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A CPFR Readiness Assessment Model

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A CPFR READINESS ASSESSMENT MODEL

A CPFR READINESS ASSESSMENT MODEL

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Industrial Engineering

By

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University of Arkansas
Bachelor of Science in Industrial Engineering, 2010

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ABSTRACT

The retail industry is a pioneer in developing new supply chain practices arising from the fact that the environment is characterized by intense competition and the need to achieve supply chain cost savings. An initiative launched by the Voluntary Interindustry Commerce and Standards Committee (VICS) introduced a concept known as the Collaborative Planning, Forecasting and Replenishment (CPFR). The objective is to integrate business and supply chain processes and provide better visibility and create an effective supply chain. This research develops a CPFR Readiness Assessment Model, which enables organizations to understand their readiness in implementing CPFR. This model can provide an initial assessment of the supply chain and propose development initiatives that will assist organizations to move towards a more effective CPFR process. Through identification of key CPFR activities, the model enables organizations to view the required tasks for executing an effective CPFR process. It also provides an insight into the level of commitment required and the specialization necessary to advance through the various stages of CPFR. Furthermore, the model also suggests a 'Path-of-Progress' to guide organizations through a systematic CPFR development process through proper utilization of resources.

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DEDICATION

I dedicate this thesis to my parents and to Anu for their continued support and inspiration. Without their sacrifice and patience this achievement would not have been possible. I am grateful to have had their support throughout my life.

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1 Introduction

Healthcare plays a significant role in a population's wellbeing, leading to a major impact on the economy. Recently, a mounting number of economic and environmental concerns have increased the focus on the healthcare supply chain. A few of the concerns include a growing uninsured population, labor shortages and high costs of medical services, reimbursement and payer trends, difficulties related to reimbursement for concurrent and new treatments and technologies, and a need for proper utilization of resources. There is also a need to align economic gains between expensive material purchasing and organization, physicians and clinicians. Understanding supply chain opportunities and best practices can be essential to an organization's success, especially in light of today's need to reduce cost and improve profit margin.

Pohl et al. (2012) examined the supply chain best practices for the retail and healthcare sectors. Their analysis included a review of conference and journal articles and graduate theses from online database services. They also conducted an intensive industry survey to shape the understanding. The survey was distributed within the retail and the healthcare industry. The study also included the formation of a Strategic Partner Study Group, including representatives from Wal-Mart and VHA that included best-practice supply chain experts. The retail and healthcare sectors have much in common in terms of supply chain importance and necessities. The retail industry is a large, complex, and diverse industry, and as a result, academic researches into their supply chain practices are vast. The retail sector has a long history of excellence in supply chain practices, with innovations and techniques that have significantly contributed to the rapid growth of the industry. This has been achieved through the implementation of supply chain practices that have been accepted as the best in class. Through methodological research, Pohl et

al. (2012) identified 22 best practices present in the retail supply chains. The best practices listed in Table 1 provide a quick overview of the supply chain practices that might be beneficial to the healthcare industry if implemented. In order to further narrow down the best practices, each practice was rated by supply chain experts on potential impact, scope of applicability, difficulty and cost of implementation. The result of the rating showed that CPFR was among one of the four best practices that supply chain experts and researchers believe will have a significant impact on the healthcare supply chain (Pohl et al, 2012).

Table 1: 22 Retail Best Practices

Commodity Centralized Purchasing and Supply	Classification of Non-Stock Thresholds	Performance Management
Supply Chain Services Reorganization	Collaborative Planning, Forecasting and Replenishment	Actual Usage Inventory Management
Strategic Sourcing	Product Standardization	E-Commerce
Regular Cycle Counting & Stock Rotation	Supplier Compliance Program	Electronic Ordering, Receiving, Invoicing & Payment
Managing End-User Inventory	Vendor Manages Inventory and Consignment	Co-operation Among Suppliers
Scanning Technology	Customer Support	Enhanced Training for Materials Management Personnel and Formal Material Management Education
Data Standardization	Vendor Representative Management	
Enterprise Resource Planning	SKU/Product Profitability Based Supply Chain Management	

Collaborative Planning, Forecasting and Replenishment (CPFR) is a business practice that focuses on enhancing external collaboration between suppliers and retailers/healthcare providers by adopting time phased forecasting and multilevel inventory planning to generate integrated

supply chain plans across an extended planning horizon. CPFR requires collaborative information networks and real time information sharing (Point of sale data (POS), stock level, demand forecasting, delivery schedules and inventory cost). It also requires incentive alignment between the collaboration partners. The need to collaborate is driven by the need to increase revenue and reduce inventory at the point of sales (POS), to increase cash flow through reduced inventory, more accurate forecasting, reduced warehousing and transportation cost and improve both internal and external business processes through coordination and transparency among other factors. CPFR is by no means a new idea. The concept of CPFR has stemmed from the framework of Efficient Consumer Response (ECR), which has been further modified to reap the benefits of technology and become more versatile in better controlling and optimizing business processes (Seifert 2002).

The purpose of this thesis is to investigate the readiness of healthcare and retail companies and organizations in implementing CPFR. The goal is to build models to measure the readiness for an organization to have a successful implementation of CPFR and its impacts. The model is based on the activities and processes required for best practice implementations. Sets of questions are developed around the type of operations involved, the scale of operations, collaboration among partners and joints business plans. Furthermore, there are other aspects that are taken into consideration including, but not limited to, data standards and IT structure.

This thesis investigates current and past research on CPFR, data collection and formation of new ideas, if necessary, in order to develop a CPFR readiness assessment model. The CPFR readiness assessment model will assist organizations and companies assess their current position in implementing CPFR. The model will also enable companies to understand the area of operation and activities that need to be developed or included in their current business process to

be more versatile in introducing CPFR. The research includes the impacts of the various stages of readiness. The model is developed based around a set of 'activities' which drives specific processes or practices within the system. In order to form such models, past research papers were reviewed, including previous CPFR models that have been developed and readiness models that have attempted to scale the readiness of a company or organization. The next section will review these past research papers and form a literature review of the CPFR models and related readiness model.

2 Literature Review

The literature review section is structured with an introduction to the healthcare industry, which will then be followed by a review of the background of the healthcare supply chain. A detailed overview of the concept of CPFR is presented followed by an overview of capabilities modeling. Since this research also focuses on the readiness model, it is important to understand what existing capability models have been developed and how they can contribute to the development of the model for this research.

CPFR is not a standalone development, which means that it has been developed from other models that had the same general framework. This literature review looks into the development of CPFR from other previous models and the shortcomings that prompted the development of CPFR. A brief overview of the types of models used for CPFR is also discussed. Among many, the most prominent CPFR model was developed by the Voluntary Interindustry Commerce Standards Association (VICS) which first described and publicized the concept of CPFR in the US (Seifert 2002, Skjoett-Larsen et al 2003). Model(s) developed by VICS are reviewed in this section since it provides a foundation for the development.

The Healthcare industry has played a significant role in the service sector in terms of revenue generation and providing vital service to the community. Recently, the increasing cost of medical supplies and supply chain management costs have motivated management to look for ways to reduce waste and streamline their operation. According to Keehan et al, (2008), health spending is expected to grow at a steady rate of about 6.7 percent per year and reach to an estimated \$4.3 trillion at 2017. The supply costs of a hospital account for one-third of the total budget of a hospital on average. Forty percent of the supply chain cost is spent on supply distribution, which is more than five times the amount spent by major retailers such as Wal-Mart and Procter & Gamble in this functional area (Eskew, 2002).

Focus on operations and logistics management in the retail, manufacturing and consumer goods industry has existed for a long time. There are scientific and mathematical models available that have been integrated into management practices. But healthcare has been relatively slow to adopt these methods and only recently the healthcare industry has started to focus on these topics (Langabeer, 2008). Therefore, there is potential for improvement in supply chain performance in the health care sector by learning from the other industries and hence, cutting costs and increasing the operating margins. Duffy (2009) mentions that collaboration and building trust between supply chain partners is the key to reducing the immense cost faced by the healthcare sector. The need to align common business goals must be realized between business partners, which will help dissipate business risk among the business partners and provide visibility into the complex operations of the supply chain. Through this process, the healthcare sector will be able to significantly reduce their cost and increase patient safety by ensuring that the right product is available in the right place.

Overall, the healthcare supply chain is structured differently than retail or other industry. The healthcare supply chain consists of four main stakeholders: manufacturers, intermediaries, providers, and patients (Burns, 2002). Intermediaries between the manufacturer and healthcare provider in the supply chain are formed by Group Purchasing Organizations (GPOs) and distributors who often facilitate the payment for and shipment of goods from the manufacturers to the providers. One of the principal tasks of GPOs is to receive contracting for material that has been outsourced to them by the healthcare provider. The GPO then negotiates this contract with the manufacturer, making the required product available to healthcare providers at a lower cost. In case studies, it has been noted that the processes that help provide accurate pricing for the provider are (1) GPO Rostering (2) ACD Reporting (3) Contract Management and (4) Letter of Commitment or Participation (Rardin et al, 2011).

Although the contract consist of different tiers, the manufacturer decides on the pricing based on a spend data. Sometimes the pricing tiers are documented via Letter of Commitment/Participation (LOC/LOP) from the provider. The contract information is made available throughout the supply chain so that every provider receives an accurate pricing. The distributor then performs the sales tracing for each provider based on purchase order, which is then conveyed to the manufacturer where the administration fees and rebates are calculated based on the sales. Provider locations are replenished by either a direct shipment from the supplier. All these require that a complicated payment system flow through the supply chain. The primary drawback of such a system is the significantly long time it takes for the payment transaction to take place within the chain (Rardin et al, 20110). Based on this basic understanding of the supply chain process in the healthcare sector, the next section will review the fundamentals of CPFR and how this process fits into the overall supply chain process.

2.1 Fundamentals of CPFR

While leaders in supply chain management have identified the need to effectively coordinate the flow of information and products, it has also been identified that limiting such coordination within a company is not enough to achieve proper optimization. Suppliers and other business partners play a significant role in the operation of a supply chain starting from the customer placing an order up to the order fulfillment. This consensus has led supply chain experts to develop plans for an integrated supply chain, partnering with suppliers by sharing information and coordination operations. Thus CPFR was developed with the aim to fulfill the need for collaboration (Denend et al, 2005).

CPFR is an effective business model that was first started by Wal-Mart and Warner Lambert. The model was designed to share forecasts between the two partners and identify any forecast discrepancies between the two organizations. The aim was to reduce inventory throughout the supply chain and reduce stock-outs (Seifert 2002). Some papers have referred to the implementation of CPFR as a nine-step approach that unifies demand planning and supply planning into one process. The nine steps for implementing CPFR are shown in Figure 1 (Danese, 2007), which depicts the stages of development. The nine steps are designed to present the process that would lead to the implementation of CPFR. The idea is to begin by planning the operations through the development of front-end agreement and creating joint business plans that take into account the goals and visions of all the business partners involved in CPFR. The second stage is primarily aimed at accurate shared forecasting, which will support the joint plans of all trading partners. The last stage is the replenishment process, which involves the delivery of the product or service from the vendor to the customer. Performance measures are identified which will provide a measure on operational effectiveness (Danese, 2007).

Combining technology with business partnering, fast and accurate data exchange was possible which led to more accurate forecasting. The key behind the success of CPFR was not the introduction of more sophisticated algorithms, but the use of realistic forecast data (VICS 2002).

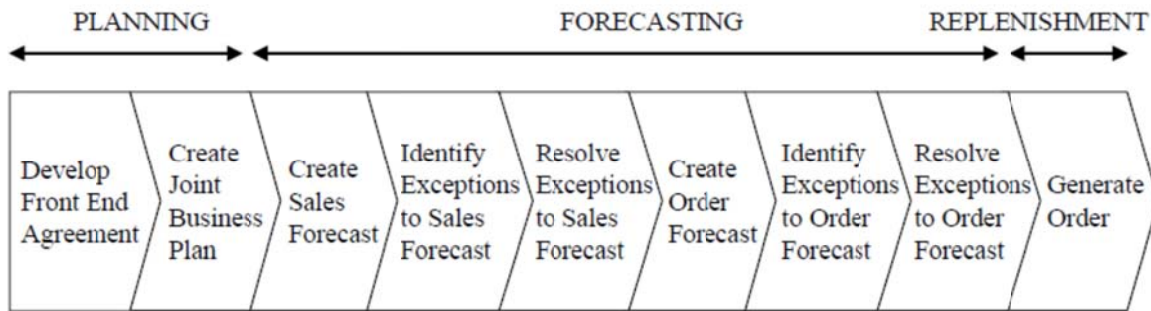


Figure 1: Nine Step CPFR Model (Danese, 2007)

The primary objective of CPFR is to reduce non-value added activities that are present in the entire supply chain. During the 1990s, American companies led an initiative to establish ‘Quick Response’ (QR) leadership committee which defined their objective as being able to “continually meet changing requirements of a competitive market place which promotes responsiveness to consumer demand, encourages business partnerships, makes effective use of resources and shortens the business cycle throughout the chain from raw materials to consumer” (Sheffi 2002). At around the same time, the Efficient Consumer Response (ECR) movement was initiated by the grocery industry with the view to efficiently meet consumer demands. In order to bridge the difference between consumer demand and the ability to make the products available, ECR focused on category management, efficient product replenishment at the store level while carrying the minimum possible inventory and the development of technologies to support these objectives (King et al. 1996).

With the need to communicate better between business partners, collaboration was termed as a priority with the practices of ECR and QR. One method of solving the communication was brought about by the introduction of Vendor Managed Inventory (VMI). In this process, the manufacturer or supplier has access to the customer's sales data, forecast and inventory levels. This allowed customers to maintain a low level of inventory but according to some papers, it only achieved in lowering the inventory at the customer's distribution center and not the retail store (Sheffi 2002). Besides the initiative of VMI, ECR embarked on a project to modify the CPFR guidelines produced by VICS in order to make it more adaptable to the European market. An analysis of the VICS CPFR guideline showed that there were little or no changes necessary to adapt the guideline to the European market, although promotion planning was identified as a key process for European companies. The document titled "A Guide to CPFR Implementation", published in 2001, contains the result of the analysis (Danese 2007& VICS 2002).

The CPFR readiness assessment model being developed in this research relies significantly on the CPFR guideline and framework developed by VICS. Although the exact framework might not be used in the model, the CPFR model proposed by VICS contributes significantly towards the framework of the model in this research. In order to better understand the structure of CPFR and the level of business operations it encompasses, a literature review of the VICS CPFR model is necessary. The next section will provide an overview of the CPFR model proposed by VICS and successfully implemented with hundreds of manufacturer and retailer around the world (VICS 2002).

2.2 VICS CPFR Model

The Voluntary Interindustry Commerce Standards (VICS) CPFR committee has been actively involved in developing standards and CPFR models to promote the effective

implementation of CPFR in industry. Since the publication of their first CPFR guideline in 1998, more than 300 companies have implemented the process (Andraski et al, 2004). The VICS CPFR Committee is considered a pioneer in this effort and many companies have since partnered with VICS in order to bring the process to their own organization. Wal-Mart was the first to approach VICS with the objective of launching the CPFR program (Denend, 2005).

The CPFR framework developed by VICS revolves around the concept of a 'buyer' and a 'seller'. Collaboration is termed as the key in this framework, which incorporates the aspects of replenishment, forecasting and planning. VICS developed this model based on the business processes of the retail industry. Other industries such as high technology and the healthcare sector might have different collaboration participants and will possibly differ from the concept of a buyer and a seller. With an emphasis on the retail business process, VICS developed four collaborative activities can improve performance.

- **Strategy & Planning:** Establish the ground rules for the collaborative relationship. Determine product mix and placement, and develop event plans for the period.
- **Demand & Supply Management:** Project consumer (point-of-sale) demand, as well as order and shipment requirements over the planning horizon.
- **Execution:** Place orders, prepare and deliver shipments, receive and stock products on retail shelves, record sales transactions and make payments.
- **Analysis:** Monitor planning and execution activities for exception conditions. Aggregate results, and calculate key performance metrics. Share insights and adjust plans for continuously improved results (Andraski et al, 2004).

These steps are not necessarily sequential to one another, but all companies involved in collaboration activities are engaged in these tasks to a significant extent. The main CPFR model

breaks down the collaboration tasks into four different sectors with 2 tasks per sector. Figure 2 is the current VICS CPFR Model and it presents the flow of the process with each task described in the process. Within the strategy and planning process, the collaboration arrangement deals with the business goals, defining the scope of collaboration, assignment of roles, responsibilities, check points and escalation procedures. The joint business plan defines the events that will or possibly will affect the demand and supply planning during the business period. Examples of such events are joint promotions, inventory policy change and other factors.

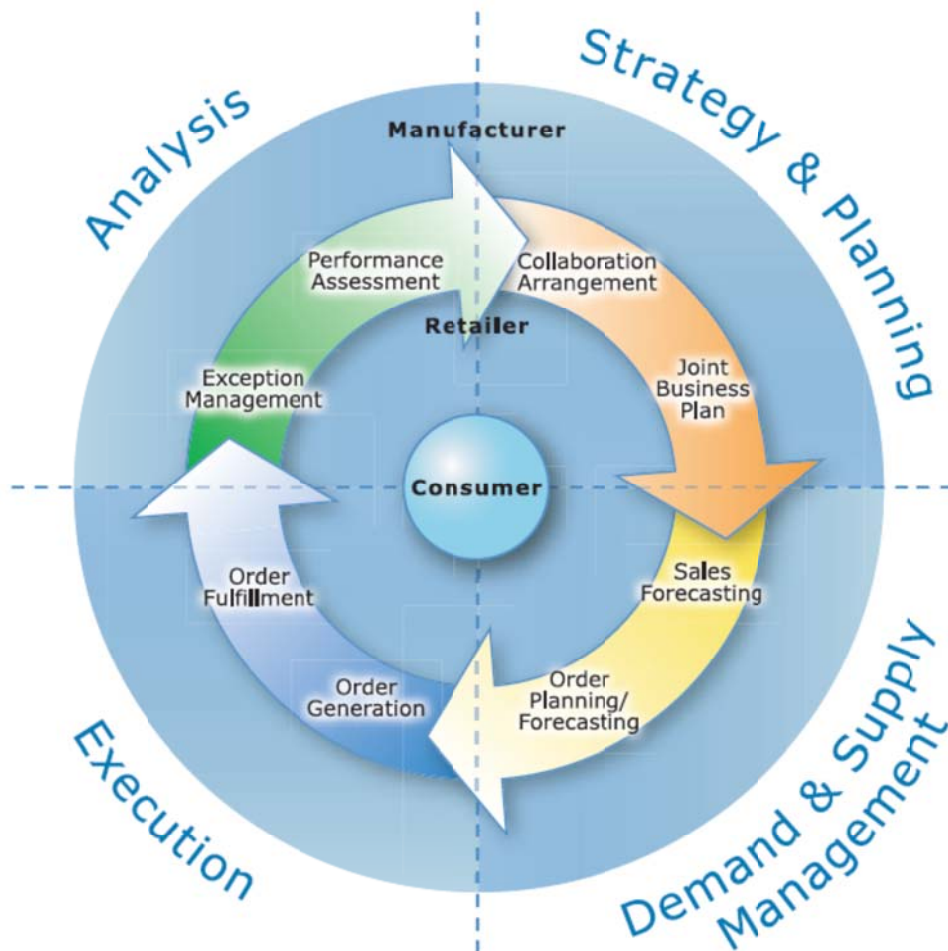


Figure 2: VICS CPFR Model (Andraski et al, 2004)

Demand and supply management breaks down into sales forecasting and order planning. These two tasks are significantly affected by the joint business plan and to some extent are known beforehand because of the business planning. Sales forecasting projects customer demand at the point of sale and order planning manages future ordering and delivery requirements stemmed from the sales forecasting, inventory position, transit lead times and other factors. This leads to the understanding that inventory control policies play a significant role in the order planning and is a key factor in the success of the demand and supply management process.

Execution includes the tasks of order generation and order fulfillment. Order generation is concerned with the transformation of the forecast from the previous process to a demand plan and the execution of the production planning. Order fulfillment involves the tasks of production based on the production planning, the shipping and delivery of the goods and stocking products for customer purchase.

The last process of analysis is concerned with the tasks of exception management and performance assessment. Exception management deals with the monitoring of planning and operations of out-of-bounds conditions such as excess demand and other abnormalities in the process, which is out of the scope of the joint business plan. Performance assessment uses metrics to keep track of performance within the system and monitors the level of achievement of the business goals for all business partners. It also involves the detection of undercover trends such as seasonal demand and the development of alternative strategies.

The VICS model of CPFR involves all business partners in the CPFR process. But each business partner in the process has specific tasks that are required in order for the joint process to succeed. VICS separates the business partners between retailers and manufacturers and assigns

specific task to each group. Table 2 summarizes the tasks and presents the collaboration aspect of each task between the retailer and manufacturer.

Table 2: VICS CPFR Collaboration Task (Andraski et al, 2004)

Retailer Task	Collaboration Task	Manufacturer Task
Strategy and Planning		
Vendor Management	Collaboration Arrangement	Account Planning
Category Management	Joint Business Plan	Market Planning
Demand and Supply Management		
POS Forecasting	Sales Forecasting	Market Data Analysis
Replenishment Planning	Order Planning/Forecasting	Demand Planning
Execution		
Buying/Re-buying	Order Generation	Production & Supply Planning
Logistics/Distribution	Order Fulfillment	Logistics/Distribution
Analysis		
Store Execution	Exception Management	Execution Monitoring
Supplier Scorecard	Performance Assessment	Customer Scorecard

An example of the tasks involved in Table 2 is the manufacturer’s sales team performs systematic account planning while the retailer conducts vendor management reviews. Both these teams come together to perform a joint strategy and planning, which produces the collaboration arrangement. Different teams might be involved in each phase of the tasks and are dependent on the business structure of the organization. But the general concept is that different teams come together to work on collaboration aspects within their field and pass down the information to the next process.

Although the model discussed in Table 2 only incorporates a single manufacturer and retailer, the model can be modified to include multiple business partners in the CPFR process. It is called n-Tier Collaboration. An example is the involvement of business partners that start from

a supplier to a manufacturer to retailer and then the consumer. The CPFR model is designed to be able to fit different scenarios where different combinations of business partners get involved. VICS has defined 4 different scenarios which have existed in industries where full scale CPFR has been established. The four scenarios are shown in Table 3 and depict the different form of collaboration, their applicability in the business process and an example of the industries that use the scenarios.

Table 3: VICS CPFR Collaboration Scenarios (Andraski et al, 2004)

Scenario	Applicability	Industry
Retail Event Collaboration	Highly-promoted channels	All industries (except EDLP)
DC Replenishment Collaboration	Retail DC distribution	Drug chain, Hardware, Grocery
Store Replenishment Collaboration	Direct store delivery or retail DC-to-store distribution	Mass merchant, Club store, European and DSD grocery
Collaborative Assortment Planning	Apparel and Seasonal Goods	Department store, Specialty

Retail Event Collaboration:

In a retail environment, different business partners join together to offer promotions that create swings in the demand pattern, which may lead to out-of-stock problems, excess inventory and unplanned logistics costs. In order to avoid these short falls, business partners join together to form promotional plans based on a yearly or quarterly basis. During the process, the collaboration determines the impact of planned events on consumer demand and retail distribution.

DC Replenishment Collaboration:

This scenario deals with the continuous replenishment process where order requirement is calculated with a short lead time. Generally, only one business partner manages the entire

process, which is similar to a Vendor Managed Inventory (VMI) process. DC replenishment collaboration enables the manufacturer to implement a make-to-order policy, which allows retailers to carry reduced inventory levels and avoid stock-out risk. In this scenario, business partners collaborate on DC withdrawal forecast, manufacturer-to-DC forecast or both. Overall, the replenishment process covers all activities from the raw material to the product on the store shelf at the retailer.

Store Replenishment Collaboration:

Similar to the DC replenishment collaboration, this process is conducted by a single business partner over a single time horizon. The collaboration initiative includes in-store POS forecasting, store clustering, replenishment parameters, presentation stock and assortment optimization. Due to the variety of collaboration, retailers engage in the process more often and take more responsibility.

Collaboration Assortment Planning:

This scenario is especially designed to incorporate businesses that face a highly seasonal demand pattern. Examples are fashion industries where market segment typically have a single season horizon. Seasonal demand also means that there is a lack of data based on which forecast can be made. As such, forecasting is heavily dependent on the collaborative interpretation of industry trends. Business partners collaborate on plans to develop joint assortment plans, which include design of products and financial models.

There are again, different levels of collaboration roles with a CPFR process. Existing demand and replenishment processes are modified to incorporate CPFR, which means each business

partners must have a different level of responsibility. Table 4 shows the different types of responsibility involved in the process.

Table 4: CPFR Collaboration Responsibilities (Andraski et al, 2004)

Alternative	Sales Forecast	Order Planning	Order Generation
Conventional Order Management	Retailer	Retailer	Retailer
Supplier Managed Inventory	Retailer	Manufacturer	Manufacturer
Co-Managed Inventory	Retailer	Retailer	Manufacturer
Retail VMI	Manufacturer	Manufacturer	Manufacturer

Based on the business setting and the industry structure, each of the options can be applicable when implementing CPFR. The CPFR model can take into account all these different combinations of responsibilities and share the tasks between the retailer and the manufacturer. With the end goal of integrating business processes, it is up to the collaborating partners to choose the option that best fits their business model. There is yet no specific model, which is most effective, but each of these options will have different organizational impacts.

There are some fundamental technology needs that are required for the successful implementation and operation of CPFR. The technology should be able to facilitate these factors which include, but are not limited to, the capability to share forecast and historical data between partners, automating the collaboration and joint business plan, evaluating exception conditions and enabling revisions and commentary. With the necessity of technology, there is also a need to have standards, which will establish a common process. Generally, CPFR builds upon EAN.UCC item identification location identification and electronic commerce message interface. Business partners can make use of EDI messages and XML messages to facilitate

communication. The EAN.UCC standard provides the most comprehensive coverage of all CPFR communication needs (Andraski et al, 2004).

The CPFR business model developed by VICS has evolved over time and has benefitted many retailers and manufacturers. The current model, covered in this review, includes lessons learned from experience and has revised the original 9 step approach to make it easier to understand and implement. The development of specific scenarios is designed to help a wide variety of business process and more scenarios will be added as the business process evolves over time. Although there is a high emphasis on the retail sector, the CPFR model has contributed to trading relationships in the high technology, chemical and automotive industries.

Section 3 of this document will outline the methodology that will be followed for conducting the research. That section will outline the processes involved in the research and the goal each of these processes will achieve at the conclusion.

3 Research Methodology

A research methodology is an organized method of conducting scientific research with systematic problem solving approaches. The first objective is to define the problem and then form a plan based on which the problem will be approached. The approach includes the activities of the research that needs to be identified, a systematic method of progress and the development of a system to measure the progress. The research methodology defines each assertion made in support of the end goal and will explain and justify the assertions. The overall model will also be evaluated and validated.

Before starting any research in any area, the purpose of the research must be clear since this purpose defines the type of research. There are mainly three categories for scientific research.

These are (1) Exploratory research, (2) Constructive research, and (3) Empirical research. This thesis will use empirical research with an evaluation through industry expert opinion. The process for conducting this research will follow a pattern of (1) planning (2) development and data collection (3) evaluation and (4) validation. This research will develop a new model for the readiness assessment of CPFR. As such, there will be a significant amount of cross pollination between different ideas. Literature review showed that collaboration and other activities in CPFR will be different between retail and other industries. In order to compensate for this difference, certain measures will have to be introduced in order for the model to be robust. The primary aim of the research methodology will be to present a structure for the research. The structure will define how (1) the model is constructed (2) how it is evaluated and (3) how it is validated.

The first stage of the process is to form a plan for the research. The planning phase helps understand the scope and applicability of the research. The plan is initiated through a thorough literature review of current CPFR practices in the industry. This led to an understanding of the process and activities involved in the CPFR process. The second step is to receive input from the industry practicing CPFR. This is done through expert interviews and collecting opinions. Once the initial understanding of the process has been gained, the scope and depth of the model is established.

During the CPFR documentation process, industry experts played a significant role in the understanding of the CPFR process. This is the first stepping stone for this research and a valid and thorough understanding of the CPFR process is crucial to the success of the model. Without the contributions of the industry experts, this process will not have the expected depth and accuracy required to develop and validate an effective readiness model. The contributions of the industry experts include:

1. Phone interview during which CPFR experts are asked about the different aspects of the CPFR process. A detailed questionnaire is used as a guide for the interview. The duration of the interviews is between 45 minutes and 1 hour with follow up questions produced after an interview report is constructed. The purpose of the follow up questions is to clarify information gathered during the interview or to gain new information brought to light after the development of the report on the initial interview.
2. Industry expert's assistance in the validation of the model. This provides a valuable insight into the effectiveness of the model and its ability to accurately assess readiness.
3. A possible pilot of the readiness assessment model within organizations. This will enable a future gap analysis between the retail and the healthcare sector.

These interview reports played a significant role in the understanding of the CPFR process and gaining leads into areas that were investigated for the purpose of this research. The reports are a valuable collection of expert opinions and experience that will be part of the validation process of the model. Appendix 1 consists of a sample letter that was used to formally contact the industry experts requesting their assistance.

The construction of the model is initiated with the objective of making it robust and applicable to industry. Primary task of the model is to establish the readiness of an industry in implementing CPFR and define a path of progress for further development of CPFR practices. This is achieved through (1) identifying the key activities in CPFR (2) Develop questions which helps rate each activity on a scale (3) understanding the importance of each activity and (4) Developing a path of progress based on activities scoring. An understanding of these factors will help establish a readiness level.

The evaluation process of the model is important to establish its robustness and applicability. The evaluation process can be best done through obtaining CPFR practicing industry opinions. In order to make the process efficient, a set of questions pertaining to the model is developed. These questions focus on the different aspects of the model, such as planning and forecasting readiness assessment. Industry practitioners can rate each question on a scale that represents the relevance of each part of the model to assessing the readiness for CPFR. This establishes an initial validation of the model where the relevance of the model can be assessed quantitatively. Furthermore, in order to ensure that an accurate and satisfactory number of activities and resources have been included in the model, a thorough literature review, including documentation of proof of the need for the activities and resources, are included in the research.

The validation process is based on industry application. Companies from the retail and healthcare industry will be requested to complete the readiness models. Companies from the retail industry should be practicing CPFR as part of their business plan. They may be in different levels of CPFR implementation within their organization, which should be represented by the model's results. The results obtained from the companies can be evaluated against each other and against their own opinion as to where they stand in CPFR implementation. The combined assessment will help validate the model and identify any weaknesses. Future research and improvements can be suggested from the initial validation process. Any weaknesses that significantly affect the model's effectiveness will be addressed immediately in a revised version of the model.

The model, described in section 5, examines the level or extent of use of activities pertinent to CPFR within the organization to understand the readiness. This information is used to

understand the impacts of the processes in CPFR on the organization. This analysis also generates a 'Path of Progress'.

The next section will give a brief overview of the tasks involved in the research and a basic outline of the timeframe within which this research will be conducted. Furthermore, industry expert contributions to this research will also be highlighted and acknowledged.

4 CPFR Activities Identification

The purpose of this section is to outline the CPFR activities in terms of supply chain processes and the required level of specialization. Based on the VICS CPFR model, this document is organized into four sections (1) Strategy and Planning (2) Demand and Supply Management (3) Execution and (4) Analysis. These four areas represent a general framework that can be applied to most industries. Each of these four quadrants is again divided into two sub-areas. Each of these areas, in turn, contains activities that have been deemed necessary for the establishment and success of CPFR. These activities are defined with an example and several questions follow at the end of each activity. These questions are developed from the discussion and analysis of the requirements of each activity and will help form the CPFR readiness model.

Although healthcare is not currently included in this model, necessary changes can be made in order to accommodate the healthcare industry within this framework. The development of this document will support the development of a CPFR readiness model in the healthcare industry. Through the establishment of standards and objectives within each of the CPFR activities, a company or organization's achievements in terms of CPFR readiness can be assessed using appropriate scales and measures. The following section begins with the first quadrant of CPFR.

4.1 Strategy and Planning

This is the first section of the CPFR model that defines the establishment of ground rules for collaboration within business partners. In general, this phase generates a guideline or blueprint based on which collaborating partners can direct their operations and make strategic and tactical decisions. Regarded as the foundation for all collaborative arrangements, strategy and planning binds the business partners in a commitment and ensures visibility in the business for all partners involved. The next section is concerned with the first of two major sub-areas within the Strategy and Planning quadrant of CPFR.

4.1.1 Collaboration Arrangement

Collaboration arrangement is the phase where business partners form the guidelines for the collaboration effort. The guidelines include the assignment of tasks for each business partner, the level of collaboration required for the business and the opportunities available to maximize or increase the benefits from this collaboration. Each of the following subsections is activities that are part of collaboration arrangement. Requirements for each activity are discussed with a set of questions that will be used within the development of the CPFR readiness model.

Establish Primary Objective

The purpose of this activity is to define and establish a solid business plan that will address the opportunities to improve operational performance and efficiency. Furthermore, business partners must decide on what benefits CPFR will bring for the business partners. A common goal must be set which will drive all collaboration effort. For example, the goal might be to reduce inventory to have better readiness in responding to market changes. This establishment of goals and vision will drive the alignment of future activities with corporate business strategy. It is

essential that this establishment of a primary objective be seen as a “strategic imperative”, which defines an organization's critical leverage points. Viewing the establishment of primary goals as a strategic imperative will place the organization on a track to achieving CPFR’s purpose. Furthermore, the establishment of a solid business plan is required in order to identify business opportunities and improve operational performance and efficiency. The business plan should be formulated in a manner such that all business partners involved are benefitted.

- To what extent is your organization’s business plan aligned with long term strategy?
- To what extent is there a set of goals that drive business or collaboration effort?
- To what extent are the goals viewed as a strategic imperative?
- To what extent is the current business plan utilized to identify
 - Future business opportunities?
 - Improve operational efficiency?

Strategic Terms Definition

In order to keep consistency during collaboration and information exchange, there needs to be a clear and agreed upon definition for all terms used to define processes and initiatives in CPFR. For example, forecast validation is defined as the process of business partners collaborating to validate the order/sales forecast. Strategic terms arise as resources within an organization are configured to take maximum advantage and direct the scope of an organization over the long term.

- To what extent are all the strategic terms in the organization standardized?
- To what extent are all the strategic terms clearly defined?

Functional Terms Definition

All terms associated with the functional operation within CPFR should be defined such that all business partners involved in the process have a common understanding of the meaning of each term. Functional operations are common CPFR activities that are required to maintain the CPFR process. An example of such a term definition can be 'collect POS data' which means the collection of the point of sales data.

- To what extent are all the functional terms in the organization standardized?
- To what extent are all the functional terms clearly defined?

Potential Benefits Definition

This is one of the key drivers for the establishment of CPFR. Organizations and their business partners need to be able to see the economic, operational or strategic gains that can be made from the adoption of CPFR. There needs to be a defined set of goals that will be achieved after the successful implementation of CPFR. The goals can be defined in terms of benefit sharing, for example, reduced inventory and percent increase in expected sales. In most cases, benefit sharing is translated into economic gains that should motivate the organization and its business partners to adopt CPFR. It is important to ensure that trading partners receive benefits in proportion to their efforts. Trust between the trading partners is a key enabler of collaborative success. Thus penalties should be decided beforehand, should any business partner fail to meet the requirements set forth during the development of business plans.

- To what extent are potential benefits from business collaboration/arrangements with business partners identified?
- To what extent does a business partner share the benefits of the business arrangement?

- To what extent are business partners penalized for failing to meet business requirements?

Contracting

Before the establishment of CPFR, it is important for business partners to come to common terms. A contracting agreement helps the organizations achieve this through establishing a memo of understanding and deciding on the amount of resources to be dedicated to CPFR. This phase is particularly important since the success of CPFR depends on the commitment of the business partners and the amount of resources dedicated for the program. For example, an organization committed to CPFR might open a new division or department that is specifically designed to meet CPFR collaboration needs. The contracting between business partners must address the standardization of supply chain processes and a method to account for each party involved to maintain supply chain commitments. Furthermore, there needs to be a fixed set of rules which will govern operations and decision making processes such as expediting orders to satisfy customer needs. These rules will help standardize the supply chain process and provide visibility for all personnel involved in the supply chain.

- To what extent are business agreements established through contracting?
- To what extent is a formal rule maintained for operation and decision making processes?
- To what extent does contracting clearly outline the key responsibilities of the supplier?
- To what extent does contracting address resource dedication?
- To what extent does contracting hold each party accountable for their commitments?

Schedule Meetings

The scheduling of meetings is necessary to maintain collaboration between business partners and to ensure that all parties are on the same page. A 30 to 60 minutes meeting every month is

encouraged with more frequent contact occurring by emails and phone calls. The monthly meetings should address vendor performance metrics and identify any short falls and devise strategies to improve. Reporting on initiative progress, discussing surface issues and establish and agree on timelines should also be components of the meeting. One of the key outcomes of the meeting is to identify and resolve future supply shortages. This being one of the cornerstones of CPFR, the discussion of future supply shortages is very important during each meeting. Finally, the meeting should be utilized to communicate any changes to the replenishment system, for example, distribution, lead-time, order cycle, forecasts, etc.

Quarterly meetings are more important and need to address a wide variety of issues. The meetings should review previous business and supply chain initiatives and assess the achievement of the milestones for each initiative. A review of all performance metrics and identifying performance opportunities is a key process during these meetings. Goals should be set forth based on the performance metrics review and the achievement assessed during the next quarterly meeting. Finally, quarterly meetings can provide a good platform to launch new initiatives to be met in the long term.

- How often are regular meetings scheduled for collaboration or business purposes with the business partners?
- To what extent are the following means of communication utilized during collaboration with **general** business partners?
 - Basic email and phone
 - Internally linked email
 - Internally linked email and spreadsheets
 - Enterprise class solutions

- To what extent are the following discussed during the meeting?
 - Vendor performance metrics
 - Report on initiative progress, surface issues, establish new timelines
 - Identify and Resolve Future Supply Shortages
 - Communicate any changes to replenishment system
- To what extent are quarterly meetings held between business partners?
- To what extent are quarterly meeting used to address
 - A review of all performance metrics to identify performance opportunities?
 - Assessment of the achievement of milestones set forth during the previous quarterly meeting?
 - Launch new initiatives?

Planning Horizon

It is important to develop a planning horizon for all business plans. A planning horizon essentially shows the capability of an organization to forecast demand and manage planning accordingly. This step helps organizations set milestones and layout a development plan. It closely coordinates with quarterly planning in setting new initiatives. For example, an organization might be able to forecast its demand over the next 6 months and schedule production and planning accordingly. Planning horizon can also show the ability of an organization to forecast its demand over a certain period of time. The forecasting accuracy depends on the quality of the data used and the type of forecasting process in place. Overall, the planning horizon spans over a lot of activities, which to some extent are inter-related.

- To what extent is the planning horizon taken into account during development of business initiatives?
- What is the typical planning horizon for your organization?

0 – 3 Weeks	0 – 3 Months	3 – 6 Months	6 – 12months	18-24 months
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IT System Compatibility

Compatibility of IT systems plays a vital role in the success of CPFR. Information transfer, meetings and collaboration efforts are facilitated by an advanced IT system that can meet the needs of the effort. Although CPFR does not fundamentally depend on technology, technology can facilitate the process and becomes a key tool in large-scale implementations of CPFR. For example, technology can be used to share forecasts between business partners. When an organization scales its CPFR process, technology can be used to integrate collaboration tools with the organization's primary systems such as ERP.

- To what extent does your organization have the ability to
 - Share forecasts with business partners?
 - Allow business partners to access historical sales and/or order data?
- To what extent is an enterprise class solution utilized in coordinating promotions, forecasts, orders and shipments?

Forecasting Agreement

A forecasting agreement is the first step towards forming a concrete forecasting process. Agreements have to be reached in determining the level of forecast, such as DC or store level forecast, the forecast update frequency and the forecasting horizon. At the same time, data plays an important role in the accuracy of forecasts. Joint consensus should be reached in determining

the quality of data to be used. This data will have to be acceptable to all parties since the forecast resulting from the data will affect all partners in the business. Often there are multiple forecasts within the same organization; the challenge is to reconcile all forecasting figures before any joint forecasting can proceed. Organizations can also choose to have just one forecast that has proven to yield good results and simplify the process.

- To what extent does a forecasting agreement determines the level of forecast and the update frequency?
- To what extent is the organization able to reconcile all forecasts into one primary forecast?
- To what extent is there an agreement between business partners to maintain a quality and standard of data?

Determine Roles and Responsibilities of all Partners

All business partners should have a defined role and responsibility corresponding to supply chain activities. Specific tasks assigned to different departments also need to be brought together. In order to achieve this, there needs to be formal and informal coordination and cooperation between departments. The ability to coordinate internally prepares an organization for external coordination. Thus, it is important to first form internal collaboration measures before external collaboration can be initiated. Most importantly, there needs to be an assigned frontline collaborator to work with the business partner's supply chain team. An example is a single point of contact from the customer to work with the supplier's planner on orders and forecasts. In short, there needs to be a clearly defined point of contact for all supply chain collaboration efforts and issues.

- To what extent is there a defined set of responsibilities for all supply chain activities?
- To what extent is internal collaboration between departments present within the organization?
- To what extent does your organization have assigned a frontline collaborator to work with your business partner?

4.1.2 Joint Business Plan

A joint business plan primarily identifies events that will affect the supply chain in the long run. These events can be in the form of promotions and new product introduction. In order to take these events into consideration during planning and forecasting, processes need to be in place to identify these events and to make appropriate arrangements. Joint business plans can also contribute towards defining the type of activities and collaboration efforts in the business plan. As previously mentioned, CPFR is a combined effort and its success depends on internal collaboration as much as it does on external collaboration. As such, sharing the information within the four areas and within each of the eight tasks is also important. For example, if there is promotional planning, then the information needs to be conveyed to personnel engaged in the execution area of CPFR. In this way, the change in demand and therefore the need to bring changes to replenishment and planning becomes more visible. Studies have found that companies experienced in CPFR have addressed these issues and that partner enthusiasm is a key success factor for this task. The following sections concern the activities within the joint business plan and what needs to be achieved from each activity.

Define Information to Share

There needs to be a defined set of information which all parties committed to CPFR are willing to share. For example, future plans to introduce a new product in the market should be

shared with the retailer by the manufacturer to make them aware of possible changes in demand and supply chain planning. This type of information is necessary when developing joint business plans as changes to the demand and supply pattern will affect the performance of the supply chain.

- To what extent is there an agreement between business partners to share information related to product introduction, changes to supplier's business plan, etc.?
- To what extent is there an agreement/understanding on the type of information to share between business partners?

Define Collaboration Frequency

Closely related to scheduling meetings is the frequency of sharing information and data. This activity addresses some very specific types of information to be shared. Data sharing in terms of sales forecast and point of sale data is not the objective. The primary goal of this activity is to build trust through the frequent sharing of future business plans and corporate strategy. This information helps all business partners in preparing for possible changes in the demand pattern or the supply chain as a whole. For example, a manufacturer can let the retailer know over a time period about the gradual development of a new product and the expected date of introduction of the product in the market. Often collaboration is not this intrusive into each other's business plan but this example is used to give a generic idea of the type of information being discussed. Furthermore, there might also be general business rules such as the retailer asking a manufacturer to make them aware of the introduction of a new business plan a certain amount of time beforehand.

- To what extent is the information shared in advance between business partners? For example, new product introduction.

- To what extent is information, which can affect supply chain planning, shared between business partners?

Define Products to Sell

An important part of engaging in CPFR is to understand the range of products and items that will fall within the CPFR operations. These products have to be defined and agreed upon by all partners. Advanced CPFR can engage all items and products in the business, while basic CPFR efforts should start with a few items and products and expand later on as the process becomes more mature. The selection of items is important as well for basic CPFR processes, as some items are more difficult to manage through CPFR than others. For example, a retail organization can plan on introducing only nonperishable items in the initial stages of CPFR to run a pilot and assess the situation.

- To what extent are products identified and defined for CPFR or other joint business initiatives?
- To what extent is the product selection formed in collaboration with business partners?

Promotional Event Planning

Often times, different manufacturers plan events to promote their product. These events generally take place at the store level with the retailer. If the business partners have foresight of these kinds of promotional events, then there are benefits to be gained. There may be sudden changes in the demand pattern because of these promotional events, and as such, retailers need to have enough items in inventory and on the shelves to meet the immediate rise in demand. Furthermore, promotional events from different business partners can be combined together. These promotions, called cross promotions that arise from the adjacent category effect often

involve items that help promote each item's sales, although the items might be manufactured by different companies. Such coordinated promotional planning helps all partners gain the benefit of increased sales. For example, promotional events of beef steak could influence the sales of charcoal and grills. Thus, companies manufacturing charcoal and grills could introduce a promotion on their items as well by collaborating with the retailers and others. Business partners need to be able to collaborate with each other about future promotional events. A certain amount of time has to be provided to all partners so that they can prepare properly for the event and coordinate with other partners to allow for cross promotions.

- To what extent are promotional events planned and coordinated in advance with the business partners?
- To what extent are adjacent category product promotion done during product promotion events?
- To what extent are all concerned business partners aware of an upcoming promotional event?

4.2 Demand and Supply Management

This area primarily deals with supply chain management where consumer demand is estimated with POS, order data and shipment requirement is set over a certain period of time. Generally, it is a good practice to have a planning horizon over which the order and shipment requirements are planned. Thus, the process can be modified or adjusted over each planning horizon and repeated. This brings about a structure to supply chain management and makes it easy for all partners to estimate future requirements since they will have a better visibility. The next sections address the tasks that are part of demand and supply management.

4.2.1 Sales Forecasting

From the inception of CPFR, forecasting has been one of the primary tasks of CPFR. This phase is related more with the technical aspect of CPFR and where all the data gathered and collaboration arrangements made come into effect. Because of the technical depth of this task, it is important to understand that technical skills will be required for personnel managing this task. The activities related to forecasting are discussed in the next few sections.

Data Collection

Data collection is the first step towards forming a forecast. The data collection can be in the form of Point-of-sale (POS) data or DC withdrawal or manufacturer consumption data. In any of these cases, arrangements have to be made during the collaboration arrangement task. The data collection responsibility is dependent on which business partner is responsible for creating the forecast. Generally, for retail, the most useful data is the POS, which translates directly into consumer demand. In order to collect a reasonable amount of good data to support forecasting, there needs to be certain requirements that should be met. During the data collection process, an integrated data collection system is needed that will help reduce manual work and human error. Furthermore, the data captured should be accessible from multiple locations. Thus, there is a need to have a common accessible data capture and storage system. An example is multi-echelon supply chain system with end-to-end visibility through an EDI link with suppliers. In this case, the data collected can also be shared with business partners for forecasting purposes.

- To what extent are sales or order data collected for forecasting and analysis purposes?
- To what extent is the data accessible by important business partners?
- To what extent is an integrated data collection system utilized?

- To what extent is the data collection process automated?

Forecasting Model Selection

It has been mentioned in several papers that the success of the forecast in CPFR does not depend significantly on the type of model selected. But nonetheless, there needs to be a forecasting model which all business partners can agree upon. Several different types of forecasting models provide different forecasts, and it is a challenge to combine these different forecasts into one output. Thus it is better to have a single forecasting model that meets the needs of all business partners. The selection should be made keeping in mind the technical aspects as well as the level of sophistication the business partners.

- To what extent is there a formal forecasting process available?
- To what extent does the forecasting process meet the requirements of important business partners?

Define Creation of Sales/Order Forecast

The simplicity of CPFR lies in the fact that there is only one forecast that all business partners agree to and implement. It is highly recommended that only one forecast be made for sales, shipping and receipts. Multiple forecasts between departments and within business partners create complications and take more time to resolve and agree upon. Instead, CPFR best practice suggests that only one forecast be made, by any of the partners. The responsibility of creating this forecast can and should be negotiated during collaboration arrangement.

For example, in cases where the retailer or healthcare provider does not have an integrated system of data collection and forecasting, one of the business partners can take up the responsibility of creating the forecast that will be agreed upon by the retailer or healthcare

provider. But in this particular case, each partner involved in CPFR will produce a forecast, thus one forecast for from every business partner. The idea is to have a single forecast for a particular item or a set of items.

- To what extent is there a single forecast shared and adhered to by business partners?
- To what extent are all forecasts consolidated into one single forecast for business purposes?

Evaluate Quality of Forecast

Although creating a forecast may be relatively easy, the quality and depth of forecast is important. Forecasts made on POS data that is distorted due to significant amount of out of stock items at the store level will give a wrong perception of the demand for a particular item. Thus, these issues need to be taken into consideration during the evaluation process. Again, the business partner most suitable to collect good data should be the one responsible for creating the forecast, or at least, should actively take part in the forecasting process. A good quality of forecast is also defined by the ability to forecast sales/orders at trading partner/DC/POS level and SKU. Furthermore, there should be a consistency in the data being shared between the business partners. As a forecast is made and shared, the validation process with the business partners should initiate with the confirmation that there is consistency in the data being used to validate the forecast.

- To what extent is quality of data assessed before creating forecasts?
- To what extent is there a consistency in data when business partners validate the forecast?
- To what extent do the business partners confirm the validity and consistency of the forecast?

Share and Update Forecast

During the share and update forecast process, the business partners share the forecast made and make each other aware of any particular point that might need attention. This process of sharing data should be automated to maintain an error free and optimized process. The particular strength of forecast is that it can be used to adopt a forward looking approach by using the forecast to anticipate demand. Furthermore, the ability to update the system on a weekly/daily/hourly frequency shows the level of maturity in CPFR. Advanced CPFR systems can generally update the frequency on an almost daily basis, thus modifying the forecast based on any change in demand pattern. An important part of sharing the forecast is being able to analyze and manage the forecast. If there are exceptions in a forecast, it can be resolved through a different process, but all business partners understanding the forecasting process and subsequent planning accordingly is imperative to the effective use of the forecast.

- To what extent are forecasts shared between business partners?
- To what extent is the data sharing process automated?
- To what extent is the forecast updated daily?
- To what extent are forecasts utilized to plan future supply chain initiatives

Exception Resolution Process

There are often issues with the forecast that need to be jointly resolved. Forecasts on SKUs that do not seem to be representative of the actual demand can be resolved through an exception resolution process. For example, if forecast accuracy is an issue and a retailer is not comfortable with the current forecast, then business partners can meet to reassess the forecast and make changes. Often, the exception can be identified by setting limits by exception criteria values.

This cooperation can be through phone calls, email or by querying shared data. Thus in this case, real time data sharing is important as this will help resolve issues quickly to positively affect the business process. After the collaboration process in exception resolution is completed, a revised forecast is submitted.

- To what extent is real time data sharing between business partners available?
- To what extent is there an exception resolution process available to resolve issues such as forecast accuracy?
- To what extent are there meetings held between business partners to discuss exception issues?

4.2.2 Order Planning/Forecasting

Order planning/forecasting is the phase where future product ordering and delivery requirements are organized and set. This phase significantly depends upon the forecasting process and is supported by inventory positions, transit lead times, etc. Essentially, this is the phase where the planning for future production or purchases is made and delivery schedules are set accordingly. At this point, the supply chain process still has not gone into the process of production or purchase. The following sections describe the activities involved within this task.

Planning

In the planning phase, future product ordering is planned through the establishment of Economic Order Quantities (EOQ) through the consideration of safety stock levels and review of lead times and other requirements. For example, based on the demand forecast, the manufacturer or supplier can create an EOQ based on lead times and stock level which detail the frequency of shipment and the quantity to be shipped in each shipment to the customer. Planning this phase is

important to translate the forecast into a plan based on which order fulfillment can be achieved. Lack of planning in this phase will not yield the full benefits of forecasting as there will be a gap between what is required and what is delivered.

- To what extent are future orders or shipments planned through the use of Economic Order Quantity or other methods?
- To what extent do future order requirements translate from forecasts made on demand?
- To what extent is the frequency and quantity of items shipped based on economic order quantity or some other optimization method?

Share Order Plan

The core of CPFR is collaboration, and as such, the planning phase is also a collaboration effort. Order plans need to be shared with business partners in order to create visibility into future shipments. Generally the planning phase is initiated and executed by the manufacturer or supplier. In CPFR, the visibility of customers into the future order plans provides the opportunity to manage exceptions. For example, order plans generated for a 6 month period based on the forecast can be amended by the customer if they feel that the plans do not meet their demand needs. This process creates a coherent demand plan more in line with actual demand and the overall business objective, which can be to reduce inventory or to meet a certain level of customer demand.

- To what extent are order plans shared between business partners in advance?
- To what extent are order plans created in advance over a certain period of time?

4.3 Execution

The execution phase generates and transports the order from the supplier to the customer. There are two primary areas in this section, Order Generation and Order Fulfillment. The overall objective of this phase is to transform the forecast into firm demand. Planning supports this phase by providing guidelines to follow. The next sections address the two areas in this section, the activities involved and their requirements.

4.3.1 Order Generation

This task translates forecasts to demand. In general, the retailer task related to this collaboration task is Buying/Re-buying, and the manufacturer task is Production and Supply. But there are other activities required which are generally common for all manufacturing partners. Some of these activities require some specialization that will be discussed in the next section.

Production Planning

The production planning activity requires the time-phased generation of distribution and production orders. Customers who send Purchase Orders (PO) should have an auto PO generation process that will reduce manual work and thus errors. Web based ordering is the most preferred form of sending and receiving PO, and for even more advanced levels, a web-based EDI transmission yields a higher cost to benefit ratio. Advanced shipment notification (ASN) is also essential in the CPFR process as this provides the customer with advance knowledge of future shipments and can help them plan accordingly. Suppliers should receive one consolidated purchase order by shipping point from the customer, which reduces work and makes the process more efficient. A good practice is to match invoices through EDI, which eliminates manual work and is much faster and efficient. EDI is an essential part in this area of CPFR as it helps the

organizations achieve the level of sophistication and efficiency required to successfully implement CPFR throughout the supply chain.

- To what extent is the purchase order (PO) generation process automated?
- To what extent is the PO receiving and sending done through web-based EDI transmission?
- To what extent is advanced shipment notification (ASN) used to notify future shipments?
- To what extent is the invoice matched through EDI or other automated processes?
- To what extent are the sent or received purchase orders consolidated by shipping point?

4.3.2 Order Fulfillment

Order Fulfillment is the process of delivering the product to the customer. This phase is related to logistics, including other general processes for receiving and verifying shipments and making payments. The next section will discuss the activities related to this phase and the requirements.

Delivery Process

Both the supplier and the customer have separate activities and requirements in this phase. Although most activities are common for all business processes, there is a requirement for a certain level of sophistication and practices for CPFR. The very basic steps involve receiving and stocking products on retail shelves, recording sales transactions and making payments. Payments should be made through EDI, as that is much faster and more secure. Electronic based order receiving, such as bar codes on boxes to electronically match the invoice with the PO is a good practice. EDI yields clearer metrics and accountabilities for all business partners. The technology

will enable customers to know when and what is shipped, which in turn will make the receiving process easier.

- To what extent are order receiving electronic based?
- To what extent is the invoice matched with the PO electronically using barcodes, etc.?
- To what extent is EDI technology used in the order receiving/shipping process?

4.4 Analysis

This section includes the areas of Exception Management and Performance Assessment. The primary task of this section is assessment. This enables business partners to bring in necessary changes to their processes. The next sections will discuss the areas and the activities in detail.

4.4.1 Exception Management

This task involves the constant monitoring of planning and operations to identify and manage exceptions in the process. Out-of-bounds conditions are identified and these conditions are then communicated with the business partners and adjusted to bring the situation back to the preferred or optimal condition. The following sections are the activities involved in exception management and the requirements for each activity.

Monitor Planning and Identify Exceptions

All processes must be monitored to ensure that requirements are met. For example, if there is a delay in shipping or an increase in the lead time, then that condition should be identified through the use of proper performance metrics or other tools. In general, it is good practice to have a single point of contact from both sides to discuss such issues and resolve them. These exception conditions, once identified, must be communicated between business partners such

that everyone is aware of the condition and can take necessary steps to accommodate the problem.

- To what extent are processes monitored through the use of metrics or other tools?
- To what extent are exceptions in the process performance that might affect others in the supply chain communicated with business partners?
- To what extent is the communication process between business partners, related to exceptions notifications, easy?
- To what extent is a single point of contact from both sides used to discuss and resolve exceptions?

Comparing Forecast

Exception management can play a vital role in adjusting forecasts. Most forecasting systems are complicated and exception management is often different between organizations, but the underlying principle is that the forecast should be compared to actual demand so that adjustments can be made to future forecasts based on this observation. This is a good practice since it keeps the forecasting process dynamic, more responsive to market change and allows for better inventory control policies.

- To what extent is are the forecasts compared to the actual demand?
- To what extent are future forecasts adjusted based on the knowledge gained from comparing the forecast to the actual demand?

Review Process Issues

This activity is primarily done through meetings between business partners. Out-of-bounds processes are reviewed in these meetings and the correcting process usually takes place during

these meetings. The most preferred form of meeting is a face-to-face meeting but meetings over the phone or live video meetings are effective as well. It is also important to note that all business partners use a common set of performance metrics as this will help standardize the review process. The primary goal of this activity is to correct processes in a manner that will mutually benefit all business partners involved.

- To what extent are out-of-bound processes reviewed during meetings with business partners?
- To what extent are performance metrics or other tools used to keep account of process performance?
- To what extent are key supply chain operations kept under review to identify out-of-bound processes?
- To what extent are face-to-face, phones, or live video meetings used during the review process?
- To what extent do business partners use a common set of performance metrics to standardize the review process?

4.4.2 Performance Assessment

This task involves the assessment of system performance for all business partners. It is a joint effort where the contribution and commitments of the business partners are recognized and future development plans can be formulated and initiated. The next sections will address the activities involved in this task.

Performance Metrics on Key Business Areas

One of the most effective tools for performance assessment is to use performance metrics. The use of metrics on key business areas can help business partners identify areas of improvement and assess their current performance. Metrics are a proven method of assessing performance, but the important aspect is that proper performance metrics be used for each business area. Typical metrics used are market share, revenue, profitability, perfect order attainment, fill rate, turns etc.

- To what extent is the performance of key business areas assessed through the use of performance metrics or other tools?

Goal Achievement

The continuous monitoring and assessment of CPFR goals is important to continue the process and identify areas of improvement. During scheduled meetings, goals achieved should be highlighted while the operations falling behind a pre-set goal should be discussed in order to identify possible improvements. For example, forecast accuracy can be set to be greater than 85% as a goal. During a scheduled meeting, the forecast is evaluated against the actual demand to determine whether forecast accuracy has attained its goal.

- To what extent are goals set for supply chain performance?
- To what extent is goal achievement identified through the use of performance metrics or other tools?

The next section will discuss the development of the readiness model based on the activities identified in this section. In developing the model, these activities are quantified in a manner such that organizations can be scored and assessed based on their performance in each activity.

5 Readiness Model

The readiness model was developed in order to quantify the CPFR activities in a manner such that it can be used to assess the readiness of an organization. An organization can be assessed by rating their performance on each of the activities identified from the research. Performance on each activity can be rated on a scale of 1 to 5, with 5 being the best. Once the activities were identified, it was necessary to be able to assess an organization's performance on each of these activities. One possible method is to rate the performance on a scale. This method was selected primarily because the model needs to have a simple method of collecting data and producing results. In order to make the process of collecting the data easy, the rating method was chosen. Organizations can assess their performance based on estimation, which expedites the process of collecting data and relies more on the analyst's experience and knowledge of their supply chain rather than numeric data.

This section describes in detail how the model was constructed, what assumptions were made during the development process and how the model can be used. The use of the model is illustrated by an example and the output of the model is explained.

5.1 Readiness Model Development

The development of the readiness model follows the VICS CPFR model. This CPFR model is the most widely accepted model in the industry and developing a readiness model based on this structure is more applicable in the industry than any other. As discussed in the previous sections, the VICS CPFR model is divided into four quadrants, with each quadrant containing 2 areas. The readiness model assesses the performance of an organization in each of the eight areas based on a series of questions that were developed in section 4. The questions were developed in a manner such that each question ascertains the different aspects of an activity. Performance on each of

these questions allows the model to calculate an overall performance index, which is then utilized to assess the readiness.

Each CPFR area contains a set of questions that are derived from the activities involved in that area. During the test, the user does not need to complete the test in any specific sequence. Each area is judged independently, this allows the user to complete each area in a non-sequential manner. The questions serve the purpose of collecting data, which is then transformed into a rating.

The scores are transformed into a rating by utilizing the Simple Multi-Attribute Rating Technique (SMART) (Bodily, 1985). This method was selected because of the simplicity of both the response required from the user and the manner in which these responses are analyzed. The 8 CPFR areas were assumed to have varying levels of importance towards the success of CPFR. Although literature review and industry opinion sometimes suggested that some of the areas have similar or equal amount of importance towards the success of CPFR, there are a few areas which are more important to CPFR's success than others. Based on this knowledge, a tool was developed to capture the varying level of importance of each area. The tool is included in Appendix 2. Industry and academic experts, with long standing excellence in CPFR, were asked to assign a weight to each of the 8 CPFR areas. In order to capture the true difference between each of these areas, 'swing weights' were used. Swing weights are designed to capture the range between the least and most preferred options. The decision maker can choose the most preferred area and give it the highest weight, and then the weights of the other areas are assigned based on their importance towards CPFR compared to the most important area. After aggregating all the responses from the academic and industry experts, a table of normalized weights was developed which is then used to calculate the ratings. Weights are a method of assigning importance when

several attributes are present. In this case, in the presence of 8 CPFR areas, the research tried to identify if there exists a varying level of importance within the areas, for their contribution towards the success of CPFR. Industry expert opinion is the base for constructing the weights which, as part of SMART, prioritizes the scores from a set of areas over others.

The readiness of an organization is divided into 4 'Tiers' with Tier 1 being the most advanced level of CPFR and Tier 4 being basic CPFR. The Tiers are developed based on the findings and research from Smith et al, 2010.

The first level of Readiness is Tier 4 that describes organizations that are independent, that is, there are minimal internal and external collaborative practices within the organization.

- These firm's capabilities lies in their ability to execute general business functions.
- The time horizon for business planning is short.
- There is minimal amount of forecast sharing between business partners, and order generation are unplanned and in reaction to market demand rather than in anticipation.
- Organizations at this level collaborate only in sales and order generation.
- At Tier 4, most of the measurement of rewards and penalties, including resources management, are done at the activity or operational level.

The second level of Readiness is Tier 3 that describes organizations that have base level CPFR operations and have an initial effort to promote internal and external collaboration.

- The concentration of collaboration is on key activities or processes that span across the organization and involve multiple departments.

- Internal teams are tasked with decision making and they are capable of executing resource planning and management efficiently.
- The planning horizon for this level is generally medium spanning over a few weeks to 2 months.
- Some level of information is shared between business partners in the form of point-of-sales data or even demand forecasts but the use of data is limited to support sales and operations between organizations.
- Some level of performance measurement is done at the organizational level, but the activity level measures are more accurate and exhaustive.
- There is some level of IT proficiency in the form of inter-departmental links. There is little technology link between business partners and most of the IT system is utilized to support internal operations.

The third level of Readiness is Tier 2 that describes organizations that have collaborative CPFR operations and can engage in significant level of internal and external collaborative practices.

- Teams are formed to facilitate and expedite CPFR collaboration effort between business partners.
- Goals are setup within the organization that drives the organization's core capabilities.
- The planning horizon for Tier 2 organizations are medium-long term spanning from 2 to 12 months for internal planning, but external planning with business partners might still be limited to a few months.

- Data sharing becomes more robust between business partners as more intensive forecast sharing takes place and future initiatives are made known between business partners. These enables business activities such as promotional plans and order plans to be executed.
- Performance measures become more sophisticated as predictive information such as forecast accuracy and revenue plans are measured.
- IT systems begin to link business partners, but the medium of exchange may be spreadsheets

The fourth level of Readiness is Tier 1 that describes organizations that have achieved a sophisticated and robust level of internal and external collaboration.

- Common goals are set between business partners that drive business and supply chain decisions.
- Planning horizon for Tier 1 companies are set anywhere between 18 and 24 months.
- Data sharing is effective between business partners as more sophisticated levels of promotional plans and order plans are included.
- Predictive information sharing becomes strategic as business plans and market strategies are developed between organizations based on shared data.
- Strategic partnerships are created and significant amount of integrated business plans are formed.
- Performance measures include key business indicators such as market share and profitability. Other industry wide measures are also included where appropriate.

- Resources and information are actively shared between business partners to serve a common goal. Resource sharing includes information, people and sometimes even physical resources.
- Enterprise level technology solutions are implemented.
- Performance is measured for all key business factors and exception management processes contentiously improve the level of performance and efficiency of the supply chain and business operations.

The other objective of the readiness model is to suggest a 'Path-of-Progress' for organizations. The idea of the path of progress is to show organizations a path to CPFR advancement within the organization. Based on the fact that not all the CPFR areas are equally important, and that a particular set of combinations of areas may have more impact on CPFR readiness has led to the development of the path of progress. In order to effectively and efficiently progress through CPFR, development needs to be structured with the most important tasks, which will have the maximum effect, completed first and then moving forward with descending level of importance. Through the completion of the questionnaire as shown in Appendix 2, this combination of areas, that will have the maximum effect on the success of CPFR, is developed. The concept is to group together a set of areas where development tasks should be concentrated during the initial stages of CPFR. With the need to optimize resource to gain maximum benefit, the path of progress rubric provides a guideline for resource planning. In the readiness model, the 8 areas are divided into 3 levels of priority. Level 1 receives the highest importance while level 3 has the lowest. Based on the SMART calculations, the model can estimate which area needs more improvement and according to the area's priority level, the path of progress rubric calculates which area needs to be improved first, followed by other areas.

5.2 Using the Readiness Model

The readiness model is spreadsheet based tool designed to give organizations a quick but effective way of measuring and understanding where they currently stand and what they need to do in order to be better prepared for CPFR. Appendix 4 includes a detailed user guide for the model that takes the user step by step through the process of conducting the self-assessment. The spreadsheet is designed around a main menu and subsections. The main menu shows the four sections that the CPFR model is divided into and the 2 areas in each section. In total, there are four major sections that are concerned with CPFR: Strategy and Planning, Demand and Supply Management, Execution and Analysis. The competency in each of these sections determines how well an organization is performing in CPFR and how capable the infrastructure is to implement CPFR. Each of these sections is further divided into 2 areas, which brings another level of depth to the model. The four areas are defined as follows:

Strategy and Planning: This is the first section of the CPFR model. This section defines the establishment of ground rules for collaboration within business partners.

Demand and Supply Management: Project consumer (point-of-sale) demand, as well as order and shipment requirements over the planning horizon

Execution: This section is concerned with the placement of orders, the preparation and delivery or shipments, the receipt and stocking of products, the recording of sales, and making payments.

Analysis: This section includes the areas of Exception Management and Performance Assessment. The primary task of this section is assessment.

Clicking each of the start buttons illustrated in Figure 3 will takes the user to the corresponding section of the CPFR model. A series of questions are asked for each section where

the user rates the organization's strength. Each of the questions pertains to an activity within that area. These activities have been identified and the questions developed in section 4.

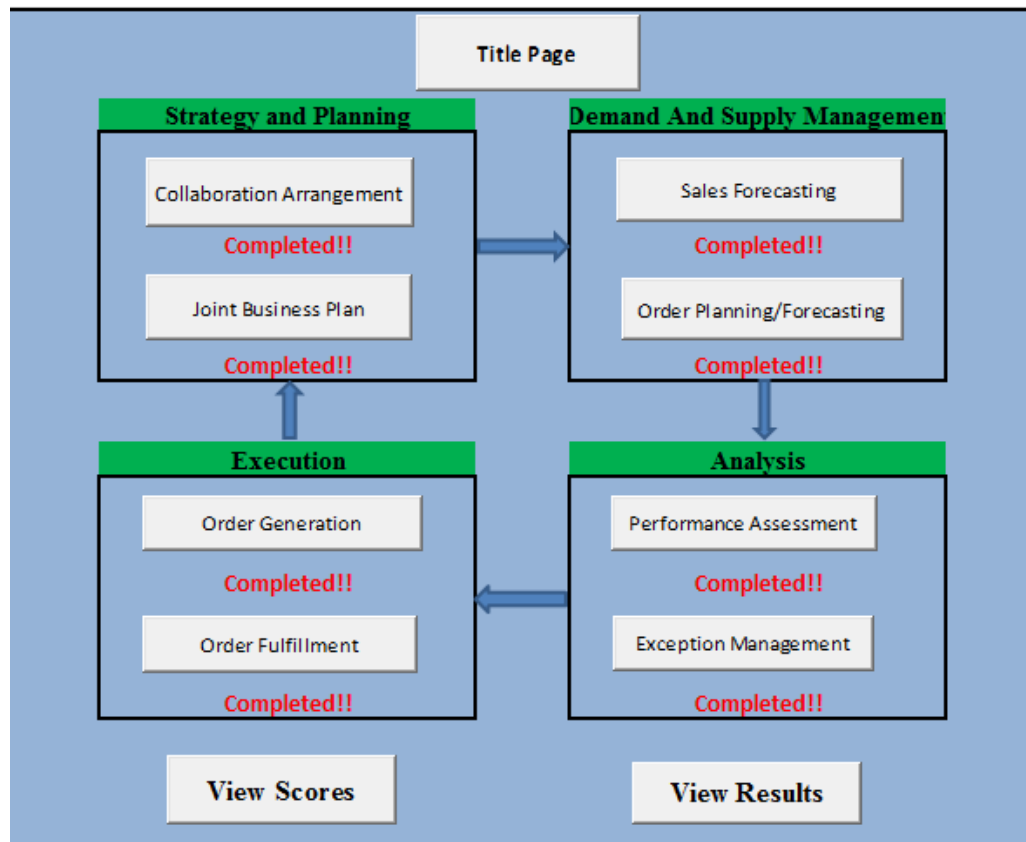


Figure 3: Main Menu

In order to rate the level of excellence, the user is asked to place the letter 'x' in one of the five boxes, corresponding to each question. The score is based on a 1-5 point scale with 5 being the best. The model is indifferent to the use of lower and upper case letters. An example is shown in Figure.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
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Figure 4: Placing the Scores

If any question is left blank, the model will not function properly and will not provide the user with the desired results. In order to ensure that all the questions have been completed, there is a warning sign at the end of the section. Once all the 8 sections have been completed, the user can click on ‘View Score’ and ‘View Results’ buttons from the main menu to view the total scores and the assessment of the organization’s readiness in CPFR.

The scores page shows the individual and total scores for all the self-assessment questions. Figure shows the score for the Sales Forecast section. There are 8 of these tables in total. Once all the tables have been populated with data, the model will generate the SMART table and the results.

Question	Demand and Supply Management
	Sales Forecast
1	1
2	2
3	2
4	2
5	3
6	3
7	2
8	1
9	2
10	2
11	1
12	2
13	2
14	3
15	3
16	2
17	1
18	3

Figure 5: Scores Table

Figure 6 shows the total scores for all the self-assessment questions by each of the 8 CPFR areas. Each area of the CPFR model is given a weight (Column 1) in order to represent its importance towards the success of CPFR. The original normalized weights are provided. The user can change the normalized weights (Column 2) according to their preference in the calculation. But the user must ensure that the normalized weights sum up to 100. A warning message will appear if it does not. If the sum of the normalized weights does not add up to 100, then the readiness calculations will be flawed and the results will not be representative of the actual readiness.

CPFR Areas	Raw Weights	Normalized Weights	Score	Total Possible	Percent Target Met
Collaboration Arrangement	96	15	2415	3075	78.54%
Joint Business Plan	78	12	216	540	40.00%
Sales Forecast	89	13	481	1170	41.11%
Order Planning/Forecasting	88	13	182	325	56.00%
Order Generation	84	13	260	325	80.00%
Order Fulfillment	84	13	104	195	53.33%
Exception Management	66	10	380	550	69.09%
Performance Assessment	75	11	99	165	60.00%
Total	660	100	4137	6345	65.20%

Norm. Weight Check	Sums to 100
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Figure 6: SMART Table

The raw scores are then transformed to a score by multiplying with the weights of each areas and a final score is presented. The column ‘Total Possible’ shows the maximum possible points in that area and ‘Percent Target Met’ shows the score as a percentage of the total possible points.

5.3 Interpreting the Scores and Results

The ‘Results’ button in the main menu takes the user to the results section of the readiness model, which assesses the level of readiness of an organization. The readiness for each CPFR area is also included to illustrate the level of readiness in a particular area as shown in Figure 7. This provides an additional depth to the understanding of an organization’s readiness and allows the user to better understand the need for improvement and the process for improvement. The process for improvement is developed from this concept and illustrated in the ‘Path of Progress’ rubric. In this research, CPFR readiness is assessed in 4 Tiers, where organizations that are in Tier 1 have achieved fully implemented CPFR while organizations in Tier 1 are engaged in minimal CPFR practices. Detailed explanations of the Tiers are discussed in Section 5.1. The overall CPFR Readiness shows the level of readiness the organization has achieved. It is further broken down into CPFR areas and shows where the organization stands in terms of readiness in

each of the areas. For example, Figure 7 shows that while Joint Business Plan is at Tier 3, Order Generation has already achieved Tier 1 status and the organization is doing better in this area than the others. This highlights the need to improve some areas and priority can be shifted from one area to the other.

Overall CPFR Readiness	
Tier 2	
Readiness Assessment	
CPFR Areas	Readiness
Collaboration Arrangement	Tier 2
Joint Business Plan	Tier 3
Sales Forecast	Tier 3
Order Planning/Forecasting	Tier 3
Order Generation	Tier 1
Order Fulfillment	Tier 3
Exception Management	Tier 2
Performance Assessment	Tier 2

Figure 7: CPFR Readiness

The Tiers are developed by taking the SMART scores for each area and benchmarking that score against a scale. Organizations that receive a score between 80 and 100 is at Tier 4, a score between 60 and 80 puts an organizations on Tier 3, a score between 40 and 60 puts the organization at Tier 2 and a score of less than 40 represents Tier 1.

The ‘Path of Progress Rubric’ as shown in Figure 8, suggests the path that can be followed to bring about a structured improvement to CPFR. The rubric was developed based on the SMART analysis scores. A basic approach was followed in the development of the rubric. Any area that has received a score of less than 80 in the SMART calculation is asked to improve. The phases

of improvement are further prioritized based on the area’s level of priority as previously discussed.

Path of Progress Rubric							
CPFR Area	Collaboration Arrangement	Joint Business Plan	Sales Forecast	Order Planning/ Forecasting	Order Generation	Exception Management	Performance Assessment
Priority							
1	Improve	Improve	Improve	Improve			
2					Good Standing		
3						Improve	Improve

Figure 8: Path of Progress Rubric

Priority 1 row shows the area that needs improvement first, followed by Priority 2 and 3 respectively. If the area is highlighted as ‘Improve’, then improvement is required at that area, while ‘Good Standing’ means that particular has achieved a score of more than 80 and does not need immediate improvement. As each CPFR area is improved and the scores changed accordingly, the rubric updates itself and suggests a future course of action.

In the scores section, the two bar charts show the level of achievement both in terms of percentage of the total possible points and in terms of raw score. The achievement chart is a comparison between the scores achieved and the total possible score in each section. This gives a general idea in numeric form of where the organization stands. For example, in Figure 9, Joint Business Plan achieved a score of 216 while the total possible score is 540. This shows that less than half is achieved within the organization in Joint Business Planning, suggesting that there is room for further improvement. These charts are meant to give the user a visual presentation of the SMART scores and the areas of improvement.

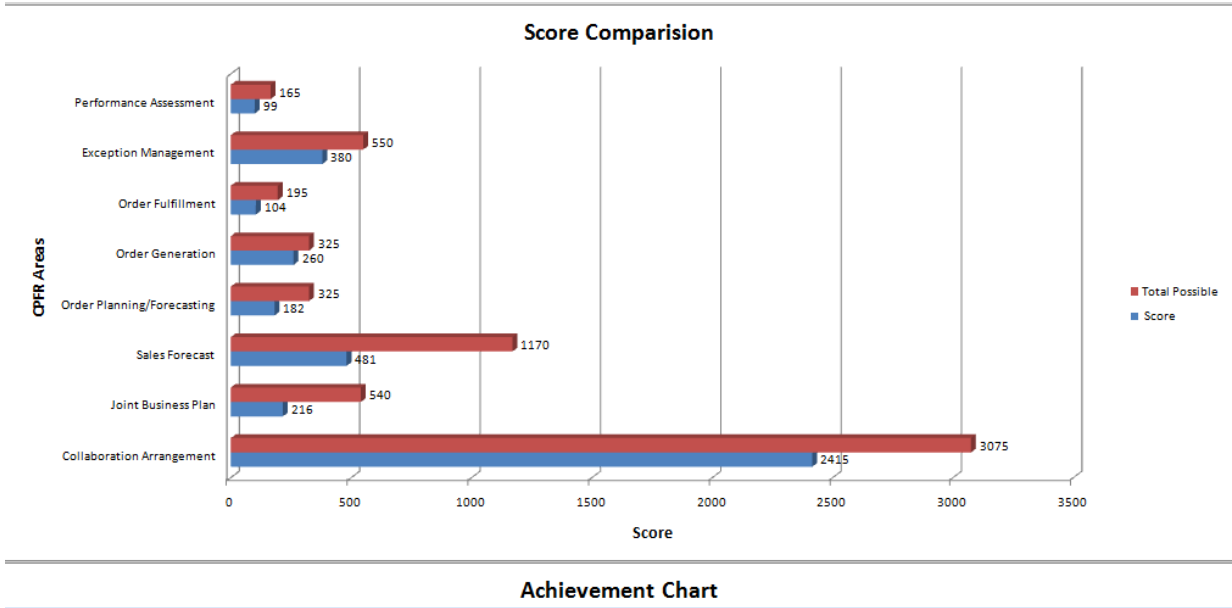


Figure 9: Score Comparison Chart

The next section discusses the validation and evaluation process of the model. In order to properly evaluate the model, it is necessary to investigate industry expert opinion of the model and, if possible, apply the model in the industry.

5.4 Validation and Evaluation

After the development of the model, an evaluation process was developed in order to gather feedback on the model and understand possible areas of improvement. The most appropriate method of evaluating the model is to implement the model in the industry and analyze the response. But due to time constraints and the limited availability of options, an assessment questionnaire was developed. The questionnaire aims to capture the response of industry experts on the effectiveness and usability of the CPFR Readiness Assessment Model.

CPFR has been intensively applied by organizations with significant benefits. It has been proven through application that CPFR can effectively contribute to cost reduction and increased supply chain efficiency. The primary objective is to see if the readiness model is able to capture

all the factors within CPFR, which contribute towards its success. The integration of key supply chain activities is important in CPFR as collaboration efforts depend on the level of integration and its complexity. Through the use of the readiness model, organizations can understand the extent of collaboration required and the integration of the various activities that operates in a mutually supportive manner. To understand the effectiveness of the model in capturing this essence of collaboration and integration, the model needs to be tested through industry application and expert opinion.

The primary objective behind the evaluation of the model is to understand the extent of effectiveness with which the model can assess CPFR readiness. It is required to thoroughly judge and examine the model to ensure that all aspects of the model have met a desired standard. There are very few ways in which the model can be evaluated since research into CPFR have thus far not yielded a significant amount of common understanding. CPFR carries different meaning in different industries, and even between suppliers and customers within the same supply chain. Some tasks and activities are more important to a certain group while that same set of tasks is less prioritized with another group of experts. As such, the model allows the user to change the weights within the SMART calculation in order to accommodate this concept. One part of the evaluation of the model includes the understanding of the current practices in the industry. During the research process, industry experts were asked how they manage their CPFR process and what activities are in place that incorporates the bulk amount of work within CPFR. This enabled the model to account for industry practices that are currently in place. Through this understanding of the industry application of CPFR and the processes involved, the readiness model can be evaluated. Furthermore, literature review yielded a set of proposed CPFR activities and practices that academic experts believe should be part of a CPFR operation. All this

knowledge has been combined to form a core set of activities, which forms the backbone of the model.

The industry expert opinion of the model is the last step in the evaluation process. Users of the tool are asked to evaluate the readiness based on 8 key factors that are believed to affect the performance and accuracy of the model. A questionnaire was developed which addresses the key points of the model and asks the user or the industry expert to rate the model on these points. The questionnaire, included in Appendix 3, investigates the extent to which the model appropriately entails the key activities which enables CPFRR. The questionnaire further goes on to address the usability of the model, the definition of the terms used and the assignment of weights to the different CPFRR areas. The primary purpose of the questionnaire is served through rating the accuracy of the model, the ability to implement the model in any industry and the model's ability to adequately assess an organization's CPFRR readiness. These three questions will directly rate the model and help understand the effectiveness with which the model can assess the readiness. During the development phase, the model was structured in a manner such that it can be applied to any industry. A part of the questionnaire is thus allocated to assessing the model's flexibility and ability to integrate the response from all industries and accurately judge the readiness.

Through industry application, the model can be properly assessed and validated. As part of a continuous improvement process, feedback from the questionnaire and industry data can be incorporated into the model. During the application of the model in an organization, the users will be asked to evaluate the model through the questionnaire after the use of the model. At the same time, the data received from the industry can be analyzed to verify that the results from the model conform to the true state of the organization. Further modification, if required, can be made to the model.

The model assessment questionnaire was distributed in the industry and three responses were received. The respondents were from the retail, manufacturing and the healthcare industry holding a position of manager and above. All the respondents are part of a company that has implemented CPFR with success or are actively looking to implement CPFR and are currently engaged in some CPFR activities and looking to expand the activities to encompass a full CPFR process. The industry experts were asked to rate the model on 8 attributes on a scale of 1 to 5, where 5 being the highest score an attribute can achieve. The responses can be summarized in the following form as shown in Table 5.

Table 5: Model Assessment Summary

Attributes	Average Score
Important CPFR activities addressed in the model	4.00
All terms are clearly defined	3.67
Proper use of weights to assign importance	4.50
Ease of taking the test	4.33
Model adequately assesses CPFR readiness	3.67
Model can be applied across industries	3.67
Usefulness of the model	4
Model accurately represents VICS CPFR	4.5

One of the key indicators of the model's ability to properly assess readiness is the question where experts are asked to rate the model on its capability to assess CPFR readiness with accuracy and effectively. The model receives an average score of 3.67, which takes it to an above average standard. With the highest score being 5, the model receiving a score of 3.67 reflects the fact that the model serves its purpose and can assess readiness with a significant degree of accuracy. But there are still opportunities for improvement to the model, such that the model can be more accurate and effective. On other aspects, such as the proper use of weights

and the accurate representation of VICS CPFR, the model does meet the standard. Both these attributes received a score of 4.5, highlighting the fact that these 2 aspects of the model have been very well addressed and can sufficiently serve its purpose. It is however important to note that, the comparatively low score for the assessment capability of the model can be attributed to a low score for the definition of terms. Several terms were used in the model, which might be foreign to a certain industry or industries. It has been suggested by industry experts that CPFR is still not clearly understood by many organizations, and the terms used to define CPFR activities are thus unknown by many. It has been suggested that there be an overview of CPFR within the model to inform the user about CPFR and the overall objective of CPFR. Some of the low scores for the ability to implement this model across various industries and assessing CPFR readiness can be attributed to the fact that not all terms are clearly defined and there is a lack of understanding of the objective of these terms. Because of lack of knowledge of the terms, the actual objective of some of the self-assessment questions might have been misunderstood, leading to a low score for the model's assessment capability.

Nonetheless, through the collection of more industry opinion, a better understanding of the model's capabilities and accuracy can be formed. Thus far, the model has been evaluated with the opinion of 3 industry experts. As more opinion is gathered as part of the continuous improvement process, a better understanding of the model's improvement opportunities can be formed. As the model currently stands, it can be said with a certain level of certainty that the model is capable of assessing CPFR readiness. Certain improvement opportunities exist, such as defining the terms more accurately and introducing more activities such that more CPFR activities are included in the model. With the proposed future improvement of these 2 attributes, it is possible that ratings for the other attributes, including the ability to assess CPFR, will see

significant improvement. More industry opinion will be helpful before making a definitive statement regarding the model’s accuracy and effectiveness. But the responses received so far do support the assumption that the model is adequate to assess CPFR readiness and can perform the task it is designed for.

The validation of the model can only be achieved through industry application of the model. Thus far, only one organization has completed the test. But the data received show promising results. The organization’s overall CPFR readiness is at Tier 2 readiness, which is significantly close to the actual level of CPFR proficiency of the organization. There are several CPFR areas in which the company excels and receives a Tier 1 readiness level. The areas that received Tier 2 level of CPFR readiness still have opportunities for improvement. But the key factor is that the company is a supplier to a retailer. This means that certain CPFR areas get more priority over the others. This is because of the company’s business structure and the industry it serves. The data shows that areas such as order planning/forecasting, order generation and order fulfillment are at Tier 1 as shown in Figure 10. This clearly represents that the supplier prioritizes these areas since these areas are part of the customer support system.

Readiness Assessment	
CPFR Areas	Readiness
Collaboration Arrangement	Tier 2
Joint Business Plan	Tier 2
Sales Forecast	Tier 2
Order Planning/Forecasting	Tier 1
Order Generation	Tier 1
Order Fulfillment	Tier 1
Exception Management	Tier 2
Performance Assessment	Tier 1

Figure 10: Company Readiness Profile

As such, the company has excelled in these areas while other areas, that are not so important for their business process, are given less attention. Although one example cannot be used for validation purposes, it establishes the ground work for the validation process. From what can be seen thus far, the model is fairly accurate in estimating CPFR readiness. The assessment process and the validation process so far have yielded consistent results. Although the sample size is small, the consistency of the results throws light on the fact that the model is fairly accurate in assessing CPFR readiness and that more data collection will lead to a satisfactory conclusion to the readiness assessment capability of the model.

Because of the fact that CPFR is an applied industry practice, the assessment and verification of the model is incomplete without industry opinions and data. Thus, the assessment and validation of the model is a long-term process, where significant amount of industry data and expert opinion can shape the understanding of the effectiveness of the model and identifying the opportunities for improvement.

6 Summary

This section presents the conclusion of the research, the expected contributions to industry and academia and a discussion on future research possibilities.

The primary objective of this research is to establish a basic level of understanding in CPFR readiness. CPFR is a supply chain as well as a business practice. In order to understand the level of specialization required to effectively implement CPFR, organizations are asked to go through a series of tests and self-assessments. This research makes an effort to bring together the key supply chain practices and activities that enables CPFR. With the knowledge of these activities, the model allows organizations to quantify their effectiveness in executing these activities. Based on this measure, organizations are then assigned a level of readiness. With the evolution of the

supply chain and the constant rising demand to become lean and effective, new methods and procedures might be introduced into CPFR. Originally, CPFR was introduced to better meet customer demands, but since its introduction, it has become more dynamic and has started to incorporate more aspects of supply chain. As a result, CPFR has led to cost savings, better supply chain practices and effective collaboration between business partners.

This research contributes towards establishing an initial understanding of an organization's supply chain practices and level of efficiency in executing these practices. Through industry study and literature review, key supply chain activities have been identified and included in the model, which is pivotal to the success of CPFR. Through the implementation of these practices and achieving a significant level of competence in the execution of the activities, organizations can receive the benefits of CPFR. The level of benefit that can be gained is tied to the extent to which competence is attained in the each of the activities. Execution of the activity does not guarantee success until unless it is performed at an acceptable standard. The model does not, however, rate the readiness of an organization based on each individual activity, but on the overall performance within a CPFR area. It can be a future research possibility to explore the effect of individual activities. However, individual activity might not contribute significantly towards overall CPFR performance. CPFR is a collective form of action, with the best results attained through a good performance of a collective set of actions. Thus, judging individual activity might not contribute significantly to good CPFR performance.

Organizations that do choose to utilize the CPFR readiness model might do so as an initial step towards understanding the requirements for a successful CPFR. Quiet often, initiatives are taken without realizing the extent of commitment required for that initiative to be beneficial. In order to assist organizations to properly understand the requirements and the commitment

required to successfully implement CPFR, the readiness model investigates key activities within CPFR and incorporates the performance aspect as well. Armed with the knowledge of what capabilities the organization currently possess and skills that needs to be developed, organizations can effectively map a course of action. The model can also assist in this regard through the use of the Path-of-Progress rubric. At a high level, the rubric suggests developments that are necessary to gain the maximum benefit of investment. With constrained resources and the need to have acceptable return on investment, the Path-of-Progress can bring a structure to the development process.

This thesis is expected to make several contributions towards the understanding of implementing CPFR in the industry with an emphasis on the healthcare sector. These expected contributions are listed below.

1. Documenting the CPFR process in a retail environment.
2. Documenting key activities which enable CPFR operations
3. Development of a readiness assessment model through which organizations can assess their current readiness level and improvement their CPFR process.
4. Identification of important issues regarding the success of CPFR and understanding a 'path of progress' in terms of CPFR readiness.
5. A future analysis of the gap between retail and healthcare CPFR readiness and understating the measures necessary to bridge the gap.

As part of the future research opportunities, it might be possible to compare healthcare and retail organizations in terms of their readiness in CPFR. This model can effectively contribute in the healthcare industry. As healthcare organizations remodel and restructure their supply chain to meet patient and cost savings need, they can compare their progress against the retail industry

which already has a long standing excellence in supply chain management and execution. Collection of data from the retail industry would enable the tabulation of data in a non-identifiable manner for benchmarking purposes. Retailers stepping into the realm of CPFR and the healthcare industry can benchmark themselves against organizations that have an established CPFR process.

With the constant changing dynamics of supply chain and the introduction of new best practices, there are opportunities for improvement to the model. The current model investigates the activities associated with CPFR. A step further in the development of the model can include the identification of resources that enables these activities. It is important for organizations to understand the required resources for CPFR and their impact on the success of CPFR. Thus it might be worthwhile to investigate how different resources can affect CPFR activities and how the introduction of new technologies might assist in the development of CPFR. The scale of the research can vary depending on the depth of the research, but an investigation along this line can help organizations better prepare for CPFR.

As previously mentioned, supply chain practices are constantly evolving as new technologies are introduced and new methods are established. The model needs to evolve along with the changes in supply chain practices in order for the model to be effective and accurate in assessing CPFR readiness. Thus there is a need for a continuous improvement process that should identify new CPFR activities and investigate other practices that are not included in this model but has the ability to affect CPFR performance. With the evolution of the supply chain, this model needs to stay updated through continuous improvement process.

Part of the future work also includes the validation and evaluation of the model. Without its application in industry, the model cannot be fully validated. Expert opinion, collected through

the implementation of the model in an industry, can shape future course of action as to how the model should be modified in order to be representative of actual CPFR readiness.

From the perspective of this research, the CPFR readiness assessment model can be implemented in other industries as an initial step towards implementation of CPFR or as a benchmarking tool to understand the current readiness in CPFR.

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8 Appendix 1: Request for Interview Letter Format

Tanvir Sattar
Department of Industrial Engineering
4134 C, Bell Engineering Center
1 University of Arkansas
Fayetteville, AR 72701

Date:

Name:

Title:

Company Name:

Address:

City, State, and Zip:

Dear (Name),

Let me introduce myself, I am Tanvir Sattar, a MS student in the Industrial Engineering Dept. at the University of Arkansas. I am investigating CPFR as a supply chain best practice under the guidance of Dr. Manuel Rossetti. Thank you for providing us the opportunity to talk to you about CPFR, we appreciate your assistance with this project.

Working within the Center for Innovation in Healthcare Logistics at the University of Arkansas, we have been performing a study to understand the differences between the retail and healthcare

supply chains. Based on the feedback from an industry steering committee, the project is targeting Collaborative Planning Forecasting and Replenishment (CPFR) as a best practice for potential impacts within the healthcare industry.

For that purpose, we are trying to understand the CPFR process and as an industry practitioner, your opinion and views are important. A questionnaire is also included with this correspondence. This document is only intended to serve as a guideline and to give you an idea of the kind of information I was hoping to receive from our interview. Please feel free to ask me any question for clarification on the questionnaire.

We can have a phone conversation about CPFR or I can come to your office, whichever will be convenient to you. My schedule will allow me to be available at these times every week: Please feel free to contact me by email at tsattar@uark.edu or by phone at 479-276-0384. I look forward to hearing from you. Thank you

Sincerely

Tanvir Sattar

9 Appendix 2: CPFR Area Weight Assessment Tool

This document is designed to understand the importance of each of the 8 tasks in the VICS CPFR model. Some of the tasks might only be involved in an advanced CPFR process and are not a necessity in a system which has implemented CPFR to a basic level. At the same time, some of the tasks can be foundational towards developing a CPFR process and are necessary to establish and properly execute a CPFR process. If there exists such an importance, then each of

these tasks can influence the CPFR process at varying degrees. Thus the success of a CPFR process can depend on how well a particular task is accomplished and not so much on another. This document is designed to understand the impact of each of the 8 tasks towards the overall success of CPFR.

On a scale from 1 to 5, with 5 being very important towards the success of CPFR and 1 being the least important to the success

1. Please rate the importance of execution of each of these tasks in terms of their contribution towards the success of the VICS CPFR process. (Please place a ‘x’ beside the number you would like to rate)

- Collaboration Arrangement

1	2	3	4	5
---	---	---	---	---

- Joint business plan

1	2	3	4	5
---	---	---	---	---

- Sales Forecast

1	2	3	4	5
---	---	---	---	---

- Order planning/forecast

1	2	3	4	5
---	---	---	---	---

- Order generation

1	2	3	4	5
---	---	---	---	---

- Order Fulfillment

1	2	3	4	5
---	---	---	---	---

- Exception Management

1	2	3	4	5
---	---	---	---	---

- Performance Assessment

1	2	3	4	5
---	---	---	---	---

2. Out of the 8 tasks of CPFR, if you were forced to choose one of the tasks which will have the most influence on the success of CPFR, which one will it be?(Please place a 'x' in the cell you would like to rate)

- Collaboration Arrangement

- Joint business plan

- Sales Forecast

- Order planning/forecast

- Order generation

- Order Fulfillment

- Exception Management

- Performance Assessment

3. Consider the above selected task. How would you rank the remaining 7 tasks from 2nd most important to 8th most important in terms of their importance towards the success of CPFR? At this stage, there can be no ties for a certain position. For example, if collaboration is the most important task selected in the previous question, then, joint business plan is 2, sales forecast is 3 and so on.

(Please place an 'x' beside the number you would like to rate)

- Collaboration Arrangement

2	3	4	5	6	7	8
---	---	---	---	---	---	---

- Joint business plan

2	3	4	5	6	7	8
---	---	---	---	---	---	---

- Sales Forecast

2	3	4	5	6	7	8
---	---	---	---	---	---	---

- Order planning/forecast

2	3	4	5	6	7	8
---	---	---	---	---	---	---

- Order generation

2	3	4	5	6	7	8
---	---	---	---	---	---	---

- Order Fulfillment

2	3	4	5	6	7	8
---	---	---	---	---	---	---

- Exception Management

2	3	4	5	6	7	8
---	---	---	---	---	---	---

- Performance Assessment

2	3	4	5	6	7	8
---	---	---	---	---	---	---

4. Based on question 2, the most important task for the success of CPFR is automatically **given a score of 100**. Please assign a score between 1 and 99 to each of the 7 tasks to represent their importance towards the success of CPFR. These scores will be essentially used to assign a weight on the importance of each task towards the success of CPFR. Multiple tasks can have the same score meaning that multiple tasks carry equal importance towards the success of CPFR.

An example is: if Collaboration Arrangement is selected as the most important task from question 2, then joint business plan might receive a score of 70 and sales forecast might receive a score of 90.

(Please put the scores in the boxes below each task)

- Collaboration Arrangement

- Joint business plan

- Sales Forecast

- Order planning/forecast

- Order generation

- Order Fulfillment

- Exception Management

- Performance Assessment

Several tasks work together towards the success of CPFR. A particular combination of a group of tasks might be more important towards the success of CPFR than a combination of others. The

objective of question 5 is to gain an understanding between the relationships of 2 tasks towards the overall success of CPFRR.

10 Appendix 3: Readiness Model Assessment Questionnaire

Instructions for Readiness Model Assessment Tool

Thank you for assisting us as we investigated and developed knowledge concerning CPFRR practices within industry.

There are a total of 8 questions in the questionnaire that will assess the effectiveness and usability of the CPFRR Readiness Assessment Model.

Steps

1. Please review the CPFRR Readiness Assessment Model and the provided user's guide. You should not need to fully utilize the Readiness Assessment Model in order to complete the questionnaire. A simply review of the tool and its functionality should be sufficient.
2. After that, it should take only a few minutes to complete the readiness model assessment questionnaire, which starts on the next page of this document.
3. Email your completed questionnaire to one of the contacts listed below.
4. (Optional) If time permits, we invite you to test the readiness tool. The tool should be able to rate your current CPFRR readiness standing and illustrate possible areas of opportunity for development.
 - a. Completing the CPFRR Readiness Assessment Model will take anywhere between an 1 – 1.5 hours depending on the availability of information and the level of sophistication of your organization's current operations.

- b. Email a copy of your completed assessment to one of the contacts listed below. The data received will be held in strict confidence and will not be distributed. We will summarize the data from a number of organizations in a non-identifiable manner in order to understand how helpful the model is to organizations.

Our research team appreciates you taking the time to assist us in this regard. If you have any questions concerning how to perform the assessment, please feel free to contact us.

Readiness Model Assessment Questions

The rating is based on a score of 1 to 5, 1 being the lowest score and 5 being the highest. Please share your comments, opinions, thoughts or improvement ideas about the CPFR readiness model and/or each of the assessment areas.

- 1. Please rate the extent to which the important aspects/activities of CPPR have been covered in this readiness model

1	2	3	4	5

Comments:

2. Please rate the extent to which you feel that the terms used in the model are clearly defined and understandable

1	2	3	4	5

Comments:

--

3. Please rate the extent to which the model adequately assigns importance, through the use of weights, for each of the eight areas of CPFR (e.g.: Collaboration Arrangement and Joint business plan)

1	2	3	4	5

Comments:

--

4. Please rate the ease with which the self-assessment can be conducted

1	2	3	4	5

Comments:

--

5. Please rate the extent to which you feel that the model can adequately assess an organization's CPFIR readiness

1	2	3	4	5

Comments:

--

6. Please rate the extent to which you feel the readiness model can be applied across various industries

1	2	3	4	5

Comments:

--

7. Please rate your satisfaction about the usefulness of this model

1	2	3	4	5

Comments:

--

8. Please rate your satisfaction on the accurate representation of VICS CPFR model by this readiness model

1	2	3	4	5

Comments:

--

General Comments

--

11 Appendix 4: CPFR Readiness Model User's Guide



CPFR Readiness Model: User's Guide

CENTER FOR INNOVATION IN HEALTHCARE LOGISTICS

Professor Manuel Rossetti
Tanvir Sattar
Associate Professor Edward Pohl
Dr. Vijith Varghese



University of Arkansas, Center for Innovation in Healthcare Logistics

Welcome to the CPFR Readiness model. This model enables an organization to measure its readiness in implementing CPFR. The readiness model is designed to give organizations a quick but effective way of measuring and understanding where they currently stand and what they need to do in order to be better prepared for CPFR. This manual will guide you through the use of the model and interpretation of the results.

Getting Started

After opening the Excel file, you will be introduced to the title page of the model. When you open the excel file, a security warning will appear on a ribbon on the top of the pages shown in Figure 1. Please click ‘Options’, select ‘Enable Content’ and click ok (Figure 2). This will activate the macros that run in the background. Please click on the ‘Main Menu’ button to start using the tool. This is the home page for the readiness model.

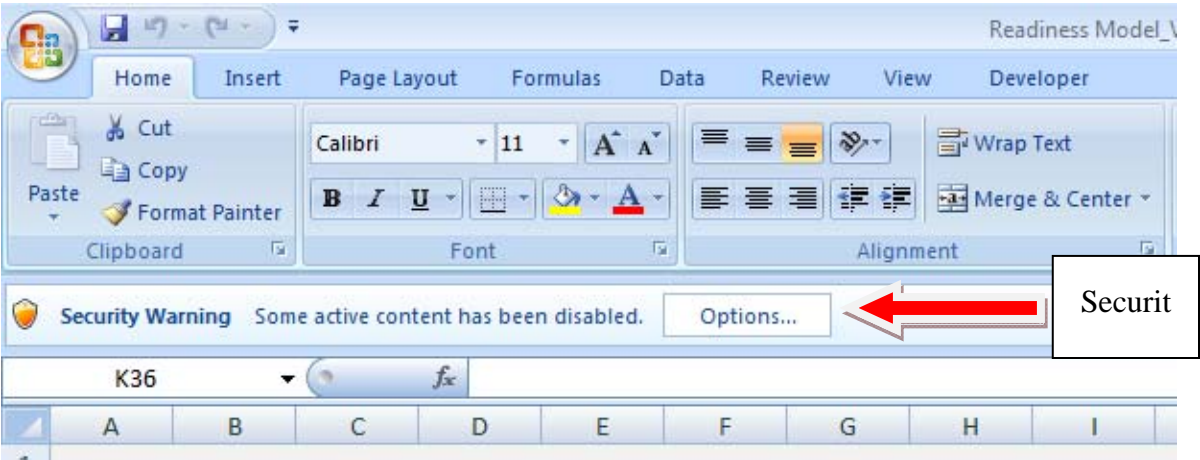


Figure 11: Security Warning



Figure 12: Enabling Macro

The main menu shows the four sections that the CPFRR model is divided into and the 2 areas in each section. The CPFRR model pertinent to this study is proposed by Voluntary Interindustry Commerce Solutions (VICS). In total, there are four major sections that are concerned with CPFRR: Strategy and Planning, Demand and Supply Management, Execution and Analysis. The competency in each of these sections determines how well an organization is performing in CPFRR and how capable the infrastructure is to implement CPFRR. Each of these sections is further divided into 2 areas, which brings another level of depth to the model. The four areas are defined as follows:

Strategy and Planning: This is the first section of the CPFRR model. This section defines the establishment of ground rules for collaboration within business partners.

Demand and Supply Management: Project consumer (point-of-sale) demand, as well as order and shipment requirements over the planning horizon

Execution: This section is concerned with the placement of orders, the preparation and delivery or shipments, the receipt and stocking of products, the recording of sales, and making payments.

Analysis: This section includes the areas of Exception Management and Performance Assessment. The primary task of this section is assessment.

The next few sections will take you through the process of taking the assessment test. These sections will show you how your input is translated into a score and what that score means for your organization in terms of its readiness.

Taking the Assessment Test

Clicking each of the start buttons illustrated in Figure 3 will take you to the corresponding section of the CPFR model. A series of questions are asked for each section where the user rates the organization's strength. Each of the questions pertains to an activity within that area. These activities have been identified as key factors for the success of CPFR. Thus, the level of excellence in each activity will determine the organization's readiness.

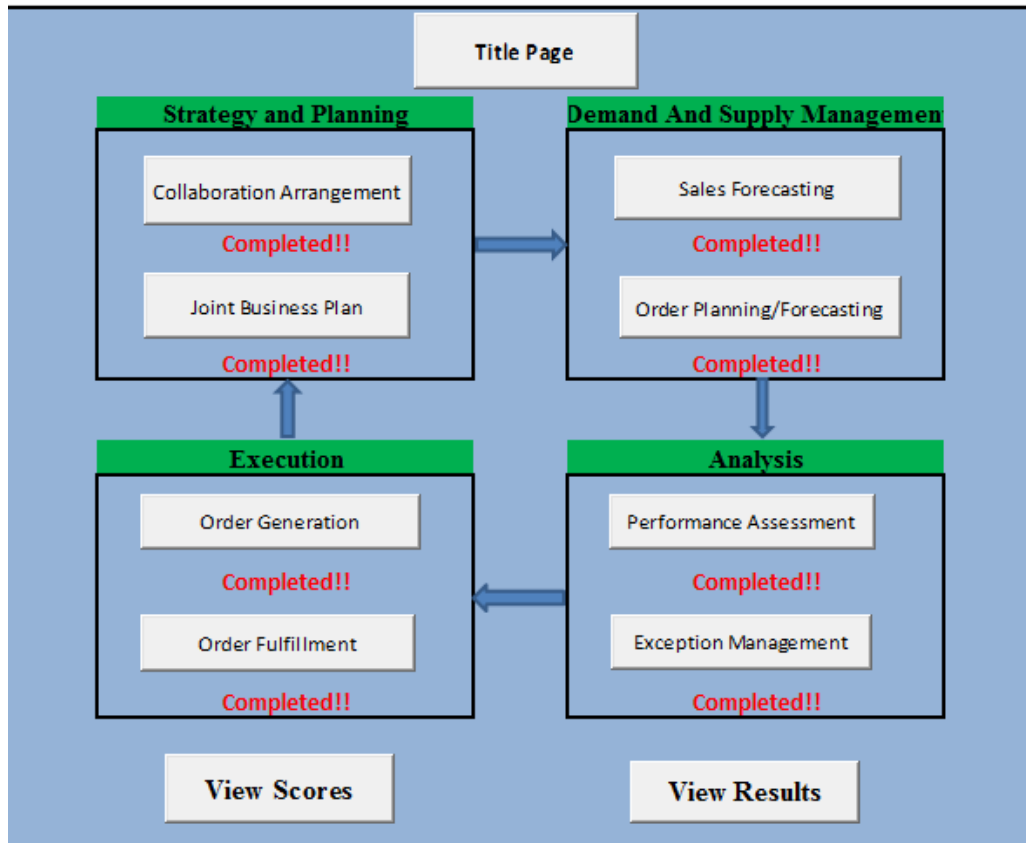


Figure 13: Starting the Test

In order to rate the level of excellence, please place the letter ‘x’ in one of the five boxes, corresponding to each question. The score is based on a 1-5 point scale with 5 being the best. The model is indifferent to the use of lower and upper case letters. An example is shown in Figure 4. In order to remove a score, please select the cell with the ‘x’ and press ‘delete’ on your keyboard. This will erase the rating. Only one of the 5 boxes can have a score, if you attempt to put two scores on the same question, the model will show you an error.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
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19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	

Strategy and Planning

This is the first section of the CPFR model which defines the establishment of ground rules for collaboration within business partners

Please scroll down the page for more questions and for options to return to main menu
All Scores are based on a 1-5 point scale with 5 being the best

Back To Main Menu Clear All Scores

Collaboation Arrangement

1 To what extent is your organization's business plan aligned with long term strategy? 1 2 3 4 5

2 To what extent is there a set of goals which drive business or collaboration effort? 1 2 3 4 5

3 To what extent are the goals viewed as strategic imperative? 1 2 3 4 5

4 To what extent is current business plan utilized to identify

4.1 Future business opportunities? 1 2 3 4 5

Figure 14: Placing the Scores

If any question is left blank, the model will not function properly and will not provide you with the desired results. In order to ensure that all the questions have been completed, there is a warning sign at the end of the section. If all questions are answered, the sign will show 'This section is complete!!' section. If a question is left unanswered, the warning sign will say 'Error!! Please fill out all questions before continuing'. Figures 5 and 6 show this with an example.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
136																			
137																			
138																			
139																			
140																			
141																			
142																			
143																			
144																			
145																			
146																			
147																			
148																			
149																			
150																			
151																			
152																			
153																			
154																			
155																			
156																			

28 To what extent is there an agreement between business partners to maintain a quality and standard of data? 1 2 3 4 5

29 To what extent is there a defined set of responsibilities for all supply chain activities? 1 2 3 4 5

30 To what extent is internal collaboration between departments present within the organization? 1 2 3 4 5

31 To what extent does your organization have assigned a frontline collaborator to work with your business partner? 1 2 3 4 5

This section is complete!!

Figure 15: Properly Completed Section

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
136																			
137																			
138																			
139																			
140																			
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154																			
155																			
156																			

28 To what extent is there an agreement between business partners to maintain a quality and standard of data? 1 2 3 4 5

29 To what extent is there a defined set of responsibilities for all supply chain activities? 1 2 3 4 5

30 To what extent is internal collaboration between departments present within the organization? 1 2 3 4 5

31 To what extent does your organization have assigned a frontline collaborator to work with your business partner? 1 2 3 4 5

Error!! Please fill out all questions before continuing

Figure 16: Section Missing a Score

Section 1: Strategy and Planning

The first section is concerned with Strategy and Planning aspect of CPFR. This section of the CPFR model defines the establishment of ground rules for collaboration within business partners. In total, there are 40 questions in this section; please answer all of them to the best of your knowledge. These questions assess your organizations ability to co-ordinate, collaborate and set business rules for both within the organization and with business partners.

Once this section is complete, you can press the 'Back to Main Menu' button to go back to the home page to complete the other sections or view your scores and results.

Section 2: Demand and Supply Management

The next section is concerned with Demand and Supply Management. It is concerned with projecting consumer (point-of-sale) demand, as well as order and shipment requirements over the planning horizon. This section contains a total of 23 questions. Please follow similar procedures for this section as you did in the previous one. Once this section is complete, you can press the 'Back to Main Menu' button to go back to the home page to complete the other sections or view your scores and results.

Section 3: Execution

The next section is concerned with Execution. The primary concern of this section is placing orders, preparing and delivering shipments, receiving and stocking products, recording sales and making payments. This section contains a total of 8 questions. Please follow similar procedures for this section as you did in the previous one. Once this section is complete, you can press the 'Back to Main Menu' button to go back to the home page to complete the other sections or view your scores and results.

Section 4: Analysis

The last section is concerned with Analysis. This section includes the areas of Exception Management and Performance Assessment. The primary task of this section is assessment of the organization's performance in the other areas and achievement of goals set forth. This section is also concerned with the development of processes and identifying areas of improvement. This section contains a total of 14 questions. Please follow similar procedures for this section as you

did in the previous one. Once this section is complete, you can press the ‘Back to Main Menu’ button to go back to the home page to complete the other sections or view your scores and results.

In order to complete the assessment, please complete all the 8 sections in the model. Once all the sections have been completed please click on ‘View Score’ and ‘View Results’ from the main menu to view your total scores and the assessment of your organization’s readiness in CPFR.

Interpreting the Scores

The scores page shows the individual and total scores for all the self-assessment questions. Figure 7 shows the score for the Sales Forecast section. There are 8 of these tables in total.

Question	Demand and Supply Management
	Sales Forecast
1	1
2	2
3	2
4	2
5	3
6	3
7	2
8	1
9	2
10	2
11	1
12	2
13	2
14	3
15	3
16	2
17	1
18	3

Figure 17: Individual Scores for a Section

Figure 8 shows the total scores for all the self-assessment questions by each of the 8 CPFR areas. Each area of the CPFR model is given a weight (Column 1) in order to represent its importance towards the success of CPFR. The original normalized weights are provided. You can change the normalized weights (Column 2) according to your preference in the calculation. But please ensure that the normalized weights sum up to 100. A warning message will appear if it does not. The raw scores are then transformed according to the weights of each area and a final score is presented. The column 'Total Possible' shows the maximum possible points in that area and 'Percent Target Met' shows your score as a percentage of the total possible points.

CPFR Areas	Raw Weights	Normalized Weights	Score	Total Possible	Percent Target Met
Collaboration Arrangement	96	15	2415	3075	78.54%
Joint Business Plan	78	12	216	540	40.00%
Sales Forecast	89	13	481	1170	41.11%
Order Planning/Forecasting	88	13	182	325	56.00%
Order Generation	84	13	260	325	80.00%
Order Fulfillment	84	13	104	195	53.33%
Exception Management	66	10	380	550	69.09%
Performance Assessment	75	11	99	165	60.00%
Total	660	100	4137	6345	65.20%

Norm. Weight Check	Sums to 100
--------------------	--------------------

Figure 18: Total Score Table

The two bar charts show the level of achievement both in terms of percentage of the total possible points and in terms of raw score. The achievement chart is a comparison between the scores achieved and the total possible score in each section. This gives a general idea in numeric form of where the organization stands. For example, in Figure 9, Joint Business Plan achieved a score of 216 while the total possible score is 540. This shows that less than half is achieved within the organization in Joint Business Planning, suggesting that there is room for further improvement.

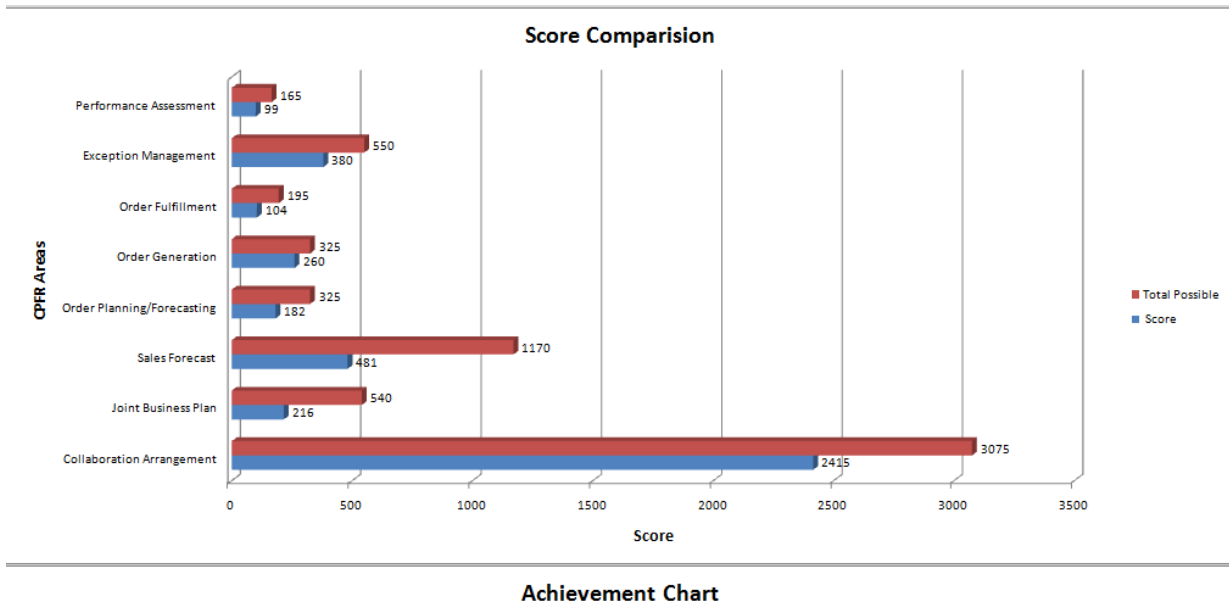


Figure 19: Score Comparison Chart

The second chart, shown in Figure 10, represents the same information in terms of percentage.

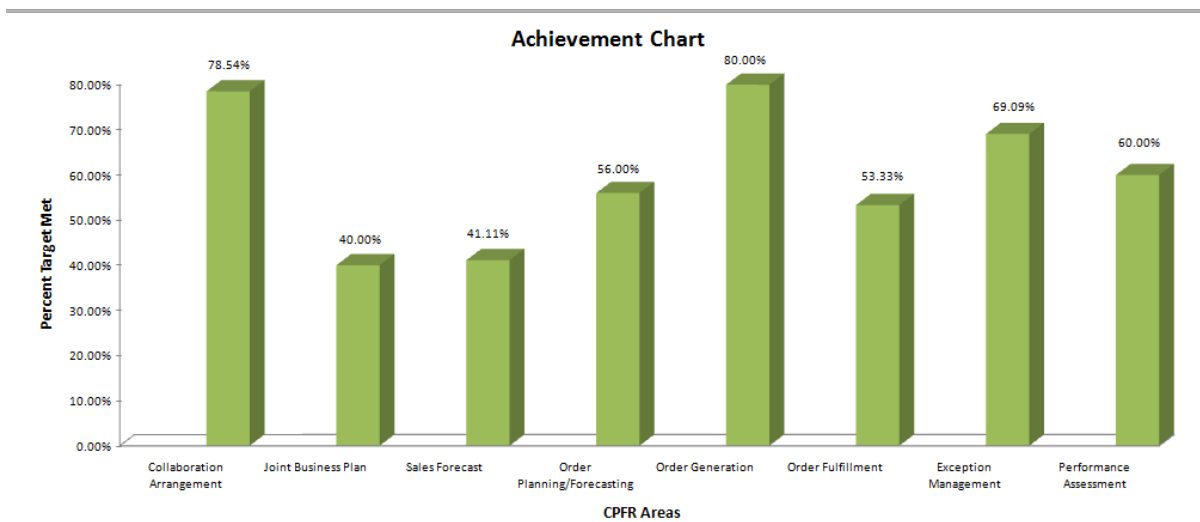


Figure 20: Achievement Chart

Please press the 'Back to Main Menu' button at the top of the page to go back to the main menu.

From the main menu please press the 'View Results' button to see your result and analysis.

Results and Analysis

The ‘Results’ button in the main menu shows the level of readiness of your organization. The readiness for each CPFR area is also included to illustrate the level of readiness in a particular area as shown in Figure 11. The readiness is assessed in 4 Tiers, where organizations that are in Tier 1 have achieved fully implemented CPFR while organizations in Tier 1 are engaged in minimal CPFR practices. The overall CPFR Readiness shows the level of readiness the organization has achieved. It is further broken down into CPFR areas and shows where the organization stands in terms of readiness in each of the areas. Figure 11 shows that while Joint Business Plan is at Tier 3, Order Generation has already achieved Tier 1 status and the organization is doing better in this area than the others. This highlights the need to improve some areas and priority can be shifted from one area to the other.

Overall CPFR Readiness	
Tier 2	
Readiness Assessment	
CPFR Areas	Readiness
Collaboration Arrangement	Tier 2
Joint Business Plan	Tier 3
Sales Forecast	Tier 3
Order Planning/Forecasting	Tier 3
Order Generation	Tier 1
Order Fulfillment	Tier 3
Exception Management	Tier 2
Performance Assessment	Tier 2

Figure 21: Readiness Assessment Table

The 'Path of Progress Rubric' as shown in Figure 12, suggests the path that can be followed to bring about a structured improvement to CPFR. Due to constraint in resources and the need to prioritize, the rubric will suggest a path of action, which can give the organization maximum return from CPFR. For example, industry opinion and research has shown that first improving collaboration arrangement over order generation will have a better impact on the success of CPFR.

Path of Progress Rubric							
CPFR Area	Collaboration Arrangement	Joint Business Plan	Sales Forecast	Order Planning/ Forecasting	Order Generation	Exception Management	Performance Assessment
Priority							
1	Improve	Improve	Improve	Improve			
2					Good Standing		
3						Improve	Improve

Figure 22: Path of Progress Rubric

Priority 1 row shows the area that needs improvement first, followed by Priority 2 and 3 respectively. If the area is highlighted as 'Improve', then improvement is required at that area, while 'Good Standing' means that particular area does not need immediate improvement and energy and resources can be focused to improve other areas if available. As each CPFR area is improved and the scores changed accordingly, the rubric will update itself and suggest a future course of action.

The description for the different level of readiness Tiers are shown in the model. You can click on the 'Description of Tiers' button at the top of the Results page to view the description. Information is provided on what an organization is required to do in order to qualify to be in a particular tier. Your organization can use these guidelines to better understand where they stand and view the possible improvement area available.

Thank you for using the CIHL CPFR Readiness Model. Please send us any feedback or opinion for improvement to the model.

We would request you to send us your completed workbook. The information will be tabulated in a non-identifiable manner for benchmarking purposes. The information and your organization will not be identified and will be held in strict confidentiality. The information will only be used in summary form for future research and development purposes. We appreciate your contribution towards our research.

Contacts:

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12 Glossary

Internal process orientation: Separate departments cooperate internally to facilitate companies to focus on the activities that fulfill the goal of achieving customer satisfaction.

External collaboration: Collaboration efforts between business partners in an industry in the area of forecasting, planning and replenishment.

Collaborative Innovation: Innovating and creating collaborative measures that add value to CPFR and the supply chain operation.

Pull model: In a "pull" supply chain system the consumer requests the product when required. Procurement, production and distribution are demand-driven and based on customer needs

Strategic business partners: Business partners involved in the customer company's business plans. Also involved in high level collaboration efforts and intensive data and information exchange.

Internally linked email: Company owned or operated secured email service limited to use within a particular organization and the business partner

