STUDY OF COLLABORATIVE PLANNING, FORECASTING AND REPLENISHMENTS IN SOUTH AFRICA RETAIL INDUSTRY

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ABSTRACT

Collaborative planning, forecasting and replenishments (CPRF) is a set of business processes that help eliminate demand and supply uncertainty through improved communications between supply chain trading partners. One way to address the bullwhip effect caused by order batching is to collaboratively plan production, forecast demand, and replenish inventory. This will lead to smaller order sizes, smoothed production volumes, and more frequent order replenishment. The result will be a smoother flow of smaller orders that the distributors and manufacturers, and able to handle more efficiently. In recent years, retailers have initiated collaborative agreements with their supply chain partners to establish well on-going planning, forecasting, and replenishment process. The purpose of this study is to find the benefits of CPRF, shortcomings of CPRF and significant differences, if any in the understanding of seven success factors of CPRF in supplier and retailer industries. Success factors were identified from a critical literature review and survey approach has been used to collect relevant data from suppliers and retailers. The paper finds that success factors have different rankings in suppliers and retailers, but both sectors comprehend that implementation of CPRF success factors is very important.

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1. INTRODUCTION

The simultaneous integration of customer requirements, internal processes, and upstream supplier performance is commonly referred to as supply chain management (SCM) [1]. A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain includes retailers, suppliers, transporters, warehouses, manufacturers, and customers themselves. Within each organization, such as retail, the supply chain includes all functions involved in receiving and meeting customer demand. These functions include marketing, operations, distribution, finance, and customer service.

By coordinating different suppliers, distributors, and manufacturers along the logistics network or establishing business partnerships, SCM is concerned with finding the best strategy for the whole supply chain [2]. Information sharing is a very important issue of finding the best strategy for the whole supply chain. SCM success is enhanced by the relationship quality, information system (IS), and quality of information and communications system [3]. Information sharing is recognized as a key requirement for collaborative inter-organizational relationships. Studies by Cannon et al., 1999[4] suggest that a successful buyer-supplier relationship is connected with high levels of information sharing.

A potentially devastating phenomenon seen in supply chains is the bullwhip effect, i.e. the amplification of demand variability as it progresses up a supply chain. It was first observed in industry by Forrester, 1961[8], who named the effect “demand amplification”. The key solution to the bullwhip effect, is efficient sharing of demand information [5]. In spite of these advantages, retailers do not desire to engage in information sharing. This is due to the fact that the primary beneficiary from information sharing is the manufacturers, not the retailers Lee et al., 2000[6].

To improve the information quality when exchanging forecasts, it is necessary to understand the causes of the deficiencies. Causes can be related to the customer-supplier relationship (Forslund and Jonsson, 2007), i.e. the level of trust and the type of communication and cooperation, between the information sender (customer company) and information receiver (supplying company). If the information sender understands how the receiver is using the information, and if they have a trustworthy and continuous dialogue, there is a greater possibility for the sender to provide information that is perceived by the receiver to have high quality when used in its planning processes. Causes of high-information quality can also be related to the data communication and registration, i.e. communication technology used and level of standardization and automatic interface in the process of generating, transferring and registering the information. For example, standardized electronic data interchange (EDI) communication significantly reduces time delays in the transferred information (Feng and Yuan, 2006).

In the face of a competitive South African market, supply chain members are now focusing on core competencies, and are attempting to achieve competitive advantage by managing purchasing activities and relationships with suppliers more effectively. Firms are utilizing their suppliers' processes, technologies, and capabilities to enhance competitive advantage Farley, 1997[7], the manufacturing, logistics, materials, distribution, and transportation functions are coordinated within organizations. Many firms have reduced their supply base so they can more effectively manage relationships with strategic suppliers. Retailers are collaborating with their suppliers, mutually beneficial relationships with suppliers and viewing suppliers as virtual extensions of their firm Copacino, 1996[8]. In doing so, they have significantly increased their reliance on suppliers. This paper compares the different effects of collaborative, planning forecasting and replenishment (CPRF) between the suppliers and the retailers.
2. LITERATURE REVIEW

Several scholars have emphasized the importance of sharing forecast data between customers and suppliers in order to decrease suppliers’ planning uncertainty (Cachon and Fisher, 2000; Kelle and Akbulut, 2005). Success of the CPRF model completely depends upon the co-operation between customer and the supplier. Traditionally, customers place orders on their suppliers. By using this traditional model both supplier and customer face various problems in their operations. Since the suppliers have no advance information of requirements they resort to make forecasts and as a result carry unnecessary stocks. Secondly, the supplier is often faced with unexpected short-term demands for products, which leads to frequent changes to their production distribution schedules and thus additional cost. Using CPRF system the customer no longer places any order but instead shares information with the supplier/vendor with the help of information technology (IT). IT based CPRF system provides a broader view of inventory-holding locations and pipeline activity, which gives the supplier better information concerning the actual usage or sales of the product, current on hand inventory and details of additional marketing activity such as promotions. On the basis of this information the supplier takes responsibility for replenishment of the customer’s inventory. The customer places no orders, but instead the customer gives an indication about the upper and lower limits of stock that they wish to keep on hand. It is the responsibility of supplier to maintain the customer’s inventory within the specified stock bands.

Growing competition and the rapid implementation of advanced information technology has encouraged retailers and suppliers to reengineer their supply chains and examine CPRF models to reduce costs and improve efficiency. Retailers’ sharing of point-of-sale (POS) data using electronic data interchange (EDI) systems has become common practice. Vendor-managed inventory (VMI) has emerged in this context as a model that takes the collaborative efforts beyond information sharing and allows the supplier to apply some amount of control on the actual inventory control at the retailer. Wal-Mart and Procter & Gamble (P&G) represent one of the first large-scale successes of such VMI agreements. Their partnership began in 1985 and significantly improved P&G’s on-time deliveries to Wal-Mart while increasing inventory turns Buzzel et al, 1995[11]. That is, in a VMI system, the retailer’s role shifts from managing inventory to simply renting retailing space Mishra et al, 2004[10].

Retailers with a competitive advantage are those that drive CPRF system more strategically, creating new revenue opportunities, efficiencies, and customer loyalty. Collaboration between retailers and manufacturers can bring benefits to both parties. A well-focused CPRF system can improve profitability, reduce waste, and contribute to more valuable relationships between retailers and their manufacturing partners Greenbaum, 2004[12]. Measuring the levels of collaborative practices assists chain members in identifying the shortcomings of their current levels and identifying possible initiatives to remedy them Shepherd et al, 2006[13].

An important problem in many distribution networks operated under the CPRF paradigm is to determine the optimal quantities of material to be dispatched to each retailer from the local warehouse. Usually, the goal is to optimise the trade-off between maintaining excessive inventory at the retailers, which increases the operating costs, and not maintaining enough inventory, which can cause stock-outs and lost sales. In addition, one cannot ignore the issue of transportation costs which can be reduced by shipping large batches that unfortunately tend to increase inventory-holding costs.

The supply chain management approach to cost minimization of inventory implies that a business can no longer compete in the marketplace by itself. This approach requires careful planning and coordination of all activities of the supply chain partners who are involved in the movement of materials and products from the supplier to manufacturer to distributor (wholesaler/reseller) to retailer and consumer. Managing inventory is considered to be one of the most important areas of supply chain management Ganeshan, 1999[14].
It is indicated that the most important benefits of VMI or CPRF rest on transparency and demand visibility in the supply chain. Fundamental for obtaining transparency and demand visibility is the customer’s willingness to supply demand data. Similarly, the supplier must be able to apply this data for planning purposes, and these two elements are said to be essential for VMI success McBeath, 2003[15]; Disney et al, 2003[16]; Kulp, 2002[17]; Lapide, 2006[18].

3. RESEARCH OBJECTIVES
The present study is a case study in South African retail industries and aims to find answers to the following questions:

1. What are the benefits and shortcomings of Collaborative planning, forecasting and replenishments (CPRF) system in retail industries?
2. What is difference between the perception of retailers and suppliers in understanding CPRF?

4. RESEARCH DESIGN AND DATA COLLECTION
The first question above can be answered through a literature survey and discussions with experts in SCM.. Academic experts mostly publish their work in reputed journals or conferences, through which we can gain knowledge of various benefits and shortcomings. Also, certain professors were contacted to understand this. The experts using CPRF practically were those retailers, manufacturers and distributors who are using CPRF in their work. Most people from procurement and operations were contacted to understand CPRF. Some of the people who were contacted were purchasing managers, purchasing officer, purchasing agents, purchasing associates, purchasing analyst, purchasing administrators, purchasing clerks and directors of purchasing. The various benefits of collaborative planning, forecasting and replenishments (CPRF) as stated by many researchers are shown in Appendix 1. These benefits ultimately culminate in a radical change in the performance standard of the organisation and ensure continual growth in a competitive market situation. Borade et al, 2010[19] Collaborative planning, forecasting and replenishments (CPRF) system requires the organisation to integrate all its activities and functions in all respects, and at various levels, for total collaboration with its suppliers to be effective.

Although there is evidence that supports the benefits of CPRF initiatives in retailers and suppliers, a large number of studies have shown CPRF initiatives fail to show a significant impact on business/service performance. Researchers have also indicated that many small to medium retailers have encountered difficulties in implementing CPRF due to cost constrains, [19]. Appendix 2 gives a list of shortcomings of CPRF based on this research. Organisations are more concerned about short-term business returns rather than long-term sustainability of business performance. To answer the second question set out in the last section, a hypothesis H0 was set and a questionnaire was prepared based upon the hypothesis:

- H0. There are significant differences in the success factors of CPRF in retailers and suppliers /distributors?

The questionnaire was based on the seven success factors which are responsiveness, effective communication, risk and reward sharing, management commitment, employees training, customer satisfaction, knowledge sharing. A total of 150 were sent to four retailers and to four suppliers companies and the response rate was 40%. The suppliers included dairy (medium enterprise), chickens (small to medium), bread (medium enterprise) and vegetables (small enterprise), while the retailers included two large enterprises, medium small enterprises. Suppliers were selected only from the food industry from the food industry for easy comparison of data. The retailers were conventional supermarkets (self-service food store offering groceries, meat and produce with limited sales of non-food items such as...
health and beauty aids and general merchandise) and super markets. The first eight questions in the questionnaire were related to background of industry, number for employees, sector of the business, type of industry, position of respondent. The different questions were grouped into seven factors. Each factor was then divided into variables or statements. Each variable was measured on a Likert scale in the questionnaire. The contents of the questionnaire were decided after thorough discussions with experts and then subjectively judged by the researchers.

5. ANALYSIS OF DATA

A purposive sampling procedure was employed and prior knowledge was used in selecting the respondents or companies to be sampled. Questionnaires were prepared and sent to targeted individuals by e-mail and in print form. The data collected were analysed by using SPSS Version 7.5 and Minitab Version 13 software in order to test the hypothesis H0 at the 5 per cent level of significance (the significance level based on the asymptotic distribution of a test statistic). A value of less than 0.05 was considered significant and was chosen to analyse the data. Table 1 illustrates the means, standard deviations and paired comparison for each factor for both retailers and suppliers industries. The paired-samples t-test is a statistical test of the hypothesis H1 (i.e. there are significant differences in understanding the success factors of CPRF in retailers and suppliers organizations). It is used when the observations for two groups can be paired in some way. The differences observed between the groups can then be attributed more readily to the variable of interest.

p-values are often used in hypothesis tests to either accept or reject a null hypothesis. The p-value represents the probability of making a Type 1 error, or rejecting the null hypothesis when it is true. The smaller the p-value, the smaller is the probability to make a mistake by rejecting the null hypothesis. A cut off value often used is 0.05, that is, the null hypothesis is rejected when the p-value is less than 0.05.

4.1 Ranking of factors

A semantic differential scale based upon a seven-point rating scale was used for all the seven factors. The respondents were asked to rank the factors in descending order of importance from 1 to 7. Rank 1 means the most important factor for vendor managed inventory system and rank 7 means the least important. The scores were then added together to determine the list of factors in a hierarchical manner. Table 2 illustrates the rank of each factor in both retailers and suppliers.

4.2 Key findings and discussion

From Table 1, it can be seen that the p values of various factors are less than 0.05, except for Risk and reward sharing, which clearly rejects the null hypothesis (there is a significant difference in the understanding of success factors for CPRF in retailers and suppliers). This observation shows that both parties understand management commitment, responsiveness, employees training, customer satisfaction, effective communication and knowledge sharing as success factors of vendor managed inventory system.

Table 1: Factors, mean, standard deviation, paired t-value and p-value for 5 per cent significance level

<table>
<thead>
<tr>
<th>Success Factor</th>
<th>mean</th>
<th>SD</th>
<th>Retailer</th>
<th>Supplier</th>
<th>Retailer</th>
<th>Supplier</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsiveness</td>
<td>3.55</td>
<td>3.93</td>
<td>0.469</td>
<td>0.482</td>
<td>2.45</td>
<td>0.028</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Companies’ supply chains may face a host of perils, including labour disputes, energy price hikes and natural disasters. However, the survey shows that risk associated with the effects of the recession had the most impact on supply chains. 62% of survey respondents cite inability to predict future demand for their products as a major disrupting force. Suppliers have taken the brunt of retailers’ efforts to cut costs, rather than customers. In the past year most of retailers negotiated lower prices from suppliers. Meanwhile, some retailers sought more efficiency from their logistics operations. In fact, all respondents say that cost-reduction programmes may have actually reduced their supply chain’s resilience. However risk and reward sharing are ranked seventh in Table 2 in both groups. From Table 2 it is clear that risk and reward sharing in the company has the least importance in both retail and supplier for collaborative planning, forecasting and replenishments (CPRF). However, the literature review showed that risk and reward sharing within the whole organisation is very important for effective and efficient operations. Better risk and reward sharing could reduce misunderstandings and confusion regarding the requirements from internal and external customers. Top management is responsible for risk and reward sharing and explaining CPRF goals and policies to the employees of companies. Also, the participation of top management in the process of CPRF can motivate employees to take an active part in CPRF activities. Figures 1 and 2 and show the scores of each factor in the retail and suppliers, respectively, on the basis of which they were ranked.

Table 2: Ranking of success factors

<table>
<thead>
<tr>
<th>Success Factor</th>
<th>Ranking of Retailers</th>
<th>Ranking of Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsiveness</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Effective communication</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Knowledge sharing</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Management commitment</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Employees training</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Risk and reward sharing</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>
The key to successful CPFR is rapid communication of information throughout the entire value chain, including end users and the entire supply chain. Communication with suppliers and business partners ranks highest among uses of enterprise resource planning ERP systems. Information that must be shared among the supply chain includes product specification and requirements, cost and delivery information, and customer communications.

Technology has begun to play a key role in changing the environment of the buyer and seller. The explosion of electronic commerce has significantly altered the methods of buyers and sellers, radically changing not only the face of procurement, but also that of marketing and advertising in the industrial environment.

Initially, implementation of an ERP package was possible only for very large multinational companies and infrastructure companies due to the high cost involved. However, today, many companies around the globe have implemented ERP software and it is expected in the near future that a great percentage of companies will implement one of the ERP packages. The cost of implementation of ERP systems are roughly 1) ERP applications including the license fee and database cost around USD 1.2 million. 2) actual implementation and related services including training employees USD 2 million 3) maintenance cost of USD 150,000 per year on maintenance.

The level of collaboration depends on the size of the business (Table 3), collaboration between large enterprise retailers and large enterprise suppliers is very high, because large enterprise has financial capacity and management structures in place to use an electronic data interchange (EDI) and enterprise resource planning systems (ERP). Collaboration between the large enterprise supplier/retailer and small enterprise supplier/ retailer is low because many small enterprises organisations have no financial capacity to install an EDI or ERP system.

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Large Enterprise</th>
<th>Medium enterprise</th>
<th>Small Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retailers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large enterprise</td>
<td>Very High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Medium enterprise</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Small enterprise</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 3: Level of collaboration and size of the business
6. CONCLUSION AND DIRECTIONS FOR FUTURE WORK

In order to effectively balance risk and opportunity, suppliers, distributors, and retailers need to periodically rethink their strategies for going to market. There are two ways to strategically address the burgeoning nature of risk: (1) shorten the supply chain in order to reduce cycle time and disruption risk or (2) optimize the portfolio of supply chain sources and locations in order to gain flexibility through diversification. Many innovative companies have used the first approach effectively, but it does have its limitations—indeed, it prevents a company from taking full advantage of the economic benefits of extending the supply chain globally.
Portfolio modelling offers several advantages. First, it is understood and practiced by CFOs and allows supply chain executives to make the case about risk in terms that senior management understands. Second, it appropriately focuses on the business value that supply chain management can deliver—through satisfied customers, capital efficiency, and low operating costs—for a given level of risk. This framework can also adapt to changes in supply chain strategy in light of shifts, over time, in relative costs and perceived risks.

It was found that both sectors understand the importance of knowledge sharing and effective communication to CPFR so ranked it the same. Implementation of ERP systems will benefit retailers and supplier by reducing the financial closing cycle. In addition, there is a reduction in procurement costs and inventory holdings, which lead to savings on working capital. It also results in overall improvement in information sharing and decision making can be achieved more efficiently.

CPFR practices combined with information technology provide a broader view of the inventory-holding locations and pipeline activity, which gives the supplier better information for planning inventory deployment across the pipeline. It also allows the supplier to be more customers specific in his planning and to plan at a much lower level of detail which leads to win-win situation.

REFERENCES


APPENDIX 1: BENEFITS OF CPRF TO RETAILERS AND SUPPLIERS

- Improved competitive position.
- Increased profitability.
- Increased productivity.
- Increased quality of delivery.
- Less inventory cost.
- Increased teamwork.
- Encourages teamwork.
- Satisfied internal and external customers.
- Revenue improvement.
- Operational improvement.
- Continuous improvement.
- Trained workforce.
- Reduced lead time.
- Development of managerial ability of leaders.
- Easy tasks of management for retailer.
Data entry errors are reduced due to computer to computer communications. Speed of the processing is also improved.

Both parties are interested in giving better service to the end customer. Having the correct item in stock when the end customer needs it, benefits all parties involved.

A true partnership is formed between the Manufacturer and the Distributor. They work closer together and strengthen their ties.

Stabilize the timing of Purchase Orders - PO's are now generated on a predefined basis.

Visibility of the Distributor’s Point of Sale data makes forecasting easier.

Promotions can be more easily incorporated into the inventory plan.

A reduction in Distributor ordering errors (which in the past would probably lead to a return) Visibility of Stock Levels helps to identify priorities (replenishing for stock or a stock-out?). Before CPRF, a manufacturer has no visibility of the quantity and the products that are ordered. With CPRF, the manufacturer can see the potential need for an item before the item is ordered.

APPENDIX 2: SHORTCOMINGS IN CPRF

- Lack of top management commitment.
- No supporting infrastructure.
- Lack of synergy between programmes and overall business strategy.
- Poor management leadership.
- Lack of focus on the process.
- Fear of change.
- Inconsistent management commitment from department to department.
- Lack of rewards and recognition.
- Initial costs are very high.
- High technical skills are required
- Benefits more the downstream players
- The goal is to have an improvement in Fill Rates from the manufacturer and to the end customer. Also, a decrease in stock-outs and a decrease in inventory levels.
- Planning and ordering cost will decrease due to the responsibility being shifted to the Manufacturer.
- The overall service level is improved by having the right product at the right time.
- The manufacturer is more focused than ever on providing great service.