COLLABORATIVE PLANNING FORECASTING REPLENISHMENT (CPFR): SUCCESSFUL IMPLEMENTATION ATTRIBUTES

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COLLABORATIVE PLANNING FORECASTING REPLENISHMENT (CPFR): SUCCESSFUL IMPLEMENTATION ATTRIBUTES & RELATIONSHIPS

Abstract:

This dissertation paper offers a theoretical and empirical explanation for why interfirm collaborations form yet fail, and further suggests how firms might manage them for a more positive outcome. The main focus of this dissertation was to research and investigate the implementation issues in the early stages of CPFR. The crux of the argument is that firms enter into collaborative relationships because these are expected to yield superior results relative to alternate organizational forms in certain situations, offering potentially synergistic combinations of complementary resources and capabilities, yet such relationships are frequently prone to failure.

Since CPFR implementations are a recent phenomena and its literature base is extreme thin, a triangulation research method is employed. First, an exhaustive literature review was performed on academic and practitioner research to provide a foundation of the understanding of supply chain management (SCM) and CPFR systems and implementations. Second, four case studies of firms that attempted CPFR implementations were closely examined. Case study research offers many benefits including the ability to observe causality, combine evidence and logic to build, develop or support theory that is not available using other research methods (Maffei and Meredith, 1995). Third, a focus group of CPFR implementation experts was convened to strengthen the research design. Qualitative procedures such as focus groups enable the researcher to get in tune with the respondent and discover how that person sees reality. These insights can be used to develop more efficient follow-up quantitative procedures such as mail out surveys (Krueger, 1994).

The research triangulation was used to develop hypotheses based on the qualitative data. A survey instrument was developed to test the validity of the hypotheses on practicing managers and consulting professionals. The instrument development procedure satisfies all the requirements for
reliability and validity. In analyzing the results of the study, statistical analysis will accept or reject
the qualitative hypotheses of CPFR implementation based upon survey results.

The results in this study confirmed that CPFR implementations should have a strategic basis
with an emphasis in organizational factors, supply chain operational characteristics and less
environmental uncertainty. The data confirmed that for successful CPFR implementations top
management support is required, firms need to assess information technology and exchange
information, establish economic, strategic and financial goals and make use of performance metrics
before and after a CPFR implementation.

The main contribution of this research is apparent in the development of policies and
guidelines that can help manufacturing professionals understand the issues surrounding CPFR
Implementations. The results of this study are expected to provide academics and practitioners with
elements and procedures that are critical to the success of CPFR implementations. This research will
provide academics with a foundational tool to use when building theory about CPFR systems. The
research design and findings of this study provide many avenues for further research investigations.
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CHAPTER I

INTRODUCTION

Over the past 30 years there has been a major shift in the operations strategy of manufacturers. In the early 1980s, Hayes & Wheelwright (1984) discussed business strategy with respect to vertically aligning operations. Currently business strategy is all about horizontally aligning operations across business processes (Ghosal & Bartlett, 1995). Supply chain management is this horizontal alignment.

Supply chain management has evolved from many directions including the quality revolution (Dale et al., 1994), materials management and integrated logistics (Carter and Price, 1993), a growing interest in industrial markets and networks (Ford, 1990, Jarillo, 1993), increased focus (Porter, 1987, Snow and Miles, 1992), and influential industry-specific studies (Womack et al., 1991, Lamming, 1993). Thus, the literature uses terms such as "supply chains", "demand pipelines" (Farmer and Van Amstel, 1991), "value streams" (Womack and Jones, 1994), "support chains", and many others. These terms only add confusion for the researcher. The origins of supply chain management (SCM) are unclear, but began around physical distribution and transport, based on the theory of Industrial Dynamics, derived from the work of Forrester (1961). Another antecedent can be found in the total cost approach to distribution and logistics.
(Heckert and Miner, 1940, Lewis, 1956). Both these approaches show that focusing on a single element in the chain cannot assure the effectiveness of the whole system (Croom et al., 2000). The term "supply chain management" was originally introduced by consultants in the early 1980s (Oliver and Webber, 1992) and has subsequently gained tremendous attention (La Londe, 1998). Analytically, a typical supply chain is simply a network of materials, information, and services processing links with the characteristics of supply, transformation, and demand.

The term "supply chain management" is used to explain the logistics activities and the planning and control of materials and information flows internally within a company or externally between companies (Christopher, 1992, Cooper et al., 1997b, Fisher, 1997). Researchers have also used it to describe strategic, inter-organizational issues (Cox, 1997, Harland et al., 1999), to discuss an alternative organizational form to vertical integration (Thorelli, 1986, Hakansson and Snehota, 1995), to identify and describe the relationship a company develops with its suppliers (e.g., Helper, 1991, Hines, 1994, Narus and Anderson, 1995), and to address the purchasing and supply perspective (e.g., Morgan and Monczka, 1996, Farmer, 1997).

Vast subject areas such as purchasing and supply, logistics and transportation, marketing, organizational behavior, network, strategic management, management information systems, and operations management have contributed to the massive amount of supply chain management literature. From the numerous amounts of research, it can be seen that a great deal of progress has been made toward understanding the essence of supply chain management. However, of crucial importance is “coordination”
and “collaboration” in SCM leads to the need to study Collaboration Planning Forecasting Replenishment (CPFR).

CPFR is an organizational model that seeks the benefits of vertical integration without the burden of financial ownership. Early business models emphasized ownership control, primarily due to necessity. Ford Motor Company is just one such example of a company that grew to industry domination through vertical integration. However, over time, the benefits of specialization combined with increasingly more complex business environment placed limits of this vertical integration ownership. Firms began purchasing materials, products, and services from other independent businesses. The new business model was one of highly independent characterized by specialization. It became clear that no firm could be self sufficient in a globally complex economic system.

In the early stages of economic specialization, the marketplace was the only mechanism for matching supply with demand. Free enterprise fueled competition as the best way to allocate resources. The federal government enacted antitrust legislation to ensure fairness which allowed little room for collaboration. However, in the late 20th century, a new and challenging perspective emerged. The free market nations of the world became attracted to the concept of working together for mutual gain, or, business collaboration. While the potential was conceptually identifiable, the corporate mechanisms needed to achieve the desired results were not well understood. The question becomes, if the benefits of collaboration has been widely known for several decades, why have very few actual implementations been performed and of those that have, few have been successful?
Collaborations between firms have become very popular in recent years, but have also been characterized by a high level of dissatisfaction with their actual outcomes relative to expectations and, correspondingly, a high rate of failure (Parlche 1991, Dodgson 1993, Pearce 1997, Hennart et al. 1997). The high failure rate suggests that even when potential synergies are present, firms face substantial difficulties in attaining them. This paradox poses an important research question which is reflected in the increasing interest one the part of organization scholars in issues pertaining to alliance formation, ongoing relational dynamics and alliance stability and instability (Balakrishnan and Koza 1993, Parkhe 1993a, Kumar and Nti 1998, Gomes Casseres 1996, Larsson et al. 1998).

Research suggests that many of the advantages that firms bring to the alliance tend to have a significant tacit component (Mowery et al. 1997). This dissertation is accordingly concerned with a specific collaborative context, namely those alliances which require a mutual and synergistic pooling of resources and capabilities and a substantial degree of commingling between partners, in terms of people, systems, skills, etc., in order to attain their objectives through sharing tacit knowledge. More than the legal form of ownership, the key issue in these collaborations is the strategic intent to combine the relevant organizational resources and capabilities of two (or more) partners in the search for a sustainable competitive advantage. Similar to Parkhe (1993a) and Teece (1992), the above definition excludes market-like exchange agreements.

In the past decade, companies focused on improving internal operations by scrutinizing internal business practices, implementing ERP systems and standardizing procedures and outsourcing. As a result, these companies now have efficient and cost-effective internal processes. Generating future revenue, however, will involve moving
beyond internal cost cutting measures to managing the supply chain in order to quickly take advantage of new business opportunities.

Traditional supply chain management has focused on product building and increasing efficiency in individual segments of the chain. The focus is now shifting from an isolated supply chain to a demand chain, where customer needs are key. In a demand chain, products are not introduced by just one manufacturer, but are developed collaboratively by the chain's trading partners, based on their understanding of what the marketplace needs and wants. Thus, supply chains are moving from a push model to a pull model as they evolve into an integrated network of trading partners. With a focus on market needs, these strategic alliances also provide partners with access to new markets and the ability to add value with additional services. They also encourage sharing best practices.

The key question for senior managers is how they can join these strategic alliances and virtual networks quickly. Through collaboration, trading partners can exchange critical internal knowledge securely over the web. Collaboration goes beyond e-mail by providing capabilities such as dynamic access to information-including real-time information from ERP systems and directed actions based on workflow and intelligent messaging. In contrast to collaboration, e-commerce automates business transactions that often occur without conversations between trading partners – companies placing purchase orders or consumers ordering products, for example.

Where should companies begin? Senior executives are asking themselves the following questions as they move to a web-enabled world: How do I relate to my trading partners and how do I leverage our core competencies to benefit my customers? What new
partnerships and/or business channels should my company be developing? Where can my company provide the most value to my customers?

Companies will want to be selective about sharing development and investment areas with their trading partners, but they will still need to focus on four common processes dealer enablement, order management, demand management and sourcing and global procurement-in order to build a sustainable competitive advantage.

1.1. Review of CPFR implementations

In reviewing CPFR implementations over the last several years, it is obvious that manufacturers of all sizes are having a difficult time gaining the value promised by implementing a CPFR system. Companies have been able to reduce cost and increase customer service due to process enabled by systems such as automatic replenishment programs (ARP), vendor managed inventory (VMI) and continuous replenishment planning (CRP).

System success would be predicated on a free exchange of critical information and commitment to reaching shared goals. While this may sound somewhat removed from reality, such a scenario is fairly close to what many leading edge companies are doing today (Davis, 1998). Automatic replenishment systems have been implemented in a great number of firms in recent years. With automatic replenishment programs (ARP), inventory restocking is triggered by actual needs rather than relying on long-range forecasts and layers of safety stock "just in case" (Andel, 1996; Cottrill, 1997; Keh and Park, 1997).

Some firms that have instituted ARP are now taking supply chain co-operation to another level through involvement in collaborative planning forecasting replenishment
(CPFR). CPFR attempts to lessen the problems associated with traditional anticipatory demand forecasts by co-operating with trading partners to better match supply and demand. Thus, it makes firms better prepared and ready to respond to market signals. ARPs provide day-to-day guidance for inventory replenishment. In contrast, CPFR relates to long-term planning. CPFR involves collaborating and jointly planning to make long-term projections which are constantly up-dated based on actual demand and market changes (competitive efforts, new promotional plans, etc.). CPFR has been described as a step beyond efficient consumer response, i.e. automatic replenishment programs, because of the high level of co-operation and collaboration needed (Tosh, 1998).

It can be inferred from the literature that executives and managers believe CPFR systems can help their company achieve improved business results and benefits. However, they are perplexed as to how to implement and manage a project. Small and midsize manufacturers that are not backed by corporate IT budgets, often lack financial resources and may be forced to adopt, at best a piecemeal approach to integrating CPFR into their facilities.

1.2. Statement of the research problem

The issue of buyer-seller relationships in supply chain management research is becoming increasing critical. Global competition and maturing domestic markets have driven supply chain members to reassess their distribution techniques to remain competitive in the market. Firms need inventory replenishment systems that enhance customer service whereas at the same time reduce inventory cost. Currently, many retailers are demanding time-phased replenishment. They want delivery made just as they need the stock for sale. High levels of anticipatory inventory are no longer acceptable.
Retailers want high volume, high turn, items delivered on a just in time basis. In this study, the use of CPFR programs and the effectiveness of these CPFRs in today’s markets are studied. Through several research methods, the examination of the transaction specific, strategic, and organizational antecedents that drive CPFR efforts, as well as the effects of these efforts on the firms’ specific and economic performance.

1.3. Purpose of the study

The fundamental purpose of this study was to examine CPFR as it applied to developing and sustaining a competitive advantage for the firm. It was also sought to investigate best practices from the perspective of the operations/procurement managers and marketing managers across a set of firms that comprise a collaborative supply chain. A key objective was to understand better how to develop and sustain collaborative supply chain relationships. Therefore, by focusing on buyers and sellers vast insight would be gained into how each viewed a range of collaborative supply chain processes and practices. Implicit in this analysis is the belief that collaboration within a supply chain can be achieved to the extent the trading partners share a common "world view" of supply chain management (Spekman et al, 1997). Admittedly, thus goal is rather broad; however, much can be gained from this rather high level approach.

This study has four main purposes:

1) To identify through case study research, literature review and expert interviews elements and procedures currently utilized in CPFR implementations to allow for investigation of the issues surrounding the implementation process.

2) To determine what CPFR consultants and practitioners believe are the critical success factors of an implementation.
3) To compare and contrast the results from CPFR consultants and manufacturing professionals to determine if there are inconsistencies/mismatches from the literature on what factors are important to an CPFR implementation.

4) The results from (1), (2) and (3) will be integrated to develop policies and guidelines to aid in the success of future CPFR implementations. These policies and guidelines will be based on the results of the survey respondents.

1.4. Plan of the study

This research uses a multiple case study approach to investigate the CPFR implementation procedures that manufacturing and retail firms in the US have used. The use of four significantly in-depth case studies will provide an excellent basis for developing hypothesis that can be tested by means such as surveys, experiments or simulation (Maffei and Meredith 1995). While developing the hypothesis, a focus group of four CPFR implementation experts was convened to discuss their experiences and help develop and led credibility to the hypothesis. Focus groups are beneficial for developing major themes such as hypothesis. Focus groups are unique from other procedures; it allows for group interaction and greater insight into why certain opinions are held (Krueger, 1994). Since the basis for the hypothesis is actual CPFR implementations and experiences, the focus group strengthens the conclusions. Of the four experts convened, all were members of project implementation teams of the four case studies. In addition, all of these members have substantial experience with other CPFR implementations and were able to provide a broad perspective. The requirements for selection to the focus group are that each member must have had significant participation as an executive sponsor, project manager, project team member or consultant on at least two CPFR
implementations. Data and information from the four projects as well as the results of the focus group are used to develop final hypothesis about activities that lead to successful CPFR implementations. Many of these individual hypothesis are also supported by literature that reports on desirable CPFR implementation activities. After the hypothesis are finalized, a survey is developed to test the hypothesis. A pre-survey check was performed to insure proper survey techniques are used. The test of the hypothesis will be done in two ways.

1) The hypothesis will be tested on CPFR consultants and manufacturing/retail managers with CPFR implementation experience.

2) The results will be compared and contrasted to show which factors are important to a CPFR implementation from the perspective of CPFR consultants and managers.

1.5. Importance of Theory

A good theory offers the researcher several important and highly compelling benefits (Melnyk & Handfield, 1998). First, a theory provides structure for data. Data, when captured from the field, has no structure. It neither tells the researcher the sequence in which activities took place nor identify what factors influenced what other factors. Rather, data simply shows that something did happen. To make sense of this data, it must be converted into information identified using sequences, constructs and relationships. These traits offered by theory are not only important to researchers but also to practitioners. Second, theory helps direct research by identifying those parts of current thinking that are unclear or incomplete. As a result, research becomes less a matter of hit and miss and more a targeted and purposeful search. Third, theory explains events and patterns occurring in a field, not only to other researchers but also to students.
and practicing managers. Theory and theory building approach are critical to the continuous success of any field since nothing is so practical as a good theory (Simon, 1967; Van DeVen, 1989). Without theory, it is impossible to make meaningful sense of empirically generated data, and it is not possible to distinguish positive from negative results (Kerlinger, 1986). Without theory, empirical research merely becomes 'data-dredging' (Handfield & Melnyk, 1998). It is also crucial for the future of any research discipline to establish its own distinct theoretical identity. Furthermore, the theory-building process serves to differentiate science from common sense (Reynolds, 1971). This study expects to help advance the understanding and theory of effective CPFR implementations.

1.6. Overview of the contributions

In general, the two major contributions of this thesis are:

1. It explores the implementation issues and challenges of CPFR.

2. It investigates the impact of these factors on implantation success.

In addition, the results are expected to make the following contributions:

1) It validates the use of case studies to develop hypothesis.

2) It addresses CPFR implementations in both successful and unsuccessful manufacturing and/or retail companies. The extant research on CPFR implementation that has been done has concentrated on a single case study or a single area.

3) It develops a process for using Focus groups to increase the validity of case study research.

4) The findings of this study can help consultants to better support their clients during CPFR implementations.
5) The findings of this study can help corporate management to better support the deployment of CPFR in their facilities.

6) The findings of this study will also help CPFR vendors to better understand the requirements for successful implementations.

7) The policies and guidelines can be viewed as an advancement of the study of CPFR implementations and can help CPFR project managers improve their skill sets.

8) This study is one of the few studies using survey data to test the requirements of successful CPFR implementations. It is expected to spur other researchers to build upon the findings.

9) Avenues for continuing theoretical and empirical investigations in the field are presented.

1.7. Outline of the Dissertation

This section identifies the organization of the dissertation. Chapter 1 presents an introduction and definition on supply chain management and collaborative planning forecasting and replenishment. It also points out the need for this effort along with its significance. Chapter 2 provides an overview of supply chain management and collaborative planning forecasting and replenishment and the various factors that affect its management. Drawing on wider literature and case studies from different research areas, this chapter presents the factors that are of significance to the successful implementations of collaborative planning forecasting and replenishment. Chapter 3 presents the research methodology which will consist of case studies, focus groups, and surveys. Chapter 4 focuses on the theoretical constructs of collaborative planning forecasting and replenishment and the research hypotheses relating them. Chapter 4 also
presents information on the research design, instrument, data collection, and analytical methods used in the instrument development and hypotheses testing. Chapter 5 focuses on the results of the analysis. It presents the response rate information along with the results of non-response analysis. It provides a brief explanation on the demographic information relating to the respondents and their companies. It also presents the finalized indicators of the various theoretical constructs. In addition, Chapter 5 presents the discussion of the results and managerial implications of the results along with the reasons for acceptance and rejection of hypotheses. Chapter 6 presents the concluding remarks, limitations of the present study, and the scope for future research with respect to collaborative planning forecasting and replenishment.
CHAPTER II

LITERATURE REVIEW

2.1. Introduction

Supply Chain management and other similar terms, such as network sourcing (Ford, 1990; Jarillo, 1993), supply pipeline management (Farmer and Van Amstel, 1991), value chain management, and value stream management (Womack and Jones, 1994), have become subjects of increasing interest in recent years to academics, consultants and business management (Christopher, 1992; Hines, 1994; Lamming; 1996; Saunders, 1995, 1998). It is recognized in some parts of the literature that the supply chain should be seen as the central unit of competitive analysis (Croom et al., 2000). Companies will not seek to achieve cost reductions or profit improvement at the expense of their supply chain partners, but rather seek to make the supply chain as a whole more competitive. In summary, the contention that it is supply chains, and not single firms, that compete is a central tenet in the filed of supply chain management.

Several definitions can be found in the literature. Supply chain management encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). Supply chain management focuses on how firms utilize their suppliers' processes, technology and capability to enhance
competitive advantage. It is a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimization and efficiency (Tan et al. 1998).

Supply chain management aims at building trust, exchanging information on market needs, developing new products, and reducing the supplier base to a particular OEM (original equipment manufacturer) so as to release management resources for developing meaningful, long term relationship (Berry et al. 1994). An integrative approach to dealing with the planning and control of the materials flow from suppliers to end-users (Jones and Riley 1985). External Chain is the total chain of exchange from original source of raw material, through the various firms involved in extracting and processing raw materials, manufacturing, assembling, distributing and retailing to ultimate end customers (Saunders 1995). A network of firms interacting to deliver product or service to the end customer, linking flows from raw material supply to final delivery (Ellram 1991). Network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer (Christopher 1992). Networks of manufacturing and distribution sites that procure raw materials, transform them into intermediate and finished products, and distribute the finished products to customers (Lee and Billington 1992). The set of entities, including suppliers, logistics services providers, manufacturers, distributors and resellers, through which materials, products and information flow (Kopczak 1997). A network of entities that starts with the suppliers' supplier and ends with the customers' custom the production and delivery of goods and services (Lee and Ng 1997).
2.2. Supply Chain Management Origins

The origins of the concept of supply chain management are unclear, but its development was initially along the lines of physical distribution and transport, using the techniques of industrial dynamics, derived from the work of Forrester (1961). Another antecedent can be found in the total cost approach to distribution and logistics (Heckert and Miner, 1940; Lewis, 1956). Both these approaches show that focusing on a single element in the chain cannot assure the effectiveness of the whole system (Croom et al., 2000).

2.3. Principal Component Bodies of Supply Chain Literature as applied to CPFR

In recent times, the theory of purchasing and supply operations has been widely studied under a variety of labels and for a number of reasons. Each of these focuses on different operations within an organization but SCM is the single most wide-ranging approach in its range of study in considering how firms utilize their suppliers' processes, technology, and capability to enhance competitive advantage (Houlihan, 1985; Cooper et al., 1993; DTI, 1995). Tan and Kannan (1998) consider how all strategic suppliers in the chain can integrate to act as a single entity and enhance overall performance in SCM.

One definition of SCM is offered by La Londe (1998) as: "the delivery of enhanced customer and economic value through synchronized management of the flow of physical goods and associated information from sourcing through consumption."

Johnston (1995) offered: "The process of strategically managing the movement and storage of materials, parts and finished inventory from suppliers, through the firm and to customers." The various definitions which have been proposed, indicate that SCM prescribes organizational restructuring, extended to the achievement of a company-wide
collaborative culture. For Rich and Hines (1997), it embraces a strong sense of integration of all activities controlling the timing and synchronization of material flows.

The benefits of collaborative, rather than adversarial, working relationships within and beyond the organization were identified by Ford (1980) while Lummus et al. (1998) suggests that SCM was growing in importance due to: increased market competition, the acceptance of a wider focus for evaluating organizational change and its full impact on company fortunes and the declining incidence of vertical integration as a result of which efficiency and innovation can no longer be solely an internal management function. Wider co-operation and consultation are a regarded as a necessity in the new order. Christopher (1992) suggested that a customer service explosion, time compression, the globalization of industry and organizational integration has given great importance to SCM. For him, a thorough business philosophy must replace logistics management. Burgess (1998), suggests that SCM offers competitive advantage in better lead times, customer service and supply chain synergy.

In terms of the SCM process, Waller (1997) stresses rigorous attention to quality, cost and lead or delivery times based on teamwork, co-operation and effective coordination throughout the organization. He argues that that the concept should be considered for all decisions and levels in the organization and he associates success with the handling of a number of key management activities in the supply chain. For some writers, the absence of a unifying common methodology throughout the supply chain, in the departmental systems of the past, resulted in conflicting goals. The balkanization of the supply process leaves many unresolved conflicts for SCM to address (Ganeshan and Harrison, 1997).
Realizing competitive advantage from organizational alignment and SCM in relation to materials supply is for Stevens (1989), a form of backward integration; at first, it involves the focal enterprise forging alliances of distribution and manufacturing activities to deliver improvements for the final customer (internal integration). In the process, the manufacturing organization obeys demands from distributors; purchasing is in turn re-structured and managed to achieve improved customer value for manufacturing; thereafter, the process addresses the suppliers to the organization (external integration) typically involving supplier rationalization and the introduction of supplier evaluation systems. For Stevens (1989), the evolutionary process develops through: the baseline organization; the functionally integrated company; the internally integrated company; and finally, the externally integrated company.

With regards to SCM implementation, a study by Lambert et al. (1998), conveys the SCM implementation process as a more straightforward matter. In their view, senior management must address the process and they identify three closely inter related elements to aid the SCM task, namely: the supply chain network structure; the business processes; and the management components. For Bushnell (1999), implementing SCM requires a thorough understanding of the concept and its technology over a lengthy and diverse range of activities and organizations. He states: "There is nothing worse than trying to train for a technology when employees do not really understand or fear the concepts that it supports. And there is nothing worse than managers pursuing a concept when they do not understand the importance of, or the difficulties related to, the technology on which the concept depends."
2.4. Fifty Year History of Collaboration

2.4.1. 1950s The Full Service Consumer Age

In the 1950's we knew who the boss was—The Customer. We did everything we could to get that end sale from the consumer. Customer Service was tops back in that day. We did not see the corporate control that we see today. Back then, the people closest to the end consumer made the decisions and it is a great model for us to look at for being Consumer Centric. The one down fall to this Consumer Centric model, it was not very cost efficient. However, Customer Loyalty was golden.

2.4.2. 1960s Transformation

In the 1960's we started seeing the Retail and Consumer Package Goods (CPG) industries make a transformational leap. The concept of One Stop Shopping went beyond the boundaries of limited retail space and into the Big Box discounters. The consumer had what seemed like un-limitless shopping choices and at a discount. However, with that came a price, less customer service on the sales floor. We cut back on the amount of labor working the retail sales floor and we started seeing sales clerks that had no product knowledge at all and could care less if they did. We also saw the CPG companies have a transformation as they now try to control costs by instituting vendor minimums. In some cases we also saw the expansion of labor unions, especially into the retail industry, which impacted some of the full service offerings a CPG sales person use to perform, such as the stocking of the shelves, the building of displays, and the facing of stock. Now the CPG onsite sales person started getting distanced from the merchandising at the store level and became simply an order taker. In both cases, the transformations we saw in the
retail and CPG industry was a migration away from the end consumer towards price containment and performance restrictions.

2.4.3. 1970s Leave the customer behind

The 1970's said, so long to the consumer. If you want our products you know where we live. We are cutting costs at your expense, so go ahead and pump your own gas. In addition, we will raise prices anyway. CPG companies no longer had a primary focus at going onsite to each individual store to get their orders, as orders are now done at corporate. Again, this entire cost savings were done at the expense of the consumer. Moreover, all the decision-making was done at the highest levels of the Corporate Kingdom where the consumer did not even shop.

We saw an emergence of the manufacturing product supply being produced based on financial goals with no consideration of the consumer demand. The CPG companies produced what they wanted and then it was up to the sales force and retailers to sale it. No matter how many deals had to be cut - make the sale no matter what the cost.

2.4.4. 1980s The Computer age

The 1980's were a transition into the modern world of computers. With computers we could not only save a lot of money, reduce the need for some of those last second deals, but also just maybe we could even recover some of those loss sales from the 1970's "Leave The Consumer Behind" out of stocks. The CPG companies lead the computer age charge as they attempted to recover the lost visibility of the consumer demand. However, the CPG suppliers only cared about the retailer's distribution center orders, where the end consumer did not shop.
Regardless, big benefits were obtained as the stores did have better in-stocks with programs such as Vendor Managed Inventory, VMI. However, the retailers that did not have the technology or good business processes still had many opportunities where they had great customer service levels at a DC, but not in their stores.

2.4.5. 1990s The Internet Age

The 1990's were one of the biggest evolutions in the computer age with the invention of the Internet and at the same time the emergence of large software companies whose solutions could replace entire corporate Home Grown systems with large enterprise software and supply chain optimization. The Supply Chain started migrated towards a Demand Chain and now we entered the ecosystem called the Value Chain. We saw the consumers start to re-emerge as they adopted technology quickly and found out about the many choices and the education that the Internet could provide.

The collaboration between the retailers and the suppliers, that seemed to be lost in history, started becoming vogue again. Just maybe, we could increase revenue and reduce costs all at the same time. Would not that be grand! Unfortunately we have one problem, our cultures and systems tended to still be focused at a corporate or DC level, but to manage at the retail level - do you know how long our computers would run?

2.4.6. 2000s

In the 2000's we are seeing history repeat itself. We have learned that in order to make money we have to sell our products to a consumer that has a lot of product choices and places to shop. The consumer is also more educated about the products and is a consumer with greater demand for service. With all this desire to increase sales revenue, in a global market place, our shareholders also want to see a larger profit.
Technology is coming to the rescue as the need for partnerships throughout the entire Value Chain shows a strong importance. For those who can succeed in these multi-tiered automated collaborative relationships the benefits seem endless.

Here again, technology is only a 20% enabler, as 80% of the opportunity is how the business processes are executed and are able to leverage the technology and collaborative partnerships. There is another old saying "You Can Have The Best Hammer, But It Doesn't Necessarily Make You A Good Carpenter".

It is our belief that the companies that become the weakest "Value Chain Links" in the 2000 era could soon join some of the companies who went out of business in the last 50 years. In today's world, a corporation has to focus on the consumer while making an increasing profit from year to year. Focusing on just one and not the other will cause the company to loose the end game. If the business managers think that the firm's Brand Name is good enough to survive in the today's world, think again.

2.5. From SCM to Collaboration

Over the past two decades, the strategic focus of supply chain management has shifted from an antagonist approach to a collaborative way of thinking (Bowersox, Closs, & Stank, 2003). The essence of supply chain collaboration is to share information, jointly develop strategic plans, and synchronize operations. The expectation is that competitive superiority will result from precise resource allocation that generates economies of scale, reduces duplication and redundant operations and gains consumer loyalty through customized service.

Within the requirements of the new competition, a shift in the level of intensity among trading partners emerges. Co-operation, whereby firms exchange bits of essential
information and engage some suppliers/customers in longer-term contracts, has become the threshold level of interaction. That is, co-operation is the starting point for supply chain management and has become a necessary but not sufficient condition. The next level of intensity is co-ordination whereby both specified workflow and information are exchanged in a manner that permits JIT systems, EDI, and other mechanisms that attempt to make seamless many of the traditional linkages between and among trading parties. Trading parties can co-operate and co-ordinate certain activities but still not behave as true partners. Again, this evolution is a necessary, but not sufficient, condition for total supply chain management.

Supply chain management is built on a foundation of trust and commitment (Lee and Billington. 1992). The consensus is that trust can contribute significantly to the long-term stability of an organization (Heide and John, 1990). Trust is conveyed through faith, reliance, belief, or confidence in the supply partner and is viewed as a willingness to forego opportunistic behavior. Trust is simply one's belief that one's supply chain partner will act in a consistent manner and do what he/she says he/she will do. It is this sense of performance in accordance with intentions and expectations that hold in check one's fear of self-serving behavior on the part of the other members of the supply chain (Nootboom et al., 1997). Commitment is the belief that the trading partners are willing to devote energy to sustaining this relationship (Dion et al., 1992). That is, through commitment partners dedicate resources to sustain and further the goals of the supply chain. To a large degree, commitment ups the ante and makes it more difficult for partners to act in ways that might adversely affect overall supply chain performance. Trading partners throughout the supply chain become integrated into their major
customers' processes and more tied to their overarching goals. For instance, supply chain partners willingly share information about future plans and designs, competitive forces, and R&D. Partners recognize that their long-term success is as strong as their weakest supply chain partner is.

Figure 1 (Spekman, 1998) summarizes the requisite transition from being an important supplier to becoming a supply chain partner.

![Diagram](image)

Figure 1. The key transition from open market negotiations to collaboration.

The transformation is depicted as linear although we envision it as a step function since the changes required to move from one level to another require changes in mind set and strategic orientation among supply chain partners. In most instances, firms have already achieved co-operation and co-ordination with key segments of their suppliers and customers. Nonetheless, the movement from co-ordination to collaboration requires levels of trust and commitment that are beyond those typically found in both JIT and EDI relationships. For instance, firms can co-ordinate production and logistics activities to ensure JIT delivery but never reach that next step of integration whereby future design and product performance, and long-term strategic intentions are shared. Simply, one can co-operate and be co-ordinated in a supply chain but not collaborate. Collaboration requires high levels of trust, commitment, and information sharing among supply chain partners. In addition, partners also share a common vision of the future.

Collaboration (Anderson and Narus, 1990; Bhone, 1987; Ellram, 1990; Kapoor, 1988; Spekman and Sawhney, 1995) has become a popular topic as an integral facet of
supply chain management sourcing strategies. Advocates (Landeros and Monczka, 1989; Womack et al., 1990) argue that the tasks of the buying and selling firms are interdependent and become conduits of information between the manufacturing firm and its preferred suppliers and that collaborative buyer/seller relationships allow purchasing managers to manage these tasks better than before. Collaborative behavior engages partners in joint planning and processes beyond levels reached in less intense trading relationships. A particularly interesting aspect of this belief in relation to the present research is that it suggests that the procurement function can transcend its traditional role of contributing to "cost leadership" (which remains important but probably not the key driver in supply chain management) and can support other revenue-enhancing strategic initiatives a manufacturing firm might choose such as new product development.

Effective supply chain management in the new competition suggests seeking close, long-term working relationships with one or two partners (both suppliers and customers) who depend on one another for much of their business; developing interactive relationships with partners who share information freely, work together when trying to solve common problems when designing new products, who jointly plan for the future, and who make their success interdependent. This notion is supported by Krause and Ellram (1997) who present a review of supplier development efforts. Over the long term, the supply chain that forges "virtual firm" relationships in those situations where uncertainty is highest and where the cost of success (or failure) is greatest will prevail.

In most business relationships today, suppliers sell to customers. Often there is considerable conflict in these buyer/seller arrangements as each party seeks the best financial deal. Neither side fully trusts the other. Vendors must guess customers' needs
since specific demand or planning information is not shared. In such situations, the potential for achieving overall operating efficiency is limited as firms maneuver for short-term benefits at the expense of their trading partners. The concept of integrated supply chain management, however, highlights the leveraged benefits of firms collaborating to achieve common goals. The notion of focused collaborative arrangements, coupled with true cradle to grave accountability, is revolutionizing the way that firms work together to streamline the distributive process. The potential for increased overall efficiency as a result of reduced work duplication and redundancy are astounding.

Developing collaborative behavior has been the subject of substantial discussion. These behaviors, however, are not well defined in most firms. Managers at many firms feel that behavioral change is extremely difficult to achieve. Often they find themselves talking about collaboration much more than they actually practice it.

There are three shifts that must occur to enhance firm collaboration. First, true collaboration is not dominated by or self-serving to one party in the arrangement. Collaborative relationships must encourage the mutual trust and value needed to develop and sustain coordinated operations and strategies. There must be a shared vision and objectives among customers and suppliers about interdependency and principles of collaboration. Efforts to achieve objectives must focus on providing the best end-customer value regardless of where along the supply chain the necessary competencies exist. This perspective is key to long-term supply chain viability.

Second, successful collaboration requires structures, frameworks, and metrics that encourage cross-organizational behavior. Rules and agreements should clarify leadership roles and shared responsibilities, delineate guidelines for sharing proprietary planning
and operational information, and create financial linkages that make firms dependent on mutual performance. They also should encourage risk and benefit sharing by detailing how rewards and penalties are to be apportioned across partner firms. Such sharing reflects commitment to the belief that individual firm performance is linked to overall supply chain performance. In addition, formal guidelines that define joint operating policies and procedures for handling both routine and unexpected events should be derived.

Finally, to be truly effective, collaborative arrangements also must be highly sensitive to the potential negative aspects of interlocking agreements. Specifically, participating firms must be willing to address difficult issues related to relationship de-integration far in advance of the actual need to dissolve a supply chain arrangement. Although most collaborative relationships are voluntary and, in effect, can be dissolved at any point, setting formal exit procedures is advisable to prevent disputes over assets. A clause relating to duration and termination of the relationship ensures that it does not outlive its usefulness to the participants.

2.6. CPFR Initiatives

Forecasting demand (and subsequently setting inventory levels) is difficult owing to the influence of promotions, changing demand patterns, and competitive pressures. The traditional answer to inventory problems has been to simply hold increased inventories. Holding high levels of anticipation inventory may offer a way to avoid out-of-stocks, but it is a very expensive method of avoidance. As an alternative, many value-chain participants (i.e. the buyer-seller dyad) have determined that a better approach is to aggressively work together to manage inventory. Co-operative planning
between trading partners facilitates better matching of supply and demand. Rather than trying to independently project demand patterns, buyers and sellers share information in advance and work together to develop realistic, informed, and detailed estimates that can be used to guide business operations.

Traditionally, separate and disjointed operating units across companies have independently made plans. This has often resulted in "uncoordinated store, procurement, and logistics planning for the retailer while manufacturers see sales, distribution, and production planning being out of synch" (Koloszyc, 1998). CPFR attempts to eliminate such problems through detailed exchange of point-of-sale and other information on a realtime basis (Wolfe 1998). Internal co-ordination is also needed. As many companies develop forecasts in disparate areas including marketing, finance, purchasing, and logistics. There is no assurance that these plans will ever "come together" or be reconciled. Instead, someone within the organization makes a decision as to which forecast to use. Valuable input from the individual areas is lost. Coordination is needed to bring the separate forecasts together into a single plan (Tosh, 1998).

Industry-level planning has provided the major impetus for CPFR. Five companies consultant Benchmarking Partners, manufacturer Warner-Lambert, retailer Wal-Mart, and two software firms, SAP and Manugistics - initiated the CPFR project in October of 1995 (Cooke, 1998). A business model was developed and tested with Wal-Mart and Warner-Lambert. The initial pilot involving Listerine products was deemed a success. Since that time, VICS (Voluntary Interindustry Commerce Standards) Committee, long known for their involvement in developing industry-wide standards for EDI, has become involved in efforts focused on improving supply chain management.
through collaborative partnerships between retailers, distributors, suppliers, carriers, third party providers, and any other relevant trading partners. In order to better understand key dimensions of collaboration, VICS set up the Dynamic Information Sharing Business Collaboration subcommittee (Staff, 1998). Twenty-six leading companies participated in the subcommittee (Voluntary Interindustry Commerce Standards, 1998). The focus of the subcommittee has been to develop voluntary guidelines for CPFR involvement.

CPFR is a collaborative initiative aimed at "making inventory management more efficient and cost-effective, while improving customer service, and leveraging technology to significantly improve profitability". Efficiency measures how well resources expended are utilized while effectiveness involves the extent to which goals are accomplished (Mentzer and Konrad, 1991). Thus, performance is a function of both efficiency (inputs) and effectiveness (goals/outputs).

CPFR represents a new management philosophy. Perhaps the best way to capture the breadth of CPFR is to provide an illustration. Utilizing principles of CPFR, a retailer and consumer goods firm would work together to jointly create a single, combined promotion calendar in advance of the selling period which could subsequently be up-dated on a real-time basis over the Internet. The retailer would also provide point-of-sale (POS) data, longer-term promotional plans, prescribed inventory levels, etc. for the consumer goods trading partner. Both firms would create sales and order forecasts. The retailer would then electronically transmit the retail forecast to the consumer goods firm (manufacturer). A collaborative system would be used to compare that forecast to the consumer goods firm's own forecast. Discrepancies or exceptions
would be identified and appropriate managers advised. Working together, the "team"
would decide on one, i.e. collaborative, forecast extending across the supply chain.

The above example attempts to capture the essence of CPFR - utilizing
technology/information capabilities to support trading partner interaction and joint
decision making. While the above scenario is generic, it should be noted that in actuality
CPFR agreements are very specific in nature. A great deal of time and effort is needed
up-front to negotiate specific items such as goals and objectives, frequency of up-dates to
the plan, exception criteria, and key measures. The result is a published document
defining relevant issues that has been jointly developed and agreed to. A nine-step
business model for CPFR (Robins, 1998) has been developed which provides an
indication of the scope of effort involved: (1) Develop front-end agreement. (2) Create
joint business plan. (3) Create sales forecast. (4) Identify exceptions for sales forecast. (5)
Resolve/collaborate on exception items. (6) Create order forecast. (7) Identify exceptions
for order forecast. (8) Resolve/collaborate on exception items. (9) Order generation.

The following quote concisely summarizes the CPFR philosophy and how it
"focuses on the process of forecasting supply and demand ... [through] efforts to bring
various plans and projections from both the retailer and supplier end of the supply chain
into synch" (Tosh, 1998, p. 113). The spirit of such collaboration is consistent with
Bowersox's definition of supply chain management: Supply-chain management is a
collaborative based strategy to link cross-enterprise business operations to achieve a
shared vision of marketing opportunity (Quinn, 1998, p. 38).

Since CPFR touches many aspects of how buyers and sellers operate and interact
across the value chain, it is appropriate to establish the relationship between
Collaborative Planning, Forecasting, and Replenishment (CPFR) and other initiatives that might be operating at either buyer or seller companies.

2.6.1. Quick Response (QR)

Dating back to approximately 1984, Quick Response (QR) (Waller, Johnson, & Davis, 1999) began as a soft goods initiative and represents the earliest example of a "continuous replenishment planning" business. Its goals were to synchronize buyer and seller (the value chain) and eliminate cost in the soft goods/apparel industry through better, more consumer-centric replenishment. Point-of-Sale (POS) was part of the shared information flow, and Electronic Data Interchange (EDI) was the technology base. QR preceded the formation of the Voluntary Interindustry Commerce Standards (VICS) Association in 1986, which then had as its role the creation of communication standards, initially focusing on EDI for the general merchandise industry, bar coding (U.P.C.), and case marking.

2.6.2. Efficient Consumer Response (ECR) (Christopher & Juttner, 2000)

The grocery industry examined Quick Response (QR) in mid-1992 and determined that although its goals were consistent with the industry's needs, a more comprehensive model was needed to create a value chain framework, which included:

- Efficient store assortment
- Efficient replenishment
- Efficient promotion
- Efficient product introduction

Efficient Consumer Response (ECR) is far more comprehensive than QR and extends the business process to include suppliers as well as manufacturers. ECR has since
spawned many other initiatives, including many that are international. It also seeks to share information between partners, using Electronic Data Interchange (EDI) as its core technology, led by Point-of-Sale (POS)-driven consumer demand.

2.6.3. Vendor-Managed Inventory (VMI)

Using elements of Quick Response (QR) and efficient replenishment, Vendor-Managed Inventory (VMI) (Waller, Johnson, & Davis, 1999) is used by the general consumer goods value chain. Its mantra is to "provide the right product, to the right place, at the right time, in the right quantity, at the least cost." VMI is a variant or type of efficient replenishment whereby the supplier is primarily responsible for the replenishment of inventory through a customer's supply chain. VMI (Christopher & Juttner, 2000) spawned a series of additional applications, including:

- Vendor-Managed Replenishment (VMR): a Canadian version of VMI
- Retailer-Managed Inventory (RMI): a version of VMI where the buyer has an "approval" role in the ordering mechanism; rarely deployed because most retailers have few resources available for this
- Co-Managed Inventory (CMI): a more sophisticated model of VMI where collaboration takes place to a degree but is not as formalized as in Collaborative Planning, Forecasting, and Replenishment (CPFR); the closest the early "continuous replenishment" strategies came to CPFR using the Electronic Data Interchange (EDI) platform

2.6.4. Supplier-Managed Inventory (SMI)

Supplier-Managed Inventory (SMI) (Christopher & Juttner, 2000) is a European business model that developed from the belief that Vendor-Managed Inventory (VMI) as
defined in the United States did not fit the upstream value chain in general and the European market in particular. There are numerous differences between the two systems, not the least of which are cross border issues (e.g., lead time demands are different across borders and are very different within borders) and the great disparity in systems for integration. SMI is the de facto standard for European upstream continuous replenishment.

Nearly all of these initiatives have similar goals, and they all focus on consumer demand and Point-of-Sale (POS)-driven forecasting and planning.

Efficient Consumer Response (ECR) is generally recognized as a broad initiative, while most of the other initiatives focus on the efficient replenishment element of ECR. Today these initiatives look far different from when they were originally conceived. For example, Electronic Data Interchange (EDI) is now a batch-oriented, computer-to-computer technology that is Internet enabled, which allows greater emphasis on real-time information. In 1992, this capability was not possible. Today these initiatives continue to evolve and take advantage of new technologies. They could easily be implemented with a Collaborative Planning, Forecasting, and Replenishment (CPFR) "layer" included, which would provide a collaborative framework on which to build.

2.6.5. Material Requirements Planning (MRP)

Conceived in the 1970s, Material Requirements Planning (MRP) was a system that took input from customer orders, forecast customer orders, and then estimated the demand using a product bill of materials (BOM). The BOM provided a complete list of material requirements for acquisition. Additionally, MRP was used to schedule shop floor activities. In the early days MRP took no account of capacity or other constraints.
2.6.6. Manufacturing Resources Planning (MRP II)

Manufacturing Resources Planning (MRP II) evolved from Material Requirements Planning (MRP) activity. MRP II extended the model to include other aspects of an organization so that system directives were more achievable. MRP produced "logical" results that sometimes were not possible and often resulted in expedite and "hot" lists. MRP II overcame this limitation by including information about constraints and resources, such as shop floor and work center capacity, output rates, supplier material rates, and elements of cost (e.g., standard, average).

Included in this additional information were Rough-Cut Capacity Planning (RCCP) and Capacity Requirements Planning (CRP). RCCP is a high level, bucketed view of a plant's aggregate capacity and is used as a preliminary verification of a plant's ability to meet orders and inquiries. CRP is a detailed explosion of capacity (resource) requirements, much like MRP is a detailed explosion of material requirements. CRP requires much more information on a traditional bill of materials (BOM). The resulting document is called a Bill of Resources (BOR) and/or Bill of Distribution (BOD). The BOR is focused on all resources; the BOD focuses on location-to-location distribution resource needs, which is more applicable to Distribution Requirements Planning (DRIP). CRP was enhanced and eventually supported Finite Capacity Planning (FCP), which closely mirrors the Advanced Planning and Scheduling (APS) applications, known for optimized production planning and scheduling. In the 1980s, FCP was used to re-schedule plants based on capacity violations, and costs and revenue were sometimes used to make such decisions.
2.6.7. Distribution Requirements Planning (DRP)

Distribution Requirements Planning (DRP) evolved out of Material Requirements Planning (MRP) and was a similar process that provided time-phased resource requirements for distribution rather than for manufacturing. DRP sought to determine which products were needed in which warehouses in order meet forecasted and customer orders. DRP evolved into Distribution Resources Planning (DRP II), much like MRP evolved into Manufacturing Resources Planning (MRP II) to include other resources beyond product, such as distribution and transportation equipment (taking into account, for example, costs to move and store products). Additionally, DRP was an unconstrained model (like MRP), and DRP II was constrained to some degree.

2.6.8. Sales and Operations Planning (S&OP)

Sales and Operations Planning (S&OP) began as an outgrowth of Manufacturing Resources Planning (MRP II) and as a process that facilitated the continual integration and synchronization of information inside a company, including the following departments:

- Sales and Marketing
- Production
- Distribution
- Finance
- Engineering (if applicable)

The goal of S&OP involved meeting frequently to review performance and direction, with a view to ensuring that all departments worked with a single set of numbers. S&OP has since evolved and now operates inside many organizations under
different names and often without any reference to Material Requirements Planning (MRP) activities. For example, a distributor might operate with an S&OP process and yet not use MRP. Likewise, a manufacturer that exploits flow or Just-In-Time (JIT) technology (for repetitive manufacturing cycles, such as ball bearings) may follow an S&OP process, although it might be called by a different name (one that implies the same coordination across the enterprise). S&OP is principally about synchronizing and balancing the demands on an organization with its ability to supply and serve, as well as about visibly coordinating plans and actions across all aspects of an enterprise.

2.6.9. Enterprise Resource Planning - ERP

Enterprise Resource Planning (ERP) systems are designed to address the problem of fragmentation of information or “islands of information” in business organizations. Traditional ERP systems improve efficiency within the four walls of an enterprise by integrating and streamlining internal processes (Koch 2001; Anderson, 2000). ERP systems promise to computerize an entire business with a suite of software modules covering activities in all manufacturing and non-manufacturing areas of the business. Furthermore, ERP is being promoted as a desirable and critical link for enhancing integration between all functional areas within the manufacturing enterprise, and indeed between the enterprise and its upstream and downstream trading partners. (Benroider and Koch, 2001; Chen, Small and Muscatello, 2000). ERP systems are considered the “backbone” of any manufacturing business. ERP software developed by SAP, Baan and Oracle has been touted as the solution for very large manufacturers as well as mid-size firms.
2.6.10. Summary

Several of these initiatives and processes are buyer or retailer oriented, several are manufacturer or seller oriented, and some are value chain or business-to-business oriented or contain multiple elements. It is arguable whether Collaborative Planning, Forecasting, and Replenishment (CPFR) is an outgrowth of one or more of these activities. To its founders, CPFR is an outgrowth of Vendor-Managed Inventory (VMI) programs that did not perform adequately. It could be argued that CPFR is an evolved form of VMI. Those who were involved with the Voluntary Interindustry Commerce Standards (VICS) Association and other associations when Efficient Consumer Response (ECR) was popular might maintain that ECR was the grandfather of CPFR. To those early pioneers of Distribution Requirements Planning (DRP), who had to develop one-number demand plans inside an enterprise, CPFR was nothing more than an extended one-number principle. The early definitions of ECR even resemble those from the CPFR world. In fact, all of these viewpoints are correct. CPFR is simply the latest embodiment of knowledge and experience that has been compiled to continually improve a company's internal efficiencies while increasing external effectiveness.

2.7. Stages of CPFR

There has been a continuous evolution in best practices over the years to refine operating processes, reduce cost, increase profitability and ultimately customer satisfaction. Industry leaders are continuously defining new approaches to win in the market place and win with the customer. The migration to Replenishment Best Practices has come in three stages: VMI, CoManage and CPFR (VICS, 1998). Each stage takes trading partner relationships to a new level. The objective has been to involve and focus
trading partners on the end consumer. VMI, CoManage and CPFR are all progressive steps to creating "collaborative value chain alliances" aligning actions and decisions driven by the consumer.

As business systems have progressed, what was considered a Best Practice 20 years ago, today, VMI is no longer considered a Best Practice. VMI is a Good Practice, just not the Best, any more. Best practices have progressed beyond suppliers managing replenishment for retailers to forming collaborative relationships jointly managing processes, decisions reaping significant results.

2.7.1. VMI -Vendor Managed Inventory

VMI, was first adopted in the early 1980's in an effort to involve suppliers in the process to improve in stocks, lead times and order shipment accuracy by providing a direct view of customer activity. Additionally, VMI was intended to leverage the manufacturer's capabilities to manage and improve warehouse replenishment for retailers with resulting improvements in sales revenue and inventory/supply chain efficiencies.

VMI was adopted because often retailers lacked technology such as found in today's store level and DC level automated forecasting and replenishment systems. Quite frankly, some vendors could just do a better job of managing replenishment than some retailers could.

2.7.1.1. Positive impacts of VMI:

1. Improved demand and inventory visibility for manufactures and focused them on end consumer demand, in-stock and supply chain execution.

2. Improved in-stocks at the distribution centers, which resulted in improved in-stocks in the retail store.
3. Involved suppliers in the process with shared goals rather than stand on the sidelines. The result with some was an increase in sales and reduction of average inventory.

2.7.1.2. Negative impacts of VMI:

1. Replenishment was based at a DC level with limited visibility by the vendor of store level sales and inventory demands. Most VMI programs have been based on warehouse shipments and not on actual "Consumer Centric Demand".

2. Disconnects in the retail pipeline limited benefits due to inventory inaccuracies, poor data integrity, poor store replenishment by the retailer, and supply issues. Blame was often pushed onto the vendor for all replenishment issues. Having the products in the DC did not always mean it was going to make it to the store shelf and the retailer didn't help to make it any better.

3. Most VMI programs turned into customer service functions and did not integrate up stream to streamline vendor's inventory management, deployment, production and procurement. High Customer Service level percentages were not optimized based on true Value Chain visibility.

4. Different manufactures had different capabilities and used different systems. Standardization of processes, methods and results became an issue. Manufactures used sophisticated replenishment systems to penny pencil and note pad. VMI lacked consistency, standardization and shifted the ownership and responsibility from retailer to supplier.

Many of the large retailers have virtually eliminated most VMI programs and are using automated retail managed replenishment systems. The primary exceptions are for
direct store deliveries, and for high maintenance and fast changing products such as
greeting cards, seasonal products, videos, and music.

2.7.2. Co-Managed Replenishment

Co-Managed Replenishment was first piloted at Wal-Mart in 1995 and has expanded to some of the larger retailers and trading partners. Co-Managed as we called it, raised the bar and addressed the issues with VMI. The new program provided the ability to share more information and data, used common systems for consistency and performance measurement, and promoted joint decision making, accountability and performance incentives.

Co-Managed Replenishment is a method by which retailers train vendors to use the retailer's proprietary automated replenishment system. Access is normally done through the Internet using a Private Exchange and allows the vendor to adjust and optimize replenishment rules for only their own set of products.

Co-Managed Replenishment has been very successful in improvements of customer service levels at the store shelf and DC. Inventory turn levels have improved substantially as sales revenues have increased. Co-Managed programs were a training step to CPFR.

2.7.2.1. Positive impacts of Co-Managed Replenishment

1. Good visibility of the demand and supply chain from the store shelf through manufacturing.

2. Allows vendors access and ability to adjust their own products replenishment policy parameters and settings directly linking joint decisions to execution.
3. Replenishment demand alignments are established and maintained between store level and DC replenishment.

4. Significant improvements in store level in-stocks, inventory turns, forecast accuracy, and reduction in replenishment emergencies.

5. Joint ownership in replenishment process and improved partnership between the retailer and vendor.

2.7.2.2. Negative Impacts of Co-Managed Replenishment

1. The replenishment technique is proprietary to a specific retailer. This forces a vendor to have to provide internal resources to be trained and only utilized to a specific retailer's program.

2. Technology constraints have prevented co-managed forecasts from being feed automatically into manufacturer's demand planning and execution systems.

3. This technique is only available to be used by a few of the larger retailers and their strategic partners.

Many of the retailers are using this as a migration step towards CPFR. The benefits of Co-Managed have been significant. Because the CPFR industry adoption has taken a long time for many companies, Co-Managed Replenishment is still being used substantially by some of the larger retailers as they wait for CPFR to evolve.

2.7.3. Collaborative Planning Forecasting and Replenishment - CPFR

Manual Collaborative Forecasting was first implemented at Wal-Mart, Inc. in 1993 and was called Vendor Forecasting and shared with the vendors using the private exchange Retail Link. This was the first retail application that utilized the integrated forecast from the automated replenishment system as a health indicator that reflected
replenishment accuracy. Wal-Mart discovered early on that if the Vendor Forecast was inaccurate then the replenishment policy file settings were also inaccurate.

CFAR - Collaborative Forecasting and Replenishment, was started by Wal-Mart in 1995 as an outgrowth of an internal process known as Integrated DRP Time Series Replenishment. CFAR was coined through piloting the process with Warner Lambert. The subsequent goal was to develop Industry Standards for business-to-business collaboration using the Internet, much like what was done with EDI in the 1980's.

The successful CFAR pilot lead to the creation of the Voluntary Inter-Industry Commerce Standards, VICS, sponsored Collaborative Planning Forecasting and Replenishment, CPFR, Working Group in 1996 and is in active existence today. There are over 80 retail and CPG member companies in the VICS CPFR Working Group today.

2.7.3.1. Positive Impacts of CPFR

1. Industry sponsored Internet business-to-business standards that provide technology as well as business process guidelines that are not proprietary and scalable across multiple trading partners.

2. Significant improvements in forecast accuracy resulting in increase store in-stock, reduced inventory levels, reduced transportation costs, and a reduction in overall cost of goods sold.

3. Manufactures are able to optimize the supply side with critical mass of product demand, integration of collaborated demand forecasts into manufacturing applications and data visibility.
4. The CPFR process lays the basic foundations allowing additional tier links in the Supply Chain that are incorporated in a many to many collaborative partnerships such as with transportation carriers and raw material providers.

5. With CPFR the collaborative process is defined to support collaborative programs focused on integrating and optimizing Merchandise Planning and Transportation/Logistics

2.7.3.2. Negative impacts of CPFR

1. Many CPG manufacturers have not been able to realize the benefits of consumer demand visibility of store sales versus orders at the retailers DC. As a result, most CPFR pilots have focused at the DC level and not at the store.

2. Technology constraints have prevented collaborated forecasts to be fed automatically into manufacturers demand planning and execution systems.

3. Collaborated partnerships have encountered internal collaboration struggles that often result in "self inflicted wounds".

4. External partnerships that result in "We Win, You Figure Out How to Win" relationships look very much like past VMI programs and inherit the negative impacts from 20 years ago.

5. Breaking of internal behaviors, attitudes and old traditional cultures stall the progress, understanding and application of collaborative principles and all of the benefits.

2.7.4. VMI, Co-Managed, CPFR Readiness Questions

Practicing managers rarely understand where they should begin. Here are a few sample readiness questions management should ask to help determine which replenishment
approach the firm should consider. The following can become an important questionnaire to help guide them in the proper direction.

2.7.4.1. VMI

1. Who is better at forecasting and managing replenishment? The retailer or the vendor?

2. What data can the retailer supply to the vendor to support VMI?
   a. POS (point of sale)
   b. Inventory levels
   c. DC (distribution center) withdrawals
   d. Sales Forecasts
   e. EDI capable

3. How can the retailer manually place or cancel orders?

4. What metrics and scorecards are in place to measure effectiveness for both the retailer, as well as, the vendor?

2.7.4.2. Co-Managed Replenishment

1. Does the retailer have a co-managed program?

2. Can access to the co-managed system be done remotely through the Internet or an extranet?

3. What training does the retailer provide?

4. How much access authority is provided?

5. How are disputes settled?

6. What are the scorecard metrics and goals?
2.7.4.3. CPFR

1. Does your trading partner currently support CPFR?
2. Does your company have an executive champion for CPFR?
3. Have you piloted CPFR before?
4. Do you have systems in place to support a CPFR program?

2.7.4.4. Summary

1. All three replenishment methodologies have successful benefits.

2. An evolution is occurring:
   - VMI adoption is decreasing, except for certain products and delivery.
   - Co-Managed Replenishment is an effective supporting process to CPFR, but may not be accessible to most due to their internal network capabilities.
   - CPFR, using private and/or public exchanges, is accessible to both large and smaller companies and is being widely adopted globally. CPFR is the current Best Practice.

3. Technology providers are moving ahead of the industry in CPFR technology solutions through execution.

4. Other areas of collaborative commerce are following the CPFR adoption wave:
   - Collaborative Assortment Optimization
   - Collaborative New Product Design
   - Collaborative Transportation Management

The industry continues to evolve, change and adjust to improve efficiency, effectiveness, shareholder value and competitive advantage. Leaders continue to lead in the adoption of innovative "value chain" practices. Early adopters, both large and small,
are reaping the early advantages while the industry laggards continue to sustain or slip in their industry position.

CPFR and value chain collaboration is a philosophy and set of business processes that lay the foundation for integrating consumer demand and supply chain in a collaborative environment with trading partners. The opportunity exists to get educated, provide leadership, build consensus and internal champions and define the migration plan to transformation for your company.

2.8. CPFR Definition

The official definition of CPFR put forth by VICS (VICS, 1998) is fairly straightforward: A collaborative technique that formalizes the processes between two trading partners used to agree upon a joint plan and forecast monitor success through replenishment, and recognize and respond to any exceptions. In a broader sense, CPFR is about people, process, and technology. It is also about evolution, adaptive cultures, standards, metrics, change management, and education.

2.8.1. CPFR Nine Implementation Steps

In its fullest implementation, CPFR is an iterative nine-step process (VICS, 1998) that begins with the agreement to establish a collaborative relationship and ends with order generation. However, CPFR can be accomplished effectively without rigidly adhering to each and every one of the steps. The nice steps in the process mode are:

1. Develop collaborative arrangement. The initial arrangement, which is reviewed annually, establishes the guidelines, expectations, actions, performance measures, and resources necessary for success.
2. *Create joint business plan.* The plan begins with the exchange of corporate strategies and the creation of a partnership strategy. The joint strategy identifies the items to be collaborated upon and the tactics to be used to achieve the joint objectives. Typically this is done on a quarterly basis.

3. *Create sales forecast.* Done monthly or weekly, the sales forecast can be developed by the retailer, supplier, or both based on the availability of data and forecasting capabilities.

4. *Identify exceptions for sales forecast.* This step identifies the items that fall outside the sales forecast constraints set jointly by the retailer and supplier. This is also done monthly or weekly.

5. *Resolve/collaborate on sales forecast exceptions.* This is the process of investigating the exceptions through shared data, e-mails, meetings, and so on, and submitting any resulting changes to the sales forecast. It should be done monthly or weekly.

6. *Create order forecast.* Various information sources are accessed to generate a specific order forecast that supports the shared sales forecast and the joint business plan. Either the retailer or the manufacturer can create the order forecast, typically on a monthly or weekly basis.

7. *Identify exceptions for order forecast.* Performed monthly or weekly, this step determines which items fall outside the order forecast constraints set jointly by the retailer and supplier.

8. *Resolve/collaborate on exception items.* Items that fall outside of the order forecast constraints are identified and resolved on a monthly or weekly basis.
9. *Generate order.* The retailer or the supplier generates the order. This step is completed weekly or daily.

2.9. **Trust**

Recent work on trust between business organizations focuses on the possibility of using it to enhance competitive advantage (Barney and Hansen, 1994, Jarillo, 1988, Mohr and Spekman, 1994). In fact, an increasing number of studies exhort companies to build trust with their business partners (Dodgson, 1993). However, trust is sometimes understood to be a by-product of norms embedded in social networks and rarely brought about through rational-instrumental means (Granovetter, 1985). Even if trust could be cultivated intentionally, it is regarded as a scarce commodity which only a few can afford (Gambetta, 1988). Before an explicit strategy of developing and maintaining trust can be considered feasible, the determinants of trust must be identified.

Inter-organizational trust may enhance organizational performance in a number of ways. For instance, trust enables a network of firms to adapt to unforeseen circumstances which are common in a world of risk and uncertainty, thus reducing transaction costs (Jarillo, 1988). Also, trust is said to promote suppliers' willingness to invest in customer specific and general assets (Dyer, 1998). But while theoretical work abounds, empirical work on the link between trust and performance has been rare. In empirical work, as in theory, it is opportunism rather than trust which has attracted more attention (Anderson, 1988). Moreover, opportunism or trust tend not to be measured directly; instead, these features are assumed to be present in transactions with certain characteristics such as specific assets (Klein et al., 1978) or long-term trading (Gulati, 1995).
The central concept of CPFR is mutual trust between a customer and a supplier organization. Trust is an expectation held by an agent that its trading partner will behave in a mutually acceptable manner (including an expectation that neither party will exploit the other's vulnerabilities). This expectation narrows the set of possible actions, thus reducing the uncertainty surrounding the partner's actions. Sako (1992) used these different reasons to distinguish between three types of trust: contractual trust (will the other party carry out its contractual agreements?), competence trust (is the other party capable of doing what it says it will do?), and goodwill trust (will the other party make an open-ended commitment to take initiatives for mutual benefit while refraining from unfair advantage taking?). Therefore, based upon the literature, trust in various forms, is of utmost importance for collaboration to occur.

Trust has been continuously identified as a key component of strong relationships in the literature. Trust has been defined as “the willingness to rely on an exchange partner in whom one has confidence” (Moorman, Deshpande, and Zaltman, 1993). Since it is reasonable to assume that supply chain members often are reluctant to share information, trust should be a key factor in predicting information exchange. In fact, many firms are seeking fewer, more intense relationships in an effort to lower total logistics costs and improve customer service (Kumar, 1996). However, one consequence of fewer relationships is that an increasing degree of importance is placed on each relationship between firms and trust in another firm becomes an essential component of successful relationships between manufacturers and retailers (Geysken, Steenkamp, and Kumar, 1997).
Trust is an essential element to strong relationships and working partnership in channels, the amount of information exchanged between channel members should increase as the strength of the relations increases, and the relationships are stronger as trust increase. Therefore, information exchange should increase as trust increases.

Stronger relationships are likely to be more important for information that firms are not used to sharing with other firms. On some levels, all firms have exchanged operational information during the ordering process. In addition, information is readily available from syndicated services about industry sales and market shares. In short, operation information is commonly exchanged between firms and is known by many firms.

Strategic information is not commonly shared between firms. In fact, most firms, whether they are competitors or supply chain partners, find out about competitive strategies that day they are introduced. Companies are not used to sharing strategic information with other firms in advance of these strategies being implemented. Common knowledge of upcoming strategies could diminish the competitive advantage that is the main goal of new strategies.

Even though another firm in the supply chain seldom represents a direct competitor, these firms often deal with several competitors simultaneously. For example, in the past, Wal-Mart has not been a direct competitor of Coca-Cola, but it has also dealt with Pepsi, 7-Up and other soft drink companies. One could understand if Coca-Cola was reluctant to share upcoming strategies with Wal-Mart for fear that the information might finds its’ way to a competitor. To further complicate matters, many retailers, including Wal-Mart, now carry its own private label brands. Wal-Mart has Sam’s Cola and one
would expect that Coca-Cola's incentive to share strategic information with Wal-Mart is further diminished by the retailer's entry as a direct competitor.

Therefore, due to the sensitive nature of strategic and operational information and because strategic information has rarely been shared among firms in the past, one should expect that trust would be very important for the exchange of strategic and operational information.

2.10. From Literature Review to Research Methodology

Several authors (Aichlmayr, 2000; Ireland and Bruce, 2000; Barratt and Oliveira, 2001; Seifert, 2003) maintain that at the heart of the CPFR process lies the aspiration to cover the gaps left by previous supply chain management (SCM) practices, such as vendor managed inventory (VMI) or continuous replenishment. Compared to these collaborative-based practices, CPFR has a more comprehensive focus that includes Designing CPFR planning, forecasting and replenishment processes, as pointed out in the CPFR VICS collaborations model (Figure 2).
<table>
<thead>
<tr>
<th>Planning</th>
<th>Develop front end agreement.</th>
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<tbody>
<tr>
<td></td>
<td>Create joint business plan.</td>
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<tr>
<td>Forecasting</td>
<td>Create sales forecast</td>
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<td></td>
<td>Identify exceptions for sales forecast.</td>
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<td>Resolve/collaborate on exception items.</td>
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<td></td>
<td>Create order forecast.</td>
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<td>Identify exceptions for order forecast.</td>
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<td>Resolve/collaborate on exception items.</td>
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<tr>
<td>Replenishment</td>
<td>Order generation.</td>
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</table>

Figure 2. Activities in the CPFR Process

Based on VICS' guidelines and definition of CPFR, a number of researchers and practitioners have studied the use and implementation of CPFR. For instance, the Efficient Consumer Response (ECR) Executive Board initiated a project on CPFR, whose first results were published in 2001 in a document entitled: "A Guide to CPFR Implementation" (ECR Europe, 2001). This document aims to highlight how to adjust the VICS model to adapt it to market characteristics. Analysis of the original VICS model revealed that no major adjustments were necessary, although promotion planning was identified as a key process for all companies.

Similarly, Barratt and Oliveira (2001) analyzed CPFR implementation, by using VICS model as their starting point. They revisited this model by adopting a process mapping tool. By utilizing the reviewed version of the CPFR process, the authors then
conducted a survey among the members of VICS CPFR contact list to examine the CPFR implementation process.

Nockentved (2000) argues that the VICS guidelines explain how to manage processes from a SCM perspective. He also analyses where CPFR works best. Generally, it works best when the focus is on long-term relationships involving highly differentiated products with limited sources of supply.

Unlike these previous studies, Larsen et al (2003) view CPFR as a general approach to coordination of processes between participants in a supply chain. They state that CPFR can be implemented in various ways, as it can be differentiated both in terms of scope of the collaboration - indicating the number of business processes involved - and depth of the collaboration - measuring the integration of business processes. In particular, the authors suggest that CPFR can be classified into three levels - basic, developed and advanced - depending on these two variables. Larsen et al (2003) maintain that the basic CPFR is frequently the starting point for the other collaborative initiatives.

A similar concept also emerges from the ECR guide (2001) on CPFR. It suggests that the VICS model is indeed a "modular" model because in some circumstances it is not necessary to implement all nine steps of the model to gain advantages. A company, for example, may decide to collaborate only in managing order forecasts (steps 6-8 of the VICS model). In particular, CPFR implementation options should vary according to the CPFR development stages. The slogan is "think big, start small, and scale intelligently" (ECR, 2001). In implementing CPFR, a company should plan the implementation by considering the final objectives of the project. Nevertheless, it is necessary to "start small" focusing on only a few processes in the early stage of the project's development,
and collaborating with a few preferred partners. The "scale intelligently" step relies on the lessons learned during the CPFR pilots. Companies need to evaluate their experiences in order to develop their individual plan towards roll-out. They may, for instance, decide to involve more actors or processes in the collaboration.

Seifert (2003) recognizes that different forms of CPFR collaboration can exist among customers and suppliers. He believes it is due to the fact that CPFR is implemented by means of a phased approach. For example, several companies are reevaluating programs such as the VMI and modernizing them by adding collaborative technologies to facilitate greater communication and improve the results. As trust builds and technology infrastructure is acquired, the collaborative process can then be extended to take on additional aspects of the CPFR standards and achieve greater benefits.

CPFR implementation cases described in the literature seem to confirm that CPFR can take a number of different forms across supply networks. Various types of CPFR partnerships are being tried. Wal-Mart and Warner-Lambert embarked on the first CPFR pilot, involving Listerine products. In their pilot scheme, Wal-Mart and Warner-Lambert used special CPFR software to exchange forecasts. Supportive data, such as past sales trends, promotion plans and even the weather, were frequently transferred in an iterative fashion to allow them to converge on a single forecast should their original forecasts differ. The pilot scheme was very successful, resulting in an increase in Listerine sales and better fill rates, and in a reduction of inventory investment (Cooke, 1998; Hill, 1999). Other examples of CPFR pilots include Sara Lee's Hanes and Wal-Mart, involving 50 SKUs of underwear supplied to almost 2,500 Wal-Mart stores (Hill, 1999, Parks, 2001, Songini, 2001). In 1996, Heineken USA employed CPFR to cut its order-cycle time and
is currently providing collaborative planning and replenishment software to its top 100 distributors (Aviv, 2001). Procter and Gamble has several active CPFR pilots underway (Schachtman, 2000). Levi Strauss & Co. incorporates certain aspects of the CPFR business process into its retail replenishment service (e.g. by creating joint business plans and identifying exceptions) (Aviv, 2001). Additionally, in the ECR report entitled "European CPFR Insights" several CPFR pilots are described including: Unilever-Sainsbury's-GNX, Condis-Henkel-Cartisa, Kraft-Sainsbury's-GNX, Carton-Scholler, Vandemoortele-Delhaize (ECR Europe, 2002).

By comparing the CPFR cases mentioned above, the existence of commonalities as well as significant differences in CPFR implementation emerge. In particular, one of the main differences concerns the collaboration approach business processes included in the collaboration and the way of collaborating (e.g. degree of discussion, communication/synchronization, etc.) may differ. Moreover, although several CPFR cases involve manufacturer-retailer dyads, it is worth noting that in some cases a company can collaborate with numerous other supply network members both upstream and downstream in the supply network (ECR Europe, 2002). As a result, the types of technologies and tools used for supporting CPFR can vary across implementation cases. Technology adoption ranges from the use of simple tools, such as a fax, to more advanced Internet-based CPFR solutions (Attaran, 2002, Sparks and Wagner, 2003). The complete literature review mainly identified gaps in research that led to problem areas with respect to implementation issues. Therefore, the research methodology includes case studies, expert panels and is augmented by the survey methodology.
CHAPTER III

RESEARCH METHODOLOGY REVIEW

3.1. A Multi-thrust Research Strategy

This research was conducted using a multi-thrust research strategy. The strategy involves four complementary research methodologies:

1. action research,
2. case studies,
3. focus groups, and
4. survey.

Each of these approaches is used to complement the others in investigating collaborative planning forecasting and replenishment in a supply chain context.

Despite the existence of the detailed and comprehensive process model the research on the implementation issues of CPFR research is still an early stages of investigation. In fact, most of the studies on CPFR discuss the advantages and potential future developments but do not discuss implementation issues.

This immediately led us to action research. Action research involves actual intervention by the researcher as a participant in a given process. In this role, the researcher is testing theory and method by applying both in a real context, rather than in a
laboratory experiment. This research will use action research to develop and sharpen the theory of collaborative planning forecasting and replenishment. The action research approach will be applied by the researcher as a participant in the development and testing of the collaborative planning forecasting and replenishment process. The author of this dissertation was involved with the implementations of a few CPFR implementations as a consultant. This action research allows the author to gather data and ultimately led to the case studies.

This led us to four case studies. These case studies did provide a source of new hypotheses and constructs simultaneously. Discovering new hypotheses to find the correct method of implementation would be a major advantage of this study. Case studies have a significant scientific role even though they had been maligned be as “scientifically worthless”. However they do not meet the minimal design but requirements for comparison, but they have a significant role. It is known that important scientific propositions have the form of universals and a universal can be falsified by a single counter instance. Thus, a single, well designed case study can provide a major challenge to a theory and provide a source of new hypotheses and constructs simultaneously. The four case studies were limited by their number and the focus group could help clarify these observations. Focus groups have research potential in business areas where the generation and evaluation of ideas and the assessment of needs is indispensable.

In exploratory research, the qualitative data that focus groups produce, is used for enriching all levels of the research questions and hypotheses and comparing the effectiveness of design options. While the focus group did help in the understanding about the questions of implementation of CPFR, more questions were raised. These
questions led to a mail survey. These research designs are complimentary by the
approach used to gather primary data. The focus group observes conditions while the
survey allowed communication about the various Implementation topics.

Triangulation was used to ensure research reliability obtaining the same piece of
information from different sources: semi-structured interviews, documentation, archival
records and direct observations (McCutcheon and Meredith, 1993).

3.1.1. Research aim

From the selected and analyzed body of literature on CPFR, two primary key
issues emerged that determined the research objectives:

(1) Despite the existence of a detailed and comprehensive process model (VICS,
1998), some authors (Larsen et al, 2003; Seifert, 2003) state that CPFR can take a
number of different forms across supply networks. Nevertheless, research is still at an
early stage of investigating the problem. In fact, most of the studies on CPFR focus on
identifying the advantages and future developments of CPFR, or describe cases of CPFR
implementation.

(2) The dominant theory explaining differences in CPFR implementation states
that CPFR forms vary according to the development stages of the implementation process
(Larsen et al., 2003; Seifert, 2003). However, this theory does not always seem to be
enough to explain CPFR differences. In some cases, for instance, a company might
decide to limit CPFR collaboration to only a few processes and collaborate with a small
number of partners, even if it has reached an advanced stage of CPFR development.
Thus, the question as to why CPFR implementation varies across supply networks is still
open.
As a result, this research aims to comprehend the rationale behind the managerial choices that lead companies to implement different types of CPFR collaborations. In particular, the aim is to analyze the relationships between:

- the dimensions explaining the implementation of CPFR collaborations; and
- the contingent factors influencing these implementations.

With regard to the dimensions explaining the implementation of CPFR collaborations, the critical review of the literature and investigated cases suggests consideration of the following factors:

- the number and type of business processes involved in the collaboration;
- the level of integration (e.g. degree of discussion, co-ordination/synchronization, etc.);

and

- the number of units with which a company collaborates.

In addition, among the contingent factors that might influence CPFR collaborations, this research considers the following:

1. CPFR goals: That is, the reasons driving companies towards CPFR implementation (e.g. cost reductions, increased service levels, etc.).
2. Product/market characteristics: Including the characteristics of the products managed through CPFR and the markets in which they are sold (e.g. product types, characteristics of demand, effect of promotions, etc.).
3. Supply network structure: Encompassing issues relating to:
   - the supply network's physical structure (e.g. sourcing policies, location, size, number, degree of specialization of facilities, etc.); and
   - the supply network's relational structure (e.g. nature of customer-supplier relationships, SCM initiatives, vertical integration, etc.).
4. CPFR development stage: Stage of development of the CPFR project.

The analyzed contingent factors were limited to these variables because it was felt that they are most directly linked to CPFR implementation, as suggested by the literature and as emerged from the investigated cases (Larsen et al, 2003; Lee, (2002); Seifert, 2003).

The investigation of the reasons why companies implement different types of CPFR collaborations is valuable from both a managerial and theoretical perspective. From a practical point of view, the understanding of the contingent factors influencing CPFR implementation decisions could support managers in selecting the most appropriate action to be taken to implement CPFR, through the analysis of the context where CPFR should be implemented. Moreover, from a theoretical point of view, theory building on CPFR (i.e. definition of variables characterizing CPFR collaborations and context, measures for these variables, and relationships) significantly contributes to advance CPFR theory, as most of literature on this theme is descriptive.

3.2. Action Research

Action research involves actual intervention by the researcher as a participant in a given process. In this role, the researcher is testing theory and method by applying both in a real context, rather than in a laboratory experiment. The basic action research routine is an iterative process of Observe, Reflect, and Act. Observing includes gathering relevant data and information and building a picture or description of the situation. Reflecting involves theorizing, i.e., exploring and analyzing what is happening, and interpreting and explaining how/why things are as they appear to be. Acting involves planning, reporting, implementing, and evaluating (adapted from Stringer 1999).
This research will use action research to develop and sharpen the theory of collaborative planning forecasting and replenishment. The action research approach will be applied by the researcher as a participant in the development and testing of the collaborative planning forecasting and replenishment process.

Of course it is both risky and challenging to conduct research in the operating context. It is risky because of the dynamic and stochastic nature of the environment in which the research is performed. The people that are the subjects of action research are generally faced with continually changing priorities and agendas, and action research must respond to the issues that are most current and pressing. An action research approach presents a unique challenge to the researcher to accurately and with some sense of urgency extract the relevant information from the day-to-day operations, and subsequently perform rigorous and relevant analysis of that information, be it quantitative or qualitative.

3.3. Case Studies

For the purposes of this research a case study is defined as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin 1994).

The case study inquiry copes well with the challenges of action research where there are often many more variables of interest than data points and multiple sources of evidence. The case study inquiry conducted as part of an action research strategy is guided by the theoretical propositions of the action research.

The case study research method is an effective complement to action research in that case studies are the preferred strategy when "how" or "why" questions are being
posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context (Yin 1994).

The case study is appropriate here because the research is conducted within the daily operating environment of a large manufacturing company. The researcher had minimal control over the daily events. However, the researcher has access and authority to conduct semi-structured interviews, a limited number of observations, focus group sessions, and a limited number of surveys. In addition, the researcher had the clearance to act as a participant observer in the planning and forecasting functions.

In actuality, the demands of a case study on a researcher’s intellect, ego, and emotions are far greater than those of any other research strategy. This is because the data collection procedures are not routinized. In laboratory experiments or in surveys, for instance, the data collection phase of a research project can be largely, if not wholly, conducted by an assistant. The assistant can carry out the data collection activities with a minimum of discretionary behavior, and in this sense the activity is routinized (Yin 1994).

In case studies, there is little room for a novice researcher. Rather, a well-trained and experienced investigator is needed to conduct a high quality case study because of the continuous interaction between the theoretical issues being studied and the data being collected. During data collection, only a more experienced investigator will be able to take advantage of unexpected opportunities rather that being trapped by them and also to exercise sufficient care against potentially biased procedures (Yin 1994).

Another key aspect of data collection in case study research is that the researcher must be able exercise sound judgment. The researcher needs to interpret the information
as it is being collected and to immediately recognize the important aspects of the information. For instance, if several sources of information contradict one another and lead to the need for additional evidence, it is critical that the researcher makes a judgment regarding which and how much additional evidence is required (Yin 1994).

The case study research methodology has been highly recommended by many researchers as an ideal tool for improving conceptual and descriptive understanding of complex phenomena (Flynn et al., 1990; McCutcheon and Meredith, 1993; Yin, 1994). The case study method also offers many benefits such as the ability to directly observe causality and combine evidence and logic to build, develop or support theory that is not available using other research methods (Maffei and Meredith 1995). In contrast to survey research formats, it allows for more meaningful follow-up questions to be asked and answered and can result in more extensive findings and insights that are valid, generalizable and rigorous (Meredith, 1998).

CPFR implementation is an expensive and extensive undertaking involving all activities related to planning, justification, installation and commissioning of the installed system. An CPFR system extends across the entire organization and even beyond to cover integral partners in the supply chain. Furthermore, CPFR projects can take two, three or more years to fully implement (Parker, 1999). All the above factors contribute to the complexity of CPFR installations, and make snap-shot/cross-sectional approaches unsuitable for investigating the entire CPFR implementation process. This study adopts a case study methodology to create propositions and further the research by testing the propositions using a Focus group and survey to investigate the myriad and complex relationships within and between the CPFR implementation steps. However, unlike the
majority of studies in this area which focus on single case studies or survey information based on a specific CPFR process or implementation plan, this study develops a survey based on CPFR implementations at four diverse manufacturing facilities.

Selection of cases is a very important aspect of building theory from case studies. While the cases may be chosen randomly, random selection is neither necessary, nor even preferable. Given the limited number of cases that can be studied, it has been suggested that researchers choose cases such as extreme situations and polar types in which the process of interest is transparently observable (Eisenhardt, 1989).

The data was generated using multiple methods including the authors' observations and constant interactions with CPFR project team members during and/or after implementation. As an integral member of the project team for two projects and as a post implementation advisor to the other two businesses the author had unlimited access to historical documents and other records, financial data, and operations statistics. Open-ended interviews were also held with corporate officers, divisional managers, project leaders, super-users and various project team members. These interviews permitted the project participants to identify and frame the important issues and factors that affect CPFR implementation success as also suggested in Maffei and Meredith (1995). This approach is consistent with the recommendation that, in an area where theory is relatively undeveloped, researchers should use an inductive approach to the process of identifying issues for inclusion in the study (Spector, 1992, Flynn et al., 1994, Hensley, 1999).

The companies covered by this study were divisions of larger companies. They represent a range of firm sizes ($55 million to $3.5 billion in annual revenues), products, types of manufacturing (continuous process, batch and job shop), markets and
organizational arrangements. The companies also had different prior experiences with manufacturing and information technology.

3.3.1. Case Study Validity

Four tests have been commonly used to establish the quality of any empirical social research, including case studies. These are:

1. Reliability - demonstrating that the operations of a study - such as the data collection procedures can be repeated, with the same results (Yin 1994). The data collection procedures and building of the case study are described in detail within this dissertation. Field notes were transcribed on a weekly basis and reviewed by two individuals that were involved in the CPFR initiative. These reviews served as validation of the accuracy of the data and the soundness of the conclusions. In addition, interim reviews of the issues and preliminary conclusions were conducted with the broader CPFR team, as well as several high level executives in the organization being studied, to further validate the findings.

2. Internal validity (for explanatory or causal studies only, and not for descriptive or exploratory studies) - establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships (Yin 1994). The survey validates the findings in the case studies. The variables that were identified as a result of the interviews and case studies are tested in the survey and are shown to be correlated to some degree with the success of CPFR pilots.

3. External validity - establishing the domain to which a study’s finding can be generalized (Yin 1994). The issues and key organizational variables were validated by the subjects of the research who are operating in a supply chain and logistics context,
which establishes that the findings can be generalized to the supply chain management and logistics domains.

4. Construct validity - establishing correct operational measures for the concepts being studied (Yin 1994). The operational measures established in these case studies are centered around revenue enhancement, leveraging technology investment, and cost reduction. More specific operational measures will be established in future case studies when more detailed controlled experiments can be conducted.

3.4. Focus Group Methodology

Focus group interviews were born out of necessity. In the late 1930's, social scientists began investigating the value of nondirective individual interviewing as an improved source of information. Nondirective interviews use open-ended questions and allow individuals to respond without setting boundaries or providing clues for potential response categories (Krueger, 1994). Many of the procedures that are now accepted practice in focus groups have been developed and recommended by many researchers over the years (Krueger, 1994, Albrecht, 1993, Merton, Fiske and Kendall, 1990/1956, Alkin, Daillak and White, 1979, Weiss, 1976). Qualitative data are typically welcomed by decision-makers because the results are presented in a concrete and understandable manner (Krueger, 1994).

Increasingly, researchers are recognizing the benefits of combining qualitative and quantitative procedures resulting in greater methodological mixes that strengthen the research design. Focus groups can precede quantitative procedures. Qualitative procedures such as focus groups enable the researcher to get in tune with the respondent
and discover how that person sees reality. These insights can be used to develop more efficient follow-up quantitative procedures such as mail-out surveys (Krueger, 1994).

This study will use the general outline established by Richard A. Krueger (1994) in his book *Focus Groups A Practical Guide for Applied Research, 2nd Edition*. The purpose of this Focus group is to gather information on CPFR implementations from industry professionals who have an in depth understanding of the issues. The focus group format was selected because it produces data of interest to researchers (Krueger, 1994). Other types of group applied research techniques were examined and rejected in favor of the Focus group. Delphic processes and nominal groups differ from the focus groups in that they attempt to identify consensus and agreeable solutions, an important objective but considerably different from the purpose of focus groups (Krueger, 1994). This research is not interested in consensus or solutions but the perceptions of industry professionals regarding the opportunities to improve CPFR implementations. Their answers are used to in conjunction with the case studies and literature reviews to strengthen the propositions. Limitation of focus groups include the difficulty individuals have in self-promoting or dominant personalities taking over a group. Since this panel includes only senior and executive level professionals with an extensive experience, training and education, the risk is minimized. However, the author will act as a mediator to insure proper meeting rules and Focus group procedures are followed. The author has extensive training and experience in facilitating meetings and group dynamics and will be following the guidelines of Krueger (1994).

The Focus group is made up of four industry professionals which fits into the typical composition size of 4-12 (Krueger, 1994). Since the research is interested in
collecting data from a highly selective group of professionals, multiple focus groups, which are used to minimize the risk of non-participation, are not necessary. The participants may know each other and in some cases have worked on CPFR projects with one another and/or the facilitator. This is acceptable as long as the analyst is able to isolate what influenced the participants (Krueger, 1994). Focus groups normally try to insure randomization. Randomization is useful in reducing selection bias, however, randomization works only if the pool of prospective participants meet the selection criteria (Krueger, 1994). In this group the criteria is highly selective, therefore, randomization is not useful.

The focus group’s purpose is to produce qualitative data that provides insight into the attitudes, perceptions and opinions of participants. These results are solicited through open-ended questions and a procedure in which respondents are able to choose the manner in which they respond and also from observations of those respondents in a group discussion. The focus group presents a more natural environment than that of an individual interview because participants are influencing and influenced by others-just as they are in real life (Krueger, 1994).

The focus group research was carried out at a neutral location. Each participant was sent a brief letter with an agenda and topic clearly stated. The whole session was audio taped for use in analysis. This is the recommended way of capturing data along without extensive note talking. Krueger (1994), recommends five types of questions be asked each serving a distinct purpose.

1. Opening questions: Used to identify characteristics that the participants have in common.
2. Introductory questions: Used to introduce the general topic of discussion.

3. Transition questions: Used to move the conversation into the broader scope of the study.

4. Key questions: Used to drive the study and gain useful analysis.

5. Ending questions: Brings closure to the discussion. Summary discussion.

Analyzing the results must be done in a systematic way. After capturing the discussion the researcher must code the data to create a label for each idea or phenomenon. The code should combine like responses and opinions into usable data for the researcher (Krueger, 1994, Strauss and Corbin, 1990). In this study the codes confirmed to various practices in the implementation of CPFR systems. The coded responses are then sent out to each participant for review to insure that the participant has a chance to respond and clarify any attributed response. In this study, the coded responses were sent out in the same raw data format as the final report. Thus the final report is the reviewed and updated document that the participants received.

Reporting results is very challenging. The process serves three functions (Krueger, 1994).

1. Communicate the results

2. Assist the researcher in developing propositions

3. Provide a historic record of findings

The report for the CPFR focus group was written in a raw data style. This style is more conducive to this research since the comments will be arranged into coded categories that help develop propositions about CPFR implementations. Since we are
looking for expert opinions without consensus or interpretation, the descriptive and interpretive styles of reporting are not as applicable.

3.5. Survey Method

A cross-sectional survey was conducted, which involves the collection of data at one point in time over a number of identifiable groups, which constitute a fraction of the total population (Richards, et al., 1995). The representative groups were the four case study teams, and the total population being represented was the population that is pursuing technology-supported collaborative planning forecasting and replenishment in a supply chain context.

To determine the right approach to carrying out the survey, consideration was given to the characteristics of the group of respondents and what issues might arise that would impact their willingness to respond, or their ability to respond candidly. Discussions were conducted with several individuals who have significant experience with survey design to obtain their guidance regarding various approaches to carrying out the survey, and their insights regarding possible threats to validity. A significant issue that came out of these discussions was who should actually conduct the survey, the primary researcher, or an individual who is not involved in this research.

The reason that anonymity was such a sensitive issue is that the primary researcher was involved at various levels of depth over the past four months with the individuals who were to be respondents to the survey. During that time, relationships, with both positive and negative attributes developed. This reality, coupled with the fact that there are questions on the survey regarding how people feel about different groups, creates two threats to validity if the survey is conducted by the primary researcher. These
threats to validity are as follows: (1) the individuals may tell the primary researcher something other than what they really believe due to some bias in their relationship with the primary researcher, and (2) the survey respondents may be naturally concerned that they are sharing their perspectives with an individual who has many other contacts, at both low and high levels of their respective organizations, and may inadvertently divulge the respondents perspectives. Conducting the survey with anonymous responses mitigates these threats to validity.

3.5.1. Testing the Survey

The survey was tested on two levels. The first level involved a screening of the survey instrument design by eight respondents with significant experience in the development of surveys. The second test of the survey was done by asking nineteen respondents to complete the survey, and provide feedback regarding their experience in doing so.

3.6. Why Not Other Research Strategies?

Several other research strategies were considered for this research. However, each had drawbacks that limited their viability as methods for this particular work. Those other research strategies that were considered, and their respective drawbacks are as follows:

Laboratory Experiment. A laboratory experiment would not be appropriate in this case due to the researchers lack of control over the environment and subjects of study.

Historical Analysis. A historical analysis would not be appropriate in this case because a focus on contemporary events is paramount to meeting the objectives of the research.
Survey. A survey is not appropriate as the primary research methodology in this case because there is too much qualitative information regarding the context of collaborative planning and forecasting that cannot be captured in a survey. However, a survey is used as a sub-methodology to obtain specific reactions of the research subjects in particular focused areas.

3.7. Chapter Summary

In this chapter we have reviewed how the methods that were used as part of a multi-thrust research strategy work together to solve the research problem. The action research approach is described as a guiding principal for gathering data and ultimately constructing four case studies for analysis. The focus group is discussed. The design and use of a survey instrument is described. Lastly, it is explained why other research methods would not have been appropriate for this particular research.
CHAPTER IV

CASE STUDY INVESTIGATIONS AND HYPOTHESES

This chapter presents the case studies and hypotheses developed from the extant literature and case studies. Section 4.1 discusses the research question. Section 4.2 discusses case studies in the literature and Section 4.3 presents case programs. Section 4.4 presents the findings from the four case studies and the focus group. Finally, Section 4.5 presents the hypotheses derived from the case study, literature review and focus group research.

4.1. Research Question

The purpose of this study is to determine the factors that affect CPFR implementation based on the extant literature review and case studies. The study aims to confirm or disavow, using a survey as the testing instrument, the hypotheses generated by the literature and case studies. The result will be an integrated factors process model which can assist managers who are planning or implementing CPFR systems.

4.2. Case Studies in the Literature

Forecasting demand (and subsequently setting inventory levels) is difficult owing to the influence of promotions, changing demand patterns, and competitive pressures. The traditional answer to inventory problems has been to simply hold increased
inventories. Holding high levels of anticipatory inventory may offer a way to avoid out-of-stocks, but it is a very expensive method of avoidance. As an alternative, many value-chain participants have determined that a better approach is to aggressively work together to manage inventory. Co-operative planning between trading partners facilitates better matching of supply and demand. Rather than trying to independently project demand patterns, buyers and sellers share information in advance and work together to develop realistic, informed, and detailed estimates that can be used to guide business operations.

Traditionally, separate and disjointed operating units across companies have independently made plans. This has often resulted in "uncoordinated store, procurement, and logistics planning for the retailer while manufacturers see sales, distribution, and production planning being out of synch" (Koloszyc, 1998). CPFR attempts to eliminate such problems through detailed exchange of point-of-sale and other information on a real time basis (Wolfe 1998). Internal co-ordination is also needed. As many companies develop forecasts in disparate areas including marketing, finance, purchasing, and logistics, there is no assurance that these plans will ever come together or be reconciled. Instead, someone within the organization makes a decision as to which forecast to use. Valuable input from the individual areas is lost. Coordination is needed to bring the separate forecasts together into a single plan (Tosh, 1998).

Industry-level planning has provided the major impetus for CPFR. Five companies -consultant Benchmarking Partners, manufacturer Warner-Lambert, retailer Wal-Mart, and two software firms, SAP and Manugistics - initiated the CPFR project in October of 1995 (Cooke, 1998). A business model was developed and tested with
Wal-Mart and Warner-Lambert. The initial pilot involving Listerine products was deemed a success. Since that time, VICS (Voluntary Interindustry Commerce Standards) Committee has become involved in efforts focused on improving supply chain management through collaborative partnerships between retailers, distributors, suppliers, carriers, third party providers, and any other relevant trading partners. In order to better understand key dimensions of collaboration, VICS set up the Dynamic Information Sharing Business Collaboration subcommittee (Staff, 1998). Twenty-six leading companies participated in the subcommittee (Voluntary Interindustry Commerce Standards, 1998). The focus of the subcommittee has been to develop voluntary guidelines for CPFR involvement.

CPFR is a collaborative initiative aimed at "making inventory management more efficient and cost-effective, while improving customer service, and leveraging technology to significantly improve profitability". Efficiency measures how well resources expended are utilized while effectiveness involves the extent to which goals are accomplished (Mentzer and Konrad, 1991). Thus, performance is a function of both efficiency (inputs) and effectiveness (goals/outputs).

CPFR represents a new management philosophy. Perhaps the best way to capture the breadth of CPFR is to provide an illustration. Utilizing principles of CPFR, a retailer and consumer goods firm would work together to jointly create a single, combined promotion calendar in advance of the selling period which could subsequently be up-dated on a real-time basis over the Internet. The retailer would also provide point-of-sale (POS) data, longer-term promotional plans, prescribed inventory levels, etc. for the consumer goods trading partner. Both firms would create sales and order
forecasts. The retailer would then electronically transmit the retail forecast to the consumer goods firm (manufacturer). A collaborative system would be used to compare that forecast to the consumer goods firm's own forecast. Discrepancies or exceptions would be identified and appropriate managers advised. Working together, the "team" would decide on one, i.e. collaborative, forecast extending across the supply chain.

The above example attempts to capture the essence of CPFR- utilizing technology/information capabilities to support trading partner interaction and joint decision making. While the above scenario is generic, it should be noted that in actuality CPFR agreements are very specific in nature. A great deal of time and effort is needed up-front to negotiate specific items such as goals and objectives, frequency of up-dates to the plan, exception criteria, and key measures. The result is a published document defining relevant issues that has been jointly developed and agreed to. A nine-step business model for CPFR (VICS, 1998) has been developed which provides an indication of the scope of effort involved:

1. Develop front-end agreement.
2. Create joint business plan.
3. Create sales forecast.
4. Identify exceptions for sales forecast.
5. Resolve/collaborate on exception items.
6. Create order forecast.
7. Identify exceptions for order forecast.
8. Resolve/collaborate on exception items.
The following quote concisely summarizes the CPFR philosophy and how it "focuses on the process of forecasting supply and demand ... [through] efforts to bring various plans and projections from both the retailer and supplier end of the supply chain into synch" (Tosh, 1998). The spirit of such collaboration is consistent with Bowersox's definition of supply chain management: Supply-chain management is a collaborative based strategy to link cross-enterprise business operations to achieve a shared vision of marketing opportunity (Quinn, 1998).

4.3. Pilot Programs

A number of pilot programs testing CPFR concepts have been instituted in the last few years. The goals of the pilot programs are to validate and refine the VICS-developed CPFR business process and technology recommendations. Pilot results have been very positive. The firms involved reported they improved their in-stock positions while achieving significant reductions in inventory levels (Sabath, 2001). For example, a pilot program established between Nabisco and Wegmans Food Markets reported sales increases of up to 50 per cent in the pilot categories. Forecast accuracy improved to the 90 per cent range (Zimmermann, 1998).

Improvements in overall channel efficiency through better asset utilization, reduced risk through co-management of inventory, and better day-to-day management because of pre-notification of fill-rate issues are other anticipated benefits. Manufacturers benefit in that CPFR means fewer expedited shipments and more accurate production; however, it also means greater accountability for manufacturers (Koloszyc, 1998).

Pilot programs have centered on forecast collaboration as well as promotional aspects of joint planning. CPFR is designed to predict sales based on information
provided relating to promotions or planned discounts. Out-of-stock situations often occur when consumer demand - sparked by retail promotions that may not have been communicated to the manufacturer - outstrips the supply chain's ability to replenish. Conversely, unsalable inventory may result from non-existent or ineffective promotion of products that have been stocked based on anticipated demand forecasts that never materialize. This is particularly true for new products. By taking promotional plans into account when forecasting, many promotion-related product availability problems are avoided. CPFR utilizes promotion information in conjunction with historical consumption patterns, market intelligence, manufacturing constraints, and raw material availability. Data are made available to trading partners over the Internet. "Live sales data" allow for constant updating and management of inventory on a real-time basis (Frook, 1998).

It is anticipated that collaborative efforts will be extended to incorporate a wide range of new joint business processes between retailers and suppliers as the CPFR initiatives mature. However, CPFR is not for every business organization. The business must have sufficient volume, i.e. enough trading partners interested to make it economically feasible. For example, the investment required generally cannot be justified if only one or two retailer trading partners are to be included. Trading partners must also overcome reservations about sharing proprietary information (Staff, 1998).

Collaborative planning will also require extensive support in the form of Internet based products and will necessitate major process changes within the businesses (Moad, 1997). Success of Internet-based operations relies on instantaneous movement of information from the customer to order planning and fulfillment and then back to
customers with tracking and confirmation numbers. This entails total supply chain integration with real-time information sharing among supply chain entities. Achieving this level of secure information and process integration will require increased information technology sophistication all along the supply chain (Ruriani, 1998). The resource commitment and synchronization of systems to ensure data security and compatibility will continually present a challenge for implementation (Doherty, 1998; Saccomano, 1998). Typically, applications supporting operational processes belong to either the manufacturer or the retailer. Even though information may be passed between the two, the processes remain disjointed. The technology needed to link operating systems and to analyze and share data forecasts has either not existed or has been too costly to deploy. Recently, however, new software solutions have been developed that enable multiple trading partners to collaborate by creating a common link through which different applications may communicate (Doherty, 1998).

4.4. Case Study Discussion

4.4.1. Company A: Successful CPFR

The author was directly involved in this case study and therefore the presentation format for Company A is different than that of Companies B, C, & D.

This case contributed to establishing a standardized start-up process for implementing CPFR. The partnerships provided input into the creation of a baseline evaluation of the partnership's four core CPFR processes. This allowed a quick understanding of the strengths and weaknesses of the partnership and actions needed to improve the process.
The case demonstrated that CPFR is not simply another form of category management. Deployed as described in this case, CPFR becomes the key essential process to begin optimizing the supply chain. The focus of this case is not simply to sell more product to the retailer's distribution center or depot; it was on selling more product to the consumer by concentrating on delivering product efficiently and reliably to the retail shelf using retail point-of-sale data.

CPFR Processes Addressed

- Collaborative Processes
- Integrated Planning and Forecasting Processes
- Replenishment Processes
- Supply Chain Management Processes

4.4.1.1. Objectives

Conservative estimates show 8% to 10% out-of-stocks still exist in retail stores, along with excessive inventory costs throughout the supply chain. These all become additional costs to the consumer.

Company A is deploying CPFR to enable creation and integration of consumer demand data. This will trigger product flow from its manufacturing plants to the customer distribution center, and to the retail store shelves, and ultimately from the store shelves into consumer homes.

The primary objective is 100% product availability on the store shelf, while simultaneously reducing inventory requirements in the retail stores, customer distribution centers, and the manufacturing plants. Eventually, Company A expects to produce and ship in response to a consumer demand signal. This case will test and validate methods
that can help achieve this. The primary CPFR output concentrates on improving inventory and reducing out-of-stocks. Company A recognizes that the main causes that prevent successful implementation of CPFR are:

1. Ineffective trust-based collaboration.
2. Ineffective planning using visibility of POS consumer demand.
3. Ineffective forecasting.
4. Ineffective product replenishment in response to demand fluctuations.

4.4.1.2. Methodology

The objective of CPFR is to test and validate the design requirements and the changes needed to create a responsive, reliable, and cost-efficient system that links manufacturing plants to customer distribution centers to retail store shelves using Point of Sale information.

The key is understanding that CPFR is not a technology, but a process. To test and deploy new processes, the CPFR partners agreed to three core activities:

1. Document and map the current supply chain processes for product and data flow.
2. Assess the current CPFR capability.
3. Create a joint action plan to address improvement opportunities.

Failure to follow the three-step process in order could lead the project down a path toward unsatisfactory results. It was critical to include this process in the Front-End Agreement, obtaining top-level consensus for the case's strategies, measures, and processes.

1. Supply Chain Lead-Time Mapping of Product and Data Flow
Together, team members from both companies traced product movement and the signals that triggered it. All of the processes were mapped, and the time lag between processes and triggers was measured from the point that a package was scanned at retail to the point new product was replenished on the shelf.

2. CPFR Assessment

Once the partners understood the supply chain process, there was no easy way to translate the supply chain improvement opportunity into CPFR action. CPFR assessment was developed to identify each of the CPFR key processes. This helped to verify the understanding from the supply chain mapping, and directed the creation of a CPFR process improvement plan.


This step combined the first two steps into a test plan. It was documented and approved by the team sponsors, and the process improvement testing and documenting began. Historical POS data was collected on the test category (limited number of SKUs) and the POS data was continuously analyzed using actual orders and shipments.

4.4.1.3. Metrics

The cases measure aspects of nine elements:

1. Forecast Accuracy vs. Actual Orders

2. Distribution Center Service Level and Inventory

3. Retail In-Stock Service Level and Inventory

4. Manufacturer Order Fill Rate vs. Original Order

5. Manufacturer Order Fill Rate vs. Advanced Shipping Notice (ASN)
6. Delivery Punctuality

7. Transportation Efficiency (Utilization)

8. Shipment Variability by SKU

9. Profitability / Cost Reduction

4.4.1.4. Company A Summary

This CPFR recognized the need for a partnership founded both on trust and on the ability and willingness to share information on processes and systems. A joint learning process would lead to understanding how to improve difficult-to-improve business results. It would not be a quick action to increase sales.

CPFR must be recognized as a process, not a technical solution. To be successful, the existing process must become either simplified, streamlined, or standardized. Once this is accomplished, the process needs to become repeatable and scalable so technology can deliver broad-scale capability. If an existing process is delivering average results, technology will enable broad-scale mediocrity.

Company A agreed on the need to reduce retail out-of-stocks, while simultaneously managing the inventory levels required to remain in stock. Lead-time process mapping offered the fastest understanding of the supply chain processes and their results. The value of this analysis was directly proportional to the detail of the documentation, which highlighted where product movement was delayed and pinpointed its causes. Non-value-added activity is anything the consumer would be unwilling to pay for, and the process provided insight into the non-value-added activity in customer and manufacturer systems and processes. The activity was charted; before/after time analysis
identified the loss for each delay. At that point, both partners had a clear picture of their supply chain. Objective decision-making about process changes could begin.

4.4.2. Company B: Marginally Successful CPFR

This case study involved the after-market materials management organization and the service center of an international division of the manufacturer. At the time the participant observation began, this CPFR case was in a marginally successful state: the CPFR case had been completed, and the group was collaborating, but not to the extent they would like to be collaborating. The CPFR initiative primarily involved three managers. At the close of the case and subsequently, this case team had realized both quantitative and qualitative benefits from CPFR. The quantitative benefits included:

- improvement in fill rate to the service center
- improvement in the number of manufacturing line stops at the service center
- improvement in inventory turnover at the materials supplier and at the service center
- reduction in inventory on the shop floor of the service center

The qualitative benefits included:

- stability in the materials management process
- a trend on the part of both organizations toward communicating more frequently, and working more closely together
- improvement of the understanding of and appreciation for one another's business processes
- a broader perspective on supply chain management.
• a focus on developing flexible processes that could evolve as required to accommodate new business situations

Analysis of this case study centered around the issues that were encountered and their significance to the design and implementation of CPFR. There were eight issues identified for Company B. Each issue is stated below in the form of a question to be answered with respect to the CPFR case implementation.

4.4.2.1. Issue 1: Who should be involved in the CPFR case?

This issue arose when the CPFR team noticed that they were planning and forecasting more efficiently, yet they were not experiencing the intended improvement in forecast accuracy, inventory utilization, etc. Upon further investigation, the team realized that they had not involved their broader supply chain partners in the CPFR initiative early enough, e.g., purchasing, and the tier one and tier two suppliers. This is significant, because it shows that without the right team members involved, simply improving the focal firm’s process will not achieve the intended results.

4.4.2.2. Issue 2: Where should inventory/ reside to most effectively support the CPFR process?

This issue arose when the team considered products that need to be delivered in extremely short lead-times, e.g., 30 minutes. This issue is critical to design and implementation of CPFR because, regardless of the efficiency of moving information and material, there are physical barriers. If a part is always needed on a 30 minute notice, it does not make sense to stock it somewhere that is more than 30 minutes away. This is significant because these last minute items are generally low dollar value items such as nuts and bolts, and can be easily overlooked when creating forecasts and business plans.
However, these same items can cause a missed delivery on the part of the service center that cannot complete the work due to a missing bolt. In addition to missed deliveries, these low dollar value parts can cause under-utilization of the service center workforce because in some cases a mechanic can be kept waiting simply due to a small hardware item that is necessary to complete one section and move on to the next. As one manager stated: "there are situations where the mechanic may not know the specific class of part required until build, and there may be a need to change the class during build in order to get the product to perform. This is a challenge of weighing materials management against workforce utilization. It does not seem to make sense for an individual to be at build and waiting for a part from stores."

4.4.2.3. Issue 3: What should be considered in a CPFR inventory rationalization, and when should the inventory/ rationalization take place?

Inventory rationalization involves determining the usefulness of existing inventory and developing plans for how the inventory will be employed or disposed of going forward. This issue arose when the team members realized that they needed to come to a common understanding regarding the actual contents of the inventory before collaborating on the plans and forecasts associated with the inventory. This is a critical issue because part of entering into a CPFR arrangement is developing a common understanding of what is included in the arrangement. This is significant because each partner in the collaborative arrangement needs to know what he/she is committing to, and knowing what is included in the inventory is central to that understanding. As it turned out, in this case, the inventory was rationalized approximately six weeks after the
physical move the inventory, and completed over about a four week period. The rationalization was used as an opportunity to identify and disposition inactive inventory.

4.4.2.4. Issue 4: How will decisions be made regarding where inventory will physically reside vs. on whose books it will reside? Who will make these decisions?

This issue arose once there was an understanding of the contents of the inventory. The issue deals with the fact that there are two aspects to inventory responsibility: (1) responsibility for the physical storage and movement of the inventory, and (2) ownership of the inventory. These two responsibilities are not always in one department. The inventory could reside at the customer's facility but still be owned by the supplier until it is actually used by the customer. This is a critical issue because it raises questions of risks and rewards associated with CPFR. Inventory ownership is a risk for any organization because there is always the possibility of not using the inventory and incurring a financial loss. In this case, a 30-day supply of bulk material, e.g., bolts, washers, is kept on the shop floor, but is on the suppliers' books until it is consumed by the service center. Replenishment for this bulk material is guaranteed within 5 days or less.

4.4.2.5. Issue 5: How will transfer pricing be addressed?

This issue stemmed from the inventory ownership issue. Transfer pricing deals with how pricing may or may not be set differently for internal organizations that are part of the same corporation, but are separate profit and loss centers. The issue is that an internal customer, in this case the service center, can offer lower prices to its customers if it can procure spare parts materials at a lower cost than from an outside vendor. Since the supplying organization is another operating unit in the same corporation, there is the possibility of transferring material at a price that does not include the same sales margin
that would be included for a customer that is not part of the same corporate organization. This issue is a serious point of contention because the supplier is a profit and loss center, and therefore does not want to remove the sales margin from its price. The supplier could be selling the same part to a customer outside the corporate organization, and realizing a sales margin that would contribute to its overall profit and loss goals. In this case, inventory is transferred from the materials supplier to the service center at the materials supplier's cost. The materials supplier makes zero margin on the material provided to the service center, but receives consideration in its individual profit and loss measurements for having contributed to the overall corporate profit and loss because margin was made in the service center.

4.4.2.6. Issue 6: What are the potential quantitative benefits of CPFR, and how will they be measured?

This issue arose when the team considered how they should measure the benefits that had been anticipated at the beginning of the CPFR initiative. This issue is significant because it is necessary to determine whether or not there are business performance improvements that can be counted and tracked over time. In this case, the service center experienced quantifiable benefits in terms of improvement in fill rate, improvement in number of line stops, overall inventory turns, reduction in inventory levels.

4.4.2.7. Issue 7: What are the potential qualitative benefits of CPFR, and how will they be measured?

This issue arose when the team considered that there were significant qualitative improvements with respect to people and process that had resulted from their efforts thus far. This issue is significant because it is useful to understand the implications of
qualitative improvements on quantitative business performance measures. In this case, there were qualitative benefits experienced on both sides in terms of stability in the materials management process, the two organizations working more closely together, materials management personnel learning more about the manufacturing processes, and the two groups feeling compelled to help others in the supply chain to better understand their respective roles. One example of a positive quantitative benefit resulting from these qualitative improvements involved the tracking of missed deliveries. As a consequence of the order management process, the service center was forced to record missed deliveries for orders in which the customer would call late in the day and request a next day delivery. The resulting missed deliveries occurred because the requests were placed so late in the day that the pick, pack, and ship operations in the warehouse were closed down for the day. Consequently, there was no way to prepare and distribute the order until the next afternoon, resulting in a delivery that was one day late. This practice detracted from delivery performance. However, as a result of the qualitative improvements this process problem has been identified and addressed, and has resulted in quantitative improvements. The process now considers an order that is placed after warehouse operations are closed down for the day as an order placed the next day, and as a result delivery performance has improved.

4.4.2.8. Issue 8: What are the information system inter-operability roadblocks, and how will they be addressed?

This issue was identified by the team as they considered the need to access new and different information systems to conduct their collaborative activities. The fact that this issue is identified in such a general fashion is significant. The information systems
allow for the timely and accurate creation and exchange of information in the new collaborative process. However, in this context, there were not appropriate resources to delve into the deeper aspects of technology integration. In this case study, the service center had visibility through an enterprise resource system to all inventory assets across service centers, both U.S. and internationally. However, the service centers did not have the technological capability to process inventory transactions across entities, resulting in a highly manual process of exchanging inventory among service centers, and consequently longer lead-times for receiving the necessary material to meet customer demands.

4.4.3. Company C: Slowly Progressing CPFR

Company C involved a newly purchased materials supplier and a service center in the manufacturer. At the time of the participant observation, the CPFR case was in the first month of implementation. The participant observer was assigned a role of identifying critical implementation issues and helping to guide the case implementation team to the extent possible. This case study spanned four months. It is considered slowly progressing because at the close of the case study, there was still a goal to implement CPFR in these business units, and individuals were sporadically making progress toward CPFR. However, there was no dedicated focus on planning, implementing, and measuring a CPFR case. Analysis of this case study centered around identification of the issues.

There were eight issues identified for Company C, some of which are the same issues that were experienced for other companies. A description of the eight issues, and how those issues manifested themselves follows.
4.4.3.1. Issue 1: What constitutes a CPFR case?

This issue arose when the team realized that they were in week four of a 12-week case plan and had not completed specific tasks, such as transferring material from one facility to another, that were ostensibly required to begin the case. This is a critical issue because if the business partners cannot identify a case, how can they assess the case in terms of its benefits, or lack thereof, to the business? This particular team realized that they were not in case mode, and reestablished their case plans.

4.4.3.2. Issue 2: Who is available to focus on the case implementation?

This issue arose when the team realized that they were not in case, partially because they had assigned insufficient resources to the CPFR project. This is a critical issue because it can significantly impact the relationships that are established at the outset of the collaborative effort. When initial project goals and timelines are not met, regardless of whether or not they were the right goals and timelines, there is the natural tendency to assign blame. Furthermore, a natural target for blame is an individual from the partner organization, who may not be a close day-to-day colleague, but is involved in the case. This issue can derail a case in its infancy. In this case, the case was hampered because several tasks, e.g., inventory rationalization, identification of team members, definition of new processes changes, etc., that were scheduled to be completed before the kick-off of the case had not been started, and the four week case was ostensibly in week two. This led the team to question whether or not the cases were being run on a realistic time schedule to obtain sustainable results.
4.4.3.3. Issue 3: Who will be involved in defining organizational roles and responsibilities and the detailed CPFR processes, and how will these individuals be involved?

This issue arose when the team began thinking through the CPFR case more comprehensively. It became clear that the roles and responsibilities, as well as the day-to-day operational processes associated with CPFR, had not been adequately defined. These processes needed to be defined at both the micro-level in terms of the two organizations involved, and within the context of the broader supply chain.

4.4.3.4. Issue 4: How will concerns of the individuals involved in the case be addressed prior to, during, and after the case implementation?

Once the case team members began seeing the reality of CPFR, they identified concerns related to each of their individual situations, as well as their overall department. This issue is significant because the concerns of the individuals who are involved need to be addressed if they are to be expected to change how they operate on a daily basis, and to contribute to the development of CPFR within their organization. Specific concerns identified in these case studies included concerns on the part of the service center regarding the ability of the materials management organization to deliver quality parts in a timely manner, and to maintain a sense of urgency regarding service center needs. One example that substantiates this concern occurred about a week into the case. The service center called the materials supplier for emergency material over the weekend, which was within the parameters of the CPFR agreement. However, the materials supplier could not be reached. Consequently, the service center had to use an alternate and considerably more expensive source for material.
4.4.3.5. Issue 5: What should be considered in a CPFR inventory rationalization, and When should the inventory rationalization take place?

This issue was experienced in the first case study as well. In this case study, the issue arose after the team members had begun to rationalize the inventory and realized that they had oversimplified the process, and at the end of the process did not have the information necessary to make effective decisions. Specific areas where additional investigation was required included capitalization vs. expensing of certain assets, the physical location of certain assets, and the historical and current demand of certain assets.

4.4.3.6. Issue 6: How will decisions be made regarding where inventory Will physically reside vs. on whose books it will reside? Who will make these decisions?

This issue was experienced in the first case study as well. In this case study, the issue arose when the service center team realized that part of the collaborative relationship could mean moving all of the material currently on their production floor to the materials supplier to be centrally managed, and that this could have a significant negative impact on daily productivity and utilization of human resources.

4.4.3.7. Issue 7: How will transfer pricing be addressed?

This issue was experienced in the first case study as well. In this case study, the issue arose when the newly acquired materials supplier faced the need to change its business model. The materials supplier was now faced with a choice it had not had to make before, selling to an internal division at a lower "transfer" price, or making a significantly higher sales margin by selling to an outside customer.
4.4.3.8. Issue 8: What are the information system inter-operability roadblocks, and how will they be addressed?

This issue was experienced in the first case study as well. In this case study, the issue arose when team members realized that there was no commonality in their approach to using and managing technology support tools. In this case study, as with the first case study, this issue was surfaced in a very general fashion due to a lack of understanding of the deeper implications of appropriate technology support. Specific inter-operability issues in this case involved the supplier not having real-time information about service center inventory to better plan for their needs. This issue was exacerbated by the fact that the service center did not have the ability to generate timely purchase orders as materials needs arose. The result is a materials organization that cannot anticipate the customers needs, and a customer that cannot tell the supplier their needs in a timely enough manner to receive adequate support.

4.4.4. Company D: Stalled CPFR

The fourth case study involved a materials supplier with a primary competency in sourcing and distributing spare parts material and a second service center. At the time of the participant observation, the CPFR case was one month prior to kick-off. The participant observer was assigned a role of identifying critical implementation issues and helping to guide the case implementation team- This case study spanned three months. The case is considered stalled because at the close of the case study, there was still a goal to case CPFR at some point, but there were no resources assigned to the project. The researcher made an effort to capture the progress that had been made before the stall
occurred, and there are plans to revive the project at some point. Analysis of this case study centered around identification of the issues.

There were eight issues identified with Company D, some of which are the same issues that were experienced in Companies A, B & C. A description of the eight issues, and how those issues manifested themselves follows.

4.4.4.1. Issue 1: How will the strategic, tactical, and operating implications of CPFR, be communicated within the impacted business units, and throughout the broader organization?

This issue arose during a focus group session in which potential CPFR team members were asked to think about how CPFR would be implemented in their organizations. This issue is critical because people act in accordance with the information they receive. If there is no communication plan that, at a minimum, discusses human resource and organizational structure issues associated with a process changing initiative such as CPFR, how can individuals in the business be expected to act accordingly? There were questions from the individuals involved in the focus group regarding how the move towards CPFR would impact them with respect to their daily activities, their current position within the, organization, their potential career growth, their financial incentives, and their performance metrics. There were also questions regarding how the goals and objectives of the overall organization would change with CPFR.

4.4.4.2. Issue 2: How will current plans to off-load inventory be impacted by the implementation of CPFR?

This issue arose during a briefing related to the potential impact of CPFR, which discussed the potential positive impact on inventory. This issue is critical because it
brings out a broader issue of integrating the new CPFR initiative with existing operating plans. The suggestion for addressing this issue was that inventory levels and inventory turns should be evaluated at the aggregate corporate level, rather than at the disaggregate level of individual profit and loss centers.

4.4.4.3. Issue 3: What elements of the existing business processes need to be integrated into the CPFR process?

This issue arose in conjunction with the prior issue regarding plans to off-load inventory. Tyne issue is significant because process integration is at the core of implementing CPFR. If CPFR is going to reach full implementation and be sustainable, it has to be coordinated with the on-going activities of the business. It was not until the potential CPFR team members entered into a serious and detailed discussion of CPFR that this issue was fleshed out. Two critical processes were identified as key coordination points for materials management: (1) outside vendor scrap, which involves the tracking and management of the number and types of parts that have to be scrapped instead of repaired when sent to outside vendors with the intent of being repaired, and (2) part repair, which involves the tracking and management of how repairs are performed and what material is used to complete the repairs.

4.4.4.4. Issue 4: Who will have responsibility for forecasting and planning in the CPFR process?

This issue arose during a focus group session that was held to develop the high level CPFR process. This issue is critical because it establishes that understanding one another's roles and responsibilities is essential to CPFR, and it implies that the potential team members are accepting the fact that change will occur simply by asking the
question. The focus group participants reached a consensus that the forecast process in a CPFR arrangement should be centralized.

### 4.4.4.5. Issue 5: How will the current forecasting process change with CPFR?

This issue arose during a focus group session that was held to develop the high level CPFR process. This issue is significant because it establishes that there is a current forecasting process that will be used as a baseline for considering the move toward CPFR. Furthermore, it is the beginning of organizational change in that this issue was identified by the day-to-day team members, who will be critical to actually changing the manner in which planning and forecasting are conducted on a daily basis. The group described the current forecasting process as heavily driven by service center sales goals, rather than technical predictions of the realities of the market. Moreover, the group recognized that with CPFR there would be a shift toward the sales team and the forecasting team working together to understand the realities of the market and incorporate those realities into the process of predicting demand.

### 4.4.4.6. Issue 6: How will the mental shift toward CPFR be handled?

This issue arose out of the process discussion described in the prior issue. This issue is significant because it represents a realization by team members that it is not only the day-to-day tasks that will change with CPFR, but that the thinking patterns of the individuals involved with CPFR will change as well. The group specifically identified the need for a paradigm shift from working to meet published delivery lead-times established by the supplier to working in the CPFR environment, with a more customer sensitive and customer responsive mentality.
4.4.4.7. Issue 7: How will concerns of the individuals involved in the case be addressed prior to, during, and after the case implementation?

This issue was identified in the second case study as well. In this case study, the issue arose once individuals had begun to fully think through the CPFR process and the roles of individuals on the CPFR team. A key concern for this team was that inventory levels at or near the service center may not be sufficient to meet immediate needs in the service center.

4.4.4.8. Issue 8: What are the information system inter-operability roadblocks, and how will they be addressed?

This issue was experienced in the first and second cases as well. Similar to the first and second cases, this issue again was not described in detail, and arose during a focus group session as a tangential issue. The group was particularly concerned with how the CPFR processes and supporting technology would integrate with existing processes centered around their enterprise resource system.

4.5. Hypotheses

The hypotheses are developed from the extant literature and the four case studies. It is noted that all hypothesis development was based on the extant literature and many, but not all, hypothesis were developed using the additional four case studies. Each hypothesis will be tested for validity using a survey as a testing instrument.

4.5.1. Communication

Communication integrates the operations of the two firms, smoothing the disturbances from expected and unexpected environmental factors. Specifically, communication focuses on the process by which the parties will continue the relationship.
Therefore, one can assume that communication would lead to greater partnership satisfaction and future expectation of partnership satisfaction. All four case studies showed that internal and external communication is important in the effective implementation of a successful CPFR.

Effective two-way communication is characterized throughout the literature as essential to successful supplier relationship (Lascelles and Dale, 1989, Ansari and Modarress, 1990, Hahn et al., 1990, Newman and Rhee, 1990, Galt and Dale, 1991, Krause, 1999). Effective inter-organizational communication could be characterized as frequent, genuine, and involving personal contacts between buying and selling personnel. In order to jointly find solutions to material problems and design issues, buyers and suppliers must commit a greater amount of information and be willing to share sensitive design information (Giumipero, 1990, Carr and Pearson, 1999). This is often achieved through engineer-to-engineer communication on design issues, in order to improve process capability, manufacturability, and performance without affecting profit margins (Bhote, 1987, Dobler et al., 1990, Turnbull et al., 1992). When communication occurs among design, engineering, quality control and other functions between the buyer and supplier firms, in addition to the purchasing-sales interface, the supplier’s quality performance is superior to that experienced when only the buying firm’s purchasing department and supplier’s sales department act as the inter-firm information conduit (Carter and Miller, 1989). Furthermore, many supplier product problems were due to poor communication (Newman and Rhee, 1990). Poor communication was often a fundamental weakness in the interface between a buying firm and its supplier, which undermined the buying firm’s efforts to achieve increased levels of supplier performance
(Lascelles and Dale, 1989). In their ten case studies of buying firms in the UK, Galt and Dale (1991) revealed the importance of two-way communication with suppliers and its potential positive effect on the buying firm’s competitiveness.

Collaborative communication coupled with CPFR would more fully integrate the buying firm and supplier. From the buying firm’s perspective, Mohr et al. (1996) found that collaborative communication was significantly related to commitment, coordination and satisfaction. They measured a limited communication as more frequent medium richness, feedback, formality and indirect influence. By using collaborative communication, it is hypothesize that:

H1: Communication has a positive effect on successful CPFR implementation.

4.5.2. Sharing of Rewards and Risks

Sharing of rewards and risks refers to the willingness of both parties to accept short-term hardships with the expectation that the other party will do the same. Specifically, it means acceptance of short-term risks in expectation of sharing future rewards and risks. For example, firms can reduce barriers to market entry by sharing risks with a partner; in return both firms will share in future benefits derived from entering the market. Thus, one can assume that this dimension will increase partnership satisfaction.

The close interaction and the investment partners make through shared decision making signify two things: (1) a commitment to and interest in outcomes, which decrease the perceived likelihood of opportunistic behavior and (2) the likelihood that a partner’s opportunistic behavior will be recognized. Information asymmetry is thereby reduced when both partners have high participation in and knowledge strategic decisions.
and actions. Thus, a high level of mutual involvement acts as both a signaling and a monitoring mechanism by establishing and building trust and commitment.

Organizational learning theory suggests that firms seek to establish and maintain competitive advantage through acquiring tacit, or nonverbalized, as well as articulated knowledge (Hedland, 1994). Organizations must learn as part of adaptive behavior to be able to respond to environmental demands (Cyert & March, 1963; Fiol & Lyles, 1985; Levitt & March, 1988). Interorganizational activities, including alliances and acquisitions, are one mechanism firms use to learn (Lyles, 1988; Pennings, Barkema, & Douma, 1994). Building on Piaget’s ideas about human learning, Nooteboom (1992) suggested that companies change ideas and even establish their identity through interaction with other firms and that closer bonds and reciprocation in relationships facilitate successful innovation. From an organizational learning perspective, the ability to appropriate the knowledge resident in a partner requires close involvement in an alliance and its decision-making processes. For these reasons, a high degree of mutual involvement in the strategic decision making of the alliance will positively affect outcomes as such involvement builds trust and enhances the appropriability of knowledge. Company A shared design and development of their cordless power tools with battery manufacturers. As the market grew for cordless power tools, both firms enjoyed increasing market share. Appropriately:

H2: Sharing benefits and burdens has a positive effect on successful CPFR implementation.
4.5.3. Demand/Supply/Technical Uncertainty

Partnership assets are the degree to which an asset can be put to alternative uses. Assets used in the relationship that cannot easily be used outside the partnership, are deemed assets specific to the partnership. If the partnership already has a high degree of assets used specifically for the partnership, then one expects a high level of satisfaction with the partnership, since these assets cannot be easily put to other uses. This area focuses on the demand/supply uncertainty and technical uncertainty.

Williamson (1985) identifies three types of asset specificity: (1) site specificity, (2) physical asset specificity, and (3) human asset specificity. Site specificity refers to the situation whereby successive production stages that are immobile in nature are located close to one another. Previous studies suggest that site-specific investments can substantially reduce inventory and transportation costs and can lower the costs of coordinating activities (Dyer, 1996a). Physical asset specificity refers to transaction-specific capital investments (e.g., in customized machinery, tools, dies, and so on) that tailor processes to particular exchange partners. Physical asset specialization has been found to allow for product differentiation and may improve quality by increasing product integrity or fit (Clark & Fujimoto, 1991; Nishiguchi, 1994). Human asset specificity refers to transaction-specific know-how accumulated by transactors through long-standing relationships (e.g., dedicated supplier engineers who learn the systems, procedures, and the individuals idiosyncratic to the buyer). Human co specialization increases as alliance partners develop experience working together and accumulate specialized information, language, and know-how. This allows them to communicate efficiently and effectively, which reduces communication errors, thereby enhancing
quality and increasing speed to market (Asunuma, 1989; Dyer, 1996a). Company C practice true collaboration with respect to physical assets as their coating facility was physically built and operated on the customer's site and inside their facility. Thus:

H3: Less demand/supply uncertainty and technical uncertainty has a positive effect on successful CPFR implementation.

4.5.4. Interdependence

As firms join forces to achieve mutually beneficial goals, they acknowledge that each is dependent on the other. Interdependence results from a relationship in which both firms perceive mutual benefits from interacting and in which any loss of autonomy will be equitably compensated through the expected gains. Thus, the willingness to give up autonomy or control for the expectation of future gains is expected to contribute to partnership satisfaction.

Interdependence exists when one actor does not entirely control all of the conditions necessary for achievement of an action or a desired outcome. Resource dependence has been explored in empirical studies, which investigate the relationship between dependence and control in buyer–supplier relationships (Handfield, 1993). For instance, dealers are less opportunistic when they depend on a primary supplier, whereas suppliers with control over dealer’s decisions exhibit greater opportunism (Provan and Skinner, 1989). Resource dependence can also influence supplier just-in-time (JIT) delivery performance (Handfield, 1993). The above literature suggests that successful partnerships are expected to be characterized by higher levels of interdependence. All of the four case study companies became intertwined into each the other firm's business. The power tool company was linked with the battery manufacturer. The automotive parts
coating company’s business depended on the production numbers of the automotive parts company. The electrical junction box manufacturer was dependent upon a few large offshore oil companies. The hypotheses is presented below:

H4: Interdependence has a positive effect on successful CPFR implementation.

4.5.5. Operational Information Exchange

Operational information exchange refers to systems designed to provide timely, accurate, and efficient information exchange. CPFR is a system capable of accomplishing this. Therefore, one would expect firms to invest the capital and time in operational information systems if they are satisfied with the partnership.

1. Johansson and Mattsson (1987) distinguish between exchange processes and the adaption processes. In this approach, exchange processes are more interesting in terms of CPFR. VICS (1988) lists four forms of exchange process: exchange of products or services;

2. exchange of information;

3. financial exchange; and

4. social exchange.

In relation to CPFR, the process of information exchange is the most interesting in CPFR. The exchange information is relatively limited in the early stages of implementation. However, as companies begin to become more developed and advanced in CPFR skills, they are capable of dealing with information concerning:

- business plan;
- promotion plan;
- new product introduction information;
• inventory data;
• POS data and forecast;
• production in capacity planning;
• lead-time information.

In addition, current adjustments to the plans and forecasts are made. The exchange of information should lead to a more successful CPFR implementation.

H5: Operational information exchange has a positive effect on successful CPFR implementation.

4.5.6. Extendedness

Extendedness in a partnering relationship refers to an ongoing relationship with no sharp beginning and no clear endpoint, a long-term open-ended relationship. This dimension is conducive to partnership satisfaction.

An extended planning horizon is a crucial characteristic of supply chain relationships since each participant expects the relationship to continue for a considerable amount of time. A close relationship means that channel participants share the risks and rewards and are willing to maintain the relationship over the long term (Landeros and Monczka, 1989; Cooper and Ellram, 1993; Stuart, 1993). Hahn et al. (1983) compared the potential costs associated with different sourcing strategies and suggested that companies would gain benefits by placing a larger volume of business with fewer suppliers using long-term contracts. Moreover, De Toni and Nassimbeni (1999) found that a long-term perspective between the buyer and supplier increases the intensity of buyer-supplier coordination. Carr and Pearson (1999) discovered that strategically managed long-term relationships with key suppliers have a positive impact on a firm’s supplier performance.
Through a long-term relationship, the supplier will become part of a well-managed chain and will have a lasting effect on the competitiveness of the entire supply chain (Choi and Hartley, 1996, Kotabe et al., 2003).

Supplier contracts have increasingly become long-term, and more and more suppliers must provide customers with information of their processes, quality performance, and even cost structure (Helper, 1991, Helper and Sako, 1995). Closer and long-term relationships with suppliers are evident in several industries (e.g., Hakansson, 1987, Lorenzoni and Ornati, 1988, Womack et al., 1991, Lamming, 1993, Nishiguchi, 1994), which cause increasing dependence on suppliers (Sabel et al., 1987, Slack, 1991, Christopher, 1992). The terms “partnership” and “partnership sourcing” have been used to refer to these closer, longer relationships with suppliers (Johnston and Lawrence, 1990, Hines, 1994, Macbeth and Ferguson, 1994). These long-term orientations support most recent findings, which discover that once transactors have made the upfront investment to develop self-enforcing safeguards such as relational trust, the transaction costs decline in the long term because self-enforcing safeguards can control opportunism over an indefinite time horizon (Dyer, 1997). Specifically, the transaction costs and inventory holding costs associated with arm’s-length bidding practices, characterized by short-term relationships with a large number of short-term suppliers, can actually outweigh the costs of the parts themselves (Dyer, 2000). The formal hypothesis is given as:

H6: Extendedness has a positive effect on successful CPFR implementation.

4.5.7. Product Cost Volatility

The term "efficiency" is generally associated with cost reduction (Robinson, 1991). Successful cost reduction requires clear understanding and precise definition of all
underlying costs including inputs and components, labor, and distribution. The task is usually complicated by the fact that many costs are volatile. Product costs, and therefore prices, are often pre-established, making volatile costs problematic in maintaining margins and revenues. Given that supply-chain members often lock in prices for several months, volatile input and production costs can lead to inaccurate price quotes. This affects both CPFR cost effectiveness and service effectiveness, because one of the partners may be less than satisfied if products arrive at prices that are higher than expected. Therefore:

H7: Lower volatility of product costs has a positive effect on successful CPFR implementation.

4.5.8. Competitive Intensity

According to transaction cost analysis, external uncertainty influences contractual arrangements between organizations. External uncertainty often takes the form of market competitiveness, where changing competitive offerings in the marketplace force firms to react to volatile pressures. This sort of uncertainty has been shown to influence firms to internalize transactions and decision making to absorb the volatility of markets. The case studies show that external uncertainty allows negative information asymmetries to develop and provides the opportunity for outside forces to behave opportunistically. High market competitiveness increases the need for quick decisions, dictating a fluid, and simple information dissemination method. Responsiveness in highly competitive markets is enhanced with reduced lead-times and predictable order cycles, driving firms to implement and maintain effective CPFR. Rather than being a detriment to CPFR effectiveness, the competitive intensity is a positive influence of CPFR effectiveness,
because firms often implement these programs as a result of this uncertainty, rather than despite it. Highly competitive markets would drive firms to differentiate and become more responsive to partner demands.

A firm can be seen is both a collectivity of transactions (Ulrich and Barney, 1984) and as a bundle of resources. Governance skills, both within and across firm boundaries, can result in performance differences and competitive advantage (Dyer and Singh, 1998). When firms transact through exchange they transact resources (Madhok and Tallman, 1998; Chi, 1994). Here, resource attributes increase the measurement problem and thus impact upon the level of transaction costs (Chi, 1994; Silverman, 1999). If firms are superior to markets for reasons of efficiency, this may well be due now just to transaction cost reductions by to productivity enhancing factors tied to superior skills and knowledge. Thus:

H8: Greater competitive intensity of the market has a positive effect on successful CPFR implementation.

4.5.9. Market-Oriented Strategy

Regarding distribution management, the strategic perspectives of organizations are seen to fundamentally influence outcomes. Traditionally, managerial strategic perspectives have been classified as either economically or market oriented; most research has focused on the former. However, firms often seek power positions in the market and block potential movement of competitors through the creation of market imperfections/monopolistic power and barriers to entry, rather than focusing on short-term economic benefits. The creation of these barriers can take the form of blocked distribution channels or exclusive arrangements with value-chain members. Strategic
positioning can be enhanced by locking supply-chain partners into CPFR agreements thus limiting supplier-switching by retailers or by enhanced relationships via improved inventory replenishment. Such tactics will be viewed as conducive to enhanced market share, customer satisfaction, and a differentiated company image, which are key strategic goals to many firms.

The strategic orientation of many supply chain members is toward the market, with goals of competitive differentiation and enhanced market share position. CPFRs accomplish this by consistently providing an array of customers with on-time products, but with less emphasis on cutting costs. Thus, two strategic factors are relevant to the discussion: market and profitability orientation (Cavusgil and Zou, 1994; Porter, 1980). Market oriented strategy deals with meeting competitive moves within the market, creating barriers to entry, and other broad strategic aims associated with enhancing market position and meeting customer needs.

Therefore:

H9: Greater market orientation of a firm has a positive effect on successful CPFR implementation.

4.5.10. Profit-Oriented Strategy

Firms with a profit-oriented strategy are more concerned with bottom-line issues and short-term profitability than market-oriented firms. Economic goals are considered paramount. The profit versus market strategic orientation can be seen as conflicting as well as complementary and subject to hierarchical considerations regarding level of importance (increased market share brings increased profits, yet to increase market share the firm may have to experience losses in the short-term by undercutting competitive
price offers). Much of the conflicting nature in strategic perspectives may be attributed to temporal issues. From the supply-chain perspective, short-term strategies are not easily synthesized with long-term objectives. Organizations involved in CPFR are interested in the long-term survival of the firm, which in turn is reliant on the ability of the organization to adapt to a variety of environmental pressures and constraints. Preliminary interviews with managers indicated that firms often have specific profitability-related strategies. It is conjectured that these firms will view CPFR as a means by which to reduce costs and increase margins. This orientation will enhance the overall cost effectiveness of a CPFR program.

The strategic considerations of the firm involve the relationships between organizational goals and the effectiveness of CPFR programs. Traditionally, managed inventory arrangements have been used to reduce costs and thereby increase margins and revenues (Stratman, 1997). This would provide the profit-oriented firm with the motive to implement CPFR strategies and subject itself to the related control and resource commitment issues of these systems. A profit-oriented strategy instead focuses on revenues and therefore is more likely to be associated with costs versus time.

H10: Greater profitability orientation of a firm has a positive effect on successful

4.5.11. Centralization of Decision-Making

Decision-making centralization is defined as the degree to which upper-level management makes firm-related decisions versus those managers closer to the point of sale. Recent studies have argued that a centralized decision making structure within the organization is related to inventory management success. The political economy framework suggests that the more centralized a decision-making process the more
efficient and effective the channel irrespective of transactional form. This perspective is supported at the firm level in past studies, where a more centralized approach to decision making was found to allow managers to integrate cost associated information into strategic moves within the distribution channel. An understanding of underlying costs is most evident at relatively high decision levels. Because centralization of decision making (this in the form of hierarchical information exchange) is a basic tenet of CPFRs, program cost effectiveness will be enhanced with this form of managerial decision making. Benefits should be realized in the form of scale economies and the possible cost advantages of increased CPFR programs. Furthermore, these cost benefits will be shared with the downstream supply-chain partner, enhancing the service performance associated with these relationships. Hierarchical decision-making, however, often comes at the expense of customer satisfaction, because lower level managers generally have greater contact time with buyers and are more familiar with their needs. Hence, a centralized approach is seen as detrimental to CPFR implementation.

The dimension associated with control and resource issues and CPFRs is that of organizational factors. The capabilities of any organization will affect its ability to effectively move products (Day, 1994). This is particularly true when implementing sophisticated transfer systems such as CPFRs. Capabilities are based on organizational structure and competence, and influence the organization's ability and management's willingness to invest resources in distribution decisions (see Madhok, 1996). According to Aulakh and Kotabe (1997, p. 148), "... a major distinction [exists] between transaction cost and organizational capability perspectives... while the former focuses on the transaction characteristics to minimize the sum of transaction costs and production costs
(Kogut, 1988; Klein et al., 1990), the latter deals primarily with firm capabilities in order to better manage its skills and resources." Successful implementation of CPFR programs will be influenced by the structural and experiential capabilities available to manage these systems, encompassing both financial and human resources. Management commitment of dedicated resources to the programs, however, is also conducive to efficient distribution systems (see Gilliland and Bello, 1997), as is the degree of autonomy and trust that exists to allow successful information exchange between channel partners. Therefore, we see decentralization as an organizational factors as influential to CPFR effectiveness.

Therefore:

H11: More decentralized the managerial decision making in the firm, has a positive effect on successful CPFR implementation.

4.5.12. Management Commitment to CPFR Programs

Given that CPFRs require substantial financial and managerial resources, significant managerial commitment to the program is required for success. Since Because CPFRs are relatively new within managerial practice with no proven track record, commitment by the firm becomes even more critical to realization of program goals. Furthermore, managerial commitment is important to programs in which information sharing between channel members is a key component. Managerial commitment is seen as the degree to which management dedicates manpower and other resources to its CPFR program, as well as the advanced planning, which takes place within the firm for the system. The more managerial commitment to the program, the better is the CPFR's overall effectiveness in both cost and service.
The importance of top management's role is heavily emphasised in the supply chain literature (Hahn, Watts and Kim, 1990; Krause and Ellram, 1997; Monczka, Trent and Callahan, 1993; Ward, Leong and Boyer, 1994). Due to their knowledge of the firm's strategic imperatives to stay competitive, top-level managers have a better understanding of the need of supply management (Hahn, Watts and Kim, 1990). Monczka, Trent and Callahan (1993) noted that top management must commit the time, personnel and financial resources to support the suppliers who are willing to be a long-term partner of the company through supplier development. One of the major functions of top management executives is to influence the setting of organizational values, and to develop suitable management styles to improve the firm's performance. Prior research has also noted that the top management must be aware of the competitive benefits that can be derived through the impact of strategic purchasing on effective supply relationships. Based on these we propose that top management support is conducive to the strategic management of the supply function. Thus,

H12: Firms that have top management support and procurement of the necessary resources of their CPFR implementations have a greater chance of success than firms with little or no support.

4.5.13. CPFR Effectiveness-Firm Performance Relationship

Similar to strategic orientation, performance should be viewed in two distinct manners: (1) strategic, where market share, creating barriers to entry, and meeting customer demands serve as performance measures; and (2) economic, which addresses the profit, ROI, and sales volume goals. Performance is defined as the extent to which a firm's economic and strategic objectives are achieved with respect to their activity in the
market. As previously discussed, two theoretical foundations underlie the implementation of CPFR programs, that of (1) cost reduction and of (2) service to supply-chain partners. Thus, the investigation of the relationships between these two effectiveness measures and the different types of firm performance is a key point of this study. Such a distinction will provide greater understanding of the outcomes of CPFR effectiveness, in that firms that achieve one CPFR effectiveness measure may benefit from either (1) economic performance, (2) strategic performance, or both. Firms achieving CPFR cost effectiveness will experience reduced waste and lower expenditures associated with CPFR, which should enhance margins and the overall profitability of the firm. Organizations with high levels of CPFR service effectiveness thereby establish more satisfied supply-chain partners and create barriers to competitors by maintaining these relationships. This also positively influences market share and enhances the strategic performance of the firm.

There are three multidimensional perspectives as appropriate for discussing the control and resource issues associated with CPFR programs: These are (1) transaction cost analysis, (2), the strategic considerations of the firm, and (3) organizational factors (Daugherty, 1999) (Attaran, 2007). The three perspectives are believed to influence the degree of CPFR effectiveness and the role of CPFR operations in the decisions of the supplying organization. Transaction cost factors are useful in understanding the problems associated with bilateral bargaining in individual relationships in dynamic environments (Aulakh and Kotabe, 1997; Kogut, 1988), which in turn enables us to investigate control related perspectives of shared systems. The strategic orientations of the firm allow investigation of the differing competitive postures of firms and their association with
working CPFRs. Concentrating on the organizational factors allows examination of the resource-related issues that are relevant to inventory management systems.

A dominant paradigm used to explore supply-chain relationships is based on transaction cost analysis. Although TCA provides a parsimonious theoretical explanation of these relationships, it focuses on individual economic exchanges (Aulakh and Kotabe, 1997; Williamson, 1975). There is a need to complement the efficiency perspective of the transaction cost model with "strategic issues concerning governance modes, for it is argued that firms may be willing to sacrifice the cost advantages... in order to improve their competitive position vis-a-vis rival firms" (Aulakh and Kotabe, 1997, 146). This is also reflective of traditional supply chain management practices of balancing or assessing cost and service trade-offs.

Transaction costs analysis addresses the behavioral assumptions of self-interest and bounded rationality of the entities involved in supply chain relationships (Williamson, 1975). Shared information provides the opportunity for firms to behave opportunistically, which increases the transaction costs associated with the exchange relationship (Aulakh and Kotabe, 1997). High transaction costs often drive firms to increase control within the channel, and in a CPFR context this can affect the balance of responsibility between buyer and seller. This is very similar to the channel integration arguments made by Anderson and Gatignon (1986), and Klein, Frazier, and Roth (1990), where enhanced transaction costs drove firms to increase their channel control by integrating distribution channels. Theory suggests that firms act in such a way as to minimize the sum of transaction costs and production costs (Klein, Frazier, and Roth,
1990). From the CPFR perspective of transaction costs, the critical factors associated with cost minimization are systems.

Given this, the following hypothesis is offered:

H13: The use of performance metrics (economic, financial and strategic performance measures) has a positive effect on a successful CPFR implementation.

4.5.14. Supplier Base Reduction

Many researchers have shown that reduced supplier base plays a major role in the effective long-term relationship. Hahn et al. (1986) note that multiple sourcing prevents suppliers from achieving the economies of scale based on order volume and learning curve effect. Also, the multiple supplier system can be more expensive than a single supplier system (Treleven, 1987). Dowlatshahi (2000) further points out that a close and workable relationship is only achievable with a limited number of suppliers. Extant research has also pointed out the multiple benefits of supplier base reduction including long-term relationship, improvised communication, logistics improvement, supplier involvement, etc. (Deming, 1986; Dowst, 1985; Newman, 1988b; Morgan & Zimmerman, 1990; Helper, 1991; Han, Wilson, & Dant, 1993; Kekre et al., 1995; Dobler & Burt, 1996; De Toni & Nassimbem, 1999).

In the past, it has been a common practice for firms to contract with a large number of suppliers, even for the same material or component. The underlying premises behind this tradition of multiple sourcing include: (1) competition is the basis of the economic system, (2) purchasing must not become source dependent, and (3) multiple sourcing is a risk-reducing technique (Newman, 1989). Reduction of the supplier base is,
however, a unique characteristic of contemporary buyer-supplier relationships (Newman, 1988b, Helper, 1991), because the administrative or transaction costs associated with managing a large number of vendors often outweigh the benefits (Dyer, 2000). Many firms are reducing the number of primary suppliers and allocating a majority of the purchased material requirements to a single source (Manooccheri, 1984, Hahn et al., 1986, Spekman, 1988, Pilling and Zhang, 1992, Kekre et al., 1995). This action provides multiple benefits including: (1) fewer suppliers to contact in the case of orders given on short notice, (2) reduced inventory management costs (Trevelen, 1987), (3) volume consolidation and quantity discounts, (4) increased economies of scale based on order volume and the learning curve effect (Hahn et al., 1986), (5) reduced lead times due to dedicated capacity and work-in-process inventory from the suppliers, (6) reduced logistical costs (Bozarth et al., 1998), (7) coordinated replenishment (Russell and Krajewski, 1992), (8) improved buyer-supplier product design relationship (De Toni and Nassimbeni, 1999), (9) improved trust due to communication (Newman, 1988a), (10) improved performance (Shin et al., 2000), and (11) better customer service and market penetration (St. John and Heriot, 1993). The benefits attributed to this practice often exceed those achieved through traditional bidding from multiple sources, which often emphasizes low price at the expense of performance (Mohr and Spekman, 1994). Moreover, supply base consolidation sets the stage for future development of the chosen suppliers (Handfield, 1993). In practice, a significant shift has occurred from traditional multiple sourcing, characterized by adversarial buyer-seller relationships, to the use of a limited number of qualified suppliers (Morgan, 1987, Raia, 1988, 1993, Burt, 1989, Helper, 1991, Offodile and Arrington, 1992). This appears to be consistent with the
notion of parallel sourcing, which involves the use of multiple sole sources for each type of component that provides incentives for supplier performance associated with multiple sourcing while preserving claimed benefits of sole sourcing (Richardson, 1993). Hence,

H14: Supply base reduction has a positive effect on successful CPFR implementations.

4.5.15. Trust

Cooperation, whereby firms exchange bits of essential information and engage some suppliers/customers in longer-term contracts, has become the threshold level of supply chain interaction (Spekman et al., 1998). Supply chain management is built on a foundation of trust and commitment (Lee and Billington, 1992, Kumar, 1996). The consensus is that trust can contribute significantly to the long-term stability of an organization (Heide and John, 1990, Handfield and Bechtel, 2002). Trust is conveyed through faith, reliance, belief or confidence in the supply partner and is viewed as willingness to forego opportunistic behavior. Trust is one's belief that one's supply chain partner will act in a consistent manner and do what he/she promises. It is the sense of performance in accordance with intentions and expectations that hold in check one's fear of self-serving behavior on the part of the other members of the supply chain (Nootenboom et al., 1997). Commitment implies that the trading partners are willing to devote energy to sustaining this relationship (Dion et al., 1992). That is, committed partners dedicate resources to sustaining and furthering the goals of the supply chain. To a large degree, commitment makes it more difficult for partners to act in ways that might adversely affect overall supply chain performance. With commitment, supply chain
partners become integrated into their major customers’ processes and more tied to their goals.

While trust comes in various forms such as "cognitive trust" and "calculative trust", it is the calculative trust that can have a significant impact on buyer-supplier relationships and, consequently, supply chain performance. For example, Hill (1990) argues that contrary to the theory of transaction cost economics (TCE) that opportunism generally characterizes exchange, relationships based on cooperation and trust are more likely to survive in the marketplace. Therefore, it is argued that the assumption that opportunism characterizes exchange should be reconsidered in favor of one that suggests that trust characterizes exchange (Zaheer and Venkatraman, 1995). Specifically, although legal contracts are viewed as the primary means for safeguarding transactions in Western economics, alternative means such as relational trust has proven to be an efficient governance mechanism that reduces transaction costs by minimizing search, contracting, monitoring, and enforcement costs over the long term (Dyer, 1997). Further, a high level of inter-organizational trust is found to be related to enhanced supplier performance, lowered costs of negotiation, and reduced conflict (Zaheer et al. 1998).

Trust and relationship commitment are essential requirements of successful CPFR implementation, but strong relationships in collaboration are often the exception rather than the norm. Trust and relationship commitment can be weakened when trading partners treat each other poorly and engaged in questionable business practices. If the questionable and unethical business practices continue to occur in relationships among manufacturers and their trading partners, Trust and relationship commitment will be
difficult to develop and the strong relationships needed to implement CPFR will be impossible to achieve. Therefore, it is posited that:

H15: Trust between the manufacturer and the retailer relationship has a positive effect on successful CPFR implementations.
CHAPTER V

RESULTS

This chapter presents the results of the study. The chapter is grouped as follows: The first section presents pertinent information on the research design. This section covers the data collection strategies, respondent and firm profile, and non-respondents analysis results. The second section presents the results of the measurement instrument development process. After a brief section including some general observation on the data collected, the fourth section presents the results of the linear regression models. Results are grouped based on the different areas; supply chain operational characteristics, organizational issues and environmental uncertainty.

5.1. Research Design

5.1.1. Data Collection

This study utilized a cross-sectional mail survey within the United States. The target sample consisted of clients and employees of KPMG and Ernst & Young with a focus on members from the Institute for Supply Management (ISM) formerly the National Association of Purchasing Management (NAPM), the Association for Operations Management - formerly American Production and Inventory Control Society (APICS) and Council of Supply Chain Management Professionals (CSCMP) - formerly the Council of Logistics Management (CLM). Four hundred and two respondents, from a
group total of 2205, were randomly selected from a list of clients and employees of
KPMG and Ernst & Young. The title of the specific respondent being sought from the
sample companies was typically Vice Presidents of Purchasing, Materials Management,
and Supply Chain Management or Directors/Managers of Operations, Purchasing,
Material Management.

In an effort to increase the response rate, a modified version of the methodology
of Dillman's total design method was followed (Dillman, 1978). All mailings were sent
via first-class mail to the respondents. The initial mailing included a cover letter, the
survey, and a postage-paid return envelope. Two weeks after the initial mailing,
reminder postcards were sent to all potential respondents. For those who did not respond,
a second mailing of surveys, cover letters, and postage-paid return envelopes were
mailed approximately 28 days after the initial mailing. Of the 402 surveys mailed, 185
responses were received, resulting in a response rate of 46.0%. A total of 57 were
discarded due to a lack of participation in a CPFR implementation, resulting in an
effective response rate of 31.8% (128/402). Considering the length of the survey, this
response rate is quite satisfactory. Also, the response rate correlates well with other
empirical studies within supply chain management (e.g., Choi and Hartley (1996), a
usable rate of 21%; Krause, Pagell, and Curkovic (2001), a usable rate of 19.6%; Stanley
and Wisner (2001), a usable rate of 23.6%) and operations management in general
(Bozarth et al. (1998), a usable rate of 19.4%; Small and Chen (1996), a usable rate of
20.4%).

5.1.2. Respondent and Firm Profile

The final sample comprised of consultants and executives and included 76
presidents/vice presidents (59%), 16 middle managers (13%), 14 partner level consultants (11%), and 22 senior consultants (17%). The respondents worked primarily for medium to large firms with 40% working for firms employing more than 1,000 employees. Nearly 64% of the firms had a gross income of greater than $100 million. The distribution of the samples with regard to respondent and firm profile is presented in Tables 5.1 and 5.2 respectively.

5.1.3. Non-response Bias

Non-response bias is the difference between the answers of non-respondents and respondents (Lambert and Harrington, 1990). In this study, non-response bias was tested by comparing the responses of early and late waves of returned surveys (Armstrong and Overton, 1977; Lambert and Harrington, 1990). This is based on the assumption that the opinions of late respondents are representative of the opinions of non-respondents. It has been a common practice to employ only demographic variables for non-response bias analysis (e.g., Chen et al., 2000; Soteriou and Chase, 1998). The inclusion of other variables for this analysis has been adopted by more recent research (e.g., Krause et al., 2001; Stanley and Wisner, 2001; Swink, 1999). The present study includes 98 randomly selected variables in addition to the 10 demographic variables for non-response bias analysis. The final sample was split into two, depending on the dates they were received. The early wave group consisted of 58 responses while the late wave group consisted of 70 responses. T-tests were performed on the responses of these two groups. The t-tests yielded no statistically significant differences (at 99% confidence interval) for the survey items tested. These results suggest that non-response may not be a problem.
5.2. General Observation

Table 5.3 displays the mean and standard deviation values for the questions included in the survey instrument. Review of data in this manner does not show any noteworthy differences. But, it does show the importance respondents place on the different factors and the underlying indicators. Except for demographic variables, all questions were measured using a 7-point Likert scale wherein 1 represents "strongly disagree" and 7 represents "strongly agree." Reverse-scored items were recoded before proceeding with any analysis. It can be clearly seen that the respondents place very high importance on the organizational factors construct (most of the mean values were close to 5.25). The organizational factors construct consists mainly of trust, top management support and managerial decision making. Also, the low standard deviation values for these indicators suggest that there is uniformity in this opinion among the respondents. Though considered as important, respondents place lesser significance on factors like supply chain operational characteristics and environmental uncertainty. The supply chain operational characteristics construct consists mainly of communication, sharing, interdependence, information exchange, extendedness, competitive intensity, market orientation, profitability orientation and cost effectiveness. The environmental uncertainty construct consists of partnership assets and lower volatility of product costs. In general, all the constructs included in this study are considered by the respondents as important to the successful implementation of CPFR. The following sections present more detailed analysis of the instrument and the relationship between the constructs.
5.3. Measurement Instrument

An iterative instrument development process was used to develop an instrument that satisfies the requirements of reliability and validity. The three-stage continuous improvement cycle, which lies at the heart of the instrument development process, employs principal components analysis. In exploratory factor analysis one postulates that there is a smaller set of unobserved (latent) variables or constructs that underlie the variables that were actually observed or measured. Principal components analysis is simply trying to mathematically derive a small number of variables to use to convey as much of the information in the observed/measured variables as possible. Prior to data collection, the content validity of the instrument was established by grounding strongly in existing literature and conducting pre-tests. In the first stage of the instrument development process, a Cronbach's alpha value was generated for each construct. The three-step approach presented by Flynn et al., (1994) was adopted in selecting constructs after the calculation of Cronbach's alpha. First, the constructs were accepted if the Cronbach's alpha value was greater than 0.7. Second, the constructs with an acceptable Cronbach alpha of at least 0.6 were further evaluated for the possibility of improvement. Items that contribute least to the overall internal consistency were the first to be considered for exclusion. The item inter-correlation matrix was utilized in determining the items that contributed the least and thus were the best candidates for deletion. The items that were negatively correlated to other items within a scale were first discarded. Also, the items with correlation value below 0.10 were discarded. The cut-off value of 0.30 as given by Flynn et al. (1994) was not used to discard the items, but for marking them for possible deletion. Third, a similar elimination procedure was performed on the
constructs that failed to achieve the minimum alpha value of 0.60. Under normal practice, if a construct still failed to achieve the target value of Cronbach’s alpha, it should be discarded. Since all the constructs achieved the target value, the analysis moved on to the next stage of instrument development.

The second stage of the development process involved exploratory factor analysis (ETA) using principal component analysis (PCA). The commonly recommended method of varimax rotation with Kaiser normalization was used to clarify the factors (Loehlin, 1998). Since the number of constructs was determined prior to the analysis, the exact number of factors to be extracted was provided in this analysis. Indicator items were discarded after comparing their loading on the construct they were intended to measure to their loading on other scales. Furthermore, nuisance items, those that did not load on the factor they intended to measure, but on other factors they did not intend to measure, were deleted from consideration. The next stage which was not performed in this study would involve confirmatory factor analysis (CFA) in evaluating construct validity and unidimensionality. A more detailed explanation and the results of the various analyses are presented in the following sections.

5.3.1. Reliability

Table 5.4 presents the Cronbach alpha for the scales at various stages of the analysis. The alpha value is presented after the completion of internal consistency tests and EFA. Table 5.4 also presents the reliability value for the CPFR implementation constructs after the instrument purification process. As it can be seen from this table, Cronbach's alpha values of the factors were well above the cut-off value and ranged from 0.623 to 0.964 with only one value below 0.70.
5.3.2. Content Validity

As a first step towards establishing content validity, the CPFR implementation factors were identified based on an exhaustive review of relevant literature and supply chain performance literature including over 50 articles. Secondly, the instrument was pre-tested in two stages before being considered for data collection. First, six experienced researchers were asked to critique the questionnaire for ambiguity, clarity, and appropriateness of the individual items within each construct (DeVellis, 1991). They were also asked to verify whether or not the indicators sufficiently addressed the subject area (Dillman, 1978). The instrument was modified based on their input. Due to concerns about response rate, some factors were then dropped to reduce the length of the survey. In the second stage of the pre-test, the survey instrument was entailed to 12 CPFR specialists affiliated with KPMG and Ernst & Young. The executives were asked to review the questionnaire for structure, readability, ambiguity, and completeness (Dillman, 1978). All reviewers reacted favorably to the questionnaire. The final survey instrument incorporated minor changes to remove a few ambiguities that were discovered during this validation process. These tests indicated that the resulting measurement instrument represented the content of the CPFR implementation factors.

5.3.3. Construct Validity

Construct validity is the extent to which the items in a scale measure the abstract or theoretical construct (Cam-lines and Zeller, 1979; Churchill, 1987). Testing of construct validity concentrates not only on finding out whether or not an item loads significantly on the factor it is measuring - "convergent" - but also on ensuring that it measures no other factors - "discriminant" (Campbell and Fiske, 1959). It can be tested
either using the correlation between total scores and item scores or using factor analysis (Kerlinger, 1978; Kim and Mueller, 1978; Spector, 1992).

Convergent validity is assessed using exploratory factory analysis. Due to existence of many constructs as well as the limitation on sample size, three different linear regression (LR) models were evaluated (Atuahene-Gima and Evangelista, 2000; Moorman, 1995). In EPA, a construct is considered to have convergent validity if its eigen value exceeds 1.0 (Hair et al., 1995). Also, all the factor loadings must exceed the minimum value of 0.30. Table 5.4 presents the final factor loading of the retained items on their underlying factors. It can be seen that all the loadings are quite high and their eigen values exceed the minimum criterion.

5.4. Model Results

Multiple linear regression was used to test the hypothesis. Bollen (1989) states that the larger the t-values or the relationship, the stronger the evidence that the individual items represent the underlying factors. The independent variables were tested using the associated t-statistics. T-values greater than 1.65 or 1.98 or 2.58 were considered to be significant at the 0.10 level, 0.05 level and 0.01 level respectively (Hair et al., 1995). The ANOVA table concluded that F was significant in all models. Furthermore, the multiple correlation coefficient (R) using the observed variables accounted for an acceptable R² and adjusted R² in all models. The standardized beta coefficients are the factor weights considered in the models. Examination of the above conditions indicates all indicators are significantly related to their underlying theoretical constructs.

The results of the multiple linear regression analysis is presented in Tables
Multiple regression was conducted to determine the best combination of factors. Three models were conducted in all. They are grouped in organizational factors, supply chain operational characteristics, and environmental uncertainty. The overall models were tested for significance by the F-test. Individual factors were tested by the t-test. In addition, the adjusted $R^2$ interpreted the percent of variance predicted by the model. A value for $p < 0.001$ was used for the confidence level for 99%.

Multicollinearity was tested using the variance inflation factor (VIF) (Atuahene-Gima, 2003).

5.4.1. Organizational Forces and CPFR Implementation

A number of driving forces play significant role in developing and maintaining superior collaboration relationships between the supplier and buyer firms. This study includes some of the key driving forces that have been identified in extant literature, scattered across diverse disciplines. Strategy and structure has long been postulated as key forces to the success of any manufacturing initiative (Thorelli, 1986; Ward, Leong and Boyer, 1994; Hayes and Wheelwright, 1984; Porter, 1990; Skinner, 1969; Williamson, 1985; Williamson, 1994). On similar lines, we argue that they are also crucial to CPFR implementation, leading to the inclusion of hypothesis below. The following sections present some support for the organizational forces of CPFR implementation.

From Table 5.5a it is evident that the regression model is statistically significant at 99.9% confidence interval. The adjusted $R^2$ value for this model is 0.713. In general, these numbers demonstrate that the hypothesized model fits the data. The individual parameter estimates show that all factors have a significant effect on the dependent
variable. The overall model was significant with an F-value of 27.35. Individual factors were tested by the t-test. Individual t-values are all greater than 2.576 (significant at 0.01 level) except purchasing at 2.433 (significant at 0.05 level). Multicollinearity was tested using the variance inflation factor (VIF) and is not a problem.

The first multiple regression equation is as follows: CFPR implementation = 3.044 + 0.169 Trust + 0.111 Top Management Support + 0.161 Managerial Decision Making + 0.116 Supply Base Reduction + 0.177 Purchasing.

5.4.1.1. Results and Managerial Implications of Hypothesis 11

It was hypothesized that managerial decision making will have a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for managerial decision making. From this table it is evident that managerial decision making (mean = 4.20; S.D. = 1.512) has been given greater importance by the respondent firms. The standard deviation for this theoretical construct further demonstrates that there is a similar opinion across the respondents. This result shows that these managerial decision making is widely considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.161; t-value = 3.256) indicates that managerial decision making has a significant positive impact on CPFR implementations. The above results demonstrate that managerial decision making and successful CPFR implementations work in conjunction with each other.

5.4.1.2. Results and Managerial Implications of Hypothesis 12

It was hypothesized that firms that have top management support and
procurement of the necessary resources of their CPFR implementations have a greater chance of success than firms with little or no support. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for supply base reduction. From this table it is evident that supply base reduction (mean = 4.96; S.D. = 1.283) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that these top management support is widely considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.111; t-value = 3.693) indicates that top management support has a significant positive impact on CPFR implementations. The above results demonstrate that top management support is characterized in terms of time, support, and resources contributed by the top management to CPFR implementations. The descriptive statistics for this construct shows that top management does support the implementation of CPFR for its strategic role. The importance of top management support has been documented in various fields. This result proves that top management support influences the level of the collaboration between the buying firm’s strategic perspective toward suppliers and vice versa. Based on the resounding support, this study suggests that top management should recognize the importance of CPFR implementations and consider it from a strategic and integrative function rather than as a support function.

5.4.1.3. Results and Managerial Implications of Hypothesis 14

It was hypothesized that supply base reduction will have a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3
presents the mean and standard deviation values for supply base reduction. From this table it is evident that supply base reduction (mean = 4.62; S.D. = 1.024) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that these supply base reduction is widely considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.116; t-value = 3.640) indicates that supply base reduction has a significant positive impact on CPFR implementations. The above results demonstrate that supply base reduction and successful CPFR implementations work hand-in-hand. As noted by the collaborative literature as well as supply chain literature, it is found that reducing the supply base is commonly one of the best means of creating closer, interdependent collaborative relationships. Reduced supply base also leads to interdependency between the involved parties, thereby facilitating improved communication and sharing of information. Therefore, based on this result, it is argued that a collaborative supplier within a reduced base will be more cooperative, efficient, and willing since they share a greater trust along with a larger share of the buying firm's business. The regression model showed that due to an increased trust and interdependence, reducing the supplier base will ultimately improve the firm's operational and financial performance through a collaborative relationship and effective communication, by Trevelen (1987), this could also be attributed to the fact that reduced the transaction cost involved in managing multiple suppliers.
5.4.1.4. Results and Managerial Implications of Hypothesis 15

It was hypothesized that trust between the manufacturer and the retailer relationship will have a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for trust. From this table it is evident that trust (mean = 4.85; S.D. = 1.240) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that trust is widely considered crucial by the participating firms. This test was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.169; t-value = 3.344) indicates that trust has a significant positive impact on CPFR implementations. The above results demonstrate that trust and successful CPFR implementations work in combination. Spekman (1988) considered trust so important as to call it "the cornerstone of strategic partnership," because mistrust breeds mistrust. As such, trust would also "serve to increase commitment in the relationship" (McDonald 1981). Morgan and Hunt (1994) called trust a major determinant in relationship commitment. Dyer (1996), for example, even argued that trust is a prerequisite to the successful involvement (commitment) of customers and mutual levels of suppliers in value analysis. However, it should be pointed out that unless trust is translated into actionable commitment, no measurable economic gains would be attained from collaborative planning. Accordingly, a framework needs to be developed to link the level of trust and the degree of commitment, commitment that certain actions benefiting both parties will be consummated to improve the CPFR implementation performance.
Several implications for implementing trust result from this study. It has been actively argued among supply chain strategists that collaborative efforts among trading partners may be the best way to minimize uncertainty and enhance the degree of trust. Simple information sharing may not be enough to overcome barriers and suspicion inherent in the information-sharing process. It is posited that enjoyment of the full benefits of supply chain collaboration (efficiency, effectiveness and profit sharing) requires each partner to willingly provide, within the collaborative framework, critical information needed for effective management of the supply chain. This information may include, but not be limited to, operational data (utilization rate, productivity goals, production and distribution systems), financial data (activity costs, cost of goods sold per unit, return on capital, carrier cost-and-profit structure), forecasting data (volume, product and market strategy), and supply chain data (cost and value-added propositions) (Henderson 2002).

5.4.2. Supply Chain Operational Characteristics and CPFR Implementation

From Table 5.5b it is evident that the regression model is statistically significant at 99.9% confidence interval. The adjusted $R^2$ value for this model is 0.794. In general, these numbers demonstrate that the hypothesized model fits the data. The individual parameter estimates show that all factors but information exchange and technology have a significant effect on the dependent variable. The overall model was significant with an F-value of 35.94. Individual factors were tested by the t-test. Individual t-values are all greater than 2.576 (significant at 0.01 level) except information exchange and technology at 2.407 (significant at 0.05 level). In addition, competitive intensity was not significant at all (t-value = -0.146). Multicollinearity was tested using the variance inflation factor
(VIF) and is not a problem. The individual parameter estimates show the factors that have a significant effect on the dependent variable.

The second multiple regression equation is as follows: CFPR implementation = -0.173 + 0.204 Sharing of Risks and Rewards + 0.253 Market orientation + 0.269 Performance Metrics + 0.227 Interdependence + 0.507 Extendedness − 0.090 Competitive Intensity + 0.344 Communication + 0.267 Information Exchange & Technology.

5.4.2.1. Results and Managerial Implications of Hypothesis 1

It was hypothesized that communication has a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for supply base reduction. From this table it is evident that supply base reduction (mean = 4.27; S.D. = 1.966) has been given greater importance by the respondent firms. The larger standard deviation for this theoretical construct further demonstrates the contradiction of the opinion across the respondents. However, this result shows that communication is mostly considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.344; t-value = 2.691) indicates that communication has a significant positive impact on CPFR implementations. The above results demonstrate that communication and successful CPFR implementations work hand-in-hand. This theoretical construct was conceptualized to involve two-way communication and interaction between collaborative partners. Due to its profound impact on other CPFR implementation issues, this construct was hypothesized to have significant positive effect on many other factors with respect to successful CPFR
implementations and its performance. All the hypotheses were strongly supported by the underlying data. This result supports the notion that timely exchange of information through effective communication will help to better coordinate buyers' and suppliers' activities. Communication is very important for complex processes such as new product development and strategic initiatives. Therefore, overcoming the resistance to sharing information between collaborative partners will help to integrate suppliers in new product design and other strategic planning.

CPFR is a direct inter-organizational communicational link that is found to be an extensively used technique in the successful supplier integration. Frequent and timely information exchange will foster confidence and eliminate negative attitudes such as mistrust, fear, disappointment, frustration, and dishonest acts on both sides. This will lead to a competitive advantage, and eventually to improved financial performance. Frequent and accurate information transfer among the collaborative partners can ultimately reduce the distortion of information as it passes up the between the collaborative partners. The regression model identified in this study convincingly demonstrate that effective inter-organizational communication leads to improved financial performance of the buying firm through superior coordination of products and production, and other activities between the collaborative partners. In general, two-way communication is found to be a vital and fundamental element of organizational and collaborative activity.

Communication integrates the operations of the two firms, smoothing the disturbances from expected and unexpected environmental factors. Specifically, communication focuses on the process by which the parties will continue the relationship. Therefore, this study proves that communication leads to greater partnership satisfaction
and future expectations of partnership satisfaction.

5.4.2.2. Results and Managerial Implications of Hypothesis 2

It was hypothesized that sharing of rewards and risks (burdens and benefits) has a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for supply base reduction. From this table it is evident that sharing of rewards and risks (mean = 4.25; S.D. = 1.330) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. However, this result shows that sharing of rewards and risks (burdens and benefits) is mostly considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.204; t-value = 4.274) indicates that sharing of rewards and risks (burdens and benefits) has a significant positive impact on CPFR implementations. The above results demonstrate that communication and successful CPFR implementations work as one.

Sharing of rewards and risks refers to the willingness of both parties to accept short-term hardships with the expectation that the other party will do the same. Specifically, it means acceptance of short-term risks in expectation of sharing future rewards and risks. For example, firms can reduce barriers to market entry by sharing risks with a partner; in return both firms will share in future benefits derived from entering the market. Thus, one can assume that this dimension will increase partnership satisfaction.

5.4.2.3. Results and Managerial Implications of Hypothesis 4

It was hypothesized that interdependence will have a positive effect on successful
CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for interdependence. From this table it is evident that supply base reduction (mean = 4.73; S.D. = 1.050) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that interdependence is widely considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.227; t-value = 5.399) indicates that interdependence has a significant positive impact on CPFR implementations. The above results demonstrate that interdependence and successful CPFR implementations work hand-in-hand.

Interdependence is the degree to which firms are able to integrate and collaborate across traditional functional boundaries to provide better customer service (Cespedes, 1996; Kahn and Mentzer, 1996; Kingman-Brundage et al., 1995). Stolle (1967) pointed out that managing logistical activities involve other functions within the firm, namely marketing, finance, purchasing, and production. Coordination is required between the firm’s internal supply chain departments to realize the desired benefits for the firm (Ballou et al., 2000). It is widely agreed that task interdependence is the catalyst for interdepartmental integration (Ellinger, 2000). In simpler terms, customer satisfaction is dependent on the output of more than one worker, or one functional area. Benefits will be realized by companies that operate their logistics processes as an integrated system rather than by optimizing functional subsystems (Kent and Flint, 1997). Numerous empirical studies suggest that collaborative cross-functional integration is positively associated to performance (Griffin and Hauser, 1996; Kahn, 1996; Souder, 1987). Collaborative
interdepartmental integration involves predominantly informal process based on trust, mutual respect and information sharing, the joint ownership of decision, and collective responsibility for outcomes (Bowersox et al., 1992; Griffin and Hauser, 1996; Kahn, 1996; Moenaert et al., 1994; Rinehart et al., 1989). Thus, collaboration between departments is often needed to ensure delivery of high quality services to customers, and involves the ability to work seamlessly across the silos that have characterized organizational structures (Liedtka, 1996). Collaborative behavior is based on cooperation (willingness), rather than on compliance (requirement). Its success is contingent upon the ability of individuals from interdependent departments to build meaningful relationships (Appley and Winder, 1977; Gray, 1989; Schrage, 1990; Tjosvold, 1988). Higher levels of internal integration would include increased coordination of logistics activities with other departments in the firm, increased importance of logistics in the overall business strategy, and a blurring of the formal distinction between logistics and other areas of the firm (McGinnis and Kohn, 1990).

5.4.2.4. Results and Managerial Implications of Hypothesis 5

It was hypothesized that information exchange and technology will have a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for information exchange and technology. From this table it is evident that information exchange and technology (mean = 4.14; S.D. = 1.535) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that these information exchange and technology is widely considered crucial by the
participating firms. This hypothesis was significant at 95% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.267; t-value = 2.407) indicates that information exchange and technology has a significant positive impact on CPFR implementations. The above results demonstrate that information exchange and technology and successful CPFR implementations work jointly.

Palmer and Griffith (1998) have noted that information technology is permeating the supply chain at every point, transforming the way exchange-related activities are performed and the nature of the linkages between them. Inter-organizational systems are information and communication technology-based systems that transcend legal enterprise boundaries (Bakos, 1991; Chisman and Meier, 1992; Konsynski, 1993). A more recent perspective on linkages within the supply chain considers the role of inter-organizational systems, which are sophisticated information systems connecting separate organizations (Kumar and van Dissel, 1996; Samli et al., 1998). Research has shown information technology to be an effective means of promoting collaboration between collections of firms, such as groups of suppliers and customers organized into networks. The strength of inter-organizational systems has been particularly important with respect to enabling the process transformation needed to create effective networks (Christiaanen and Kumar, 2000; Drew and Smith, 1995; Holland et al., 1992; Holland, 1995; Greis and Kasarda, 1997; Teng, et al., 1996; Kumar and van Dissel, 1996; Venkataraman, 1994). Information technology also enhances supply chain efficiency by providing real-time information regarding product availability, inventory level, shipment status, and production requirements (Radstaak and Ketelaar, 1998). In particular, it has vast potential to facilitate collaborative planning among supply chain partners by sharing information on
demand forecasts and production schedules that dictate supply chain activities (Karowy, 1997). Furthermore, information technology can effectively link customer demand information to upstream supply chain functions (e.g., manufacturing, distribution, and purchasing) and subsequently facilitate “pull” (demand driven) supply chain operations (Min and Galle, 1999).

Effective coordination of supply chain activities, by means of excellent information technology processes, is essential to organizational performance (Lewis and Talalayevsky, 1997). The goal of these systems is to replace inventory with perfect information. Seamless material flows are achieved by replacing the notion of a sequential and linear chain of information exchange with a set of simultaneous information exchanges that span the members of the supply chain (Greis and Kasarda, 1997). These information systems may be simple electronic data interchange (EDI) systems for exchanging data such as purchase orders, advice of delivery notice and invoices or may involve more complex transactions such as integrated cash management systems, shared technical databases, internet, intranet, and extranet and CPFR systems (Min and Galle, 1999).

5.4.2.5. Results and Managerial Implications of Hypothesis 6

It was hypothesized that extendedness will have a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for extendedness. From this table it is evident that extendedness (mean = 5.02; S.D. = 1.133) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that
extendedness is widely considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.507; t-value = 2.935) indicates that extendedness has a significant positive impact on CPFR implementations. The above results demonstrate that extendedness and successful CPFR implementations work hand-in-hand. Extendedness in a partnering relationship refers to an ongoing relationship with no sharp beginning and no clear endpoint, a long-term open-ended relationship. This dimension is conducive to partnership satisfaction. Extendedness is the integration of logistics activities across firm boundaries. It reflects a transformation of manufacturing enterprise to encompass the entire supply chain, not an individual company, as the competitive unit (Greis and Kasarda, 1997). Managers are coordinating with companies beyond their own, seeking new ways to lower costs or improve service through such mechanisms as vendor managed inventory and just-in-time scheduling (Ballou et al., 2000). Collaboration will need to be achieved across enterprise boundaries interfacing with external suppliers, carrier partners and customers. As such, logistics is in a boundary-spanning role with these external customers as well (Bowersox and Closs, 1996; Bowersox et al., 1988; Leifer and Delbecq, 1978). Morash et al. (1997) identify customer service, quality, channel distribution, and total cost maximization as major boundary-spanning interface capabilities. Although not meant to be exhaustive of extendedness capabilities, these concepts are mentioned most often in modern logistics literature and are central to logistics thinking (Christopher, 1994; Lambert and Stock, 1993; Morash, 1990; Stock and Lambert, 1992). Various extendedness interactions have been examined extensively in prior research (Dolan, 1987; Vonderembse et al., 1995; Walton and Maruchek, 1997).
Higher levels of external integration would include increased extendedness related communication, greater coordination of the both firm's activities with those of the suppliers and customers, and more blurred organizational distinctions between the logistics activities of the firm and those of its suppliers and customers (Stock et al., 2000).

5.4.2.6. Results and Managerial Implications of Hypothesis 8

It was hypothesized that the greater competitive intensity of the market will have a positive effect on successful CPFR implementations. This was not supported by the underlying data. Table 5.3 presents the mean and standard deviation values for the competitive intensity. From this table it is evident that competitive intensity (mean = 4.92; S.D. = 1.378) has been given little importance by the respondent firms. The high standard deviation for this theoretical construct further demonstrates the non-uniformity of the opinion across the respondents. This result shows that greater competitive intensity of the market is not considered crucial by the participating firms. This hypothesis was not significant at the 90% confidence. The standardized coefficient for this relationship (standardized coefficient = -0.090; t-value = -0.146) indicates that the greater competitive intensity of the market has no significance on CPFR implementations. The above results demonstrate that competitive intensity and successful CPFR implementations are not correlated.

According to transaction cost analysis, external uncertainty influences contractual arrangements between organizations. External uncertainty often takes the form of market competitiveness, where changing competitive offerings in the marketplace force firms to react to volatile pressures. This sort of uncertainty has been shown to influence firms to
internalize transactions and decision making to absorb the volatility of markets. The case studies show that external uncertainty allows negative information asymmetries to develop and provides the opportunity for outside forces to behave opportunistically. High market competitiveness increases the need for quick decisions, dictating a fluid, and simple information dissemination method. Responsiveness in highly competitive markets is enhanced with reduced lead-times and predictable order cycles, driving firms to implement and maintain effective CPFR. This study noted that it is a detriment to CPFR effectiveness, the competitive intensity is a not related to CPFR effectiveness. However, it is noted that firms often implement these CPFR programs as a result of this uncertainty. However, any competitive market would drive firms to CPFR programs to differentiate and become more responsive to partner demands.

5.4.2.7. Results and Managerial Implications of Hypothesis 9

It was hypothesized that the greater market orientation of a firm will have a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for market orientation. From this table it is evident that supply base reduction (mean = 4.59; S.D. = 1.039) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that these market orientation is widely considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.253; t-value = 5.901) indicates that market orientation has a significant positive impact on CPFR implementations. The above results demonstrate that market orientation and
successful CPFR implementations work together.

Regarding distribution management, the strategic perspectives of organizations are seen to fundamentally influence outcomes. Traditionally, managerial strategic perspectives have been classified as either economically or market oriented; most research has focused on the former. However, firms often seek power positions in the market and block potential movement of competitors through the creation of market imperfections/monopolistic power and barriers to entry, rather than focusing on short term economic benefits. The creation of these barriers can take the form of blocked distribution channels or exclusive arrangements with value chain members. Strategic positioning can be enhanced by locking supply chain partners into CPFR agreements thus limiting supplier switching by retailers or by enhanced relationships via improved inventory replenishment. Such tactics will be viewed as conducive to enhanced market share, customer satisfaction, and a differentiated company image, which are key strategic goals to many firms. This study has confirmed the above that CPFR agreements create a strategic position through market orientation that is used to enhance relationships by integrating collaborative partners into CPFR agreements which limit supplier switching and enhance the supply chain by improved inventory replenishment.

5.4.2.8. Results and Managerial Implications of Hypothesis 10

It was hypothesized that the greater profitability orientation of a firm will have a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for profitability orientation or economic performance. From this table it is evident that profitability orientation (mean = 4.61; S.D. = 0.801) has been given greater importance
by the respondent firms. The very low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that profitability orientation is widely considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.269; t-value = 5.421) indicates that supply base reduction has a significant positive impact on CPFR implementations. The above results demonstrate that profitability orientation and successful CPFR implementations work intermingled very tightly. As noted by the collaborative literature as well as supply chain literature, it is found that it is difficult to assess financial measures.

Financial performance measures are more likely to reflect the assessment of a firm by factors outside of the firm's boundaries. These measures would include conventional indicators of business performance, such as market share, return on investment, present value of the firm, firm's net income, and profit after sales. Operational measures of performance relate to the efficiency and effectiveness of the operations within the firm. These categories of performance reflect competencies in specific areas of manufacturing and logistics, including cost, delivery speed and reliability, quality, and flexibility. They also reflect the two arguably most important dimensions of performance-efficiency, or the ability to provide a service at a lowest possible cost, and customer service, or the ability to accommodate customers' special requests (Fawcett and Clinton, 1996). Operational performance measures provide a relatively direct indication of the effects of the relationship between the various supply chain constructs. Under this framework, it would be logical to treat such measures as return on investment, profit, present value, net income, new product introduction, product
quality, marketing effectiveness, manufacturing value-added, and other measures of technological efficiency within the domain of business (Smith and Grimm, 1987; Tushman and Romanelli, 1985; Venkatraman and Ramamujam, 1986). Therefore, this study concludes that profitability orientation is a success factor in CPFR implementations.

5.4.2.9. Results and Managerial Implications of Hypothesis 13

It was hypothesized that the use of performance metrics (economic, financial and strategic performance measures) has a positive effect on a successful CPFR implementation. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for supply base reduction. From this table it is evident that supply base reduction (mean = 4.75; S.D. = 0.845) has been given greater importance by the respondent firms. The very low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. This result shows that these performance metrics are widely considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficient for this relationship (standardized coefficient = 0.269; t-value = 5.421) indicates that performance metrics have a significant positive impact on CPFR implementations. As noted by the collaborative literature as well as supply chain literature, it is found that goal establishment increases the chance of CPFR success if those goals are economic, financial and strategic. Goal setting has long been a measurement of manufacturing firms, however, designing, implementing and measuring their effectiveness has always been difficult. Successful CPFR implementations establish and meet these goals. The more successful companies in our case study research established economical, strategic
and financial goals.

Everyone agreed very strongly about the role that economic, financial and strategic goals play in the success of an CPFR system. Economic and financial goals are set for a variety of reasons. First, most firms view an CPFR implementation as an expense large enough to require an appropriation request. An appropriation request determines the amount of cost, time required for implementation and cost savings after the project is finished. These numbers are then used to calculate some type of pay back period or break even period where the CPFR system starts to generate more income or cost savings than the amount of money spent on the implementation. Without an appropriation request, or something similar, firms will not know if the project met expectations in terms of financial returns.

Other financial measurements that are popular amongst firms that implement CPFR systems include, personnel cost reduction, inventory cost reduction, overhead cost reduction, procurement cost reduction, maintenance cost reduction, etc. Strategic goals are a little less tangible than economic and financial goals but are no less real. Many firms implement CPFR systems to achieve strategic goals such as market share increases or developing new markets. These firms realize that a successful CPFR implementation can provide not only cost reductions and profit margin increases but also improved customer service levels, increased quality levels, cycle time reductions, reduced research and development time, etc. These strategic initiatives, although sometimes hard to tangibly define, will increase the growth and performance of a company.

Managers need to investigate and make known to all employees the goals of the organization during and after the CPFR implementation. This knowledge can help
employees define their firm’s new business processes to maximize the company’s goals. Goal setting may also increase the chance of CPFR success by showing employees what the company is working towards with this investment.

The easiest way to show that the CPFR initiative was correct is to provide the organization with proof of financial improvements (profit) and/or strategic improvements (market share). Thus, the use of the same performance measures before and after the implementation can help insure that proper credit is applied to the CPFR systems.

Another reason why before and after performance metrics are so strongly thought of may be the reliance of performance measures both corporate boards of directors and the business investment community place upon financial measurement systems. The emphasis on performance metrics provides directors and investors information that can be used to benchmark a firm against competitors. If the board recognizes an improvement in performance of the firm, then they are more likely to give approval for further funding of initiatives. If investors recognize an improvement in performance then they are more likely to increase their investment in the firm. The data in this study showed that increases in economic, financial and strategic benefits, measured before and after an CPFR implementation, are one of the best indicators of an CPFR systems implementation success.

5.4.3. Environmental Uncertainty and CPFR Implementation

As environmental uncertainty appears to be a fundamental problem for any type of organization (Thompson, 1967), it is included as an important driving force of CPFR implementation. The uncertainty that plagues supply chains can be attributed to three different sources: supplier uncertainty, arising from on-time performance, average
lateness and degree of inconsistency, manufacturing uncertainty, arising from process performance, machine breakdown, supply chain performance, etc., and customer/demand uncertainty, arising from forecasting errors, irregular orders, etc. (Davis, 1993). The extant supplier development literature further proposes that increased competition in the marketplace and the increased pace of technological innovation are two primary factors driving companies' needs for world-class suppliers and for supplier development (Hahn, Watts and Kim, 1990). Although there are multiple forms of uncertainties plaguing the supply chain, in this study we include uncertainty in the forms of supply, demand and technology. When demand in the market fluctuates, instability will occur within the firm and eventually the entire supply chain (McClelland and Marucheck, 1986). The result is a combination of less than ideal customer service, excess capacities at various stages, excess inventory, waste, and therefore, a higher than necessary total cost of supply (Fisher et al., 1994; McGuffog and Wadsley, 1999). Research on environmental uncertainty and governance form shows that even the modest levels of supply uncertainty will entice firms to integrate vertically (Helfat and Teece, 1987). Therefore, we hypothesis that environmental uncertainties (demand/supply, technical and product volatility costs) will have a negative effect on the CPFR implementation. Uncertainties in the form of supply, demand and technology were included in this study. All the uncertainty constructs were found to have acceptable reliability level. This study recognizes that stabilizing the environment will require excellent coordination between the collaborative partners on both the supply and customer side. Therefore, the impact of supply uncertainty on CPFR implementations was studied using another multiple regression model. Less environmental uncertainty was hypothesized to increase the
positive effect of successful CPFR implementations. Supply uncertainty was found to have a significant positive impact on strategic purchasing and supplier relationship. This result shows that the strategic nature of purchasing leads to increased coordination needed between the collaborative partners. It also provides empirical support to the theory that under conditions of uncertainty, supply chain members will engage in collaborative action in order to stabilize their environment (Ouchi, 1980; Pfeffer & Salancik, 1978; St. John & Heriot, 1993; Zenger and Hesterly, 1997). The significant positive effect on information technology shows that to counteract the potentially detrimental effects of uncertainty, firms are more likely to incorporate sophisticated inter-organizational information systems that will improve coordination between the partners and sharing of information across boundaries. Based on these conclusions, it is recommended that the best solution under conditions of uncertainty is not to incorporate multiple sourcing strategies. Rather, firms should strive to achieve strategic, long-term relationship with their key suppliers and consider them as an partners which are an extension of their company. Also, to counteract the problems due to uncertainty, appropriate information technology can be utilized to coordinate the supply activities within as well as outside the organization.

From Table 5.5c it is evident that the regression model is statistically significant at 99.9% confidence interval. The adjusted $R^2$ value for this model is 0.656. In general, these numbers demonstrate that the hypothesized model fits the data. The individual parameter estimates show that all factors but product cost volatility have a significant effect on the dependent variable. The overall model was significant with an F-value of 18.93. Individual factors were tested by the t-test. Individual t-values are all greater than
2.576 (significant at 0.01 level). In addition, product cost volatility was not significant at all (t-value = -0.027). Multicollinearity was tested using the variance inflation factor (VIF) and is not a problem. The individual parameter estimates show the factors that have a significant effect on the dependent variable.

The third and final multiple regression equation is as follows: CFPR implementation = 3.798 + 0.208 Demand/Supply Uncertainties + 0.109 Technical Uncertainty - 0.003 Product Costs Volatility.

5.4.3.1 Results and Managerial Implications of Hypothesis 3

It was hypothesized that less uncertainty (demand/supply and technical) has a positive effect on successful CPFR implementations. This was supported by the underlying data. Table 5.3 presents the mean and standard deviation values for supply base reduction. From this table it is evident that less demand/supply uncertainty and less technical uncertainty (mean = 4.22; S.D. = 1.386, mean = 4.51; S.D. = 1.453, respectively) has been given greater importance by the respondent firms. The low standard deviation for this theoretical construct further demonstrates the uniformity of the opinion across the respondents. However, this result shows that less uncertainty (demand/supply and technical) has is mostly considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficients for this relationship (standardized coefficient = 0.208; t-value = 3.615, standardized coefficient = 0.109; t-value = 3.494, respectively) indicates that less uncertainty (demand/supply and technical) has a significant positive impact on CPFR implementations. The above results demonstrate that partnership assets and successful CPFR implementations work as one. Partnership assets are the degree to which an asset can be put to alternative uses. Assets
used in the relationship that cannot easily be used outside the partnership, are deemed assets specific to the partnership. If the partnership already has a high degree of assets used specifically for the partnership, then one expects a high level of satisfaction with the partnership, since these assets cannot be easily put to other uses. Therefore, this study proves that less demand/supply uncertainty and technical uncertainty environmental uncertainty leads to more successful CPFR implementations.

5.4.3.2 Results and Managerial Implications of Hypothesis 7

It was hypothesized that lower volatility of product costs has a positive effect on successful CPFR implementation. This was not supported by the underlying data. Table 5.3 presents the mean and standard deviation values for product cost volatility. From this table it is evident that product cost volatility (mean = 3.39; S.D. = 1.567) has not been given a significant importance by the respondent firms. The high standard deviation for this theoretical construct further demonstrates the non-uniformity of the opinion across the respondents. This result shows that product cost volatility are not considered crucial by the participating firms. This hypothesis was significant at 99% confidence. The standardized coefficients for this relationship (standardized coefficient = -0.003; t-value = -0.027) indicates that product cost volatility do not have a significant positive impact on CPFR implementations. The above results demonstrate that product cost volatility and successful CPFR implementations are correlated to each other.

5.5. Conclusion

This chapter presented the results of measurement instrument development as well the various research models of CPFR implementation. The results of the measurement instrument process shows that the constructs developed in this study are
reliable and valid. All other research questions were evaluated using the exploratory factor analysis. Based on multiple regression analysis, the research models were found to fit the data well. These results provide support to the importance of the factors in the successful implementation of CPFR. Chapter V focuses on providing more detailed discussion on the results as well as their managerial significance. This chapter presented a detailed discussion of the results from this study. The results were found to be consistent with previous research on these theoretical constructs. A closer look at the results signify the importance of the various CPFR implementation factors and their interrelationships. Being an impediment, environmental uncertainty was found to have a negative impact on successful CPFR implementation. It is also evident that the organizational driving forces such as trust, top management support and managerial decision making can help in the successful management of CPFR implementations. Superior supply chain operational characteristics and strategic collaborative relationships were found to have a positive impact on successful CPFR implementation, thereby leading to a win-win situation for the collaborative partners.
CHAPTER VI

Summary and Conclusions

This chapter presents an overview of the research, a summary of the research findings, contributions of the research and the limitations of the research and future research direction.

6.1 Overview of the Research

Collaborative planning represents one of the most significant paradigm shifts of modern supply chain management which recognizes that individual businesses no longer compete as solely autonomous entities, but rather as collaborative partners (Lambert and Cooper, 2000). Supply chain management, along with CPFR, in operations management, however, is still in its embryonic stage (Handfield and McNulty, 1998). The scientific development of a coherent supply chain management discipline requires that advances be made in the development of measurement instruments as well as theoretical models to improve our understanding of supply chain phenomena (Croom et al., 2000). However, the main focus of this dissertation was to research and investigate the implementation constructs in the early stages of CPFR. Thus, the research agenda in supply chain management must not be driven by industrial interest alone (New, 1997). Research about supply chain management as a conceptual
artifact of the modern world is also quintessential. Indeed, it is necessary to understand the broader context before robust prescription is possible.

Any scientific research discipline can be viewed in terms of two interrelated streams: substantive and construct validation. While the former reflects the relationships among theoretical constructs inferred through empirically observed relationships, the latter involves the relationships between the results obtained from empirical measures and the theoretical constructs that the measures are purported to access (Schwab, 1980). Since "all theories in science concerning statements mainly about constructs rather than observable variables" (Nunnally, 1978), the process of construct conceptualization is at least as important as the examination of substantive relationships (Venkatraman, 1989).

Nevertheless, while research on various CPFR relationships has been growing, there has not been a comprehensive approach to construct development and measurement. This could be largely attributed to the fact that efforts are to underway to develop CPFR constructs and measures.

This study, through a simple analysis has arrived at an initial set of constructs and operational measures with a strong support of their measurement properties (i.e., reliable and valid) by recognizing the interdisciplinary nature of CPFR. These implementation issues could be used by researchers either directly in their research contexts or as a basis for refinement and extension in the best tradition of cumulative theory building and testing and to ultimately create a coherent theory of collaborative planning.

This study has three main purposes identified through an exhaustive literature review, a focus group session and four case studies.
1. To identify through case study research, literature review and expert interviews elements and procedures currently utilized in CPFR implementations to allow for investigation of the issues surrounding the implementation process.

2. To determine and validate the results from CPFR consultants and manufacturing professionals to determine what factors are important to an CPFR implementation.

3. The results from (1) and (2) can be integrated to develop policies and guidelines to aid in the success of future CPFR implementations. These policies and guidelines will be based on the results of the survey respondents.

A cross sectional survey methodology was used to collect data from both manufacturing practitioners and professional consultants. This data was analyzed using exploratory factor analysis, principal components analysis and multiple regression models to determine the results.

6.2 Summary of Results

A preliminary review of means and standard deviation of survey responses showed that the respondents place high importance on driving forces like trust, top management support and managerial decision making. The relationships and organizational factors were considered as very instrumental to the management of the CPFR implementations. Multiple regression models were used to link the essential constructs of successful CPFR implementations. Based on the analysis, all the models were found to fit the data quite well. The model results were found to be consistent with previous research. A detailed look at the results further signify the importance of the various CPFR implementation factors and their interrelationships.
The major findings of this study are summarized below:

1. The data confirmed that CPFR implementations should have a strategic basis with an emphasis in organizational factors, supply chain operational characteristics and less environmental uncertainty.

2. The data confirmed that top management support is required for a successful CPFR implementation.

3. The data confirmed that CPFR implementations need an assessment for information technology and exchange to be performed to increase the likelihood of an CPFR implementation success.

4. The data confirmed that successful CPFR implementations require establishing economic, strategic and financial goals.

5. The data confirmed that successful CPFR implementations that make use of performance metrics before and after an CPFR implementation increases the chances of success.

6. The data confirmed that successful CPFR projects needs top management support and procure the necessary tools, throughout the project, to increase the likelihood of success.

6.3 Research Contributions

The findings of this study are expected to have a significant impact on academicians as well as practitioners. This study will be of great value not only to readers who desire to extend their research avenues into this exciting area, but also to those who have already investigated this topic but in isolation or with limited scope. In its entirety, this study will provide a better understanding of the elements of collaborative planning
and their effect on the collaborative partner performance. Specifically, this study is expected to make contributions of great interest to operations research/management professionals interested in CPFR including:

1. The main contribution of this research is apparent in the development of policies and guidelines that can help manufacturing professionals understand the issues surrounding CPFR Implementations.

2. This research will provide academics with a foundational tool to use when building theory about CPFR systems. The research design and findings of this study provide many avenues for further research investigations.

3. This research helps manufacturing professionals resolve the myth that CPFR system implementations are strictly a technology implementation.

4. This study reaffirms the use of case studies and focus groups as legitimate avenues for pursuing academic research.

5. This study is one of the few efforts to combine case studies, focus group results and literature reviews to develop hypotheses.

6. Providing the CPFR managers with an insight into the most conducive practices that their counterparts, in general, consider as important.

7. Presenting the CPFR managers with a better picture of the scope of both problems and opportunities associated with CPFR system implementations.

8. Verifying the importance of supply chain initiatives along with their environmental uncertainty and its impact on the management of CPFR implementations.
9. Providing a better understanding of the relationship between organizational factors, supply chain operational characteristics and environmental uncertainty.

10. Studying the importance of structure in collaborative partnerships and CPFR implementation performance.

11. Providing a better understanding of the management of collaborative planning partnerships by facilitating unification of the domain of theoretical knowledge.

12. Presenting empirically validated theoretical constructs to help researchers to evaluate the various success formulae for the management of collaborative partnerships.

13. Providing a study that will offer a well-grounded and robust basis for theoretical development of alternative models, thereby allowing researchers to test the validity of and relationships among of various collaborative initiatives along with their impact on CPFR performance.

14. Ultimately, helping to create a coherent theory of CPFR performance and management.

6.4 Limitations and Future Research Directions

This study was limited to four case studies which may not be representative of all industries. Further, the focus group had a limited number of participants who may not have had experience in all industries or all processes with respect to CPFR.

Another limitation is wide range of the size of the firms responding. Small manufacturers may have different problems than large manufacturers.

This analysis gives the general understanding and trend of CPFR implementations. It is useful as a guideline and structure for CPFR implementations but
should be taken in the context of, and relative to, all the responses and potential shortcomings. These results should be accepted as indicative rather than conclusive. The appropriateness to generalize any of these findings varies on each subject and for each project. Therefore, it is dependent on the judgment of the reader and specific settings of the firm as to the appropriateness of generalization.

This study has identified a wide range of factors that is essential for the successful CPFR implementations. Due to this very fact, it was not able to represent any theoretical construct to the fullest extent [i.e., with lots of indicators]. So, future study can be directed to focus on narrower areas of concern and perform extensive analysis to validate the results presented in this study.

Another limitation of this research is related to the sample population. Having drawn from a list of KMPG and Ernst & Young as a convenience study, the results of this research are generalizable only to the population of the firms represented by the KMPG and Ernst & Young databases. Though the final sample in this study spanned a wider range of firms based on demographics such as the number of employees and annual sales, future research endeavors should attempt to include a mixed population of respondents from multiple sources so as to extend the generalizability of the results.

Due to the inclusion of numerous manufacturing-oriented factors, the sample firms were heavily oriented towards manufacturing firms. Therefore, future research should also include non-manufacturing firms in the sample to validate the relationships illustrated in this research. Also, cross-country samples should be evaluated to study the difference in management and culture.
REFERENCES


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APPENDIX
March 12, 2006

Mr. John Smith  
Vice President  
Smith, Inc.  
222 Supply Chain Way  
Cleveland, OH 44115  

Dear Mr. Smith:

Please assist us in our research project by taking 5-10 minutes to complete the enclosed survey. Our goal is to better understand Collaborative Planning Forecasting & Replenishment (CPFR).

The successful implementation of Collaborative Planning Forecasting & Replenishment (CPFR) requires real-world examples of implementation expectations, successes and failures. This doctoral dissertation focuses real-world practices in order to validate the theory. Therefore, I am collecting extensive empirical data. Your help in providing this information will be of great importance to this study.

It is important to assess the impact of CPFR and your response can help us better understand this issue. If you agree to participate in this study, please complete the survey and return it using the enclosed prepaid business reply envelope, fax the completed survey to Robert Stoll at 216-241-0105 or email it to robertgstoll@yahoo.com.

Your responses will be completely anonymous and confidential. There are no numbers on the survey that can be used to identify you or your firm. Company-specific information will be used only for an aggregate description of the firms that respond. If you have any questions about your rights as a research subject, you may contact the Cleveland State University's Institutional Review Board at 216-687-3630.

We would be happy to share results of this research with you upon completion of the project. If interested, please check the box in the questionnaire and I will be happy to forward a copy of the report.

Thank you for your willingness to contribute to our understanding of this important topic.

Sincerely,

[Signature]

Robert G. Stoll
Cleveland State University
Collaborative Planning Forecasting & Replenishment (CPFR) Implementation Survey

CPFR is a relatively new type of Supply Chain Management initiative that formalizes the processes used between two trading partners to agree upon a joint plan and forecast, monitor success through replenishment, and recognize and respond to any exceptions. In a broader sense, CPFR is about people, process, and technology; including evolution, adaptive cultures, standards, metrics, change management, and education.

If you would like a copy of the summary report please print your name and address below:

Name: 
Address: 

OR  Email:

Have you ever participated in any way in a CPFR implementation?  
☐ If yes, please fill out the survey based upon your experience.  
☐ If no, thank you for your time.

Instructions: Your initial response to agreement or disagreement to each of the statements provided below is requested. Please check the indicator which best describes your business environment. Every CPFR partner related indicator refers to the top one or two key suppliers. Key CPFR partners can be selected based on dollar amount and/or criticality of materials purchased.

1 - Strongly Disagree  4 - Neither Agree nor Disagree  7 - Strongly Agree

Trust
1. We maintain close relationship with a limited pool of suppliers.  
2. Our CPFR partner is not always honest with us.  
3. We trust our CPFR partner keeps our best interests in mind.  
4. We find it necessary to be cautious with our CPFR partner.  
5. Our CPFR partner engages in ethical business practices.  
6. This CPFR partner is trustworthy.  
7. CPFR partners have a strong sense of loyalty to us.  
8. We treat our CPFR partners and their products with respect.

Top Management Support
1. Top management is supportive to our efforts to implement CPFR.  
2. Top management considers collaboration to be a vital part of our corporate strategy.  
3. The CPFR project manager has high visibility within top management.  
4. Top management emphasizes the collaborative function’s strategic role.  
5. Top management supports the need for inter-organizational information systems.  
6. Top management of my firm is aware of the benefits of CPFR.  
7. Top management is willing to implement CPFR projects.

Managerial decision-making
1. Upper-level management makes most firm-related decisions  
2. An understanding of underlying costs is only evident at relatively high management levels.  
3. Those managers closer to the point of sale (middle and lower level management) makes most firm-related decisions.  
4. We have few management levels in our relationship with suppliers.  
5. The decision making process in our organization is decentralized.
### Sharing of risks and rewards

1. We give a fair profit share to key suppliers.
2. The bottom line is the most important factor in our firm.
3. We share sensitive cost savings (financial, production, design, research, and/or competition) with our suppliers.
4. Suppliers are provided with profit incentives for certain achievements.
5. We exchange performance feedback.

### Demand/Supply Uncertainties

1. Our master production schedule has a high percentage of variation in demand.
2. Our demand fluctuates drastically from week to week.
3. Our supply requirements vary drastically from week to week.
4. We keep weeks of inventory of the critical material to meet the changing demand.
5. The volume and/or composition of demand are difficult to predict.
6. We have extensive inspection of incoming critical materials from suppliers.
7. We have a high rejection rate of incoming critical materials from suppliers.
8. The suppliers consistently meet our requirements.
9. The suppliers produce materials with consistent quality.

### Market orientation

1. Our firm has a substantial market share.
2. There exists large barriers to entry in our market.
3. CPFR has increased our market share.
4. Strategic positioning is enhanced by locking supply-chain partners into CPFR agreements.
5. CPFR limits supplier-switching by retailers and enhances relationships via improved inventory replenishment.
6. CPFR has enhanced our market share.
7. CPFR has enhanced customer satisfaction of our firm.

### Performance metrics - economic, financial and strategic goals

1. CPFR has reduced waste in our organization.
2. Our CPFR project has met certain economic, financial and strategic goals.
3. Our firm has justified our CPFR project using economic and other strategic performance measures.
4. A strategic justification before the CPFR project was performed.
5. Our organization has achieved a high level of CPFR service effectiveness.
6. CPFR has established more satisfied supply-chains and created barriers to competitors.
7. A financial justification before the CPFR project was performed.

### Interdependence

1. The relationship we have with key suppliers is essentially evergreen.
2. We expect our relationship with key suppliers to last a long time.
3. We work with key suppliers to improve their quality in the long run.
4. The suppliers see our relationship as a long-term alliance.
5. We view our suppliers as an extension of our company.

### Extendedness

1. We expect our relationship with our CPFR partner to continue for a long time.
2. We expect our relationship with our CPFR partner to strengthen over time.
3. Our CPFR partner relationship refers to an ongoing relationship.
4. Our CPFR partner relationship is a long-term open-ended relationship.
### Supply base reduction
1. We rely on a small number of high quality suppliers.  
2. We rely on few reliable suppliers.  
3. We continue to reduce our supplier base for critical components.  
4. We maintain a single or dual-sourcing policy for our critical components.  
5. We maintain close relationship with a limited pool of suppliers.

### Competitive intensity
1. Our strategy cannot be described as the one to offer products with the lowest price.  
2. Our strategy is based on quality performance rather than price.  
3. We place greater emphasis on innovation than price.  
4. We place greater emphasis on launching new products quickly.  
5. We place greater emphasis on customer service than price.  
6. Our strategy places importance on delivering products with high performance.  
7. Our strategy places importance on reducing lead-times.

### Communication (with CPFR partners)
1. We coordinate joint planning committees with our suppliers.  
2. We promote task force teams with our suppliers.  
3. We have frequent face-to-face planning/communication.  
4. We use supplier involved ad hoc teams based on our strategic objectives.  
5. We share ideas and information with our supplier.  
6. We communicated before and after CPFR performance results to our partner.

### Technical Uncertainty
1. Our industry is characterized by rapidly changing technology.  
2. If we don't keep up with changes in technology, it will be difficult for us to remain competitive.  
3. The rate of process obsolescence is high in our industry.  
4. The production technology changes frequently and sufficiently.

### Purchasing
1. Purchasing is included in the firm's strategic planning process.  
2. Purchasing professionals have a good knowledge of the firm's strategic goals.  
3. The purchasing function has a formerly written long-range plan.  
4. Purchasing performance is measured in terms of its contributions to the firm's success.  
5. Purchasing professionals' development focuses on elements of competitive strategy.  
6. Purchasing is considered to be a vital part of our corporate strategy.  
7. The chief purchasing officer has high visibility within top management.  
8. Top management emphasizes the purchasing function's strategic role.

### Product costs volatility
1. Our major raw material costs are very volatile.  
2. Our labor costs are very volatile.  
3. Our distribution costs are very volatile.  
4. Our firm has problems maintaining expected margins.  
5. Our firm has problems maintaining expected revenues.

### Information Exchange & Technology
1. There are direct computer-to-computer links with our CPFR partner.  
2. CPFR coordination is achieved using electronic links.  
3. We use information technology to enable joint transaction processing.  
4. We have electronic capabilities with our CPFR partner.  
5. Our electronic capabilities with our CPFR partner provide accurate information.
6. We use CPFR systems to track inventory.

A) Based upon your experience, what were the results of your CPFR Implementation(s)?

<table>
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<tr>
<th><strong>Operational Performance</strong></th>
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<td>Reduced manufacturing lead times</td>
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<td>Reduced time to market for new products</td>
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<td>Lower lead time to customers</td>
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<td>Reduced set up times</td>
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<td>Reduced engineering design times</td>
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<td>Reduced Inventory</td>
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<td>Improved cash-to-cash cycle</td>
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<td>Decreased logistics costs</td>
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<td>Personnel reduction</td>
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<td>Decreased labor costs</td>
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<td>Faster financial close and feedback of information</td>
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<td>Greater Inventory turns</td>
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<td>Increased economic position</td>
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<th><strong>Project Performance</strong></th>
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<tbody>
<tr>
<td>Functionality of CPFR supports our growth</td>
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<td>Project completed on time</td>
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<td>Project completed within budget</td>
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<td>Has your project been completed?</td>
<td>☐ Yes ☐ No</td>
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B) For those respondents who are business practitioners please fill out this section on company profiles. Consultants, go to section C.

- How many years has this firm been in operation? ☐ 0-5 ☐ 6-15 ☐ 16-30 ☐ Over 30
- What organization type best describes your firm? ☐ Private ☐ Public ☐ Joint venture ☐ Other
- What types of products are produced? ☐ Components ☐ Sub-assemblies ☐ End products ☐ Other
- What is the main market for your products? ☐ Consumer ☐ Commercial ☐ Industrial ☐ Military ☐ Government ☐ Retail ☐ Transportation ☐ Wholesaler ☐ Other
- How many CPFR systems has your firm implemented? ☐ 1 ☐ 2 ☐ 3 or more

C) You are a:

☐ Consultant at the partner, director or executive level
☐ Consultant at the Management, senior consultant or consultant level
☐ Manufacturing/Business executive (CEO, CFO, President, Vice President, Director)
☐ Manufacturing/Business middle manager, supervisor, analyst, scheduler, etc.
☐ Other ________________

**Firm size: What is the annual sales volume of your firm?**

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<thead>
<tr>
<th>☐</th>
<th>$10M or less</th>
<th>☐</th>
<th>$50M-$100M</th>
<th>☐</th>
<th>$500-$1000M</th>
<th>☐</th>
<th>$5B-$20B</th>
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<tbody>
<tr>
<td>☐</td>
<td>$10M-$50M</td>
<td>☐</td>
<td>$100M-$500M</td>
<td>☐</td>
<td>$1B-$5B</td>
<td>☐</td>
<td>Over $20B</td>
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</table>

**Number of employees:**

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<tr>
<th>☐</th>
<th>Less than 25</th>
<th>☐</th>
<th>101 to 250</th>
<th>☐</th>
<th>501 to 1000</th>
<th>☐</th>
<th>Over 1000</th>
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<tr>
<td>☐</td>
<td>25 to 100</td>
<td>☐</td>
<td>251 to 500</td>
<td>☐</td>
<td>Over 1000</td>
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</tbody>
</table>

I am affiliated with:

☐ Institute for Supply Management (ISM) - formerly the National Association of Purchasing Management (NAPM)
☐ The Association for Operations Management - formerly American Production and Inventory Control Society (APICS)
☐ Council of Supply Chain Management Professionals (CSCMP) - formerly the Council of Logistics Management (CLM)
☐ Other, please specify: ______________________________

Thank you very much for your cooperation and help.
<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Application</th>
<th>Literature Support</th>
</tr>
</thead>
</table>
| **Hypothesis 1**: Communication has a positive effect on successful CPFR implementation. | Communication integrates the operations of the two firms, smoothing the disturbances from expected and unexpected environmental factors. Specifically, planning focuses on the process by which the parties will continue the relationship. Therefore, one can assume that the general joint planning process for the CPFR implementation would lead to greater partnership satisfaction and future expectation of partnership satisfaction. | Aguillar (1992)  
Ammer (1989)  
Carlisle and Parker (1989)  
Carr and Smeltzer (1997, 1999)  
Carter and Narasimhan (1996)  
Elram and Carr (1994)  
Fearn (1989)  
Freedman and Cavinato (1990)  
Fung (1999)  
Gadde and Hakansson (1993)  
Hidi and John (1990)  
Keough (1994)  
Krause (1999)  
Krause et al. (2001)  
Lamming (1993)  
Landeros and Monezka (1989)  
Morris and Calantone (1991)  
Pearson and Gritzner cher (1990)  
Pearson et al. (1996)  
Reck and Long (1988)  
Shin et al. (2000)  
Speckman and Hill (1980)  
Speelman et al. (1994)  
Watts et al. (1992)  
Young and Varble (1997) |
| **Hypothesis 2**: Sharing benefits and burdens has a positive effect on successful CPFR implementation. | Sharing of rewards and risks refers to the willingness of both parties to accept short-term hardships with the expectation that the other party will do the same. Specifically, it means acceptance of short-term risks in expectation of sharing future rewards and risks. For example, firms can reduce barriers to market entry by sharing risks with a partner; in return both firms will share in future benefits derived from entering the market. Thus, one can assume that this dimension will increase partnership satisfaction. | Contractor and Lorange (1988)  
Dyer (2000)  
Dyer and Singh (1998)  
Hines (1994)  
Johnston and Lawrence (1990)  
Kanter (1994)  
Macbeth and Ferguson (1994)  
Moberg et al. (2003)  
Nielson (1988)  
Speckman et al. (1998) |
| **Hypothesis 3**: Partnership assets have a positive effect on successful CPFR implementation. | Partnership assets are the degree to which an asset can be put to alternative uses. Assets used in the relationship that cannot easily be used outside the partnership, are deemed assets specific to the partnership. If the partnership already has a high degree of assets used specifically for the partnership, then one expects a high level of satisfaction with the partnership, since these assets cannot be easily put to other uses. | Christopher (1992)  
Helper (1991)  
Helper and Sako (1995)  
Lamming (1993)  
Nishiguchi (1994)  
Slack (1991)  
Womack et al. (1990) |
| **Hypothesis 4**: Interdependence has a positive effect on successful CPFR implementation. | As firms join forces to achieve mutually beneficial goals, they acknowledge that each is dependent on the other. Interdependence results from a relationship in which both firms perceive mutual benefits from interacting and in which any loss of autonomy will be equitably compensated through the expected gains. Thus, the willingness to give up autonomy or control for the expectation of future gains is expected to contribute to partnership satisfaction. | Armistead and Mapes (1993)  
Ballou et al. (2000)  
Berry et al. (1994)  
Bowersox (1997)  
Bowersox and Closs (1996)  
Bowersox et al. (1988)  
Busch (1988)  
Christopher (1994)  
Cooper et al. (1997b)  
Dolan (1987)  
Drew and Smith (1995)  
Fox (1991, 1992)  
Greis and Kasarda (1997)  
Oustin et al. (1995) |
<table>
<thead>
<tr>
<th>Hypothesis 5: Operational information exchange has a positive effect on successful CPFR implementation.</th>
<th>Operational information exchange refers to systems designed to provide timely, accurate, and efficient information exchange. CPFR is a system capable of accomplishing this. Therefore, one would expect firms to invest the capital and time in operational information systems if they are satisfied with the partnership.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 6: Extendedness has a positive effect on successful CPFR implementation.</td>
<td>Extendedness in a partnering relationship refers to an ongoing relationship with no sharp beginning and no clear endpoint, a long-term open-ended relationship. This dimension is conducive to partnership satisfaction.</td>
</tr>
<tr>
<td>Hypothesis 7: Lower volatility of product costs has a positive effect on successful CPFR implementation.</td>
<td>The term &quot;efficiency&quot; is generally associated with cost reduction (Robinson, 1991). Successful cost reduction requires clear understanding and precise definition of all underlying costs including inputs and components, labor, and distribution. The task is usually complicated by the fact that many costs are volatile. Product costs, and therefore prices, are often pre-established, making volatile costs problematic in maintaining margins and revenues. Given that supply-chain members often lock in prices for several months, volatile input and production costs can lead to inaccurate price quotes. This affects both CPFR cost effectiveness and service effectiveness, because one of the partners may be less than satisfied if products arrive at prices that are higher than expected.</td>
</tr>
<tr>
<td>Hypothesis 8: Greater competitive intensity of the market has a positive effect on successful CPFR implementation.</td>
<td>According to transaction cost analysis, external uncertainty influences contractual arrangements between organizations. External uncertainty often takes the form of market competitiveness, where changing competitive offerings in the marketplace force firms to react to volatile pressures. This sort of uncertainty has been shown to influence firms to internalize transactions and decision making to absorb the volatility of markets. The case studies show that external uncertainty allows negative information asymmetries to develop and provides the opportunity for outside forces to behave opportunistically. High market competitiveness increases the need for quick decisions, dictating a fluid, and simple information exchange.</td>
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<tr>
<td>Hypothesis 10: Greater profitability orientation of a firm has a positive effect on successful CPFR implementation.</td>
<td>Firms with a profit-oriented strategy are more concerned with bottom-line issues and short-term profitability than market-oriented firms. Economic goals are considered paramount. The profit versus market strategic orientation can be seen as conflicting as well as complementary and subject to hierarchical considerations regarding level of importance (increased market share brings increased profits, yet to increase market share the firm may have to experience losses in the short-term by undercutting competitive price offers). Much of the conflicting nature in strategic perspectives may be attributed to temporal issues. From the supply-chain perspective, short-term strategies are not easily synthesized with long-term objectives. Organizations involved in CPFR are interested in the long-term survival of the firm, which in turn is reliant on the ability of the organization to adapt to a variety of environmental pressures and constraints. Preliminary interviews with managers indicated that firms often have specific profitability-related strategies. It is conjectured that these firms will view CPFR as a means by which to reduce costs and increase margins. This orientation will enhance the overall cost effectiveness of a CPFR program.</td>
</tr>
<tr>
<td>Hypothesis 11: More decentralized the managerial decision making in the firm, has a positive effect on successful CPFR implementation.</td>
<td>Decision-making centralization is defined as the degree to which upper-level management makes firm-related decisions versus those managers closer to the point of sale. Recent studies have argued that a centralized decision making structure within the</td>
</tr>
<tr>
<td>Hypothesis 12: Firms that have top management support of their CPFR implementations have a greater chance of success of CPFR implementation.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Given that CPFRs require substantial financial and managerial resources, significant managerial commitment to the program is required for success. Since CPFRs are relatively new within managerial practice with no proven track record, commitment by the firm becomes even more critical to realization of program goals. Furthermore, managerial commitment is important to programs in which information sharing between channel members is a key component. Managerial commitment is seen as the degree to which management dedicates manpower and other resources to its CPFR program, as well as the advanced planning, which takes place within the firm for the system. The more managerial commitment to the program, the better is the CPFR's overall effectiveness in terms of cost.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypothesis 13: Greater cost effectiveness of the CPFR program, the greater the economic performance of the firm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Similar to strategic orientation, performance should be viewed in two distinct manners: (1) strategic, where market share, creating barriers to entry, and meeting customer demands serve as performance measures; and (2) economic, which addresses the profit, ROI, and sales volume goals. Performance is defined as the extent to which a firm's economic and strategic objectives are achieved with respect to their activity in the market. As previously discussed, two theoretical foundations underlie the implementation of CPFR programs, that of (1) cost reduction and of (2) service to supply-chain partners. Thus, the investigation of the relationships between these two effectiveness measures and the different types of firm performance is a key point of this study. Such a distinction will provide greater understanding of the outcomes of CPFR effectiveness, in that firms that achieve one CPFR effectiveness measure may benefit from either (1) economic performance, (2) strategic performance, or (3) a combination of the two.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Author and Year</th>
<th>Author and Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hahn et al. (1990)</td>
<td>Buri (1978)</td>
</tr>
<tr>
<td>Helfert and Vith (1999)</td>
<td>Hahn et al. (1990)</td>
</tr>
</tbody>
</table>
Hypothesis 14: Supply base reduction has a positive effect on successful CPFR implementations.

Many researchers have shown that reduced supplier base plays a major role in the effective long-term relationship. Hahn et al. (1986) note that multiple sourcing prevents suppliers from achieving the economies of scale based on order volume and learning curve effect. Also, the multiple supplier system can be more expensive than a single supplier system (Treleven, 1987). Dowlatshahi (2000) further points out that a close and workable relationship is only achievable with a limited number of suppliers. Extent research has also pointed out the multiple benefits of supplier base reduction including long-term relationship, improved communication, logistics improvement, supplier involvement, etc. (Deming, 1986; Dowst, 1985; Newman, 1988b; Morgan & Zimmerman, 1990; Helper, 1991; Han, Wilson, & Dant, 1993; Kekre et al., 1995; Dobler & Burt, 1996; De Toni & Nassimbeni, 1999).

Bozarth et al. (1998)
Burt (1989)
De Toni and Nassimbeni (1999)
Dyer (2000)
Hahn et al. (1986)
Handfield (1993)
Helper (1991)
Kekre et al. (1995)
Mohr and Speckman (1994)
Manoocheri (1984)
Morgan (1987)
Newman (1988a b)
Newman (1989)
Offodile and Arrington (1992)
Pilling and Zhang (1992)
Raia (1988, 1993)
Richardson (1993)
Russell and Krajewski (1992)
Shin et al. (2000)
Speckman (1988)
St John and Heriot (1993)
Treleven (1987)

Batt (2003)
Beccerra and Gupta (1999)
Chen and Paulraj (2004)
Dion et al. (1992)
Dyer (1997)
Handfield and Bechtel (2002)
Heck and John (1990)
Hill (1990)
Kumar (1996)
Kwon and Soh (2004)
LaLonde (2002)
Lee and Billington (1992)
Nooteboom et al. (1997)
Speckman et al. (1998)
Zaheer and Venkatraman (1995)
Zaheer et al. (1998)

Hypothesis 15: Trust between the manufacturer and retailer relationship has a positive effect on successful CPFR implementations.

Trust and relationship commitment are essential requirements of successful CPFR implementation, but strong relationships in collaboration are often the exception rather than the norm. Trust and relationship commitment can be weakened when trading partners treat each other poorly and engaged in questionable business practices. If the questionable and unethical business practices continue to occur in relationships among manufacturers and their trading partners, trust and relationship commitment will be difficult to develop and the strong relationships needed to implement CPFR will be impossible to achieve.
<table>
<thead>
<tr>
<th>Type of Business</th>
<th>COMPANY A</th>
<th>COMPANY B</th>
<th>COMPANY C</th>
<th>COMPANY D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Power Tool Manufacturer</td>
<td>Specialty paint and coatings manufacturer</td>
<td>Automotive parts industrial coaters</td>
<td>Electrical Junction Box Manufacturer</td>
</tr>
<tr>
<td>Annual Sales</td>
<td>$4 Billion</td>
<td>$3.5 Billion</td>
<td>$300 Million</td>
<td>$20 Million</td>
</tr>
<tr>
<td>Market Share</td>
<td>25%</td>
<td>15%</td>
<td>65%</td>
<td>7%</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>2300</td>
<td>1300</td>
<td>1100</td>
<td>75</td>
</tr>
<tr>
<td>Estimated CPFR cost</td>
<td>$1.0 Million</td>
<td>$1.2 Million</td>
<td>$250,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>Year of Implementation</td>
<td>2003</td>
<td>2003</td>
<td>2002</td>
<td>2003</td>
</tr>
<tr>
<td>Estimated Implementation time for pilot</td>
<td>6 months</td>
<td>5 months</td>
<td>4 months</td>
<td>3 months</td>
</tr>
<tr>
<td>Current Status of CPFR project</td>
<td>Successful implementation</td>
<td>Marginally Successful</td>
<td>Progressing slowly</td>
<td>Stalled CPFR</td>
</tr>
<tr>
<td></td>
<td>COMPANY A</td>
<td>COMPANY B</td>
<td>COMPANY C</td>
<td>COMPANY D</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------------------------------------------</td>
<td>------------------------------------------------</td>
<td>------------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td><strong>Type of Business</strong></td>
<td>Power tool manufacturer</td>
<td>Specialty paint and coatings manufacturer</td>
<td>Automotive parts industrial coaters</td>
<td>Electrical Junction Box Manufacturer – division of $900 Million industrial manufacturing company.</td>
</tr>
<tr>
<td><strong>Annual Sales</strong></td>
<td>$4 billion</td>
<td>$3.5 Billion</td>
<td>$300 Million</td>
<td>$20 Million</td>
</tr>
<tr>
<td><strong>Market Share</strong></td>
<td>70%</td>
<td>15%</td>
<td>80%</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Primary Markets</strong></td>
<td>Industrial and consumer buyers</td>
<td>Industrial and consumer buyers</td>
<td>Original Equipment manufacturers (OEM's)</td>
<td>Industrial buyers only</td>
</tr>
<tr>
<td><strong>Type of Manufacturing</strong></td>
<td>Assembly line</td>
<td>Batch/repetitive</td>
<td>Continuous</td>
<td>Job-shop</td>
</tr>
<tr>
<td><strong>Number of Employees</strong></td>
<td>87</td>
<td>1,228</td>
<td>1145</td>
<td>106</td>
</tr>
<tr>
<td><strong>Inventory Levels</strong></td>
<td>High finished goods inventory</td>
<td>High finished goods inventory High raw material inventory</td>
<td>Low finished goods inventory and high WIP Inventory compared to their industry</td>
<td>High raw material inventory</td>
</tr>
<tr>
<td><strong>Inventory Turnover Rates</strong></td>
<td>Low compared to industry</td>
<td>Low compared to industry</td>
<td>Slightly below industry</td>
<td>Low compared to industry</td>
</tr>
<tr>
<td><strong>On-time (in full) Delivery Performance</strong></td>
<td>60%</td>
<td>85%</td>
<td>62% - far below the industry average.</td>
<td>76%</td>
</tr>
<tr>
<td><strong>Industry on-time delivery performance</strong></td>
<td>85%</td>
<td>98%</td>
<td>85%</td>
<td>60%</td>
</tr>
<tr>
<td><strong>Impetus for Process Change</strong></td>
<td>Declining profits (40% over a 3 year period)</td>
<td>Declining profits, loss of market share.</td>
<td>Just breaking even in a growing market.</td>
<td>Losing money, struggling with shop loads and coordination of orders through multiple work centers.</td>
</tr>
<tr>
<td><strong>Corporate Stance</strong></td>
<td>Improvement or wholesale management changes</td>
<td>Improvement or sell or close under performing divisions</td>
<td>Improvements or will consider outsourcing</td>
<td>Improvements or closure</td>
</tr>
<tr>
<td><strong>Estimated CPFR cost</strong></td>
<td>$1.0 Million</td>
<td>$5.7 Million</td>
<td>$3.0 Million</td>
<td>$0.7 Million</td>
</tr>
<tr>
<td><strong>Year of CPFR Implementation</strong></td>
<td>2003</td>
<td>2003</td>
<td>2001</td>
<td>2002</td>
</tr>
<tr>
<td><strong>Estimated Implementation time</strong></td>
<td>1 year</td>
<td>2 years</td>
<td>1.5 years</td>
<td>1 year</td>
</tr>
<tr>
<td><strong>Actual Implementation time</strong></td>
<td>2 years</td>
<td>3 years</td>
<td>On-going at 3 years</td>
<td>Abandoned</td>
</tr>
</tbody>
</table>

Table 3: Company CPFR Performance
<table>
<thead>
<tr>
<th>Title</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Consultant Partner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultant Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultant Executive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultant Management</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Consultant Senior Consultant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultant Consultant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing/Business Executive</td>
<td>76</td>
<td>59</td>
</tr>
<tr>
<td>Manufacturing/Business Executive CEO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing/Business Executive CFO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing/Business Executive President</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing/Business Executive Vice President</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing/Business Executive Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing/Business Executive Middle Manager</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Manufacturing/Business Executive Supervisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing/Business Executive Analyst</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing/Business Executive Scheduler</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 4.2
**Company Profile**

<table>
<thead>
<tr>
<th>Firm Type</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>30</td>
<td>23</td>
</tr>
<tr>
<td>Public</td>
<td>78</td>
<td>61</td>
</tr>
<tr>
<td>Other</td>
<td>20</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than 25</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>25 - 100</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>101 - 250</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>251 - 500</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>501 - 1000</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>Over 1000</td>
<td>52</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Sales Volume (In Millions)</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10M or less</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>$10M - $50M</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>$50M - $100M</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>$100M - $500M</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$500M - $1000M</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>$1B - $5B</td>
<td>62</td>
<td>48</td>
</tr>
<tr>
<td>$5B - $20B</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Over $20B</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years in Operation</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>6 - 15</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>16 - 30</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Over 30</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>Number of CPFR systems implemented</td>
<td>Count</td>
<td>Percent</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>85</td>
<td>66</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>3 or more</td>
<td>35</td>
<td>28</td>
</tr>
</tbody>
</table>

*Note.* The total percent may not add to 100% due to rounding.
Table 4.3
Descriptive Statistics (Mean and Standard Deviation)

<table>
<thead>
<tr>
<th>Trust</th>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>5.15</td>
<td>3.93</td>
<td>4.64</td>
<td>4.09</td>
<td>5.38</td>
<td>5.34</td>
<td>4.84</td>
<td>5.42</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.211</td>
<td>1.862</td>
<td>1.362</td>
<td>1.638</td>
<td>0.972</td>
<td>0.864</td>
<td>0.912</td>
<td>1.106</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Top Management Support</th>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>5.13</td>
<td>5.09</td>
<td>4.94</td>
<td>4.84</td>
<td>5.02</td>
<td>4.88</td>
<td>4.82</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.298</td>
<td>1.301</td>
<td>1.195</td>
<td>1.215</td>
<td>1.343</td>
<td>1.434</td>
<td>1.193</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Managerial Decision Making</th>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>5.26</td>
<td>4.02</td>
<td>3.50</td>
<td>4.49</td>
<td>3.71</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.459</td>
<td>1.721</td>
<td>1.380</td>
<td>1.436</td>
<td>1.568</td>
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</table>

<table>
<thead>
<tr>
<th>Sharing of Risks and Rewards</th>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>4.33</td>
<td>5.73</td>
<td>2.91</td>
<td>3.73</td>
<td>4.56</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.137</td>
<td>1.120</td>
<td>1.496</td>
<td>1.581</td>
<td>1.315</td>
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</table>

<table>
<thead>
<tr>
<th>Demand/Supply Uncertainties</th>
<th>Question</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>4.80</td>
<td>4.68</td>
<td>4.31</td>
<td>3.77</td>
<td>4.34</td>
<td>3.50</td>
<td>2.60</td>
<td>5.42</td>
<td>4.57</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.225</td>
<td>1.500</td>
<td>1.515</td>
<td>1.624</td>
<td>1.382</td>
<td>1.511</td>
<td>1.336</td>
<td>1.114</td>
<td>1.265</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Market Orientation</th>
<th>Question</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>4.52</td>
<td>4.89</td>
<td>4.63</td>
<td>4.40</td>
<td>4.45</td>
<td>4.51</td>
<td>4.75</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.665</td>
<td>1.589</td>
<td>0.730</td>
<td>1.052</td>
<td>0.685</td>
<td>0.721</td>
<td>0.832</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Metrics – Economic, Financial and Strategic Goals</th>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>4.88</td>
<td>4.84</td>
<td>4.78</td>
<td>4.72</td>
<td>4.66</td>
<td>4.81</td>
<td>4.59</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>0.717</td>
<td>0.821</td>
<td>0.841</td>
<td>0.947</td>
<td>0.951</td>
<td>0.771</td>
<td>0.864</td>
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</table>
Table 4.3 (continued)
Descriptive Statistics (Mean and Standard Deviation)

<table>
<thead>
<tr>
<th>Interdependence</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1</td>
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<tr>
<td>Mean</td>
<td>4.14</td>
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<td>5.12</td>
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<td>1.048</td>
<td>1.124</td>
<td>1.024</td>
<td>0.885</td>
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<td>Question</td>
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<tr>
<td>Mean</td>
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<tr>
<td>Mean</td>
<td>4.76</td>
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<td>4.31</td>
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<tr>
<td>Std. Deviation</td>
<td>1.155</td>
<td>1.354</td>
<td>0.929</td>
<td>0.810</td>
<td>0.871</td>
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<table>
<thead>
<tr>
<th>Competitive Intensity</th>
<th>1</th>
<th>2</th>
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<th>5</th>
<th>6</th>
<th>7</th>
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<td>2</td>
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<td>4</td>
<td>5</td>
<td>6</td>
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<td>Mean</td>
<td>5.34</td>
<td>5.26</td>
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<td>4.89</td>
<td>4.89</td>
<td>4.73</td>
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<td>1.331</td>
<td>1.382</td>
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<td>1.427</td>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Mean</td>
<td>4.48</td>
<td>4.17</td>
<td>4.27</td>
<td>4.28</td>
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<td>4.22</td>
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<tbody>
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<td>Question</td>
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<td>2</td>
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</tr>
<tr>
<td>Mean</td>
<td>4.36</td>
<td>5.02</td>
<td>4.17</td>
<td>4.48</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>1.738</td>
<td>1.560</td>
<td>1.358</td>
<td>1.157</td>
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<table>
<thead>
<tr>
<th>Purchasing</th>
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<tbody>
<tr>
<td>Question</td>
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<td>2</td>
<td>3</td>
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<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
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<tr>
<td>Mean</td>
<td>5.18</td>
<td>4.99</td>
<td>4.36</td>
<td>4.69</td>
<td>4.48</td>
<td>4.96</td>
<td>4.55</td>
<td>4.56</td>
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<td>Std. Deviation</td>
<td>1.245</td>
<td>1.354</td>
<td>1.520</td>
<td>1.162</td>
<td>1.298</td>
<td>1.160</td>
<td>1.526</td>
<td>1.556</td>
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</table>
Table 4.3 (continued)
*Descriptive Statistics (Mean and Standard Deviation)*

### Product Costs Volatility

<table>
<thead>
<tr>
<th>Question</th>
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<tbody>
<tr>
<td>Mean</td>
<td>4.05</td>
<td>3.08</td>
<td>3.25</td>
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<td>Std. Deviation</td>
<td>1.738</td>
<td>1.434</td>
<td>1.458</td>
<td>1.576</td>
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</table>

### Information Exchange and Technology

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.03</td>
<td>4.47</td>
<td>4.14</td>
<td>4.13</td>
<td>4.16</td>
<td>3.88</td>
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<tr>
<td>Std. Deviation</td>
<td>1.739</td>
<td>1.537</td>
<td>1.606</td>
<td>1.458</td>
<td>1.389</td>
<td>1.480</td>
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### Operational Performance

<table>
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<tr>
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<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.53</td>
<td>4.37</td>
<td>4.59</td>
<td>4.23</td>
<td>4.58</td>
<td>4.31</td>
<td>4.10</td>
<td>4.68</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>0.922</td>
<td>0.868</td>
<td>1.154</td>
<td>0.889</td>
<td>1.302</td>
<td>1.176</td>
<td>1.034</td>
<td>0.980</td>
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</table>

### Economic Performance

<table>
<thead>
<tr>
<th>Question</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.68</td>
<td>4.65</td>
<td>5.10</td>
<td>5.04</td>
<td>4.43</td>
<td>4.54</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>0.606</td>
<td>0.837</td>
<td>0.680</td>
<td>0.680</td>
<td>0.627</td>
<td>0.769</td>
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</table>

### Project Performance

<table>
<thead>
<tr>
<th>Question</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.78</td>
<td>4.17</td>
<td>3.96</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>0.878</td>
<td>1.522</td>
<td>1.449</td>
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</table>

*Note.* The order of indicators follows the survey questionnaire in Table 4.4.
Table 4.4
Reliability and Validity

<table>
<thead>
<tr>
<th>Indicator (Cronbach’s Alpha, Eigen Value)</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trust (α = 0.903, Eigen value = 4.372)</strong></td>
<td></td>
</tr>
<tr>
<td>1. We maintain close relationship with a limited pool of suppliers.</td>
<td>.827</td>
</tr>
<tr>
<td>2. Our CPFR partner is not always honest with us.</td>
<td>.949</td>
</tr>
<tr>
<td>3. We trust our CPFR partner keeps our best interests in mind.</td>
<td>.811</td>
</tr>
<tr>
<td>4. We find it necessary to be cautious with our CPFR partner.</td>
<td>.891</td>
</tr>
<tr>
<td>5. Our CPFR partner engages in ethical business practices.</td>
<td>.836</td>
</tr>
<tr>
<td>6. This CPFR partner is trustworthy.</td>
<td>.840</td>
</tr>
<tr>
<td>7. CPFR partners have a strong sense of loyalty to us.</td>
<td>.743</td>
</tr>
<tr>
<td>8. We treat our CPFR partners and their products with respect.</td>
<td>.809</td>
</tr>
<tr>
<td><strong>Top Management Support (α = 0.947, Eigen value = 5.342)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Top management is supportive to our efforts to implement CPFR.</td>
<td>0.854</td>
</tr>
<tr>
<td>2. Top management considers collaboration to be a vital part of our corporate strategy.</td>
<td>0.928</td>
</tr>
<tr>
<td>3. The CPFR project manager has high visibility within top management.</td>
<td>0.770</td>
</tr>
<tr>
<td>4. Top management emphasizes the collaborative function’s strategic role.</td>
<td>0.805</td>
</tr>
<tr>
<td>5. Top management supports the need for inter-organizational information systems.</td>
<td>0.908</td>
</tr>
<tr>
<td>6. Top management of my firm is aware of the benefits of CPFR.</td>
<td>0.887</td>
</tr>
<tr>
<td>7. Top management is willing to implement CPFR projects.</td>
<td>0.949</td>
</tr>
<tr>
<td><strong>Managerial decision-making (α = 0.904, Eigen value = 2.524)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Upper-level management makes most firm-related decisions</td>
<td>0.918</td>
</tr>
<tr>
<td>2. An understanding of underlying costs is only evident at relatively high management levels.</td>
<td>0.655</td>
</tr>
<tr>
<td>3. Those managers closer to the point of sale (middle and lower level management) makes most firm-related decisions.</td>
<td>0.806</td>
</tr>
<tr>
<td>4. We have few management levels in our relationship with suppliers.</td>
<td>0.953</td>
</tr>
<tr>
<td>5. The decision making process in our organization is decentralized.</td>
<td>0.667</td>
</tr>
<tr>
<td><strong>Sharing of risks and rewards (α = 0.787, Eigen value = 2.034)</strong></td>
<td></td>
</tr>
<tr>
<td>1. We give a fair profit share to key suppliers.</td>
<td>0.846</td>
</tr>
<tr>
<td>2. The bottom line is the most important factor in our firm.</td>
<td>0.528</td>
</tr>
<tr>
<td>3. We share sensitive cost savings (financial, production, design, research, and/or competition) with our suppliers.</td>
<td>0.705</td>
</tr>
<tr>
<td>4. Suppliers are provided with profit incentives for certain achievements.</td>
<td>0.777</td>
</tr>
<tr>
<td>5. We exchange performance feedback.</td>
<td>0.834</td>
</tr>
<tr>
<td><strong>Demand/Supply Uncertainties (α = 0.734, Eigen value = 3.205)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Our master production schedule has a high percentage of variation in demand.</td>
<td>0.725</td>
</tr>
<tr>
<td>2. Our demand fluctuates drastically from week to week.</td>
<td>0.925</td>
</tr>
</tbody>
</table>
3. Our supply requirements vary drastically from week to week. 0.894
4. We keep weeks of inventory of the critical material to meet the changing demand. 0.911
5. The volume and/or composition of demand are difficult to predict. 0.697
6. We have extensive inspection of incoming critical materials from suppliers. 0.804
7. We have a high rejection rate of incoming critical materials from suppliers. 0.914
8. The suppliers consistently meet our requirements. 0.949
9. The suppliers produce materials with consistent quality. 0.965

**Market orientation (α = 0.775, Eigen value = 3.244)**
1. Our firm has a substantial market share. 0.602
2. There exists large barriers to entry in our market. 0.909
3. CPFPR has increased our market share. 0.820
4. Strategic positioning is enhanced by locking supply-chain partners into CPFPR agreements. 0.850
5. CPFPR limits supplier-switching by retailers and enhances relationships via improved inventory replenishment. 0.750
6. CPFPR has enhanced our market share. 0.875
7. CPFPR has enhanced customer satisfaction of our firm. 0.853

**Performance metrics - economic, financial and strategic goals (α = 0.904, Eigen value = 4.474)**
1. CPFPR has reduced waste in our organization. 0.907
2. Our CPFPR project has met certain economic, financial and strategic goals. 0.615
3. Our firm has justified our CPFPR project using economic and other strategic performance measures. 0.562
4. A strategic justification before the CPFPR project was performed. 0.931
5. Our organization has achieved a high level of CPFPR service effectiveness. 0.859
6. CPFPR has established more satisfied supply-chains and created barriers to competitors. 0.791
7. A financial justification before the CPFPR project was performed. 0.941

**Interdependence (α = 0.717, Eigen value = 2.406)**
1. The relationship we have with key suppliers is essentially evergreen. 0.911
2. We expect our relationship with key suppliers to last a long time. 0.841
3. We work with key suppliers to improve their quality in the long run. 0.851
4. The suppliers see our relationship as a long-term alliance. 0.798
5. We view our suppliers as an extension of our company. 0.810

**Extendedness (α = 0.897, Eigen value = 3.062)**
1. We expect our relationship with our CPFPR partner to continue for a long time. 0.895
2. We expect our relationship with our CPFPR partner to strengthen over time. 0.892
3. Our CPFPR partner relationship refers to an ongoing relationship. 0.843
4. Our CPFPR partner relationship is a long-term open-ended relationship. 0.868

**Supply base reduction (α = 0.841, Eigen value = 3.208)**
1. We rely on a small number of high quality suppliers. 0.775
2. We rely on few reliable suppliers. 0.755
3. We continue to reduce our supplier base for critical components. 0.818
4. We maintain a single or dual-sourcing policy for our critical components. 0.866
5. We maintain close relationship with a limited pool of suppliers. 0.786
Competitive Intensity ($\alpha = 0.915$, Eigen value = 4.739)
1. Our strategy cannot be described as the one to offer products with the lowest price. 0.502
2. Our strategy is based on quality performance rather than price. 0.869
3. We place greater emphasis on innovation than price. 0.957
4. We place greater emphasis on launching new products quickly. 0.809
5. We place greater emphasis on customer service than price. 0.882
6. Our strategy places importance on delivering products with high performance. 0.874
7. Our strategy places importance on reducing lead-times. 0.787

Communication (with CPFR partners) ($\alpha = 0.894$, Eigen value = 4.002)
1. We coordinate joint planning committees with our suppliers. 0.887
2. We promote task force teams with our suppliers. 0.778
3. We have frequent face-to-face planning/communication. 0.797
4. We use supplier involved ad hoc teams based on our strategic objectives. 0.899
5. We share ideas and information with our supplier. 0.828
6. We communicated before and after CPFR performance results to our partner. 0.694

Technical Uncertainty ($\alpha = 0.870$, Eigen value = 2.947)
1. Our industry is characterized by rapidly changing technology. 0.849
2. If we don’t keep up with changes in technology, it will be difficult for us to remain competitive. 0.891
3. The rate of process obsolescence is high in our industry. 0.793
4. The production technology changes frequently and sufficiently. 0.896

Purchasing ($\alpha = 0.939$, Eigen value = 2.524)
1. Purchasing is included in the firm’s strategic planning process. 0.839
2. Purchasing professionals have a good knowledge of the firm’s strategic goals. 0.923
3. The purchasing function has a formerly written long-range plan. 0.789
4. Purchasing performance is measured in terms of its contributions to the firm’s success. 0.858
5. Purchasing professionals’ development focuses on elements of competitive strategy. 0.863
6. Purchasing is considered to be a vital part of our corporate strategy. 0.897
7. The chief purchasing officer has high visibility within top management. 0.813
8. Top management emphasizes the purchasing function’s strategic role. 0.777

Product costs volatility ($\alpha = 0.623$, Eigen value = 2.349)
1. Our major raw material costs are very volatile. 0.760
2. Our labor costs are very volatile. 0.942
3. Our distribution costs are very volatile. 0.926
4. Our firm has problems maintaining expected margins. 0.982
5. Our firm has problems maintaining expected revenues. 0.952

Information Exchange & Technology ($\alpha = 0.964$, Eigen value = 5.111)
1. There are direct computer-to-computer links with our CPFR partner. 0.909
2. CPFR coordination is achieved using electronic links. 0.916
3. We use information technology to enable joint transaction processing. 0.974
4. We have electronic capabilities with our CPFR partner. 0.922
5. Our electronic capabilities with our CPFR partner provide accurate information. 0.924
6. We use CPFR systems to track inventory.

Operational Performance ($\alpha = 0.801$, Eigen value = 3.677)
1. Reduced manufacturing lead times
2. Reduced time to market for new products
3. Lower lead time to customers
4. Linked corporate systems
5. Increased market share
6. Reduced set up times
7. Reduced engineering design times
8. Reduced Inventory

Economic Performance ($\alpha = 0.865$, Eigen value = 6.182)
1. Improved cash-to-cash cycle
2. Increased market share
3. Increased profits
4. Improved customer service
5. Decreased logistics costs
6. Decreased procurement costs
7. Personnel reduction
8. Decreased overhead costs
9. Decreased material costs
10. Decreased labor costs
11. Faster financial close and feedback of information
12. Greater Inventory turns
13. Increased economic position

Project Performance ($\alpha = 0.756$, Eigen value = 2.023)
1. Functionality of CPFR supports our growth
2. Project completed on time
3. Project completed within budget

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Table 4.5a
Regression Results

Organizational:

<table>
<thead>
<tr>
<th>Parameter Estimates</th>
<th>Standard β</th>
<th>Standard Error</th>
<th>Variance Inflation Factor</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Constant</td>
<td>3.044</td>
<td>0.464</td>
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<td>6.559</td>
<td>0.000</td>
</tr>
<tr>
<td>Trust</td>
<td>0.169</td>
<td>0.085</td>
<td>1.311</td>
<td>3.344</td>
<td>0.017</td>
</tr>
<tr>
<td>Top Management Support</td>
<td>0.111</td>
<td>0.105</td>
<td>1.248</td>
<td>3.693</td>
<td>0.000</td>
</tr>
<tr>
<td>Managerial decision-making</td>
<td>0.161</td>
<td>0.056</td>
<td>1.273</td>
<td>3.256</td>
<td>0.001</td>
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<tr>
<td>Supply base reduction</td>
<td>0.116</td>
<td>0.090</td>
<td>1.521</td>
<td>3.640</td>
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<td>Purchasing</td>
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<td>0.078</td>
<td>1.212</td>
<td>2.433</td>
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</table>

Note: Dependent variable: CPFR implementation performance (operational and economic performance); F-value = 27.35; Significant F = 0.000, Adjusted R² = 0.713
### Table 4.5b
*Regression Results*

**Supply Chain Performance:**

<table>
<thead>
<tr>
<th>Parameter Estimates</th>
<th>Standard β</th>
<th>Standard Error</th>
<th>Variance Inflation Factor</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Constant</td>
<td>-0.173</td>
<td>0.418</td>
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<td>5.399</td>
<td>0.000</td>
</tr>
<tr>
<td>Sharing of risks and rewards</td>
<td>0.204</td>
<td>0.038</td>
<td>1.105</td>
<td>4.274</td>
<td>0.001</td>
</tr>
<tr>
<td>Market orientation</td>
<td>0.253</td>
<td>0.043</td>
<td>1.109</td>
<td>5.901</td>
<td>0.000</td>
</tr>
<tr>
<td>Performance metrics - economic, financial and strategic goals</td>
<td>0.269</td>
<td>0.050</td>
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<td>5.421</td>
<td>0.000</td>
</tr>
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<td>1.070</td>
<td>5.399</td>
<td>0.000</td>
</tr>
<tr>
<td>Extendedness</td>
<td>0.507</td>
<td>0.096</td>
<td>1.323</td>
<td>2.935</td>
<td>0.004</td>
</tr>
<tr>
<td>Competitive intensity</td>
<td>-0.090</td>
<td>0.999</td>
<td>1.108</td>
<td>-0.146</td>
<td>0.884</td>
</tr>
<tr>
<td>Communication (with CPFR partners)</td>
<td>0.344</td>
<td>0.128</td>
<td>1.368</td>
<td>2.691</td>
<td>0.008</td>
</tr>
<tr>
<td>Information Exchange &amp; Technology</td>
<td>0.267</td>
<td>0.111</td>
<td>1.103</td>
<td>2.407</td>
<td>0.018</td>
</tr>
</tbody>
</table>

Note: Dependent variable: CPFR implementation performance (operational and economic performance); F-value = 35.94; Significant F = 0.000, Adjusted $R^2 = 0.794$
### Table 4.5c

*Regression Results*

Environmental Uncertainty:

<table>
<thead>
<tr>
<th>Parameter Estimates</th>
<th>Standard β</th>
<th>Standard Error</th>
<th>Variance Inflation Factor</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Constant</td>
<td>3.798</td>
<td>0.379</td>
<td></td>
<td>3.398</td>
<td>0.000</td>
</tr>
<tr>
<td>Demand/Supply Uncertainties</td>
<td>0.208</td>
<td>0.073</td>
<td>1.079</td>
<td>3.615</td>
<td>0.000</td>
</tr>
<tr>
<td>Technical Uncertainty</td>
<td>0.109</td>
<td>0.064</td>
<td>0.829</td>
<td>3.494</td>
<td>0.001</td>
</tr>
<tr>
<td>Product costs volatility</td>
<td>-0.003</td>
<td>0.104</td>
<td>1.023</td>
<td>-0.027</td>
<td>0.978</td>
</tr>
</tbody>
</table>

Note: Dependent variable: CPFR implementation performance (operational and economic performance); F-value = 18.93; Significant F = 0.000, Adjusted $R^2 = 0.656$