

Collaborative Planning and Forecasting

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Abstract—Collaborative Planning and Forecasting is an innovative and systematic approach towards productive integration and assimilation of data synergized into information. The changing and variable market dynamics have persuaded global business chains to incorporate Collaborative Planning and Forecasting as an imperative tool. Thus, it is essential for the supply chains to constantly improve, update its nature, and mould as per changing global environment.

Keywords—Information transfer, Forecasting, Optimization.

I. INTRODUCTION

THE paper pertains to the protocols in Collaborative Planning and Forecasting that are inclusive of the five basic steps of compilation of data, patterns of exchange of data, forecasting, distribution of targets to the divisions involved and assessment of the activities.

A. Data Compilation

Compilation of data pertains to the collection and filtering of data, subsequently used for strategy planning by the different external and internal divisions of business associated with the product.

Data collection from consumers, retailers and suppliers has become innovative today. Companies are looking at newer ways to collect data from consumers by the use of RFID, QR codes, Vending machines, credit cards, point of sale technology and detailed audits [1].

Data from warehouse distributions and manufacturing consumptions are thus noted and analyzed. Radio-frequency identification technology employs use of wireless radio frequency electromagnetic field to transfer data without contact. The use of RFID reduces clerical errors and enhances data quality thereby improvising the quality of forecasting, strategic and tactical decisions made using this data information. It optimizes asset visibility and thereby contributing to efficient and economical asset utilization. It integrates service offerings, automates customer tasks, and assists in responding and anticipating customer needs in a proactive and beneficial manner. Thus it not only reduces dependency on manual accuracy but improves planning and reduces costs due to errors. The use of RFID technology to track product flow is a major innovation to supply chain management. Companies lost tracks while transporting goods from factory to store, resulting in huge loss in revenue. RFID technology helps in improving productivity and securing the source of the goods in supply chain. RFID is being used to

identify inbound and outbound logistics and to locate products in the warehouse. In manufacturing industries it is used to track and locate WIP (Work in Progress) and finished goods. Further RFID is used to monitor and track products in transit, to ensure replenishment on time.

The quick response code, QR code is a technologically advanced step up from the RFID. QR codes are two-dimensional and information on QR codes can be stored along both the horizontal and the vertical axis. More information can be stored in the QR codes than typical bar codes. Thus with ever expanding activities in the globalized economic scenario, QR gives a higher data collection source and format. It is essential to realize that in manufacturing industries, QR codes could be used in place of documents which would minimize the amount of paperwork. QR codes are used for marketing purposes and tracking inventory thereby increasing efficiency and lowering costs. A QR code on the item could provide information such as item number, item description, color, size, shape, vendor information and inventory count.

The use of Vending machines provides secure point-of-use distribution. It helps to eliminate overuse by employee, department, etc. and provides automated replenishment.

Point of Sale (POS) systems are used in every retail store and restaurant. Point of sale is also called check out and due to electronic intervention lately, it is often referred to as electronic point of sale. It refers to the counter or the location in a retail outlet or place where transaction or exchange occurs. The customer is informed the value to that he/she is liable to pay in order to purchase the good or service and is thus given options for mode of payment. Thus due to the direct interface with the customer, it provides accurate details with respect to the quantity demanded in a particular location at the specified price in the prevailing economic and environmental stimuli. The valuable data collected from these systems are used for supply chain planning because these POS data are close to the actual demand. POS data are also collected by warehouses, and raw material manufacturers. They are used for determining re-order points, for analyzing trends and seasonality to forecast demand. Sharing of POS Data across the supply chain helps to reduce the bullwhip effect. If the retailers share POS Data with other supply chain units, all supply chain units can forecast future demands, based on customers demand which helps in reducing bullwhip effect. Companies share demand data and current inventory position with many suppliers on the internet, thereby reducing fluctuations in supply and demands.

B. Consolidation into Joint Plan

Preparation of preliminary working plan based on exchange of information among different tiers in the business is one of the most challenging areas as it seeks to channelize flow of the

accurate and necessary information. Once POS data is shared, different stages of supply chain must plan and forecast, if complete coordination is to be achieved. But remember, without collaborative planning, sharing of POS data does not guarantee coordination. A joint plan for all the members of supply chain is required for the flow of information, goods and services in the value supply chain. The information sharing among the partners in the supply chain enables monitoring of progress of different products as they pass through the chain. Further it includes data acquisition, data processing, storage and representation, end-to-end inventory and order status, cost-related data and performance status.

In CPF, there is not only flow of materials but also flow of information to the stakeholders of the company such as suppliers, departments and retailers. There is information flow integration by supply chain coordination among manufacturers, suppliers and retailers. Information from manufacturers goes to suppliers and retailers, which is then used by the retailers or suppliers to forecast demand. Retail sector has a complex and scattered structure. Retailers have to work and manage relations with hundreds of suppliers in different areas and integrate them. Integration of all the suppliers is very important for the manufacturers for the transit of goods and information. A retailer may run a promotion program in certain month that leads to increase in demand of a product. However if the promotion is not well planned in the supply chain then the forecast of retailer and manufacturer will differ. This will lead to decrease in production and supply of the product. So, the manufacturer must be aware of the plans of the retailers in order to achieve coordination in the supply chain [2]. Businesses of all sizes come together for creating an efficient and low cost structure. Production and delivery schedules are shared among the partners. This facilitates partners to make decisions accordingly, for example a retailer will go for sales promotions in month of low sales. After comparing the corporate strategies of different companies a business plan is made which is acceptable to all. Agreements are made on things like minimum order quantities, lead times and capacity limitations. Regular periodic review of CPF is done. The managers uses consolidated plan to simplify the task of shipping, transporting and receiving complex orders. Performance metrics, inventory details, demand forecasts are shared among the partners of supply chain. This improves supply chain, promotes quality and reduces out of stock conditions. The key is to ensure that the entire supply chain is operating to a common forecast.

C. Forecasting

Forecasting is the prediction of future requirements; it dictates the potential for untapped new markets along with successful flow of goods in the existing market space while catering to contingencies

Forecasting is the ability to generate patterns of demand based on time series analysis, on judgment, on analysis of what if questions or on use of data of multiple variables. Simple exponential smoothing and moving averages are used for sequential data varying around a common mean, but

for data with trends it is essential to use techniques as double exponential smoothing. Forecasting essentially revolves around understanding past business decisions and patterns, assimilation of collection of the right variables, identifying the business activities to be analyzed and using appropriate techniques to predict the needed factor.

The Industry incorporates forecasting as a tool to judge not only demand forecasting but also capacity forecasting. The shelf life of food products and the necessity of a synchronized time cycle for segmented product parts to reach at the optimum time for assembling necessitates the advent of forecasting. Forecasting facilitates the marketing division to estimate the probable as well as potential consumers while assisting in studies of market differentiation based on previous patterns of consumer behavior to market stimuli. Budgetary and investment planning use forecasting as a strategic tool to formulate growth strategies of the company, in relation to previous events synergized with probability of impactful economic and behavioral changes in the future global financial market [3].

Forecasting can be used in different sectors, for example:

- Marketing people need forecasts to evaluate market segmentation, market targeting and in optimally determining the marketing mix.
- Individuals involved with the sales division use forecasting to estimate the future sales and quotas.
- Production, procurement and logistics plans are formulated using the basis of forecasting.
- The finance division inevitably uses the tools of forecasting to estimate their fiscal deficits and surplus and to plan accordingly.

Every organisation works towards a future, it formulates long term strategies and short term tactics to optimally and profitably achieve its goal. Forecasting uses the quantitative and qualitative data available so as to enhance the feasibility and accuracy in determining the future and prospective trends. The industry in which an organisation operates determines the feasibility and extent to which forecasting may be utilized. The primary advantage of forecasting is that it provides the business with a probability driven analysis of future occurrences. But it should be borne in mind that longer the duration for which forecasting is performed, higher is the probability of inaccurate results. The changing and dynamic political, technological, environmental and social environmental forces alter patterns used in forecasting, at a fast and unpredictable pace. It is not possible to accurately forecast the future.

Fig. 1 can be used to broadly identify how forecasting is incorporated in the procedure to assess the variables for future. First, it is essential to identify the industry in which one operates, as it will determine the variables that will largely impact the future prospects of the firm.

For example, the paper industry forecasts for generally periods around 25 years as a normal tree takes about 20 years to grow, but industries for milk, cheese forecasts on generally monthly basis.

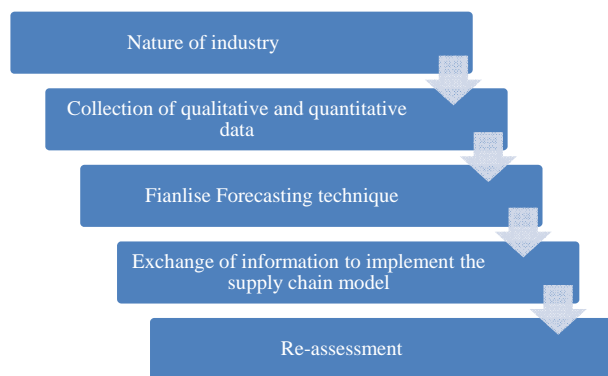


Fig. 1 Broad outline of how forecasting is used

Second, the nature of quantitative and qualitative data involved has to be assessed and incorporated skillfully. The advancing age of internet and knowledge has every firm open to a huge and invariable source of data and thus it is very essential to be able to choose the correct nature of data to use for the creation of model to be used in forecasting. There are variable available methods that can be used for forecasting and thus depending on the aspect to be catered to, one should use the method that not only gives accurate results but in reasonable time as in the corporate world, time is a form of money.

D. Integration of Forecasted Data in Other Divisions

A Synergy between Production, marketing and logistic divisions to work on the forecasted data is essential so as to optimise the interpretation of forecasted data.

A successful supply chain essentially involves an efficient and optimised channel for information transfer. It is imperative for the vector of information flow to have a strategically selected time cycle to ensure an optimum operation schedule. The forecasted data need to be shared through unambiguity and maximum possible accuracy with the other divisions involved in operation cycle for sustainable and timely operations. Supply chains may involve sequential, reciprocal or hub and spoke models for information transfer. It should be noted that suitability of each method is subject to the receiver and sender of information [4].

Sequential information transfer – This is the simplest form of information transfer as it involves the flow of information from one unit to other in a sequence and thus the two units involved can decide their way and format of information exchange. Thus because of its limited and simple network, the information transfer is unidirectional and in pre-defined format. Thus one divisions output is the other divisions input. It should be note that information transfer pattern cannot be used beneficially in a globalized intricate environment where each division is interdependent.

Reciprocal information transfer – This is a complex form of information transfer as it involves bi-directional flow of information and each unit can interact and communicate with several other units and thus a synchronization and integration of information exchange is often useful. This is a decentralized information transfer and involves simultaneous

actions and assessments among the different divisions.

Hub and spoke – It is based on a central hub that communicates to all its partners and thus the standardization plays an important role in the optimal and efficient working of the system. This form of information transfer is beneficial when a certain format or a certain level of centralized distribution system is desired.

Every global industry revolves around efficient and timely integration and assimilation of information. The distributor, retailer, manufacturer and the consumer are inter-dependent and mutually inclusive. It should be realised that the forecasted data is not essentially accurate and the dependent divisions using forecasted data often need to validate their capacity and ability to generate or deliver the required product or service as per the forecasted values [5]. Thus, it is essential to formulate a methodological, flexible, coherent and productive information sharing network between the dependent variables. The ever-changing and dynamic economic environment necessitates the need for a simultaneous, efficient information dissemination system to be able to respond to stimuli in a comprehensive and timely manner.

II. ASSESSMENT

Assessment of accuracy of forecast and assimilation of information by the different divisions with respect to the market behavior is thus judged to evaluate the required changes and corrections in the work plan. Thus the planning, controlling and decision making is eventually followed by assessment of the entire procedure. A feedback from not only the financial tracers but also qualitative tracers like customer satisfaction and efficiency of operations need to be validated as a continuum towards enhancement of the quality of decisions. Productive and coherent decisions eventually need to be channelized and errors in decision making need to be filtered and dealt with using appropriate changes in the model of supply chain.

It should be emphasized that owing to the ever-changing and dynamic nature of the market a continuous and effective evaluation of the results obtained in relation to the expected results is essential to study the market.

A basic procedure has to be essentially followed while assessing the performance of execution of the forecasting and model of the existing supply chain. It should be noted that the supply chain should not only be evaluated on the basis of its impact on the efficiency of deliverables but also on the potential to be improvised, upgraded and optimized with the evolving and changing available technology. It should be noted that each firm, rather each industry has its own set of possible formats and protocols that are assessed and followed while measuring the feasibility and ability of the supply chain to be a successful option for the existing contingencies.

Thus, referring to Fig. 2, the first step to assessment involves understanding of the long term strategies and short term tactics of the firm. It is essential to be explicitly clear with regard to the desired final output, to be able to judge the feasibility and nature of the decisions incorporated as we plan,

control, and decide.

Next, it is essential to develop a detailed process flow which will cater to not only evaluation of the existing system through feedbacks but also instill a sense of judgment on the existing running model. The key information indicators and the pattern of information exchange amidst other variables are observed and the potential for improvisation is noted.

Third, gaps leading to discontinuities and inefficiencies are observed and noted so as to be explored and removed to cater to the development of an efficient model with minimum loss of resources. The gaps are often created due to dysfunction between units or a lack of clarity in the objective of each unit. Thus, it is imperative to reduce and remold the gaps so as to ensure a smooth flow of information and a successful model.

A very important and vital step is to ensure the identification of processes that need to be replaced and thus the demarcation of alternatives is essential to be able to timely replace redundant and inefficient process lines and procedures. Alternatives necessitate the urgency and requirement to be innovative and have a grasp of technical expertise to be able to identify suitable alternatives to existing procedures. Thus, it is essential to have a sound knowledge of the interconnected webs in the supply chain to be able to judge the impact of replacing any of the component units [6].

The alternatives identified need to be tailored and moulded to be able to fit into the existing supply chain models. It is imperative to be able to retain the identity of the alternative and also sync it and blend it with the existing supply chain model to create, communicate and deliver value with the upgraded model.

It is necessary to be able to assess the resources available to run a supply chain model efficiently. Constraints are inevitable and shape the existing model as well as influence the working of the future supply chain model. Limited and finite resources play a crucial and governing rule to assess the feasibility of amendments and alterations to the existing as well as potential supply chain model. Thus, it is imperative to be able to strike a balance between the inputs and outputs to ensure profitability and sustainability. The resources are thus at first gauged and oriented to successfully alter the supply chain and then a balance is struck between the extent to which these are incorporated and used.

Implementation is the key to application of every strategy, to every tactic. An efficient implementation is imperative to be able to run the supply chain optimally. A successful supply chain is one which not only has the correct and accurate orientation but also which has been implemented successfully and correctly. Thus implementation is the key to strategic and efficient functions being carried out in optimal and minimum loss bearing forms.

Thus, it is essential to observe, identify, analyze, judge, innovate, maneuver and implement strategies and tactics to be able to successfully build efficient optimal models. The variable facets of each diverse and different alternative should be explored with in-depth analysis depending on its importance and impact on the output of supply chain.

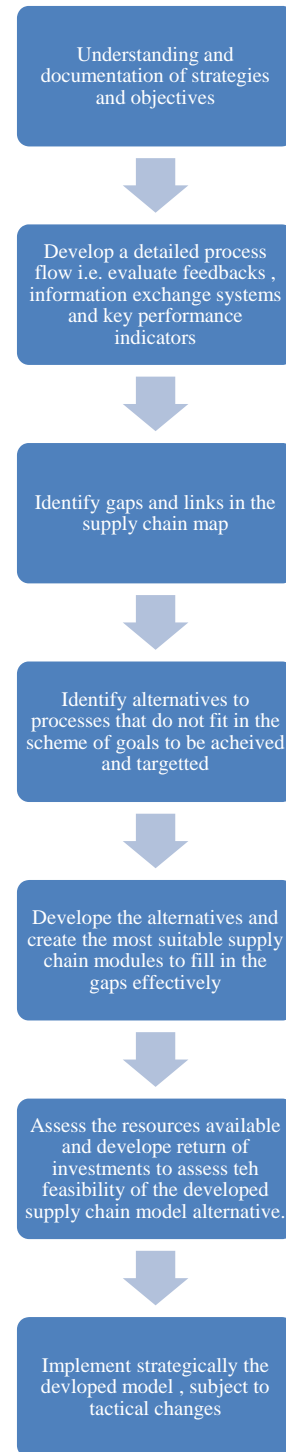


Fig. 2 Supply chain assessment methodology

III. CONCLUSION

CPF thus revolves around synchronization and alignment of variable and diverse resources, generation of optimum information sharing patterns, efficient production protocols, result oriented distribution decisions, accurate forecasting interpretations and determination of targets for market capitalization. Limitations owing to data accuracy, unpredictable consumer behavior, difference in cultures and

language barriers are untracked but significant factors that need to be borne in mind while adopting CPF.

CPF is an evolving strategy in its nascent stage. Its full potential is yet to be explored, identified and used in supply chain models.

It is a technical standard that serves to enhance the variables, protocols and procedures involved in basic functioning of supply chains and to work upon not only the process related issues but units that create discontinuity, units that are obsolete due to changing environments and the ever—changing variable needs of the industry.

It compares not only the existing pattern with the old pattern but innovate using the culmination of existing and potential patterns that can be developed to serve the supply chain.

The entire concept of collaborative concept of supply chains is based on the basic fact that information needs to flow for a successful and informed functioning of the units involved. Each unit is in some form dependent on the other units irrespective of the nature of the units because their cumulated and combined actions decide the result that is their combined results lead to the goal and target of the company.

To summarize, the methodology to assess a supply chain is not only the evaluation existing factors but also the ability to judge suitable and coherent alternatives to existing units in supply chain models. Thus, it is very essential to be able to judge the qualitative and quantitative aspects of the diverse, segregated units in supply chain models to be able to skillfully and accurately derive the most suitable and well tailored supply chain model for any industry or any specific firm with its specific needs and requisites.

Planning is an essential and important aspect of supply chains as it orients the supply chain towards its targets and maneuver them towards their specific goals. It is essential to imbibe the functions of each unit to be able to successfully plan the model. Planning essentially revolves with the target to reduce inventory cost, logistics cost and the transportation cost involved. Thus planning is imperative to set the direction for a successful output from the use of inherent resources of the business model.

It is imperative for any sustainable business model to not only create an efficient supply chain but collaborate with minimum loss of information and expertise so as to forecast with maximum possible accuracy.

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