IMPLEMENTING BUSINESS-TO-BUSINESS

ONLINE REVERSE AUCTIONS

BY

LOAY SEHWAIL

Bachelor of Science
University of Jordan
Amman, Jordan
1999

Master of Science
Oklahoma State University
Stillwater, Oklahoma
2001

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IMPLEMENTING BUSINESS-TO-BUSINESS

ONLINE REVERSE AUCTIONS

Dissertation Approved:

Dr. Ricki G. Ingalls
Dissertation Advisor

Dr. David B. Pratt

Dr. Camille DeYong

Dr. William D. Warde

Dr. Dan Tilley

Dr. A. Gordon Emslie
Dean of the Graduate College

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CHAPTER 1: INTRODUCTION

1.1 Overview

This research is motivated by the recent phenomenal growth in the use of business-to-business (B2B) online reverse auctions, by organizations on a global basis. Business-to-business online reverse auctions have gained popularity among Fortune 1000 companies (Emiliani and Stec 2004) as a tool to reduce the price of purchased products and services (Judge 2001; Richards 2000; Tully 2000).

Virtually every major industry has begun to use online reverse auctions on a regular basis; examples include General Electric (GE), Motorola, Boeing, Quaker Oats, Dell, and many others. Some of these companies, such as Quaker Oats and SmithKlineBeecham, reported millions of dollars of savings with the use of online reverse auctions compared to traditional purchasing methods (Brunelli 2000). Others have reported that the annual volume of industrial purchases for their organizations through online reverse auctions has reached billions of dollars. According to Jason Seigel, Motorola Director of Corporate E-procurement, in the fiscal year of 2003, Motorola outsourced $2.8 billions of direct material through online reverse auctions with an estimated savings of 20%, up from $1.6 billion in 2002. Motorola auctions off about 15 percent of its total spend, up from 10 percent in 2002 and 5 percent in 2001 (Carbone 2004).

This dissertation investigates the business-to-business online reverse auction implementation by buying organizations. The goal is to generate a reliable and valid theory through the introduction of hypotheses that will help guide companies and researchers in successfully implementing online reverse auctions in this rapidly evolving field of inquiry. For the purpose of this research, am online reverse auction is defined as an online real-time bidding event hosted by a single buyer to outsource products and/or services, in which multiple pre-qualified suppliers compete for the buyer's business. These suppliers compete by bidding against each other online over the Internet using specialized software by submitting successively lower-priced bids during a scheduled time period. The price is successively reduced until no one bids less than the current price. The research focuses on the use of one-sided auctions. "One-sided" refers to the fact that there exists a single buyer and multiple sellers.

Business-to-business online reverse auctions promise a range of benefits to both buyers and suppliers. Lower transaction costs, shorter order cycle-times, and competitive purchase prices are the obvious benefits of online reverse auctions for the buying organizations. Buyers are not the only benefactors of online reverse auctions. Suppliers can benefit by obtaining market information, by having an outlet to better manage excess capacity, and by competing for business from new customers. Suppliers also gain valuable information about their competitors' cost structures that can help then become more effective in the long run. The fact that less time is required for online reverse auctions compared to traditional competitive bidding reduces the supplier's reliance on forecasting for planning purposes. Consequently, suppliers may need less inventory and, thus, have lower total inventory costs.

The purpose of the research is to explore the implementation of online reverse auctions by buying organizations, with the goal of reducing the purchase prices and developing/maintaining the buyer-supplier strategic alliance.The research studies the effects of the auction design and the purchase/product type on reducing the purchase prices and on the buyer-supplier partnership. The research studies the auction design from the following two dimensions: auction format and event organization. The research focuses on three types of industrial purchases: production material and components, MRO's, and services.

The following sections present the problem statement of the research, discuss the research purpose, and summarize the contribution of the research. An outline detailing the structure of the rest of the research concludes this chapter.

1.2 Problem Statement

In 2003, Giants Eagle, a 72 year-old supermarket retailer with a presence in Pennsylvania, Ohio, Maryland, and West Virginia, used business-to-business online reverse auctions to outsource $100 million dollars worth of unbranded goods like frozen pizza, lettuce, tomatoes, onions, cheese, bottled water, and indirect items like steel for construction, paper, PCs, advertising, print services, and air conditioning, according to Russ Ross, Giant Eagle's CIO. In the last five years, many companies in the United States, Europe, and Southeast Asia have used online reverse auctions to outsource billions of dollars. Examples include General Electric (GE), General Motors, Ford, Nissan, Motorola, Boeing, Quaker Oats, DuPont, Dell and many others.

Although business-to-business online reverse auctions hold many promises for both the buyers and the suppliers, numerous risks exist. Many articles in the popular business press defending the applications of online reverse auctions, have been contrasted with other articles summarizing and arguing the risks, limits, and abuses of online reverse auctions (Atkinson 2000; de Saint-Seine 2002; Kenczyk 2001). Other articles indicate that online reverse auctions are a destructive cost reduction tactic if it divides buyers and suppliers (Emiliani 2000a; Emiliani and Stec 2001).

Like any tool, online reverse auctions can provide value when properly implemented, but the savings they promise can be illusory when online reverse auctions are over used, misused, or poorly implemented. Even more dangerous is the deterioration in the buyer-supplier relationships when online reverse auctions are used to beat up suppliers on prices. Many buyers, suppliers, and researchers are concerned about the damage of the online reverse applications to the buyer-supplier relationship in the long-term and how it affects the potential savings. Suppliers who have been building relationships with the buying company for years might feel betrayed when asked to participate in a reverse auction, which might affect supplier responsiveness to the buyer's needs (Sehwail and Ingalls 2004).

Several recent studies (Emililiani 2000b; Jap 2002; Pearcy et al. 2002; Van Tulder and Mol 2002) concluded that online reverse auctions damage the buyer's long-term performance by creating distrust among its incumbent suppliers. One such source of distrust arises when buyers use online reverse auctions to test the market with no real intention of switching sources, but instead to drive down prices of incumbent suppliers.

In order to fill the gap in the supply management literature about online reverse auctions implementation, this research addresses the implementation of online reverse auctions with respect to (1) reducing purchase prices, and (2) developing/maintaining buyer-supplier strategic alliance relationships in the business-to-business online reverse auction environment for different auction design options and different types of industrial purchases. The research was motivated by three reasons: the lack of available survey research on best practices in the area of implementing online reverse auctions, the lack of understanding of how and when to use online reverse auctions, and finally the need to provide a platform/directions for companies who are using or plan to use online reverse auctions.

Over the past few years, practitioners have been swamped with information about online reverse auctions in journals and magazines, as well as, seminars and conferences. All major consulting firms (e.g., Boston Consulting Group, Deloitte Touche Tohmatsu), market research institutions (e.g., Datamonitor, Jupitor Research, AMR Research), software companies (e.g, Ariba, CommerceOne, Oracle) as well as application service providers (ASP) and electronic procurement service providers (e.g., TradingPartners, Freemarkets, eBreviate, Iasta) have published "best practice" studies, market reports, and products, software, or service brochures related to the use of online reverse auctions in industrial purchasing. The business press is also replete with articles on online reverse auctions, drawing primarily on the experiences of individual organizations. Most of these materials are commercial marketing materials with their sole target to promote the use of online reverse auctions based on a few successful case studies without arguing the risks, limits, and abuses of online reverse auctions.

Only recently has research on online reverse auctions begun to be presented at academic conferences and published in journals in the supply chain, marketing, management, and purchasing fields. A review of the methods underlying these publications (presented in Chapter Three) reveals that the majority of the research is conceptual, prescriptive and descriptive in nature, and based on few interviews and case studies. Furthermore, the small amount of survey research is based on rather small sample sizes when compared to "typical" quantitative research. This clearly indicates that online reverse auctions are a very recent emerging research area.

In summary, the phenomenon of business-to-business online reverse auctions in procurement has been receiving increasing attention among scholars from purchasing and supply management (e.g., Atkinson 2000; De Ruiter and Van Heck 2004; de Saint-Seine 2002; Emiliani 2000b; Emiliania and Stec 2004; Hong and Hartley 2001; Jap 2002; Pearcy 2002; Smeltzer and Carr 2002; Sehwail and Ingalls 2004; Smart and Harrison 2003; Van Tulder and Mol 2002; Wagner and Schwab 2004). The use of business-to-business online reverse auctions by managers is still quite new, and the research in the area of reverse auctions is in its infancy (Jap 2002). As a result, the following central research question remain largely unanswered in the literature: How does a corporation effectively use and implement one-sided online reverse auctions to meet the buying organization's simultaneous emphasis on cost management while developing/maintaining the cooperative buyer-supplier strategic alliance?

1.3 Research Purpose

The primary objective of this research is to address the gap in the academic literature by developing and testing a model to successfully implement online reverse auctions with respect to (1) reducing purchase prices, and (2) developing/maintaining buyer-supplier strategic alliance relationships in the business-to-business online reverse auctions environment.

The overall research question is: How to effectively use and implement one-sided business-to-business online reverse auctions to achieve organizational objectives of cost management while maintaining/developing the strategic alliance partnership with the suppliers? Specifically, the research seeks to address the following research questions:

1. What is the relationship between successful online reverse auction events (as perceived by the buying organization) and the reduction in purchase prices?
2. What is the relationship between successful online reverse auction events (as perceived by the buying organization) and developing/maintaining a strategic alliance with the suppliers?
3. What is the relationship between online reverse auction design and the reduction in purchase price objective in terms of auction format and event organization?
4. What is the relationship between the product/purchase type and the reduction in purchase price objective?
5. What is the relationship between the product/purchase type and the online reverse auction application?

6. How does the use of the online reverse auction as a sourcing tool affect the buyer strategic alliance relationship with the supplier, based on the measures developed by Mohr and Spekman (1994) and expanded by Monczka et al. (1998)?

In addition, the prime advantage of this research is the knowledge base that will assist organizations in their benchmarking efforts, as they compare their use of online reverse auctions as a procurement tool to the results of this research. This is true for organizations that use online reverse auctions. At the same time, the research presents the current best practices in the online reverse auction implementation for those who are still using traditional purchasing methods and are looking at the transition to online reverse auctions as one of their sourcing tools.

1.4 Contribution of the Research

According to AMR Research, online reverse auctions continue to gain acceptance. In 2003, only 15% of buyers reported using online reverse auctions while AMR Research 2004 numbers show 27% of buyers use online reverse auctions and another 21% say they will use them in the future (Carbone 2004). Because of the expected surge in the use of online reverse auctions, the research aims to increase the body of knowledge in the area of implementing online reverse auctions.

More specifically, the objective of the research is to understand the implementation of online reverse auctions to meet organizational objectives of reducing purchase prices while maintaining/developing the strategic buyer-supplier collaborative alliance. The research will investigate the effects of the auction design and the industrial purchase type on the implementation of online reverse auctions.

The findings from this study will increase the understanding of the implementation of business-to-business online reverse auctions, from the auction design and industrial purchase type perspectives, as an effective procurement tool among both procurement professionals and academicians in several ways. First, a review of the available literature (presented in Chapter Two and Chapter Three) reveals that the majority of the research is conceptual, prescriptive, and descriptive in nature or is based on few interviews and case studies; this research will be the first study to develop a scale for measuring the effects of the auction design on online reverse auction implementation, the first research to study the effects of purchase product type, in particular service, on the online reverse auction implementation, and the first research to adopt the Mohr and Spekman (1994) model to test the buyer-supplier strategic alliance in the online reverse auction environment.

Second, the development and testing of the research model can guide future research on various aspects of business-to-business online reverse auction implementation and provide a foundation for further exploration and analysis for auction design elements. Third, the research will provide important directions for companies who are using or considering using online reverse auctions. The research will guide the companies in assessing twoauction designs elements for outsourcing different types of industrial purchases in the online reverse auction implementation process.

1.5 *Outline of Dissertation*

The research is organized into six chapters. In Chapter Two, a literature review is presented over the areas deemed relative to this research. The literature review summarizes the published research in the areas of electronic commerce and supply chain management, electronic procurement, online marketplaces, online reverse auctions, and buyer-supplier relationships.

Chapter Three proposes the research framework on which the research is based. The chapter addresses the research question and the research hypotheses. The chapter begins with outlining the academic research on online reverse auction implementation. In the remaining part of the chapter, the research hypotheses are presented and supported with the necessary theoretical and logical basis. Finally, the research model is presented.

Chapter Four presents the methodological procedures used to test the research model. Specifically, this chapter presents the research instrument, the methodology for data analysis, the sample, data collection, and the research timeline.

Chapter Five contains an evaluation of the data that will be collected, and the results of the statistical analysis. The hypotheses are reviewed to check whether they are supported or not supported by the data. The proposed model is modified accordingly. A summary of the data analysis findings is also presented.

Finally, the results of this research are summarized in Chapter Six. The chapter is dedicated to interpretations, limitations, contributions, and implications of the research. The managerial implications and future research areas are also discussed in Chapter Six. Figure 1-1 provides a graphical overview of the structure of this study.

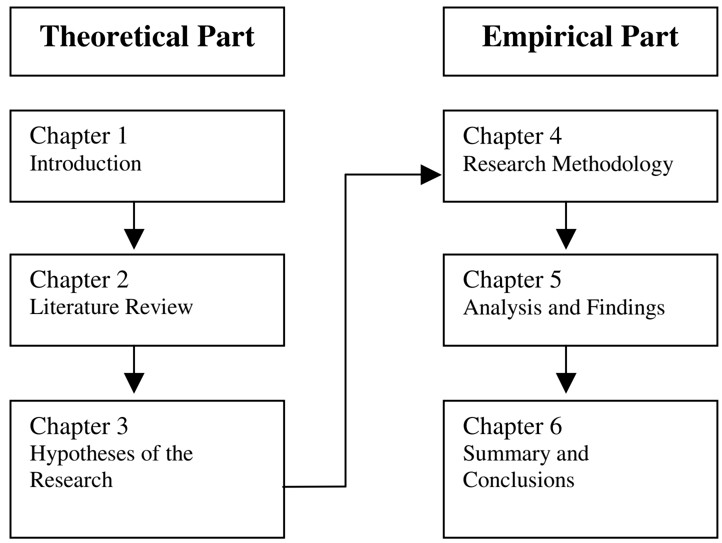

Figure 1-1: Research Structure and Content

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

For more than a decade, the academic literature and business press have been remarking that "The Internet will change everything." One trend that is showing increasing promise is the use of online reverse auctions. Virtually every major industry has begun to use and adopt online reverse auctions on a regular basis (Smith 2002). For example, Motorola has been using online reverse auction since the summer of 2003, according to Rob Haraln, senior e-procurement director, "Motorola had $11 billion direct material spend and $9.8 billion was electronically quoted and about $2.8 billion went through reverse auctions" (Carbone 2004).

This chapter reviews the literature relevant to the research. Section 2.2 examines the impact of electronic commerce on supply management practices. The review focuses on how electronic commerce has affected the information exchange side of supply chain management. New technologies in electronic commerce, such as online marketplaces, have reduced the transaction costs and total transaction time for many processes in the supply chain management system.

Section 2.3 presents the concept of electronic procurement. The emphasis in this section is on electronic procurement benefits for the buyers and suppliers. Section 2.4 presents online marketplace. The emphasis of the review will be on the definition, benefits for buyers and suppliers, and the functions of online marketplaces. Section 2.5 presents a differentiation of online marketplaces along four segmentation dimensions: ownership, stakeholder-focus, commerce model, and revenue model.

Section 2.6 reviews what has currently been written about online reverse auctions. First, different definitions of online reverse auction are presented; next, a summary of reasons for using online reverse auctions by buyers and suppliers; a review of the buyer and sellers risks of participating in an online reverse auction; the different types of auctions based on the research presented by McAfee and McMillan (1987); and finally, the differences between online reverse auctions and manual physical auctions.

Section 2.7 reviews and summarizes the literature that deals with the buyer-supplier relationships. One focus of this review is to present the two major types of buyer-supplier relationships. The review of the buyer-suppliers using online reverse auctions is important because business professionals spend as much as twenty percent of their time dealing with conflicts (King 1981).

Section 2.8 summarizes the literature review. Then the section builds a bridge between the literature review and the research framework that is presented in Chapter Three.

2.2 *The Impact of Electronic Commerce on Supply Chain Management*

Over the past two decades, businesses in virtually every industry in the world economy have benefited or at least been influenced by the technologies of electronic commerce. We are witnessing a revolution in commerce and society, primarily due to an explosion in information technology and the resulting rapid emergence of electronic commerce. Most transactions and profits in electronic commerce have been realized in business-to-business (B2B) commerce and not in business-to-consumer (B2C) commerce, which is no surprise, since business-to-business transactions outnumber consumer sales ten to one (Westland and Clark 2000). Other researchers estimated the business-to-business electronic commerce to be closer to 78% of the overall electronic commerce market (Lancioni, Smith, and Oliva 2003).

Many researchers have focused on the comprehensive effects of the e-commerce and Internet revolution on supply chain management practices (e.g. Lancioni, Smith, and Oliva 2000), and concluded that the Internet will enable companies to achieve major cost efficiencies, besides providing the necessary tools to react quickly to market changes. The use of information technologies is critical in supply chains as information technologies enable dynamic reconfiguration of organizational structures, add flexibility (Chandrachekar and Schary 1999) and prevent the distortion of information as it flows upstream (Mason-Jones and Towill 1999). Supply chain management has been literally reinvented by the new networked technologies and the practices they facilitate, i.e., e-procurement, e-marketplaces, e-logistics, collaborative commerce, real-time demand forecasting, inventory management, true just-in-time (JIT) production, customer interface, and web-based package tracking (Lancioni, Smith, and Oliva 2003).

Simchi-Levi et al. (2003) defined supply chain management (SCM) as a set of approaches to efficiently integrating suppliers, manufacturers, warehouses and stores, so that the merchandise is procured and distributed in the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying the service level requirement.

Tang, Shee, and Tang (2001) defined the term SCM as a holistic approach for organizations to plan, design, control, and facilitate the processes and functions performed inside the linkage or network, from procurement, manufacturing, and production to distribution, all for the sake of satisfying end customer requirements. The goal of SCM is to coordinate and optimize the supply–demand relationship by managing the single-direction flow of materials and products and the bi-directional flow of information that carries control and feedback mechanisms.

In the supply chain management literature, much attention has been focused on online marketplaces and their potential benefit to an organization's supply chain capabilities (Bakos 1991, 1997, 1998; Foley and Wallace 2000; Hof 1999; Sehwail and Ingalls 2003; Schmid and Lindemann 1998). In an online marketplace environment, a partner can participate in any stage of the supply chain, and is able to remove some of the inefficiency traditionally associated with supply chains. Thus partners can streamline their supply chains, improve coordination, and share information instantaneously. Online marketplaces also have the power to create "real time" manufacturing based on demand, eliminating unnecessary inventory costs and helping manufacturers turn over their inventory at a much quicker rate. However, the ultimate goal, and the main driver for online marketplace integration, is to reduce supply chain management costs.

Companies are clearly aware of the significant savings that are possible when taking their supply chains online, and are generally supportive of the evolution of the online marketplace (Murtaza, Gupta, and Carroll 2004). Many companies that are leaders in their respective industries have gone as far as creating their own e-marketplaces, for example Covisint, a joint venture of the leading manufacturers in the automotive industry (Tsou and Chen 2004). Covisint was founded (originally under the name of "NewCo") by Daimler Chrysler, Ford, and General Motors as the initial three original equipment manufacturer (OEM) partners. They were later joined by Renault and Nissan in April 2000, and the venture was renamed "Covisint" in May 2000. At the end of that year, Covisint was enhanced by the involvement of its technical partners Commerce One and Oracle and, in May 2001, Peugeot-Citroen also joined the initiative (Kandampully 2003).

2.3 Electronic Procurement

Using information technologies for purchasing activities is not new. Over the past several decades, supply managers have sought to increase the strategic role of purchasing and supply management in their organizations (Ellram and Carr 1994). Electronic procurement (e-procurement) is a vehicle for achieving this goal (Hartley, Lane, and Hong 2004), especially since the establishment of online marketplaces that built a new dimension for purchasing with reduced personal contact but increased transactional focus.

The term e-procurement refers to the use of the Internet to buy production items, services and information (Heizer and Render 2000). According to Neef (2001), "E-procurement means a giant leap forward in the long sought after development of the extended enterprise, where the supply chain becomes a continuous, uninterrupted process extending from buyer through selling partners.” Neef regarded e-procurement as one of the major enablers for supply chain management. Breite and Vanharanta (2001) went a step further and stated that “information technology changed the supply chain management concept more radically than any other technology.”

E-procurement applications aim to improve the efficiency of purchasing personnel, automate the approval cycle, enable negotiation of better contract pricing, leverage existing contract more effectively, and reduce off-contract purchases (Croom 2000). Wyld (2000) developed an e-procurement model, presented in Figure 2-1, that look at the totality of the e-procurement process, from drivers though impact to imperatives. The model demonstrates some of the changes that are affecting the e-procurement value chain. The author asserted that organizations on the buying and selling sides will need to address these challenges to capture both the tactical cost control and the more strategic market developments.

Drivers	Impacts	Imperatives
Fast pace of tech innovation	Shift of power from suppliers to buyers	Internal linkage between supply chain & portals
Economic Globalization		Develop online supplier qualification
Rapid growth of e-Business portal sector	Market makers increasing competition	Leverage suppliers into e-portal marketplaces
Large organizations become market makers		Develop vertical markets to force B2B and lower costs
Vertical trading communities	New product & services requirements	Build strategic alliances between e-commerce players
Demand for B2B solutions		

Figure 2-1: The Wyld (2000) e-Procurement Model

One of the main objectives for organizations deploying e-procurement initiatives is to reduce transaction costs (Croom 2000; Sashi and O'Leary 2002). For instance, managers at Covisint estimate that the cost of processing an order can be cut from $150 to $15 through use of Covisint online marketplace (Meredith 2001). The benefits result from reduced paper transactions, shorter order cycle times and subsequent inventory reduction resulting from the instantaneous transmission of purchase order related information and enhanced opportunities for the buyer-supplier relationship through the establishment of a web of business-to-business communication networks.

The supply management and e-procurement literature is rich with estimates of the benefits of e-procurement. The key proposition of e-procurement is one of cost optimization. Any reduction in the cost of purchased goods, both direct material and indirect material, often goes straight to the bottom line (Verespej 2002). To achieve the same improvement by increasing revenue or reducing overheads would require significantly more effort.

The potential for savings to be made from e-procurement is beyond dispute (Eakin 2003). The benefits of electronic procurement have received a lot of attention in the business press and among scholars from purchasing and supply management (Blodget and McCabe 2000; Detourn 2000; Moser 2002; Essig and Arnold 2001; Sehwail and Ingalls 2003). The incentive to reduce purchase prices through aggregate buying was what initially caught most buyers' attention. Online marketplaces help buyers reduce maverick spending, since every item is pre-negotiated and catalogued; expensive emergency buying by individuals within large organizations is significantly reduced (Croom 2000; Barratt and Rosdahl 2002).

Online marketplace buyer benefits also include better information management through accessing more suppliers, exchanging real-time information with a single point of access to assure consistent workflow, reducing processing errors, and reducing information technology complexity by reducing the numbers of electronic connections established with suppliers (Sehwail and Ingalls 2003). The marketplace also improves the procurement process through reducing the amount of paper work required for purchase orders and though linking the various decision-making employees with each other electronically (Detourn 2000).

Buyers are not the only benefactors of online marketplaces. Suppliers' benefits include lower transaction costs through simplified order processing, reduced errors, and buyer discovery. Market discovery through accessing new buyers is considered by most authors the main driver for suppliers to join marketplaces. Other benefits include back-office facilitation through the possibilities of remote inventory management, standardization of specification, easier liquidation of excess inventory using the marketplace, and time saving through reducing the bidding cycle time and the time to integrate with customers (Sehwail and Ingalls 2003).

In 2000, Forrester Research interviewed 55 procurement and sales executives of firms involved in B2B online marketplace ventures to uncover their motivation to join online marketplaces. Buyers focused on cost savings and improved processes as their main motivation, whereas sellers' main motivation was expanding the market (Favior et al. 2000). Figure 2-2 illustrates the Forrester interview results.

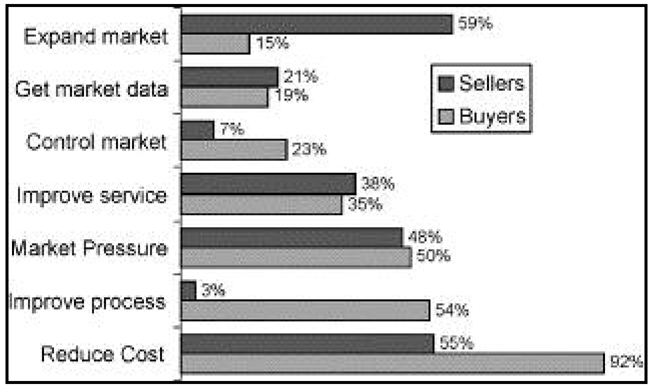

Figure 2-2: Main Motivations for using Online Marketplaces
Source: Favior et al. (2000)

2.4 Online Marketplace

A marketplace, as a historically evolved institution, allows customers and suppliers to meet at a certain place and at a certain time in order to communicate and announce buying or selling intentions, which eventually match and may be settled. Today the institution market still does the same, but has occasionally been remodeled due to the evolution of media. However, owing to the evolution of modern information and telecommunication technology, time and space restrictions have weakened and cyberspace has become the new meeting point (Grieger 2003).

Online marketplaces (or e-marketplaces) are defined as systems of suppliers, distributors, customers, infrastructure, and service providers that use the Internet for communication and transactions. Online marketplaces are virtual marketplaces where multiple business clients buy or sell goods or services from each other in a "virtual sense", while exchanging product related information and lowering transaction costs in the process (Sehwail and Ingalls 2003).

Bakos (1991) defined online marketplaces as inter-organizational information systems that allow the participating buyer and suppliers to exchange information about the prices and product offering. Schmid and Lindemann (1998) defined online marketplaces as media which foster market-based exchanges between agents in all transaction phases.

In a white paper published by IBM in 2000, an online marketplace is defined as a many-to-many, web-based trading and collaboration solution that enables companies to more efficiently buy, sell, and collaborate on a global scale. At a basic level, online marketplaces can be viewed as information technology (IT) facilitated markets (Bakos 1998). E-marketplaces cut costs for business buyers through increased choice and price competition, while giving sellers a new and potentially lucrative channel for unloading inventory (Foley and Wallace 2000).

Although online marketplaces' most often quoted advantage is their potential to cut costs of purchased goods and services (Hof 1999), they also provide many value-added services such as customized product design, quoting, vendor management, order processing, and collaborative planning (e.g., forecasting, VMI, supply planning), while lowering transaction costs and improving transaction efficiencies for all parties (Bakos 1997). Online marketplaces have three main functions: matching buyers and sellers; facilitating the exchange of information, goods, services and payments associated with market transactions; and providing an institutional infrastructure, such as a legal and regulatory framework, that enables the efficient functioning of the market (Bakos 1998).

2.5 Online Marketplace Classification Dimensions

Commercial transactions between buyers and suppliers have taken place forever. In the last decade, these transactions are increasingly being facilitated through online marketplaces. In the literature, the online marketplaces are differentiated along four segmentation dimensions: ownership, stakeholder-focus, commerce model, and revenue model.

2.5.1 Ownership Dimension

Over the past decade, a variety of online marketplace models have emerged to leverage the opportunities presented by collaborative e-business (Grimes 2001). Online marketplaces can be classified according to their ownership into public, consortia, and private marketplaces (Sehwail and Ingalls 2003).

Public online marketplaces are independently owned, often funded by venture capitalists. Public online marketplaces are neutral and have a primary focus on price discovery and clearing. They provide a forum for listing supplies of or demand for specific products and/or services in an effort to create a transparent market. Public e-markets are many-to-many exchanges. Examples include FastParts, Medibuy, and theoilsite.com.

Industry sponsored e-marketplaces (consortia) are jointly developed and owned by two or more industry incumbents, sometimes including a blend of industry-specific buyers, suppliers, and distributors. Industry-sponsored e-marketplaces can also address industry standards (systems or data) as they comprise a forum of multiple industry players. Consortia address many-to-many relationships. However, several consortia are also now offering hosted private exchange services that allow members to obtain value from tailored technology and/or confidential one-to-many relationships. Examples include Trade-Ranger, Covisint, and Pantellos.

Finally, independent private exchanges (PTXs) are incumbent-owned marketplaces with one-to-many information technology platforms used to manage, monitor, and/or optimize value chain processes with key trading partners. As with consortia, functionality can address any value chain process(es) and can be broad or narrow in scope. PTXs require that partners adapt to or integrate with the owner's technical applications and/or data management standards in order to participate. Examples include Eastman Chemical and Chemconnect.

2.5.2 Stake-Holders Focus Dimension

The online marketplace can either be buyer-oriented, seller oriented or neutral. The role of a buyer-oriented marketplace (e.g. Trade-Ranger) is to aggregate buyers. Buyer-oriented marketplaces such as CommerceOne's Marketsite concentrate primarily on creating efficiencies for the corporate buyer. Buyer-oriented networks generally have several objectives: drive procurement costs down for the participating buyers, allow buyers to aggregate their expenditures, reduce administrative costs, increase visibility, and facilitate global sourcing (Grieger 2003). Buyers have the ability to join forces with other large buyers to create procurement syndicates, which can demand more favorable pricing and trading terms. All types of relationships in this marketplace type are aligned to increase benefits to the buyers.

The seller-oriented aggregated marketplace concentrates on bringing multiple sellers together into a central catalogue and product information repository (e.g. e-Steel). Where buy-side marketplaces target the procurement needs of corporations, seller-oriented marketplace focus on sales. The key to seller-oriented marketplaces is to provide multiple sellers a forum to present their catalogues and trade with as many buyers as possible. Seller-oriented marketplaces also have the ability to aggregate their sellers, acting as a service provider, wrapping products and services together and offering them to buyers. All types of relationships in this marketplace type are aligned to increase benefits to the suppliers.

Neutral online marketplaces, driven by a third party, are the true market makers because of their attractiveness to sellers and buyers equally. Neutral marketplaces often face the "chicken-and-egg" problem: buyers do not want to participate unless there are a sufficient numbers of sellers, and sellers do not want to participate unless there are a sufficient number of buyers. In addition, these neutral marketplaces have to overcome channel conflicts to persuade more powerful players to participate. Making deals with more powerful players to gain liquidity is a threat to their neutrality (Grieger 2003).

2.5.3 Commerce Model Dimension

Online marketplaces can be divided generally into five categories according to their commerce models (Sehwail and Ingalls 2003):

1. Forward Auctions: Multiple buyers bid competitively for products from individual suppliers. Prices only move up, but buyers can buy below list prices while sellers sell for more than a liquidator pays (Wyld 2000).

2. Reverse Auctions: Also known as downward price auctions, have recently become a popular method for reducing the price of purchased materials used in the production of durable goods (Tulley 2000). Buyers post their need for a product or service, and then suppliers bid to fulfill that need. Unlike a forward auction, prices only move down (Hong and Hartley 2001).

3. Exchanges: Two-sided marketplaces where buyers and suppliers negotiate prices, usually with a bid and ask system, and where prices move both up and down. Exchanges work best with easily definable products without complicated attributes--commodities, perishable items such as food, or intangibles such as electric power. Exchanges produce fluctuating, sometimes volatile prices (Wyld 2000).

4. E-catalogs: Online catalogs are representatives of systematic sourcing of direct materials. They automate sourcing of non-commodity manufacturing inputs and create value by reducing transaction costs. Industry-specific suppliers publish their content using the catalog provided and maintained by the marketplace. Catalogs create value for buyers by bringing together many suppliers at one easy-to-use Website (Sawhney and Kaplan 2001).

5. RFx's: Delivers the capability to launch an online request for information, quote, or proposal with real-time tracking of supplier responses. The three RFx product offerings consist of the following (Sehwail and Ingalls 2003):

A. Request for Information (RFI): the request is to gather critical information about an item from a selected group of suppliers. This information may be returned with extensive attachments to provide supplementary documentation to the person's request. The purpose of an RFI is to gather as much information as possible about a particular product or service.

B. Request for Quotation (RFQ): the request is to gather quotes on particular items from a short list of suppliers. Once a buyer sends out an RFQ, a potential supplier can provide as much information about a product as it chooses. For some suppliers, this may include descriptive product information, shipping rules, and other important attributes.

C. Request for Proposal (RFP): the request is to gather additional information about an item and attributes related to price and quantity. A potential supplier will send back information in response to this RFP that may lead to negotiation between the buyer and supplier over specific details of the proposal.

2.5.4 Revenue Model Dimension

Revenue models for generating money in the online marketplace business vary from company to company. Some companies believe more firmly in the subscription model, others prefer the pay-per-use approach, while others rely on product sales margins in more traditional retailing. Many marketplaces are not committed to just one revenue model and employ multiple strategies at the same time.

The transaction model, in most cases used with the aggregation mechanism, calculates a percentage of the transaction volume, which is usually paid by the seller. A typical range varies from 0.5% to 8% of the transaction volume. Some online marketplaces have opted for standard annual subscription fees, based on assumptions about anticipated usage. Similar to the flat subscription fee is the membership or storefront fee, which is charged to a merchant to list its catalog and promotional material in a segmented storefront in the marketplace. If the intermediary is offering the software package for operating the marketplace, a license fee is charged to the users. Flat fees encourage marketplace usage and avoid the tax associated with straight transaction fees (Kerrigan et al. 2001; Phillips and Meeker 2000).

2.6 Online Reverse Auctions

The competitive bidding for business is classified as an auction (Kaufmann and Carter 2004). Auctions are an “explicit set of rules determining resource allocation and prices on the basis of bid from the market participants” (McAfee and McMillan 1987). Theoretically, any auction is an attempt to create a pure market with perfect information among both buyers and sellers. The term “auction” has been used by several researchers to describe both forward auctions (selling auctions) and reverse auctions (purchasing auctions). This research studies the online purchasing auction known as the online reverse auction.

The forward auction (bidding to buy auction) in which the seller offers a product to numerous buyers is the most common type of auction (Bulow and Klemperer 1996). The seller “controls” the market because a product is being offered that is in demand by a number of buyers. The price offered by the buyer continues to increase until a theoretical rational price is met in the market according to supply and demand (Smeltzer and Carr, 2002). In a reverse auction environment (offering to sell auction), the buyer “controls” the market because an item is being auctioned that is offered by a number of sellers. The price offered by the sellers continues to decrease until a theoretical rational market price is achieved.

Beam et al. (1999) described an online reverse auction functioning as an intermediary in the auction process. Online reverse auctions are a special case of automated negotiations. The auction patterns vary with the trade objects and trade rules. Auctions and bidding have been established methods of commerce for generations; these methods deal with products and services for which the conventional marketing channels are ineffective or inefficient.

CAPS Research (2003) defined an online reverse auction as an online, real-time dynamic auction between a buying organization and a group of pre-qualified suppliers who compete against each other to win the business to supply goods or services that have clearly defined specifications for design, quantity, quality, delivery, and related terms and conditions. These suppliers compete by bidding against each other online over the Internet using specialized software by submitting successively lower-priced bids during a scheduled time period.

Sehwail and Ingalls (2004) defined online reverse auctions as the real-time electronic bidding events a company uses to outsource goods or services with bid prices descending, and bidders allowed to enter bids once or continuously according to the auction format. Carter et al. (2004) defined an online reverse auction as a real-time auction between a buying organization and two or more invited suppliers, where suppliers can submit multiple bids during the time period of the auction and where some degree of visibility exists among suppliers regarding the actions of their competitors.

An online reverse auction may result in what is referred to as dynamic pricing. Dynamic pricing simply means that the price for the item being auctioned changes on an instantaneous basis because of the electronic format (Sparks and Lesoing 2000). As sellers observe the price changes in real time, the assumption is that the price will continue to decrease until a true market price is established. Tully (2000) described how online reverse auctions are increasingly used as an efficient coordination mechanism for establishing price near the true market price for an item.

2.6.1 Reasons for Using Online Reverse Auctions

Online reverse auctions offer a wide range of benefits to buying organizations. Lower transaction costs, shorter order cycle times, and competitive purchase prices are the obvious benefits of online reverse auctions (Hartley et al. 2004). Moser (2002) asserted that online reverse auctions attract buyers with the allure of lower prices, a broader supplier base, and a more efficient procurement process. Several large companies reported decreases in purchase prices of 10% or more through the use of online reverse auctions (Hannon 2004). Other companies, such as Quaker Oats and SmithKlineBeecham, reported millions of dollars in savings with online reverse auctions compared to traditional purchasing methods (Brunelli 2000).

The incentive to reduce purchase prices was what initially caught most buyers' attention. Online reverse auctions lower purchase prices by overcoming some of the limitations of traditional competitive bidding (Sashi and O'Leary 2002). Less obvious than cost savings are the strategic advantages of online reverse auctions. With online reverse auctions, supply managers can identify world-class suppliers, gather and analyze market information, and focus on strategic sourcing rather than on processing transactions (Avery 2000; Fitzgerald 2000).

Inventory costs for the buyer also may be affected by the use of online reverse auctions. The classic economic order quantity model suggests that as ordering costs are reduced, it becomes more economical to order in smaller quantities, lowering total inventory holding costs. Thus, with the promise of lower ordering costs with the use of online reverse auctions compared to traditional competitive bidding, organizations should have lower inventory costs (Hartley et al. 2004). Just-in-time (JIT) purchasing and having small quantities of materials delivered frequently can lower the buyer's inventory costs and purchase prices (Dong, Carter, and Dresner 2001).

Supply chain integration, which is related to JIT purchasing, may be reduced as companies move to online auctions if companies frequently switch suppliers (Dong, Carter, and Dresner 2001). Sashi and O'Leary (2002) support these findings and suggest that online auctions are compatible with a just-in-time strategy because sourcing can be done quickly.

Furthermore, buyers can widen their supplier base using online reverse auctions through identifying new suppliers (Moser 2002). The Gartner report (2001) stated that the ability to identify new suppliers electronically is valuable, especially in a fragmented international industry such as chemicals and plastics. With online reverse auctions, buyers can quickly find backup and alternative suppliers. Additional benefits to the buyer might include reduction in process costs and accelerated product development, according to an IDC study in 2001.

Buyers are not the only benefactors of online reverse auctions. Suppliers can benefit by obtaining market information, having an outlet to better manage excess capacity, and competing for business from new customers (Hartley et al. 2004). Online reverse auctions help suppliers to gain a better understanding of the buyer's financial goals. Suppliers also gain valuable information about their competitors' cost structures that can help them to become more effective in the long run (Jap 2000).

In online reverse auctions, suppliers to alter their bids during an online reverse auction event to increase their chances of winning the auction. Suppliers also can bow out of the process at any time. In addition, some suppliers have adopted the attitude, "If you can't beat them, join them". Such suppliers are increasingly starting to purchase their own supplies using online reverse auctions. This approach can produce savings throughout the supply chain for buyers and suppliers alike (Moser and Miller 2002). Smeltzer and Carr (2002) investigated the benefits of online reverse auctions for suppliers as perceived by the buyers. The authors' listed four items perceived by buyers are reasons for suppliers to use reverse auctions: new business, market penetration, cycle time reduction, and inventory management.

2.6.2 Online Reverse Auctions Risks and Conditions

Although online reverse auctions hold much promise, numerous risks still exist. Smeltzer and Carr (2003) are the only researchers who conducted a comprehensive study to research the risks and promises of online reverse auctions; other researchers just expressed opinions or personal experiences, so most of this section is based on Smeltzer and Carr's (2003) paper titled "Electronic Reverse Auctions: Promises, Risk and Conditions for Success."

Most academic journals and business press articles agree that the negative effect on the buyer-supplier relationship is the biggest concern related to using online reverse auctions (Altman 2003; Emiliani and Stec 2001; Jap 2000; Sehwail and Ingalls 2003; Smeltzer and Carr 2003). The buying companies are afraid that using online reverse auctions will destroy their relationships with the suppliers. Many companies have spent decades building strategic alliance partnerships based on trust and loyalty with their suppliers. This fear is especially pronounced when the buyer and the supplier have had a long working history. With the announcement that an online reverse auction would be used, the buyer was possibly indicating that the supplier was no longer meeting the expectations of the buying company (Smeltzer and Carr 2003).

Other risks include suppliers' not participating in the auction. In theory, only two competitor firms are required for an auction. But economic game theory indicates that when only two competitors exist, they are not inclined to participate in either a reverse or forward auction. Even though only two parties may well be involved in the final stages of bidding, at least four or five viable, competitive bidders are generally required to begin an auction (Cassady 1967). Another risk according to Smeltzer and Carr (2003) is that the sellers may get caught up in what may be termed "the race." Bidders may get so caught up in the emotion of the race or competition that they offer unreasonably low prices.

Suppliers are not the only party that might be affected by the risks of online reverse auctions. Buyers might be so blinded by all the promises of online reverse auctions that they do not anticipate the hidden costs, those associated with changing and approving suppliers, traveling to monitor new suppliers, additional manpower to move products from one supplier to the other, technical assistance, and the fees of the market maker.

To maximize the potential of online reverse auctions and avoid the risks associated with online reverse auctions, several considerations must be given to the specification of the product or service being auctioned. Smeltzer and Carr (2003) presented four general guidelines to avoid failure risks when implementing an online reverse auction event: the buyer must clearly state the commodity specifications, the purchase lots must be large enough to encourage suppliers to bid, the appropriate supply market conditions must exist, and the correct organizational infrastructure must exist for the buying organization.

Jap (2002) presented several factors to minimize the risks associated with online reverse auctions: auctioning products or services in which the purchase price constitutes the largest component of the product or service value, auctioning products or services that are commoditized, and availability of enough capacity on the supply side. If the buying company expected to save on the product or service price, the online reverse auction should be conducted when there is extra capacity on the supply side (Jap 2002).

2.6.3 Types of Auctions

The auctioneer or intermediary in an auction has several different types of auctions from which to choose. McAfee and McMillan (1987) categorized the different types of auctions into four distinct groups: the English auction, the Dutch auction, the first-price sealed-bid auction and the second-price sealed-bid auction.

English auctions, or forward auctions, bring together bidders into one forum where they openly compete against one another for the chance to obtain the asset. In an English auction, the price is successively raised until only one bidder remains. This can be done by having an auctioneer announce bids, or by having bidders call the bids themselves, or by having bids submitted electronically with the current best bid posted. The essential feature of the English auction is that, at any point in time, each bidder knows the level of the current best bid (McAfee and McMillan 1987).

The mirror image of the English auction is characterized by falling prices through successively lower bids, where each supplier can bid more than once and sees the current price (depending on the auction format). The vast majorities of electronic procurement auctions today use this basic format and call it an online reverse auction (Kaufmann and Carter 2004).

The Dutch auction, or reverse auction, is the converse of the English auction. The auctioneer calls an initial high price and then lowers the price until one bidder accepts the current price. The Dutch auction is used, for example, for selling flowers in the Netherlands (McAfee and McMillan 1987). The online business-to-business reverse auction usually resembles a descending Dutch auction with limited sharing of information. The information that is not shared with the bidder may include the identity of the seller, the identity of other bidders, the reserve price, and the historical piece price of the asset (Ruzicka 2000).

With the first-price sealed bid auction, potential buyers submit sealed bids and the highest bidder is awarded the item(s) for the winning price. The basic difference between the first-price sealed-bid auction and the English auction is that, with the English auction, bidders are able to observe their rival's bids and accordingly, if they choose, revise their own bids. With the sealed-bid auction, each bidder can submit only one bid. First price sealed-bid auctions are used for government procurement contracts (McAfee and McMillan 1987).

Under the second-price sealed-bid auction, also called the Vickrey auction, bidders who submit sealed bids have been told that the highest bidder wins the item but pays a price equal not to his own bid but the second highest bid (Vickrey 1961).

2.6.4 Differences between Online and Manual/Physical Auctions

When organizations decide to buy or sell using an auction, the first decision the organization has to make is whether to use an online or a manual/physical auctions. According to a senior procurement information technology manager for Conoco-Phillips, the first question that companies asked when they were exploring their outsourcing options using online reverse auctions was, "Are online reverse auctions different from physical manual auctions that have historically been used in sourcing activities, and if yes, how?"

The short answer is yes and no. There are similarities and differences between online reverse auctions and physical manual auctions. The similarity of these auctions is that they both have the same goal, which is to purchase the goods and/or services at the lowest possible price. On the other hand, online auctions differ from manual auction in several ways. Emiliani (2000a) stated that the main difference is that online auctions require less time to organize, while Jap (2000) discussed three major differences: real-time information, cost of contact, and amount of time required for finding and qualifying suppliers.

First, the speed of information in online auctions is rapid, with instant communication and feedback. The suppliers in online auctions bids via a computer mediated environment, usually through an online reverse auction provider, with real-time update on the bidding prices. Second, the cost of contact among bidders is greatly reduced via the use of a service provider. The market maker (online auction service provider) introduces qualified new suppliers to the buyer, manages the interaction between the buyer and the suppliers, and leverages its own product or industry-specific knowledge in the process.

Third, online auctions represent a significant comparison in negotiation time and preparation. Instead of protracted negotiations through the phone, fax, and email over weeks and months, the negotiation of multiple product lots occurs within a few hours. Finally, the online auction preserves bidder anonymity, by not allowing the bidders to know the identity or number of other bidders in the auction process.

According to De Ruiter and Van Heck (2004), the most fundamental difference between traditional and e-auctions is the communication environment. The communication between buyers and sellers in online auctions takes place by means of communications technology. Therefore, communication between buyers and sellers in online auctions requires Internet communication technologies instead of the direct, face-to-face communication between buyers and sellers in traditional auctions.

2.7 Buyer-Supplier Relationships

The character of buyer-supplier relationships has undergone dramatic changes over the last couple of decades. Industry observers and researchers have described these relationships as "partnerships" or "strategic alliances" as opposed to the traditional "arm's length" type of relationships. The buyer–supplier relationship has evolved towards strategic alliances in order to respond to intensified competition in industry. These strategic alliances were defined with the intention of integrating key processes and enhancing quality in the systems of production, manufacturing, stocking, and distribution (Larsen, Kotzab and Grieger 2003).

Traditionally, the buyer–supplier relationships as often characterized by falling into one of two major types: adversarial and collaborative (Lamming 1986; Imrie and Morris 1992). The adversarial model has the characteristics of tough negotiation, focus on price, short-term contracts and multiple sourcing (Matthyssens and Van den Bulte 1994). This model is in direct contrast with the collaborative (or cooperative) model. But the current trend of relationships is evolving towards a more collaborative form based on cooperation, mutual benefit, trust, and relational exchange (Gules and Burgess 1996). Under the collaborative model, the buyers' consideration of a preferred supplier is not only based on price or cost, but also on factors that contribute more to the suppliers' competence in production, distribution, and post-purchase service (Womack, Jones, and Roos 1990).

Under the collaborative model, suppliers are able to get access to the business skill and expertise of their buyer partners (Imrie and Morris 1992). The enormous number of strategies in use today, such as cross-functional team decision making, supply base rationalization, and long-term contract and relationship (Lyon et al. 1990) can all be categorized as collaborative.

Even though the literature is rich in the positive evidence of collaboration, some research results, however, support the adversarial relationships. One example is research in purchasing strategy or the evolution of the relationship. The purchasing strategy for multiple-sourcing or single-sourcing is always in debate. Some claim that the buying firms are fear of dependence on a single source, and if a buying firm has several options for suppliers for a product, then the buying firm is less reliant on a single supplier (Carter, Smeltzer, Narasimhan 1998). But several studies show that companies try to limit their supply base in order to support lean manufacturing processes (Lamming 1993), increase supply chain leverage, and focus buying firm efforts and resources on fewer valued-added relationships (Carter, Smeltzer, Narasimhan 1998).

Another argument states that the issue of the evolution of a relationship must include the degree of involvement of either party. This is evidenced by some buyers questioning the internal workings of their suppliers, deploying sophisticated computer systems to monitor their suppliers, or even imposing their own quality standards on suppliers (Imrie and Morris 1992). It is common to see suppliers' being asked to provide products at the lowest price and with the highest quality and fastest delivery, or even to see buyers insist on an internal audit process to evaluate and inspect the manufacturing and production process in order to gain insight into quality control. But several researchers still assert that the practical, or even old-fashioned adversarial model, will be prevalent because of the considerations of cost minimization; the inability of suppliers to control their manufacturing, scheduling and inventory; the continued mistrust between buyers and suppliers; and the lack of mutual commitment (Imrie and Morris 1992).

2.8 Summary of the Literature Review

The literature review has revealed many pieces of information about e-procurement in general and online reverse auctions in particular. Elements from the review have been combined to create a proposal model for online reverse auction implementation based on the motivation of reducing purchase prices and developing/maintaining a collaborative relationship with the suppliers. The model's testable hypotheses are presented in Chapter Three.

Because of rapid advances in information technology and online reverse auctions, the literature review needs to be updated constantly to capture the latest breakthroughs and uses of online reverse auctions are captured. Advancement in information technologies appears to be one of the main drivers for these innovations. Lower costs of computing and communication have changed the structure and the operation of the electronic reverse auction to become economically feasible.

The literature review now leads into the hypotheses in Chapter Three, which includes the definitions of the variables and the research hypotheses.

CHAPTER 3: HYPOTHESES OF THE RESEARCH

3.1 Introduction

Chapter Three provides the research framework, definition of variables in the research, and the research questions and hypotheses. The chapter begins by outlining the academic research on online reverse auction implementation. In the following sections, the research hypotheses are presented and supported with the necessary theoretical and logical bases. Dubin (1976) mentioned the importance of establishing a conceptual and a theoretical basis for any study exploring new phenomena and understanding a relation of a particular study within the overall context.

3.2 Academic Research on Reverse Auctions Implementations

The emergence of online reverse auctions represents a new area of inquiry in the development of inter-organizational relationship management theory (Jap 2003). Given its relative newness, the phenomenon of online reverse auctions in purchasing has only recently received attention among scholars from the fields of purchasing and supply management. A limited amount of academic literature about the use of online reverse auctions is available. Table 3-1 classifies and summarizes the research available in the academic literature. The table updates and expands the literature summary done by Wagner and Schwab (2004).

Table 3-1: Online Reverse Auction Implementation Literature Summary

Authors	Contribution/Findings	Comments on Methods
Prescriptive/descriptive/conceptual		
Ruzicka (2000)	Develops a model for the appropriateness of acquiring products or services through online reverse auctions based on a supply positioning matrix (risk versus total relative cost).	Conceptual
Emiliani (2000b)	Describes the process for conducting online reverse auctions for direct material and related management issues (e.g. the task a buyer has to perform, the skill set required of a buyer).	Based on the author's prior experience in the aerospace industry
Hong and Hartley (2001)	Present a model exploring satisfaction with online reverse auctions. The buyer's competitive priorities (cost, quality, delivery, etc.), the nature of the purchase (standard versus custom, spend level, market structure) and organizational readiness (top management support, degree of centralization, etc.) are expected to impact the buyer's satisfaction.	Conceptual prescriptive
Emiliani and Stec (2001)	Touch upon the types of terms and conditions of contracts resulting from online reverse auctions but primarily discuss the desired terms and conditions under lean vs. batch-and-queue production practices. As 70-90% of costs are determined during design, reverse auctions are advisable for "commercially available items".	Based on several online reverse auctions conducted by companies from the durable goods industry
Lee and Corbitt (2001)	Present benefits of online reverse auctions conducted for indirect materials for the buying firm and the supplier throughout seven stages of the procurement process ("Reverse Auction Stakeholder-Benefit Grid"). The authors assert that, in general, online reverse auctions can benefit both, the buyer and the supplier.	Preliminary interviews with buyers, from a financial institution, and suppliers who participated in a "series" of online reverse auctions.
Emiliani and Stec (2002 a)	Elaborate on potential savings and losses as results of online reverse auctions (e.g. net gross savings, switching costs, direct losses, indirect losses). Examine the use of online reverse auctions for custom-designed machine parts. Online reverse auctions support "quick hits" and local optimization of financial dimensions. Because of direct and indirect losses, collaborative cost reduction methods are more effective in reducing costs significantly in the long-term.	Prescriptive

Table 3-1 (continued)

Authors	Contribution/Findings	Comments on Methods
Emiliani and Stec (2002 b)	Examine the consistency of online reverse auctions with the "Caux Round Table Principles for Business", i.e. values against which business behavior can be measured. Conclude that online reverse auctions, if used by buyers to source buyer-designed industrial components, can never comply with these principles.	Based on the involvement in "nearly a dozen" reverse auctions at a company from the durable goods industry.
Sashi and O'Leary (2002)	Describe auction types and potential benefits and drawbacks. Provide limited recommendations concerning factors to make online reverse auctions feasible. Focus on the use and roles of intermediaries in online reverse auctions, and the impact on channel relationships.	Prescriptive
Jap and Mohr (2002)	Develop and interpret a matrix which recommends how exchange types (relational versus transactional) are related to web-efficiencies (improvement of information sharing, increase of reach, dynamic pricing). Conclude that online reverse auctions can harm relational exchanges because today many auction formats focus solely on price issues.	Literature based and conceptual
Griffiths (2003)	Examines the ability to adversely affect relationships between suppliers and buyers. Buyers have to consider relationships with their own companies, existing suppliers and new suppliers, building trust and being aware of competing objectives. The author considers how an auction changes the dynamics of these relationships, outline the positives for using online reverse auctions but highlights some possible abuses of the system.	Prescriptive
Case Studies/interviews		
Smeltzer and Ruzicka (2000)	Describe the integration of online reverse auctions as a tool in the sourcing process for direct material. Conclude that online reverse auctions should not be used in isolation; instead, it must be thoroughly integrated.	Single case study (company from the aerospace industry)
Mabert and Schoenherr (2001)	Describe the move of the firm from face-to-face negotiation to becoming an active online reverse auction user. Authors provide discussion of outside third-party versus in-house solutions.	Single case study (supplier to the construction industry)

Table 3-1 (continued)

Authors	Contribution/Findings	Comments on Methods
Meier et al. (2002)	Describe the change in the firm's communication practices while moving into online reverse auctions. The firm achieved annual savings related to the volume auctioned of 34% ($2.4M).	Single case study (company from the automotive industry)
Mabert and Skeels (2002)	Describe the tasks required to conduct online reverse auctions, present the third-party help available and possible tasks and fee structures of third-party auction services. Both firms used FreeMarkets for technical support and as a "market maker".	Two case studies (Fortune 100 industrial company and USA Navy)
Smeltzer and Carr (2002)	Discuss advantages and disadvantages of using online reverse auctions and conditions which have to be present in order to maximize the potential on online reverse auctions.	41 interviews with managers who previously participated in online reverse auction events.
Smeltzer and Carr (2003)	Besides the suppliers' and buyers' reasons for using online reverse auctions and conditions for success, the authors describe potential risks for both parties. Buyers were most afraid of destroying the relationship and the suppliers' trust.	41 interviews with managers (23 manufacturing, 12 service, 5 retail, 1 governmental)
Arbin and Hultman (2003)	Using the Kraljic portfolio as a foundation, the researchers conclude that online reverse auctions are more suitable for strategic products than for leverage products, non-critical items and bottleneck products. Important success factors are a high number of suppliers, excess supply and changing market prices.	3 online reverse auction events
Smart and Harrison (2003)	Examine the impact of reverse auctions on buyer-supplier relationships through six case studies, analyzing primarily the supplier perspective through participant interviews. The authors identify potential benefits for both parties in a reverse auction, through tendering and transactional cost advantages.	Six case studies (5 buyers and 22 suppliers)

Table 3-1 (continued)

Authors	Contribution/Findings	Comments on Methods
Surveys		
Jap (2002)	Provides an extensive review of the current online reverse auctions use. The author discusses and provides initial analysis with respect to the difference of online reverse auction from physical auctions and from auction in the literature. The author also discusses the conditions and structures of how to use online reverse auctions.	Online survey, purchasing managers as respondents (n=38)
Jap (2003)	Investigates the impact of different auction types (open-bid, sealed bid) on supplier relationships. The author concludes that open bid auctions make current and new suppliers believe that the buyer will act opportunistically. If the buyer uses sealed bid auctions, suppliers are more likely to make relationship specific investments.	Online survey, bidding suppliers as respondents (n=68)
Pearcy et. al (2003 a, b)	Examine the relationship between corporate strategy and the use of online reverse auctions, and the relationship between online reverse auction strategy and supplier cooperation. The authors confirm the relationship between firms pursuing a differentiation strategy and the use of online reverse auctions for supporting long-term relationships. The authors also confirm the relationship between firms pursuing cost leadership strategy and the use of bid-and-buy auction strategy.	Mail survey, purchasing professionals from firms were "known to use" online reverse auctions (n=142)
Wagner and Schwab (2004)	Examine the purchasing management related conditions which influence the success of online reverse auctions in terms of product cost reduction. The researchers conclude that it is vital that the product or service to be auctioned be properly specified and that the companies spend sufficient time and effort to carefully analyze, understand and, if possible, increase competition among suppliers participating in an online reverse auction.	Email questionnaire and phone interviews, purchasing managers (n=23)
Hartley et al. (2004)	Examine differences between online reverse auction adopters and non-adopters. The data do not support that online reverse auction adopters differ from non-adopters on the level of importance placed on cost management and supplier collaboration. The data do show that adopters have higher annual sales than non-adopters.	Mail survey, Director or Vice Presidents of Purchasing/Supply Management (n=163)
Emiliani and Stec (2004)	Examine how aerospace part and sub-component suppliers specializing in producing engineered machined parts and sub-assemblies react to online reverse auctions. The results show that online reverse auctions have numerous serious shortcomings as far as incumbent suppliers are concerned.	Email Survey, Aerospace part and sub-assembly suppliers, senior managers (n=23)

A review of the methods underlying these publications reveals that the majority of the research is conceptual, prescriptive, and descriptive in nature or is based on qualitative interviews and case studies. Furthermore, the small amount of survey research is based on rather small sample sizes when compared to "typical" quantitative research. This clearly indicates that online reverse auctions are a very recent and hence just an emerging research area. Ruzarika (2000) was among the first researchers to use surveys in studying online reverse auctions. The author proposed a conceptual model of the usage of online reverse auctions in negotiations. The author used a telephone survey to examine the relationship of the use of online reverse auctions as a tool to improve the negotiation process and the characteristics of the auction item. The author also examined whether the use of online reverse auctions affects the quality of an agreement for the contract of a product or a service. Finally, the author examined the circumstances that drive organizations to choose to use online reverse auctions in negotiations with their suppliers.

Hong and Hartley (2001) provided a brief review of the relatively scarce trade literature that was available at the time their paper was written, and then advocated that online reverse auctions should reduce purchase prices and shorten cycle times. The authors examined the differences between online reverse auction adopters and non-adopters, they also suggested that an insufficient number of suppliers that are able to participate in an online reverse auction will reduce auction effectiveness. Pearcy et al. (2003 a, b) were among several researchers who advocated the use of a survey methodology to examine the reverse auction process. The authors presented the results of surveying 142 purchasing professionals to examine the relationship between corporate strategy and the use of online reverse auctions and the relationship between the online reverse auction strategy and the supplier's cooperation. The authors confirmed the relationship between a firm pursuing a differentiation strategy and the use of online reverse auctions for supporting long-term relationships. The authors also confirmed the relationship between a firm pursuing a cost leadership strategy and the use of bid-and-buy auction strategy. Finally, the authors discovered that a short-term ("bid-and-buy") focus predominated when firms bought both direct materials and MRO supplies.

Jap (2002) also advocated the use of a survey methodology in the context of a quasi-experiment involving six reverse auctions to examine the relationship between the use of open or sealed bid reverse auction, supplier performance, and the attitude of incumbent and new suppliers toward the buyer. Smeltzer and Carr (2002) advocated the use of a survey methodology in the context of nondirective field interviews format. The authors interviewed 41 purchasing professionals who had been involved in more than two auctions to examine the promises, risks, and conditions associated with the implementation of online reverse auctions.

Parker (2003) presented the results of a survey conducted in the United Kingdom to examine the consequences of using online reverse auctions on buyer-supplier relationships. According to the results of the survey, suppliers are backing online reverse auctions as a way to improve long-term relationships with their customers. Almost two-thirds of suppliers said auctions made purchasers more competent. The authors also found that more than half of the suppliers felt confident that auctions gave the buyers no more power.

Emiliani and Stec (2004) presented the results of a survey among aerospace part and subassembly suppliers to quantitatively assess the suppliers' reaction to online reverse auctions and its impact on their business policies and practices. The authors also compared their findings to the qualitative benefits identified for suppliers by the online reverse auction service providers. The authors concluded that both buyers and sellers participating in online reverse auctions will likely encounter unfavorable outcomes; thus the authors questioned the use of online reverse auctions as a mean of reducing the unit price of buyer-designed engineering components.

Wagner and Schwab (2004) examined the purchasing management-related conditions which influence the success of online reverse auctions in terms of product cost reduction. After surveying 23 purchasing professionals, the researchers concluded that it is vital to properly specify the product or service to be auctioned, and it is equally vital that the companies spend sufficient time and effort to carefully analyze, understand and, if possible, increase competition among suppliers participating in an online reverse auction.

Carter et al. (2004) used a survey methodology in the context of a field interview format to examine the barriers to implementing online reverse auctions, as well as consequences such as cycle time reduction and productivity. The authors also examined the parameters that affect the savings that occur during a specific online reverse auction event, including lotting (multiple lots as opposed to a single lot) strategies and the degree of supplier visibility.

Recently, Hartley, Lane, and Hong (2004) used a survey methodology in the context of mail format. The authors mailed 800 surveys to members of the National Association of Purchasing Management (NAPM) who reported that they are Directors or Vice Presidents for Purchasing/Supply Management. Based on the 163 usable returned surveys, the authors examined the differences between buying organizations that have adopted online reverse auctions and those that have not used online reverse auctions for sourcing.

3.3 The Fit between Auction Design and Reduction in Purchase Price

Once the buying organization decides to organize an online reverse auction, the buying organization must decide on the auction design. Unfortunately, research related to the effect of the auction design on the success of the online reverse auction implementation is very limited. This research studies the auction design from the following two dimensions: the auction format and the event organization.

Auction Format

While there are many types of reverse auctions, the research focuses on the use of one-sided open and multi-round sealed bid auctions. "One-sided" refers to the presence of a single buyer and multiple sellers. The main difference between open-bid and multi-round sealed bid is the supplier's ability to view other competitors' bidding prices and the current bidding price.

Under sealed-bid auction conditions, the buyer invites the suppliers to participate in the auction. After the bidding process starts, the suppliers are not able to view their competitors' price bids and only the buyer views the bids. The suppliers are only notified that they have been outbid by a competitor, so the supplier can submit a lower bid, if interested. In the open-bid auction condition, suppliers are able to view the price bids of every competitor and have the opportunity to bid against their competitors in real time. In the open-bid auction format, the bids are submitted for the buyer and all the suppliers to view and the price falls successively until one bidder remains.

The rapid and dynamic nature of price competition in the open-bid format creates a stronger emphasis on price reduction relative to the sealed-bid format. The fast-paced bidding along with the need to respond quickly to competitors' bids produces tension and pressure on suppliers to cut prices vigorously, and this tension forces additional price concessions from the suppliers (Jap 2002). Hence, the following hypothesis:

H1: Using online reverse auctions, the reduction in purchase prices is more likely to be higher in the open-bid auction format than the sealed-bid format.

Event Organization

Companies that provide online reverse auction services are known as "market makers." These companies assist buyers in locating suppliers, set up the auction event, provide the technological expertise, and create a comprehensive request for quote (RFQ) packages. The RFQ's are often better structured than those the buyer historically produced, which results in a more complete description of the procurement under consideration. Sellers thus gain a better understanding of the buyer's total requirements with regard to cost, delivery, and quality (Emiliani and Stec 2001a).

The leading providers of online reverse auction services include Ariba, Commerce One, eBreviate, Trading Partners, and Frictionless Commerce. The value delivered by online market makers is primarily in the RFQ process and joining the buyers and the sellers in real-time reverse auctions using proprietary software (Emiliani and Stec 2002b). The market maker does not support implementation of online reverse auction results.

The buyers' decision as to whether to organize the auction in-house or with the help of a market maker primarily depends on the buyer's experience in using online reverse auctions, the dollar value of the purchases made through the auctions, and the frequency of using online reverse auctions. The cost of online auction service providers can range from a couple of thousand to hundreds of thousands of dollars depending on the size of the auction and the effort the market maker spends on organizing the auction. For companies that are just starting to use online reverse auctions and companies that do not use online reverse auctions frequently, it is more logical to use online service providers. But for buyers who have used online reverse auctions more frequently (the target sample for the research survey) and have the required technology infrastructure to support the online reverse auction, it is expected that they prefer to organize online reverse auctions in-house in order to cut the cost associated with the online reverse auction provider fees. Hence, the following hypothesis:

H2: With the objective of using online reverse auctions to reduce purchase prices, buyers are more likely to prefer to organize the auction event in-house than with the help of a market maker.

3.4 The Fit between Product Type and Reduction in Purchase Price

Starting with Robinson, Faris, and Wind (1967), many researchers have examined the theory, methods, and empirical observations in organizational buyer behavior (OBB), including the type of purchases. The three conceptual models in OBB published in the 1960s and 1970s (Robinson, Faris, and Wind 1967; S heth 1973; Webster and Wind 1972) were significantly influential in generating academic interest in organizational buying behavior.

Since the early 1980s, research on OBB has exploded (Sheth 1996). This can be attributed to at least three reasons. First, the shift from understanding and influencing consumers to customers (industrial, institutional, and trade) has led to a greater focus on OBB. Second, both the academic journals and business professional organizations, including the National Association of Purchasing Management (NAPM), have encouraged research and publications on inter-organizational buying behavior (Sheth 1996). Finally, as suggested in Sheth, Gardner, and Garrett (1988), the marketing discipline is increasingly influenced by the disciplines of organizational behavior, industrial organizations, and transaction cost theories in economics.

Most purchasers and industrial marketing researchers support the notion that organizational buying activities vary according to the type of product bought. Davis, Eppen, and Mattson (1974) divided purchased products into four categories (raw materials, capital goods, components, and supplies) and found that supplier selection for raw materials and capital goods is more centralized and is carried out more systematically than supplier selection for components and supplies.

Bradley (1977), in his study of industrial buying concerning public sector enterprises in Ireland, classified products as routine buying products, stock buying products, and capital buying products. Routine buying products (e.g. raw materials, general supplies, office supplies, repair and maintenance services) are frequently ordered as a result of a stock control check and pose no significant application problems for the buying organization. Stock buying products (e.g. spare machinery parts, components, and small motors) in many cases are bought in conjunction with guaranteed after-sale technical service. Finally, capital buying products (e.g. plant, equipment, and buildings) usually involve large expenditures and decisions are made at the managerial level. Ellram (1996) classified organizational purchases as low impact, leverage, or strategic, in terms of their cost and impact on the organization and their relationship potential

Kraljic (1983) classified industrial purchases into four categories according to the purchases' profit, impact, and supply risk: strategic (high profit impact, high supply risk), bottleneck (low profit impact, high supply risk), leverage (high profit impact, low supply risk), and non-critical (low profit impact, low supply risk) (see Figure 3-1).

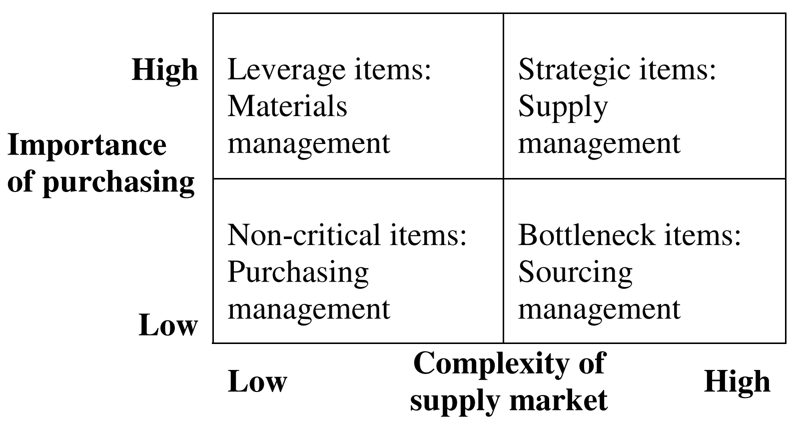

Figure 3-1: The Kraljic Purchasing Portfolio Model (Modified from Kraljic 1983)

Mattson (1988) classified purchasing products as capital equipment, product essentials, support essentials, and consumption products, suggesting that this type of classification is easily determined and directly related to the level of management involvement. More specifically, Mattson found that capital equipment is approved at a higher level than product essentials, while both of those categories dominate the other two.

The most widely used classification in the business world is production materials, components, maintenance materials and supplies, capital equipment, and services (Laios and Moschuris 2001). This research focuses on three of the four types of industrial purchases identified by Laios and Moschuris (2001). For purposes of this research, production materials and components are combined under one category:

1. Production materials and components – items which become part of the final product. For retail companies that will include retail items.

2. Maintenance materials and supplies – items consumed by maintenance and repair or operating equipment in support of operations, also known as maintenance, repair, and operating supplies (MRO). This category also includes office supplies.

3. Services – non-physical purchases in support of operatiosn. Services can be divided further into routine services, standard services, and customer-specific services, each requiring different kinds of purchasing practices. For the purposes of this research, all different types of services will be considered under the "Service" industrial purchase type without further classification.

The available literature on testing the relationship between the product type (production materials and components, MRO, and services) and the reduction in purchase prices using online reverse auctions is very limited. Pearcy et al. (2002) stated that companies will be more likely to reduce the purchase prices of direct material and MRO supplies through the use of online reverse auctions. In general, the majority of the articles published in the business press seem to agree that online reverse auctions will lead to a reduction of purchase prices, without going into details about the purchase type. The following hypotheses explore the relationships between the purchase type and the use of online reverse auctions to reduce purchase prices:

H3a: When purchasing production materials and components, a positive, significant relationship exists between the type of purchase and the purpose of using online reverse auctions to reduce purchase prices.

H3b: When purchasing MRO supplies, a positive, significant relationship exists between the type of purchase and the purpose of using online reverse auctions to reduce purchase prices.

H3c: When purchasing services, a positive, significant relationship exists between the type of purchase and the purpose of using online reverse auctions to reduce purchase prices.

3.5 The Fit between the Product Type and the Auction Application

The types of relationships that exist between buyers and sellers of products and/or services purchased have been well documented by numerous researchers (e.g. Womack, Jones, and Roos 1990; Womack and Jones 1996; Humphreys, Shiu, and Shan 2001). Their findings can be broadly characterized by buyers' two basic approaches to the use of online reverse auctions for their purchasing perspectives (Emiliani 2003):

1. Power-based bargaining (short-term relationships): the online reverse auction process is used to award business to suppliers with a transaction-oriented basis (i.e., focus on the price only).
2. Collaborative problem solving (long-term relationships): the online reverse auction process is not only used to award business to suppliers, but to establish and maintain a long-term relationship with the suppliers.

Power-based bargaining is quite common and leads to ongoing conflicts between buyers and sellers, while collaborative problem-solving tends to be less common (Womack, Jones, and Roos 1990). The rules that govern power-based bargaining are normally ad hoc, while collaborative problem-solving requires a highly disciplined approach supported by stable management principles, policies, and practices (Monden 1995; Cooper and Slagmulder 1999).

It is widely accepted by academics that power-based bargaining has many shortcomings and generally represents an immature, antiquated, or unsophisticated means of conducting business (Womack, Jones, and Roos 1990; Cooper and Slagmulder 1999; Tracey and Tan 2001). When asked, most practitioners will also acknowledge the deficiencies of transactional or exploitative approaches to purchasing, particularly with regards to achieving strategic alignment, trust, and long-term commitment. While many researchers have outlined the steps to achieve improved supplier relationships (Cooper and Slagmulder 1999; Handfield et al. 2000; Liker and Wu 2000), their solutions do not typically address the fundamental source of misalignment between buyers and sellers.

Despite the existence of more effective collaborative purchasing and supply chain management processes and widespread recognition of numerous negative consequences

(Cooper and Slagmulder 1999), power-based bargaining remains the dominant practice in most large purchasing organizations. Further evidence supporting this view includes the widespread use of online reverse auctions among Fortune 1,000 businesses to reduce the price of purchased goods (Emiliani and Stec 2001a; Richards 2000; Tully 2000; Judge 2001). Recently, some of the large purchasing organizations who have been using online reverse auctions for years as a power-based bargaining tool (e.g. General Electric) have started using online reverse auctions as a collaborative sourcing tool (Parker 2003; Emiliani and Stec 2004).

The hypotheses in this section aim at testing the applications of online reverse auctions as power-based bargaining or collaborative problem solving tools for sourcing, through examining the effect of the type of purchased items. The available literature on testing the relationship between the product type (production materials and components, MRO, and services) and the online reverse auction application (power-based bargaining or collaborative problem solving tools) is very limited.

Several researchers tested the relationship and effectiveness of using online reverse auctions to purchase production material, components, and MRO (Pearcy et al. 2002; Emiliani and Stec 2004). Contradictory results are available in the literature about the effectiveness of using online reverse auctions to purchase production materials, components, and MRO. Pearcy et al. (2002) stated that buying companies will be more likely to use online reverse auctions to buy direct material and MRO supplies for short-term contracts. On the other hand, Emiliani and Stec (2004) questioned the effectiveness of online reverse auctions as a tool to outsource components for the short-term and long-term.

The academic literature has no available published research about testing the relationship and effectiveness of using online reverse auctions to purchase services. On the other hand, the business press and the auction service provider marketing material strongly advocate the success of online reverse auctions in reducing purchase prices. Based on the above literature and research, the following is hypothesized:

H4a-c: When purchasing X, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and for the purpose of developing/maintaining long-term relationships.

X: can be production material and components, MROs, or services.

H5a-c: When purchasing X, purchasers will be more likely to use online reverse auctions for the purpose of short-term relationships than developing/maintaining long-term relationships.

X: can be production material and components, MROs, or services.

3.6 The Fit between Auction Application and Strategic Supplier Alliance

For more than a decade, there has been a growing understanding that supply chain management should be built around the integration of trading partners. Christopher (1998) proposes that “today's business is increasingly 'boundaryless', meaning that internal functional barriers are being eroded in favor of horizontal process management and externally the separation between vendors, distributors, customers and the firm is gradually lessening.” Bowersox, Closs, and Stank (2000) state that companies collaborate in the sense of “leveraging benefits to achieve common goals.”

Anthony (2000) suggests that supply chain collaboration occurs when “two or more companies share the responsibility of exchanging common planning, management, execution, and performance measurement information.” Blackwell and Blackwell (1999), suggest that “the battle commands of today are flexibility, speed, and productivity, all amplified by the winds of consumer demand.” Continuing, they suggest that “the new competitive realities are causing suppliers, manufacturers, wholesalers, and retailers alike to rethink their strategic initiatives with their supply chain partners.”

The birth and acceptance of online reverse auctions has not been without controversy. One of the main concerns with the use of online reverse auctions is that buyer-supplier strategic relationships will be negatively affected (Jap 2000; Kwak 2002). Since the late 1980’s, the trend in supply chain management has been to move away from traditional, competitive, power-based bargaining buyer-supplier relationships toward collaborative, problem solving buyer-supplier partnerships (Cusumano and Takeishi 1991; Hahn et al. 1986; Helper 1991). Power-based bargaining relationships are defined as having a primary emphasis on price, using short-term contracts, evaluating suppliers based on bids, and using multiple suppliers (Stuart 1993). By design, online reverse auctions use many suppliers, evaluate suppliers based on bids, and primarily focus on price (Hartley et al. 2004). On the other hand, collaborative problem solving buyer-supplier partnerships are formed by selecting fewer suppliers and longer-term contracts (Cooper and Slagmulder 1999).

Online reverse auctions generally increase and leverage competition and thus may reduce supplier cooperation when used as a power-bargaining tool (Hartley et al. 2004). Jap (2000) suggests that after participation in an online reverse auction, suppliers may feel that they have been treated unfairly. Emiliani and Stec (2002b) suggest that online reverse auctions lead to a breakdown of cooperation between the buyer and sellers, as the buyer seeks to satisfy its own selfish desires.

Alternatively, the buyer may use an online reverse auction as a tool to pursue a collaborative strategy as a way to reduce costs (Hartley et al. 2004). Jap (1999) suggests that supplier cooperation can be used to achieve lower costs so organizations can pursue one objective to achieve the other. By collaborating, buyers and suppliers can be more competitive than if either organization worked independently. Parker (2003) suggests that some buyers and suppliers are backing online auctions as a way of improving long-term relationships by building strategic supplier alliances.

A strategic supplier alliance involves more than just payments from the buyer in exchange for the suppliers' products or services. Buyers typically do not only buy their suppliers' products and services, but also their suppliers' systems and capabilities. Measures of the success of strategic alliances with the suppliers fall into two categories: soft (e.g. competitive technology, supply chain integration) and hard (e.g., cost, quality, and cycle time) measures of success (Monczka et al. 1998). These performance measures are expected to exceed the performance measures under "regular long-term contracts."

Online reverse auctions can be used to maintain and develop strategic supplier alliances (Parker 2003). Buying organizations can use online reverse auctions to identify suppliers and determine contract prices. If the supplier meets the buyer's requirements, a long-term contract is signed. The buying organization has to explain its intensions to use the online reverse auction as a tool to work collaboratively with the suppliers through establishing long-term contracts.

Several researchers have identified the critical attributes associated with strategic buyer-supplier alliances, including the existence of trust, co -location, asset specificity, information sharing, and other conflict management factors (McAllister 1995; Monczka and Trent 1991; Yoshino and Rangan 1995). Moher and Spekman (1994) developed and tested appropriate measures for the critical attributes associated with collaborative buyer-supplier relationships within the context of dealer-supplier channel transactions. The research focused on behavioral and communication attributes of the buyer-supplier relationships. They studied the partnership attributes, communication behavior, and conflict resolution techniques in terms of satisfaction and sales volume as indicators to the partnership's success. Figure 3-2 represents Mohr and Spekman's model.

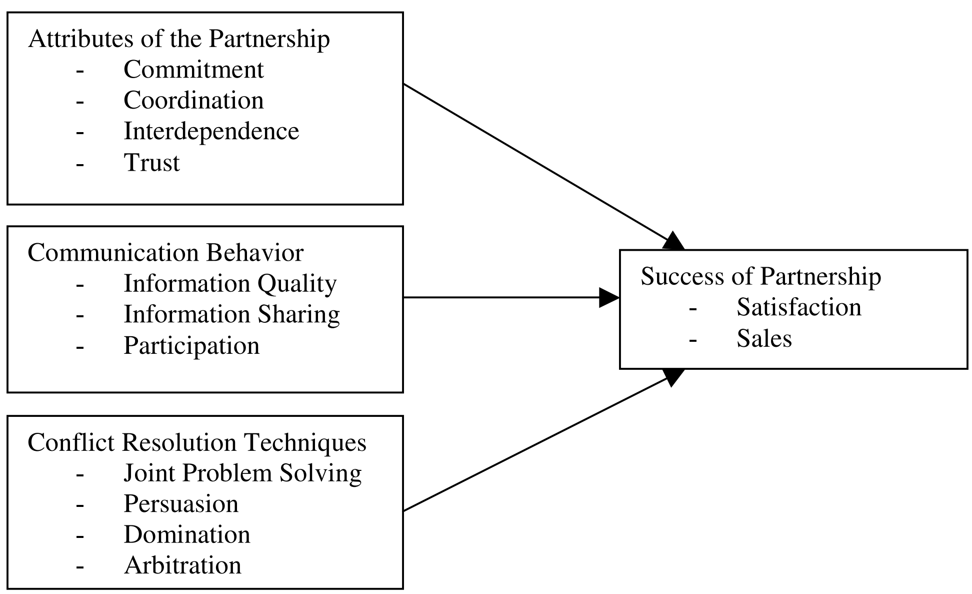

Figure 3-2: Mohr and Spekman (1994) Model

Monczka et al. (1998) expanded the Mohr and Spekman (1994) model from the buyer's perspective for industrial purchasing alliances. From the perspective of the buying company in the alliance, the following attributes of supplier alliances were found to be significantly related to partnership success: trust and coordination, interdependence, information quality and participation, information sharing, joint problem solving, avoiding the use of severe conflict resolution tactics, and the existence of a formal supplier selection process.

For purposes of this study, based on the model developed by Mohr and Spekman (1994) and enhanced by Monczka et al. (1998), the hypotheses will test the buyer-supplier strategic alliance relationship in the context of online reverse auction transactions with focus on three dimensions: attribute of the alliance, communication behavior, and conflict resolution techniques. Hypotheses 6 and 7 are based on the hypotheses established by Monczka et al. (1998) based on Mohr and Spekman's (1994) research.

Attributes of the Alliance

Trust

Several studies confirm the importance of trust as a component of collaborative buyer-supplier relationship (Mohr and Spekman 1994; Monczka et al. 1998; Pilling and Zhang 1992; Smith et al. 1995). Moorman et al. (1992) define trust as "the willingness to rely on an exchange partner in whom one has confidence." Pruitt (1981) indicates that trust is highly related to the buyers' and suppliers' desire to collaborate. Anderson and Narus (1990) suggest that once trust is established, companies learn that joint efforts will lead to outcomes that exceed what the firm would achieve had it acted solely in its own best interests.

Commitment

Commitment refers to the willingness of buyers and suppliers to exert effort on behalf of the relationship (Porter et al. 1974). Commitment suggests a future orientation in which partners attempt to build a relationship that can weather unanticipated problems (Mohr and Spekman 1994). Commitment to a relationship is most frequently demonstrated by committing resources to the relationship, which may occur in the form of an organization's time, money, facilities, etc (Monczka et al. 1998).

Coordination

Coordination is related to boundary definition and reflects the set of tasks each party expects the other to perform. Narus and Anderson (1977) suggest that successful working partnerships are marked by coordinated actions directed at mutual objectives that are consistent across organizations.

Interdependence

Interdependence exists when one actor does not entirely control all of the conditions necessary for achievement of an action or a desired outcome (Monzcka et al. 1998). As organizations join forces to achieve mutually beneficial goals, they acknowledge that each is dependent on the other.

In sum, the literature cited above and the literature in Monczka et al. (1998) suggest that more successful strategic alliances are expected to be characterized by higher level of commitment, coordination, interdependence, and trust. By applying this suggestion to the application of online reverse auctions, the following is hypothesized:

H6a: Using online reverse auctions as a collaborative problem solving tool is associated with high levels of trust, commitment, coordination and interdependence.

H7a: Successful strategic supplier alliances are associated with high levels of commitment, trust, coordination and interdependence.

<u>Communication Behavior</u>

Information Exchange

Information exchange refers to the extent to which critical, often proprietary, information is exchanged between the buyer and the supplier (Mohr and Spekman 1994). For instance, details of the supplier's financial health, level of debt, ability to grow, and overhead structure are required in order to effectively plan future purchases and grow within the alliance (Burt, Norquist, and Anklesaria 1990). Helper (1991) argued that increased communication and integrated problem solving are important for improving design quality and overall performance.

Information Quality and Participation

Information quality is a key aspect of information transmission and includes aspects such as the accuracy, timeliness, adequacy, and credibility of information exchanged. Information participation refers to the extent to which partners engage jointly in planning and goal setting (Mohr and Spekman 1994).

In sum, the literature cited above suggests that more successful partnerships are expected to be characterized by higher levels of exchanging quality information. Applying this suggestion to the application of online reverse auctions, the followings are hypothesized:

H6b: Using online reverse auctions as a collaborative problem solving tool is associated with high levels of buyer-supplier (a) information sharing (b) information quality and (c) information participation.

H7b: Successful strategic supplier alliances are associated with high levels of (a) information sharing and (b) information quality and participation.

Conflict Resolution

Conflict inevitably exists between buyers and suppliers. The manner in which conflicts are resolved has a direct implication for the success and continuity of the relationship. Organizations in a strategic partnership are motivated to engage in joint problem solving to enhance the relationship's success. Partners might attempt to persuade each other to adopt particular solutions to the conflict situation. These persuasive attempts are more constructive than the use of domination or confrontation destructive conflict resolution techniques. In some situations, buyers and suppliers might seek outside arbitration to resolve conflicts. Other conflict resolution techniques involve smoothing over or avoiding the issues. By applying these suggestions to the application of online reverse auctions, the following are hypothesized:

H6c: Using online reverse auctions as a collaborative problem solving tool is associated with (a) higher use of buyer-supplier constructive resolution *techniques (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques.*

H7c: Successful strategic supplier alliances are associated with (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques.

3.7 Successful Implementation

In recent years, organizations have adopted management practices and technologies designed to reduce costs. Recently, organizations have adopted online reverse auctions to lower purchase prices and reduce transaction costs (Brunelli 2000; Dong, Carter, and Dresner 2001; Hong and Hartley 2001; Moser 2002; Ruzarika 2000). Several large companies have reported decreases in purchase prices of 10% or more through the use of online reverse auctions (Brunelli 2000; Hannon 2001). Online reverse auctions also affect purchase prices, transaction costs, and inventory costs (Hartley, Lane, and Hong 2004). Carter et al. (2004) observed that buyers consider "successful auctions as those that exceed the expected or perceived savings of a face-to-face negotiation or traditional bid process." Wagner and Schwab (2004) used product cost reduction as the performance measure of the successful implementation of an online reverse auction event. So, based on the literature cited above and the literature cited in the previous sections, the following is hypothesized:

H8: A positive, significant relation exists between reducing purchase prices and the buyer's perception of a successful online reverse auction event.

In recent years, the trend in supply management has been to move away from traditional competitive buyer-supplier relationships toward collaborative buyer-supplier strategic alliances (Helper 1991; Stuart 1993; Womack and Jones 1996). However, one of the main concerns with the use of online reverse auctions is that buyer-supplier strategic relationships will be negatively affected (Jap 2000; Kwak 2002).

Several authors listed destroying buyer-supplier relationship as the main disadvantages of online reverse auctions (Emiliani and Stec 2002; Jap 2002), while Hartley, Lane, and Hong (2004) saw an opportunity to enhance the buyer-supplier strategic alliance and pursue a collaborative strategy as a way to reduce cost. Smart and Harrison (2003) studied the impact of reverse auctions on the buyer-supplier relationships and concluded that "reverse auctions have the potential to be used in both the collaborative and competitive relationships as a means of tendering contracts." In spite of the contradicting views of these authors, all agree that if implementing an online reverse auction did not have a negative effect on supplier strategic alliances, then they would consider the auction event successful, hence the following hypothesis:

> *H9: A positive, significant relation exists between buyer-supplier strategic alliance, and the buyer perception of a successful online reverse auction event.*

The research model was developed using multi-disciplinary academic research as well as articles and reports in the popular press. Figure 3-3 shows the research model and hypotheses.

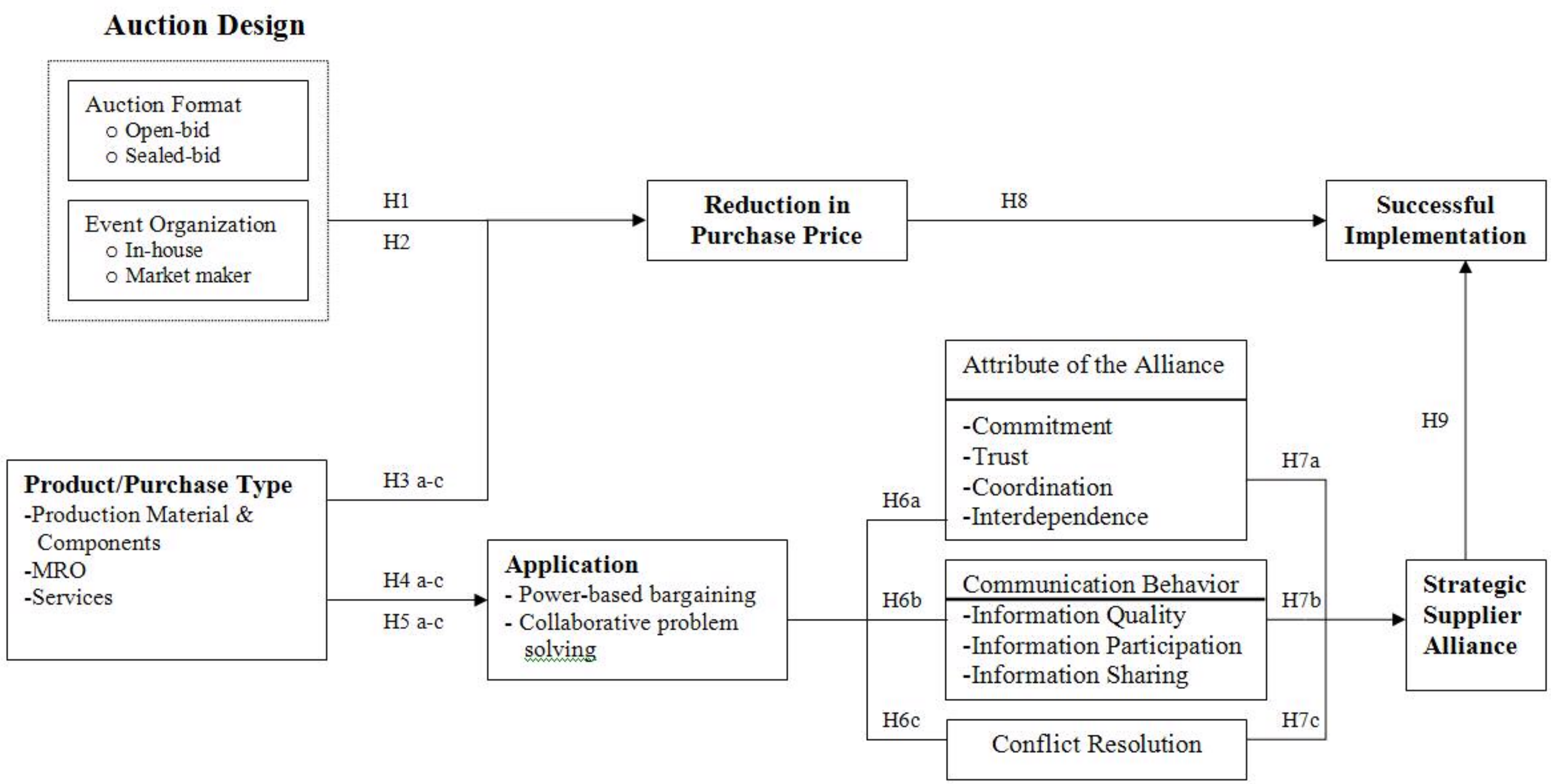

Figure 3-3: Research Hypothesized Model

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the methodological procedures that were used to test the research model. Specifically, this chapter presents the research instrument, methodology for data analysis, the sample, data collection, and the research timeline. In section 4.2, the chapter presents the development of the research instrument that was used to test the research model. Section 4.3 presents the research sample which is members of the Institute for Supply Management (ISM). Section 4.4 summarizes the data collection process.

4.2 Data Gathering Tool

The author developed a standardized self-administered questionnaire, where all participants have the same questionnaire with the same questions in the same order. The standardized questionnaire was mailed to the potential participants. The questionnaire (available in Appendix I) contains ten sections, which are explained in the following paragraphs (refer to Table 4-1):

Basic Information and Reverse Auction Experience

The participants were asked to provide some basic information regarding their company and their position within their supply chain. The information involved estimating the dollar amount spent on purchases using online reverse auctions, the company's annual sales and purchasing volumes, and the number of employees in the company in general and in purchasing in particular.

The participants were asked personal information about their job title, years of experience with the company, years of experience using online reverse auctions, the number of online reverse auction events organized in-house, and the number of auction events organized with the help of an online reverse auction provider. Finally, the respondents were asked to provide their email address if they elected to receive a copy of this research.

Reduction in Purchase Prices and Auction Design (sections I-III)

The construct "reduction in purchase price" will be evaluated from two different dimensions: reduction in purchase prices due to auction design (sections I and II) and reduction in purchase prices due to purchase type (section III). A scale to assess the "reduction in purchase prices due to auction design" did not exist; therefore the researcher developed it. The construct "reduction in purchase prices due to purchase type" was also measured by a scale developed by the researcher since one did not currently exist.

Online Reverse Auction Application (section IV)

The scale to assess the "application" construct was developed by Pearcy et al. (2002, 2003 a, b) in their study of the impact of the firm's corporate and e-purchasing strategy, purchase type, and relative strategic importance of the buyer-supplier relationship on reverse auction implementation. The authors reported scale reliabilities of 0.75 and 0.8 for short-term application and long-term application scales respectively as indicated by the Cronbach coefficient alpha. The authors stated that the reliabilities were acceptable according to the guidelines of Nunnally (1967), which considered an alpha of 0.70 as sufficient in scale development.

Successful Strategic Alliance (section VI-IX)

The measures developed by Mohr and Spekman (1994) were used to assess the "successful strategic alliance" (section IX) and its critical antecedents including attributes of the relationship (trust, commitment, coordination and interdependence) in section VI, communication behavior (information quality, participation, and sharing) in sections VII and IX, and conflict resolution techniques in section VIII.

The scales used in this research were patterned after the improvements done by Monczka et al. (1998) to test the magnitude of the effect of using online reverse auctions on the buyer-supplier strategic alliance. TheMonczka et al. (1998) scale asked the respondents to assess the buyer-supplier alliance success by examining several specific performance dimensions for their most and least successful alliance experiences. The researchers tested their instrument's face validity using a group of industry executives and subject-matter experts. The extent of convergent validity for the four constructs was assessed through the use of principle components factor analysis with Varimax rotation. Finally, the reliability of each construct was measured using Cronbach alpha. All of the measures had a Cronbach alpha greater than 0.70 as an indication of sufficient reliability.

Successful Online Reverse Auction Implementation (section V)

The scale to assess the "success of online reverse auction implementation" construct was created by the researcher, as one did not exist. The scale was developed according to success criteria published in the online reverse auction literature (Brunelli 2000; Carbone 2004; Jap 2000; Emiliani and Stec 2002 a & b, 2004; Hartley et al. 2004; Kwak 2002; Pearcy et al. 2003a; Porter 2000; Smart and Harrison 2003; Wagner and Schwab 2004). Table 4.1 provides a summary of the components of each scale.

Reverse scoring was used in several sections of the survey as shown in Table 4-1. Reverse scoring several questions forces the survey respondent to slow down and think about each question, thus minimizing the temptation to score all questions the same without reading them. Reverse scoring can also flag surveys that may not be useful because all items (questions) are scored the same this suggesting that the survey taker was not honestly and thoughtfully completing the survey. These surveys may be considered biased and removed from the study.

Construct	Survey Questions
Auction Design (format)	**I. The following refers to the effect of the auction price visibility on the efficiency of online reverse auctions to reduce purchase prices:** 1. Auctions where suppliers can see each other bids are effective in reducing purchase prices (Open-bid). 2. Auctions where suppliers can only know they have been outbid are effective in reducing purchase prices (sealed-bid). (Reverse Scored) 3. Multi-round sealed bid auctions are more effective than multi-round open bids in reducing the purchasing prices. (Reverse Scored) 4. Multi-round open-bid auctions are more effective than multi-round sealed bids in reducing the purchasing prices.
Auction Design (event organization)	**II. The following refers to the effect of the auction event organization on the efficiency of online reverse auction to reduce purchase prices:** 1. In-house organized online reverse auctions are effective in reducing purchase prices. 2. Auctions organized in-house are more effective than auctions organized with the help of an online reverse auction service provider (market maker) in reducing purchasing prices. 3. Auctions organized with the help of an online auction service provider (like Trade-Partners or Freemarkets) are effective in reducing purchase prices. (Reverse Scored) 4. Auctions organized with the help of an online reverse auction service provider (market maker) are more effective than auctions organized in-house in reducing the purchasing prices than what we historically used to pay. (Reverse Scored)
Reduction in Purchase Price	**III. The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing:** 1. Production material and components / Retail Items 2. MRO (maintenance, repair and operating supplies) / Office Supplies 3. Services
Auction Application (power based bargaining)	**IV. The following refers to the effect of different types of purchases on the application of online reverse auctions as a power-based bargaining tool (short-term contracts) <u>or</u> a collaborative problem solving tool (long-term relationships).** 1. a) Online reverse auctions are an excellent tool to reduce purchase prices on the short term. 2. We use online reverse auctions to achieve multiple sourcing. 3. We use online reverse auctions to identify new long-term partnering suppliers. (Reverse Scored) 4. We use online reverse auctions to pressure our suppliers to reduce prices.

Auction Application (collaborative problem solving)	**IV. The following refers to the effect of different types of purchases on the application of online reverse auctions as a power-based bargaining tool (short-term contracts) <u>or</u> a collaborative problem solving tool (long-term relationships).** 1. Online reverse auctions are an excellent tool to reduce purchase prices on the long term. 2. We use online reverse auctions to achieve multiple sourcing. (Reverse Scored) 3. We use online reverse auctions to identify new long-term partnering suppliers. 4. We use online reverse auctions to pressure our suppliers to reduce prices. (Reverse Scored)
Attribute of the Allia□e (Trust)	**VI. Please rate your level of agreement about the following statements regarding your company relationship with your suppliers for the following dimensions:** 1. We trust that our strategic supplier alliances will be beneficial to our business. 2. We do not get an equitable (fair) deal from our suppliers in these alliances. (Reverse Scored) 3. The relationships with our suppliers are marked by a high degree of harmony.
Attribute of the Alliance (commitment)	**VI. Please rate your level of agreement about the following statements regarding your company relationship with your suppliers for the following dimensions:** 1. We would like to discontinue buying from our current suppliers. (Reverse Scored) 2. We are very committed to buying from our current suppliers. 3. We have minimal commitment to our suppliers. (Reverse Scored)
Attribute of the Alliance (coordination)	**VI. Please rate your level of agreement about the following statements regarding your company relationship with your suppliers for the following dimensions:** 1. Our activities with our suppliers are well coordinated. 2. Programs at our company are well coordinated with our suppliers. 3. We feel like we never know what we are suppose to do for our suppliers. (Reverse Scored)
Attribute of the Alliance (interdependence)	**VI. Please rate your level of agreement about the following statements regarding your company relationship with your suppliers for the following dimensions:** 1. It would be very easy to terminate the relationship with any supplier and establish another strategic supplier. (Reverse Scored) 2. The time to establish another new strategic supplier partnership would be extremely long. 3. The cost to establish another new strategic supplier partnership would be extremely high.

Communication Behavior (information quality)	**VII. To what extent do you feel that your company communication with your suppliers:** a. Timely (1=Not timely at all, 7=very timely) b. Accurate (1=Not accurate at all, 7=very accurate) c. Adequate (1=Not adequate at all, 7=very adequate) d. Complete (1=Not complete at all, 7=very complete) e. Credible (1=Not credible at all, 7=very credible)
Communication Behavior (information participation)	**IX. Please rate your level of agreement about the following statements regarding your company relationship with your suppliers:** 1. We actively seek advice, counsel, and information from our suppliers. 2. Our strategic suppliers participate in our planning and goal setting activities. 3. We participate in our suppliers' planning and goal setting activities that are relevant to our strategic partnership. 4. We actively encourage improvement suggestions from our suppliers.
Communication Behavior (information sharing)	**IX. Please rate your level of agreement about the following statements regarding your company relationship with your suppliers:** 1. We share proprietary information with our suppliers. 2. Our suppliers share proprietary information with us. 3. We inform our suppliers in advance of changing needs. 4. In this relationship, it is expected that any information which might help the other party will be provided. 5. The parties are expected to keep each other informed about events or changes that might affect the other party. 6. It is expected that the parties will only provide information according to a pre-specified agreement. (Reverse Scored) 7. Our Supplier keep us fully informed about issues that affect our business.
Conflict Resolution	**VIII. Assuming that some conflict exists over program and policy issues and how the relationship with your supplier is executed, how frequently are the following methods used to resolve such conflict? (1=Never, 7=Occasionally)** a. Smooth over the problem b. Outside arbitration c. Persuasive attempts by either party d. Joint problem solving e. Harsh words

Strategic Supplier Alliance	**X. Please rate your level of agreement with the following statements regarding your company's relationship with your suppliers:** 1. In our strategic supplier alliances, the parties work together to solve problems. 2. Our suppliers are flexible to requests we make. 3. Our suppliers make an effort to help us during emergencies. 4. When an agreement is made, we can always rely on our suppliers to fulfill the requirements. 5. We are satisfied with our company strategic supplier alliances.
Successful Event Implementation	**V. Please rate your level of agreement about the following statements regarding how your company define the success of an online reverse auction event:** 1. If the prices paid for purchases using reverse auction are less than the prices we used to pay, the online reverse auction event is considered successful. 2. We are satisfied with our company online reverse auctions results. 3. An online reverse auction event is considered a failure if it results in destroying our relationship with one of our suppliers 4. We are likely to reward our current loyal suppliers by continuing business with them even if they are not the lowest bidders in the online reverse auction event. 5. We are satisfied with our savings using online reverse auctions.

Table 4-1: Construct Measures before Scale Purification

4.3 The Sample

The sampling frame consists of members of the Institute for Supply Management (ISM). The survey respondents are members who reported themselves to be senior purchasing professionals, senior executives, vice-presidents, and even owners of the supply business who handle large purchases and had the authority to determine major investment decisions to make price concessions.

This sampling frame was chosen because of the likelihood that these purchasing professionals would have participated in at least one online reverse auction event and would be willing to participate in the survey.

Ideal sample size is contingent upon a number of factors including the confidence level, the margin of error (tolerance), and the proportion of individuals in the population. For the purpose of this research, a 95% confidence interval with ±4% margin of error is assumed to yield a sample size of 600.

Author(s)	**Sample Size**	**Usable Returns**	**Response Rate**
Jap (2002)	54	38	70%
Jap (2003)	154	68	44%
Pearcy et al. (2003 a, b)	***1,025***	***142***	***14%***
Hartley et al. (2004)	***800***	***163***	***20%***
Emiliani and Stec (2004)	43	23	53%

Table 4-2: Online Reverse Auction Surveys Response Rates

The research sampling frame is similar to the frame surveyed in the research done by Pearcy et al. (2003 a, b) and Hartley et al. (2004); therefore, the researcher expects a similar response rate of 15-20%. Pearcy et al. (2003 a, b) mailed 1,025 surveys to members of the Institute of Supply Management (ISM) who reported to be purchasing professionals. Hartley et al. (2004) used a survey methodology in the context of mail format. The authors mailed 800 surveys to members of the National Association of Purchasing Management (NAPM) who reported that they are Directors or Vice Presidents for Purchasing/Supply Management.

4.4 Data Collection

Survey Preliminary Test

After the development of the survey, a detailed pretest was administered with a group of three e-procurement professionals, three faculty members, and five graduate students. The survey was also reviewed by two members of the English Writing Center at Oklahoma State University. Suggestions were solicited to ensure that the survey is clear and comprehensive. Based on the feedback, the appropriate revisions were made to improve the research instrument. The major change was in section III in the survey, where the suggestion was to change the questions from a Likert scale format to a percentage format. Changes were also done on the survey style, and the paper color was changed from white to yellow.

Survey Distribution

After modifying and finalizing the initial survey, an email was sent to all the participants in the study to introduce the purpose of the study and the importance of their participation. The objectives for sending these emails were to check if the participant was still with the company in a role related to supply management and to insure a higher response rate.

Six hundred and three potential participants were mailed a cover letter explaining the purpose of the study, the importance of their participation, a questionnaire, and a return envelop with a stamp on it.

Survey Follow-up

An email was sent to participants two weeks later as a follow-up/reminder to return the questionnaire. Depending on the response rate, a second mailing of the survey might have been required.

Survey Analysis

Various statistical analysis procedures were used to analyze the results of the survey including t-test, bi-variate correlation, and multiple linear regression (see Chapter 5). Table 4-3 provides a summary of the hypotheses and the suggested statistical analysis procedures.

Hypothesis	Statistical Analysis Tool
H1: Using online reverse auctions, the reduction in purchase prices is more likely to be higher in the open-bid auction format than the sealed-bid format.	One tailed t-test
H2: With the objective of using online reverse auctions to reduce purchase prices, buyers are more likely to prefer to organize the auction event in-house than with the help of a market maker.	One tailed t-test
H3a-c: When purchasing X, a positive, significant relationship will exist between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices. X can be production material and components, MROs, or services.	Means analysis & one tailed t-test
H4a-c: When purchasing X, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships. X can be production material and components, MROs, or services.	Correlation analysis
H5a-c: When purchasing X, purchasers will be more likely to use online reverse auction for the purpose of a short-term relationship than developing/maintaining long-term relationships. X can be production material and components, MRO, or services.	One tailed t-test
H6a: Using online reverse auctions as a collaborative problem solving tool is associated with high levels of trust, commitment, coordination and interdependence.	Multiple linear regression
H6b: Using online reverse auctions as a collaborative problem solving tool is associated with high levels of buyer-supplier (a) information sharing (b) information quality and (c) information participation.	Multiple linear regression
H6c: Using online reverse auctions as a collaborative problem solving tool is associated with (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques.	Multiple linear regression
H7a: Successful strategic supplier alliances are associated with high levels of commitment, trust, coordination and interdependence.	Multiple linear regression
H7b: Successful strategic supplier alliances are associated with high levels of (a) information sharing and (b) information quality and (c) information participation.	Multiple linear regression
H7c: A positive, significant relationship will exist between the success of the strategic alliance and (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques	Multiple linear regression
H8: A positive, significant relation exists between reducing purchase prices and the buyer perception of a successful online reverse auction event.	Correlation analysis
H9: A positive, significant relation exists between buyer-supplier strategic alliance, and the buyer perception of a successful online reverse auction event.	Correlation analysis

Table 4-3: Hypotheses Statistical Analyses Procedures

CHAPTER 5: ANALYSIS AND FINDINGS

5.1 Introduction

Chapter five provides analysis of the data and the research results. The chapter is divided into six sections. Section 5.2 discusses the survey response rates in general and response rates based on the SIC code and geographic location in particular. In section 5.3, the chapter presents analysis of early versus late responses; the surveys received in the first two weeks are the early responses while the remaining surveys are the late responses. Analyses are also provided based on using the first three weeks as early responses.

Section 5.4, presents a statistical description of the survey responses based on the position of respondents, employment experience, and auction experience. The section also provides a statistical description of the surveys based on the annual sales in 2004, the annual purchasing volume in 2004, total number of employees, number of purchasing employees, position (job title), and/or auction experience. In section 5.5, the reliability and validity analyses of the survey instrument are presented.

Finally, scale descriptive statistics and hypotheses tests and are presented in section 5.6. Tables in this section summarize the hypotheses supported with the data and the hypotheses not supported with the data.

5.2 Survey Response

Survey instruments were mailed to participants on July 14, 2005 (see Appendix A) after getting approval from the Oklahoma State University Institutional Review Board (see Appendix B). Included with the survey were a stamped return envelop, a cover letter, and a letter from the Institute of Supply Management (see Appendix A) containing an explanation of the importance of the research study and an explanation of the time required to complete the survey.

Confidentiality was assured to each participant. Data were to be reported in aggregate form so that no individuals would be identified. Participants were informed that their participation was voluntary and neither their names nor that of the company would be identified and reported in any manner.

Of 603 surveys mailed out, 146 surveys were returned before September 2, 2005. Respondents employed by companies that did not use online reverse auctions returned 49 of the 146 surveys. Seven surveys were returned undeliverable for various reasons (including moved with no forwarding address, not at this address any more and/or invalid mailing zip code). Two surveys were received after the cut-off date of September 2, 2005 and were not included in the data analysis. One survey was eliminated due to excessive missing responses on 5 pages of the 6 pages of the survey. The total number of usable surveys was 145 surveys, which brings the response rate to 24%.

According to the SIC division structure, 74% of the surveys were mailed to companies from Division D (manufacturing), 16% from Division G (retail trade) and 10% from Division I (services). Surveys received from manufacturing companies represent 77% of the total while retail/trade and service companies represent 16% and 6% respectively. Figure 5-1 summarizes the surveys sent out by division number and the corresponding response percentage for each division. Table 5-1 details the surveys sent out and received by the SIC major group number.

According to the geographic location, based on the U.S. Census Bureau division of the United States, surveys received from companies in the West had the highest response rate of 43%, while companies from the Midwest, South and Northeast had response rates of 27%, 23% and 21% respectively (for more details on the response by state refer to Appendix C.1).

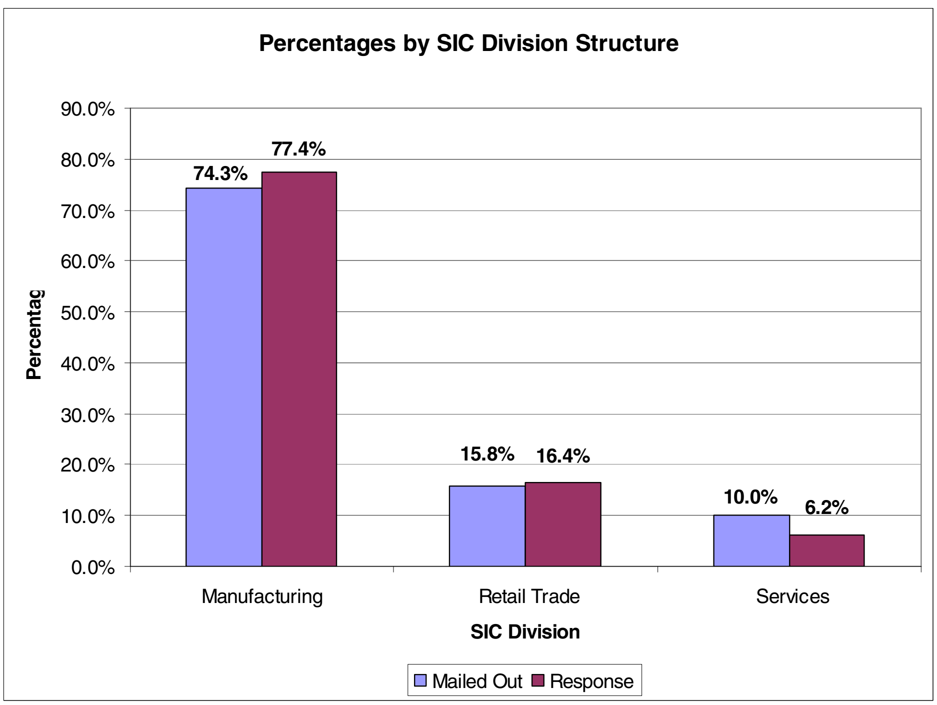

Figure 5-1: Survey Percentages by SIC Division Code

	SIC Code	Total Sent-out	Total Received	Received Percentage
Division D (Manufacturing)	**Major Group 20:** Food & Kindred Products	49	12	24%
	Major Group 28: Chemicals And Allied Products	92	24	26%
	Major Group 29: Petroleum Refining & Related Industries	8	1	13%
	Major Group 33: Primary Metal Industries	15	5	33%
	Major Group 34: Fabricated Metal Products, Except Machinery & Transportation Equipment	37	10	27%
	Major Group 35: Industrial And Commercial Machinery & Computer Equipment	47	17	38%
	Major Group 36: Electronic & Other Electrical Equipment & Components, Except Computer Equipment	115	23	20%
	Major Group 37: Transportation Equipment	55	14	25%
	Major Group 38: Measuring, Analyzing, & Controlling Instruments; Photographic, Medical and Optical Goods; Watches & Clocks	30	6	20%
Division G (Retail Trade)	**Major Group 52:** Building Materials, Hardware, Garden Supply, and Mobile Home Dealers	14	3	21%
	Major Group 53: General Merchandise Stores	12	4	33%
	Major Group 54: Food Stores	15	6	40%
	Major Group 56: Apparel And Accessory Stores	19	7	37%
	Major Group 57: Home Furniture, Furnishings, Equipment Stores	11	1	9%
	Major Group 58: Eating And Drinking Places	24	3	13%
Division I (Services)	**Major Group 70:** Hotels, Rooming Houses, Camps, and Other Lodging Places	5	0	0%
	Major Group 73: Business Services	25	3	12%
	Major Group 80: Health Services	14	1	7%
	Major Group 82: Educational Services	11	2	18%
	Major Group 87: Engineering, Accounting, Research, Management, and Related Services	5	3	60%

Table 5-1: Summary of Industries Surveyed by SIC Code

5.3 Early versus Late Response

In studying the non-response bias in anonymous surveys, Venkatraman (1989) found that late respondents' profiles tend to match those of non-respondents. Therefore, using this approach, the profiles of early and late respondents were compared using a t-test on each of the scales.

The early respondents for this research are those who responded within two weeks of the first return while late respondents are those who returned later than two weeks of the first return but before the cut-off date of September 2, 2005.

The data indicate that a statistically significant difference existed only between early and late respondents on the auction application (collaborative problem solving) scale at (α=0.05, p=0.047). The p-values for the remaining scales ranged from 0.10 to 0.96 (see Appendices C.3 and C.4).

Further analysis was conducted by assuming early respondents to be those who responded within three weeks of the first return while late respondents are those who returned later than three weeks of the first return but before the cut-off date of September 2, 2005. The data indicate that no statistically significant difference exists between early and late respondents for any scale. The p-value for the scales ranged from 0.09 to 0.95 (see Appendices C.5 and C.6).

5.4 Sample Descriptive Statistics

The majority of the respondents hold mid-to-senior management positions. More than half of the respondents (53%) reported being managers, 35% reported to be holding an upper management position (vice president, director or senior manager) and 12% reported being either buyers or senior buyers (see Figure 5-2).

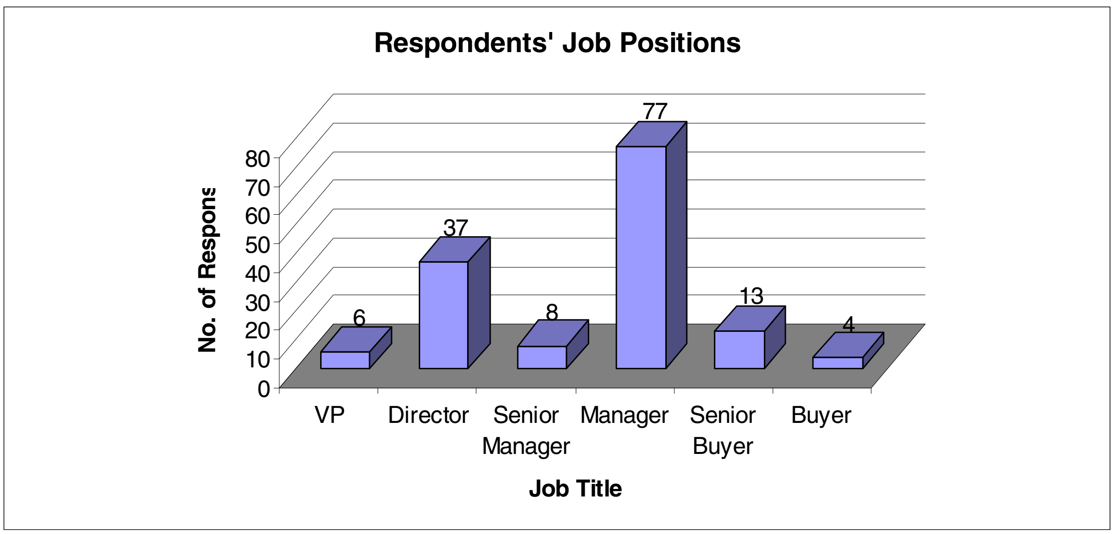

Figure 5-2: Respondents' Job Titles

The mean number of years of employment with the current company for respondents in purchasing/supply management role is just over 10 years (10.3), with 1/2 year of experience as the minimum, and 42 years of experience as the maximum. The average number of auctions in which the respondents' company participated during the last 3 years was 146 auctions (ranging from 1 to 5,000 auctions). The average number of auctions completed in-house in year 2004 was greater than the average number of auctions completed with the help of an online reverse auction service provider in 2004. Also, the median number of auctions completed in-house in 2004 was 5, which was greater than the median number of two auctions completed with the help of an online reverse auction service provider in 2004. For more details see Appendix C.2.

In terms of responding companies' financial descriptive statistics, a majority of the survey respondents (57%) represented companies with annual sales of more than one billion US dollars in 2004; Figure 5-3 shows the annual sales for the respondents' companies. On the other hand, the annual purchasing volume for the year 2004 exhibited substantial variation with half of the respondents' reporting annual purchasing volume less than $500 million and the other half reporting an annual purchasing volume of more than $500 million. Figure 5-4 summarizes annual purchasing volume for the responding companies in 2004.

Similarly, a majority of these companies (60%) reported their number of employees to exceed 1,000. More than half of the responding companies reported having a purchasing staff of 20 or more employees, with 39% having more than 50 employees. Figure 5-5 summarizes the total number of employees and Figure 5-6 summarizes the number of purchasing employees for the companies responding to the survey.

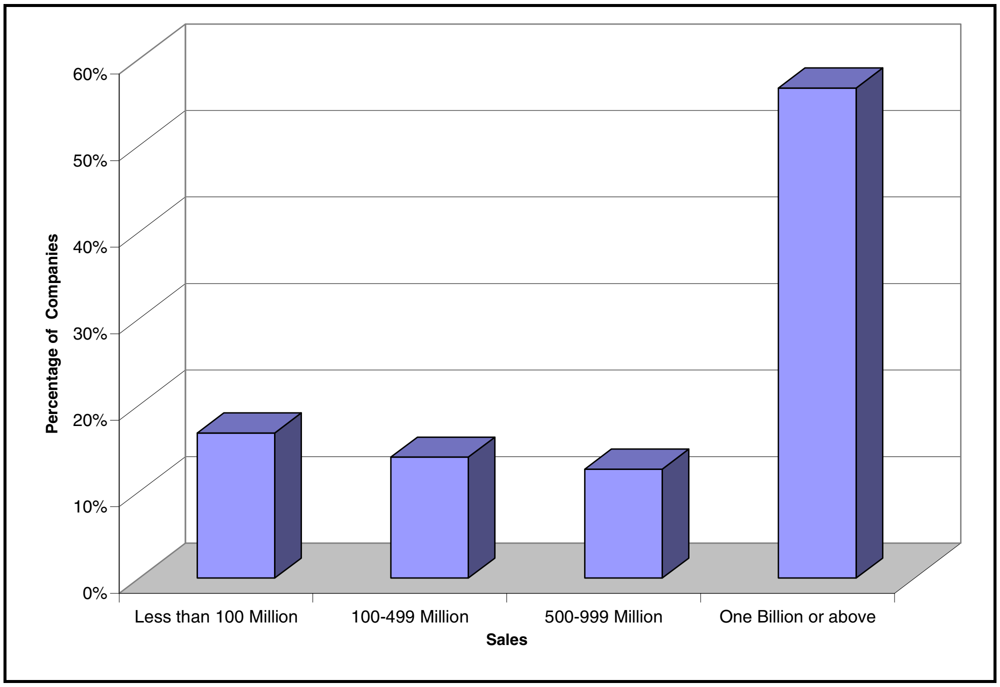

Figure 5-3: Frequency Data on Year 2004 Annual Sales

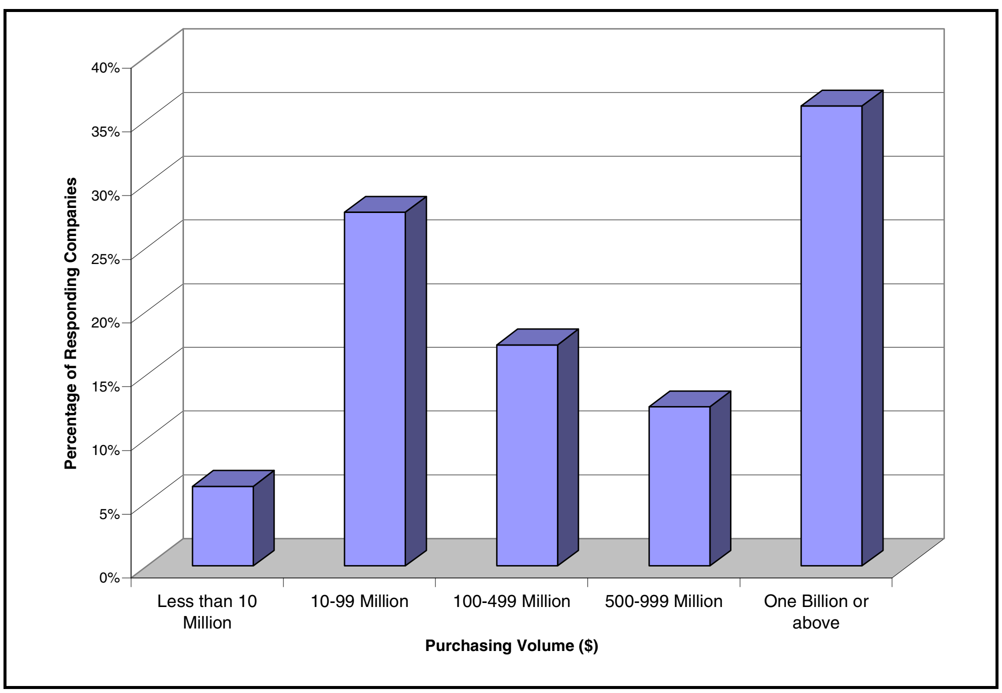

Figure 5-4: Frequency Data on Year 2004 Annual Purchasing Volume

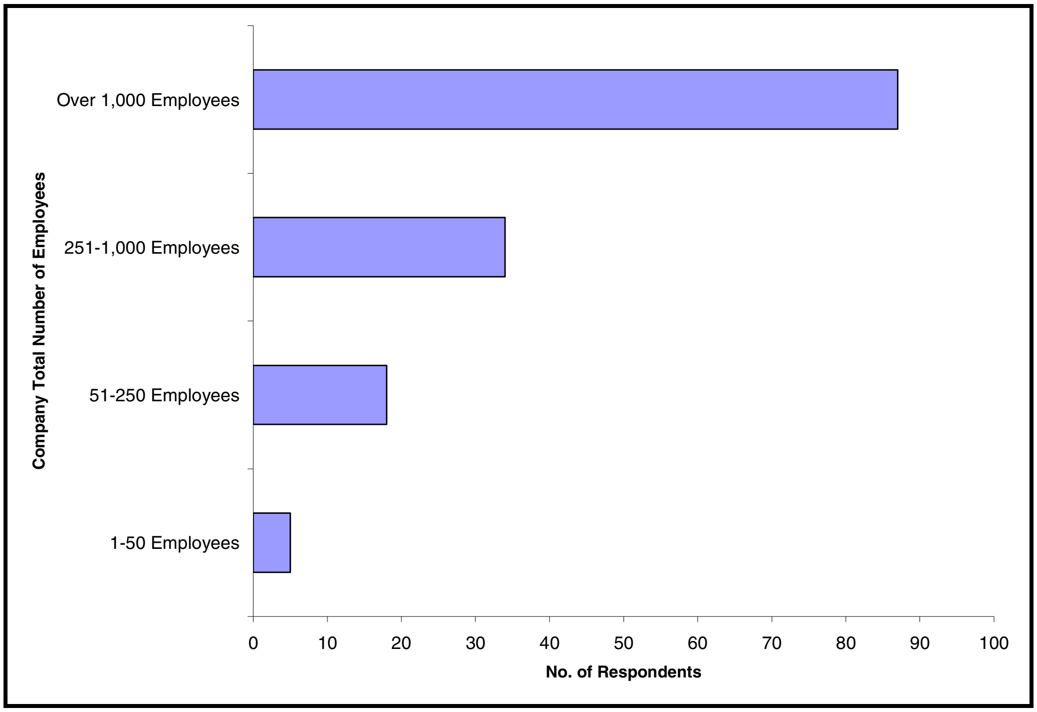

Figure 5-5: Frequency Data on Total Number of Employees

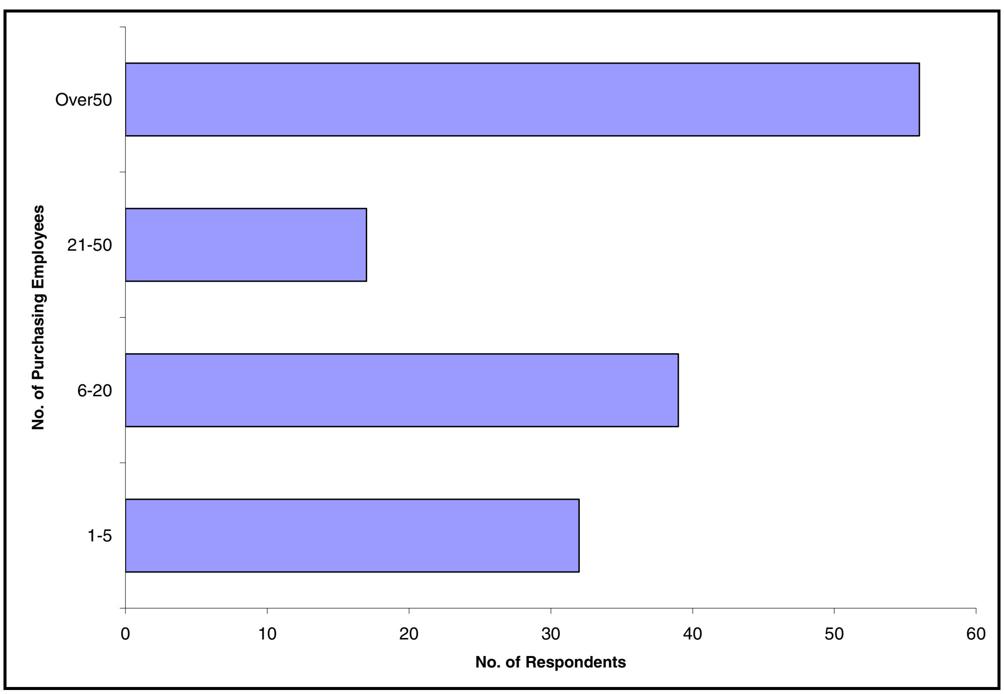

Figure 5-6: Frequency Data on Number of Purchasing Employees

5.5 Reliability and Validity Analysis

The theoretical part of this study has developed concepts to express theoretical constructs, such as auction format. These constructs have been expressed by various items in the survey. For evaluating theoretical constructs, indicators have been generated. The quality of these indicators, how well the indicators describe the theoretical construct, can be tested by two tests: the reliability test and the validity test.

5.5.1 Reliability Analyses

Stainback and Stainback (1988) defined reliability as “the consistency and stability of data and findings”. Hayes (1997) defined reliability as “the extent to which measurements are free from random errors”. A reliability test describes the probability of random errors influencing the test results of a study. A low impact of random errors is reflected in a high reliability. The reliability of the construct is assessed using factor analysis and by assessing the Cronbach alpha (Cronbach 1951). Factor analysis is a statistical procedure used to reduce the number of variables by combining highly correlated variables with each other (Gall, Borg, and Gall 1996). Subsequent to the initial factor analysis, which revealed the number of factors for each subscale, Varimax rotation was used to clarify the solution if more than one factor was present (Pearcy 2002). The items with low loading were deleted. According to Comrey and Lee (1992), a factor loading of 0.45 is considered fair; therefore only items with loading of 0.45 or more were retained.

Next, the remaining sets of items were subject to assessments of the scale reliabilities as indicated by Cronbach alpha (Cronbach 1951). This allowed the research study to identify additional items whose deletion would increase Cronbach alpha. The minimum acceptable "cut-off" value for alpha was determined to be 0.65 (Nunnally 1978 and DeVellis 1991). Devellis (1991) suggested the following alpha ranges: below 0.60 is unacceptable; between 0.6 and 0.65 is undesirable; between 0.65 and 0.7 is minimally acceptable; between 0.7 and 0.8 is respectable; and above 0.8 is very good.

Accordingly, if a scale had a coefficient alpha that was less than 0.65, one or more items were deleted in order to achieve an acceptable level. Factor analysis was then conducted to verify that the original factor structure was still intact as suggested in previous scale development research (Flynn and Goldsmith 1999; Derbaix and Pecheux 1999). This process was conducted in an iterative manner until the reliability could not be improved by deleting items, unless the increase in coefficient alpha was minimal. Table 5-2 summarizes the acceptable "cut-off" criteria that were used in the reliability analysis phase of the study.

Criteria	≥
Item-to-total correlation	0.30
Factor loading	0.45
Explained variance	50%
Cronbach's alpha	0.65

Table 5-2: Summary of Reliability Criteria

For each of the following tests of scale reliability using factor analysis (FA), KMO and Bartlett's test of sphericity indicated that factor analysis was justified with $P<0.0001$ in each case (Pearcy, 2002).

The factor analysis conducted for the auction design (format) scale revealed one factor. Table 5-3 summarizes the reliability analysis results for the auction design (format) construct (the scores for Q2 and Q3 have been reversed to assure uniformity in positive factor loading across the construct). Each of the five items exhibited high factor loading, ranging from 0.66 to 0.83. The items explained 56.7% of the variance in the data (see Appendix D.1). The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.73. Improvement in coefficient alpha was not possible with the deletion of any item; therefore all the items were retained (see Appendix D.2).

Factor **Auction Design (Format)**	**Item-to-total correlation**	**Factor loading**
Q1. Auctions where suppliers can see others' bids are effective in reducing purchase prices (open-bid).	0.421	0.658
Q2. Auctions where suppliers only know they have been outbid are effective in reducing purchase prices (sealed-bid). (Reverse Scored)	0.603	0.802
Q3. Multi-round sealed bid auctions are more effective than multi-round open bids in reducing the purchasing prices. (Reverse Scored)	0.513	0.716
Q4. Multi-round open-bid auctions are more effective than multi-round sealed bids in reducing the purchasing prices.	0.627	0.826
Cronbach's Alpha	0.729	
Explained Variance	56.75%	

Table 5-3: Reliability Analysis: Auction Design (Format) Scale

The factor analysis conducted for the auction design (event organization) scale revealed two factors (see Appendix D.3); questions 6-8 loaded on one factor and question

5 loaded on another factor (the scores for Q7 and Q8 have been reversed). Tabachnick and Fidell (2000) warned of factors consisting of one item; therefore Q5 was deleted (see Appendix D.4). The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.747. Improvement in coefficient alpha was minimal with the deletion of Q7; therefore all the items were retained (see Appendix D.5). Table 5-4 summarizes the reliability analysis results for the auction design (format) construct. Each of the three items exhibited high factor loading, ranging from 0.76 to 0.84. The items explained 66.26% of the variance in the data.

Factor **Auction Design (Event Organization)**	**Item-to-total correlation**	**Factor loading**
Q6. Auctions organized in-house are more effective than auctions organized with the help of an online reverse auction service provider (market maker) in reducing purchasing prices.	0.648	0.840
Q7. Auctions organized with the help on an online auction service provider (like Trade-Partners or Freemarkets) are effective in reducing purchase prices. (Reverse Scored)	0.497	0.760
Q8. Auctions organized with the help on an online auction service provider (like Trade-Partners or Freemarkets) are more effective than auctions organized in-house in reducing the purchasing prices. (Reverse Scored)	0.651	0.840
Cronbach's Alpha	0.747	
Explained Variance	66.261%	

Table 5-4: Reliability Analysis: Auction Design (Event Organization) Scale

The factor analysis conducted for the reduction in purchase price scale revealed one factor (see Appendix D.6). The factor analysis was followed by a reliability analysis using Cronbach's alpha, which indicated the scale to be reliable with coefficient alpha of 0.861 (see Appendix D.7). Table 5-5 summarizes the reliability analysis results for the reduction in purchase price construct. Each of the three items exhibited high factor loading, ranging from 0.822 to 0.925. The factors explained 79% of the variance in the data.

Factor Reduction in Purchase Price	Item-to-total correlation	Factor loading
EPMC: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing production material and components.	0.471	0.766
EMRO: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing MRO.	0.540	0.740
ESER: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing services.	0.430	0.744
Cronbach's Alpha	0.660	
Explained Variance	56.22%	

Table 5-5: Reliability Analysis: Reduction in Purchase Price Scale

The factor analysis conducted for the auction application (power based bargaining) scale revealed two factors (see Appendix D.8), questions 9-11 and Q19 loaded on one factor while questions 15 and 17 loaded on another factor. According to Tabachnick and Fidell (2000): "If two variables load on a factor, then whether or not it is reliable depends on the pattern of correlations of these two variables with each other and with other variables. If the two variables are highly correlated with each other (say, r>0.7) and relatively uncorrelated with other variables, the factor maybe reliable."

Bivariate correlation was conducted on Q15 and Q17 (see Appendix D.9). The analysis showed that Q15 and Q17 are not highly correlated with each other (r=0.22, p=0.026); therefore, Q15 and Q17 were deleted. Reliability analysis was re-conducted using Q9, Q10, Q11 and Q19 (see Appendix D.10). Table 5-6 summarizes the reliability analysis results for the auction application (power based bargaining) construct. The items loading ranged between 0.58-0.92 and explained 56.7% of the variance in the data (see Appendix D.10). The coefficient alpha is 0.852 with an opportunity of improvement to 0.905 by deleting Q19, but since the current value of the coefficient alpha is considered very good, the deletion was not necessary (see Appendix D.11).

Factor Auction Application (Power based bargaining)	Item-to-total correlation	Factor loading
Q9. Our goal is short term contract with the suppliers when we buy production material and components.	0.739	0.858
Q10. Our goal is short term contract with the suppliers when we buy MRO.	0.846	0.912
Q11. Our goal is short term contract with the suppliers when we buy services.	0.829	0.921
Q19. We use online reverse auctions to pressure our suppliers to reduce prices.	0.426	0.576
Cronbach's Alpha	0.852	
Explained Variance	68.679%	

Table 5-6: Reliability Analysis: Auction Application (Power Based Bargaining) Scale

As indicated in Appendix D.12, the factor analysis conducted for the auction application (collaborative problem solving) scale revealed two factors. Questions 12-14 and Q18 loaded on one factor while question 16 loaded on another factor. Tabachnick and Fidell (2000) warned of factors consisting of one item; therefore Q16 was deleted (see Appendix D.13). The factor analysis was followed by a reliability analysis, which indicated the scale was reliable with coefficient alpha equal to 0.737. The opportunity to improve coefficient alpha by deleting Q12 was minimal (<0.05) so the item was kept (see Appendix D.14). The items explained 56.6% of the variance in the data.

Factor Auction Application (Collaborative Problem Solving)	Item-to-total correlation	Factor loading
Q12. Our goal is long term contract with the suppliers when we buy production material and components.	0.306	0.508
Q13. Our goal is long term contract with the suppliers when we buy MRO.	0.691	0.873
Q14. Our goal is long term contract with the suppliers when we buy services.	0.693	0.883
Q18. We use online reverse auctions to identify new long-term partnering suppliers.	0.453	0.682
Cronbach's Alpha	0.737	
Explained Variance	56.616%	

Table 5-7: Reliability Analysis: Collaborative Problem Solving Scale

The factor analysis conducted for the successful event implementation scale revealed two factors (see Appendix D.15). Questions 20, 21 and 25 loaded on one factor while questions 22 and 23 loaded on another factor. Bivariate correlation was conducted on Q22 and Q23 (see Appendix D.16). The analysis showed that Q22 and Q23 are not highly correlated with each other (r=0.408, p=0.000); therefore, Q22 and Q23 were deleted. Reliability analysis was re-conducted using Q20, Q21 and Q24. The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.712. Major improvement in coefficient alpha was possible with the deletion of Q20; therefore, the item was deleted (see Appendix D.18).

Table 5-8 summarizes the reliability analysis results for the auction application (power-based bargaining) construct. The item loadings were high (0.938) and explained 88% of the variance in the data (see Appendix D.19).

Factor **Successful Event Implementation**	**Item-to-total correlation**	**Factor loading**
21. We are satisfied with our savings using online reverse auctions.	0.758	0.938
24. We are satisfied with our company online reverse auctions results.	0.758	0.938
Cronbach's Alpha	0.858	
Explained Variance	87.894%	

Table 5-8: Reliability Analysis: Successful Event Implementation Scale

The factor analysis conducted for the attribute of the alliance (trust) scale revealed one factor. Table 5-9 summarizes the reliability analysis results for the attribute of the alliance (trust) construct (the scores for Q26 were reversed to assure uniformity in positive factor loading across the construct). Each of the three items exhibited high factor loading, ranging from 0.739 to 0.796. The items explained 59.5% of the variance in the data (see Appendix D.21). The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.646. Improvement in coefficient alpha was not possible with the deletion of any item; therefore, all the items were retained (see Appendix D.22).

Factor **Attribute of the Alliance (Trust)**	**Item-to-total correlation**	**Factor loading**
Q25. We trust that our strategic supplier alliances will be beneficial to our business.	0.433	0.739
Q26. We do not get an equitable (fair) deal from our suppliers in these alliances. (Reverse Scored)	0.481	0.777
Q27. The relationships with our suppliers are marked by a high degree of harmony.	0.501	0.796
Cronbach's Alpha	0.646	
Explained Variance	59.472%	

Table 5-9: Reliability Analysis: Attribute of the Alliance (Trust)

The factor analysis conducted for the attribute of the alliance (commitment) scale revealed one factor. Table 5-10 summarizes the reliability analysis results for the attribute of the alliance (commitment) construct. Each of the three items exhibited high factor loading, ranging from 0.748 to 0.801. The items explained 61% of the variance in the data (see Appendix D.23). The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.656. Improvement in coefficient alpha was not possible with the deletion of any item; therefore, all the items were retained (see Appendix D.24).

Factor Attribute of the Alliance (Commitment)	Item-to-total correlation	Factor loading
Q28. We would like to discontinue buying from our current suppliers. (Reverse Scored)	0.455	0.748
Q29. We are very committed to buying from our current suppliers.	0.499	0.793
Q30. We have minimal commitment to our suppliers. (Reverse Scored)	0.504	0.801
Cronbach's Alpha	0.656	
Explained Variance	61.02%	

Table 5-10: Reliability Analysis: Attribute of the Alliance (Commitment)

The factor analysis conducted for the attribute of the alliance (interdependence) scale revealed one factor; Table 5-11 summarizes the reliability analysis results for the construct. Each of the three items exhibited high factor loading, ranging from 0.696 to 0.890. The items explained 76.7% of the variance in the data (see Appendix D.25). The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.754. While the deletion of Q31 would increase the coefficient alpha, the increase was rather minimal, and since the value of alpha of 0.754 is considered respectable (DeVellis 1991); the item was retained.

Factor Attribute of the Alliance (Interdependence)	Item-to-total correlation	Factor loading
Q31. It would be very easy to terminate the relationship with any supplier and establish another strategic supplier. (Reverse Scored)	0.440	0.696
Q32. The time to establish another new strategic supplier partnership would be extremely long.	0.637	0.868
Q33. The cost to establish another new strategic supplier partnership would be extremely high.	0.689	0.890
Cronbach's Alpha	0.754	
Explained Variance	76.699%	

Table 5-11: Reliability Analysis: Attribute of the Alliance (Interdependence)

The factor analysis conducted for the attribute of the alliance (coordination) scale revealed one factor (see Appendix D.27). The factor analysis was followed by a reliability analysis that revealed a coefficient alpha of 0.71. Improvement in coefficient alpha to a value of 0.901 was possible with the deletion of Q36; therefore Q36 was deleted and the remaining two items had a high inter-correlation of r=0.821 (see Appendix D.30). A second factor analysis was conducted where the items formed one factor with loadings of 0.955 for both items. The factor explained 91.253% of the variance in the data (see Appendix D.29). Table 5-12 summarizes the reliability analysis results for the attribute of the alliance (coordination) construct.

Factor **Attribute of the Alliance (Coordination)**	**Item-to-total correlation**	**Factor loading**
Q34. Our activities with our suppliers are well coordinated.	0.825	0.955
Q35. Programs at our company are well coordinated with our suppliers.	0.825	0.95
Cronbach's Alpha	0.901	
Explained Variance	91.253%	

Table 5-12: Reliability Analysis: Attribute of the Alliance (Coordination)

The factor analysis conducted for the communication behavior (information quality) scale revealed one factor. Table 5-13 summarizes the reliability analysis results for the communication behavior (information quality) construct. Each of the five items exhibited high factor loading, ranging from 0.77 to 0.93. The items explained 74.3% of the variance in the data (see Appendix D.32). The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.911. While the deletion of Q41 increased coefficient alpha, the increase was rather minimal (0.02), and since the value of coefficient alpha of 0.911 is considered "very good" (DeVellis, 1991); therefore, the item was retained (see Appendix D.33).

Factor **Communication behavior (Information quality)**	**Item-to-total correlation**	**Factor loading**
Q37. To what extent do you feel that your company communication with your suppliers is timely?	0.765	0.851
Q38. To what extent do you feel that your company communication with your suppliers is accurate?	0.811	0.887
Q39. To what extent do you feel that your company communication with your suppliers is adequate?	0.784	0.866
Q40. To what extent do you feel that your company communication with your suppliers is complete?	0.878	0.928
Q41. To what extent do you feel that your company communication with your suppliers is credible?	0.660	0.772
Cronbach's Alpha	0.911	
Explained Variance	74.341%	

Table 5-13: Reliability Analysis: Information Quality Scale

The factor analysis for the communication behavior (information participation) scale revealed one factor. Table 5-14 summarizes the reliability analysis results for the communication behavior (information participation) construct. Each of the four items exhibited high factor loading, ranging from 0.70 to 0.905. The items explained 64.1% of the variance in the data (see Appendix D.35). The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.807. While the deletion of Q47 increased the coefficient alpha, the increase was rather minimal (0.04), and since the coefficient alpha value of 0.807 is considered "very good" (DeVellis 1991), the item was retained (see Appendix D.36).

Factor Communication behavior (Information participation)	Item-to-total correlation	Factor loading
Q47. We actively seek advice, counsel, and information from our suppliers.	0.512	0.700
Q48. Our strategic suppliers participate in our planning and goal setting activities.	0.904	0.905
Q49. We participate in our suppliers' planning and goal setting activities that are relevant to our strategic partnership.	0.690	0.833
Q50. We actively encourage improvement suggestions from our suppliers.	0.568	0.749
Cronbach's Alpha	0.807	
Explained Variance	64.126%	

Table 5-14: Reliability Analysis: Information Participation Scale

The factor analysis conducted for the communication behavior (information sharing) scale revealed twofactor s: Q51 and Q52 loaded on one factor and Q53-Q57 loaded on another factor (see Appendix D.37).

Bivariate correlation was conducted on Q51 and Q52 (See Appendix D.38). The analysis showed that Q51 and Q52 are not highly correlated with each other (r=0.67); therefore, the items were deleted. A second factor analysis was conducted using Q53-Q57, which revealed that Q56 had a low factor loading (0.27); therefore, the item was deleted. Table 5-15 summarizes the reliability analysis results for the communication behavior (information sharing) construct. Each of the four items exhibited high factor loading, ranging from 0.794 to 0.717. The items explained 64.4% of the variance in the data (see Appendix D.39). The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with a coefficient alpha of 0.80. Improvement in the coefficient alpha was not possible with the deletion of any item; therefore, all the items were retained (see Appendix D.40).

Factor Communication behavior (Information Sharing)	Item-to-total correlation	Factor loading
Q53. We inform our suppliers in advance of changing needs.	0.641	0.794
Q54. In this relationship, it is expected that any information which might help the other party will be provided.	0.632	0.817
Q55. The parties are expected to keep each other informed about events or changes that might affect the other party.	0.617	0.797
Q57. Our Supplier keep us fully informed about issues that affect our business.	0.641	0.800
Cronbach's Alpha	0.800	
Explained Variance	64.375%	

Table 5-15: Reliability Scale: Information Sharing

The factor analysis for the conflict resolution scale revealed three factors as expected: Q44 and Q45 loaded on a factor which represents the constructive conflict resolution techniques (persuasion and joint problem solving), Q43 and Q46 loaded on a factor that represents destructive conflict resolution techniques (outside arbitration and harsh words), and Q42 loaded on a factor by itself that represents the conflict avoidance techniques (see Appendix D.34). The factor analysis results of having three factors agree with the findings of previous research (Mohr and Spekman 1994; Monczka et al. 1998).

The measures for conflict resolution included five modes by which conflict could be resolved. These items were designed to cover a spectrum of conflict resolution modes as described in Chapter 3. Howell (1987) refers to this type of measurement as a "check list," or composite scale, in which each item taps a different dimension of the construct. Hence, traditional reliability analysis is not appropriate (Mohr and Spekman 1994). Therefore, the five items (smooth over the problem, outside arbitration, persuasion, joint problem solving and harsh words) are treated as unitary items with no inter-correlation among these factors.

The factor analysis conducted for the strategic supplier alliance scale revealed one factor. Table 5-16 summarizes the reliability analysis results for the strategic supplier alliance construct. Each of the five items exhibited high factor loading, ranging from 0.70 to 0.83. The factors explained 61% of the variance in the data (see Appendix D.41).

The factor analysis was followed by a reliability analysis, which indicated the scale was indeed reliable with coefficient alpha of 0.832. Improvement in coefficient alpha was not possible with the deletion of any item; therefore, all the items were retained (see Appendix D.42).

Factor **Strategic Supplier Alliance**	**Item-to-total correlation**	**Factor loading**
Q58. In our strategic supplier alliances, the parties work together to solve problems.	0.703	0.830
Q59. Our suppliers are flexible to requests we make.	0.639	0.793
Q60. Our suppliers make an effort to help us during emergencies.	0.643	0.785
Q61. When an agreement is made, we can always rely on our suppliers to fulfill the requirements.	0.547	0.696
Q62. We are satisfied with our company strategic supplier alliances.	0.668	0.796
Cronbach's Alpha	0.832	
Explained Variance	61.023%	

Table 5-16: Reliability Analysis: Strategic Supplier Alliance Scale

5.5.2 *Validity Analyses*

Construct validity, which is defined broadly as "the extent to which an operationalization measures the concept it is supposed to measure" (Cook and Campbell 1979), has been singled-out by many researchers as a central issue in organizational research (Mitchell 1985; Webb and Weick 1979). The validity test describes the correctness of the data-gathering tool that, is if it is able to measure what it should measure. Hayes (1997) defines validity as "the degree to which evidence supports the inferences made from scores derived from measures, or the degree to which the scale measures what it is designed to measure." Although validity has a broad definition (Jacoby 1978), for the purpose of this study, the convergent validity, the discriminate validity, and the validity of the content will be the only ones in focus.

Bagozzi, Phillips, and Lynn (1982) define convergent validity as "the degree to which two or more attempts to measure the same concept are in agreement". The authors also define the discriminate validity as "the degree to which measures of distinct concepts differ". Convergent and discriminate validity were assessed through correlation analyses, and since no objective criteria exist for measuring the validity of the content, it can be assumed based on the pre-test of the instrument. High correlations were expected to exist between items that are intended to measure the same construct and those items were expected to exhibit low correlations with items intended to measure different constructs (Pearcy 2002).

The Pearson Product Moment correlations among items for each scale on the survey are presented in Appendix E. The correlations for the "auction design-format" scale were all statistically significant at α=0.01 and ranged from 0.233 to 0.529 except the correlation between Q1 and Q3, which was significant with a value of 0.233 at α=0.05 (see Appendix E.1). The correlations for the "auction design - event organization" scale were all statistically significant at α=0.01 and ranged from 0.45 to 0.58 (see Appendix E.2). The correlations for the "reduction in purchase" scale were all statistically significant at α=0.05 and ranged from 0.32 to 0.36 (see Appendix E.3). The correlations for the "auction application-power based bargaining" scale were all statistically significant at α=0.01 and ranged from 0.30 to 0.85 (see Appendix E.4). The correlations for the "auction application-collaborative problem solving" scale were all statistically significant at α=0.01 and ranged from 0.23 to 0.81 (see Appendix E.5). As illustrated in Appendix E.6, the correlations for the "successful event implementation" two-item scale was statistically significant with a value of 0.76 at α=0.01. The correlations for the "attribute of the alliance-trust" scale were all statistically significant at α=0.01 and ranged from 0.35 to 0.44 (see Appendix E.7). The correlations for the "attribute of the alliance-commitment" scale were all statistically significant at α=0.01 and ranged from 0.38 to 0.47 (see Appendix E.8). The correlations for the "attribute of the alliance-interdependence" scale were all statistically significant at α=0.01 and ranged from 0.38 to 0.71 (see Appendix E.9). The correlation between the "attribute of the alliance-coordination" scale two items was statistically significant with a value of 0.83 at α=0.01 (see Appendix E.10). The correlations for the "communication behavior - information quality" scale were all statistically significant at α=0.01 and ranged from 0.52 to 0.72 (see Appendix E.11).

The correlations for the “communication behavior - information participation” scale were all statistically significant at $\alpha=0.01$ and ranged from 0.38 to 0.75 (see Appendix E.12). The correlations for the “communication behavior – information sharing” scale were all statistically significant at $\alpha=0.01$ and ranged from 0.48 to 0.62 (see Appendix E.13). Finally, the correlations for the “strategic supplier alliance” scale were all statistically significant at $\alpha=0.01$ and ranged from 0.37 to 0.60 (see Appendix E.14).

The inter-correlations between scales are shown in Appendix E.15. As expected, the correlations between different scales were below 0.7 except for the correlations between the “auction application-power based bargaining” and the “auction application-collaborative problem solving” scales (-0.73). With respect to this high negative correlation, it would be expected that a company would use online reverse auctions either as a power based bargaining tool or as a collaborative problem-solving tool.

The steps to assure reliability and validity of the measures resulted in the deletion of some items of the survey. Table 5-17 summarizes the components of each scale after the scale purification through reliability and validity testing.

Table 5-17: Construct Measures after Scale Purification

Construct	Survey Questions
Auction Design (Format)	Q1. Auctions where suppliers can see others' bids are effective in reducing purchase prices (open-bid). Q2. Auctions where suppliers only know they have been outbid are effective in reducing purchase prices (sealed-bid). (Reverse Scored) Q3. Multi-round sealed bid auctions are more effective than multi-round open bids in reducing the purchasing prices. Q4. Multi-round open-bid auctions are more effective than multi-round sealed bids in reducing the purchasing prices. (Reverse Scored)
Auction Design (Event Organization)	Q6. Auctions organized in-house are more effective than auctions organized with the help of an online reverse auction service provider (market maker) in reducing purchasing prices. Q7. Auctions organized with the help on an online auction service provider (like Trade-Partners or Freemarkets) are effective in reducing purchase prices. (Reverse Scored) Q8. Auctions organized with the help on an online auction service provider (like Trade-Partners or Freemarkets) are more effective than auctions organized in-house in reducing the purchasing prices. (Reverse Scored)
Reduction in Purchase Price	EPMC: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing production material and components. EMRO: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing MRO. ESER: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing services.
Auction Application (Power-Based Bargaining)	Q9. Our goal is short term contract with the suppliers when we buy production material and components. Q10. Our goal is short term contract with the suppliers when we buy MRO. Q11. Our goal is short term contract with the suppliers when we buy services. Q19. We use online reverse auctions to pressure our suppliers to reduce prices.
Auction Application (Collaborative Problem Solving)	Q12. Our goal is long term contract with the suppliers when we buy production material and components. Q13. Our goal is long term contract with the suppliers when we buy MRO. Q14. Our goal is long term contract with the suppliers when we buy services. Q18. We use online reverse auctions to identify new long-term partnering suppliers.

Successful Event Implementation	Q21. We are satisfied with our savings using online reverse auctions. Q24. We are satisfied with our company online reverse auctions results.
Attribute of the Alliance (Trust)	Q25. We trust that our strategic supplier alliances will be beneficial to our business. Q26. We do not get an equitable (fair) deal from our suppliers in these alliances. (Reverse Scored) Q27. The relationships with our suppliers are marked by a high degree of harmony.
Attribute of the Alliance (Commitment)	Q28. We would like to discontinue buying from our current suppliers. (Reverse Scored) Q29. We are very committed to buying from our current suppliers. Q30. We have minimal commitment to our suppliers. (Reverse Scored)
Attribute of the Alliance (Interdependence)	Q31. It would be very easy to terminate the relationship with any supplier and establish another strategic supplier. (Reverse Scored) Q32. The time to establish another new strategic supplier partnership would be extremely long. Q33. The cost to establish another new strategic supplier partnership would be extremely high.
Attribute of the Alliance (Coordination)	Q34. Our activities with our suppliers are well coordinated. Q35. Programs at our company are well coordinated with our suppliers.
Communication Behavior (Information Quality)	Q37. To what extent do you feel that your company communication with your suppliers is timely? Q38. To what extent do you feel that your company communication with your suppliers is accurate? Q39. To what extent do you feel that your company communication with your suppliers is adequate? Q40. To what extent do you feel that your company communication with your suppliers is complete? Q41. To what extent do you feel that your company communication with your suppliers is credible?

Conflict Resolution	**VIII. Assuming that some conflict exists over program and policy issues and how the relationship with your supplier is executed, how frequently are the following methods used to resolve such conflict? (1=Never, 7=Occasionally)** Q42. Smooth over the problem Q43. Outside arbitration Q44. Persuasive attempts by either party Q45. Joint problem solving Q46. Harsh words
Communication Behavior (Information Participation)	Q47. We actively seek advice, counsel, and information from our suppliers. Q48. Our strategic suppliers participate in our planning and goal setting activities. Q49. We participate in our suppliers' planning and goal setting activities that are relevant to our strategic partnership. Q50. We actively encourage improvement suggestions from our suppliers.
Communication Behavior (Information Sharing)	Q53. We inform our suppliers in advance of changing needs. Q54. In this relationship, it is expected that any information which might help the other party will be provided. Q55. The parties are expected to keep each other informed about events or changes that might affect the other party. Q57. Our Supplier keep us fully informed about issues that affect our business.
Strategic Supplier Alliance	Q58. In our strategic supplier alliances, the parties work together to solve problems. Q59. Our suppliers are flexible to requests we make. Q60. Our suppliers make an effort to help us during emergencies. Q61. When an agreement is made, we can always rely on our suppliers to fulfill the requirements. Q62. We are satisfied with our company strategic supplier alliances.

5.6 *Hypotheses Testing*

5.6.1 *Scale Descriptive Analyses*

Descriptive statistics for each scale were obtained before hypotheses testing; Appendix F summarizes the minimums/maximums, means, standard deviations, and variances for each scale.

The respondents' companies appeared to prefer to use open-bid auctions more than sealed bid-auctions. The means for the open-bid auction format items were 6.07 and 5.41, while the means for the items intended to measure the preference of the sealed-bid format auction were 2.92 and 4.41. Similarly the respondents seemed to prefer to organize auctions with the help of online auction service providers (like TradingPartners or Freemarkets). The mean for the item measuring the preference to use online auction service providers was 5.78 while those for the items that measure the preference to organize auctions in-house were 3.56 and 4.51.

The data provided clear support for the published literature that online reverse auctions result in price reduction. The average of savings range was 12.9%-16.9% with a minimum of 0% and maximum of 71%.

The respondents gave mixed responses about the use of the online reverse auction as a power-based bargaining tool or a collaborative problem solving tool. With respect to production material and components, respondents obviously preferred to use the auctions as a collaborative tool. The mean of the item measuring using auction as a collaborative problem solving tool was 5.18, while it was 3.90 for the item measuring the auction as a power based bargaining tool. With respect to MROs and services, respondents did not seem to have a preference on the use of online reverse auctions application. The means of the items measuring the use of auctions as a power based bargaining tool were (4.35 and 4.2) for MROs and services while those for the items measuring the use of auctions as a collaborative problem solving tool were (4.1 and 4.1) for MROs and services. But respondents gave clear support (mean of 5.94) to the notion that companies use online reverse auctions to pressure their suppliers to reduce purchase prices (an indication of the auction's use as a power based bargaining tool).

The data provided clear satisfaction with respect to the savings from using online reverse auctions. The mean for the items measuring the successful event implementation ranged between 5.70 and 5.84.

The data provided positive support for the importance of the attributes of the relationship. The means for items which comprised the trust scale ranged from 5.34-6.26. The means for items which comprised the commitment scale ranged from 4.49-5.14. The means for items which comprised the interdependence scale ranged from 4.46-5.30. The means for items which comprised the coordination scale ranged from 5.18-5.43.

The data provided positive support for the importance of the communication behavior (information quality, participation, and sharing) in the strategic alliance. The means for items which comprised the information quality scale ranged from 5.23-5.77. The means for items which comprised the information participation scale ranged from 4.57-5.89. The means for items which comprised the information sharing scale ranged from 5.07-6.03.

The data also provided positive support for the importance of using constructive conflict resolution techniques and clear support for not using destructive and avoidance conflict resolution techniques. The means for the items measuring constructive conflict resolution techniques ranged from 4.74-6.03. The means for the items measuring destructive conflict resolution techniques ranged from 1.54-2.23. The respondents' were indifferent about the use of avoidance conflict resolution techniques (mean of 4.16).

Finally, respondents appeared to be satisfied with their strategic supplier alliances. The means of the items measuring strategic supplier alliance scale ranged from 5.51-6.25.

5.6.2 Hypotheses Tests

Eleven of the nineteen hypotheses were supported by the data. A summary of the results of the hypotheses tests appears in Tables 5-18 and 5-19.

Various statistical procedures were used to analyze the results of the survey, including t-test, bi-variate correlations, and multiple linear regressions. Bi-variate correlation allows the researcher to determine the size and direction of the association between two variables (Tabachnick and Fidell 1996). A t-test assesses the statistical significance of the difference between two sample means for a single dependent variable (Hair et al. 1998). Multiple linear regression assesses the relationship between one dependent variable and the independent variables. The objective is to predict the changes in the dependent variable in response to changes in the independent variables. More details of the various statistical techniques that were used to analyze each hypothesis are provided with each test.

Table 5-18: Summary of Hypotheses Tests Supported by the Data

H1: Using online reverse auctions, the reduction in purchase prices is more likely to be higher in the open-bid auction format than the sealed-bid format.	**H3a:** When purchasing production material and components, a positive, significant relationship will exist between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices.	**H3b:** When purchasing MROs, a positive, significant relationship will exist between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices.
H3c: When purchasing services, a positive, significant relationship will exist between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices.	**H4a:**When purchasing production material and components, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships.	**H4b:** When purchasing MROs, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships.
H4c: When purchasing services, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships.	**H7a:** Successful strategic supplier alliances are associated with high levels of commitment, trust, coordination and interdependence.	**H7b:** Successful strategic supplier alliances are associated with high levels of (a) information sharing and (b) information quality and (c) information participation.
H7c: A positive, significant relationship will exist between the success of the strategic alliance and (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques	**H9:** A positive, significant relation exists between buyer-supplier strategic alliance, and the buyer perception of a successful online reverse auction event.	

Table 5-19: Summary of Hypotheses Tests not Supported by the Data

H2: With the objective of using online reverse auctions to reduce purchase prices, buyers are more likely to prefer to organize the auction event in-house than with the help of a market maker.	**H5a:** When purchasing production material and components, purchasers will be more likely to use online reverse auction for the purpose of a short-term relationship than developing/maintaining long-term relationships.	**H5b:** When purchasing MROs, purchasers will be more likely to use online reverse auction for the purpose of a short-term relationship than developing/maintaining long-term relationships.
H5c: When purchasing services, purchasers will be more likely to use online reverse auction for the purpose of a short-term relationship than developing/maintaining long-term relationships.	**H6a:** Using online reverse auctions as a collaborative problem solving tool is associated with high levels of trust, commitment, coordination and interdependence.	**H6b:** Using online reverse auctions as a collaborative problem solving tool is associated with high levels of buyer-supplier (a) information sharing (b) information quality and (c) information participation.
H6c: Using online reverse auctions as a collaborative problem solving tool is associated with (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques.	**H8:** A positive, significant relation exists between reducing purchase prices and the buyer perception of a successful online reverse auction event.	

The Fit between Auction Design and Reduction in Purchase Price

H1 was supported by the data; the hypothesis stated that "using online reverse auctions, the reduction in purchase prices is more likely to be higher in the open-bid auction format than in the sealed-bid format." For statistical analysis, the null hypothesis stated that "using online reverse auctions, there is no difference in the reduction in purchase prices between the open-bid auction format and the sealed-bid format," while the alternative hypothesis is the hypothesis stated earlier. The data rejected the null hypothesis ($P<0.05$) and therefore the data claim support for the alternative hypothesis.

As illustrated in Table 5-20, a one-tailed t-test revealed significant mean difference between the reduction in purchase prices in the open-bid auction format and the sealed-bid format through evaluating the difference (QTEST) between the sum of Q1 and Q4 (open bid) and Q2 and Q3 (sealed bid).

Test Value = 0 versus > 0							
	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
QTEST	85	4.32	4.63	0.50	3.48	8.59	0.000

QTEST=(Q1+Q4)-(Q2+Q3)

Table 5-20: Test of H1

Further analyses of hypotheses H1-H5 and H8-H9 were conducted through filtering the data into groups as shown in Table 5-21. The data were divided into two groups by the annual sales volume, annual purchasing volume, number of employees in the company, number of purchasing employees in the company, and the job title (position) of the respondent. Table 5-22 illustrates the online reverse auction experience associated with each group identified in Table 5-21. As illustrated in Appendix G.1, a one-tailed t-test supported H1 for all the different groups.

Several other alternative approaches for analysis were possible but not implemented in this study. The data could have been clusterednto more than two groups for each criterion. For example, the annual sales volume could have been clustered into four groups (less than 100 million, 100-499 million, 500-999 million, and one billion dollars or above), but due to the low number of data points that might show up in some of these categories, the researches elected to cluster the data into two groups.

Similarly, for certain hypotheses (as shown later in this chapter), the clustering criteria (annual sales volume, annual purchasing volume, number of employees in the company, number of purchasing employees in the company, and the job title/position of the respondent) were not included as variables in the regression models for several reasons: (1) the researcher did not find enough support in the published literature to justify such activity, (2) the research followed the Crown (1998) guidelines in splitting and analyzing the data for each group instead of using these criteria as independent variables within the regression model.

	Criteria	**Code**
Annual sales (Year 2004 in US Dollars)	Less than One Billion Dollars	1
	Equal or More than One Billion Dollar	2
Annual Purchasing Volume (Year 2004 in US Dollars)	Less than $500 Million	1
	Equal or More than $500 Million	2
No. of Employees	Less than 1000 Employees	1
	Equal or More than 1000 Employees	2
No. of Purchasing Employees	Less than 20 Purchasing Employees	1
	Equal or More than 20 Purchasing Employees	2
Job title	Director or VP	1
	Manager or Senior Manager	2
	Buyer or Senior Buyer	3

Table 5-21: Filtering Data Criteria for Further Analysis

	Criteria	N	Mean	Min	Median	Max
Annual Sales Volume (2004)	Less than One Billion Dollars	31	15	1	6	100
	Equal or More than One Billion Dollars	61	212	1	20	5000
Annual Purchasing Volume	Less than $500 Million	37	14	1	6	100
	Equal or More than $500 Million	55	234	1	20	5000
No. of Employees	Less than 1000 Employees	32	13	1	8	100
	Equal or More than 1000 Employees	60	217	1	20	5000
No. of Purchasing Employees	Less than 20 Purchasing Employees	34	59	1	6	1600
	Equal or More than 20 Purchasing Employees	58	197	1	20	5000

Table 5-22: Companies' Experience in Using Reverse Auctions

H2 was not supported by the data; the alternative hypothesis stated that "with the objective of using online reverse auctions to reduce purchase prices, buyers are more likely to prefer to organize the auction event in-house than with the help of a market maker." The null hypothesis stated that "with the objective of using online reverse auctions to reduce purchase prices, there is no difference in the buyers' preference to organize the auction event in-house or with the help of a market maker." Since the P-value is below 0.05, the data rejected the null hypothesis and therefore the research data claim support for the alternative hypothesis (but in the opposite direction).

As illustrated in Table 5-23, a one tailed t-test revealed a significant mean difference between organizing auctions in-house and with the help of a market maker, but in the opposite direction of the hypothesis. The negative mean of the difference between the in-house item (Q6) and the average of the market maker items (Q7 and Q8) indicates that buyers prefer organizing online reverse auction events with the help of market maker than organizing the auction event in-house.

Test Value = 0 versus > 0							
	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
QTEST	85	-1.65	2.77	0.30	-2.15	-5.49	1.000
Test Value = 0 versus <0							
	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
QTEST	85	-1.65	2.77	0.30	-1.15	-5.49	0.000

Table 5-23: Test of H2

Further analysis of hypothesis H2 was conducted through dividing the data into groups as shown in Table 5-21. The analysis failed to support H2 for any group, but the results revealed that buyers prefer to organize auction events with the help of a market maker rather than organizing them in-house (see Appendices G.2 and G.3).

<u>The Fit between Purchase Type and Reduction in Purchase Price</u>

H3a-c was supported by the data; the alternative hypothesis stated that "when purchasing X, a positive, significant relationship will exist between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices, where X can be production material and components, MROs, or services." As illustrated in Table 5-24, a one tailed t-test revealed a significant positive mean difference between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices.

For the purpose of the statistical analysis, the null hypothesis stated that "when purchasing X, no significant relationship will exist between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices, where X can be production material and components, MROs, or services." While the alternative hypothesis stated that ""when purchasing X, a positive, significant relationship will exist between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices, where X can be production material and components, MROs or services". Since the P-value is less than 0.05, the data rejected the null hypotheses and claim support for the alternative hypotheses.

The mean for question EPMC - "the use of online reverse auctions has led to a decrease in the purchase price paid for purchasing production material and components" was 12.86%. The mean for question EMRO – "the use of online reverse auctions has led to a decrease in the purchase price paid for purchasing MRO" was 16.86%. The mean for question ESER, "the use of online reverse auctions has led to a decrease in the purchase price paid for purchasing services" was 13.45%.

Test Value = 0 versus > 0					
	N	Mean	StDev	T	P
EPMC	81	0.1286	0.0653	17.73	0.000
EMRO	79	0.1688	0.1058	12.95	0.000
ESER	76	0.1345	0.0825	12.85	0.000

Table 5-24: Test of H3

Further analysis of hypotheses H3a-c was conducted through clustering the data into groups as shown in Table 5-21. The data was divided into groups by the annual sales volume, annual purchasing volume, number of employees in the company, number of purchasing employees in the company, and the job title (position) of the respondent. As illustrated in Appendix G.4-G.6, a one-tailed t-test supported H3a-c for all the different groups.

The Fit between the Product Type and the Auction Application

H4a was supported by the data; the hypothesis stated that "when purchasing production material and components, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." As illustrated in Table 5-25, a negative significant correlation exists between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships when purchasing production material and components.

For statistical analysis, the null hypothesis stated that "when purchasing production material and components, a positive, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." While the alternative hypothesis state that "when purchasing production material and components, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." Since the Pearson correlation value was significant and negative, the data rejected the null hypothesis and supported the alternative hypothesis.

Table 5-25: Test of H4a

		Q9	Q12
Q9	Pearson Correlation	1	-.510(**)
	Sig. (2-tailed)		.000
	N	94	94
Q12	Pearson Correlation	-.510(**)	1
	Sig. (2-tailed)	.000	
	N	94	94

** Correlation is significant at the 0.01 level

Further analysis of hypothesis H4a was conducted through dividing the data into groups as shown in Appendix G.7. The hypothesis was supported regardless of the sales volume, purchasing volume, number of employees, or number of purchasing employees. When the data were analyzed based on the job title (position) of the respondent within the company, respondents at the middle and senior management level supported the hypothesis while buyers and senior buyers did not support the hypothesis.

H4b was supported by the data; the hypothesis stated that "when purchasing MROs, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." As illustrated in Table 5-26, a negative significant correlation exists between the use of online reverse auctions for the purpose of a short-term relationship and for the purpose of developing/maintaining long-term relationships when purchasing MROs. The hypothesis was also supported for all different groups when the data was divided according to Table 5-21 (seeAppendix G. 8).

For statistical analysis, the null hypothesis stated that "when purchasing MROs, a positive, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." While the alternative hypothesis state that "when purchasing MROs, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." Since the Pearson correlation value was significant and negative, the data rejected the null hypothesis and supported the alternative.

Table 5-26: Test of H4b

		Q10	Q13
Q10	Pearson Correlation	1	-.798(**)
	Sig. (2-tailed)		.000
	N	91	90
Q13	Pearson Correlation	-.798(**)	1
	Sig. (2-tailed)	.000	
	N	90	90

** Correlation is significant at the 0.01 level (2-tailed)

H4c was supported by the data; the hypothesis stated that "when purchasing services, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." As illustrated in Table 5-27, a negative significant correlation exists between the use of online reverse auctions for the purpose of a short-term relationships and the purpose of developing/maintaining long-term relationships when purchasing services. The hypothesis was also supported for all different groups when dividing the data according to Table 5-21 (see Appendix G.9).

For the purpose of the statistical analysis, the null hypothesis stated that "when purchasing services, a positive, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." While the alternative hypothesis state that "when purchasing services, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." Since the Pearson correlation value was significant and negative, the data rejected the null hypothesis and supported the alternative.

Table 5-27: Test of H4c

		Q11	Q14
Q11	Pearson Correlation	1	-.887(**)
	Sig. (2-tailed)		.000
	N	85	83
Q14	Pearson Correlation	-.887(**)	1
	Sig. (2-tailed)	.000	
	N	83	84

** Correlation is significant at the 0.01 level (2-tailed)

H5a was not supported by the data; the hypothesis (for statistical analysis purposes, this is the alternative hypothesis) stated that "when purchasing production material and components, purchasers will be more likely to use online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." For statistical purposes, the null hypothesis stated that "when purchasing production material and components, purchasers are equally likely to use online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships."

As illustrated in Table 5-28, a one tailed t-test revealed a significant mean difference between the use of online reverse auction for the purpose of a short-term relationships, and developing/maintaining long-term relationships, but in the opposite direction of the hypothesis. The negative mean of the difference (QTEST), between the short-term contract goal (Q9) and the long-term contract goal (Q12) when buying production items and material, indicates that buyers will be more likely to use online reverse auctions for the purpose of developing/maintaining long-term relationships than short-term relationships. Further analysis of the hypothesis by dividing the data into groups according to Table 5-21 failed to support the hypothesis (H5a) for any group (see Appendix G.10). Further analysis (see Appendix G.11) showed that all groups based on the company size and all levels of employees within the purchasing organization support the opposite direction of the hypothesis which is “when purchasing production material and components, purchasers will be more likely to use online reverse auctions for the purpose of developing/maintaining long-term relationships rather than short-term relationships”.

Table 5-28: Test of H5a

Test Value = 0 versus > 0							
	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
QTEST	94	-1.27	3.13	0.323	-1.81	-3.95	1.000
Test Value = 0 versus <0							
	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
QTEST	94	-1.27	3.13	0.323	-0.74	-3.95	0.000

** QTEST=Q9-Q12

H5b was not supported by the data; the hypothesis (for statistical analysis purposes, this is the alternative hypothesis) stated that “when purchasing MROs, purchasers will be more likely to use online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships.” For statistical purposes, the null hypothesis stated that “when purchasing MROs, purchasers are equally likely to use online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships.”

As illustrated in Table 5-29, the research failed to reject the null hypothesis (QTEST=0) since P>0.05. The one tailed t-test did not reveal any significant mean difference between the use of online reverse auctions for the purpose of short-term relationship and developing/maintaining long-term relationships when buying MROs. The buyers’ responses indicated an equal likelihood of using online reverse auctions for the purpose of developing/maintaining long-term relationships and short-term relationships when purchasing MROs.

Further analysis of the hypothesis by filtering the data into groups according to Table 5-21 supported the hypothesis for smaller size companies (less than one billion dollars in sales volume, less than \$500 million in purchasing volume, less than 1,000 employees, and/or less than 20 purchasing employees). Respondents from larger size companies failed to support the hypothesis H5b (see Appendix G.12 and G.13).

Table 5-29: Test of H5b

Test Value = 0 versus > 0							
	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
QTEST	90	0.256	3.69	0.389	-0.39	0.66	0.256

** QTEST=Q10-Q13

H5c was not supported by the data; the hypothesis (for statistical analysis purposes, this is the alternative hypothesis) stated that "when purchasing services, purchasers will be more likely to use online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships." For statistical purposes, the null hypothesis stated that "when purchasing services, purchasers are equally likely to use online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships."

As illustrated in Table 5-30, the research failed to reject the null hypothesis (QTEST=0) since P>0.05. The one tailed t-test did not reveal any significant mean difference between the use of online reverse auctions for the purpose of short-term relationships and developing/maintaining long-term relationships when buying services.

The buyers' responses indicated an equal likelihood of using online reverse auctions for the purpose of developing/maintaining long-term relationships and short-term relationships when purchasing services.

Table 5-30: Test of H5c

Test Value = 0 versus > 0							
	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
QTEST	83	0.096	3.88	0.426	-0.613	0.23	0.411

** QTEST=Q11-Q14

Further analysis of the hypothesis by dividing the data into groups (according to Table 5-21) failed to support the hypothesis (H5c) for most of the groups except for respondents that reported to be working for small companies. As shown in Appendix G.14, the hypothesis (H5c) was supported for companies with annual sales less than one billion dollars, purchasing volume less than $500 million, total number of employees less than 1000 and with less than 20 employees in purchasing.

<u>The Fit between Strategic Supplier Alliance and Auction Application</u>

Multiple linear regressions were used as the statistical analysis techniques for H6 a-c and H7a-c. Before proceeding to the final regression analysis for these hypotheses, the data were examined for outliers and assumptions. The following is an explanation of the criteria and methods used to validate the regression assumptions.

Outliers

Demaris (2004) defined outliers as extreme observations that are noticeably "out of step" with the trend shown by the majority of the data points. The study used both graphical and statistical measures to identify outliers. The graphic inspection using the residual plots was coupled with examination of the assumptions. The study applied four diagnostic measures simultaneously in order to achieve the best results: the leverage statistic (h), Cook's distance (D), residuals plot analysis, and Casewise diagnostic for outliers if its standard score is ±3.0 or beyond.

The *leverage statistic, h*, also called the *hat-value*, is used to identify cases which influence the regression model more than others. The leverage statistic varies from 0 (no influence on the model) to 1 (completely determines the model). A rule of thumb is that cases with leverage under 0.2 are not a problem, but if a case has leverage over 0.5, the case has undue leverage and should be examined for the possibility of measurement error or the need to model such cases separately.

Cook's distance, D, is another measure of the influence of a case. Cook's distance measures the effect of deleting a given observation. Observations with larger D values than the rest of the data are those which have unusual leverage. A rule of thumb is to identify observations with a Cook's distance of 1.0 or greater (Hair et al. 1998).

Assumptions

The major assumptions for multiple linear regression analysis were checked for each hypothesis: linearity, normality of the residuals, homoscedasticity, independence of the residuals and non-multicollinearity. Both graphical analysis and statistical tests (when applicable) were used in this study to assess whether a group of independent variables met these assumptions.

The linearity of the relationship between dependent and independent variables represents the degree to which the change in the dependent variable is associated with the independent variable (Hair et al. 1998). The linearity assumption was confirmed by plotting the residuals against the predictor variables and against the fitted values. The normality of the error term assumption was confirmed visually with a check of the histogram of the residuals and normal probability plot of the residuals, and statistically using the Kolmogorov-Smimov normality test.

The diagnosis for homoscedasticity (examining the constancy of the variance of the error terms) was made using a plot of the residuals against the fitted values and a plot of the absolute residuals against the fitted values. A homoscedastic model will display a cloud of dots, whereas lack of homoscedasticity will be characterized by a pattern such as a funnel shape, indicating greater error as the dependent increases. If nonconstancy is detected, a plot of the absolute residuals against each of the predictor variables may identify one or several of the predictor variables to which the magnitude of the error variability is related (Kutnerm, Nachtsheim, and Neter 2004 - Page 234). Also, if nonconstancy is detected, a formal statistical test, like White's test, Barlett's test or Levene's test, is necessary to conclusively prove the existence of heteroscedasticity. If heteroscedasticity (the presence of unequal variances) is present, two remedies are available. If the violation can be attributed to one or more independent variable, the procedure of weighted least squares can be employed. Another solution is to follow variance stabilizing transformations that allow the transformed variables to be used directly in the regression model: inverse, square root, square, and logarithm (Hair et al. 1998).

The assumption of the independence of the error terms was assessed through a plot of the residuals against the identification number that represents the order in which the data were collected. The Pearson correlation coefficient (r) was also calculated between the predictors and the residuals to assure that residuals are uncorrelated with the independent variables.

Multicollinearity is defined as the extent to which a variable can be explained by other variables in the analysis (Hair et al. 1998). High correlations among two or more explanatory variables create the multicollinearity problem. Multicollinearity makes it impossible for the regression model to decompose the variation of the dependent variable that is due to one variable versus another. As a consequence, one gets highly unstable coefficients and t-statistics that fluctuate widely in magnitude (and even sign) depending upon which variables are included in the regression model (Crown 1998).

The non-multicollinearity assumption was assessed through the values of the Tolerance, Variance Inflation Factor (VIF), Eigenvalue, Condition Index, Variance proportions and the correlation between the predictors. A rule of thumb is that the correlation between the independent variables should not exceed 0.7.

Tolerance is 1 - R^2 for the regression of that independent variable on all the other independents, ignoring the dependent. There will be as many tolerance coefficients as there are independents. The higher the intercorrelation of the independents, the closer the tolerance will be to zero. As a rule of thumb, if a tolerance is less than 0.20, a problem with multicollinearity is indicated. When tolerance is close to 0, there is high multicollinearity of that variable with other independents and the regression coefficients will be unstable. The more the multicollinearity, the lower the tolerance, which leads to an increase in the standard error of the regression coefficients.

Variance Inflation Factor, VIF is simply the reciprocal of tolerance: when VIF is high there is high multicollinearity. VIF >= 4 is an arbitrary but common cut-off criterion for deciding when a given independent variable displays "too much" multicollinearity: values above 4 suggest a multicollinearity problem. Some researchers use the more lenient cutoff of 5.0 or even 10.0 to signal when multicollinearity is a problem. It might be necessary to drop the variable with the highest VIF if multicollinearity is indicated and theory warrants.

Eigenvalue is a measure of the amount of variance contained in the correlation matrix so that the sum of the Eigenvalues is equal to the number of variables. Multiple Eigenvalues close to 0 indicate there may be a problem with multicollinearity and the condition indices should be examined as described below.

Condition indices and variance proportions: condition indices are used to flag excessive collinearity in the data. A condition index over 30 suggests serious collinearity problems and an index over 15 indicates possible collinearity problems. If a factor (component) has a high condition index, one looks in the variance proportions column. Criteria for "sizable proportion" vary among researchers, but the most common criterion is whether two or more variables have a variance partition of 0.50 or higher on a factor with a high condition index. If this is the case, these variables have high linear dependence and multicollinearity is a problem, with the effect that small data changes or arithmetic errors may translate into very large changes or errors in the regression analysis. It is possible for the rule of thumb for condition indices (no index over 30) to indicate multicollinearity, even when the rules of thumb for tolerance >0.20 or VIF < 4 suggest no multicollinearity. Computationally, a "singular value" is the square root of an

Eigenvalue, and "condition indices" are the ratio of the largest singular values to each other singular value. Table 5-31 provides a summary of the visual and statistical tools used to test the regression model assumptions.

Table 5-31: Tests to Validate Regression Assumptions

Regression Assumption	Testing Tool	Comments (No problems)
Outliers	Plot of residuals against fitted values	
	Cook's Distance	Below 1.0
	Leverage statistic	Below 0.2
	Standard score value	Below ±3.0
Normality of the Residuals	Histogram of the residuals	
	Normal probability plots	
	Kolmogorov-Smimov normality test	
Independence of the error term	A plot of residuals versus order	
	Pearson correlation between the predictor(s) and the residuals	Should have no correlation
Multicollinearity	Tolerance	Greater than 0.2
	Variance Inflation Factor (VIF)	Less than 4.0
	Eigenvalue	Greater than 0.1
	Condition Index	Less than 30
	Variance proportions	Less than 0.5 for factors that has high condition index
	Correlation between IVs	Below 0.7
Linearity	Plot residuals against predictor variables	Model will display a cloud of dots, whereas lack of linearity will be characterized by a pattern
Homoscedasticity	Plot of residuals against fitted values Plot of absolute residuals against fitted values	Homoscedastic model will display a cloud of dots, whereas lack of homoscedasticity will be characterized by a pattern
	Absolute residuals against each of the predictor variables	If nonconstancy is detected
	Statistical test like White's test, Barlett's test or Levene's test	If nonconstancy is detected

Hypothesis 7a is used to illustrate the detailed investigation of the assumption of the regression model. Hypothesis 7a stated that "successful strategic supplier alliances are associated with high levels of commitment, trust, coordination, and interdependence." There are four independent variables (trust, commitment, interdependence and coordination) and one dependent variable (supplier strategic alliance). The outliers' analysis revealed two data points with a standard score beyond ±3, as shown in Figure 5-7 and Table 5-32.

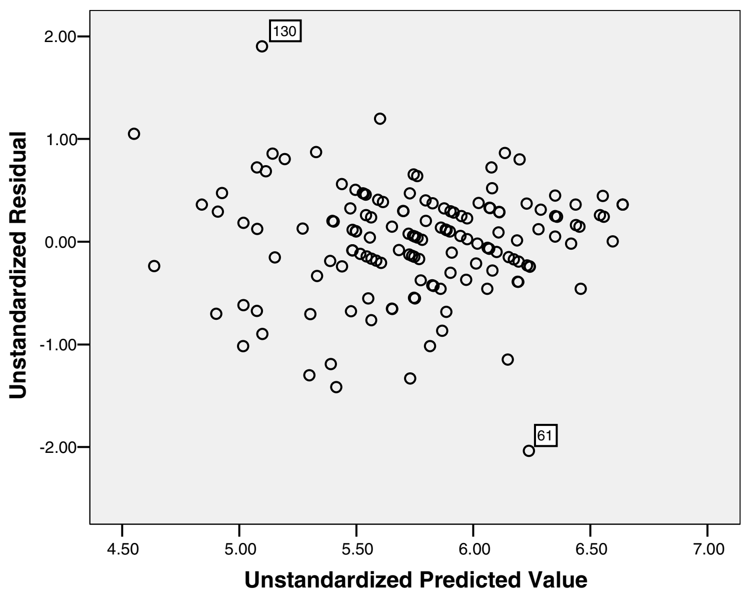

Figure 5-7: Plot of Residuals against Predicted Values for H7a

Table 5-32: H7a Outliers

Case Number	Std. Residual	SSA	Predicted Value	Residual
61	-3.742	4.20	6.2370	-2.03698
130	3.496	7.00	5.0969	1.90314

Further investigation of these two data points (see Table 5-33) revealed no error in coding the data and no error in measure. Since the Cook's distance and the leverage value (measures of outliers' influence on the regression model) were low, the two data points were deleted.

Table 5-33: Cook's Distance and Leverage Stastic Value for H7a Outliers

Case Number	Cook's Distance	Leverage Value
61	0.00011	0.01541
130	0.44540	0.12912

The normality of the error term assumption was confirmed visually with a check of the histogram of the residuals and the normal probability plot of the residuals, and statically using the Kolmogorov-Smimov normality test (shown in Table 5-34). As shown in Figures 5-8 and 5-9, the histogram and the normal probability plot indicate normality of the residuals.

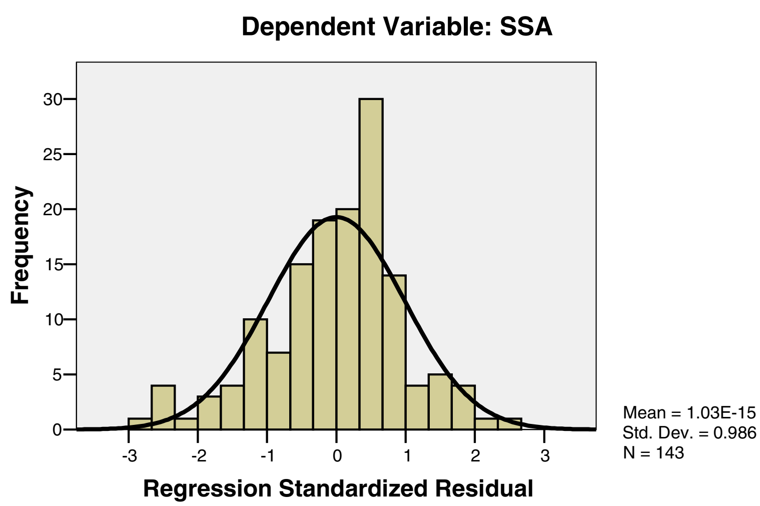

Figure 5-8: Histogram of H7a Residuals

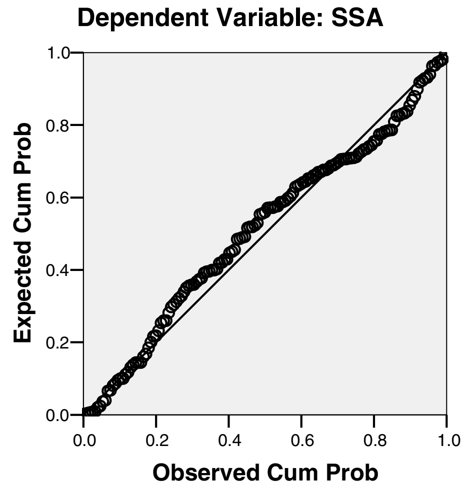

Figure 5-9: Normal P-P Plot of H7a Regression Standardized Residuals

Table 5-34: K-S Normality Test for H7a Regression Residuals

	Kolmogorov-Smirnov(a)		
	Statistic	df	Sig.
Unstandardized Residual	0.072	143	0.07

The assumption of the independence of the error terms was assessed through a plot of the residuals against the identification number that represents the order in which the data was collected (shown in Figure 5-10). The Pearson correlation coefficient (r) were also calculated between the predictors and the residuals to assure that residuals are uncorrelated with the independent variables (see Table 5-35).

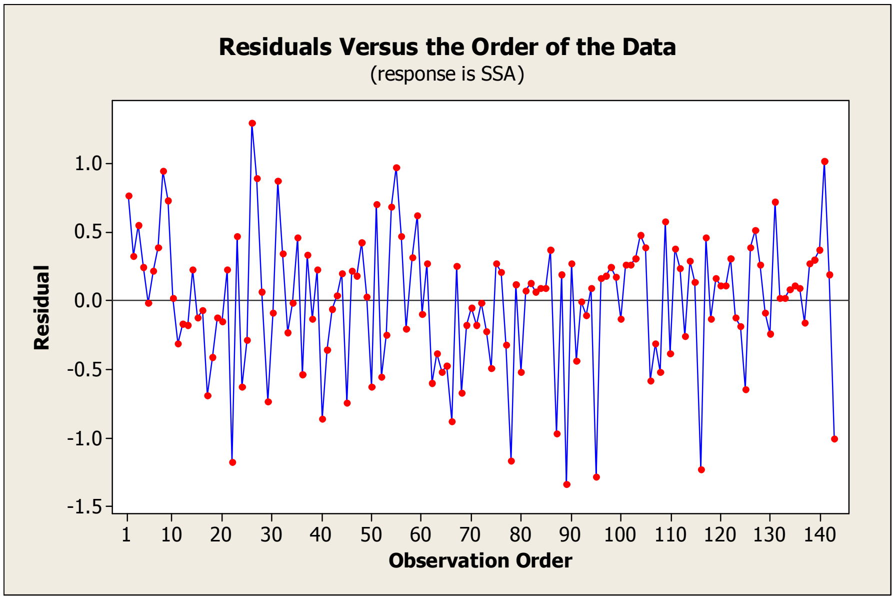

Figure 5-10: H7a Test for Independence of the Residuals

Table 5-35: Correlation between Independent Variables and Residuals for H7a

		Unstandardized Residual
TRUST	Pearson Correlation	0.000
	Sig. (2-tailed)	1.000
COMM	Pearson Correlation	0.000
	Sig. (2-tailed)	1.000
INTERDEP	Pearson Correlation	0.001
	Sig. (2-tailed)	0.988
COORD	Pearson Correlation	0.000
	Sig. (2-tailed)	1.000

** Correlation is significant at the 0.01 level (2-tailed).

The non-multicollinearity assumption was assessed through the values of the Tolerance, Variance Inflation Factor (VIF), Eigenvalue, Condition Index, and the Variance Proportions (shown in Table 5-36). The linearity assumption was confirmed using the residual plot against the predictor variables (shown in Figure 5-11).

Table 5-36: Multicollinearity test values for H7a

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.768	.335		8.259	.000		
	TRUST	.222	.067	.258	3.331	.001	.620	1.614
	COMM	.139	.045	.247	3.095	.002	.584	1.713
	INTERDEP	.001	.035	.001	.016	.987	.884	1.132
	COORD	.204	.040	.359	5.096	.000	.748	1.337

a. Dependent Variable: SSA

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	TRUST	COMM	INTERDEP	COORD
1	1	4.880	1.000	.00	.00	.00	.00	.00
	2	.055	9.392	.00	.01	.01	.68	.17
	3	.035	11.816	.08	.00	.77	.00	.06
	4	.022	14.865	.16	.09	.01	.26	.76
	5	.007	25.833	.76	.90	.20	.05	.01

a. Dependent Variable: SSA

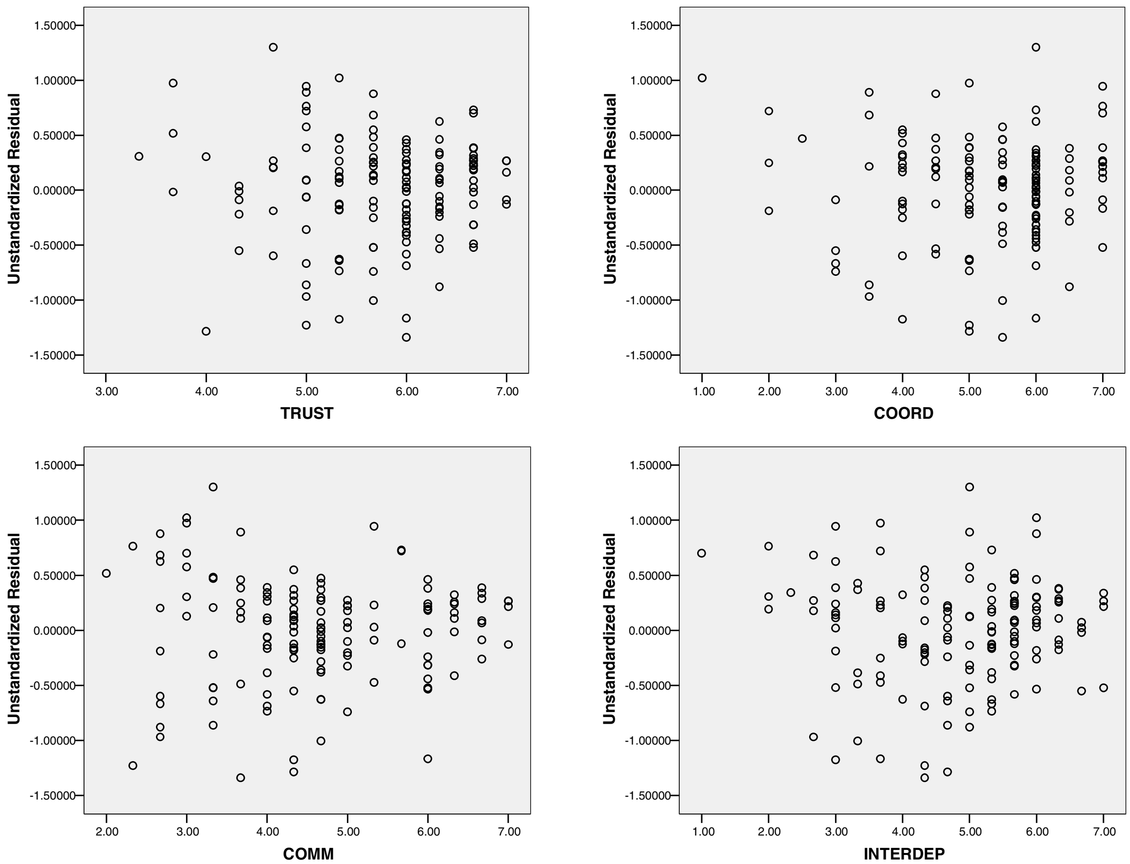

Figure 5-11: Plot of Residuals vs. IVs to Assess Linearity for H7a

The homoscedasticity assumption was tested using a plot of the residuals against the fitted values and a plot of the absolute residual against the fitted values (shown in Figure 5-12). The plot of the residuals against the fitted values indicated heteroscedasticity; therefore the White test was used to test the homogeneity of variances.

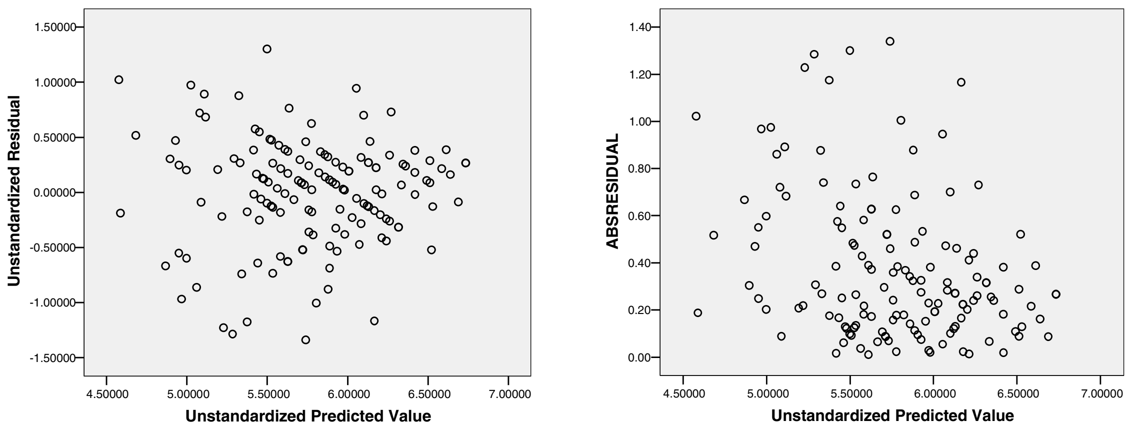

Figure 5-12: Homoscedasticity Visual Tests for H7a

The White test (White, 1980) is accomplished by first estimating the model with OLS and then saving the residuals. One then regresses the squares of the residuals on all of the independent variables, their squares and cross products. The R-square (0.196) of this regression model is used to calculate $n*R^2=143*0.265=37.90$, and this value is compared to $\chi^2(0.95,\ 14)=23.68$ obtained from χ^2 table. Since $n*R^2 > \chi^2_{(\alpha,14)}$, the conclusion isthatthere is heteroscedasticity.

Based on the above analysis, the study launched several remedies to correct the heteroscedasticity violation. First, transformations were done on the dependent variable and/or each independent variable. Such transformation methods as inverse, square root, square, and logarithms were tried on each variable but little or no improvement was found. Then, the study implemented Weighted Least Square (WLS) to re-estimate the regression function. The WLS procedure can be summarized in the following steps (DeMaris 2004):

1. Run the regression of Y on X_1, X_2, X_3, X_4 and save the residuals, e_i
2. Create the variable $log\, e_i^2$
3. Regress $log\, e_i^2$ on X_1, X_2, X_3, X_4 and get the fitted values, $\log \hat{e}_i^2$
4. Exponentiate $\log \hat{e}_i^2$ to recover $\hat{e}_i^2$
5. Regress Y on X_1, X_2, X_3, X_4 via WLS using as weights $w_i = 1/\hat{e}_i^2$

Model Summary[b,c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.737[a]	0.544	0.531	0.84861

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM
b. Dependent Variable: SSA
c. Weighted Least Squares Regression – Weighted by W

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	118.475	4	29.619	41.129	0.000[a]
	Residual	99.380	138	0.720		
	Total	217.855	142			

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM
b. Dependent Variable: SSA
c. Weighted Least Squares Regression – Weighted by W

Coefficients[a,b]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	St. Error	Beta	t	Sig.
1	(Constant)	2.701	0.308		8.782	0.000
	TRUST	0.203	0.061	0.249	3.309	0.001
	COMM	0.148	0.043	0.271	3.408	0.001
	INTERDEP	0.008	0.034	0.015	0.246	0.806
	COORD	0.222	0.041	0.370	5.447	0.000

a. Dependent Variable: SSA
b. Weighted Least Squares Regression – Weighted by W

Figure 5-13: H7a WLS Regression Output

Figure 5-13 shows the WLS regression model for hypothesis H7a, which is similar to the non-weighted regression model (shown in Figure 5-14). A comparison of the two models in Figure 5-13 and 5-14 revealed little difference between correspondent regression coefficients, suggesting that there was no need to re-estimate the standard deviation function and the weights based on the residuals for the weighted regression and that heteroscedasticity did not have a big impact on the estimated model in this research study.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.698[a]	0.487	0.473	0.49047

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM
b. Dependent Variable: SSA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.574	4	7.894	32.812	0.000[a]
	Residual	33.198	138	0.241		
	Total	64.772	142			

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM
b. Dependent Variable: SSA

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	St. Error	Beta	t	Sig.
1	(Constant)	2.768	0.335		8.259	0.000
	TRUST	0.222	0.067	0.258	3.331	0.001
	COMM	0.139	0.045	0.247	3.095	0.002
	INTERDEP	0.001	0.035	0.001	0.016	0.987
	COORD	0.204	0.040	0.359	5.096	0.000

a. Dependent Variable: SSA

Figure 5-14: H7a OLS Regression Output

H7a was partially supported by the data. As illustrated in Figure 5-13, all the independent variables are significant except interdependence. Based on the survey responses, successful strategic supplier alliances are associated with high levels of commitment, trust, and coordination.

Further analysis of H7a was conducted by grouping the data according to the number of online reverse auctions the responding company completed in the last 3 years. Table 5-37 represents the regression coefficients for the different groups. The first 3 columns from the left represent all the respondents, respondents with auction experience in general, and respondents with no auction experience. The last 2 columns represent splitting the data from respondents with auction experience into two groups: no more than 15 auctions in the last 3 years and more than 15 auctions in the last 3 years. For further details of the regression models refer to Appendices G.15-G.18.

Table 5-37: H7a Regression Coefficients by Auction Experience

	All the Data	Auction Experience	No Auction Experience	No More than 15 Auctions	More than 15 Auctions
Trust	0.249 ***	0.254 ***	0.249*	---	0.380***
Commitment	0.271***	0.275***	0.224*	0.281*	0.389***
Interdependence	---	---	---	---	---
Coordination	0.370***	0.305***	0.438***	0.414***	---
df	142	94	47	44	45
R^2	0.544	0.527	0.432	0.526	0.549

* p<0.10
** p<0.05
*** p<0.01
--- Not statistically significant

As shown in Table 5-37, H7a was partially supported when splitting the data into 2 groups: companies with auction experience and companies with no auction experience. All the independent variables are significant except interdependence. Based on the survey responses, successful strategic supplier alliances are associated with high levels of commitment, trust, and coordination regardless of the auction experience.

When splitting the responses from companies with auction experience into two groups, less than 15 auctions in the last 3 years and more than 15 auctions in the last 3 years, mixed results were obtained. Companies who completed less than 15 auctions in the last 3 years reported that successful strategic supplier alliances are associated with high levels of commitment and coordination while trust and interdependence were insignificant. Companies with experience of more than 15 auctions in the last 3 years reported that successful strategic supplier alliances are associated with high levels of trust and commitment while coordination and interdependence were insignificant.

H7b was fully supported by the data. As indicated in Figure 5-15, multiple linear regression supported the hypothesis that successful strategic supplier alliances are associated with high levels of (a) information sharing, (b) information participation, and (c) information quality.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.753[a]	0.568	0.558	5.14238

a. Predictors: (Constant), Quality, Participation, Sharing
b. Dependent Variable: SSA_SQUARE

Coefficients[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4893.22	3	1632.07	61.718	0.000[a]
	Residual	3728.62	141	26.44		
	Total	8624.84	144			

a. Predictors: (Constant), Quality, Participation, Sharing
b. Dependent Variable: SSA_SQUARE

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	St. Error	Beta	t	Sig.
1	(Constant)	-7.517	3.187		-2.359	0.020
	Sharing	4.012	0.786	0.411	5.107	0.000
	Participation	1.634	0.540	0.232	3.023	0.003
	Quality	1.894	0.575	0.229	3.296	0.001

a. Dependent Variable: SSA_SQUARE

Figure 5-15: H7b Multiple Regression Output

The regression model was tested for outliers and assumptions. The visual and statistical tests revealed that there are no outliers and that all assumptions were met except the homogeneity of variances.

Further analysis using Levene's test revealed that two of the three independent variables (sharing and quality) do not have equal variances of residuals. Transformation of the dependent variable by squaring it solved the heteroscedasticity problem.

Appendix G.19 shows the regression model for hypothesis H7b before transforming the dependent variable, which is similar to the regression model after transforming the dependent variable (shown in Figure 5-15). A comparison of the two models in Figure 5-15 and Appendix G.19 revealed little difference between correspondent regression coefficients, suggesting that heteroscedasticity did not have a big impact on the estimated model in this research study.

As shown in Table 5-38, further analysis of H7b was conducted by clustering the data according to the number of online reverse auctions the responding company completed in the last 3 years. For further details of the regression models refer to Appendices G.20-G.23.

H7b was fully supported by companies who reported having organized auctions in the last three years. Companies with no auction experience reported that successful strategic supplier alliances are associated with high levels of (a) information sharing and (b) information quality, while information participation was insignificant.

Table 5-38: H7b Regression Coefficients by Auction Experience

	All the Data	Auction Experience	No Auction Experience	No More than 15 Auctions	More than 15 Auctions
Sharing	0.411 ***	0.424 ***	0.434*	0.434***	0.350**
Participation	0.232***	0.297***	---	0.250*	0.467***
Quality	0.229***	0.166**	0.227*	0.232*	---
df	144	95	48	45	42
R^2	0.568	0.630	0.453	0.648	0.758

* p<0.10
** p<0.05
*** p<0.01
--- Not statistically significant

When splitting the responses from companies with auction experience into 2 groups, no more than 15 auctions in the last 3 years and more than 15 auctions in the last three years, mixed results were obtained (see Table 5-38). Companies who completed no more than 15 auctions in the last 3 years have fully supported H7b and reported that successful strategic supplier alliances are associated with high levels of (a) information sharing, (b) information quality and (c) information participation. Companies with experience of more than 15 auctions in the last 3 years reported that successful strategic supplier alliances are associated with high levels of (a) information sharing and (b) information participation while information quality was insignificant.

H7c was fully supported by the data. According to Tabachnick and Fidell (2000), based on the value of the R-square, it is considered a poor fit. As indicated in Figure 5-16, the multiple linear regression model supported the hypothesis that "a positive, significant relationship will exist between the success of the strategic alliance and (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques." The regression model was tested for outliers and assumptions. The visual and statistical tests revealed that there are no outliers and that all assumptions were met.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.395[a]	0.156	0.138	0.64155

a. Predictors: (Constant), Avoidance, Destructive, Constructive
b. Dependent Variable: SSA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.714	3	3.571	8.677	0.000[a]
	Residual	58.034	141	0.412		
	Total	6.748	144			

a. Predictors: (Constant), Avoidance, Destructive, Constructive
b. Dependent Variable: SSA

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	St. Error	Beta	t	Sig.
1	(Constant)	5.652	0.383		14.772	0.000
	Constructive	0.164	0.065	0.196	2.524	0.013
	Destructive	-0.266	0.064	-0.321	-41.146	0.000
	Avoidance	-0.064	0.032	-0.157	-2.028	0.044

a. Dependent Variable: SSA

Figure 5-16: H7c Multiple Regression Output

As shown in Table 5-39, further analysis of H7c was conducted by grouping the data according to the number of online reverse auctions the responding company completed in the last 3 years. For further details of the regression models refer to Appendices G.24-G.27.

H7c was fully supported by companies who reported having organized auctions in the last 3 years. No conclusions can be made on companies that had no auction experience due to the low value of R^2.

Table 5-39: H7c Regression Coefficients by Auction Experience

	All the Data	Auction Experience	No Auction Experience	No More than 15 Auctions	More than 15 Auctions
Constructive	0.196***	0.255***	---	0.383***	---
Destructive	-0.321***	-0.364***	---	-0.393***	-0.269*
Avoidance	-0.157***	-0.163*	---	---	-0.335**
df	144	94	48	45	45
R^2	0.156	0.238	0.062	0.325	0.229

* p<0.10
** p<0.05
*** p<0.01
--- Not statistically significant

When splitting the responses from companies with auction experience into 2 groups, no more than 15 auctions in the last 3 years and more than 15 auctions in the last 3 years, mixed results were obtained (see Table 5-39). Results from companies who completed no more than 15 auctions in the last 3 years partially supported H7c, that successful strategic supplier alliances are associated with (a) high use of constructive conflict resolution techniques, and (b) low use of conflict avoidance techniques while destructive resolution techniques were insignificant. Companies with experience of more than 15 auctions in the last 3 years reported that successful strategic supplier alliances are associated with low use of conflict avoidance techniques and low use of destructive resolution techniques while constructive conflict resolution techniques were insignificant.

H6a was not supported by the data. As indicated in Figure 5-17, multiple linear regression did not supported the hypothesis that "using online reverse auctions as a collaborative problem solving tool is associated with high levels of trust, commitment, coordination and interdependence." All the independent variables were insignificant except the independent variable "Interdependence," which was significant but in the opposite direction.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.378[a]	0.143	0.106	1.28638

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM
b. Dependent Variable: COLLAB

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.181	4	6.295	3.804	0.007[a]
	Residual	150.585	91	1.655		
	Total	175.766	95			

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM
b. Dependent Variable: COLLAB

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	St. Error	Beta	t	Sig.
1	(Constant)	6.214	1.038		5.987	0.000
	TRUST	0.221	0.228	0.132	0.969	0.335
	COMM	-0.279	0.148	-0.261	-1.891	0.062
	INTERDEP	-0.291	0.116	-0.258	-2.516	0.014
	COORD	-0.065	0.129	-0.058	-0.505	0.615

a. Dependent Variable: COLLAB

Figure 5-17: H6a Regression Output

The regression model was tested for outliers and assumptions. The visual and statistical tests revealed that there were no outliers and all assumptions were met except the normality of the error term. Crown (1998) stated that "although the regression residuals are assumed to be normally distributed with mean zero and constant variance, the assumption of normality is not needed to derive the formulas for the regression coefficients and standard errors. Consequently, even if the residuals are not normally distributed, the regression coefficients are still the best linear unbiased estimators (BLUE). ”

Crown (1998) also stated that although the t-tests for the significance of the coefficients do depend on the assumption of normality, it can be shown that the sampling distribution for the least squares estimators approaches the normal distribution for large samples. Even in such samples, the least squares estimates may not be too seriously affected if the distribution of the residuals is not too different from the normal distribution.

Although not part of the formalized hypothesis, regression analysis was conducted on hypothesis 6a by replacing the use of online reverse auction from “as a collaborative problem solving technique” to “as a power based bargaining technique.” The WLS regression analysis also revealed that all of the independent variables were insignificant and also failed to support the (see Figure 5-18).

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.182[a]	0.033	-0.010	1.52109

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM
b. Dependent Variable: Power
c. Weighted Least Squares Regression – Weighted by w

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.181	4	1.795	0.776	0.544[a]
	Residual	210.548	91	2.314		
	Total	217.729	95			

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM
b. Dependent Variable: COLLAB
c. Weighted Least Squares Regression – Weighted by w

Coefficients[b]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	St. Error	Beta	t	Sig.
1	(Constant)	2.966	1.076		2.756	0.007
	TRUST	0.087	0.235	0.052	0.371	0.712
	COMM	0.055	0.158	0.049	0.349	0.728
	INTERDEP	0.120	0.126	0.103	0.953	0.343
	COORD	0.063	0.132	0.057	0.480	0.632

a. Dependent Variable: COLLAB
b. Weighted Least Squares Regression – Weighted by w

Figure 5-18: H6a Regression Output - Power based Bargaining Assumption

H6b was not supported by the data. As indicated in Figure 5-19, multiple linear regression did not supported the hypothesis that "using online reverse auctions as a collaborative problem solving tool is associated with high levels of buyer-supplier (a) information sharing, (b) information quality, and (c) information participation." As shown in Figure 5-19, the regression analysis revealed that two independent variables (participation and sharing) are insignificant while the third independent variable was significant but in the opposite direction.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.355[a]	0.126	0.097	1.2924

a. Predictors: (Constant), Sharing, Quality, Participation
b. Dependent Variable: COLLAB

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.099	3	7.366	4.410	0.006[a]
	Residual	153.667	92	1.670		
	Total	175.766	95			

a. Predictors: (Constant), Quality, Participation, Sharing
b. Dependent Variable: COLLAB

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	St. Error	Beta	t	Sig.
1	(Constant)	6.923	0.958		7.223	0.000
	Quality	-0.509	0.187	-0.375	-2.714	0.008
	Participation	0.156	0.175	0.125	0.890	0.376
	Sharing	-0.106	0.270	-0.062	-0.394	0.695

a. Dependent Variable: COLLAB

Figure 5-19: H6b Regression Output

Although not part of the formalized hypothesis, regression analysis was conducted on hypothesis 6b by replacing the use of online reverse auction from "as a collaborative problem solving technique" to "as a power based bargaining technique." The WLS regression analysis also revealed that all of the independent variables were insignificant and also failed to support the hypothesis.

H6c was not supported by the data. As indicated in Figure 5-20, multiple linear regression did not support the hypothesis that "using online reverse auctions as a collaborative problem solving tool is associated with (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques, and (c) low use of destructive resolution techniques." As shown in Figure 5-20, the regression analysis revealed that the three independent variables are insignificant.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.331[a]	0.109	0.060	1.3188

a. Predictors: (Constant), HARSH, SMOOTH, ARBT, PERS, JOINT
b. Dependent Variable: COLLAB

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.235	5	3.847	2.212	0.060[a]
	Residual	156.531	90	1.739		
	Total	175.766	95			

a. Predictors: (Constant), HARSH, SMOOTH, ARBT, PERS, JOINT
b. Dependent Variable: COLLAB

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	St. Error	Beta	t	Sig.
1	(Constant)	5.375	1.339		4.015	0.000
	SMOOTH	0.150	0.091	0.173	1.642	0.104
	ARBT	0.045	0.169	0.027	0.266	0.791
	PERS	-0.159	0.105	-0.161	-1.519	0.132
	JOINY	-0.203	0.184	-.122	-1.104	0.273
	HARSH	0.142	0.100	0.150	1.417	0.160

a. Dependent Variable: COLLAB

Figure 5-20: H6c Regression Output

Successful Online Reverse Auction Event

H8 was not supported by the data; the hypothesis stated that "a positive, significant relationship exists between reducing purchase prices and the buyer's perception of a successful online reverse auction event." As illustrated in Table 5-40, the correlation that exists between reducing purchase prices and the buyer's perception of a successful online reverse auction event is not significant (p>0.05).

For the purpose of the statistical analysis, the null hypothesis stated that "no significant relationship exists between reducing purchase prices and the buyer perception of a successful online reverse auction event." While the alternative hypothesis state that "a positive, significant relationship exists between reducing purchase prices and the buyer perception of a successful online reverse auction event." Since the Pearson correlation value was not significant (P>0.05), the data fail to reject the null hypothesis and therefore fail to support the alternative hypothesis.

Table 5-40: Test of H8

		IMPLT
RED	Pearson Correlation	0.209**
	Sig. (2-tailed)	0.053
	N	86

** Corelation i s significant at the 0. 10 level
RED: Reduction in Purchase Prices
IMPLT: Successful Online Reverse Auction Event

Further analysis of H8, through grouping the survey responses based on the criteria listed in Table 5-21, failed to support the hypothesis for most of the groups. As shown in Appendix G.28, the calculated correlations for the survey responses for each group show no correlation between the auction objective of reducing purchase prices and the buyer's perception of a successful online reverse auction event for all of the groups except companies with sales volume above a billion dollars. Also, filtering the data based on the number of auction completed within the last 3 years failed to support the hypothesis for either of the 2 groups shown in Table 5-41.

Table 5-41: Test of H8 Based on Auction Experience

		Successful Online Reverse Auction Event	
		No more than 15 auctions in last 3 years	More than 15 auctions in the last 3 years
Reduction in Purchase Prices	Pearson Corr.	0.143	0.265
	Sig. (2-tailed)	0.343	0.113
	N	46	37

H9 was supported by the data; the hypothesis stated that "a positive, significant relationship exists between buyer-supplier strategic alliance and the buyer's perception of a successful online reverse auction event." As illustrated in Table 5-44, a positive significant correlation exists between buyer-supplier strategic alliance, and the buyer's perception of a successful online reverse auction event.

For the purpose of the statistical analysis, the null hypothesis stated that "no significant relationship exists between buyer-supplier strategic alliance and the buyer's perception of a successful online reverse auction event." While the alternative hypothesis state that "a positive, significant relationship exists between buyer-supplier strategic alliance and the buyer perception of a successful online reverse auction event." Since the Pearson correlation value was not significant ($P<0.05$), the data reject the null hypothesis and support the alternative hypothesis.

Table 5-42: Test of H9

		IMPLT
SSA	Pearson Correlation	0.369**
	Sig. (2-tailed)	0.000
	N	96

** Correlation is significant at the 0.01 level
SSA: Strategic Supplier Alliance
IMPLT: Successful Online Reverse Auction Event

Further analysis of H9, through grouping the survey responses based on the criteria listed in Table 5-21, supported the hypothesis for every group. As shown in Appendix G.29, regardless of the sales volume, purchasing volume, number of employees, number of purchasing employees, and job title, all groups supported the hypothesis that "a positive, significant relation exists between buyer-supplier strategic alliance and the buyer's perception of a successful online reverse auction event". Also, filtering the data based on the number of auctions completed within the last 3 years supported the hypothesis for the two groups shown in Table 5-43.

Table 5-43: Test of H9 Based on Auction Experience

		Successful Online Reverse Auction Event	
		Less than 15 auctions in the last 3 years	More than 15 auctions in the last 3 years
Reduction in Purchase Prices	Pearson Correlation	0.428**	0.396**
	Sig. (2-tailed)	0.002	0.010
	N	51	41

** Correlation is significant at the 0.01 level

CHAPTER 6: SUMMARY, CONCLUSIONS & FUTURE RESEARCH

6.1 Introduction

Previous chapters have addressed the relevance of the research problem, the focus of this research study, the supporting literature, the conceptual model, the research design methodology, and the data analysis.

This chapter summarizes the research outcomes of this study. The chapter contains a discussion based on the data supplied by 145 respondents. In Section 6.2, the chapter summarizes the research conclusions and managerial implications based on the test results of nineteen hypotheses presented in Chapter Three. The findings of the research are divided into six general groups, and conclusions related to each group are presented.

Section 6.3 summarizes the hypotheses and their test results. The objective of this section is to interpret the data, explain how the data related to the hypothesized model, explain how the findings relate to previous research and/or provide suggestions for application of the research findings in practice. Finally, in Section 6.4, the chapter concludes with the limitations of the study and addresses guideline for future research.

6.2 Research Conclusions

The goal of this research is to address the gap in the academic literature by developing and testing a model to successfully implement online reverse auctions with respect to (1) reducing purchase prices, and (2) developing/maintaining buyer-supplier strategic alliance relationships in the business-to-business online reverse auction environment.

The managerial implications to be drawn from this research relate to the manner in which the buyers (1) design auctions to reduction purchase prices, (2) use online reverse auctions for the short-term and/or the long term according to the purchase type, (3) define successful online reverse auction events, and (4) attempt to manage the future scope and tone of their buyer-supplier relationships.

The research study goals were systematically addressed and successfully achieved through the testing of nineteen hypotheses, defined in Chapter Three, and the accomplishment of the six research objectives, defined in Chapter One, through analyzing the responses of 145 companies. Table 6.1 summarizes the results of the hypotheses tests.

A model to successfully implement business-to-business online reverse auctions (from the buyer's perspective) can be divided into two parts: strategic and operational. From the strategic dimension, a successful model focuses on the importance of the strategic buyer-supplier alliance more than the promised reduction in purchase prices. Companies should use online reverse auctions as a procurement negotiation tool within their effort to develop/maintain the strategic alliance.

Hypothesis	Data Support
H1: Using online reverse auctions, the reduction in purchase prices is more likely to be higher in the open-bid auction format than the sealed-bid format.	Yes
H2: With the objective of using online reverse auctions to reduce purchase prices, buyers are more likely to prefer to organize the auction event in-house than with the help of a market maker.	No
H3a-c: When purchasing X, a positive, significant relationship will exist between the type of the purchase and the purpose of using online reverse auctions to reduce purchase prices (X can be production material and components, MROs, or services).	Yes
H4a-c: When purchasing X, a negative, significant relationship will exist between the use of online reverse auctions for the purpose of a short-term relationship and the purpose of developing/maintaining long-term relationships (X can be production material and components, MROs, or services).	Yes
H5a-c: When purchasing X, purchasers will be more likely to use online reverse auction for the purpose of a short-term relationship than developing/maintaining long-term relationships (X can be production material and components, MRO, or services).	No
H6a: Using online reverse auctions as a collaborative problem solving tool is associated with high levels of trust, commitment, coordination and interdependence.	No
H6b: Using online reverse auctions as a collaborative problem solving tool is associated with high levels of buyer-supplier (a) information sharing (b) information quality and (c) information participation.	No
H6c: Using online reverse auctions as a collaborative problem solving tool is associated with (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques.	No
H7a: Successful strategic supplier alliances are associated with high levels of commitment, trust, coordination and interdependence.	Yes
H7b: Successful strategic supplier alliances are associated with high levels of (a) information sharing and (b) information quality and (c) information participation.	Yes
H7c: A positive, significant relationship will exist between the success of the strategic alliance and (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques and (c) low use of destructive resolution techniques	Yes
H8: A positive, significant relationship exists between reducing purchase prices and the buyer perception of a successful online reverse auction event.	No
H9: A positive, significant relationship exists between buyer-supplier strategic alliance, and the buyer perception of a successful online reverse auction event.	Yes

Table 6-1: Hypothesis Testing Results

Firms who have established long-term relationships with key suppliers are still required to check on market prices from time to time, or to invite new or alternative sources of supply to bid. The model to be a successful buyer in implementing online reverse auctions uses reverse auctions as the mechanism for such activity because of their ability to reduce time, cost, and resources. From this perspective, the model states that the buyer should use online reverse auctions as a process improvement tool.

A model of successful implementation of online reverse auctions emphasizes the importance that the buyer company should not lose sight of the importance of trust, coordination, commitment, information participation, information quality, information sharing, and joint problem solving to achieve a win-win buyer-supplier strategic alliance. Buyers should not let the use of online reverse auctions drive the buyer-supplier partnership, but reverse auctions should be used as a tool to improve the negotiation process.

With respect to the model's operational details of successful online reverse auctions, buyers should use an open-bid format rather than sealed-bid format to achieve a higher reduction in purchase prices. Also, buyers should organize online reverse auctions with the help of an online reverse auction service provider. The reduction in purchase prices is likely to be higher when organizing auctions with the help of a market maker than when organizing the event in-house because of the market maker's expertise in conducting thousands of auctions.

Online reverse auctions will help reduce purchase prices regardless of the purchase type (production material and components, MROs, or services). An average of 14.4% is the reduction in purchase prices when using online reverse auctions to outsource products, as reported by the survey respondents. With respect to the model's operational details of successful online reverse auctions, buyers should focus on the long-term objective when outsourcing production material and components.

The model (research findings) has led the researcher to believe that the way companies are using online reverse auctions is changing. Published research in the early use of online reverse auctions reported the abuses and the negative effects of reverse auctions on the buyer-supplier relationships. With maturity and experience in the use of online reverse auctions, and buyers' realization of the importance of their supplier strategic alliances, buyers have changed the way they are implementing and viewing online reverse auctions.

Finally, the model to successfully implement online reverse auctions (based on survey respondents) emphasizes the need for companies to understand the use of business-to-business online reverse auctions as a process improvement tool in their negotiation process (price audit) with the suppliers within the effort to develop/maintain the buyer-supplier alliance.

6.3 Summary of the Research Study

The increasing pressure on companies to reduce the expense of products and services has caused the procurement organizations to seek out and experiment with new electronic procurement tools. Procurement professionals' desire to reduce the total cost of their companies' purchases has led them to use online reverse auctions without fully understanding the effect on their buyer-supplier relationships and without fully understanding whether online reverse auctions have helped other companies reduce purchase prices and if so, what is the reduction percentage of the overall price.

This section summarizes the hypotheses and their test results. The objective of this section is to interpret the data, explain how the data relate to the hypothesized model, explain how the findings relate to previous research and/or provide suggestion for application of the research findings in practice.

Auction Design-Format

The data provided support for the hypothesized relationship between reduction in purchase price and the open-bid auction format. While there are several different bidding formats of online reverse auctions, the research focused on the use of one-sided multi-round open and sealed-bid auctions. Respondents were asked to evaluate and compare the reduction in purchase prices between the open-bid format and the sealed-bid format. The buying companies (respondents) clearly supported the open-bid format. This finding is similar to Jap (2002); the fast-paced bidding nature of the open-bid format and the need to respond quickly to competitors' bids yields tense and pressure on suppliers to cut prices vigorously and thus force additional price concessions from the suppliers, and that in turn will result in higher price reductions for the buyers.

The data also provided support for the hypothesized relationship between reduction in purchase price and the open-bid auction format for all companies regardless of the sales volume, purchasing volume, or number of employees. The hypothesis was also supported by all different management levels.

Auction Design-Event Organization

The data did not provide support for the hypothesized relationship between reduction in purchase price and the buyers' preference to organize the auction event in-house rather than with the help of a market maker. On the contrary, the data clearly supported the opposite hypothesis: "with the objective of using online reverse auctions to reduce purchase prices, buyers are more likely to prefer to organize the auction event with the help of a market maker than in-house."

The hypothesis was initially constructed based on the logic that the target sample for this research was companies who have used online reverse auctions frequently, and these companies have the required technology infrastructure to support and organize online reverse auctions; therefore, it was expected that these buyers would prefer to organize online reverse auctions in-house in order to avoid the cost associated with the fees of the online reverse auction service provider. But because the survey respondents reported a median of only fifteen auctions completed by their company in the last 3 years, the online reverse auction experience of the companies participating in the survey was below expectations. Therefore, the assumption that the target sample of the research was companies who have used online reverse auctions frequently was no longer valid. Because the survey responding companies are not using online reverse auctions, as frequently as initially thought, it makes perfect sense that these companies would prefer to use online reverse auction service providers like Tradingpartners rather than organizing the events in-house.

Another possibility is that buyers did not want to get involved in the online reverse auction business since auctions are outside their core competencies. The finding also implies that the companies appreciate the value that the market makers bring to the auction event organization process. Through the market maker's experiences in conducting thousands of auctions, market makers are more efficient than buyers in organizing the event, locating new suppliers, providing the technological expertise, and creating comprehensive RFQ packages. Online reverse auction providers usually are better in structuring the RFQ than what the buyer historically produced, which results in a more complete description of the procurement under consideration. Sellers thus gain a better understanding of the buyer's total requirements with regard to cost, delivery, and quality.

The data also provided support for the hypothesized relationship between reduction in purchase price and the event organization by a market maker for all companies regardless of the sales volume, purchasing volume, or number of employees. The hypothesis was also supported by all different management levels. While the data was analyzed based on categorizing the respondents into three levels within the purchasing organization (senior management, middle management, and buyers), all different categories supported the alternative hypothesis that "with the objective of using online reverse auctions to reduce purchase prices, buyers are more likely to prefer to organize the auction event with the help of a market maker than in-house."

Reduction in Purchase Price

The data provided support for the hypothesized positive relationship between the type of purchase (production items and components, MROs, and services) and the purpose of using online reverse auctions to reduce purchase prices. Companies reported that online reverse auctions helped in reducing the purchase prices by an average of 12.9% when purchasing production material and components, 16.9% when purchasing MROs, and 13.5% when purchasing services.

The data also provided support for the hypothesized relationship between reduction in purchase prices and the type of the purchase (production items and components, MROs, and services) for all companies regardless of the sales volume, purchasing volume or number of employees. The hypothesis was also supported by all different management levels. The data were analyzed based on the position (job title) of the respondent and all the different categories supported the hypothesis.

The findings agree with the majority of the articles published in the business press that online reverse auctions will lead to reduction in purchase prices. This finding is similar to the conclusion of previous research that senior managers of many Fortune 2000 companies continue to believe in the efficiency of online reverse auctions to reduce purchase prices (e.g. Judge 2001; Grant 2003; Emiliani and Stec 2005). The findings are also similar to Pearcy (2002), who stated that companies will be more likely to reduce the purchase prices of direct material and MRO supplies through the use of online reverse auctions.

Auction Application

The data suggest that the type of purchase (production materials and components, MROs, or services) is an important factor when deciding the manner is which the reverse auction will be used for short-term or long-term objectives.

Production material and components

The data supported the hypothesized model that "when purchasing production material and components, a negative significant relationship will exist between the purpose of short-term relationships and the purpose of developing/maintaining long-term relationships." At the same time, the data failed to support the hypothesized relationship that "when purchasing production material and components, purchasers will be more likely to use online reverse auctions for the purpose of short-term relationships rather than developing/maintaining long-term relationships."

But the data supported the opposite hypothesis of the model: "when purchasing production material and components, purchasers will be more likely to use online reverse auctions for the purpose of developing/maintaining long-term relationships rather than short-term relationships."

Further analysis of the data showed that larger companies (sales volume greater than one billion dollars, purchasing volume greater than $500 million, total number of employees greater than 1000, and more than 20 purchasing employees) support the model's opposite hypothesis at a 95% confidence interval and all the smaller companies categories supported that hypothesis at the 95% confidence interval except companies with less than 1000 employees supported the model's opposite hypothesis at 90% confidence interval. Grouping the data also showed that all different levels of employees within the purchasing organization (buyers, managers, and directors) advocate the importance of using online reverse auctions to outsource production material and components for the purpose of developing/maintaining long-term relationships rather than short-term relationships.

This finding that companies are using online reverse auctions to outsource production material and components for the purpose of developing/maintaining long-term relationships is unexpected and counter to the hypothesized model. One possibility for explaining this finding is that companies believe the purchasing price of production material and components is not the only determinant factor in outsourcing these items.

Other factors (such as quality, on-time delivery, and reliability) are more important and achieving the acceptable desired level requires time. Taking that into consideration, buyers view online reverse auctions as any other procurement negotiation tool to identify and negotiate with the supplier for the purpose of purchasing/outsourcing to this supplier for a long time and not a one-time shot.

Another possibility is based on the nature of production items and components. Such products require a high level of collaboration and coordination between the buyer and the supplier in terms of engineering design, quality, replenishment, and delivery and this is usually a time consuming process (usually years). Therefore, switching suppliers frequently is not an option.

This finding is counter to previous research conclusions (e.g. Emiliani and Stec 2004; Jap 2002; Pearcy et al. 2002). Pearcy et al. (2002) stated that buying companies will be more likely to use online reverse auctions to buy direct material and MRO supplies for short-term contracts. On the other hand, Emiliani and Stec (2004) questioned the effectiveness of using online reverse auction as a tool to outsource components for the short-term and the long-term.

Maintenance materials and supplies (MROs)

The data supported the hypothesized model that “when purchasing MROs, a negative significant relationship will exist between the purpose of short-term relationships and the purpose of developing/maintaining long-term relationships.” At the same time, the data failed to support the hypothesized relationship that “when purchasing

MROs, purchasers will be more likely to use online reverse auctions for the purpose of short-term relationships rather than developing/maintaining long-term relationships."

Further analysis of the data showed that smaller size companies (sales volume less than one billion, purchasing volume less than $500 million, total number of employees less than 1000, and/or less than 20 purchasing employees) support the model hypothesis. Respondents' who reported to work for smaller size companies appear to subscribe to the premise that online reverse auctions are used to outsource MROs for the purpose of short-term relationships rather than developing/maintaining long-term relationships. This finding is similar to Pearcy (2002), who stated that buying companies will be more likely to use online reverse auctions to buy MRO supplies for short-term contracts.

Respondents who reported to work for larger size companies (sales volume greater than 1000, purchasing volume greater than $500 million, total number of employees greater than 1000, and more than 20 purchasing employees) reported no difference in using online reverse auctions for the short-term or long-term objective when buying MRO supplies. When grouping the data based on the employment level within the purchasing organization (buyers, middle management, and upper senior management), respondents reported no difference in using online reverse auctions for the short-term or long-term objective when buying MRO supplies.

The finding that a negative relationship exists between the purpose of short-term relationship and the purpose of developing/maintaining long-term relationship was expected and according to the hypothesized model. The finding that the data failed to completely support the hypothesized relationship, "when purchasing MROs, purchasers will be more likely to use online reverse auctions for the purpose of short-term relationships rather than developing/maintaining long-term relationships," is unexpected and counters to the hypothesized model. The hypothesis was supported for smaller size companies but larger size companies reported no difference in using online reverse auctions for the short-term or long-term objective when buying MRO items.

One possible explanation is that larger size companies have more experience in using online reverse auctions (median of 20 auctions in the last 3 years) while smaller size companies have less experience (median of 6 auctions in the last 3 years). When a smaller size company organizes an auction to outsource MROs, a hit-and-run scenario is the motive behind using online reverse auctions. Smaller size companies, due to their lack of experience in using online reverse auctions, believe reducing purchase prices in the short-term can be achieved through the use of online reverse auctions to switch suppliers or force their current suppliers to reduce their prices. On the other hand, larger size companies use online reverse auctions as a procurement negotiation tool or as an audit tool of their current supplier to assure competitive purchasing prices. In either scenario, larger size companies assume that online reverse auctions will help reduce purchase prices regardless of the short-term or long-term objectives.

Services

With respect to the services product category, the data supported the hypothesized model that when purchasing services, a negative significant relationship will exist between the purpose of short-term relationships and the purpose of developing/maintaining long-term relationships. At the same time, the data failed to support the hypothesized relationship that “when purchasing services, purchasers will be more likely to use online reverse auctions for the purpose of short-term relationships rather than developing/maintaining long-term relationships.”

Further analysis of the data showed that smaller size companies (sales volume less than one billion, purchasing volume less than $500 million, total number of employees less than 1000, and/or less than 20 purchasing employees) support the model hypothesis. Respondents’ who reported to work for smaller size companies appear to subscribe to the premise that online reverse auctions are used to outsource services for the purpose of short-term relationships rather than developing/maintaining long-term relationships. Comparison of this finding to previous research is not possible due to the lack of the research in the area of the outsourcing services using online reverse auctions.

Respondents who reported working for larger size companies (sales volume greater than 1000, purchasing volume greater than $500 million, total number of employees greater than 1000, and more than 20 purchasing employees) reported no difference in using online reverse auctions for the short-term or long-term objective when buying services. When grouping the data based on the employment level within the purchasing organization (buyers, middle management, and upper senior management), respondents reported no difference in using online reverse auctions for the short-term or long-term objective when buying services.

The finding that a negative relationship exists between the purpose of short-term relationship and the purpose of developing/maintaining long-term relationship was expected and according to the hypothesized model. The finding that the data failed to support the hypothesized relationship, “when purchasing services, purchasers will be more likely to use online reverse auctions for the purpose of short-term relationships rather than for developing/maintaining long-term relationships”, is unexpected and counter to the hypothesized model. The hypothesis was supported for smaller size companies but larger size companies reported no difference in using auctions for the short-term or long-term objective when buying services.

The same explanation that was used for MROs also applies for services. Due to the experience in using auctions, the objective and the expected outcome between different sizes of companies vary. Smaller size companies use online reverse auctions to reduce purchase prices on the short-term and assume to use reverse auctions to outsource the service(s) whenever required. Simply, smaller size companies use online reverse auctions due to their ability to provide immediate cost savings in the short-term. On the other hand, larger size organizations use auctions to either audit their current suppliers to assure competitive prices or as a negotiation tool that will help reduce purchase prices regardless of the short-term or long-term objectives. Larger size companies believe that online reverse auctions will yield immediate savings in the short-term and/or can be used as a screening device for long-term relationships.

Successful Strategic Supplier Alliances

For more than two decades, the formation of partnerships became an increasingly common way for companies to find and maintain a competitive advantage. The following summarizes the results of testing the hypotheses related to the success of the buyer-supplier strategic alliances from the following three dimensions (discussed earlier in Chapter Three):

Attribute of the Relationship

The data provided support for the hypothesized positive relationship between successful strategic supplier alliances and the attribute of the relationship (commitment, trust, and coordination were significant while interdependence was insignificant).

Further analyses of the hypothesized relationship between successful strategic supplier alliances and attributes of the relationship (commitment, trust, coordination, and interdependence) were conducted by filtering the data according to the number of online reverse auctions the respondent's company completed in the last 3 years. The data was initially clustered into two groups: companies without any online reverse auction experience as a buyer and companies with experience in using online reverse auctions to purchase products and/or services. The two groups had similar results where trust, commitment, and coordination emerged as significant predictors of the success of the supplier strategic alliance, while interdependence was insignificant.

For further analysis, the survey responses were clustered into three groups: companies with no auction experience, companies with experience of no more than 15 auctions in the last 3 years, and companies who completed more than 15 auctions in the last 3 years. Companies that had completed no more than 15 auctions in the last 3 years reported that successful strategic supplier alliances are associated with high levels of commitment and coordination while trust and interdependence were insignificant. On the other hand, companies that had completed more than 15 auctions in the last 3 years reported that successful strategic supplier alliances are associated with high levels of trust and commitment, while coordination and interdependence were insignificant.

Interestingly, interdependence was insignificant across the three groups. But further examination of the other three predictor variables (trust, commitment, and coordination) across the maturity of companies' experiences in using reverse auctions, revealed that the value of the commitment predictor increases with auction experience while the value of the coordination variable decreases until it becomes insignificant.

An examination of Table 5-37 shows that commitment emerged as a significant predictor of the success of the supplier strategic alliance for all three groups. Commitment had the lowest significance value with respect to the other predictors for companies with no auction experience, but the value of commitment kept increasing with the auction experience until it became the most significant predictor of the success of the supplier strategic alliance.

On the other hand, coordination emerged as a significant predictor of the success of the supplier strategic alliance for all the three groups. Coordination was the most significant predictor variable, with its value decreasing until it became insignificant for companies with experience of more than 15 auctions.

Trust emerged as a significant predictor of the success of the supplier strategic alliance for 2 of the 3 groups: companies with no auction experience and companies that had completed more than 15 auctions in the last 3 years.

One possible explanation of the behavior of trust, commitment, and coordination as predictor variables of the success of the supplier strategic alliance is that companies are using online reverse auctions as an audit tool for their current suppliers and/or a procurement negotiation tool. When companies start to use auctions, the buyer and the suppliers are in a learning process. Commitment and coordination are the significant predictors of the success of the strategic alliance while trust is insignificant due to its nonexistence.

In the initial experiences of using online reverse auctions, the buyers do not believe they are getting a fair deal from their suppliers (might be the buyers' main reason for using online reverse auctions). The buyer is still committed to buying from the current supplier (commitment is a significant predictor with a moderate weight) if provided with good prices, but coordination is the significant predictor of the success of the supplier strategic alliance (coordination has more weight than commitment).

Trust has been established with the buyer's current suppliers as a significant predictor of their relationship, but when the buyer companies start to use reverse auctions it might be due to a lack of trust that their suppliers are giving them fair/good deals. With time and experience in using online reverse auctions, the trust in the relationship between the buyer and the supplier increases to be one of the most important predictors of the success of the relationship. Buyers, due to the continuous participation of their strategic suppliers in the online reverse auctions, trust that (a) the strategic supplier alliances are beneficial to their business; (b) they are getting an equitable deal from their suppliers in these alliances; and (c) the strategic supplier alliance/partnership is marked by a high degree of harmony.

Commitment has a moderate weight in the strategic alliance for companies with no auction experience. While gaining more experience in using online reverse auctions, the buyers become more committed to buying from their current suppliers and online reverse auctions become similar to any other price negotiation tool/methodology.

On the other hand, coordination has a moderate weight in the strategic alliance for companies with no auction experience. While gaining more experience in using online reverse auctions, coordinating activities with the supplier does not become a significant element in determining the success of the alliance while the trust and commitment are the most important elements. The experience in organizing auctions helped the buyers in coordinating their activities with their suppliers.

The general findings of this hypothesis, before filtering the data based on auction experience, are consistent with those of Monczka et al. (1998) and Mohr and Spekman (1994) with some minor exceptions. Monczka et al. (1998) defined trust and coordination as one single predictor while this study and the study by Mohr and Spekman (1994) defined trust and coordination as two separate predictors.

Commitment emerged as a significant predictor of the success of the strategic supplier alliances for this study and for the study by Mohr and Spekman (1994) but had little effect on industrial purchasing alliance success according to the study by Monczka et al. (1998).

Interdependence emerged as an insignificant predictor of the success of strategic supplier alliances in this study and the market channel relationships study by Mohr and Spekman (1994). Interdependence emerged as a significant predictor in the Monczka et al. (1998) study but not as a critical antecedent due to the small β value of 0.107, while trust and coordination β value was 0.751.

Communication Behavior

The data provided support for the hypothesized positive relationship between successful strategic supplier alliances and high levels of information sharing, information quality, and information participation.

Further analyses of the hypothesized relationship between successful strategic supplier alliances and communication behavior (information sharing, information quality, and information participation) were conducted by filtering the data according to the number of online reverse auctions the responding company had completed in the last 3 years. The data was initially clustered into two groups: companies without any online reverse auction experience (as buyers) and companies with experience in using online reverse auctions to purchase products and/or services.

The two groups had similar results with one exception. Information sharing, information quality, and information participation emerged as positive significant predictors of the success of the supplier strategic alliance for companies with auction experience. Companies without any experience in using online reverse auctions to outsource products and/or services revealed information sharing and information quality as positive significant predictors of the success of the supplier strategic alliance while information participation was insignificant (an explanation is discussed later).

For further analysis, the data was clustered into three groups (see Table 5-38): companies with no auction experience, companies with experience of no more than 15 auctions in the last 3 years, and companies who had completed more than 15 auctions in the last 3 years. Companies that had completed no more than 15 auctions in the last three years reported that successful strategic supplier alliances were associated with high levels of information sharing, information quality and information participation. On the other hand, companies that had completed more than 15 auctions in the last 3 years reported that successful strategic supplier alliances were associated with high levels of information sharing and information participation, while information quality was insignificant.

The insignificance of the predictor "information quality" is difficult to explain. One possibility is that, with the maturity in using online reverse auctions, companies are assuring the quality of the communication with the suppliers (timely, accurate, adequate, complete, and credible) through the auction process. Companies that have wide experience in using online reverse auctions, are using auctions as any other purchasing negotiation tool/methodology. Through the auction process and with the help of the market maker, who is usually better than the buyers in organizing RFQs, the buyer's communication with the supplier is assured to be timely, accurate, adequate, complete, and credible. Therefore, information quality can be an insignificant predictor of the success of the strategic supplier alliance.

On the other hand, information participation (seeking advice and counsel from suppliers, having the supplier participate in the buyer's planning activities, having the buyer participate in the supplier's planning activities, and soliciting improvement suggestions from the suppliers) started as an insignificant predictor of the supplier strategic alliance. With time and experience in using online reverse auctions, the information participation between the buyer and the suppliers becomes the most significant predictor of success.

The results of this research study, without filtering the data according to the auction experience, are consistent with those of Monczka et al. (1998) and Mohr and Spekman (1994), with some minor exceptions. Monczka et al. (1998) defined information quality and participation as one single predictor while this research study and the study by Mohr and Spekman (1994) defined Information quality and information participation as two separate predictors. Information sharing was negatively related to the success of the strategic supplier alliances according to the Mohr and Spekman study (although predicted to be positively related). This research study and the study by Monczka et al. (1998) found that information sharing was positively related to the success of the strategic supplier alliance.

Conflict Resolution

The data provided support for the hypothesized positive relationship between successful strategic supplier alliances and (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques, and (c) low use of destructive resolution techniques.

Further analyses of the hypothesized relationship between successful strategic supplier and conflict resolution were done in two steps as in the previous two sections. Companies with online reverse auction experience revealed positive significant relationships between successful strategic supplier alliances and (a) high use of constructive conflict resolution techniques, (b) low use of conflict avoidance techniques, and (c) low use of destructive resolution techniques. The research study was unable to give any conclusions for companies with no auction experience due to the low proportion of variation in the dependent variable (success of strategic supplier alliance) explained by the regression model (R^2=0.06).

Companies with experience of no more than 15 auctions in the last 3 years had reported avoidance resolution techniques to be insignificant. Companies with experience of more than 15 auctions in the last 3 years have reported constructive conflict resolution techniques to be insignificant. The research failed to provide any logical explanation for these results.

The results of this research study, without filtering the data according to reverse auction experience, are consistent with those of Monczka et al. (1998) and Mohr and Spekman (1994) with some minor exceptions. The study by Monczka et al. (1998) found a negative relationship between one of the two items measuring constructive conflict resolution techniques and successful strategic supplier alliances (although hypothesized to be positive). The study by Monczka et al. (1998) also reported the use of conflict avoidance techniques to be insignificant. The study by Mohr and Spekman (1994) reported a positive relationship between one of the two items measuring destructive conflict resolution techniques and successful strategic supplier alliances (although hypothesized to be negative).

Successful Online Reverse Auction Event

The research evaluated the success of online reverse auction events from two perspectives: ability to reduce purchase prices and the success of the strategic buyer-supplier alliance. Two hypotheses were developed that linked the reduction in purchase prices and the success of the supplier alliance to the perceived success of the online reverse auction event.

Interestingly, no significant relationship was found between reduction in purchase prices and the buyer's perception of a successful online reverse auction event. On the other hand, the data strongly supported the hypothesized positive relationship between the success of supplier strategic alliances and the buyer's perception of successful online reverse auction events. This finding emphasizes the buying companies' appreciation of the importance of the value of the strategic supplier alliance success. This finding is encouraging, considering the emphasis that has been (and should be) placed on the importance of cooperative strategic alliances with the suppliers to achieve prosperity for all the supply chain members.

The relationship between the success of an auction event and the reduction in purchase price was not significant for any group of data even after grouping the data based on the annual purchasing volume, number of employees, number of purchasing employees, and/or respondent's job position. Similar results were obtained when clustering the data based on the number of auctions the respondents had completed in the last three years. On the other hand, the relationship between the success of an auction event and the success of the strategic alliance was significant for all the different groups.

The insignificant relationship between reduction in purchase prices and the buyer's perception of a successful online reverse auction event could be simply explained by the companies' belief that the importance of the successful strategic alliances overshadows the importance of a short-term reduction in purchase prices. One possibility is that companies use auctions as audit tools for their current suppliers to assure the best prices and/or as a procurement negotiation tool with the intention to work collaboratively with the suppliers to establish and/or develop the relationship. Under this possibility, buyers know that with time and cooperation, reduction in purchase prices will be achieve sooner or later.

The finding of no significant relationship between reduction in purchase prices and the buyer's perception of a successful online reverse auction event is unexpected and counter to the hypothesized model. The hypothesized relationship was based on previous research which reported a strong positive relationship between successful implementation and the reduction in purchase price (e.g. Carter et al. 2004; Hartley et al. 2004; Wagner and Schwab 2004), especially the fact thatmany researchers reported that organizations adopt online reverse auctions to lower purchase prices and reduce transaction costs (Brunelli 2000; Hong and Hartley 2001; Moser 2002; and Ruzarika 2000).

One possibility for the contradiction between this research study and the previous research is the age of online reverse auctions. Freemarkets was the first online reverse auction service provider that introduced online reverse auctions less than a decade ago, and most other companies started introducing and using reverse auctions less than five years ago. It is possible that companies started to use reverse auctions with the sole purpose of reducing purchase prices, and that explains the findings of the previous research that was based on surveys and case studies in the early use of online reverse auctions (years 2000-2002).

With maturity and experience in the use of online reverse auctions, and buyers' realization of the importance of their supplier strategic alliances, buyers changed the way they are implementing and viewing online reverse auctions. From the buyers' experiences in using online reverse auctions, they figured out that the importance of the strategic alliances overshadows the expected quick reduction in purchase prices that will be achieved eventually.

The finding of the positive significant relationship between perceived successful implementation of an online reverse auction event and the success of strategic buyer-supplier alliances was expected and agrees with previous research, which emphasized that destroying buyer-supplier relationships was the main disadvantage of online reverse auctions (Emiliani and Stec 2002; Jap 2002). The finding also agrees with previous researchers (e.g. Hartley et al. 2004; Smart and Harrision 2003) who saw an opportunity in using online reverse auctions to enhance the strategic alliance and pursue a collaborative strategy as a way to reduce costs.

6.4 Limitations of the Study and Future Research Guidelines

The research has extended previous research in the area of online reverse auctions in several ways, by building on past theoretical and empirical research. This research study also opens a window for further research in this new emerging area. Each of the limitations of this study is an opening to an area of new research for future studies. Therefore, in this section, the researcher discusses some of the limitations of this research and recommendations for future research. The research was limited by:

(1) The type of companies surveyed: This research study focused mainly on manufacturing companies, with less than 25% of the respondents representing companies from retail and services companies.

(2) The size of the companies surveyed and the sample size: Due to the small sample size it was only viable to cluster the responses into two groups that represented smaller size companies and larger size companies. With a bigger sample size, the researcher recommends clustering the data into three groups and adding another group called medium-sized companies.

(3) The type of purchases made by the respondents companies: This study has classified purchased items into three categories. Other purchase types like capital equipment and resale items were not considered.

(4) The online reverse auction design elements: This study has only looked at the effects of two auction design elements (event organization and bidding format) on the reduction in purchase prices. Other possible online reverse auction design criteria include the opening price, bid decrement, closing rule (soft versus hard), and reserve price policy (with or without).

(5) The way buyers view online reverse auctions: The researcher assumed that online reverse auctions are used as a power-based bargaining tool or as a collaborative problem solving tool. The research revealed that the relationship between the auction application and the predictors of the success of the strategic alliances was insignificant. One future research possibility is investigating how companies

view auction applications when considering the online reverse auction effect on the predictors of the success of the strategic alliances.

(6) The geographic location: This research study focused on companies within the United States only. Other possibilities are to extend the research concept, methodology, and survey tool to companies in Western Europe and Japan.

(7) The buyer perspective: This research study has surveyed companies from the buyer's perspective only. An interesting possibility is to survey these companies from the suppliers' perspective.

(8) The elements of a successful online reverse auction event. This research study has defined a successful reverse auction event in terms of reduction in purchase price and supplier partnership. An interesting research possibility is to consider other criteria like service, quality, and delivery time.

(9) The filtering (grouping) criteria: For hypotheses 1-5 and 8-9, the data was clustered based on the annual sales volume, the annual purchasing volume, number of purchasing employees, total number of employees, and respondents' position. Similarly, for hypotheses 6-9 the data were grouped based on the auction experience. Further analysis can be done by grouping H1-H5 based on the auction experience, H6-H9 based on the company size, and/or H1-H9 based on the SIC codes in two categories (manufacturing companies versus retail and service companies).

Klemperer (1999) concluded his guide to auction theory literature by stating that "auction theory has been among the most successful branches of economics in recent years. The theory has developed rapidly, and is increasingly being looked at for assistance in practical applications. Testing auction-theoretic models is seen as one of the brightest spots in applied economics." The following are some other suggestions for future online reverse auction related research studies. It should be noted that several of these suggestions are a continuation of this research study:

1. A research study to determine why respondents prefer to organize online reverse auctions with the help of a market maker. An important question is whether, when a company is using auctions as a tool to reduce prices, should the company not also eliminate the fees of the market maker by organizing the reverse auction in-house? The real question is how market makers are adding value to the auction process.

2. A research study that tailors this study toward a specific industry like the petroleum industry.

3. A research study that compares the auction theory literature to the behavior and economics of online reverse auctions.

4. A research study on investigating when buyers are willing to switch suppliers. What is the expected percentage in the reduction in purchase prices in order to switch suppliers by purchase type using an online reverse auction? When should the company switch to a new supplier and when should it not?

5. This research study provides an interesting set of results worthy of future studies. There is a need to understand how online reverse auctions have affected the

evolution of trust in strategic alliances, and how this process can be managed through information sharing and participation.

6. There are several issues related to the buyer-supplier relationship dimension such as understanding the nature of conflict between collaborative supply chain management practices and online reverse auctions. Suppliers participate with the expectation that if they win business, they are awarded a long-term agreement that places them in a favorable position for renewal of the agreement when it expires. But will buyers that rely on cost reduction to meet financial goals stop seeking cost reduction at the end of the long-term agreement? Will the product/service be put up for bid again? Will it be re-bid during the term of the contract, thus effectively breaking the contract? Then what good is a contract? And what will be the impact upon trust, either implicit or explicit, in the buyer-supplier relationship? Does trust in business relationships matter anymore? If it does, then does re-bidding the work make sense? Will buyers and sellers ever revert to traditional, off-line, human negotiation processes?

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APPENDIX A

SURVEY INSTRUMENT

ISM™

institute for
supply management

2055 East Centennial Circle
Tempe, AZ 85284-1802
P.O. Box 22160
Tempe, AZ 85285-2160
USA

Phone: 480/752-6276
Fax: 480/752-7890

Memorandum

July 2005

The attached survey is collecting information toward the completion of the doctoral dissertation research project, "Implementing Business-to-Business Online Reverse Auctions," by Louie Sehwail, Ph.D. candidate at Oklahoma State University, School of Industrial Engineering and Management.

I encourage you to fill out the enclosed survey. Increasing the body of knowledge in the field and advancing the supply profession depends on solid research, which benefits us all.

Paul Novak, C.P.M., A.P.P.

Paul Novak, C.P.M., A.P.P.
Chief Executive Officer
ISM

Preparing Purchasing and Supply Professionals for the Future
www.ism.ws

A Survey on
Business-to-Business Online Reverse Auctions Implementation

by

Oklahoma State University - School of Industrial Eng. & Mgmt
in collaboration with the Institute of Supply Management (ISM**)**

Business-to-business online reverse auctions are the electronic procurement auctions hosted by a buying company to buy goods and/or services, in which multiple pre-qualified suppliers bid prices downward. Under the direction of **Dr. Ricki Ingalls** of Oklahoma State University-School of Industrial Engineering and Management, I am conducting my doctoral dissertation research using this questionnaire to examine how to use and implement online reverse auctions (procurement auctions) to achieve the buying organizations' simultaneous goals of cost management and cooperative buyer-supplier strategic alliances.

Electronic reverse auctions have been getting more attention in the areas of purchasing and supply management due to their controversy. All participants will receive a copy of the research findings, upon completion, if desired. You will get a chance to know the "best in-class" criteria for assuring successful auction events, how the "best-in-class" companies implement reverse auctions in order to reduce purchase prices while maintaining/developing the buyer-supplier relationships.

The completion of this survey would typically take 15 minutes and your response is vital. All information regarding participants is **confidential**. If you have any questions or concerns about the study, please contact **Louie Sehwail** at **Sehwail@okstate.edu** or **(405) 269-1010** or **Dr. Ricki Ingalls** at **Ingalls@okstate.edu** or **(405) 744-9129.**

Please return the survey before August 15, 2005 in the enclosed-paid envelop. Thank you for your participation. If you personally have not been involved in an online reverse auction event, please forward this questionnaire to the person in your organization with experience in online reverse auction. **Even if your company did not use online reverse auctions, you can provide valuable information about the nature of the buyer-supplier relationships by answering the survey *(please skip pages 3 & 4).***

Thank you for your assistance and cooperation.

Sincerely,

Louie Sehwail
PhD Candidate

Sincerely,

Ricki G. Ingalls, Ph.D.
Associate Professor

We kindly ask you to fill out this questionnaire and thank you in advance for your responses.

The data collected in this survey will be treated as confidential and will be made anonymous before analyzing. Neither you nor your company will be identified in any way. Information in reports will only be discussed at the aggregate level so that information about any particular firm cannot be ascertained or deduced by readers.

In every business-to-business online reverse auction event, there are buyers and suppliers. The objective of this survey is to identify the circumstances and sourcing strategies with regard to online reverse auctions that would create the most cost savings from the **buyer's** perspective according to buyers' experiences only.

If you were not involved in any reverse auction event, please route this questionnaire to the individual in your company who could most appropriately and accurately provide the pertinent information sought.

If you have any questions, please contact ***Louie Sehwail*** at **Sehwail@okstate.edu** or call him at 405-269-1010.

Did your company ever participate in an online reverse auction as a buyer?

Yes ____ No ____

If your answer was NO, please answer questions in page 1, 2, 5, 6 only.

General Information

(Please give an estimate if you do not know the exact answer)

1. What is your company approximate dollar value of purchases made in each category in the fiscal year 2004 using online reverse auctions?

$ ________ Production items and components

$ ________ Services

$ ________ MRO (maintenance, repair and operating expenses)

2. Please answer the following questions about your company:

Annual Sales (Year 2004 in US dollars)

___ Less than 100 Million ____ 100-499 Million

___ 500-999 Million ____ One Billion US dollars or above

Annual purchasing volume (Year 2004 in US Millions $)

_____ Less than 10 Million _____ 10-99 Million _____ 100-499 Million

_____ 500-999 Million _____ One Billion US dollars or above

Number of employees in your company:

___ 1 -50 ___ 51-250 ___ 251-1000 ___ Over 1000

Number of purchasing employees in your company:

___ 1 -5 ___ 6-20 ___ 21-50 ___ Over 50

Please check the position of your company in your supply chain (mark all that applies):

___ Raw Material Supplier ___ Component Supplier ___ Assembler

___ Sub-assembler ___ Manufacturer ___ Distributor

___ Wholesaler ___ Retailer

3. Please answer the following questions about yourself (the respondent)

Your job title ....

Years of experience with the company ________

(Please give an estimate if you do not know the exact answer for the following questions):

No. of online reverse auctions your company completed in the last 3 years ________

Number of reverse auctions completed in-house in 2004 ________

Number of reverse auctions completed with the help of an Online reverse auction provider in 2004 ________

Please indicate your email address if you would like to receive a summary report of the research findings:

______________________________ (Email)

IF YOUR COMPANY HAS NEVER ORGANIZED AN ONLINE REVERSE AUCTION EVENT TO PURCHASE PRODUCTS/SERVICES, PLEASE SKIP PAGES 3 & 4 AND GO DIRECTLY TO PAGES 5 & 6.

For each item identified below, circle the number that best fits your company experiences regarding using online reverse auctions.

Please indicate your agreement to the statements in this survey by selecting the appropriate number:

("1"= strongly disagree, "7"=strongly agree, "N/A"=not applicable).

Except where stated otherwise.

I. The following refer to the effect of the auction price visibility on the efficiency of online reverse auction to reduce purchase prices

	Not Applicable	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Auctions where suppliers can see each other bids are effective in reducing purchase prices (Open-bid).	N/A	1	2	3	4	5	6	7
2. Auctions where suppliers only know they have been outbid are effective in reducing purchase prices (sealed-bid).	N/A	1	2	3	4	5	6	7
3. Multi-round *sealed bid* auctions are more effective than multi-round *open bids* in reducing the purchasing prices.	N/A	1	2	3	4	5	6	7
4. Multi-round *open-bid* auctions are more effective than multi-round *sealed bids* in reducing the purchasing prices.	N/A	1	2	3	4	5	6	7

II. The following refers to the effect of the auction event organization on the reduction in purchase prices:

1. In-house organized online reverse auctions are effective in reducing purchase prices (compared to what the company used to pay).	N/A	1	2	3	4	5	6	7
2. Auctions organized in-house are more effective than auctions organized with the help of an online reverse auction service provider (market maker) in reducing purchase prices.	N/A	1	2	3	4	5	6	7
3. Auctions organized with the help of an online auction service provider (like TradingPartners or FreeMarkets) are:								
a) Effective in reducing purchase prices.	N/A	1	2	3	4	5	6	7
b) More effective than auctions organized in-house in reducing purchase prices.	N/A	1	2	3	4	5	6	7

III. The percentage of decrease in the purchase price due to the use of online reverse auction is:
(compared to what the company historically used to pay)

- Production material & components ________ %
- MRO (maintenance, repair and operating supplies) & Office Supplies ________ %
- Services ________ %

IV. The following refer to the effect of different types of purchases on the application of online reverse auctions as a power-based bargaining tool (short-term contracts) or a collaborative problem solving tool (long-term relationships).

	Not Applicable	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Our goal is short term contracts with the suppliers when we buy:								
- Production material & components	N/A	1	2	3	4	5	6	7
- MRO (maintenance, repair and operating supplies) & Office Supplies	N/A	1	2	3	4	5	6	7
- Services	N/A	1	2	3	4	5	6	7
2. Our goal is long term contracts with the suppliers when we buy:								
- Production material & components	N/A	1	2	3	4	5	6	7
- MRO (maintenance, repair and operating supplies) & Office Supplies	N/A	1	2	3	4	5	6	7
- Services	N/A	1	2	3	4	5	6	7
3. An online reverse auction is an excellent tool to reduce purchase prices on the :								
- Short term		1	2	3	4	5	6	7
- Long term		1	2	3	4	5	6	7
4. We use online reverse auctions to:								
- Achieve multiple sourcing		1	2	3	4	5	6	7
- Identify new long-term partnering suppliers		1	2	3	4	5	6	7
- Pressure our suppliers to reduce prices		1	2	3	4	5	6	7

V. Please rate your level of agreement about the following statements regarding how your company defines the success of an online reverse auction event:

1. If the prices paid for purchases using an online reverse auction event are less than the prices we used to pay, the auction event is considered successful.	1	2	3	4	5	6	7
2. We are satisfied with our savings from using online reverse auctions.	1	2	3	4	5	6	7
3. An online reverse auction event is considered a failure if results in destroying our relationship with one of our suppliers.	1	2	3	4	5	6	7
4. We are likely to reward our current loyal suppliers by continuing business with them, even if they are not the lowest bidders in the online reverse auction event.	1	2	3	4	5	6	7
5. We are satisfied with our online reverse auctions results.	1	2	3	4	5	6	7

VI. Please rate your level of agreement about the following statements regarding your company's relationship with your suppliers for the following dimensions:

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Trust							
1. We trust that our strategic supplier alliances/partnership will be beneficial to our business.	1	2	3	4	5	6	7
2. We do not get an equitable (fair) deal from our suppliers in these alliances.	1	2	3	4	5	6	7
3. The strategic supplier alliance/partnership is marked by a high degree of harmony.	1	2	3	4	5	6	7
Commitment							
1. We would like to discontinue buying from some of our current suppliers.	1	2	3	4	5	6	7
2. We are very committed to buying from our current suppliers.	1	2	3	4	5	6	7
3. We have minimal commitment to our suppliers.	1	2	3	4	5	6	7
Interdependence							
1. It would be very easy to terminate the relationship with any supplier and establish another strategic supplier.	1	2	3	4	5	6	7
2. The time to establish another new strategic supplier partnership would be extremely long.	1	2	3	4	5	6	7
3. The cost to establish another new strategic supplier partnership would be extremely high.	1	2	3	4	5	6	7
Coordination							
1. Our activities with our suppliers are well coordinated	1	2	3	4	5	6	7
2. Programs at our company are well coordinated with our suppliers.	1	2	3	4	5	6	7
3. We feel like we never know what we are suppose to be doing for our suppliers.	1	2	3	4	5	6	7

VII. To what extent do you feel that your company communication with your suppliers is:

a. Timely (1= Not timely at all, 7= very timely)	1	2	3	4	5	6	7
b. Accurate (1= Not accurate at all, 7= very accurate)	1	2	3	4	5	6	7
c. Adequate (1= Not adequate at all, 7= very adequate)	1	2	3	4	5	6	7
d. Complete (1= Not complete at all, 7= very complete)	1	2	3	4	5	6	7
e. Credible (1= Not credible at all, 7= very credible)	1	2	3	4	5	6	7

VIII. Assuming that some conflict exists with your supplier, how frequently are the following methods used to resolve such conflict? (1=Never, 7=Occasionally)

a. Smooth over the problem	1	2	3	4	5	6	7
b. Outside arbitration	1	2	3	4	5	6	7
c. Persuasive attempts by either party	1	2	3	4	5	6	7
d. Joint problem solving	1	2	3	4	5	6	7
e. Harsh words	1	2	3	4	5	6	7

IX. Please rate your level of agreement about the following statements regarding your company's relationships with your suppliers:

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Information Participation							
1. We actively seek advice, counsel, and information from our suppliers.	1	2	3	4	5	6	7
2. Our strategic suppliers participate in our planning & goal setting activities.	1	2	3	4	5	6	7
3. We participate in our suppliers' planning and goal setting activities that are relevant to our strategic supplier alliance/partnership.	1	2	3	4	5	6	7
4. We actively encourage improvement suggestions from our suppliers.	1	2	3	4	5	6	7
Information Sharing							
1. We share proprietary information with our suppliers.	1	2	3	4	5	6	7
2. Our suppliers share proprietary information with us.	1	2	3	4	5	6	7
3. We inform our suppliers in advance of changing needs.	1	2	3	4	5	6	7
4. In this relationship, it is expected that any information which might help the other party will be provided.	1	2	3	4	5	6	7
5. The parties are expected to keep each other informed about events or changes that might affect the other party.	1	2	3	4	5	6	7
6. It is expected that the parties will only provide information according to a pre-specified agreement.	1	2	3	4	5	6	7
7. Our suppliers keep us fully informed about issues that affect our business.	1	2	3	4	5	6	7
Strategic Alliance/Partnership							
1. In our strategic supplier alliances, the parties work together to solve problems.	1	2	3	4	5	6	7
2. Our suppliers are flexible to requests we make.	1	2	3	4	5	6	7
3. Our suppliers make an effort to help us during emergencies	1	2	3	4	5	6	7
4. When an agreement is made, we can always rely on our suppliers to fulfill the requirements.	1	2	3	4	5	6	7
5. We are satisfied with our company strategic supplier alliances.	1	2	3	4	5	6	7

X. When buying each of the following, the minimum expected percentage reduction in purchase price in order to switch suppliers is:

- Production material & components ______ %
- MRO (maintenance, repair and operating supplies) & Office Supplies ______ %
- Services ______ %

APPENDIX B

IRB APPROVAL

Oklahoma State University Institutional Review Board

Date:	Tuesday, July 05, 2005
IRB Application No	EG059
Proposal Title:	Implementing Business-To - Business Online Reverse Auctions
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 7/4/2006

Principal Investigator(s

Loay Sehwail 322 Engineering North Stillwater, OK 74078	Ricki Ingalls 322 Engineering North Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 415 Whitehurst (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Sue C Jacobs

Sue C. Jacobs, Chair
Institutional Review Board

APPENDIX C

GENERAL DESCRIPTIVE STATISTICS

APPENDIX C.1 - DESCRIPTIVE STATISTICS: EXPERIENCE AND NUMBER OF AUCTION COMPLETED

State	Sent	Rec'd	%
AL	18	2	11%
AR	3	0	0%
AZ	3	1	33%
CA	11	6	55%
CT	22	2	9%
DE	5	1	20%
FL	32	2	6%
GA	28	6	21%
IA	8	5	63%
IL	11	4	36%
IN	18	3	17%
KS	5	2	40%
KY	15	4	27%

State	Sent	Rec'd	%
LA	1	0	0%
MA	32	3	9%
MD	11	3	27%
ME	2	1	50%
MI	22	5	23%
MN	18	5	28%
MO	2	2	100%
MS	7	1	14%
NC	26	10	38%
NE	3	0	0%
NH	4	1	25%
NJ	31	9	29%
NY	45	9	20%

State	Sent	Rec'd	%
OH	56	16	29%
OK	3	2	67%
PA	54	15	28%
RI	3	0	0%
SC	10	1	10%
SD	2	0	0%
TN	18	6	33%
TX	25	10	40%
VA	13	2	15%
VT	2	0	0%
WA	7	2	29%
WI	26	5	19%
WV	1	0	0%

APPENDIX C.2 - DESCRIPTIVE STATISTICS: EXPERIENCE AND NUMBER OF AUCTION COMPLETED

Item	N	Min.	Max.	Mean	Median	Standard Deviation
Years of experience with the company	143	0.5	42	10.3	7	9.295
Number of online reverse auctions your company completed in the last 3 years	92	1	5000	145.9	14.5	569
Number of online reverse auctions completed in-house in 2004	93	0	1800	56.45	5	221.9
Number of online reverse auctions completed with the help of an online auction provider in 2004	93	0	500	13.56	2	54.86

APPENDIX C.3 - DESCRIPTIVE STATISTICS: EARLY (FIRST 2 WEEKS) VERSUS LATE RESPONSES

		N	Mean	Std. Deviation	Std. Error Mean
FOR	Early	61	4.07	0.95	0.12
	Late	35	3.91	0.70	0.12
EVENT	Early	60	3.13	1.26	0.16
	Late	35	2.82	1.36	0.23
RED	Early	58	0.15	0.08	0.01
	Late	28	0.14	0.05	0.01
POWER	Early	61	4.46	1.43	0.18
	Late	35	4.94	1.48	0.25
COLLAB	Early	61	4.63	1.35	0.17
	Late	35	4.05	1.31	0.22
IMPLT	Early	61	5.71	1.13	0.14
	Late	35	5.87	1.07	0.18
TRUST	Early	102	5.70	0.75	0.07
	Late	43	5.75	0.95	0.15
COMM	Early	102	4.61	1.13	0.11
	Late	43	4.54	1.41	0.22
INTD	Early	102	4.83	1.21	0.12
	Late	43	4.81	1.32	0.20
COORD	Early	102	5.24	1.14	0.11
	Late	43	5.47	1.29	0.20
INFOQ	Early	102	5.39	0.90	0.09
	Late	43	5.59	1.00	0.15
Conflict	Early	102	3.70	0.65	0.06
	Late	43	3.83	0.47	0.07
INFOP	Early	102	5.17	1.08	0.11
	Late	43	5.39	1.14	0.17
INFOS	Early	102	5.53	0.81	0.08
	Late	43	5.69	0.75	0.12
SSA	Early	102	5.70	0.69	0.07
	Late	43	5.91	0.68	0.10

APPENDIX C.4 – T-TEST FOR EQUALITY OF MEANS: EARLY (FIRST 2 WEEKS) VERSUS LATE RESPONSES

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig.	Mean Diff.	Std. Err. Diff.	95% CI of the Diff.	
									Lower	Upper
FOR	Equal variances assumed	2.24	0.14	0.82	94	0.41	0.15	0.18	-0.21	0.52
	Equal variances not assumed			0.89	88	0.37	0.15	0.17	-0.19	0.49
EVENT	Equal variances assumed	0.89	0.35	1.10	93	0.27	0.30	0.28	-0.25	0.85
	Equal variances not assumed			1.08	67	0.29	0.30	0.28	-0.26	0.87
RED	Equal variances assumed	2.57	0.12	0.848	84	0.40	0.01	0.02	-0.02	0.05
	Equal variances not assumed			0.969	75	0.34	0.01	0.01	-0.01	0.04
POWER	Equal variances assumed	0.39	0.53	-1.56	94	0.12	-0.48	0.31	-1.09	0.13
	Equal variances not assumed			-1.55	69	0.13	-0.48	0.31	-1.10	0.14
COLLAB	Equal variances assumed	0.00	0.98	2.01	94	0.05	0.57	0.28	0.01	1.13
	Equal variances not assumed			2.03	73	0.05	0.57	0.28	0.01	1.13
IMPLT	Equal variances assumed	0.01	0.94	-0.67	94	0.50	-0.16	0.23	-0.62	0.31
	Equal variances not assumed			-0.68	74	0.50	-0.16	0.23	-0.62	0.30
TRUST	Equal variances assumed	1.35	0.25	-0.34	143	0.74	-0.05	0.15	-0.34	0.24
	Equal variances not assumed			-0.31	65	0.76	-0.05	0.16	-0.38	0.28
COMM	Equal variances assumed	3.42	0.07	0.36	143	0.72	0.08	0.22	-0.36	0.52
	Equal variances not assumed			0.33	66	0.74	0.08	0.24	-0.41	0.56
INTD	Equal variances assumed	2.00	0.16	0.06	143	0.95	0.01	0.23	-0.43	0.46
	Equal variances not assumed			0.06	73	0.96	0.01	0.23	-0.45	0.48
COORD	Equal variances assumed	0.18	0.67	-1.06	143	0.29	-0.23	0.22	-0.66	0.20
	Equal variances not assumed			-1.01	71	0.32	-0.23	0.23	-0.68	0.22
INFOQ	Equal variances assumed	0.50	0.48	-1.19	143	0.23	-0.20	0.17	-0.54	0.13
	Equal variances not assumed			-1.14	72	0.26	-0.20	0.18	-0.56	0.15
Conflict	Equal variances assumed	6.84	0.01	-1.13	143	0.26	-0.12	0.11	-0.34	0.09
	Equal variances not assumed			-1.29	108	0.20	-0.12	0.10	-0.32	0.07

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	Sig.	t	df	Sig.	Mean Diff.	Std. Err. Diff.	95% CI of the Diff.	
									Lower	Upper
INFOP	Equal variances assumed	0.20	0.66	-1.12	143	0.27	-0.22	0.20	-0.62	0.17
	Equal variances not assumed			-1.09	75	0.28	-0.22	0.20	-0.63	0.18
INFOS	Equal variances assumed	0.05	0.82	-1.10	143	0.27	-0.16	0.14	-0.44	0.13
	Equal variances not assumed			-1.14	84	0.26	-0.16	0.14	-0.44	0.12
SSA	Equal variances assumed	0.47	0.49	-1.66	143	0.10	-0.21	0.12	-0.45	0.04
	Equal variances not assumed			-1.68	81	0.10	-0.21	0.12	-0.45	0.04

APPENDIX C.5 - DESCRIPTIVE STATISTICS: EARLY (FIRST 3 WEEKS) VERSUS LATE RESPONSES

		N	Mean	Std. Deviation	Std. Error Mean
FOR	Early	80	4.04	0.91	0.10
	Late	16	3.88	0.62	0.15
EVENT	Early	79	3.03	1.29	0.14
	Late	16	2.94	1.41	0.35
RED	Early	73	0.15	0.08	0.01
	Late	13	0.13	0.05	0.01
POWER	Early	80	4.59	1.45	0.16
	Late	16	4.87	1.51	0.38
COLLAB	Early	80	4.52	1.35	0.15
	Late	16	3.89	1.30	0.33
IMPLT	Early	80	5.76	1.09	0.12
	Late	16	5.81	1.20	0.30
TRUST	Early	125	5.70	0.78	0.07
	Late	20	5.80	1.02	0.23
COMM	Early	125	4.60	1.18	0.11
	Late	20	4.53	1.45	0.33
INTD	Early	125	4.82	1.23	0.11
	Late	20	4.87	1.35	0.30
COORD	Early	125	5.30	1.13	0.10
	Late	20	5.33	1.52	0.34
INFOQ	Early	125	5.40	0.92	0.08
	Late	20	5.76	1.00	0.22
Conflict	Early	125	3.75	0.62	0.06
	Late	20	3.67	0.48	0.11
INFOP	Early	125	5.19	1.09	0.10
	Late	20	5.51	1.15	0.26
INFOS	Early	125	5.56	0.79	0.07
	Late	20	5.68	0.85	0.19
SSA	Early	125	5.73	0.70	0.06
	Late	20	6.00	0.63	0.14

APPENDIX C.6 – T-TEST FOR EQUALITY OF MEANS: EARLY (FIRST 3 WEEKS) VERSUS LATE RESPONSES

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig.	Mean Diff.	Std. Err. Diff.	95% CI of the Diff.	
									Lower	Upper
FOR	Equal variances assumed	1.00	0.32	0.68	94	0.50	0.16	0.24	-0.31	0.63
	Equal variances not assumed			0.88	29	0.39	0.16	0.19	-0.22	0.54
EVENT	Equal variances assumed	0.37	0.55	0.26	93	0.79	0.09	0.36	-0.62	0.81
	Equal variances not assumed			0.25	20	0.81	0.09	0.38	-0.70	0.89
RED	Equal variances assumed	2.66	0.11	0.619	84	0.54	0.01	0.02	-0.03	0.06
	Equal variances not assumed			0.846	24	0.41	0.01	0.02	-0.02	0.05
POWER	Equal variances assumed	0.05	0.83	-0.71	94	0.48	-0.28	0.40	-1.08	0.51
	Equal variances not assumed			-0.69	20	0.50	-0.28	0.41	-1.14	0.57
COLLAB	Equal variances assumed	0.02	0.88	1.72	94	0.09	0.63	0.37	-0.10	1.36
	Equal variances not assumed			1.76	21	0.09	0.63	0.36	-0.11	1.38
IMPLT	Equal variances assumed	0.20	0.66	-0.16	94	0.87	-0.05	0.30	-0.65	0.55
	Equal variances not assumed			-0.16	20	0.88	-0.05	0.32	-0.72	0.62
TRUST	Equal variances assumed	0.58	0.45	-0.49	143	0.62	-0.10	0.20	-0.48	0.29
	Equal variances not assumed			-0.41	22	0.69	-0.10	0.24	-0.59	0.40
COMM	Equal variances assumed	0.25	0.62	0.23	143	0.82	0.07	0.29	-0.52	0.65
	Equal variances not assumed			0.20	23	0.85	0.07	0.34	-0.64	0.77
INTD	Equal variances assumed	1.02	0.31	-0.17	143	0.87	-0.05	0.30	-0.64	0.54
	Equal variances not assumed			-0.16	24	0.88	-0.05	0.32	-0.71	0.61
COORD	Equal variances assumed	0.49	0.49	-0.09	143	0.93	-0.03	0.29	-0.59	0.54
	Equal variances not assumed			-0.07	22	0.95	-0.03	0.36	-0.76	0.71

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig.	Mean Diff.	Std. Err. Diff.	95% CI of the Diff.	
INFOQ	Equal variances assumed	0.13	0.72	-1.62	143	0.11	-0.36	0.22	-0.80	0.08
	Equal variances not assumed			-1.52	24	0.14	-0.36	0.24	-0.85	0.13
Conflict	Equal variances assumed	1.37	0.24	0.56	143	0.57	0.08	0.15	-0.21	0.37
	Equal variances not assumed			0.68	30	0.50	0.08	0.12	-0.17	0.33
INFOP	Equal variances assumed	0.01	0.93	-1.23	143	0.22	-0.32	0.26	-0.85	0.20
	Equal variances not assumed			-1.18	24	0.25	-0.32	0.28	-0.89	0.24
INFOS	Equal variances assumed	0.46	0.50	-0.61	143	0.54	-0.12	0.19	-0.50	0.26
	Equal variances not assumed			-0.58	24	0.57	-0.12	0.20	-0.53	0.30
SSA	Equal variances assumed	0.97	0.33	-1.64	143	0.10	-0.27	0.17	-0.60	0.06
	Equal variances not assumed			-1.77	27	0.09	-0.27	0.15	-0.59	0.04

APPENDIX D

RELIABILITY ANALYSIS

APPENDIX D.1 – FACTOR ANALYSIS: AUCTION DESIGN (FORMAT)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.270	56.750	56.750	2.270	56.750	56.750
2	.798	19.946	76.696			
3	.493	12.337	89.034			
4	.439	10.966	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q4	.826
Q2	.802
Q3	.716
Q1	.658

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.2 – RELIABILITY ANALYSIS: AUCTION DESIGN (FORMAT)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	.421	.725
Q2	.603	.639
Q3	.513	.673
Q4	.627	.618

Reliability Statistics

Cronbach's Alpha	N	N of Items
.729	85	4

APPENDIX D.3 – FACTOR ANALYSIS: AUCTION DESIGN (EVENT ORGANIZATION)

Total Variance Explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	1.986	49.644	49.644
2	1.028	25.692	75.337
3			
4			

Extraction Method: Principal Component Analysis.

Rotated Component Matrix(a)

	Component	
	1	2
Q5	-.022	.992
Q6	.845	.098
Q7	.761	.003
Q8	.832	-.187

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.

APPENDIX D.4 – FACTOR ANALYSIS: AUCTION DESIGN (EVENT ORGANIZATION) After deleting Q5

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.988	66.261	66.261	1.988	66.261	66.261
2	.596	19.859	86.120			
3	.416	13.880	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component 1
Q6	.840
Q7	.760
Q8	.840

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.5 – RELIABILITY ANALYSIS: AUCTION DESIGN (EVENT ORGANIZATION)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q6	.648	.572
Q7	.497	.770
Q8	.651	.572

Reliability Statistics

Cronbach's Alpha	N	N of Items
.747	83	3

APPENDIX D.6 – FACTOR ANALYSIS: REDUCTION IN PURCHASE PRICE

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.686	56.216	56.216	1.686	56.216	56.216
2	.680	22.663	78.879			
3	.634	21.121	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component1
EPMC	.766
EMRO	.740
ESER	.744

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.7 – RELIABILITY ANALYSIS: REDUCTION IN PURCHASE PRICE

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
EPMC	.471	.575
EMRO	.540	.475
ESER	.430	.650

Reliability Statistics

Cronbach's Alpha	N	N of Items
.660	55	3

APPENDIX D.8 – FACTOR ANALYSIS: AUCTION APPLICATION (POWER BASED BARGAINING)

Total Variance Explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	2.681	44.690	44.690
2	1.324	22.073	66.763
3			
4			
5			
6			

Extraction Method: Principal Component Analysis.

Rotated Component Matrix(a)

	Component	
	1	2
Q9	.805	.299
Q10	.863	.257
Q11	.871	.282
Q15	.038	.670
Q17	.219	.742
Q19	.693	-.300

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.

APPENDIX D.9 – BIVARIATE CORRELATION ANALYSIS: AUCTION APPLICATION (POWER BASED BARGAINING) – Q16 & Q18

Correlations

			Q15	Q17
Spearman's rho	Q15	Correlation Coefficient	1.000	.228(*)
		Sig. (2-tailed)	.	.026
		N	96	96
	Q17	Correlation Coefficient	.228(*)	1.000
		Sig. (2-tailed)	.026	.
		N	96	96

* Correlation is significant at the 0.05 level (2-tailed).

APPENDIX D.10 – FACTOR ANALYSIS: AUCTION APPLICATION (POWER BASED BARGAINING) – Q9, Q10, Q11, Q19

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.747	68.679	68.679	2.747	68.679	68.679
2	.762	19.042	87.721			
3	.346	8.652	96.373			
4	.145	3.627	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q9	.858
Q10	.912
Q11	.921
Q19	.576

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.11 – RELIABILITY ANALYSIS: AUCTION APPLICATION (POWER BASED BARGAINING)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q9	.739	.793
Q10	.846	.739
Q11	.829	.747
Q19	.426	.905

Reliability Statistics

Cronbach's Alpha	N	N of Items
.852	84	4

APPENDIX D.12 – FACTOR ANALYSIS: AUCTION APPLICATION (COLLABORATIVE PROBLEM SOLVING)

Total Variance Explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	1.963	39.265	39.265
2	1.516	30.327	69.592
3			
4			
5			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component	
	1	2
Q12	.641	.514
Q13	.840	-.394
Q14	.827	-.470
Q16	.522	.644
Q18	.713	.206

Extraction Method: Principal Component Analysis.
a 2 components extracted.

APPENDIX D.13 – FACTOR ANALYSIS: AUCTION APPLICATION (COLLABORATIVE PROBLEM SOLVING) After deleting Q16

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.265	56.616	56.616	2.265	56.616	56.616
2	.897	22.424	79.039			
3	.653	16.333	95.372			
4	.185	4.628	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q12	.508
Q13	.873
Q14	.883
QQ19	.682

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.14 – RELIABILITY ANALYSIS: AUCTION APPLICATION (COLLABORATIVE PROBLEM SOLVING)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q13	.306	.782
Q14	.691	.574
Q15	.693	.570
Q19	.453	.720

Reliability Statistics

Cronbach's Alpha	N	N of Items
.737	83	4

APPENDIX D.15 – FACTOR ANALYSIS: SUCCESSFUL EVENT IMPLEMENTATION

Total Variance Explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	1.962	39.235	39.235
2	1.381	27.615	66.851
3			
4			
5			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component	
	1	2
Q20	.506	-.300
Q21	.880	-.211
Q22	.290	.828
Q23	.581	.554
Q24	.831	-.271

Extraction Method: Principal Component Analysis.
a 2 components extracted.

APPENDIX D.16 – CORRELATION ANALYSIS: Q22 and Q23

Correlations

		Q22	Q23
Q22	Correlation Coefficient	1.000	.408(**)
	Sig. (2-tailed)	.	.000
	N	96	96
Q23	Correlation Coefficient	.408(**)	1.000
	Sig. (2-tailed)	.000	.
	N	96	96

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX D.17 – FACTOR ANALYSIS: SUCCESSFUL EVENT IMPLEMENTATION (After deletion of Q22 and Q23)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.932	64.399	64.399	1.932	64.399	64.399
2	.831	27.687	92.086			
3	.237	7.914	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q20	.552
Q21	.915
Q24	.889

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.18 – RELIABILITY ANALYSIS: SUCCESSFUL EVENT IMPLEMENTATION (After deletion of Q22 and Q23)

Reliability Statistics

Cronbach's Alpha	N of Items
.712	3

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q20	.301	.858
Q21	.715	.385
Q24	.633	.487

APPENDIX D.19 – FACTOR ANALYSIS: SUCCESSFUL EVENT IMPLEMENTATION (After deletion of Q21, Q23 and Q24)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.758	87.894	87.894	1.758	87.894	87.894
2	.242	12.106	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q21	.938
Q24	.938

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.20 – RELIABILITY ANALYSIS: SUCCESSFUL EVENT IMPLEMENTATION (After deletion of Q20, Q22 and Q23)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q21	.758	.(a)
Q24	.758	.(a)

Reliability Statistics

Cronbach's Alpha	N	N of Items
.858	96	2

APPENDIX D.21 – FACTOR ANALYSIS: ATTRIBUTE OF THE ALLIANCE (TRUST)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.784	59.472	59.472	1.784	59.472	59.472
2	.658	21.918	81.390			
3	.558	18.610	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q25	.739
Q26	.777
Q27	.796

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.22 – RELIABILITY ANALYSIS: ATTRIBUTE OF THE ALLIANCE (TRUST)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q25	.433	.606
Q26	.481	.531
Q27	.501	.483

Reliability Statistics

Cronbach's Alpha	N	N of Items
.646	145	3

APPENDIX D.23 – FACTOR ANALYSIS: ATTRIBUTE OF THE ALLIANCE (COMMITMENT)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.831	61.020	61.020	1.831	61.020	61.020
2	.635	21.181	82.202			
3	.534	17.798	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q28	.748
Q29	.793
Q30	.801

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.24 – RELIABILITY ANALYSIS: ATTRIBUTE OF THE ALLIANCE (COMMITMENT)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q28	.455	.629
Q29	.499	.553
Q30	.504	.516

Reliability Statistics

Cronbach's Alpha	N	N of Items
.656	145	3

APPENDIX D.25 – FACTOR ANALYSIS: ATTRIBUTE OF THE ALLIANCE (INTERDEPENDENCE)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.031	67.699	67.699	2.031	67.699	67.699
2	.681	22.684	90.382			
3	.289	9.618	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q31	.696
Q32	.868
Q33	.890

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.26 –RELIABILITY ANALYSIS: ATTRIBUTE OF THE ALLIANCE (INTERDEPENDENCE)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q31	.440	.828
Q32	.637	.606
Q33	.689	.550

Reliability Statistics

Cronbach's Alpha	N	N of Items
.754	145	3

APPENDIX D.27 – FACTOR ANALYSIS: ATTRIBUTE OF THE ALLIANCE (COORDINATION)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.995	66.516	66.516	1.995	66.516	66.516
2	.830	27.664	94.180			
3	.175	5.820	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q34	.920
Q35	.926
Q36	.540

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.28 – RELIABILITY ANALYSIS: ATTRIBUTE OF THE ALLIANCE (COORDINATION)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q34	.673	.463
Q35	.671	.431
Q36	.305	.901

Reliability Statistics

Cronbach's Alpha	N	N of Items
.710	144	3

APPENDIX D.29 – FACTOR ANALYSIS: ATTRIBUTE OF THE ALLIANCE (COORDINATION) with Q36 deleted

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.825	91.253	91.253	1.825	91.253	91.253
2	.175	8.747	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q34	.955
Q35	.955

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.30– INTER-CORRELATION ANALYSIS: ATTRIBUTE OF THE ALLIANCE (COORDINATION) with Q36 deleted

Correlations

			Q34	Q35
Spearman's rho	Q34	Correlation Coefficient	1.000	.821(**)
		Sig. (2-tailed)	.	.000
		N	145	145
	Q35	Correlation Coefficient	.821(**)	1.000
		Sig. (2-tailed)	.000	.
		N	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX D.31 – RELIABILITY ANALYSIS: ATTRIBUTE OF THE ALLIANCE (COORDINATION) with Q36 deleted

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q34	.825	.
Q35	.825	.

Reliability Statistics

Cronbach's Alpha	N	N of Items
.900	145	2

APPENDIX D.32 – FACTOR ANALYSIS: ATTRIBUTE OF THE ALLIANCE (INFORMATION QUALITY)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.717	74.341	74.341	3.717	74.341	74.341
2	.529	10.589	84.930			
3	.324	6.489	91.419			
4	.277	5.531	96.950			
5	.152	3.050	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q37	.851
Q38	.887
Q39	.866
Q40	.928
Q41	.772

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.33 –RELIABILITY ANALYSIS: ATTRIBUTE OF THE ALLIANCE (INFORMATION QUALITY)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q37	.765	.893
Q38	.811	.885
Q39	.784	.892
Q40	.878	.868
Q41	.660	.913

Reliability Statistics

Cronbach's Alpha	N	N of Items
.911	145	5

APPENDIX D.34 – FACTOR ANALYSIS: ATTRIBUTE OF THE ALLIANCE (CONFLICT RESOLUTION)

Total Variance Explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	1.267	25.336	25.336
2	1.224	24.472	49.808
3	1.115	22.302	72.110
4			
5			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component		
	1	2	3
Q42	.676	.133	-.550
Q43	.193	-.667	.407
Q44	.554	.611	.252
Q45	-.601	.532	.311
Q46	.532	.039	.641

Extraction Method: Principal Component Analysis.
a 3 components extracted.

APPENDIX D.35 – FACTOR ANALYSIS: ATTRIBUTE OF THE ALLIANCE (INFORMATION PARTICIPATION)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.565	64.126	64.126	2.565	64.126	64.126
2	.640	16.007	80.134			
3	.566	14.138	94.271			
4	.229	5.729	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q47	.700
Q48	.905
Q49	.833
Q50	.749

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.36 – RELIABILITY ANALYSIS: ATTRIBUTE OF THE ALLIANCE (INFORMATION PARTICIPATION)

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q47	.512	.811
Q48	.804	.659
Q49	.690	.731
Q50	.568	.788

Reliability Statistics

Cronbach's Alpha	N	N of Items
.807	145	4

APPENDIX D.37 – FACTOR ANALYSIS: INFORMATION SHARING

Total Variance Explained

Component	Rotation Sums of Squared Loadings			
	Total	Total	% of Variance	Cumulative %
1	3.000	2.609	37.276	37.276
2	1.378	1.768	25.259	62.534
3	.974			
4	.676			
5	.423			
6	.350			
7	.200			

Extraction Method: Principal Component Analysis.

Rotated Component Matrix(a)

	Component	
	1	2
Q51	.091	.931
Q52	.217	.908
Q53	.787	.077
Q54	.805	.156
Q55	.788	.077
Q56	.262	.055
Q57	.773	.194

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.

APPENDIX D.38 – CORRELATION ANALYSIS: INFORMATION SHARING

Correlations

			Q51	Q52
Spearman's rho	Q51	Correlation Coefficient	1.000	.671(**)
		Sig. (2-tailed)	.	.000
		N	145	145
	Q52	Correlation Coefficient	.671(**)	1.000
		Sig. (2-tailed)	.000	.
		N	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX D.39 – FACTOR ANALYSIS: INFORMATION SHARING (With Q51, Q52, and Q56 deleted)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.575	64.375	64.375	2.575	64.375	64.375
2	.646	16.157	80.533			
3	.410	10.262	90.794			
4	.368	9.206	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q53	.794
Q54	.817
Q55	.797
Q57	.800

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.40 – RELIABILITY ANALYSIS: INFORMATION SHARING

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q53	.641	.735
Q54	.632	.742
Q55	.617	.767
Q57	.641	.752

Reliability Statistics

Cronbach's Alpha	N	N of Items
.800	145	4

APPENDIX D.41 – FACTOR ANALYSIS: STRATEGIC SUPPLIER ALLIANCE

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.051	61.023	61.023	3.051	61.023	61.023
2	.689	13.771	74.794			
3	.496	9.914	84.708			
4	.396	7.917	92.625			
5	.369	7.375	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component
	1
Q58	.830
Q59	.793
Q60	.785
Q61	.696
Q62	.796

Extraction Method: Principal Component Analysis.
a 1 components extracted.

APPENDIX D.42 – RELIABILITY ANALYSIS: STRATEGIC SUPPLIER ALLIANCE

Item-Total Statistics

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q58	.703	.778
Q59	.639	.796
Q60	.643	.803
Q61	.547	.827
Q62	.668	.788

Reliability Statistics

Cronbach's Alpha	N	N of Items
.832	145	5

APPENDIX E

VALIDITY ANALYSIS

APPENDIX E.1 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE AUCTION DESIGN (FORMAT) SCALE

Correlations

		Q1	Q2	Q3	Q4
Q1	Pearson Correlation	1	.346(**)	.233(*)	.473(**)
	Sig. (2-tailed)		.001	.032	.000
	N	95	93	85	85
Q2	Pearson Correlation	.346(**)	1	.493(**)	.529(**)
	Sig. (2-tailed)	.001		.000	.000
	N	93	94	85	85
Q3	Pearson Correlation	.233(*)	.493(**)	1	.437(**)
	Sig. (2-tailed)	.032	.000		.000
	N	85	85	85	85
Q4	Pearson Correlation	.473(**)	.529(**)	.437(**)	1
	Sig. (2-tailed)	.000	.000	.000	
	N	85	85	85	85

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

APPENDIX E.2 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE AUCTION DESIGN (EVENT ORGANIZATION) SCALE

Correlations

		Q6	Q7	Q8
Q6	Pearson Correlation	1	.446(**)	.584(**)
	Sig. (2-tailed)		.000	.000
	N	85	84	84
Q7	Pearson Correlation	.446(**)	1	.447(**)
	Sig. (2-tailed)	.000		.000
	N	84	94	86
Q8	Pearson Correlation	.584(**)	.447(**)	1
	Sig. (2-tailed)	.000	.000	
	N	84	86	87

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.3 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE REDUCTION IN PURCHASE PRICE SCALE

Correlations

		EPMC	EMRO	ESER
EPMC	Pearson Correlation	1	.352(**)	.357(**)
	Sig. (2-tailed)		.005	.005
	N	81	62	59
EMRO	Pearson Correlation	.352(**)	1	.320(*)
	Sig. (2-tailed)	.005		.015
	N	62	66	57
ESER	Pearson Correlation	.357(**)	.320(*)	1
	Sig. (2-tailed)	.005	.015	
	N	59	57	62

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

APPENDIX E.4 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE AUCTION APPLICATION (POWER BASED BARGAINING) SCALE

Correlations

		Q9	Q10	Q11	Q19
Q9	Pearson Correlation	1	.702(**)	.701(**)	.301(**)
	Sig. (2-tailed)		.000	.000	.003
	N	94	90	84	94
Q10	Pearson Correlation	.702(**)	1	.854(**)	.324(**)
	Sig. (2-tailed)	.000		.000	.002
	N	90	91	85	91
Q11	Pearson Correlation	.701(**)	.854(**)	1	.416(**)
	Sig. (2-tailed)	.000	.000		.000
	N	84	85	85	85
Q19	Pearson Correlation	.301(**)	.324(**)	.416(**)	1
	Sig. (2-tailed)	.003	.002	.000	
	N	94	91	85	96

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.5 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE AUCTION APPLICATION (COLLABORATIVE PROBLEM SOLVING) SCALE

Correlations

		Q12	Q13	Q14	Q18
Q12	Pearson Correlation	1	.268(*)	.226(*)	.306(**)
	Sig. (2-tailed)		.011	.040	.003
	N	94	89	83	94
Q13	Pearson Correlation	.268(*)	1	.809(**)	.371(**)
	Sig. (2-tailed)	.011		.000	.000
	N	89	90	84	90
Q14	Pearson Correlation	.226(*)	.809(**)	1	.434(**)
	Sig. (2-tailed)	.040	.000		.000
	N	83	84	84	84
Q18	Pearson Correlation	.306(**)	.371(**)	.434(**)	1
	Sig. (2-tailed)	.003	.000	.000	
	N	94	90	84	96

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.6 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE SUCCESSFUL EVENT IMPLEMENTATION SCALE

Correlations

		Q21	Q24
Q21	Pearson Correlation	1	.758(**)
	Sig. (2-tailed)		.000
	N	96	96
Q24	Pearson Correlation	.758(**)	1
	Sig. (2-tailed)	.000	
	N	96	96

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.7 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE ATTRIBUTE OF THE ALLIANCE (TRUST) SCALE

Correlations

		Q25	Q26	Q27
Q25	Pearson Correlation	1	.353(**)	.384(**)
	Sig. (2-tailed)		.000	.000
	N	145	145	145
Q26	Pearson Correlation	.353(**)	1	.438(**)
	Sig. (2-tailed)	.000		.000
	N	145	145	145
Q27	Pearson Correlation	.384(**)	.438(**)	1
	Sig. (2-tailed)	.000	.000	
	N	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.8 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE ATTRIBUTE OF THE ALLIANCE (COMMITMENT) SCALE

Correlations

		Q28	Q29	Q30
Q28	Pearson Correlation	1	.383(**)	.396(**)
	Sig. (2-tailed)		.000	.000
	N	145	145	145
Q29	Pearson Correlation	.383(**)	1	.465(**)
	Sig. (2-tailed)	.000		.000
	N	145	145	145
Q30	Pearson Correlation	.396(**)	.465(**)	1
	Sig. (2-tailed)	.000	.000	
	N	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.9 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE ATTRIBUTE OF THE ALLIANCE (INTERDEPENDENCE) SCALE

Correlations

		Q31	Q32	Q33
Q31	Pearson Correlation	1	.380(**)	.436(**)
	Sig. (2-tailed)		.000	.000
	N	145	145	145
Q32	Pearson Correlation	.380(**)	1	.708(**)
	Sig. (2-tailed)	.000		.000
	N	145	145	145
Q33	Pearson Correlation	.436(**)	.708(**)	1
	Sig. (2-tailed)	.000	.000	
	N	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.10 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE ATTRIBUTE OF THE ALLIANCE (COORDINATION) SCALE

Correlations

		Q34	Q35
Q34	Pearson Correlation	1	.825(**)
	Sig. (2-tailed)		.000
	N	145	145
Q35	Pearson Correlation	.825(**)	1
	Sig. (2-tailed)	.000	
	N	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.11 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE COMMUNICATION BEHAVIOR (INFORMATION QUALITY) SCALE

Correlations

		Q37	Q38	Q39	Q40	Q41
Q37	Pearson Correlation	1	.706(**)	.712(**)	.721(**)	.520(**)
	Sig. (2-tailed)		.000	.000	.000	.000
	N	145	145	145	145	145
Q38	Pearson Correlation	.706(**)	1	.662(**)	.794(**)	.646(**)
	Sig. (2-tailed)	.000		.000	.000	.000
	N	145	145	145	145	145
Q39	Pearson Correlation	.712(**)	.662(**)	1	.799(**)	.541(**)
	Sig. (2-tailed)	.000	.000		.000	.000
	N	145	145	145	145	145
Q40	Pearson Correlation	.721(**)	.794(**)	.799(**)	1	.661(**)
	Sig. (2-tailed)	.000	.000	.000		.000
	N	145	145	145	145	145
Q41	Pearson Correlation	.520(**)	.646(**)	.541(**)	.661(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	145	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.12 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE COMMUNICATION BEHAVIOR (INFORMATION PARTICIPATION) SCALE

Correlations

		Q47	Q48	Q49	Q50
Q47	Pearson Correlation	1	.522(**)	.404(**)	.383(**)
	Sig. (2-tailed)		.000	.000	.000
	N	145	145	145	145
Q48	Pearson Correlation	.522(**)	1	.745(**)	.575(**)
	Sig. (2-tailed)	.000		.000	.000
	N	145	145	145	145
Q49	Pearson Correlation	.404(**)	.745(**)	1	.461(**)
	Sig. (2-tailed)	.000	.000		.000
	N	145	145	145	145
Q50	Pearson Correlation	.383(**)	.575(**)	.461(**)	1
	Sig. (2-tailed)	.000	.000	.000	
	N	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.13 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE COMMUNICATION BEHAVIOR (INFORMATION SHARING) SCALE

Correlations

		Q53	Q54	Q55	Q57
Q53	Pearson Correlation	1	.501(**)	.456(**)	.598(**)
	Sig. (2-tailed)		.000	.000	.000
	N	145	145	145	145
Q54	Pearson Correlation	.501(**)	1	.622(**)	.492(**)
	Sig. (2-tailed)	.000		.000	.000
	N	145	145	145	145
Q55	Pearson Correlation	.456(**)	.622(**)	1	.481(**)
	Sig. (2-tailed)	.000	.000		.000
	N	145	145	145	145
Q57	Pearson Correlation	.598(**)	.492(**)	.481(**)	1
	Sig. (2-tailed)	.000	.000	.000	
	N	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.14 – PEARSON PRODUCT-MOMENT CORRELATION FOR THE STRATEGIC SUPPLIER ALLIANCE SCALE

Correlations

		Q58	Q59	Q60	Q61	Q62
Q58	Pearson Correlation	1	.596(**)	.550(**)	.467(**)	.595(**)
	Sig. (2-tailed)		.000	.000	.000	.000
	N	145	145	145	145	145
Q59	Pearson Correlation	.596(**)	1	.597(**)	.374(**)	.505(**)
	Sig. (2-tailed)	.000		.000	.000	.000
	N	145	145	145	145	145
Q60	Pearson Correlation	.550(**)	.597(**)	1	.423(**)	.485(**)
	Sig. (2-tailed)	.000	.000		.000	.000
	N	145	145	145	145	145
Q61	Pearson Correlation	.467(**)	.374(**)	.423(**)	1	.516(**)
	Sig. (2-tailed)	.000	.000	.000		.000
	N	145	145	145	145	145
Q62	Pearson Correlation	.595(**)	.505(**)	.485(**)	.516(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	145	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

APPENDIX E.15 – PEARSON PRODUCT-MOMENT INTER CORRELATIONS BETWEEN SCALES

	FOR	EVENT	RED	POWER	COLL AB	IMPL T	TRUS T	COMM	INTD	COOR D	SMOO TH	ARB T	PERS	JOINT	HARS H	INFO Q	INFO P	INFOS	SSA
FOR	1																		
EVENT	.05	1																	
RED	-.08	-.03	1																
POWE R	.01	-.08	-.03	1															
COLLA B	-.05	.07	-.02	-.73**	1														
IMPLT	-.08	-.04	.21	.20	-.06	1	.38**												
TRUST	.09	-.20	-.20	.18	-.13	.38**	1												
COMM	-.00	-.21*	-.21*	.20	-.28**	.31**	.60**	1											
INTD	-.05	-.12	-.12	.17	-.31**	.08	.16	.32**	1										
COOR D	.05	-.12	-.12	.15	-.14	.48**	.42**	.40**	.05	1									
SMOO TH	.09	-.04	-.04	-.05	.18	-.11	-.07	-.17*	-.15	-.128	1								
ARBT	-.16	.14	.14	-.18	.04	-.04	-.13	-.07	.12	-.030	-.02	1							
PERS	.04	-.37**	-.37**	.15	-.14	-.05	-.15	-.07	-.01	-.043	.23**	-.02	1						
JOINT	-.03	-.27**	-.28**	.30**	-.23*	.44**	.29**	.37**	.08	.42**	-.27**	-.13	.037	1					
HARS H	.01	.04	.04	-.19	.18	-.30**	-.42**	-.33**	-.18*	-.14	.02	.07	.21**	-.15	1				
INFOQ	.078	-.13	-.13	.29**	-.34**	.28**	.37**	.41**	.10	.66**	-.01	.03	.06	.44**	-.19*	1			
INFOP	-.02	.05	.05	.23*	-.14	.53**	.43**	.49**	.27**	.59**	-.05	.07	-.12	.45**	-.37**	.52**	1		
INFOS	.09	-.09	-0.09	.215*	-.23*	.34**	.40**	.41**	.14	.47**	-.07	.01	-.03	.44**	-.26**	.58**	.68**	1	
SSA	.09	-.15	-.15	.23*	-.24*	.37**	.47**	.48**	.12	.54**	-.15	-.08	-.07	.46**	-.32**	.58**	.63**	.70**	1

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

FOR: Auction Design (Format)
EVENT: Auction Design (Event Organization)
RED: Reduction in Purchase Price
POWER: Auction Application (Power based Bargaining)
COLLAB: Auction Application (Collaborative Problem Solving)
IMPLT: Successful Event Implementation
TRUST: Attribute of the Alliance (Trust)
COMM: Attribute of the Alliance (Commitment)
INTD: Attribute of the Alliance (Interdependence)
COORD: Attribute of the Alliance (Coordination)
SMOOTH: Smooth over the Problem
ARBT: Outside Arbitration
PERS: Persuasive Attempts by Either Party
JOINT: Joint Problem Solving
HARSH: Harsh Words
INFOQ: Information Quality
INFOP/INFOS: Information Participation / Information Quality
SSA: Strategic Supplier Alliance

APPENDIX F

SCALE DESCRIPTIVE STATISTICAL ANALYSIS

Factors / Items	N	Min.	Max.	Mean	Std. Deviation
Auction Design (Format)					
Q1. Auctions where suppliers can see others' bids are effective in reducing purchase prices (open-bid).	95	2	7	6.07	1.15
Q2. Auctions where suppliers only know they have been outbid are effective in reducing purchase prices (sealed-bid).{Reverse Scored}	94	1	7	4.41	2.03
Q3. Multi-round sealed bid auctions are more effective than multi-round open bids in reducing the purchasing prices. {Reverse Scored}	85	1	7	2.92	1.56
Q4. Multi-round open-bid auctions are more effective than multi-round sealed bids in reducing the purchasing prices.	85	2	7	5.41	1.35
Auction Design (Event Organization)					
Q6. Auctions organized in-house are more effective than auctions organized with the help of an online reverse auction service provider (market maker) in reducing purchasing prices.	85	1	7	3.56	1.70
Q7. Auctions organized with the help on an online auction service provider (like Trade-Partners or Freemarkets) are effective in reducing purchase prices.{Reverse Scored}	94	2	7	5.78	1.05
Q8. Auctions organized with the help on an online auction service provider (like Trade-Partners or Freemarkets) are more effective than auctions organized in-house in reducing the purchasing prices.{Reverse Scored}	87	1	7	4.51	1.73
Reduction in Purchase Price					
OPMC: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing production material and components.	81	0%	30%	12.9%	0.065
OMRO: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing MROs.	66	3%	71%	16.7%	0.106
OSER: The use of online reverse auctions has led to a decrease in the purchase price paid for purchasing services.	62	0%	40%	13.5%	0.082

Factors / Items	N	Min.	Max.	Mean	Std. Deviation
Auction Application (Power-based Bargaining)					
Q9. Our goal is short term contract with the suppliers when we buy production material and components.	94	1	7	3.90	2.03
Q10. Our goal is short term contract with the suppliers when we buy MROs.	91	1	7	4.35	1.95
Q11. Our goal is short term contract with the suppliers when we buy services.	85	1	7	4.20	1.99
Q19. We use online reverse auction to pressure our suppliers to reduce purchase prices.	96	1	7	5.94	1.00
Auction Application (Collaborative Problem Solving)					
Q12. Our goal is long term contract with the suppliers when we buy production material and components.	94	1	7	5.18	1.55
Q13. Our goal is long term contract with the suppliers when we buy MROs.	90	1	7	4.08	1.94
Q14. Our goal is long term contract with the suppliers when we buy services.	84	1	7	4.08	2.01
Q18. We use online reverse auction to identify new long-term partnering suppliers.	96	1	7	4.22	1.82
Successful Event Implementation					
Q21. We are satisfied with our savings using online reverse auctions.	96	1	7	5.84	1.10
Q24. We are satisfied with our company online reverse auctions results.	96	1	7	5.70	1.26
Attribute of the Alliance (Trust)					
Q25. We trust that our strategic supplier alliances will be beneficial to our business.	145	2	7	6.26	0.78
Q26. We do not get an equitable (fair) deal from our suppliers in these alliances. {Reverse Scored}	145	1	7	5.54	1.24
Q27. The relationships with our suppliers are marked by a high degree of harmony.	145	1	7	5.34	1.11
Attribute of the Alliance (Commitment)					
Q28. We would like to discontinue buying from our current suppliers. {Reverse Scored}	145	1	7	3.51	1.94
Q29. We are very committed to buying from our current suppliers.	145	1	7	5.12	1.24
Q30. We have minimal commitment to our suppliers. {Reverse Scored}	145	1	7	5.14	1.48

Factors / Items	N	Min.	Max.	Mean	Std. Deviation
Attribute of the Alliance (Interdependence)					
Q31. It would be very easy to terminate the relationship with any supplier and establish another strategic supplier. {Reverse Scored}	145	1	7	5.30	1.54
Q32. The time to establish another new strategic supplier partnership would be extremely long.	145	1	7	4.70	1.55
Q33. The cost to establish another new strategic supplier partnership would be extremely high.	145	1	7	4.46	1.46
Attribute of the Alliance (Coordination)					
Q34. Our activities with our suppliers are well coordinated.	145	1	7	5.43	1.17
Q35. Programs at our company are well coordinated with our suppliers.	145	1	7	5.18	1.32
Communication Behavior (Information Quality)					
Q37. To what extent do you feel that your company communication with your suppliers is timely?	145	2	7	5.51	1.01
Q38. To what extent do you feel that your company communication with your suppliers is accurate?	145	2	7	5.48	0.99
Q39. To what extent do you feel that your company communication with your suppliers is adequate?	145	1	7	5.23	1.28
Q40. To what extent do you feel that your company communication with your suppliers is complete?	145	2	7	5.26	1.15
Q41. To what extent do you feel that your company communication with your suppliers is credible?	145	3	7	5.77	0.99
Conflict Resolution					
Q42. Smooth over the problem	145	1	7	4.16	1.69
Q43. Outside arbitration	145	1	4	1.54	0.76
Q44. Persuasive attempts by either party	145	1	7	4.74	1.41
Q45. Joint problem solving	145	3	7	6.03	0.81
Q46. Harsh words	145	1	7	2.23	1.43

Factors / Items	N	Min.	Max.	Mean	Std. Deviation
Communication Behavior (Information Participation)					
Q47. We actively seek advice, counsel, and information from our suppliers.	145	2	7	5.78	1.02
Q48. Our strategic suppliers participate in our planning and goal setting activities.	145	1	7	4.69	1.63
Q49. We participate in our suppliers' planning and goal setting activities that are relevant to our strategic partnership.	145	1	7	4.57	1.65
Q50. We actively encourage improvement suggestions from our suppliers.	145	2	7	5.89	1.11
Communication Behavior (Information Sharing)					
Q53. We inform our suppliers in advance of changing needs.	145	1	7	5.43	1.05
Q54. In this relationship, it is expected that any information which might help the other party will be provided.	145	3	7	5.76	0.93
Q55. The parties are expected to keep each other informed about events or changes that might affect the other party.	145	3	7	6.03	0.71
Q57. Our Supplier keep us fully informed about issues that affect our business.	145	2	7	5.07	1.25
Strategic Supplier Alliance					
Q58. In our strategic supplier alliances, the parties work together to solve problems.	145	3	7	5.86	0.87
Q59. Our suppliers are flexible to requests we make.	145	3	7	5.68	0.91
Q60. Our suppliers make an effort to help us during emergencies.	145	4	7	6.25	0.68
Q61. When an agreement is made, we can always rely on our suppliers to fulfill the requirements.	145	2	7	5.53	1.01
Q62. We are satisfied with our company strategic supplier alliances.	145	3	7	5.51	0.96

APPENDIX G

HYPOTHESES ANALYSIS

APPENDIX G.1 – HYPOTHESIS 1 ANALYSIS FOR DIFFERENT GROUPS

Test Value = 0 versus > 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	29	5.79	4.74	0.88	4.29	6.57	0.000
More than One Billion	55	3.55	.47	0.60	2.53	5.89	0.000
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	33	5.42	4.99	0.87	3.95	6.25	0.000
More than 500 Million	51	3.61	4.34	0.61	2.59	5.94	0.000
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	30	5.37	5.37	0.98	3.70	5.47	0.000
More than 1000 Employees	54	3.74	4.16	0.57	2.79	6.61	0.000
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	30	5.73	5.04	0.92	4.17	6.23	0.000
More than 20 Employees	54	3.53	4.29	0.58	2.56	6.06	0.000
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	25	4.88	4.17	0.84	3.45	5.84	0.000
Sr. Manager or Manager	50	4.38	4.79	0.68	3.24	6.47	0.000
Sr. Buyer or Buyer	9	2.44	5.27	1.76	-0.82	5.39	0.000

APPENDIX G.2 – HYPOTHESIS 2 ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus > 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	27	-2.56	3.13	0.60	-3.58	-4.24	1.000
More than One Billion	57	-1.17	2.49	0.33	-1.73	-3.56	1.000
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	32	-2.63	2.96	0.52	-3.51	-5.02	1.000
More than 500 Million	52	-1.00	2.48	0.34	-1.57	-2.91	0.997
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	28	-2.57	3.25	0.61	-3.62	-4.19	1.000
More than 1000 Employees	56	-1.14	2.39	0.32	-1.68	-3.57	1.000
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	31	-2.55	2.95	0.53	-3.45	-4.80	1.000
More than 20 Employees	53	-1.08	2.53	0.35	-1.66	-3.09	0.998
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	26	-1.31	2.74	0.53	-2.22	-2.43	0.989
Sr. Manager or Manager	49	-1.92	2.94	0.42	-2.52	-4.32	1.000
Sr. Buyer or Buyer	9	-1.44	1.94	0.65	-2.65	-2.23	0.972

APPENDIX G.3 – HYPOTHESIS 2 ANALYSIS BY DIFFERENT GROUPS – IN THE OPPOSITE DIRECTION

Test Value = 0 versus < 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	27	-2.56	3.13	0.60	-1.53	-4.24	0.000
More than One Billion	57	-1.17	2.49	0.33	-0.62	-3.56	0.000
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	32	-2.63	2.96	0.52	-1.74	-5.02	0.000
More than 500 Million	52	-1.00	2.48	0.34	-0.42	-2.91	0.003
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	28	-2.57	3.25	0.61	-1.52	-4.19	0.000
More than 1000 Employees	56	-1.14	2.39	0.32	-0.61	-3.57	0.000
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	31	-2.55	2.95	0.53	-1.50	-4.80	0.000
More than 20 Employees	53	-1.08	2.53	0.35	-0.49	-3.09	0.002
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	26	-1.31	2.74	0.53	-0.39	-2.43	0.011
Sr. Manager or Manager	49	-1.92	2.94	0.42	-1.11	-4.32	0.000
Sr. Buyer or Buyer	9	-1.44	1.94	0.65	-0.24	-2.23	0.028

APPENDIX G.4 – HYPOTHESIS 3A ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus > 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	26	0.12	0.08	0.015	0.096	7.85	0.000
More than One Billion	54	0.13	0.06	0.007	0.12	16.87	0.000
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	33	0.127	0.077	0.1013	0.10	9.53	0.000
More than 500 Million	47	0.13	0.06	0.008	0.12	15.73	0.000
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	28	0.11	0.06	0.012	0.09	9.53	0.000
More than 1000 Employees	52	0.14	0.066	0.009	0.12	15.16	0.000
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	26	0.011	0.066	0.013	0.09	8.66	0.000
More than 20 Employees	54	0.14	0.06	0.008	0.123	15.81	0.000
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	23	0.12	0.06	0.0129	0.097	9.14	0.000
Sr. Manager or Manager	50	0.13	0.07	0.009	0.12	14.03	0.000
Sr. Buyer or Buyer	7	0.14	0.069	0.026	0.089	5.36	0.001

APPENDIX G.5 – HYPOTHESIS 3B ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus > 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	20	0.14	0.10	0.022	0.104	6.43	0.000
More than One Billion	44	0.18	0.11	0.016	0.15	10.96	0.000
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	25	0.15	0.092	0.018	0.12	8.15	0.000
More than 500 Million	39	0.18	0.11	0.018	0.15	9.79	0.000
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	18	0.13	0.079	0.018	0.095	6.86	0.000
More than 1000 Employees	46	0.18	0.11	0.016	0.16	11.10	0.000
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	18	0.14	0.09	0.02	0.103	6.37	0.000
More than 20 Employees	46	0.18	0.11	0.016	0.15	10.99	0.000
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	19	0.14	0.063	0.014	0.112	9.56	0.000
Sr. Manager or Manager	38	0.18	0.13	0.02	0.14	8.76	0.000
Sr. Buyer or Buyer	7	0.19	0.07	0.025	0.138	7.39	0.000

APPENDIX G.6 – HYPOTHESIS 3C ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus > 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	18	0.13	0.08	0.018	0.092	6.65	0.000
More than One Billion	42	0.13	0.08	0.012	0.112	10.56	0.000
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	22	0.12	0.08	0.017	0.094	7.30	0.000
More than 500 Million	38	0.14	0.08	0.013	0.113	10.15	0.000
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	19	0.14	0.08	0.019	0.11	7.46	0.000
More than 1000 Employees	41	0.13	0.08	0.012	0.11	10.04	0.000
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	17	0.14	0.08	0.02	0.103	6.74	0.000
More than 20 Employees	43	0.13	0.08	0.012	0.011	10.51	0.000
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	19	0.12	0.062	0.014	0.09	8.23	0.000
Sr. Manager or Manager	35	0.14	0.09	0.015	0.11	9.06	0.000
Sr. Buyer or Buyer	6	0.14	0.08	0.03	0.068	4.09	0.005

APPENDIX G.7 – HYPOTHESIS 4A ANALYSIS BY DIFFERENT GROUPS

By Annual Sales			
Sales Volume	**N**	**Pearson correlation**	**P-Value**
Less than One Billion	31	-0.409**	0.022
More than One Billion	64	-0.581**	0.000
By Annual Purchasing Volume			
Purchasing Volume	**N**	**Pearson correlation**	**P-Value**
Less than 500 Million	37	-0.412**	0.011
More than 500 Million	58	-0.584**	0.000
By Number of Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 1000 Employees	33	-0.445**	0.009
More than 1000 Employees	62	-0.554**	0.000
By Number of Purchasing Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 20 Employees	35	-0.449**	0.007
More than 20 Employees	60	-0.557**	0.000
By Job Title			
Job Title	**N**	**Pearson correlation**	**P-Value**
VP or Director	27	-0.406**	0.035
Sr. Manager or Manager	57	-0.613**	0.000
Sr. Buyer or Buyer	9	-0.129	0.741

** Correlation is significant

APPENDIX G.8 – HYPOTHESIS 4B ANALYSIS BY DIFFERENT GROUPS

By Annual Sales			
Sales Volume	**N**	**Pearson correlation**	**P-Value**
Less than One Billion	31	-0.796**	0.000
More than One Billion	64	-0.800**	0.000
By Annual Purchasing Volume			
Purchasing Volume	**N**	**Pearson correlation**	**P-Value**
Less than 500 Million	36	-0.766**	0.000
More than 500 Million	53	-0.816**	0.000
By Number of Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 1000 Employees	33	-0.833**	0.000
More than 1000 Employees	62	-0.784**	0.000
By Number of Purchasing Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 20 Employees	34	-0.823**	0.000
More than 20 Employees	55	-0.796**	0.000
By Job Title			
Job Title	**N**	**Pearson correlation**	**P-Value**
VP or Director	25	-0.822*	0.000
Sr. Manager or Manager	55	-0.778**	0.000
Sr. Buyer or Buyer	9	-0.773**	0.015

** Correlation is significant

APPENDIX G.9 – HYPOTHESIS 4C ANALYSIS BY DIFFERENT GROUPS

By Annual Sales			
Sales Volume	**N**	**Pearson correlation**	**P-Value**
Less than One Billion	27	-0.940**	0.000
More than One Billion	56	-0.860**	0.000
By Annual Sales			
Sales Volume	**N**	**Pearson correlation**	**P-Value**
Less than 500 Million	21	-0.943**	0.000
More than 500 Million	61	-0.865**	0.000
By Annual Purchasing Volume			
Purchasing Volume	**N**	**Pearson correlation**	**P-Value**
Less than 500 Million	31	-0.927**	0.000
More than 500 Million	50	-0.856**	0.000
By Number of Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 1000 Employees	30	-0.946**	0.000
More than 1000 Employees	57	-0.851**	0.000
By Number of Purchasing Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 20 Employees	33	-0.914**	0.000
More than 20 Employees	49	-0.863**	0.000
By Job Title			
Job Title	**N**	**Pearson correlation**	**P-Value**
VP or Director	23	-0.859**	0.000
Sr. Manager or Manager	51	-0.910**	0.000
Sr. Buyer or Buyer	8	-0.813**	0.014

** Correlation is significant

APPENDIX G.10 – HYPOTHESIS 5A ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus > 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	31	-1.13	3.27	0.59	-2.13	-1.92	0.968
More than One Billion	62	-1.42	3.05	0.39	-2.07	-3.66	1.000
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	37	-1.03	3.13	0.52	-1.90	-2.00	0.973
More than 500 Million	56	-1.52	3.12	0.42	-2.21	-3.65	1.000
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	33	-0.88	3.36	0.59	-1.87	-1.50	0.929
More than 1000 Employees	60	-1.57	2.97	0.38	-2.21	-4.08	1.000
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	35	-0.97	3.34	0.56	-1.93	-1.72	0.953
More than 20 Employees	58	-1.53	2.98	0.39	-2.19	-3.92	1.000
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	27	-1.11	3.20	0.62	-2.16	-1.80	0.958
Sr. Manager or Manager	57	-1.35	3.20	0.42	-2.06	-3.19	0.999
Sr. Buyer or Buyer	9	-1.78	2.49	0.83	-3.32	-2.14	0.968

APPENDIX G.11 – OPPOSITE OF HYPOTHESIS 5A ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus < 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	31	-1.13	3.27	0.59	-0.13	-1.92	0.032
More than One Billion	62	-1.42	3.05	0.39	-0.77	-3.66	0.000
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	37	-1.03	3.13	0.52	-1.158	-2.00	0.027
More than 500 Million	56	-1.52	3.12	0.42	-0.821	-3.65	0.000
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	33	-0.88	3.36	0.59	0.11	-1.50	0.071
More than 1000 Employees	60	-1.57	2.97	0.38	-0.93	-4.08	0.000
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	35	-0.97	3.34	0.56	-0.017	-1.72	0.047
More than 20 Employees	58	-1.53	2.98	0.39	-0.880	-3.92	0.000
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	27	-1.11	3.20	0.62	-0.060	-1.80	0.042
Sr. Manager or Manager	57	-1.35	3.20	0.42	-0.642	-3.19	0.001
Sr. Buyer or Buyer	9	-1.78	2.49	0.83	-0.235	-2.14	0.032

APPENDIX G.12 – HYPOTHESIS 5B ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus > 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	30	1.16	3.62	0.66	0.043	1.76	0.044
More than One Billion	59	-0.17	3.69	0.48	-0.972	-0.35	0.637
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	36	1.00	3.57	0.59	-0.005	1.68	0.051
More than 500 Million	53	-0.21	3.74	0.51	-1.07	-0.40	0.656
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	31	1.52	3.54	0.64	0.44	2.39	0.012
More than 1000 Employees	58	-0.38	3.64	0.48	-1.18	-0.79	0.785
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	34	1.03	3.67	0.63	-0.04	1.63	0.056
More than 20 Employees	55	-0.18	3.67	0.41	-1.01	-0.37	0.643
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	25	0.36	4.01	0.80	-1.01	0.45	0.329
Sr. Manager or Manager	51	0.63	3.67	0.51	-0.23	1.22	0.114
Sr. Buyer or Buyer	9	-1.89	3.44	1.15	-4.02	-1.65	0.931

APPENDIX G.13 – HYPOTHESIS 5B OPPOSITE - ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus < 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	30	1.16	3.62	0.66	2.29	1.76	0.956
More than One Billion	59	-0.17	3.69	0.48	0.63	-0.35	0.363
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	36	1.00	3.57	0.59	2.01	1.68	0.949
More than 500 Million	53	-0.21	3.74	0.51	0.65	-0.40	0.344
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	31	1.52	3.54	0.64	2.59	2.39	0.988
More than 1000 Employees	58	-0.38	3.64	0.48	0.42	-0.79	0.215
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	34	1.03	3.67	0.63	2.10	1.63	0.944
More than 20 Employees	55	-0.18	3.67	0.41	0.65	-0.37	0.357
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	25	0.36	4.01	0.80	1.73	0.45	0.671
Sr. Manager or Manager	51	0.63	3.67	0.51	1.40	1.22	0.893
Sr. Buyer or Buyer	9	-1.89	3.44	1.15	0.25	-1.65	0.069

APPENDIX G.14 – HYPOTHESIS 5C ANALYSIS BY DIFFERENT GROUPS

Test Value = 0 versus > 0							
By Annual Sales							
Sales Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than One Billion	27	1.67	3.63	0.70	0.47	2.38	0.012
More than One Billion	55	-0.60	3.80	0.51	-1.46	-1.17	0.876
By Annual Purchasing Volume							
Purchasing Volume	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 500 Million	32	1.44	3.83	0.78	0.29	2.12	0.021
More than 500 Million	50	-0.68	3.72	0.53	-1.56	-1.29	0.899
By Number of Employees							
Total Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 1000 Employees	30	1.70	3.64	0.66	0.57	2.56	0.008
More than 1000 Employees	52	-0.75	3.76	0.52	-1.62	-1.44	0.922
By Number of Purchasing Employees							
Purchasing Employees	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
Less than 20 Employees	33	1.39	3.71	0.65	0.30	2.16	0.019
More than 20 Employees	49	-0.69	3.80	0.54	-1.61	-1.28	0.896
By Job Title							
Job Title	**N**	**Mean**	**StDev**	**SE Mean**	**95% Lower Bound**	**t**	**P**
VP or Director	23	-0.04	4.20	0.88	-1.55	-0.05	0.520
Sr. Manager or Manager	51	0.63	3.67	0.51	-0.23	1.22	0.114
Sr. Buyer or Buyer	8	-2.37	3.70	1.31	-4.85	-1.82	0.944

APPENDIX G.15 – HYPOTHESIS 7A ANALYSIS FOR COMPANIES WITH AUCTION EXPERIENCE

Model Summary

Model	R auctionuse = 1 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.726[a]	.527	.506	.50374

a. Predictors: (Constant), COORD, INTERDEP, COMM, TRUST

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.472	4	6.368	25.095	.000[a]
	Residual	22.838	90	.254		
	Total	48.310	94			

a. Predictors: (Constant), COORD, INTERDEP, COMM, TRUST

b. Dependent Variable: SSA

c. Selecting only cases for which auctionuse = 1

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.519	.417		6.037	.000
	TRUST	.237	.094	.254	2.520	.014
	COMM	.160	.058	.275	2.736	.007
	INTERDEP	.044	.046	.073	.955	.342
	COORD	.179	.053	.305	3.358	.001

a. Dependent Variable: SSA

b. Selecting only cases for which auctionuse = 1

APPENDIX G.16 – HYPOTHESIS 7A ANALYSIS FOR COMPANIES WITH NO AUCTION EXPERIENCE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	auctionuse = 0 (Selected)			
1	.658[a]	.432	.380	.46325

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.031	4	1.758	8.191	.000[a]
	Residual	9.228	43	.215		
	Total	16.259	47			

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM

b. Dependent Variable: SSA

c. Selecting only cases for which auctionuse = 0

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.300	.592		5.574	.000
	TRUST	.185	.096	.249	1.926	.061
	COMM	.117	.072	.224	1.625	.112
	INTERDEP	-.077	.056	-.171	-1.372	.177
	COORD	.230	.062	.438	3.693	.001

a. Dependent Variable: SSA

b. Selecting only cases for which auctionuse = 0

APPENDIX G.17 – HYPOTHESIS 7A ANALYSIS FOR COMPANIES WITH LESS THAN 15 AUCTIONS IN THE LAST 3 YEARS

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.725[a]	.526	.479	.51285

a. Predictors: (Constant), COORD, INTERDEP, COMM, TRUST

b. Dependent Variable: SSA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.689	4	2.922	11.111	.000[a]
	Residual	10.520	40	.263		
	Total	22.210	44			

a. Predictors: (Constant), COORD, INTERDEP, COMM, TRUST

b. Dependent Variable: SSA

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.962	.590		5.018	.000
	TRUST	.097	.139	.111	.694	.492
	COMM	.156	.086	.281	1.811	.078
	INTERDEP	.050	.061	.095	.820	.417
	COORD	.255	.085	.414	3.015	.004

a. Dependent Variable: SSA

APPENDIX G.18 – HYPOTHESIS 7A ANALYSIS FOR COMPANIES WITH MORE THAN 15 AUCTIONS IN THE LAST 3 YEARS

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.768[a]	.589	.549	.48400

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM

b. Dependent Variable: SSA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.788	4	3.447	14.714	.000[a]
	Residual	9.604	41	.234		
	Total	23.392	45			

a. Predictors: (Constant), COORD, INTERDEP, TRUST, COMM

b. Dependent Variable: SSA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.948	.615		3.167	.003
	TRUST	.396	.134	.380	2.959	.005
	COMM	.257	.092	.389	2.798	.008
	INTERDEP	-.030	.077	-.044	-.383	.703
	COORD	.088	.073	.156	1.211	.233

a. Dependent Variable: SSA

APPENDIX G.19 – HYPOTHESIS 7B REGRESSION MODEL BEFORE TRANSFORMATION OF THE DEPENDENT VARIABLE

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.751[a]	.564	.555	.46117

a. Predictors: (Constant), Quality, Participation, Sharing

b. Dependent Variable: SSA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38.760	3	12.920	60.750	.000[a]
	Residual	29.987	141	.213		
	Total	68.748	144			

a. Predictors: (Constant), Quality, Participation, Sharing

b. Dependent Variable: SSA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.094	.286		7.328	.000		
	Sharing	.361	.070	.414	5.123	.000	.473	2.115
	Participation	.144	.048	.229	2.969	.004	.520	1.924
	Quality	.166	.052	.225	3.228	.002	.637	1.569

a. Dependent Variable: SSA

APPENDIX G.20– HYPOTHESIS 7B ANALYSIS FOR COMPANIES WITH AUCTION EXPERIENCE

Model Summary

Model	R auctionuse = 1 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.630	.618	4.98675

a. Predictors: (Constant), Quality, Participation, Sharing

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3897.215	3	1299.072	52.239	.000[a]
	Residual	2287.825	92	24.868		
	Total	6185.040	95			

a. Predictors: (Constant), Quality, Participation, Sharing

b. Dependent Variable: SSA_SQUARE

c. Selecting only cases for which auctionuse = 1

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-9.795	3.698		-2.648	.010
	Sharing	4.332	1.041	.424	4.159	.000
	Participation	2.199	.676	.297	3.251	.002
	Quality	1.338	.723	.166	1.850	.068

a. Dependent Variable: SSA_SQUARE

b. Selecting only cases for which auctionuse = 1

APPENDIX G.21 – HYPOTHESIS 7B ANALYSIS FOR COMPANIES WITH NO AUCTION EXPERIENCE

Model Summary

Model	R auctionuse = 0 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.673[a]	.453	.417	5.44225

a. Predictors: (Constant), Quality, Sharing, Participation

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1104.919	3	368.306	12.435	.000[a]
	Residual	1332.814	45	29.618		
	Total	2437.733	48			

a. Predictors: (Constant), Quality, Sharing, Participation

b. Dependent Variable: SSA_SQUARE

c. Selecting only cases for which auctionuse = 0

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.281	6.782		-.631	.531
	Sharing	3.884	1.249	.434	3.110	.003
	Participation	1.099	.956	.166	1.150	.256
	Quality	2.071	1.116	.227	1.856	.070

a. Dependent Variable: SSA_SQUARE

b. Selecting only cases for which auctionuse = 0

APPENDIX G.22 – HYPOTHESIS 7B ANALYSIS FOR COMPANIES WITH LESS THAN 15 AUCTIONS IN THE LAST 3 YEARS

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.805[a]	.648	.622	5.04690

a. Predictors: (Constant), Quality, Participation, Sharing

b. Dependent Variable: SSA_Square

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1966.151	3	655.384	25.730	.000[a]
	Residual	1069.790	42	25.471		
	Total	3035.941	45			

a. Predictors: (Constant), Quality, Participation, Sharing

b. Dependent Variable: SSA_Square

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-16.279	6.397		-2.545	.015
	Sharing	5.116	1.619	.433	3.160	.003
	Participation	2.027	1.065	.250	1.903	.064
	Quality	1.978	1.040	.232	1.901	.064

a. Dependent Variable: SSA_Square

APPENDIX G.23 – HYPOTHESIS 7B ANALYSIS FOR COMPANIES WITH MORE THAN 15 AUCTIONS IN THE LAST 3 YEARS

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.871[a]	.758	.740	.35621

a. Predictors: (Constant), Quality, Participation, Sharing

b. Dependent Variable: SSA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.528	3	5.176	40.791	.000[a]
	Residual	4.949	39	.127		
	Total	20.476	42			

a. Predictors: (Constant), Quality, Participation, Sharing

b. Dependent Variable: SSA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.951	.389		5.020	.000
	Sharing	.305	.132	.350	2.303	.027
	Participation	.280	.077	.467	3.644	.001
	Quality	.090	.077	.135	1.173	.248

a. Dependent Variable: SSA

APPENDIX G.24– HYPOTHESIS 7C ANALYSIS FOR COMPANIES WITH AUCTION EXPERIENCE

Model Summary[c]

Model	R: auctionuse = 1 (Selected)	R: auctionuse ~= 1 (Unselected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.488[a]	.165	.238	.213	.62588

a. Predictors: (Constant), Avoidance, Destructive, Constructive

c. Dependent Variable: SSA

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.121	3	3.707	9.463	.000[a]
	Residual	35.647	91	.392		
	Total	46.769	94			

a. Predictors: (Constant), Avoidance, Destructive, Constructive

b. Dependent Variable: SSA

c. Selecting only cases for which auctionuse = 1

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.554	.477		11.645	.000
	Constructive	.207	.074	.255	2.774	.007
	Destructive	-.302	.076	-.364	-3.962	.000
	Avoidance	-.074	.042	-.163	-1.778	.079

a. Dependent Variable: SSA

b. Selecting only cases for which auctionuse = 1

APPENDIX G.25 – HYPOTHESIS 7C ANALYSIS FOR COMPANIES WITH NO AUCTION EXPERIENCE

Model Summary

Model	R auctionuse = 0 (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.250[a]	.062	.000	.62641

a. Predictors: (Constant), Avoidance, Destructive, Constructive

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.175	3	.392	.998	.402[a]
	Residual	17.658	45	.392		
	Total	18.833	48			

a. Predictors: (Constant), Avoidance, Destructive, Constructive

b. Dependent Variable: SSA

c. Selecting only cases for which auctionuse = 0

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.381	.666		9.588	.000
	Constructive	-.035	.134	-.042	-.264	.793
	Destructive	-.075	.122	-.096	-.611	.544
	Avoidance	-.070	.048	-.211	-1.449	.154

a. Dependent Variable: SSA

b. Selecting only cases for which auctionuse = 0

APPENDIX G.26 – HYPOTHESIS 7C ANALYSIS FOR COMPANIES WITH LESS THAN 15 AUCTIONS IN THE LAST 3 YEARS

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.570[a]	.325	.277	.61304

a. Predictors: (Constant), Avoidance, Constructive, Destructive

b. Dependent Variable: SSA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.614	3	2.538	6.754	.001[a]
	Residual	15.784	42	.376		
	Total	23.398	45			

a. Predictors: (Constant), Avoidance, Constructive, Destructive

b. Dependent Variable: SSA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.916	.648		7.586	.000
	Constructive	.293	.097	.383	3.004	.004
	Destructive	-.281	.092	-.393	-3.045	.004
	Avoidance	-.016	.058	-.035	-.269	.789

a. Dependent Variable: SSA

APPENDIX G.27 – HYPOTHESIS 7C ANALYSIS FOR COMPANIES WITH MORE THAN 15 AUCTIONS IN THE LAST 3 YEARS

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.479[a]	.229	.174	.65519

a. Predictors: (Constant), Avoidance, Constructive, Destructive

b. Dependent Variable: SSA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.363	3	1.788	4.164	.011[a]
	Residual	18.030	42	.429		
	Total	23.392	45			

a. Predictors: (Constant), Avoidance, Constructive, Destructive

b. Dependent Variable: SSA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.468	.762		8.487	.000
	Constructive	.071	.120	.080	.591	.558
	Destructive	-.284	.146	-.269	-1.949	.058
	Avoidance	-.167	.069	-.335	-2.425	.020

a. Dependent Variable: SSA

APPENDIX G.28 – HYPOTHESIS 8 ANALYSIS BY DIFFERENT GROUPS

By Annual Sales			
Sales Volume	**N**	**Pearson correlation**	**P-Value**
Less than One Billion	29	0.066	0.732
More than One Billion	56	0.315**	0.018
By Annual Purchasing Volume			
Purchasing Volume	**N**	**Pearson correlation**	**P-Value**
Less than 500 Million	36	0.139	0.419
More than 500 Million	49	0.275	0.056
By Number of Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 1000 Employees	30	0.326	0.078
More than 1000 Employees	55	0.197	0.150
By Number of Purchasing Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 20 Employees	29	0.257	0.178
More than 20 Employees	56	0.189	0.163
By Job Title			
Job Title	**N**	**Pearson correlation**	**P-Value**
VP or Director	24	0.014	0.948
Sr. Manager or Manager	53	0.263	0.057
Sr. Buyer or Buyer	9	0.566	0.144

** Correlation is significant at 0.05 level

APPENDIX G.29 – HYPOTHESIS 9 ANALYSIS BY DIFFERENT GROUPS

By Annual Sales			
Sales Volume	**N**	**Pearson correlation**	**P-Value**
Less than One Billion	29	0.598**	0.000
More than One Billion	66	0.239**	0.048
By Annual Sales			
Sales Volume	**N**	**Pearson correlation**	**P-Value**
Less than 500 Million	23	0.619**	0.002
More than 500 Million	72	0.263**	0.026
By Annual Purchasing Volume			
Purchasing Volume	**N**	**Pearson correlation**	**P-Value**
Less than 500 Million	37	0.510**	0.001
More than 500 Million	58	0.272**	0.039
By Number of Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 1000 Employees	33	0.454**	0.008
More than 1000 Employees	62	0.305**	0.016
By Number of Purchasing Employees			
Total Employees	**N**	**Pearson correlation**	**P-Value**
Less than 20 Employees	35	0.527**	0.001
More than 20 Employees	60	0.264**	0.021
By Job Title			
Job Title	**N**	**Pearson correlation**	**P-Value**
VP or Director	27	0.362**	0.046
Sr. Manager or Manager	59	0.333**	0.010
Sr. Buyer or Buyer	9	0.695**	0.038

** Correlation is significant

VITA

Loay Sehwail

Candidate for the Degree of

Doctor of Philosophy

Dissertation: IMPLEMENTING BUSINESS-TO-BUSINESS ONLINE REVERSE AUCTIONS

Major Field: Industrial Engineering and Management

Biographical:

Personal Data: Born in Kuwait on May 4, 1977, the son of Munir Sehwail and Sabiha Al-Saber.

Education: Graduate from Al-Itehad High School in Amman-Jordan in May 1994; received Bachelor of Science degree in Industrial Engineering and Management from the University of Jordan in May 1999. Received Master of Science Degree in Industrial Engineering and Management in May 2001. Completed the requirements for the Doctor of Philosophy degree with a major in Industrial Engineering and Management at Oklahoma State University, Stillwater, Oklahoma in July, 2006.

Experience: Worked for Hikma Pharmaceuticals in Jordan in 1999; employed as a half-time graduate assistant for the School of Industrial Engineering and Management from 2000 to 2001; employed as an Industrial Engineer for Gulf Stream Aerospace from 2001-2002; worked as a consultant for Kwikset Corporation in summer of 2002 and 2003; employed as a half-time lecturer and graduate associate for the School of Industrial Engineering and Management at Oklahoma State University from 2002 till now.

Professional Memberships: Phi Kappa Phi (academic achievement national honor society), Alpha Pi Mu (Industrial Engineering honor society), Institute of Industrial Engineers (IIE), Institute for Operations Research and Management Science (INFORMS), Production and Operation Management Society (POMS), American Society for Quality (ASQ) and Institute of Supply Management (ISM).

Name: Loay Sehwail Date of Degree: July, 2006

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: IMPLEMENTING BUSINESS-TO-BUSINESS ONLINE REVERSE AUCTIONS

Pages in Study: 304 Candidate for the Degree of Doctor of Philosophy

Major Field: Industrial Engineering and Management

Scope and Method of the Study: The purpose of this study was to address the gap in the academic literature by developing and testing a model to successfully implement online reverse auctions with respect to: (1) reducing purchase prices, and (2) developing/maintaining buyer-supplier strategic alliance relationships in the business-to-business online reverse auctions environment. A survey questionnaire was sent to 603 members of the Institute of Supply Management who reported to be in purchasing or supply management role. Companies were surveyed to determine the effect of auction design and purchase type on the "successful" implementation of online reverse auctions, in terms of the reduction in purchase price and the success of buyer-supplier strategic alliance. The measures developed by Mohr and Spekman (1994) and Monczka et al. (1998) were used to assess the "successful strategic alliance" and its critical antecedents including attributes of the relationship (trust, commitment, coordination and interdependence), communication behavior (information quality, participation and sharing) and conflict resolution techniques.

Findings and Conclusions: The research concluded that for the purpose of reducing purchase prices (1) companies prefer to use open-bid rather than sealed bid auctions, (2) companies prefer to organize auctions with the help of a market maker than in-house, (3) an average of 14.4% is the reduction in purchase prices when using online reverse auctions to outsource products. The research study also concluded that online reverse auctions are used for: (1) either the short-term or long the term and not for both when purchasing any type of product, (2) the long-term when larger size companies outsource production items and material, and (3) the short-term when smaller size companies outsource MROs and/or services. The research study found that from the perspective of the buying company in the alliance, the following were found to be significantly related to partnership success: trust, coordination, communication, information quality, information participation, information sharing, joint problem solving, persuasive attempts, and low use of avoidance and destructive conflict resolution tactics. The research found that buyers did not find any significant relationship between the auction application and the predictors of the success of the supplier strategic alliances. Finally, the study concluded that buyers value the importance of the strategic relationships with their suppliers more than the promised reduction of purchase prices when outsourcing products and/or services using an online reverse auction.

Advisor's Approval: Dr. Ricki G. Ingalls