enhanced delivery performance" (1997: 423). Additionally,

delivery performance is one of the key supplier selection criteria, so improved delivery performance is beneficial for both the buyer and the supplier.

Decreased inventories

In Cousins 1999 survey, 40 percent of respondents said inventory reduction was the reason they went forward with supply base reduction. Other literature cites “that good communication of demand information can reduce the amount of inventory carried in the supply chain” (Ogden, 2003: 36). Accurate information of demand can reduce the amount of surplus inventory the supplier carries which can lead to a reduction in price as well as a more accurate delivery schedule. With better oversight of the delivery schedule the organization is able to reduce their safety stock inventory (Ogden, 2003: 36).

Decreased supplier management or transaction costs

Reduced administrative or transaction costs are typically associated with supply base reduction. As the number of suppliers is lowered costs may be reduced since purchasing personnel are completing fewer purchase orders, reports, contracts, payments and sales calls (Ates and others, 2015; Chen and Paulraj, 2004; Choi and Krause, 2006; Cousins, 1999; Goffins and others, 1997; Ogden, 2003). In fact, 100 percent of survey respondents stated they completed supply base reduction in order to reduce the amount of purchase order placed in order to save time and money (Cousins, 1999: 150).

Increased quality

“Quality levels are likely to increase when the number of suppliers is reduced due to the increased attention which buyers are able to give to the reduced number of suppliers” (Ogden, 2003: 38). Better communication between the buyer and supplier allows for clarification of requirements and resolution of issues, thereby increasing the

quality of the purchase. The longer the partnership, the greater the communication of requirements, the greater quality at lower cost (Goffin and others, 1997: 423).

Improved speed or time

Time is essential in competing in today's markets and the ability to provide purchases at the right time is one of the main goals in supply chain management (Johnson and others, 2011: 47). In order to remain competitive, organizations need to be able to meet their demands which requires their supplies to be delivered on time. A reduction in lead time is one of the advantages that come with supply base reduction (Chen and Paulraj, 2004: 138).

Decreased risk or uncertainty

By using the tiered approach to supply base reduction, organizations are able to decrease their risk by spreading it to their first-tier suppliers, placing the onus on them to insure all supplies are available as needed. 60 percent of survey respondents stated this was their rationale for proceeding with supply base reduction (Cousins, 1999: 150). Additionally, Ogden states "increased mutual dependence, caused by the increased volume of purchases between buyer and supplier, may lower the risk of losing supply source and create greater stability through increased supplier loyalty" (2003: 40).

Improved service

The ability for a supplier to provide better customer service comes with the increased volume of purchases made by the buyer. The buyer has increased importance with the supplier and so requires a higher level of service. The ability of the supplier to provide support for its products is then passed on to the buyer, who can in turn provide support to its customers (Ogden, 2003: 40).

Increased dependability

Dependability is synonymous with trustworthiness, which was mentioned in the literature. “Trust is one’s belief that one’s supply chain partner will act in a consistent manner and do what he promises” (Chen and Paulraj, 2004: 141). With improved communication occurring due to the reduction in suppliers, trust is able to build within the buyer-supplier relationship. As the trust builds, so does the dependability of the supplier.

Disadvantages of Supply Base Reduction

While there are many advantages to supply base reduction, there are also disadvantages which must be considered prior to implementing the process. Again, Ogden provides a consolidated list gathered from the available literature. The disadvantages are as follows: supply disruptions or capacity problems, price escalation risk, decreased access to technology and innovation, becoming too dependent on suppliers, increased likelihood of opportunistic behavior, and decreased quality (2003: 42).

Supply disruptions or capacity problems

Multiple sources spoke of single versus multiple sourcing. In most cases “single sourcing was seen to be too high risk and a backup mechanism was implemented,” so while there was only one active supplier, the organization also had a back-up supplier in the event of an emergency (Goffin and others, 1997: 432). As an organization relies more on fewer suppliers, issues of supplier capacity and capability become much more noticeable (Choi and Krause, 2006: 640). Another point to make is that once a supplier is

eliminated from an active supply base, they may focus on other areas not in line with the organization (Ogden, 2003: 43). This may hurt the organization if ever they need they supplier in the future.

Price escalation risk

Price escalation occurs when suppliers increase their price after becoming a buyer's only source of a particular item (Ogden, 2003: 43). The buyers may be unable to combat the price increase due to contract language. This is a risk when using a sole source if it is not managed properly.

Decreased access to technology and innovation

Limiting the supply base may have a negative impact on the buyer's ability to acquire new technologies that exists in a wider supply network as well as tie up resources in a single supplier which may limit the organization's ability to develop new technologies (Ates and others, 2015: 206). Additionally, if organizations do not need to compete for buyers, innovation may suffer as there is no need to distinguish themselves from other suppliers with a new technology or process.

Becoming too dependent on suppliers

As an organization reduces the number of suppliers in its supply base, it quickly increases its dependence on the remaining suppliers. This can have a disastrous impact on the organization if something goes wrong. An example would be the automobile manufacturer Toyota who suffered a 300-million-dollar loss when its sole supplier for 90 percent of its brake valves failed to meet requirements (Sarkar and Mohapatra, 2004: 123).

Increased likelihood of opportunistic behavior

The increased probability of opportunistic behavior by suppliers is another negative of supply base reduction. Ogden states “the increased dependence of the buying organization on the reduced supply base may increase the probability of the suppliers taking advantages of their increased leverage by charging more for their products or services” (2003:45).

Decreased Quality

Cousins states that one of the risks of sole sourcing is poor quality (1999: 147), which may be due to suppliers not having to compete with other suppliers in order to stand out in a large supply base. Additionally, they may feel the need to reduce quality in order to meet the requirements of reduced prices (Ogden, 2003: 46

Supply Base Performance Factors

Supply base decisions should be based on multiple factors, not just the individual advantages and disadvantages of supply base reduction. Tradeoffs are required and the long term strategic goals of the organization need to be considered. Results of Cousins (1999) survey show that firms appear to be pursuing supplier reduction without a clear assessment of the costs and benefits involved (153). A similar response was cited by Goffin and other where “OEM managers rarely consider the considerable risks of these strategic moves [supplier base reduction]” (as cited in Goffin and others, 1997: 426).

There are two types of cost drivers: structural – which deals with an organizations economic structure; and executional – which are determinants of an organization cost position (Ogden, 2003: 48). In this case the number of suppliers would be the structural

cost driver while the organizations relationship with the suppliers would be the executional cost driver. Costs that are typically associated with suppliers are price, quality, delivery, storage, inventory and management; however, there are many other areas supplier impact (Ogden, 2003: 48). Supply Base Performance Factors are used to evaluate the cumulative effect of all suppliers regarding certain aspects of an organization's performance (Ogden, 2003: 49). Table 1 provides a list of the factors.

Table 1. Supply Base Performance Factors

Availability or Capacity	Quality
Communication and Information	Risk or Uncertainty
Sharing	Service or Responsiveness
Delivery and Transportation	Technology and Innovation
Dependability	Time or Speed
Flexibility	Unit Price
Inventory	Management Costs

As organizations become more dependent on suppliers, the ability to understand how they impact the organization and how to control the costs they generate becomes ever more important. “The framework of Supply Base Performance Factors (SBPF) is useful for classifying and understanding the relevant costs and the tradeoffs between those costs on the supply base level” (Ogden, 2003: 49).

Conclusion

The literature reviewed for this research included a background of why organizations would choose supply base reduction, the process of how supply base reduction occurs, barriers and success factors, advantages and disadvantages to supply base reduction and supply base performance factors.

III. Methodology

Overview

The case study method was used for gathering information concerning supply base reduction within hospital networks. The first part of this chapter will go over case study methodology selection and how it best fits the research while the second part goes over methods of collecting data and the selection of case study organizations.

Case Study Decision

The decision to proceed with case study methodology was based on three factors: the form of the research questions, does it require control of behavioral events and does it focus on contemporary events. First, the research questions posed are “how” and “why” questions. These types of questions deal with operational links that need to be traced over time rather than looking at the frequency or times of an occurrence which make the case study one of the preferred methodologies (Yin, 2014: 10). The need to know why and how something occurred requires gathering a wider array of information than would be possible from a survey or experiment, but would be possible in a history, case study or experiment.

Second, in regards to controlling behavioral events, the research questions look to examine an event or process which has already occurred, which does not allow any control of behavioral events. This eliminates the use of an experiment and pushes the research to either a history or case study. However, a history is used when looking at the “dead past,” and it is not possible to directly observe or speak with individuals involved (Yin, 2014: 12). Our research questions are based on a contemporary event which

allows for the direct observation of the event and interviews with individuals involved, making a case study the appropriate method.

Multiple Case Study Design

A case study seeks to “illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what results” (Schramm, 1971: 6). A case study which uses multiple cases allows for analysis between the cases which can highlight similarities and “enhance the probability that the investigators will capture novel finding which may exist in the data” (Eisenhardt, 1989: 541). Yin states that “the ability to conduct 6 or 10 case studies is analogous to the ability to conduct 6 to 10 experiments on related topics” (Yin, 2014: 57). Therefore, this research used a multiple case study design within the case study methodology and focused on selecting 6 to 10 cases with similar circumstances.

Ensuring Quality of Research Design

According to Yin, there are four tests to assess the quality of the research and which should be considered during the research design portion; they are construct validity, internal reliability, external validity and reliability (Yin, 2014: 45).

Multiple sources of evidence were used to meet the construct validity test. Interviews were conducted with multiple individuals within each organization to ensure an accurate portrayal of the supply base reduction process. After the interviews were complete, they were summarized and a copy sent to each interviewee to verify the information contained was accurate and to provide an opportunity for the member to

provide feedback. Internal validity was ensured by using pattern matching within the six supply base reduction efforts. Moreover, the patterns found will generate the building of explanations as to why the patterns exist. As the research involved multiple case studies, replication logic was used to ensure external validity. “Replication logic is analogous to that used in multiple experiments...only with such replications would the original finding be considered robust and worthy of continued investigation or interpretation” (Yin, 2014: 57). In this case, each of the hospital networks represented one experiment and were compared against each other to develop patterns and explanations.

Finally, in order to pass reliability, case study protocol and a case study database were created. The case study protocol has the following sections: overview of the case study project, field procedures, case study questions, and a guide for the case study report (Yin, 2014: 49). The database was used to maintain all notes, interview questionnaires and other documents gathered during the course of research.

Collecting Data

The primary data collection method for this research was the interview, “one of the most important sources of case study evidence (Yin, 2014: 110). Interviews with well-informed individuals can provide important insights into how or why an action was taken as well as provide other relevant sources of evidence (Yin, 2014: 113). The interview questions used for this study can be found in Appendix C. Additionally, documentation was provided by multiple organizations that assisted in adding depth to the interviews.

Unit of Analysis

The unit of analysis is used to define the exact nature of the case study. It is related to the way the initial research questions are defined (Yin, 2014: 31). As this research is specifically looking at a particular group of products, chemical laboratory reagents, the unit of analysis was the subsection of suppliers who are directly related to this group of products. The following figure presents a pictorial view (Ogden, 2003: 75).

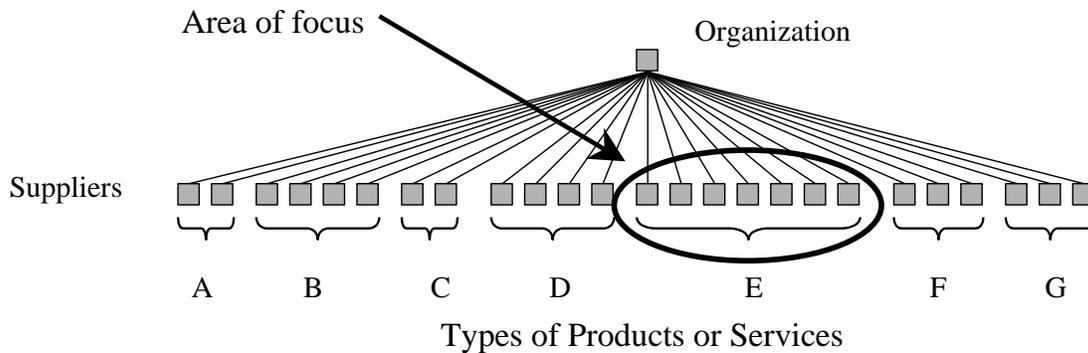


Figure 1. Unit of Analysis

Case Selection

The goal of the case selection process was to find large hospital organizations who had completed supply base reduction. Specific criteria were used to select organizations for this research. The organization would have 1) successfully implemented a supply base reduction project, 2) completed the project more than six months ago but not more than five years ago, 3) involved employees who are currently accessible for interviews, 4) recorded information about the state of the supply base prior to supply base reduction activities, 5) quantified the benefits that were achieved through

the supply base reduction efforts, and 6) be willing to provide access to the supply base reduction information (Ogden, 2003: 76).

The search began with a request for assistance to the Air Force Medical Operations Agency (AFMOA) and to local area hospital networks. AFMOA assisted in by providing points of contact in three organizations, while individual effort was used to contact five other organizations. Overall, eight organizations were contacted via phone or email; however, two did not fit the criteria mentioned above. One was still in the process of their supply base reduction and the other was outside of the five-year limitation. In total, six organizations were chosen for case studies and thirteen interviews were conducted regarding those cases. The organizations are listed below in Table 2.

Table 2. List of Organizations

Organization	Location	Product/Section
A	Ohio	Chemistry Analyzer
B	Maryland	Microbiology
C	Ohio	Allergy Analyzer
D	Ohio	Chemistry Analyzer
E	Ohio	Chemistry Analyzer
F	Oregon	Chemistry Analyzer

Conclusion

This study of supply base reduction within hospital networks, how it was completed and why it was successful can help the Air Force Medical Operations Agency

make informed decisions on ways to improve their supply base. This chapter served to explain why a multiple case study was appropriate and how the quality of the data would be ensured. Additionally, it explained the data collection method, unit of analysis and how the organizations used as cases were selected.

IV. Results

This chapter will be used to report the findings of six supply base reduction case studies conducted among hospital networks. It will first look at the reasons why the organization completed a supply base reduction followed by the process the organizations used. Next, the critical success factors are investigated to determine if any common factors are visible among the organizations. Finally, the organizations were questioned regarding advantages and disadvantages that were found after supply base reduction took place.

Reasons for Supply Base Reduction

There are many possible reasons for a hospital network to go forward with a reduction of the supply base. This research has identified three drivers that were consistently seen as supply base reduction motivators: need for cost reduction, desire for increased leverage and desire for partnership with suppliers. While other drivers were identified, they did not impact the decision as strongly as the drivers mentioned above. Table 3 lists the drivers for supply base reduction with the ranking of importance (1 = none, 3 = moderate, and 5 = significant) given by the corresponding organization on how that item impacted their decision. The top three drivers are highlighted and will be discussed in greater detail.

Table 3. Drivers for Supply Base Reduction

Driver	Organization						Total
	A	B	C	D	E	F	
Top Management Directives	4	5	4	1	1	2	17
Change in Level of Centralization	1	5	3	1	1	3	14
Need for Cost Reductions	4	5	5	4	5	4	27
Changes in Supply Market	2	4	1	5	1	1	14
Changes in Level of Competitive Pressure	3	4	4	1	3	1	16
Supply Chain Management Initiatives	4	3	5	1	3	3	19
Changing Customer Requirements/Expectations	5	3	1	4	4	1	18
Changes in level of Product/Service Standardization	5	3	1	2	5	1	17
Merger & Acquisition Activity	5	1	1	4	3	3	17
Changes in Level of Uncertainty/Risk	1	1	2	2	1	1	8
Desire for Partnership with Suppliers	4	1	3	5	5	2	20
Desire for Increased Leverage	5	3	4	5	5	4	26
Changes in the Level of Asset Specific Investment Required	2	2	1	1	3	1	10
Pressure for government/regulatory agencies	2	1	1	1	1	3	9
Change in use of corporate benchmarking	4	4	3	4	1	1	17
Pressure from Professional Organizations	3	1	1	1	1	1	8
Changes in the frequency of transactions	1	1	1	1	1	1	6
Desire to fit in with other companies (bandwagon)	3	1	1	3	1	1	10
Desire to adopt other purchasing strategies for which supply base reduction is a prerequisite	4	2	2	1	3	1	13
Changes in the financial importance of the product or service purchased	3	5	1	1	5	1	16

Need for Cost Reduction

The need for cost reduction appears to be the most significant driver to implement supply base reduction. Cost reduction was given as a fairly significant driver for supply base reduction in all six cases with three organizations rating it as 5, or significant. Four of the six organizations mentioned they had goals, either organizational or section-specific, of reducing costs with one company making the statement “as revenue is decreased due to lower reimbursements, costs must also be decreased.” Several organizations also stated an external challenge was suppliers constantly looking to charge

more for supplies simply because the items were medically related. This led some organizations to begin Group Purchasing Organizations (GPOs) in order to get better pricing while others looked toward standardization to lower costs.

Desire for Increased Leverage

Desire for increased leverage appears as the second strongest driver for supply base reduction. Five organizations rated increased leverage as a moderately high or significant driver with one organization rating it as a moderate driver for supply base reduction. This driver ties in closely with cost reduction as increased leverage will be used to negotiate a reduction in item price as well as other items such as delivery costs, technical support and customer service. This driver is also seen as an advantage to supply base reduction and will be discussed more later in this chapter.

Desire for Partnership with Suppliers

As the third strongest driver for supply base reduction, desire for partnership with suppliers appears to have a strong influence. Half of the organizations rated this driver as having either a moderately high or significant influence on going forward with supply base reduction. Two of the organizations stated they wanted to have better communication with their suppliers and the only way to accomplish this was to reduce the number of suppliers they used. Organizations B and F ranked this low on their list of drivers. Organization B stated “they were more concerned with reducing costs and meeting management directives than in trying to create a closer relationship with the supplier” (Laboratory Supervisor, 9/21/16)

Supply Base Reduction Process

Each organization looked at a specific laboratory reagent or analyzer when completing their supply base reduction efforts. This section will discuss the product characteristics, the organizational goals for the supply base reduction and the approach the organization used to conduct supply base reduction as well as the overall process.

Product characteristics

In order to determine how the reagents were selected for supply base reduction, the organizations were asked to rank the reagent in percentage of total spend for the laboratory compared to the strategic importance of the reagent. Figure 2 shows how each organization ranked their respective supply base reduction project and, with the exception of organization C, all organizations ranked their projects as having high strategic importance with a medium to high percentage of total spend. For Organization C, while the project did not rank high, they saw an opportunity to reduce the supply base and leverage the supplier due to high purchase volume and desire for a second analyzer.

Strategic Importance	High		B D E	F A
	Medium			
	Low		C	
		Low	Medium	High

% of Total Spend

Figure 2. Strategic Importance vs Percentage of Total Spend

The organizations were also asked why this item was selected for supply base reduction. The responses of each organization are summarized in Table 4 and show each organization had multiple reasons they selected the item.

Table 4. Characteristics of Products Selected for Supply Base Reduction Efforts

Product Characteristics	Organization					
	A	B	C	D	E	F
Cost Reduction Opportunities	X	X	X	X	X	X
Strategically Important to Organization	X	X			X	
Opportunity for Standardization	X			X	X	X
Leverage with Supplier	X		X			

Cost reduction opportunities were the number one characteristic for all six of the organizations. Each organization felt that it could cut costs by reducing the supply base, which was seen as a main reason for supply base reduction in the literature review. Organization B, for example, felt that it could get a better price agreement with the remaining supplier due to the increased volume of orders. Organization E stated “it was the way forward for their organization” (Vice President Strategic Sourcing, 9/26/16).

The second most common characteristic was the opportunity for standardization. Four of the six organizations believed supply base reduction would offer opportunities for standardization within the laboratory or the hospital. With Organization F, different laboratories within the network had different suppliers, standardization would allow them to all use the same supplier and reduce the different types of products having to be ordered.

Next, the products strategic importance to the organization was an important factor for three of the six organizations. This meant the supply base reduction was not only a benefit for the laboratory, but for the hospital network in general. For Organization A, the hospital had one manufacturer being used to supply medical equipment. For the laboratory to also use this manufacturer would benefit other areas of the hospital thereby making this product strategically important to the organization.

Finally, leverage with supplier was a factor for two organizations. In these cases, the organizations wanted to leverage the volume of purchases with the supplier to gain a better price on the capital equipment as well as the reagent. For Organization C, the laboratory had one analyzer but also had to send out tests for analysis as they could not meet demand. The organization leveraged the future increase in volume to gain a better price on the purchase of a second analyzer. Organization A stated “the main leverage with the supplier is that their equipment was being used throughout the rest of the hospital, so a partnership already existed” (Executive Director of Laboratory Services, 9/13/16).

Organizational goals for supply base reduction

During the interviews the organizations were asked what the goals or objectives were for the supply base reduction project. While all agreed that price reduction was the main goal, other objectives such as improvements in quality, efficiency, ensuring supply or reducing complexity were also seen. These are goals and objectives are listed in Table 5.

Table 5. Goals and Objectives of Specific Supply Base Reduction Projects

Goals and Objectives	Organization					
	A	B	C	D	E	F
Price Reduction	X	X	X	X	X	X
Reduce complexity through standardization	X	X				
Ensure supply			X		X	
Improve efficiency		X			X	X
Improve quality		X		X	X	

Organizations B and E had many of the same goals and objectives outside of price reduction. For example, both were looking to improve the quality of the tests they ran as well as the efficiency of ordering the product. Both organizations had goals to improve the quality of their reagents as well as their ease of use. They wanted their technicians is be able to rotate between sites without having to train on multiple systems in order to become competent. Organization B specifically said “it is not just about price, the techs need to be able to use the equipment easily” (Laboratory Supervisor, 9/21/16).

Approach to supply base reduction

The three main approaches to supply base reduction are systematic elimination of suppliers, standardization and tiering. However, tiering was not used by any of the six organizations for this supply base reduction project. Two organizations did make mention of using a third party distributor, aka Prime Vendor, to consolidate purchases and reduce costs for other reagents and supplies. The approach was split in half with

three of the organizations using systematic elimination, while the other three organizations used standardization as the main approach to supply base reduction. Table 6 lists the approach taken by each organization.

Table 6. Type of Supply Base Reduction Process Utilized

Primary Type of Process Utilized	Company					
	A	B	C	D	E	F
Systematic Elimination			X	X		X
Standardization	X	X			X	

As Ogden states “these processes are not mutually exclusive...both systematic elimination and standardization involve elimination of suppliers” (2003: 127). The main difference is whether the organization was standardizing the type of products, which led to the reduction in suppliers or if the organization eliminated suppliers, which in turn led to the standardization of a product.

A good example of systematic elimination is Organization D. The organization had five suppliers for their chemistry analyzer which occurred through “sloppy purchasing with unorganized purchasing habits” (Supply Chain Director, 9/15/16). In order to reduce the number of suppliers, the organization began to eliminate the suppliers based on specific criteria provided by the laboratory in order to reach a single supplier. Organization B provides the best example of standardization. The organization was using between nine to twelve suppliers for their microbiology departments. In order to get the hospitals on the same page, the department heads determined what type of products they wanted based on specific criteria such as ease of use, storage, packaging,

complexity of the test and waste disposal costs. Once the network had agreed on standardized products they found a single supplier who could meet their needs.

Each organization saw a decrease in the number of suppliers from their supply base. Table 7 shows each organization with the number of suppliers before and after the supply base reduction process. Organization B had the greatest reduction, going from 12 suppliers down to one. Organizations A and E had the smallest reduction, going from three suppliers to one supplier. Organization D gave the reason for going to a single supplier as “less is better because service levels are higher.” Other reasons provided were the organization did not want to go through a third-party distributor, a single supplier offers a better relationship and better quality assurance documentation.

Table 7. Number of Suppliers within Organization

Number of Suppliers	Organization					
	A	B	C	D	E	F
Before Supply Base Reduction	3	12	6	5	3	4
After Supply Base Reduction	1	1	1	1	1	1

Supply base reduction process

While the approaches differed between standardization and systematic elimination within the organizations, they all used a similar method when developing their process. The process began with a cross functional team, usually composed of representatives from the laboratory, purchasing and sourcing. The team would determine what was needed and then begin looking for potential suppliers. Once a supplier was found who

meet the criteria, they were selected and a contract was drafted. This process is illustrated in Figure 3.



Figure 3. Supply Base Reduction Process

Critical Success Factors

Critical success factors were identified by the organization as objects they felt made the supply base reduction project successful and would recommend to other organizations to consider before attempting supply base reduction. Table 7 lists the factors described by the six organizations. The factors mentioned the most by the respondents are key management support, which echoes the literature, and good communication during the project.

Table 8. Supply Base Reduction Critical Success Factors

Critical Success Factors	Organization						Total
	A	B	C	D	E	F	
Cross-functional team	X	X			X		3
Choosing the right supplier(s)				X	X		2
Good communication during the project	X	X		X	X	X	5
Win-win relationship with vendor			X				1
Key management support	X	X		X	X	X	5
Leverage	X		X				2
Understanding organization's objectives		X			X		2
Price				X	X		2
Information on what other organizations paid for same product			X	X			2
Desire to be successful		X					1

Key management support

Having the involvement, and buy-in, of top management and other key leadership personnel is vital to the success of a supply base reduction process as it helps the project flow smoothly. Knowing that top leaders have approved of a project can stop detractors and push personnel to accept the change with little to no complaint. This was seen in Organization E where multiple suppliers were being used. The decision came from the top management to standardize and select one supplier which made it easier for the cross-functional team to introduce the new supplier to the staff as they knew the decision had already been made and approved.

Good communication during the project

Good communication is essential to the success of a supply base reduction project. Members of the project need to talk to determine what the requesting section needs and the specifications they are looking for in addition to the best way to purchase the item. By communicating frequently, the team can make sure that all needs are being met and that everyone is on the same page. Good communication also allows management and leaders to stay informed on the progress of the project as well as provide any needed support.

Cross-functional team

Cross-functional teams allow for input from relevant stakeholders, and ensure they are able to see the efforts that are being made and how they will impact the organization. These teams are used to determine the best option to meet the needs of all parties involved. The best example of this was with Organization B which created a team with multiple member from the three hospitals involved. Each hospital had a member

from the microbiology department, the purchasing department and management. These members communicated to select the best products to meet the needs of all microbiology departments.

Advantages of Supply Base Reduction

Each of the case study organizations was asked what advantages of supply base reduction were seen after the project was completed. Table 8 lists the advantages as described by the organizations. The table is broken down into sections based on information gathered from the literature on what advantages could be seen.

Table 9. Advantages of Supply Base Reduction Efforts

Advantages		Organization						Total
		A	B	C	D	E	F	
Technology and Innovation								
	Increased access to technology and innovation	X	X			X	X	4
	Easier to involve suppliers in the development of new products		X					1
Availability and Capacity								
	Availability increased due to better visibility into needs		X					1
Supplier Management Costs								
	Decrease in supplier management costs (long-term)		X		X	X		3
	Increased productivity of purchasing employees		X		X	X		3
	Increased productivity of laboratory employees		X			X		2
Quality								
	Increased quality levels	X	X	X		X	X	5
	Better information sharing about quality levels	X	X			X		3
Information Sharing								
	Increased information sharing about inventory levels and usage rates		X				X	2
	Increased information sharing about forecasts and schedules		X				X	2
	Increased information sharing internally		X					1

Table 9. Continued

Inventory								
	Organization - reduced inventory levels - higher inventory turns		X		X		X	3
	Easier to implement supply chain managed inventory systems	X						1
Delivery and Transportation								
	Decrease in delivery or transportation costs				X			1
	Improved delivery performance				X			1
	Easier scheduling of deliveries				X			1
Buyer-Supplier Relationships								
	Better buyer-supplier relationships	X			X		X	3
Leverage								
	Increased organizational leverage		X	X	X	X		4
Time and Speed								
	Shorter lead times – overall		X		X			2
	Faster processing		X		X			2
	Improved service levels – overall			X	X		X	3
	Dedicated supplier representatives				X			1
Unit Price								
	Reduction in price paid		X	X	X		X	4
Dependability								
	More dependable suppliers		X		X		X	3

Technology and Innovation

Four of the six organizations stated they saw an increase in access to technology and innovation by reducing their supply base and developing a better relationship with their remaining suppliers. Organizations A and B both stated they saw new updates to the analyzers and worked with their companies to develop the ability to run specific tests. Additionally, Organization F wrote specific language into their contract with the supplier stating the organization's specific technological requirements regarding updates to the analyzers and how new innovations would be handled by the organization. The overall impression the four organizations had was once the supplier base reduction was

complete, the remaining supplier was more willing to work with the organization regarding their technological needs.

Quality

An increase in quality levels was the most commonly reported advantage seen, with five organizations reporting an improvement. The one organization that did not report an improved quality level, Organization F, did state that their products were already of a high quality and they did not see a decrease in quality with the supply base reduction.

In addition to receiving a quality product, the supply base reduction also allowed the organizations to improve the quality of the laboratory tests. By reducing to a single supplier, each organization was able to standardize the reference ranges for the tests they ran, which in turn allowed for an easier determination of results and consequently a more accurate diagnosis by the physician. Organization E stated this had an expanding impact on the labs in the network. They were able to move technicians between locations without having to provide additional training on the reference ranges and they were able to maintain a high quality of test because the technician was already familiar with the analyzer.

Leverage

Four organizations indicated an increase in their leverage with suppliers after completing supply base reduction. By increasing the volume of purchases with a single supplier, the organizations were able to get better options regarding cost, quality and delivery. One exception to this was Organization D, who did not have a high volume of purchases, but showed their commitment by making all their purchases through a single

vendor. Organization D leveraged their commitment to a single supplier as a replacement for a large volume of purchases, and was able to gain better pricing, service and quality.

Unit Price

Identified as a goal for the organization, a reduction in price paid was also an advantage seen by a majority of the organizations. This was accomplished in multiple ways by each organization. First, the organization increased the volume of its purchases to the remaining supplier after the supply base reduction and negotiated a better contract price. A supplier would be more willing to offer better prices for a large volume purchase due to the lower fixed costs that it would have to pay for the transaction. Second, price reductions were seen solely by standardizing the products for the organizations. For Organization B, supply base reduction lowered the price for two sites and raised it for the third; however, the overall result was a price reduction for the organization.

Disadvantages of Supply Base Reduction

Each of the case study organizations was asked what disadvantages of supply base reduction were seen after the project was completed. Table 9 lists the disadvantages as described by the organizations. The table is broken down into sections based on information gathered from the literature on what disadvantages may be seen, but only areas which had a response are included. The two main sections mentioned by the organizations are uncertainty or risk, and flexibility.

Table 10. Disadvantages of Supply Base Reduction Efforts

Disadvantages		Organization						
		A	B	C	D	E	F	Total
Technology and Innovation								
	Decreased access to technology and innovation – overall					X		1
Availability and Capacity								
	Increased risk of shortage or capacity problem			X				1
Inventory								
	Initial increase in inventory levels						X	1
Delivery and Transportation								
	Increased transportation costs (for some locations)						X	1
Uncertainty or Risk								
	Increased risk of shortage due to business failure or catastrophe		X	X	X		X	3
	Initial decrease in productivity due to new platform	X	X					2
Service								
	Initial increase in service, but then return to normal	X						1
Flexibility								
	Decrease in number of supplier choices		X	X		X	X	4
Dependability								
	Decrease in dependability		X				X	2
Other								
	Increase in contract length					X		1
	Training personnel on new platform	X						1

Uncertainty or Risk

Nearly every organization mentioned a type of uncertainty or risk as a disadvantage to supply base reduction. The most frequently mentioned risk was a shortage due to the supplier discontinuing an item, running out of stock or, the worst-case scenario, the supplier going out of business. Organization D identified it as “the risk of putting all your eggs in one basket,” and the best way to manage this uncertainty was to have secondary suppliers available. Additionally, two organizations, A and F, ran into

problems after the implementation of supply base reduction with the introduction of new equipment platforms. As with any new technology or process, there was a learning curve, for both the staff and the equipment service technicians. The new platforms created an uncertainty in the testing process while the bugs were worked out, but after training for the staff and service technicians, the issue was resolved.

Flexibility

The other main disadvantage mentioned was the lack of flexibility. This included the number of suppliers available, as well as the ability to change the technology being used and the contract duration. The number of suppliers available tied directly back to the uncertainty of being able to change suppliers in the event something happened. Organizations remedied this issue by having backup suppliers available. The other flexibility factor was how the organization is now locked into a specific technology platform by a contract which can make it more difficult to obtain a better platform if it were to come along. Most organizations dealt with this by having contracts no longer than seven years with the first three years guaranteed and the remaining years as option years where the organization has the ability to opt out if they desire.

Summary

This chapter discussed the findings regarding six case studies on hospital networks that underwent supply base reduction of laboratory reagents. The reasons for supply base reduction were discussed as well as the process the organizations used to develop their supply base reduction project. Critical success factors were identified by

the organizations and an analysis of the advantages and disadvantages of the various projects was produced.

V. Discussion

The purpose of this research is to assist the Air Force Medical Operations Agency in understanding why hospital networks have conducted supply base reduction efforts regarding laboratory reagents. This research provides an understanding of supply base reduction, how it is implemented in an organization, critical success factors and the specific advantages of supply base reduction and if they are able to be applied to the AFMS. Six different hospital networks were interviewed following the case study methodology and a cross-case analysis as conducted on the organizations. This chapter will provide answers to the research questions based on the results found from the cases.

Research Questions Answered

Research Question 1: Why did the organizations determine a need for a supply base reduction regarding laboratory reagents?

Hospital networks conduct supply base reduction for a variety of reason. Each organization was provided a list of 20 different drivers for supply base reduction, based on the literature review, and asked to rank how they impacted the organizations decision for supply base reduction on a scale of one to five, with 5 being the most influential and one being the least. The top three drivers are listed in Table 10 below.

Table 11. Most Influential Drivers of Supply Base Reduction Efforts

Driver	Rank
Need for cost reductions	1
Desire for increased leverage	2
Desire to form closer relationships with suppliers	3

The need for cost reduction was the most influential driver for all six organizations. As one organization stated “as revenue is decreased due to lower [insurance] reimbursements, costs must also be decreased” (Clinical Lab Business Director, 9/30/16). One way for hospitals to save is on their supplies, as supplies can make up 25 to 30 percent of the total operating costs (Toba and others, 2008). When looking specifically at laboratory reagents, the majority of organizations choose items that had high strategic importance with a medium high to high percentage of total spend. Cost reduction would be of great importance for these organizations.

The second most influential driver was a desire for increased leverage with the supplier. The thought was that by increasing the volume of purchases with a single supplier, the organizations would be able to get better options regarding cost, quality and delivery. By becoming a significant customer, the organization hopes to negotiate a better price for the product as well as customer service or product packaging and delivery.

A desire to form closer relationships with suppliers was the third driving factor as long term relationships can benefit both the buyer and supplier. These relationships allow collaboration and a reduction of fears about opportunistic behavior (Ates and others, 2015) and have a positive impact on supplier performance. The organizations hoped that better developing a stronger relationship with their suppliers they could improve communication and product development.

Research Question 2: How did the organizations transition from a large supply base and how were issues managed?

The organizations used two of the three possible ways available per the literature review, systematic elimination and standardization, to complete supply base reduction. As stated earlier, the main difference is whether the organization was standardizing the type of products, which led to the reduction in suppliers or if the organization eliminated suppliers, which in turn led to the standardization of a product. Both approaches were seen by three organizations each, which offered multiple views of the process.

Each organization was asked what made the supply base reduction process a success and what barriers were encountered. The success factors were key management support, good communication and cross-functional teams while the barriers were resistance to change and end user buy-in. The organizations noted that the success factors were what enabled them to overcome the barriers. The good communication and cross-functional teams were able to allow input by the end user and let them have a say in the product they would be using. Good communication during the process allowed all parties to have continual updates on the status of the project which helped keep the key management support and lower the resistance to change.

Research Question 3: What benefits have the organizations received from supply base reduction efforts in terms of the supply base performance factors and how do these benefits occur?

Using the supply base performance factors discussed in Chapter 2, the organizations selected the benefits they had seen since the completion of the supply base reduction project. The top four benefits are listed in Table 11 below. Other benefits were seen by the organizations; however, only the most common were listed.

Table 12. Summary of Advantages Achieved by Case Study Organizations

Benefit
Increased access to technology and innovation
Increased quality levels
Increased organizational leverage
Reduction in price paid

These benefits are a result of the closer relationship with the remaining supplier after the supply base reduction. The remaining supplier is more likely to work with the organization as the organizations business has become more valuable. With this type of relationship, the organization and supplier can work together to develop new laboratory tests based on the organizations needs or work to increase the quality of the reagents. With the additional volume of purchases the organization is providing to the supplier, the organization is able to request better prices as well as other leverage items such as delivery, packaging or customer service.

Research Question 4: How does the US Air Force Medical Operations Agency (AFMOA) compare in structure to the case study organizations?

The Air Force Medical Operations Agency contains seventy-five medical laboratories, which is a significantly greater amount than the case study organizations, of which the largest ones contained ten laboratories. Other than size, the basic structure is similar in that the outpatient laboratories outnumber the hospital laboratories. The Air Force Medical Service has fourteen hospitals or medical centers, with five located outside the continental United States. The remaining sixty-one facilities are considered outpatient clinics as they do not have facilities to allow patients to stay overnight. Additionally, both medical facilities fall under a similar command structure type. They

are headed by individuals outside the lab who typically do not have experience with lab reagents or with purchasing.

Each organization had a purchasing department that worked with the laboratory to procure the reagents. Each department had their own director as well as individuals underneath him who were responsible for specific activities. This is similar to how an Air Force medical group is configured. Each laboratory has a flight commander who is in charge of the overall operation of the laboratory and then has noncommissioned officers who handle specific aspects of the laboratory such as microbiology. The purchasing department for the Air Force is the same way. The purchasing for the medical group is done by the medical logistics flight which is also run by a flight commander. This flight commander also has noncommissioned officers which handles specific aspects such as pharmaceuticals.

Research Question 5: What aspects of a supply base reduction approach would be applicable to the AFMOA?

If the AFMOA were to undertake supply base reduction, its size and the numerous locations of the facilities would present the largest obstacle. If the facilities were split into regions that would allow for a simpler application of supply base reduction; however, it could be possible to do an overall supply base reduction with considerable effort. The most likely approach would be standardization of laboratory reagents as it would allow for easier movement of personnel between locations without requiring training on new equipment at every location.

Additionally, the AFMOA could gain many advantages by pursuing supply base reduction. It would be easy to gain leverage with the large purchases the Air Force

would make, which would allow for price reductions, improved delivery/packaging as well as improved customer service. The increased communication with suppliers would allow for laboratories to request new technology and improvements on the equipment and products they currently use.

Limitations

Potential limitations that have been identified are the case studies will be entirely from the same sector. These organizations do not have some of the buying restrictions that government organizations face and it may come about that there is not a way to correlate the two. A second limitation is the types of organizations being studied are all healthcare networks. Other organizations utilize chemical laboratory reagents, such as forensic analysis and independent laboratories. These organizations may have a different structure and priorities which would change the manner in which supply base reduction takes place. In addition, each case study organization had a positive experience with supply base reduction. This could skew the research as not all possibilities were observed.

Recommendations for Future Research

Several possibilities exist for future research mainly due to the limitations mentioned above. One area would be to conduct case studies on organizations which use laboratory reagents, but are not tied to health care such as forensic laboratories to see if they have undergone any supply base reduction projects. This may provide a different perspective as well as see if they determined a need for supply base reduction. A second

area would be to look at the organizations in this case study in the future to determine if they are still using the same number of suppliers or if they have regressed back to their original supply strategy. This would provide an opportunity to see how the organizations was able to maintain its relationship with the supplier, or in the event they reverted back to their original supply strategy, what caused the increase in suppliers. Finally, research could be done into organization which did not have a successful supply base reduction project or who had reviewed their supply base and did not see a need for change. This would allow better insight into the disadvantages of supply base reduction.

Summary

The goal of this research was to use the case study methodology to showcase how hospital networks applied supply base reduction to laboratory reagent purchases. Interviews with six organizations identified the reasons why hospital networks implemented supply base reduction, the processes used for supply base reduction, factors which made the supply base reduction project a success, and various advantages and disadvantages of supply base reduction. This information will allow the AFMOA to make an informed decision on whether supply base reduction is appropriate.

Appendix A: IRB Exemption Approval



DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY (AETC)

23 Aug 2016

MEMORANDUM FOR Dr. Jeffrey Ogden

FROM: John J. Elshaw, Ph.D.
AFIT IRB Research Reviewer
2950 Hobson Way
Wright-Patterson AFB, OH 45433-7765

SUBJECT: Approval for exemption request from human experimentation requirements (32 CFR 219, DoDD 3216.2 and AFI 40-402) for Supply Base Reduction Efforts for Laboratory Reagents.

1. Your request was based on the Code of Federal Regulations, title 32, part 219, section 101, paragraph (b) (2) Research activities that involve the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior unless: (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) Any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
2. Your study qualifies for this exemption because you are not collecting sensitive data, which could reasonably damage the subjects' financial standing, employability, or reputation. Further, the demographic data you are utilizing and the way that you plan to report it cannot realistically be expected to map a given response to a specific subject.
3. This determination pertains only to the Federal, Department of Defense, and Air Force regulations that govern the use of human subjects in research. Further, if a subject's future response reasonably places them at risk of criminal or civil liability or is damaging to their financial standing, employability, or reputation, you are required to file an adverse event report with this office immediately.

8/23/2016

X 

Signed by: ELSHAW.JOHN.J.1078680454

Appendix B: Interview Questionnaire

INTERVIEW QUESTIONS FOR CPO OR SENIOR PSM EXECUTIVE

Company: _____ Date _____ Time _____

PERSONAL DATA

Name: _____ Job Title: _____

Years with Company: _____ Years in Position: _____

E-mail address _____ Phone Number _____

Address: _____

CORPORATE PROFILE

Primary Business Location: _____

Number of Clinics within Network: _____

Total Sales (_____): Year _____

Net Profit (_____): Year _____

Number of Employees: _____

Number of Purchasing Employees _____

Approximate Total Value of Purchases: _____

BACKGROUND INFORMATION

1. What are the major challenges facing your business?
 - internally
 - externally
2. What important events have occurred at your company within the past 5 years?
 - merger/acquisitions/JV-s
 - new CEO / new senior management
 - major organizational change
 - expansion
 - downsizing

B. OVERALL SUPPLY BASE REDUCTION EFFORTS

3. How would you describe the general organization structure of the company for the following purchases?

	Centralized	Decentralized	Hybrid	Outsourced
Direct Material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Indirect Material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Capital Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Have any major changes occurred to these organizational structures in the past 2 years? If so, what have they been?
5. Briefly describe the organization's overall purchasing strategy, goals, and objectives in terms of the following areas:
6. How are purchasing strategies determined?
7. How do supply base reduction efforts support the overall purchasing strategy?
8. Please tell me about your organization's overall supply base reduction efforts during the past 5 years.
- How is the number of suppliers tracked?
 - How is the information on these suppliers aggregated?
 - Main products/commodities/categories affected?
 - Overall change in total number of suppliers utilized?
 - Number of personnel/functions involved?
 - Organizational level of personnel involved?
 - Time spent?
 - Resources dedicated?
 - Rewards / incentives utilized?
9. Why did the organization decide to implement supply base reduction efforts regarding laboratory reagents?

10. How much influence did each of the following items have on the decision to implement supply base reduction efforts for laboratory reagents?

	None		Moderate		Significant
	1	2	3	4	5
Top management directives	0	0	0	0	0
Change in level of centralization	0	0	0	0	0
Need for cost reductions	0	0	0	0	0
Changes in supply market	0	0	0	0	0
Changes in level of competitive pressure	0	0	0	0	0
Supply chain management initiatives	0	0	0	0	0
Changing customer requirements/expectations	0	0	0	0	0
Changes in level of product/service standardization	0	0	0	0	0
Merger & acquisition activity	0	0	0	0	0
Changes in level of uncertainty/risk	0	0	0	0	0
Desire for partnership with suppliers	0	0	0	0	0
Desire for increased leverage	0	0	0	0	0
Changes in the level of asset-specific investment required	0	0	0	0	0
Pressure from government/regulatory agencies	0	0	0	0	0
Change in use of corporate benchmarking	0	0	0	0	0
Pressure from professional organizations	0	0	0	0	0
Changes in the frequency of transactions	0	0	0	0	0
Desire to fit in with other companies (bandwagon)	0	0	0	0	0
Desire to adopt other purchasing strategies for which supply base reduction is a prerequisite	0	0	0	0	0
Changes in the financial importance of product or service purchased	0	0	0	0	0
Other	0	0	0	0	0

11. What is the biggest gain that your organization has seen since implementing supply base reduction efforts for laboratory reagents?

12. In which of the following areas has your organization experienced advantages since implementing supply base reduction efforts for laboratory reagents?

	(Check all that apply)	(Check if quantified)
Technology/innovation	<input type="checkbox"/>	<input type="checkbox"/>
Availability/capacity	<input type="checkbox"/>	<input type="checkbox"/>
Supplier management costs	<input type="checkbox"/>	<input type="checkbox"/>

Quality	<input type="checkbox"/>	<input type="checkbox"/>
Inventory	<input type="checkbox"/>	<input type="checkbox"/>
Delivery/transportation	<input type="checkbox"/>	<input type="checkbox"/>
Uncertainty	<input type="checkbox"/>	<input type="checkbox"/>
Information sharing	<input type="checkbox"/>	<input type="checkbox"/>
Leverage	<input type="checkbox"/>	<input type="checkbox"/>
Partnerships	<input type="checkbox"/>	<input type="checkbox"/>
Unit cost	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility	<input type="checkbox"/>	<input type="checkbox"/>
Service	<input type="checkbox"/>	<input type="checkbox"/>
Time/speed to market	<input type="checkbox"/>	<input type="checkbox"/>
Dependability/responsiveness	<input type="checkbox"/>	<input type="checkbox"/>
Accounts payable	<input type="checkbox"/>	<input type="checkbox"/>
Working capital requirements	<input type="checkbox"/>	<input type="checkbox"/>
Asset reduction	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>

13. How have each of the above mentioned advantages been determined/measured/quantified?
14. What is the biggest drawback that the organization has seen, since implementing supply base reduction efforts for laboratory reagents?
15. In which of the following areas has your organization experienced shortcomings since implementing a supply base reduction for laboratory reagents?

	(Check all that apply)	(Check if quantified)
Technology/innovation	<input type="checkbox"/>	<input type="checkbox"/>
Availability/capacity	<input type="checkbox"/>	<input type="checkbox"/>
Management costs	<input type="checkbox"/>	<input type="checkbox"/>
Quality	<input type="checkbox"/>	<input type="checkbox"/>
Inventory	<input type="checkbox"/>	<input type="checkbox"/>
Delivery/transportation	<input type="checkbox"/>	<input type="checkbox"/>
Uncertainty	<input type="checkbox"/>	<input type="checkbox"/>
Information sharing	<input type="checkbox"/>	<input type="checkbox"/>
Leverage	<input type="checkbox"/>	<input type="checkbox"/>
Partnerships	<input type="checkbox"/>	<input type="checkbox"/>
Unit cost	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility	<input type="checkbox"/>	<input type="checkbox"/>
Service	<input type="checkbox"/>	<input type="checkbox"/>
Time/speed	<input type="checkbox"/>	<input type="checkbox"/>
Dependability/responsiveness	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>

16. How have each of the above-mentioned shortcomings been determined/measured/quantified?
17. Are there any internal documents that provide additional information concerning these questions? If so, may I have access to those documents?
18. Is there anyone else within the organization that I should speak to concerning the organization's reasons for implementing supply base reduction for laboratory reagents, the process involved, or the outcomes?

INTERVIEW QUESTIONS FOR SUPPLY BASE REDUCTION PROJECT MANAGER

Company: _____ Date _____ Time _____

PERSONAL DATA

Name: _____ Job Title: _____

Years with Company: _____ Years in Position: _____

E-mail address _____ Phone Number _____

Address: _____

SPECIFIC SUPPLY BASE REDUCTION PROJECT

1. What specific laboratory reagent was selected for supply base reduction efforts?
2. What is the nature of this product or service?

Strategic Importance	High			
	Medium			
	Low			
		Low	Medium	High
		% of Total Spend		

3. Why was this reagent selected for supply base reduction efforts?
4. What was your role in the supply base reduction efforts for this laboratory reagent?
5. How many suppliers were there prior to the supply base reduction efforts?

6. How did there get to be _____ number of suppliers prior to the supply base reduction efforts?
7. How many suppliers were there following supply base reduction efforts?
8. Why was this number of suppliers acceptable?
9. Is this laboratory reagent purchased by a centralized corporate purchasing department or by decentralized purchasing departments within the organization?
10. Had this reagent undergone any significant changes prior to the supply base reduction efforts?
 - Part standardization
 - Specification changes
 - Requirement changes
 - Material changes
11. If this supply base reduction project also deals with a service such as equipment leasing and maintenance, were there any changes to the specifications of the service being purchased prior to supply base reduction efforts?
12. What is the supplier market for this product like in terms of:
 - Competition?
 - Number of suppliers available?
 - Size of suppliers?
 - Location of suppliers?
13. Did the supply market for this particular reagent undergo any significant changes prior to the supply base reduction efforts?
14. How would you describe the relationship between your organization and your suppliers for this reagent prior to supply base reduction efforts?
 - Price oriented
 - Alliance
 - Collaborative
 - Leveraged

Other _____

15. How would you describe the relationship between your organization and your suppliers for this reagent after supply base reduction efforts?

Price oriented

Alliance

Collaborative

Leveraged

Other _____

16. Why do you think these changes in the relationship between your organization and your suppliers, if any, occurred?

17. How frequently is this laboratory reagent ordered from suppliers?

18. What is the typical contract length for this laboratory reagent?

19. How often do you consider re-sourcing this laboratory reagent?

20. Does this laboratory reagent require any relationship-specific investments by either the buyer or the supplier? If so, what kinds of investments are required?

21. Describe the supply base reduction process utilized.

- When did this process take place?
- How long did it take?
- Who was involved?
- How were suppliers selected for elimination or retention?
- How did this reduction in the supply base occur?
 - Eliminating seldom used suppliers
 - Shift to full service suppliers / tiering of supply base
 - Elimination of parts through standardization

- Awarding larger contracts to fewer suppliers based on competitive bidding
 - Systematically eliminating suppliers based upon some predetermined criteria
 - Other
- What were the critical success factors for this project?
 - What were the significant barriers that needed to be overcome?
 - How were these barriers surmounted?

22. What were the specific outcome forecasts/goals/targets/projections for this supply base reduction process?

23. The following list represents possible advantages from supply base reduction efforts. Please check all that occurred in this situation, circle the top 3 benefits that occurred, and mark whether these benefits were quantified.

	(Check all that apply)	(Check if quantified)
Technology/innovation	<input type="checkbox"/>	<input type="checkbox"/>
Availability/capacity	<input type="checkbox"/>	<input type="checkbox"/>
Management costs	<input type="checkbox"/>	<input type="checkbox"/>
Quality	<input type="checkbox"/>	<input type="checkbox"/>
Inventory	<input type="checkbox"/>	<input type="checkbox"/>
Delivery/transportation	<input type="checkbox"/>	<input type="checkbox"/>
Uncertainty	<input type="checkbox"/>	<input type="checkbox"/>
Information sharing	<input type="checkbox"/>	<input type="checkbox"/>
Leverage	<input type="checkbox"/>	<input type="checkbox"/>
Partnerships	<input type="checkbox"/>	<input type="checkbox"/>
Unit cost	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility	<input type="checkbox"/>	<input type="checkbox"/>
Service	<input type="checkbox"/>	<input type="checkbox"/>
Time/speed	<input type="checkbox"/>	<input type="checkbox"/>
Dependability/responsiveness	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>

24. How were these advantages measured or quantified?

25. Are there any documents or materials that detail these advantages?

26. May I have access to this information?

27. Why do you think that the supply base reduction efforts affected the above listed items in the manner in which you describe?
28. From your experience, what is the general relationship between the number of suppliers and the above listed items?
29. The following list represents possible disadvantages of supply base reduction efforts. Please check all that occurred in this situation, circle the top 3 disadvantages that occurred, and mark whether these disadvantages were quantified.

	(Check all that apply)	(Check if quantified)
Technology/innovation	<input type="checkbox"/>	<input type="checkbox"/>
Availability/capacity	<input type="checkbox"/>	<input type="checkbox"/>
Management costs	<input type="checkbox"/>	<input type="checkbox"/>
Quality	<input type="checkbox"/>	<input type="checkbox"/>
Inventory	<input type="checkbox"/>	<input type="checkbox"/>
Delivery/transportation	<input type="checkbox"/>	<input type="checkbox"/>
Uncertainty	<input type="checkbox"/>	<input type="checkbox"/>
Information sharing	<input type="checkbox"/>	<input type="checkbox"/>
Leverage	<input type="checkbox"/>	<input type="checkbox"/>
Partnerships	<input type="checkbox"/>	<input type="checkbox"/>
Unit cost	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility	<input type="checkbox"/>	<input type="checkbox"/>
Service	<input type="checkbox"/>	<input type="checkbox"/>
Time/speed	<input type="checkbox"/>	<input type="checkbox"/>
Dependability/responsiveness	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>

30. How were these disadvantages measured or quantified?
31. What plan/processes have been implemented, if any, to prevent the size of the supply base from growing in the future?
32. Is there any other information relating to the supply base reduction efforts for this laboratory reagent that I should know about? Any additional comments?
33. Are there any other people that I should speak with about this particular supply base reduction project, its drivers, the process followed, or the benefits? If so, will you provide me with the contact information?

What is the best time and method to contact you for any follow-up questions?

Appendix C: Coding Scheme

- 1 Reasons for Supply Base Reduction
 - 1 1 Desire to form partnerships with suppliers
 - 1 2 Desire to decrease costs
 - 1 3 Complexity of purchasing
 - 1 4 Financial importance of the product
 - 1 5 Standardization
 - 1 6 Desire to implement other purchasing strategies
 - 1 7 Relationship-specific investment
 - 1 8 Desire for increased leverage
 - 1 9 Frequency of transaction
 - 1 10 Centralization
- 2 Processes for Supply Base Reduction
- 3 Barriers to Supply Base Reduction
- 4 Critical Success Factors
- 5 Advantages of Supply Base Reduction
 - 5 1 Better relationships with suppliers
 - 5 2 Increased leverage
 - 5 3 Better communication and information sharing
 - 5 4 Decreased unit cost or price
 - 5 5 Increased flexibility and responsiveness
 - 5 6 Better access to technology and innovations
 - 5 7 Improved delivery performance
 - 5 8 Decreased inventories

- 5 9 Decreased inventories
- 5 10 Decreased supplier management or transaction costs
- 5 11 Increased quality
- 5 12 Improved speed or time
- 5 13 Decreased risk or uncertainty
- 5 14 Improved service
- 5 15 Increased dependability
- 6 Disadvantages of Supply Base Reduction
 - 6 1 Supply disruptions or capacity problems
 - 6 2 Price escalation risk
 - 6 3 Decreased access to technology and innovation
 - 6 4 Becoming too dependent on suppliers
 - 6 5 Increased likelihood of opportunistic behavior
 - 6 6 Decreased quality
- 7 Supply Base Performance Factors

Appendix D: Titles of Individuals Interviewed at Case Study Organizations

Title	Company					
	A	B	C	D	E	F
High Level Purchasing Executive						
System VP - Strategic Sourcing					1	
Director – Purchasing, Contract, & Value Analysis			1			
Executive Director of Network Laboratory Services	1					
Administrative Director – Laboratory Services		1				
Directory, Supply Chain Management				1		
Senior Director Strategic Sourcing Business Services						1
Supply Base Reduction Project Manager						
Director – Clinical Laboratories			1			
Technical Director Regional Laboratory Services						1
Microbiology Supervisor and Safety Officer		1				
Laboratory Project Coordinator					1	
Other Purchasing Employees						
Clinical Sourcing Manager – Strategic Sourcing					1	
Manager - Strategic Sourcing	1					
Purchasing Coordinator				1		
Total Interviews	2	2	2	2	3	2

Bibliography

- Ates, M. A., Wynstra, F., & van Raaij, E. M. (2015). An Exploratory Analysis of the Relationship between Purchase Category Strategies and Supply Base Structure. *Journal of Purchasing & Supply Management*, 21, 204–219.
- Chen, I. J., & Paulraj, A. (2004). Understanding Supply Chain Management: Critical Research and a Theoretical Framework. *International Journal of Production Research*, 42(1), 131–163.
- Choi, T. Y., & Krause, D. R. (2006). The Supply Base and its Complexity: Implications for Transaction Costs, Risks, Responsiveness, and Innovation. *Journal of Operations Management*, 24(5), 637–652.
- Cousins, P. D. (1999). Supply Base Rationalization: Myth or Reality. *European Journal of Purchasing & Supply Management*, 5, 143–155.
- Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), 532–550.
- Goffin, K., Szwajkowski, M., & New, C. (1997). Managing Suppliers: When Fewer Can Mean More. *International Journal of Physical Distribution & Logistics*, 27(7), 422–436.
- Holmen, E., Pedersen, A., & Jansen, N. (2007). Supply Network Initiatives – A Means to Reorganize the Supply Base? *Journal of Business & Industrial Marketing*, 22(3), 178–186.
- Homburg, C., & Kuester, S. (2001). Towards an Improved Understanding of Industrial Buying Behavior: Determinants of the Number of Suppliers. *Journal of Business-to-Business Marketing*, 8(2), 5–33.
- Johnson, P. F., Leenders, M. R., & Flynn, A. E. (2011). *Purchasing and Supply Management* (14th ed.). New York: McGraw-Hill.
- McKone-Sweet, K. E., Hamilton, P., & Willis, S. B. (2005). The Ailing Healthcare Supply Chain: A Prescription for Change. *The Journal of Supply Chain Management*, 41(1), 4–17.
- Nam, S.-H., Vitton, J., & Kurata, H. (2011). Robust Supply Base Management: Determining the Optimal Number of Suppliers Utilized by Contractors. *International Journal of Production Economics*, 134(2), 333–343.
- Ogden, J. A. (2006). Supply Base Reduction: An Empirical Study of Critical Success Factors. *The Journal of Supply Chain Management*, 42(4), 29–39.

- Ogden, J. A. (2003). *An Empirical Investigation of the Antecedents, Processes, and Benefits of Supply Base Reduction Efforts* (Doctoral Dissertation). Arizona State University.
- Sarkar, A., & Mohapatra, P. K. J. (2006). Evaluation of Supplier Capability and Performance: A Method for Supply Base Reduction. *Journal of Purchasing and Supply Management*, 12(3), 148–163.
- Sarkar, A., & Mohapatra, P. K. J. (2009). Determining the Optimal Size of Supply Base with the Consideration of Risks of Supply Disruptions. *International Journal of Production Economics*, 119(1), 122–135.
- Schramm, W. (1971). *Notes on Case Studies of Instructional Media Projects*. Institution for Communication Research.
- Toba, S., Tomasini, M., & Yang, Y. H. (2008). Supply Chain Management in Hospital: A Case Study. *California Journal of Operations Management*, 6(1), 49–55.
- Trent, R. J., & Monczka, R. M. (1998). Purchasing and Supply Management: Trends and Changes Throughout the 1990s. *International Journal of Purchasing and Materials Management*, (Fall), 2–11.
- Yin, R. K. (2014). *Case study research: Design and methods*. SAGE Publications: Thousand Oaks, CA. (5th ed.). Los Angeles: SAGE.

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 074-0188		
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 23-03-2017		2. REPORT TYPE Master's Thesis		3. DATES COVERED (From - To) August 2015-March 2017	
4. TITLE AND SUBTITLE Supply Base Reduction Efforts Regarding Laboratory Reagents within Hospital Networks			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Hughes, Kelsie L., Captain, USAF			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(S) Air Force Institute of Technology Graduate School of Engineering and Management (AFIT/EN) 2950 Hobson Way, Building 640 WPAFB OH 45433-8865			8. PERFORMING ORGANIZATION REPORT NUMBER AFIT-ENS-MS-17-M-134		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Medical Operations Agency/Medical Logistics Division 693 Neiman Street Fort Detrick, MD 21702-5006			10. SPONSOR/MONITOR'S ACRONYM(S) AFMOA/SGAL		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED					
13. SUPPLEMENTARY NOTES This material is declared a work of the U.S. Government and is not subject to copyright protection in the United States.					
14. ABSTRACT The Air Force Medical Operations Agency currently has contracts for laboratory reagents at approximately 75 Air Force medical treatment facilities; however, each medical facility has a separate means used to procure these reagents. AFMOA wants to know how other hospital networks are purchasing their reagents and see if it could be applied to the Air Force. The goal of this research was to use the case study methodology to showcase how other hospital networks applied supply base reduction to laboratory reagent purchases. We examine what drove the organizations to begin supply base reduction, how they transitioned to a smaller supply base, the barriers and success factors of the process and what advantages and disadvantages were seen once the process was complete.					
15. SUBJECT TERMS Multi-skilling, cross utilization, skill retention					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Dr. Jeffrey Ogden, PhD
U	U	U	UU	80	19b. TELEPHONE NUMBER (Include area code) (937) 255-6565 (Jeffrey.ogden@afit.edu)

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18