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Manmohan Joshi

Supply Chain Management

MANMOHAN JOSHI

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Supply Chain Management
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CONTENTS

ABOUT THE AUTHOR

Dr. Manmohan Joshi, M.A., M.Ed., Cert. Educational Admin, Dip. HRD, Dip. Mgmt. (UK), MBA, Ph.D. (Mgmt.), has over 45 years' teaching, training and administrative experience. He has worked as Principal of large and reputed educational institutions in India, Kuwait and the Sultanate of Oman.

For his work on Innovative Practices in Value Education he was awarded by the National Council of Educational Research and Training, India.

He is also the recipient of the Best Teacher Award from the Govt. of Tamilnadu as well as the Central Board of Secondary Education, India.

He has presented papers at various national and international conferences under the auspices of UNESCO. He has also conducted various workshops for teachers, students, parents and administrators. The topics covered a wide area viz., Leadership and Team Building, Value Education, Administration Skills, Career Choice, Effective Decision Making in Administration, Effective Communication Skills, Interpersonal Relationships, Continuous Comprehensive Evaluation, Skills in Dealing with Managers, Secretarial Skills. He has also authored several books on different subjects.

Later he worked as Acting Chief Executive for a reputed Training Institute in the Sultanate of Oman.

His recent formal official assignment was at a group of educational institutes in Bangalore, India, where he conducted workshops and training programmes – especially training in Soft Skills and Business Communication – for college professors and students, and taught students of MBA, B.Ed. and Law.

Currently he is a freelancer and conducts workshops and training programmes for college students, professors as well as those working in the corporate sector – particularly in the area of Soft Skills, Business Communication, Pedagogy of Teaching, Guidance and Counselling at College/School level.

He spends a great deal of time in writing books which are published as eBooks on www.bookboon.com

He can be contacted through e-mail: manmohan.joshi@gmail.com

https://in.linkedin.com/in/manmohan-joshi-2306033a

PREFACE

In today's business world organisations have necessarily to focus on maintaining efficient relationships with customers and suppliers. This is so because there is a fierce competition among producers and suppliers, and also because of increased expectations of customers.

This phenomenon has led to the growth and development of supply chains. Today businesses no longer compete as autonomous entities but rather as supply chains. Management personnel have realised that the successful coordination, integration and management of key business processes across members of the supply chain will determine the ultimate success of the single enterprise.

This book has made an attempt to describe the fundamentals of supply chain management, and is likely to be of great use to management personnel at various levels.

I'd like to express my gratitude to Karin Hamilton Jacobsen and Sophie Tergeist for encouraging me at all stages.

I'd also like to thank the entire team of bookboon.com for publishing several of my books, including this one.

Manmohan Joshi

1 CONCEPT OF SUPPLY CHAIN

1.1 INTRODUCTION

In today's world business organisations have been forced to focus on relationships with customers and suppliers. This is because of the following:

- Fierce competition among producers and suppliers;
- Introduction of products with short life cycles; and
- Increased expectations of customers.

These have led to the growth and development of supply chains. According to Christopher (1998), businesses no longer compete as autonomous entities, but rather as supply chains. Executives have become aware that the successful coordination, integration and management of key business processes across members of the supply chain will determine the ultimate success of the single enterprise (Van der Vorst, 2000).

1.2 WHAT IS SUPPLY CHAIN?

A supply chain is a collection of suppliers to create one specific product for a company. The chain is made up of 'links' which can include:

- Multiple manufacturers for parts;
- Completed product;
- Warehouse for storing the product;
- Distribution centres; and
- Store where a consumer can purchase the product.

The supply chain not only includes the manufacturer and its suppliers, but also – depending on the logistic flows – encompasses:

- Transporters;
- Warehouses;
- Retailers;
- Consumers;
- Also includes:
  - New product development,
  - Marketing,
  - Operations,
  - Distribution,
  - Finance,
  - Customer service.

The concept of chain is important because each link is connected in a specific direction and order, and the next link cannot be reached without going through the previous one. Each link adds time and costs and can involve labour, parts, and transportation. Every product a company carries may have its own supply chain; they may use certain suppliers for multiple products. That's why this gets so complicated, especially for international supply chains.

The process described above is that of a typical retail supply chain. However, there are many different types in practice. Here are three examples from well-known supply chains:

- Big Box supply chain – Walmart
- E-commerce platform supply chain – Amazon
- Specialised own supply chain – Tesla

1.2.1 BIG BOX SUPPLY CHAIN

This model – e.g. Walmart – thrives on size and well-planned supply chains to drive out the competition. This is how it does so:

- Buys more generic goods directly from manufacturers, and not from suppliers;
- Uses 'Vendor Managed Inventory' which ensures that manufacturers are responsible for managing products in Walmart's warehouses;
- Deals only with those suppliers who can meet:
  - The quantity,
  - Frequency desired,
  - Low prices, and
  - Location that limits transportation needs.

Thus, they manage their supply chain like one firm, with all partners operating on the same communication network. The end result is that this system reduces links in the supply chain and cost per item, translating to low prices for consumers. Fig. 1/1 below shows the links in the chain.

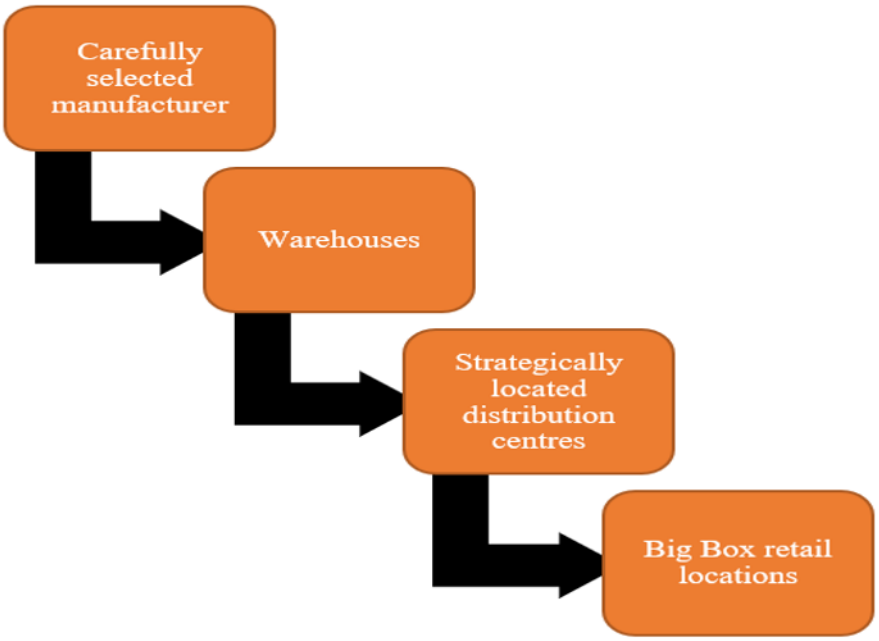

Fig. 1/1 Big Box supply chain

1.2.2 E-COMMERCE PLATFORMS

E-commerce online shops – e.g. Amazon, Alibaba, and innumerable others in various countries – are a perfect example of unique supply chains. They ship from distribution centre to consumer's home directly, thus cutting the retail store out. Where online stores like Amazon innovate is both in their supplier-side and the final supply chain link delivery.

Let us take the example of Amazon. Just about anyone can sell things on Amazon because it is a platform, not just a shop. It differentiates itself because:

- It probably has more things than any other online store;
- It offers everyday goods cheaply;
- It underbids suppliers;
- Its warehouses make serious use of automation to store items going to similar destinations together, ready for immediate transport;
- Its investments in delivery staff and technology make 2-day shipping a basic exception, and even same-day delivery a possibility;
- It ditches third-party logistics and fulfils orders itself.

Fig. 2/1 below shows this link.

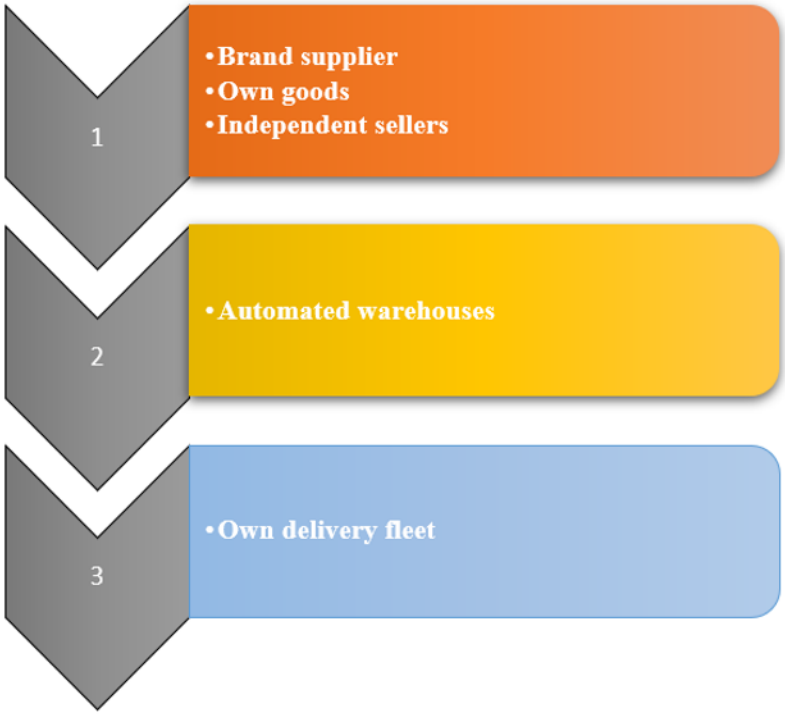

Fig. 1/2 E-commerce platform supply chain

1.1.1 SPECIALISED OWN SUPPLY CHAIN

Automotive manufacturers – e.g. Tesla – are making innovative, popular and luxurious cars in a location – California, USA – with incredibly costly real estate. Rather than having a long supply chain of cheap part makers, they have arranged the following:

- A vertically integrated supply chain – full-service auto plant near its corporate headquarters;
- Plans for a supplier park;
- A massive battery factory;
- Digital supply chain – pushing new firmware and algorithm updates to existing car owners over the cloud.

Fig. 1/3 below shows this.

Fig. 1/3 Specialised own supply chain

2 CONCEPT OF SUPPLY CHAIN MANAGEMENT

2.1 CONCEPT OF SCM

Supply Chain Management (SCM) is the active management of supply chain activities to maximise customer value and achieve a sustainable competitive advantage. It represents a conscious effort by the supply chain to develop and run supply chains in the most effective and efficient ways possible. Supply chain activities cover:

- Product development;
- Sourcing;
- Production;
- Logistics; and
- Information systems for coordination.

The concept of SCM is based on two core ideas:

- Every product represents the cumulative effort of multiple organisations i.e. supply chain;
- Organisations in the supply chain are linked together through:
  - Physical flows: They involve the transformation, movement, and storage of goods and materials.
  - Information flows: They allow the various supply chain partners to coordinate their long-term plans, and to control the day-to-day flow of goods and materials up and down the supply chain.

2.1.1 DEFINITION OF SCM

Supply Chain Management is handling and optimizing all the complicated facets of a supply chain, involving goods and services. It can be defined as the management of flow of products and services, which begins from the origin of products and ends at the product's consumption. It also comprises movement and storage of raw materials that are involved in work in progress, inventory and fully finished goods. According to Jack Van der Vorst (2004):

"SCM is the integrated planning, coordination and control of all business processes and activities in the supply chain to deliver superior consumer value at less cost to the supply chain as a whole whilst satisfying requirements of other stakeholders in the supply chain (e.g. government and NGOs)".

2.1.2 HISTORY OF SCM

The term 'Supply Chain Management' is relatively new. It first appeared in logistics literature in 1982 as an inventory management approach with an emphasis on the supply of raw materials (Oliver and Webber, 1982). During the Industrial Revolution, the ability to quickly produce goods with machine assistance led to the need to manage significant inventory and constant consumption. When Henry Ford started assembly line for the world's first car production in 1913, supply chain management had become an art.

As the century wore on, more companies were producing more goods and looking for ways to reduce costs. This integrated into owned supply chains to try to reduce costs at each stage.

Now the Internet and new technologies have led to collaborative platforms. Better communication and planning tools are providing a way for small and large companies alike to manage even more complex supply chains.

2.2 ADVANTAGES OF SCM

In modern times SCM is very important because commerce exists in a networked global economy. All the companies are highly dependent on effective supply chain process. The main advantages of SCM are these:

- Develops better customer relationship and service;
- Creates better delivery mechanisms;
- Improves business functions;
- Minimizes warehouse and transportation costs;
- Helps in shipping right products to the right place at the right time;
- Assists in minimizing waste; and
- Achieves efficiencies throughout the supply chain process.

2.3 CHARACTERISTICS OF SCM

Value is the amount consumers are willing to pay for what a company provides and it is measured by total revenue. The concept value-added activity originates from Porter's 'value chain' framework and characterises the value created by an activity in relation to the cost of executing it (Porter, 1985). Moving in the same vein, Cooper and Ellram (1993) have specified the following characteristics of SCM:

- Joint reduction in channel inventories;
- Channel-wide cost efficiencies;
- Long-term time horizon;
- Amount of information sharing and monitoring as required for planning and monitoring purposes;
- Multiple contacts between levels in firms and levels of channel;
- On-going joint planning;
- Compatibility of corporate philosophies at least for key relationships;
- Small to large supplier base;
- Channel leadership for coordination focus;
- Risks and rewards shared over longer term;
- Quick response across the channel.

2.4 OBJECTIVES OF SCM

The main objective of SCM is to monitor and relate production, distribution and shipment of products and services. This can be done by companies with a good hold over:

- Internal inventories;
- Production;
- Distribution;
- Internal production; and
- Sales.

Supply chain management basically merges the supply and demand management. Every firm strives to do so with the most efficient use of resources.

Here are some of the important objectives of supply chain management:

- Supply chain partners coordinate at different levels to:
  - Maximize resource productivity,
  - Construct standardised processes,
  - Remove duplicate efforts, and
  - Minimize inventory levels.
- Minimize supply chain expenses;
- Coordinate on value creation for their customers;
- Meet the customers' expectations on a regular basis;
- Match expectations of higher product variety, customized goods, and off-season availability of inventory;
- Leverage inventory as a shared resource;
- Utilise the distributed order management technology to complete orders;
- Contribute to the financial success of the organisation;
- Drive competitive benefit and shareholder value by using the supply chain to:
  - Improve differentiation,
  - Increase sales, and
  - Penetrate new markets.

3 PRINCIPLES OF SUPPLY CHAIN MANAGEMENT

3.1 INTRODUCTION

To balance customers' demands with the need for profit and growth companies try to find various ways to tackle the situation. They do so by strengthening their supply chain. Their efforts reflect "the Seven Principles of Supply Chain Management" propagated by David Anderson, Frank Britt and Donavan Favre (1997). David et al have suggested the following Seven Principles of Supply Chain Management:

- Adapt supply chain to customer's needs;
- Customize logistics network;
- Align demand planning across supply chain;
- Differentiate products close to customer;
- Outsource strategically;
- Develop IT that support multilevel decision making; and
- Adopt both service and financial metrics.

Fig. 3/1 below represents these seven principles.

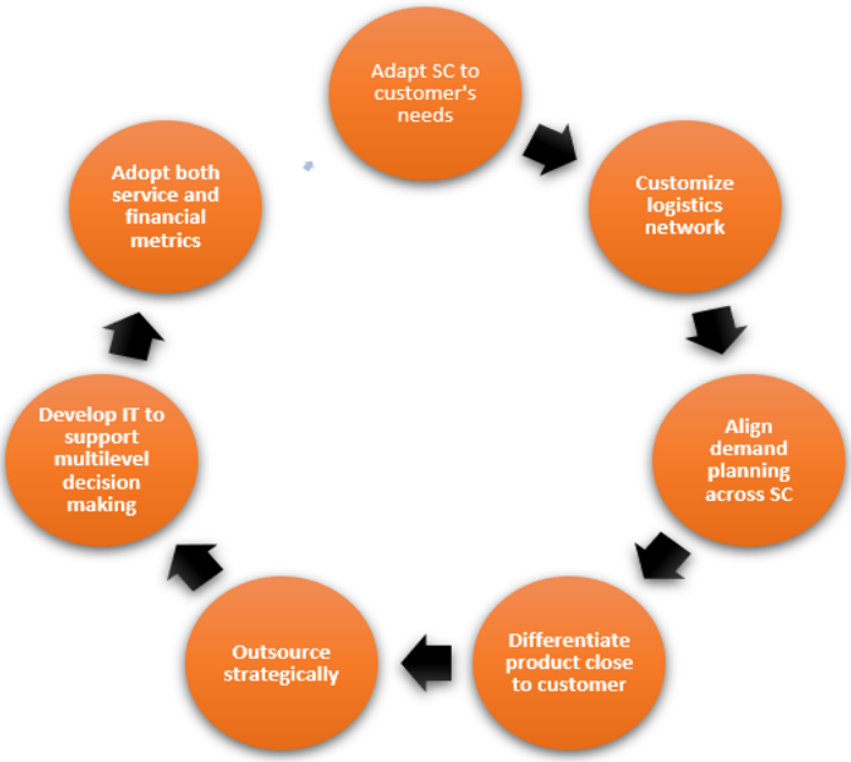

Fig. 3/1 Seven Principles of Supply Chain Management

3.1.1 ADAPT SUPPLY CHAIN TO CUSTOMER'S NEEDS

It means to segment customers based on the service needs of distinct groups and adapt the supply chain to serve these segments profitably. Both business people and supply chain professionals are trained to focus on the customer's needs. Segmenting customers by their particular needs enables a company to look after the various segments effectively. Methods that help in ascertaining customer needs include – among others – surveys, interviews and industry research.

However, today manufacturers are also applying techniques such as cluster and conjoint analysis to measure customer satisfaction and predict profitability of each segment.

3.1.2 CUSTOMISE LOGISTICS NETWORK

This is to be done to match logistics network to the service requirements and profitability of customer segments. When you segment a customer based on the service needs, you may have to tailor the different logistics networks to serve a different segment. Companies have traditionally taken a monolithic approach to logistics network design in organising their work with the aim of achieving one of the following:

- To meet the average service requirements of all customers; or
- To satisfy the toughest requirements of a single customer.

Neither approach can achieve segment-specific excellence in supply chain management. However, much can be achieved through inventory deployment strategy, supported by outsourcing of management of the quick response centres and the transportation activities, etc. Furthermore, combining logistics for both complementary and competing firms under third-party ownership can provide a lower-cost industrywide solution.

3.1.3 ALIGN DEMAND PLANNING ACROSS SUPPLY CHAIN

Supply chain practitioners need to listen to market signals and align demand planning accordingly across the supply chain. This will enable them to ensure consistent forecasts and optimal resource allocation. They are actually taught to share the demand data with trading partners so nobody has to keep the unnecessary inventory. Excellent supply chain management, in fact, calls for Sales and Operations Planning (S & OP) that involves every link in the supply chain (from the supplier's supplier to the customer's customer) in developing forecasts collaboratively and then maintaining the required capacity across the operations.

3.1.4 DIFFERENTIATE PRODUCTS CLOSE TO CUSTOMER

Manufacturers have traditionally based production goals on projections of the demand for finished goods and have stockpiled inventory to offset forecasting errors. However, many manufacturers keep components and assemble them only after a customer places the order in order to increase the product variety.

'Standardisation' is the opposite polarity of 'differentiation'. For example, some cosmetics manufacturers formulate products and choose packaging and labelling that complies with the regulations of multiple countries in Asia. So, they only make one SKU (Stock Keeping Unit) that can be sold in 15 countries instead of 1 SKU per country. By standardising product appropriately, they can drive the purchasing cost down drastically due to economy of scale and improve international business operations.

The key to just-in-time product differentiation is to locate the leverage point in the manufacturing process where the product is unalterably configured to meet a single requirement and to assess options, such as postponement, modification of design on manufacturing processes, that can increase flexibility.

3.1.5 OUTSOURCE STRATEGICALLY

Manufacturers should manage sources of supply strategically to reduce the total cost of owning materials and services. Excellent supply chain management requires an enlightened mindset. While manufacturers should place high demands on suppliers, they should also realize that partners must share the goal of reducing costs across the supply chain in order to lower prices in the marketplace and enhance margins. The logical extension of this thinking is gain-sharing arrangements to reward everyone who contributes to the greater profitability. A good supply chain management calls for creativity and flexibility.

3.1.6 DEVELOP INFORMATION TECHNOLOGY THAT SUPPORT MULTILEVEL DECISION MAKING

Here the idea is to develop a supply chain-wide technology strategy that supports multiple levels of decision making and gives a clear view of the flow of products, services, and information. To sustain re-engineered business processes, many progressive companies have been replacing inflexible, poorly integrated systems with enterprise-wide systems. Many companies that have embarked on large-scale supply chain re-engineering attest to the importance of information technology in sustaining the benefits beyond the first annual cycle.

3.1.7 ADOPT BOTH SERVICE AND FINANCIAL METRICS

It is suggested to adopt channel-spanning performance measures to gauge collective success in reaching the end-user effectively and efficiently. Activity-based costing (ABC) needs to be implemented in order to determine customer's profitability. However, deriving maximum benefit from activity-based costing requires sophisticated information technology, specifically a data warehouse.

3.2 FURTHER IDEAS FOR SCM

We can further describe below what supply chain management actually creates:

- **Systems thinking**: Supply chain management requires an understanding of the end-to-end system – the combination of people, processes, and technologies – that must work together so that product or service may be provided. Systems thinking involves an appreciation for the series of cause-and-effect relationships that occur within a supply chain. Because they are complex systems, supply chains often behave in unpredictable ways, and small changes in one part of the system can have major effects somewhere else.
- **Bimodal innovation**: The world of business is changing quickly, and supply chains need to keep up by innovating. Lean, Six Sigma, and the Theory of Constraints are process improvement methods that can help with the task. Continuous process improvement is not sufficient, though, because new technologies can disrupt industries. This effect is called 'disruptive innovation'. When a new solution for a customer's needs emerges and becomes accepted, this solution becomes the new dominant paradigm.
- **Collaboration**: Supply chain management cannot be done in a vacuum. People need to work across silos inside an organisation, and they need to work with suppliers and customers outside the organisation. An environment in which people trust one another and collaborate for shared success is much more profitable for everyone than an environment in which each person is concerned only with their own success.
- **Flexibility**: Flexibility is a measurement of how quickly a supply chain can respond to changes, such as an increase or decrease in sales or a disruption in supplies. This flexibility often comes in the form of extra capacity, multiple sources of supply, and alternative forms of transportation. Usually, flexibility costs money, but it also has value. The key is understanding when the cost of flexibility is a good investment.

- **Global perspective**: The ability to share information instantly and to move products around the world cheaply means that every company today operates in a global marketplace. As a supply manager, one must recognize how their business depends on global factors to supply inputs and drive demand for outputs. They also need to think globally about the competition.
- **Risk management**: There are lots of things that can go wrong. Even a disturbance, like a shipment that gets delayed, can lead to a series of problems further down the supply chain, such as stockouts, shutdowns, and penalties. Supply chain management means being aware of risks and implementing processes to detect and mitigate threats. Risk management can provide opportunities to capture value during times of uncertainty.
- **Visibility**: One cannot manage what they cannot see, so supply chain management needs to make visibility a priority. Knowing what is happening in real time (or close to real time) lets them make better decisions faster. Having better visibility into supply and demand allows them to optimize the amount of inventory that is held throughout the supply chain.
- **Value creation**: Supply chain management is about creating value – meeting customers' needs in the right place, at the right time, at the right level of quality, for the lowest cost. This value is at the core of supply chain management.

4 PROCESS OF SUPPLY CHAIN MANAGEMENT

4.1 INTRODUCTION

Supply chain management process has a huge significance in running key operations for almost every organisation. Without a successful supply chain, processes could halt at the floor level and ultimately bring down the results. With ever-evolving supply chain concepts, supply chain management process has become a dedicated function. Supply chain management is increasingly being recognized as the integration of key business processes across the supply chain. For example, Hammer (2001) argues:

> *"Streamlining cross-company processes is the next great frontier for reducing costs, enhancing quality, and speeding operations. It is where the decade's productivity wars will be fought. The victors will be those companies that are able to take a new approach to business, working closely with partners to design and manage processes that extend across traditional corporate boundaries. They will be the ones that make the leap from efficiency to super efficiency".*

4.2 PROCESSES

The Global Supply Chain Forum, according to Cooper et al (1997), has identified eight key processes that make up the core of supply chain management:

- Customer relationship management;
- Customer service management;
- Demand management;
- Order fulfilment;
- Manufacturing flow management;
- Supplier relationship management;
- Product development and commercialization; and
- Returns management.

4.2.1 CUSTOMER RELATIONSHIP MANAGEMENT

The principles of SCM state that everything in the supply chain must be adapted to the customer. If no one is buying, there is no need to produce anything. The customer relationship management process provides the structure for how the relationship with the customer is developed and maintained. CRM (Customer Relationship Management) tools are needed to gather information for marketing and market research, all to determine the products and services to offer in the future. This process provides the framework for managing relationships with customers, and is comprised of the following sub-processes:

- Reviewing corporate and marketing strategies to identify customer segments;
- Identifying the criteria for categorizing customers;
- Developing guidelines for the degree of differentiation in the PSA (Product/ Service Agreement);
- Developing a framework of metrics of interest and relating them to the customer's impact on the firm's profitability as well as the firm's impact on the customer's profitability;
- Developing the guidelines for sharing process improvement benefits with customers.

4.2.2 CUSTOMER SERVICE MANAGEMENT

The customer service management process is the firm's face to the customer. Real-time information is provided to the customer such as product availability, shipping dates and order status. This process is unarguably the most important aspect of supply chain management. The way CRM is managed is greatly responsible for retaining existing customers as well as attracting new ones. It has been observed that in many organisations not much attention is paid to equipping the staff concerned with relevant soft skills. Nor are there proper arrangements for ensuring that these staff have complete, correct and relevant information. This can happen only when there is proper coordination between different departments, and that the front office staff (including those who attend to customers through Internet, phone etc. are fully trained to withstand the onslaught of even angry dissatisfied customers. To obtain best results it is necessary to ensure the following:

- Ensure the number of operatives available at any given point of time, instead of the customer not getting connected, and ultimately giving up;
- Develop proper response procedures;
- Develop response strategy;
- Develop infrastructure to implement strategy;

- Implement solutions;
- Effective system of escalation of customer grievances;
- Monitoring, reporting and evaluating performance.

4.2.3 DEMAND MANAGEMENT

This process takes customer interactions and orders into account to determine the workload all the way up the supply chain. The demand management process needs to balance the customers' requirements with the firm's supply capabilities. This includes forecasting demand and synchronising it with production, procurement, and distribution. Customer forecasting is an important task that analysts must perform well to determine the current demand and what it will be in the future, to prevent waste in the supply chain. To achieve the objective there is a necessity to:

- **Determine forecasting approaches**: determining the levels and time frames of the forecasts needed throughout the firm;
- **Plan information flow**: several functional silos and customer relationship management need to provide input to the forecasting process; the forecasts are then communicated to the other process teams that are affected by them;
- **Determine synchronization procedures**: they need to determine the synchronization procedures required to match the demand forecast to the firm's production, sourcing and distribution capabilities;
- **Develop contingency management system**: team develops guidelines or rules to deal with unexpected demand or interruptions to supply. (To be developed in accordance with the expectations of customers outlined in the customer relationship management process.)
- **Develop framework of metrics**: used to measure and monitor the performance of the process – including forecast error and capacity utilisation.

4.2.4 ORDER FULFILMENT

It involves coordinating with distribution centres and retail locations to get the product direct to consumers. Effective order fulfilment requires integration of the firm's manufacturing, logistics and marketing plans. The sub-processes for this are the following:

- **Review marketing strategy**: Team reviews the role of customer service in the marketing strategy, customer service goals and the supply chain structure.
- **Define requirements for order fulfilment**: Key inputs include manufacturing capabilities, lead-times and customer service requirement.

- **Evaluate logistics network**: To include evaluation of the location of warehouses, plants, and suppliers, and also which transportation modes should be used.
- **Define plan for order fulfilment**: Determining how orders from various customers will be filled.
- **Develop framework of metrics**: Typical process measures might include order-to-cash cycle time, order fill rate and order completeness.

4.2.5 MANUFACTURING FLOW MANAGEMENT

This process deals with making the products and establishing the manufacturing flexibility needed to serve the target markets. The following are the sub-processes:

- **Review manufacturing, sourcing, marketing and logistics strategies**: to determine the manufacturing infrastructure needed for fulfilling the customers' needs and wants.
- **Determine degree of manufacturing flexibility requirement**: The team plans capacity growth based on the marketing strategy and the business plan.
- **Determine Push/Pull boundaries**: These boundaries help to determine the stocking points in the supply chain for servicing manufacturing facilities, distribution centres and customers.
- **Identify manufacturing constraints and requirements**: The process team designs communication mechanisms for synchronizing the activities with minimal management effort.
- **Determine manufacturing capabilities**: The team determines the manufacturing capabilities and translates them into deliverables to the customer.
- **Develop framework of metrics**: The team develops these metrics to measure the effectiveness of the manufacturing flow process and might include cycle time, inventory levels, and product quality.

4.2.6 SUPPLIER RELATIONSHIP MANAGEMENT

It is the process that defines how a company interacts with its suppliers. Just as a company needs to develop relationships with its customers, it needs to foster relationships with its suppliers. The following are the sub-processes:

- **Review corporate manufacturing and sourcing strategies**: The team reviews the corporate, manufacturing and sourcing strategies, and identifies products and service components that are key to the organisation's success now and in the future.

- **Identify criteria for categorizing suppliers**: Criteria to examine might include, but are not limited to:
  - Supplier's profitability, growth and stability;
  - The criticality or required service level of the components purchased;
  - The sophistication and compatibility of the supplier's process implementation;
  - The supplier's technological capabilities and compatibility;
  - The volume purchased from the supplier;
  - The supplier's anticipated quality levels.
- **Provide guidelines for the degree of customization in Product/Service Agreement**: To consider the quality and cost implications of various differentiation alternatives, and select the boundaries for the degree of customization that might be required or desired.
- **Develop framework of metrics:** The team should relate these metrics to the supplier's impact on the firm's profitability as well as the profitability of the supplier.
- **Develop guidelines for sharing process improvement benefits with suppliers**: The supplier relationship management process team must develop guidelines for doing this.

4.2.7 PRODUCT DEVELOPMENT AND COMMERCIALISATION

Developing new products quickly and getting them to the marketplace in an efficient manner is a major component of corporate success. These are the steps in the process:

- **Review**: Sourcing, manufacturing and marketing strategies.
- **Develop the idea generation and screening processes**: At this point the product development and commercialization process interferes with the customer relationship management process to provide the framework that will be used to determine how new products will impact customers and the level of acceptance of those products.
- **Establish guidelines for cross-functional product development of team membership**: It is critical to have the right people from the internal functional silos along with key customers and suppliers involved in the product development and commercialization process.
- **Develop product rollout issues and constraints**: The team identifies pinch points that could hamper the product development and commercialization process. Activities within this sub-process include market and promotion planning, sales force training, inventory deployment planning, and transportation planning.

- **Establish new product project guidelines**: This includes determining time-to-market and profitability expectations, and estimating the drain on human resources resulting from new product projects.
- **Develop framework of metrics**: Typical process metrics might include time to market, time to profitability and first year sales.

4.2.8 RETURNS MANAGEMENT

Returns management is a vital part of the flow of products that does not fit perfectly into the clean supply chain. It involves picking up online orders from customers' addresses and accepting returns at retail locations. These are the steps in this process:

- **Review environmental and legal compliance guidelines**: Team members need to understand laws that apply to used products planned for disposal; and also recognize rules associated with recall campaigns and packaging issues.
- **Develop avoidance, gatekeeping and disposition guidelines**: Return avoidance means manufacturing and selling the product in a manner such that returns are minimized. Gatekeeping assures that only product that should be returned to a specific point in the returns network is indeed returned to that point. Typical disposition options include return to supplier, refurbish or manufacture, recycle, and landfill.
- **Develop return network and flow options**: A firm should be able to make disposition decisions quickly. Disposition and return reason codes compliant with company policy are developed during this stage of the process. The team develops the returns network and flow options. During this stage, the team develops plans for transporting and holding returned products until they reach their final disposition.
- **Develop credit rules**: The team establishes credit authorization guidelines and credit policies.
- **Develop framework of metrics**: The team develops procedures for analysing return rates and tracing the returns back to the root causes.

5 SALES AND OPERATIONS PLANNING

5.1 INTRODUCTION

The challenge many companies face is that demand exceeds their production capacity or several products compete within the facility for limited resources. Budgets and schedules are required to ensure that these limited resources are spent in the best interest of the company in order to reach its vision, mission, and goals. The products scheduled through a manufacturing company should ensure the highest possible level of profitability. This is the basis for the introduction of Advanced Planning and Scheduling (APS) tools. These automated computer tools provide the computational power to analyse many possible alternatives before a final schedule is determined. However, before the computer tools can be used effectively, a well-defined sales and operations planning process must be established.

5.2 NEED FOR SALES AND OPERATIONS PLANNING

In any organisation the various departments are engaged in their specific functions:

- **Sales and marketing**: analysing market needs and forecasting customer demands.
- **Manufacturing**: scheduling what needs to be built to optimize the uses of its resources.
- **Distribution**: optimizing storage location to provide ready access as per demand.
- **Finance**: projecting sources and uses of cash, and determining availability of sufficient assets.
- **Development**: working on the next generation of product(s).

Each of the above functional areas has its own goals. However, to be successful, these diverse groups should be aligned on the same objectives and strategies to meet the company's goals. The integrating mechanism which provides that alignment is sales and operations planning. Dick Ling (1986) has defined this practice as:

> *"the integrated business planning process that provides management the ability to strategically direct its businesses to achieve competitive advantage on a continuous basis by integrating customer-focused marketing plans for new and existing products with the management of the supply chain".*

Sales and operations planning highlights areas of change and the decisions that need to be made to provide directional leadership. It also provides management with decisions for the enterprise.

5.3 ELEMENTS OF SALES AND OPERATIONS PLANNING

There are four key elements of sales and operations planning:

- New Product Planning;
- Demand Planning;
- Supply Planning;
- Financial Planning.

5.3.1 NEW PRODUCT PLANNING

New product launches can have an enormous impact throughout the organisation. The target market must first be identified. It is imperative in a new product launch that the marketing plans, development resources, and new product strategy are in alignment so that the risk is minimized.

Additional issues that must be addressed during the launch of the new product include the difficulty of forecasting how the new product will be accepted in the market, particularly in view of similar other existing products. The company must also take into consideration the possibility that the product will sell either significantly more or less than the forecasts.

5.3.2 DEMAND PLANNING

Demand planning is the main driver in the sales and operations planning. Management must determine the objectives, strategies, and expectations of products as they move through their product life cycle. The life cycle begins with introduction and then moves to the growth phase and then to steady state and finally to the decline phase. A diversity of products is needed so that the company does not find itself in a major product-rebuilding situation. Marketing supports this management strategy with market information. This can include the history of the product, external factors that may affect the demand for the product, and overall product plans including the marketing, promotion, and pricing approach.

The most difficult issue to overcome is the lack of focus on sales and operations planning as a key management process. Demand plans are essential because every business has a lead time to react. Although the focus has been to reduce response time, there is still a certain amount of time required to order materials, deploy the internal and external capacity, and deliver the desired products to the customer.

For demand plans to be effective, it requires a significant amount of hard work, timely reviews of actual experience against the forecast, inclusion of customer input, appropriate software support, and most important, good judgment on how to react. It is important to understand that appropriate software is not the only requirement for effective demand plans, regardless of what the software companies would assert. Deciding what to forecast and how the forecast will be used is the first major hurdle. Then the hard work of organising and analysing the data to glean meaningful and relevant information can be done. This information is the real key to successful demand planning.

5.3.3 SUPPLY PLANNING

Supply planning defines the resources and strategies available to meet demand. These supply strategies must align the external suppliers and the internal facilities, labour, and materials to deliver the products that the customer demands. The supply planning process includes planning resources and eliminating undesired constraints. In addition, an overall plan must be developed to meet seasonal demand peaks in such a way that the company ensures the best financial results. The amount of desired flexibility is defined and integrated with the company's marketing strategy. If the company is competing in low volume, high variety products, their flexibility will focus on multiple use machines capable of producing a wide breadth of products. When the company is competing in high volume, low variety products, the flexibility focus will be on the agile reaction to changes in volume by utilising machines that have a very focused use. The benefit of the supply planning process is to ensure short, medium, and long-term resource requirements that can be met with available or projected supply.

5.3.4 FINANCIAL PLANNING

Financial planning is where the business plan, the inventory plan, and the revenue, costs, and margins are brought into alignment. Financial planning must be based on current plans for proper financial projects of revenue and inventory. If the sales and operations planning process is followed, there should be no surprises at the end of the year from a financial perspective. Since the final measure of a company's effectiveness is financial, this integration of the sales and operations plan is essential for all departments to improve their

understanding of the financial impact on the enterprise from decision made in their particular areas. Financial planning allows decision making at the appropriate level in the company where demand supply mismatches can be identified and resolved. The market implications, customer satisfaction, and long-term impacts on the product all must be considered. The integrated financial plan also helps ensure that the new product strategy is being followed and supported through enhanced visibility to the management team. Sales and operations planning process provides alignment of operational plans with the business plan and the strategic direction of the company.

5.4 MANAGERIAL REVIEW

The monthly review by the senior management team should include a review of performance measures such as revenue, cost, customer service, sales plan performance, forecast accuracy, new product launch, and supply performance. From this review, action plans are developed for improvement. In addition, the assumptions behind the plan should be well-defined including internal and external assumptions. Any changes in these assumptions should be highlighted during the meeting. After this review, the key issues by customer, market segment, product family, or resource are identified and discussed, including the review of multiple scenarios for the business. Affirmative plans are discussed including the opportunities and risks associated with these alternatives. Decisions are made during this meeting to address the alternative opportunities and provide direction for all affected departments. The sales and operations planning processes bring customer demands, business plans, and the enterprise strategic thrust into alignment.

5.5 PROCESS

We can typically divide the process of sales and operations planning in three phases.

5.5.1 PHASE I

Typically, new product planning is done during the first week of the month. This is followed by the analysis of demand planning, supply planning, and financial planning. This is because most companies will take the first week of the month to close the financial results from the previous month. This is followed in the next week by the integrated reconciliation of business plans and the senior management business review where the decisions are made and integrated into the master production schedule.

5.5.2 PHASE II

This is devoted to integrating and streamlining the process into everyday management of the enterprise. During this phase the company learns that S&OP (Sales and Operations Planning) is a process and, therefore, should be continuously improved. This improvement includes restructuring the timing of the meeting and the refinement of the meeting agenda. The sales & operations planning process focuses on change. The important questions to be considered are:

- What has changed? How has it been measured?
- Do we agree with the changes?
- Do we understand the impact of these changes?
- What decisions need to be made as a result of these changes?
- What can we do to improve the process?

5.5.3 PHASE III

During this phase the company internalizes the sales and operations planning process and utilises it for competitive advantage. A company that has successfully implemented sales and operations planning is customer driven. This company drives the execution of the business plan by ensuring that plans are integrated and realistic rather than allowing chance to play a large role. A sales and operations planning company embraces change as a competitive strategy and drives internal change through continuous improvement. The underlying advantage is that strategies and tactics have been integrated into one plan that everyone drives towards. Too many times each department attempts to drive in its own direction to the negative impact on the overall enterprise.

5.6 GLOBAL SALES AND OPERATIONS PLANNING

As more companies are competing on a global basis, the sales and operations planning process must also span the globe. This plan needs to be an integrated one, as having the information systems becomes even more important to the effective management of the company as the operating scope of the company gets broader. Failure to integrate the plans from the different regions and geographies will cause the company to operate like an unrelated group of independent enterprises and not given the results expected from global reach and integration.

6 BUFFER RESOURCE STRATEGY

6.1 INTRODUCTION

The two most flexible resources in an enterprise are inventory and capacity. Both of these resources can be utilised to buffer customer demand from the manufacturing process. Different types of industries and manufacturing processes require different types of buffers. Inventory is the largest single current asset in most companies today. The investment in inventory must be made very carefully to assure the best profits possible for the enterprise. Even though the inventory has a certain value on the balance sheet, in the event of excess inventory, the true market value is really a small fraction of that value or may actually cost the organisation money to unload. Given that customers are demanding higher variety, shorter lead-times, and lower volumes, the modern enterprise must carefully invest its inventory dollars to ensure that they can turn that investment into profit and not loss. Capacity is perishable. The capacity that is not used today is no longer available tomorrow. Both these resources must be wisely spent to realize the best benefit for the enterprise.

6.2 INVENTORY BUFFERS

Inventory can be successfully used as a strategy to meet the market demand with an acceptable response time. The company must ask where it desires to meet the market demand: finished goods, work in progress inventory, or raw materials. A company has three options:

- **Make-to-stock**: The company may consider a safety stock of finished goods to buffer the uncertainty of the demand from customers. The level of this buffer is directly dependent on the response time to customer demand and the level of demand variability from the customers. If the company is able to quickly convert raw materials into finished goods, item inventory buffer can be relatively small. This is because in the event of any unexpected demands, this agility provides recovery fairly quickly. This requires flexible capacity resources.
- **Made-to-order**: The company may consider its customer at the level of common component raw materials. This strategy works especially well when the product designers keep the number of raw materials to a minimum. This lead-time and reliability of the supply base also directly affect this inventory investment. The less reliable the supplier's performance, the higher the level of safety stock that will be required. Internal capacity resources should be flexible and the schedule requirements well understood.

- **Assemble-to-order**: To improve response time with a wide variety of goods without investing heavily in finished goods inventory, many companies move to an assemble-to-order philosophy. In this strategy, a small variety of semi-finished goods are inventoried followed by the final assembly of a wide product variety being accomplished quickly after customer demand by choosing from the list of alternatives.

Decisions made early in the design process can make effective production and inventory management easier or impossible. For example, the desire is to stock inventory at the raw material level in a make-to-order company. The customer does not need to wait for the supplier to order the raw material and then fabricate the parts. If the designers insist on frequently using non-standard materials or sizes for every part that is designed, this investment in inventory will sit on the shelf tying up scarce financial resources while the customer waits for the finished parts. This is a lose-lose proposition even though the designer may have a perfectly logical reason for desiring that particular raw material. The overall implications of these choices must be considered from an enterprise and not just from the functional area perspective.

6.3 VOLUME/VARIETY MATRIX

To better understand the competitive position of an enterprise, the relationship between the volume produced by the company is compared relative to the variety produced. An interesting diagonal has evolved where most companies are clustered in order to compete effectively. Movements from that competitive diagonal can either be a competitive advantage for the company or disaster. According to Hill (1990), this can be represented in the matrix as shown in Fig. 6/1 below.

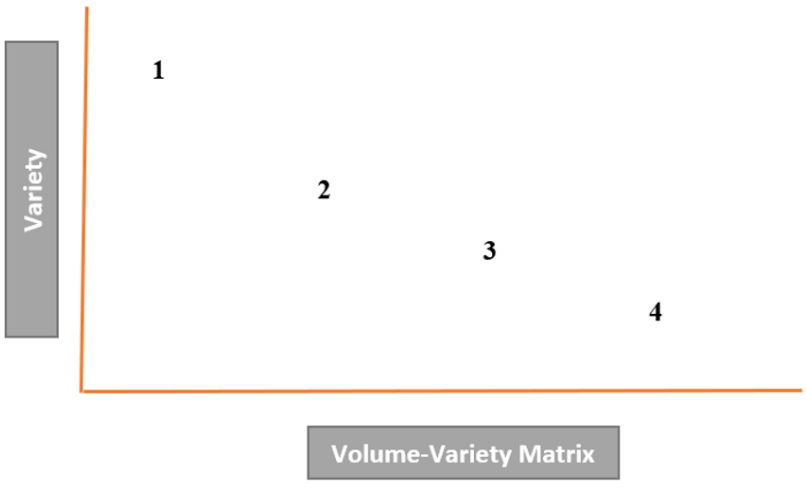

Fig. 6/1 Volume - Variety Matrix

This relationship shows an inverse relationship between variety and volume. In general, as the product volume increases the variety tends to decrease.

We can further explain this phenomenon as follows:

- **Project driven company**: It is a company that produces a very high variety of products but in very low volume. This can mean that a single product may be developed, planned, and produced once and never produced again. These products or deliverables are typically managed as unique projects. A project-driven company competes in the market based on the wide variety of products that it can produce utilising the same resources.
- **Make-to-stock company**: This type of company typically ships to customer on demand. The customers are not willing to wait very long for their needs to be fulfilled. They expect the products they want to be on the shelf, typically in a retail environment. Since manufacturing has to build products in advance of customer demand, the manufacturing schedule is typically driven by a demand forecast. Ideally, the sales force will sell to the 'available-to-promise' (ATP), the uncommitted portion of inventory.
- **Make-to-order company**: This type of company competes in the market by providing a wide variety of products in the shortest lead-time possible. In addition to common raw materials, all products in this company tend to go through similar operations. This type of manufacturing facility is generally capital intensive with general-purpose equipment that can accomplish a wide range of processes.
- **Assemble-to-order company**: In this company, the customer is provided with more product variety than the make-to-stock company if they are willing to wait a small amount of time.
- **Make-to-stock/Assemble-to-order company**: Some companies may be a combination of two types and encompass a number of positions of the volume/variety matrix. An example of this kind of company would be a computer manufacturer that also assembles its own circuit boards and cables. Many individual parts need to be managed and planned to support the assembly of significantly fewer semi-finished goods. From these options, a wide variety of final products can be assembled. This company has all the challenges of both make-to-stock and assemble-to-order companies. This company is driven from forecasts for semi-finished goods similar to assemble-to-order company. The inventory strategy is to have these semi-finished goods available based on the overall sales and operations plan by product mix.

6.4 CONCLUSION

Inventory and capacity resources are key assets in every company. A successful company does not want too much inventory or assets will be wasted and the company is restricted in cash flow. Too little inventory and customer demands cannot be met, therefore, reducing overall profits. Just the right amount of inventory in the right place and the company is profitably meeting customer demands and expectations. Knowing what kind of a company one manages and what the strategy is for competing on volume and variety is essential for developing an overall resource buffer strategy for success.

7 ENTERPRISE RESOURCE MANAGEMENT

7.1 INTRODUCTION

Many companies have embarked on major projects to implement ERP (Enterprise Resource Planning) systems with very little to show in the way of actual results. The reason many of these companies have failed to realise the full benefits of ERP is because most organisations are not organised correctly to benefit from the new information tools provided by ERP. Many of the companies attempting implementation of enterprise-wide systems have run into difficulty because the organisation is not positioned for integration. Departments work to their own sets of objectives. Measurements are functional not global. People are specialists not generalists. Information is spread over many systems and platforms. Systems are often fragmented and there are very few people who have an enterprise-wide view or understanding of the organisation.

ERP is only part of the challenge facing most organisations today. It is not good enough to just plan the resources required to run the enterprise. These resources need to be managed as well. Enterprise Resource Management (ERM) more accurately describes all planning, control, and management functions required to effectively operate the enterprise.

7.2 ERM CHECKLIST

ERM (Enterprise Resource Management) checklist could include answer to several questions as mentioned below:

- **Are the systems of performance measurement customer-focused?**
  Customers care only about how their needs are serviced. They care little about the supplier's internal efficiencies and utilisation. When a company clearly understands the needs of the customer and aligns its business processes to meet those needs, it enjoys a market advantage over the competition. The latest advance in obtaining this data is the use of Customer Relationship Management (CRM) systems. These systems provide analysis of which customers tend to purchase what products. This kind of information is invaluable when deciding how to market new product introductions. CRM provides insights into the customer's ordering patterns such that the enterprise can begin to anticipate the customer's needs for new products and/or services. The integrated resource model begins and ends with the customer.

Competitiveness in today's market requires that the enterprise not only focuses on the needs of the customers but also focuses on the needs of its customer's customer until the final consumer is reached. This is the essence of supply chain management where performance measures are consistent – from the supplier's supplier to the customer's customer. Some customer-focused measures could include the following:

- **Response lead-time**: This measures the amount of time that a company takes to deliver a product once the demand is received. Customers are increasingly demanding and expecting products that are mass customized to fit their needs delivered in a relatively short lead-time. Decreasing this lead-time also reduces the impact that the market forecast has on the operation. Having an agile response capability within the enterprise translates directly into a more accurate market forecast because the time period to forecast is shorter.
- **Product development time**: Customers can provide a wealth of information concerning potential new products. Derivative product ideas easily come from current products as different applications are realised for the current product. Listening to this kind of feedback can be very profitable as the company can leverage on what has been already developed. The time to market for these derivative products is another very useful performance measure. The less time it takes, the more market share that would be available.
- **On time to promise**: This is rather a traditional measure but still very important. Having reliable deliveries to customers is a key part of overall customer satisfaction.
- **On time to request**: We may promise the customer a date but in reality, this is not the date they requested. On time to request is a comparison of the actual shipping date to what the customer really wanted. This measure can realistically be expected to be more aggressive than on time to promise and some would question its use. On time to request provides very valuable information about the customer's needs and wants, and can provide market-driven target goals for the response lead-time.

• **Has the organisational hierarchy been flattened?**

An organisation with many levels of supervision suffers reduced speed of communication and agility. A flattened organisation has more direct communication and can respond more quickly to the needs of the customer. The biggest benefit of successful ERP implementation is that the useful information that can be used for making quality decisions is available throughout all levels of the enterprise. No longer are the key decisions reserved only for senior management; given a common vision and good performance measure, decisions can be accurately made at much lower levels in the organisation. Flattening the organisational hierarchy means fewer overhead expenses and more rapid communication.

- **Are the personnel educated in enterprise-wide thinking?**
  Only personnel that understand what the organisation is attempting to achieve and why can begin to implement customer-focused ideas and processes. Silo-based organisational myopia must be replaced with an enterprise-wide focus. Departments are not in competition with each other but rather must collaborate with an integrated customer focus. This collaboration then extends outside the enterprise through the entire supply chain.
- **Is the organisation team-based?**
  Teams with a clear vision and mission have consistently outperformed individual efforts. The creativity of a high-performing team can successfully move the organisation to significantly higher levels of performance. Assigning people to work together does not make them a team, only a work group. Skills needed to ensure an effective team-based organisation include facilitation, communication, brainstorming, and problem solving, to name just a few,
  Teams normally will evolve through four stages of development (Blanchard, 2003). These are:
  - **Forming stage**: Here the team has just been named and people are trying to determine how they individually fit. This is usually a time of professional aloofness.
  - **Storming stage**: Here the team begins to get to the task at hand. This entails experiencing conflict in roles and responsibilities while the team determines how it will work together.
  - **Norming stage**: Here the team determines how it will work together, including roles, responsibilities and communication.
  - **Performing stage**: Here the team is able to accomplish more than the individuals separately could

  A high performing team can help ensure a competitive edge for the company. Teams do not just happen. Education and training are required. Moreover, all leadership needs to provide the overall guidance and vision of the goal.
- **Have business processes been re-engineered to eliminate waste?**
  Waste is any nonvalue-added activity upon which the organisation expends resources. These critical resources can yield consistently higher profits for the organisation when they are focused only on the desired results. A key part of the ERP implementation process is to closely examine the current business processes and how they map to industry best practices. Implementing ERP is an excellent time to re-examine the current business processes to ensure that they really do best fit the organisation. The easy way out for companies has been to accept the 'industry best practices' that are forced on them during the ERP implementation. Unfortunately, these 'industry-based practices' may be exactly the wrong answer and may replace some processes that are the competitive advantage for the company. There is no one right answer

on how to configure an ERP system. The first step in every ERP implementation is to carefully examine the current business processes and determine which should be changed because they contain nonvalue-added activities and which should not be touched because they provide a competitive advantage.

- **Have the traditional costing methods been changed to value-added costing?**
  Traditional costing methods spread overhead on direct labour hours. This has caused many organisations to feel that the cost to produce in-house is too high. The result is they purchase at the lowest purchase cost. This encourages large volume overseas procurement while at the same time decreasing in-house production. Overall cost rise from the increased inventory and real profits decline. There is no direct cause and effect between overhead charges and direct labour cost. Value-added costing includes only those direct benefits and costs when considering product line costing. Value-added costing provides a more realistic cost assessment based on what is constraining the company's ability to move more product out the door to the customer.
- **Have the principles of integrated supply chain management been adopted?**
  The information about the available supply and desired demand must be shared from the company's supplier's supplier to the company's customer's customer. These principles of integrated supply chain management provide a seamless integration of supply and demand and provide the ability for the company to deliver products that uniquely meet the needs of the market.
- **Have the reliable networks of information and communication been completely implemented?**
  The information systems of a company – software, hardware, and human systems – must be completely reliable for the information to be trusted by everyone using it. Sophisticated computer tools still require the basic building blocks of information to be accurate for the tool to be effective. Data accuracy is also important. The humans involved in the process also must be reliable and consistent with the desired processes. Hardware and software are not a replacement for effective management.
- **Have the evaluation and appraisal systems been changed to recognize both team and individual performance?**
  How people are measured will determine how they will behave. Since personnel are expected to function both as part of a team and also as individuals, measurement systems must be changed to measure and reward the desired team behaviour. Performance measures are another area where there is not a single right answer for all enterprises. Measures included in annual performance reviews often have only short-term effect. The real measures that people respond to are the day-to-day comments and interactions with their immediate supervisor. The measures should fit the individual overall strategy direction for the enterprise and support process improvement.

- **Has the organisation become customer-focused?**
  A key competitive strategy is to focus on the needs, wants, and desires of the customer:
  - How well does the organisation understand what the customer really wants?
  - How well is the organisation aligned to serve these needs?
  - How does the organisation know what the customer desires?

  Becoming a customer-focused organisation requires the alignment of performance measurement systems to encourage a focus on the customer.
- **Have the procedures to ensure standardisation of business operations been developed and implemented?**
  Only when a process is standardised can it be reliably depended upon and improved. This includes all purchasing, production, or distribution processes, together with the delivery of information, products, and services. For the enterprise to align itself to achieve its mission, standard information must be available to all areas of the enterprise. This is a driving force behind the benefits of ERP. Having a common database from which to draw information, then making informed decisions based on that information, is a key reason to purchase ERP. The larger the enterprise, the more the enterprise can benefit from having a single database of information and standardised processes.
- **Are the leaders committed to lifelong learning?**
  New tools and techniques are being developed on a daily basis, so the need for lifelong learning has never been greater. Lifelong learning is not a luxury but rather a necessity to stay competitive and current. Senior level managers in many organisations were never exposed to how computers can be used as a critical business tool by providing 'what if' analysis and consolidating information from multiple divisions. Lifelong learning is required to make early identification of industry trends during an enterprise's environmental scanning. Lifelong learning is also required to be able to link and integrate new concepts that are introduced into the market.
- **Have the organisational silos been replaced with process teams?**
  Cross-functional teams can begin to understand the sources and uses of information and to work across departmental barriers. Process teams require vision and collaboration rather than competition. These teams must have a common base from which to operate and share a common vision. Effective teams require a great deal of work and nurturing. An effective team is a collection of people who are able to accomplish more than could be done individually. To be effective, a team must have a clear vision, an inclusive view of the issues surrounding the problem at hand, and the skills that can solve the problem. High-performing teams can accomplish incredible feats for the enterprise. Developing these high-performance teams can be a real challenge.

- **Does the company have a single company compensation programme?**
  Compensation systems must be perceived to be fair and equitable by all concerned. This includes performance bonuses and salary increases. Rewards should be based on achievement of objectives that are in alignment with the overall strategy – not longevity. The organisation of the future is quickly looking like a construction team that is used to build a house. To achieve the highest level of effectiveness, the performance measurement and compensation system should be simple, easy to understand, and directly reward the desired behaviour.
- **Is the organisational performance benchmarked with 'best in class' practices globally?**
  Not only must the company improve on what it has always done, but also it must do better than the competition. Only through benchmarking practices with best in class companies can one begin to understand what is required for the business to move ahead of the competition. An organisation must look externally to see how well it compares to others in the same industry, as well as compare its processes to best in class. Global competition requires that the organisation look outside its own company and country boundaries to identify the best in the world. Benchmarking is not just sharing information but rather clearly identifying one's own processes first and how you measure them.
- **Is there process capability performance of six sigma or better?**
  Six Sigma quality in all processes virtually guarantees that failures in quality cannot happen. Six Sigma is one way to quantify the reliability of the company's processes. Although the company may never reach Six Sigma capability across all processes, setting this as a goal reinforces the consistency of the process as a key focus for the enterprise. If the processes increase in reliability, then the buffers that are required to ensure continuous flow are drastically reduced. This phenomenon is true in the manufacturing area as well as the support function area.
- **Are there procedures for complete data integrity?**
  Every sophisticated computer system has the same requirement: accurate input information. When quantities on hand, bills of material, routings, schedules, and other inputs are accurate, then the outputs are reliable. If any of these requirements are inaccurate the result is that people do not use the system. The probability of having realistic information output by the system is the product of the level of accuracy of the inputs. Only accurate input data will provide accurate requirements for the supplier.
- **Are the personnel ready to operate in a paperless environment?**
  The evolution of sophisticated computers should eliminate the need for paper. Part of an effective ERP implementation is to re-examine the current business processes to determine which add value and which add only cost. Paperwork is a very visible result of a process that is normally nonvalue-added. Adjusting to a paperless environment can be difficult for the operation. In fact, some companies experience more paperwork after an ERP implementation rather than less.

- **Has the organisation become truly global?**
  Many companies talk about market share in only the U.S. or North America. In today's business world, a company must get its products to global markets. Its competition is certainly targeting the traditional marketplace. A large gap exists between a multinational company and a truly global one. A multinational company does business in a number of different countries usually as a series of independent entities. A global organisation leverages its global reach to provide a consistent and seamless offering to the customer. Becoming a truly global organisation requires an understanding of a variety of cultures, business practices, and customer needs. The employees in the enterprise must think globally for the enterprise to act globally. This means that the performance measures should also encourage global thinking and global considerations. The enterprise will not be global unless direct interaction is enabled between employees and customers globally.
- **Does the organisation culture have a shared vision, values, and goals?**
  Shared vision, values, and goals enable an organisation to nimbly respond to the needs of the market. When this culture is empowered, the result is an organisation that can successfully change to the changing environment. Without shared values, vision, and goals, each department or area will develop its own goals and strategies that best fit it and not necessarily the enterprise. Alignment on the global optimum is impossible. Only when an organisation has a clear and articulated vision and goals supported by common values can it possibly achieve a competitive advantage. Part of the vision and goals should include the value proposition for serving customers' needs.

8 INTEGRATION OF SUPPLY CHAIN

8.1 INTRODUCTION

In the very beginning products were made manually only when needed. Then as our society moved from an agrarian base to an industrial base, people began to specialise their talents. A few pieces were made to demonstrate the craftsman's ability. Actual products for sale to customers were made only to order. As markets and customer demand changed, an expectation developed for immediately available finished products. Then there was inventory. From inventory came the need for inventory control and then for production planning. In the early days (1950s) these planning tools were called 'requirements generation' or BOM (Bill of Materials) processors. The tools continued to evolve by adding additional functionality. As the computer has become increasingly powerful, so have management tools that utilise the computer.

8.2 SCOR (SUPPLY CHAIN OPERATIONS REFERENCE) MODEL

Until recently the main focus of these tools has been internal to the enterprise. In the mid-1990s, the focus began to move externally from the enterprise to the supply base and customer needs. The term 'supply chain management' was coined to capture these linkages from the customer's customer to the supplier's supplier. We can define supply chain management as planning, organising, and controlling of supply chain activities. In 1996, Supply Chain Council (SCC) was organised through Pitiglio, Rabin, Todd, and McGrath (PRTM) and Advanced Manufacturing Research (AMR). According to the SCC:

> *"Process reference models integrate the well-known concepts of business process re-engineering, benchmarking, and process measurement into a cross-functional framework".*

The framework contains:

- The standard descriptions of management processes;
- A framework of relationships among the standard processes;
- Standard metrics to measure process performance;
- Management practices that produce best in class performance;
- Standard alignment to software features and functionality.

The SCOR (Supply Chain Operations Reference) model was developed and endorsed by the SCC. The SCOR model includes:

- All customer interactions, from order entry through the paid invoice;
- All physical material transactions, from the supplier's supplier to the customer's customer, including equipment, supplies, spare parts, bulk product, software, etc.;
- All market interactions, from the understanding of aggregate demand to the fulfilment of each order.

The four distinct processes for the SCOR model are:

- Source
- Make
- Deliver, and
- Plan.

These processes are defined in increasing levels of details beginning with a description of the overall process. The processes are further divided into the process elements, tasks and activities. The supply chain configuration is driven by:

- 'Deliver' channels, inventory deployment and products;
- 'Make' production sites and methods;
- 'Source' locations and products;
- 'Plan' levels of aggregation and information sources.

The real results from supply chain management come from the integration of processes throughout the entire supply chain from the supplier's supplier to the customer's customer.

8.3 SUPPLY CHAIN COMPETITIVENESS

Any chain is only as strong as its weakest link. The big return on ERP investment and the future revenue and profit growth come from integrating the enterprise to its entire supply chain. No longer will a company compete solely on its own merits. An enterprise will compete in the market based on the overall strength of its supply chain. Supply chains will compete with each other for market share and profits. While product is moving from the supplier to the customer, information needs to move backward to provide adequate time for planning and re-planning. Technology will continue to develop that will enhance and speed up these information linkages. The term 'supply chain' is really quite descriptive for the concept. The supply chain is the interrelationship of a series of links from individual companies focused on serving and providing value for the end consumer.

8.4 PLOSSL'S SEVEN SUPPLY CHAIN POINTS

George Plossl (1985) continues to be a thought leader in the supply chain arena. His seven supply chain points are the following:

- **Satisfy the customer's real needs**: Communication about real need can be a challenge. For effective supply chain management, the customers' real needs must be satisfied, not their wants.
- **Understand how the real-world works**: All benefits increase in direct proportion to the speed of flow of material and information. The more quickly information moves, the more value it has. Information that is old has very little value. When demand is synchronised with supply, everyone wins. The customers get the product they want. The retailers sell the product they stock. The distributors sell the product they have. Products that can be made and shipped close to actual demand are more likely to be what the customer wants.
- **Have a complete integrated system**: A complete system includes both planning and execution management. This is the point where ERP can be so effective as a tool. The fact remains, plans will change but to fail to plan is planning to fail. The planning side of the integrated system uses soft data. Changes and variability are expected events. The more quickly an enterprise can react, the less cost is incurred by the operation. However, implementation requires hard data. This is where the resources of the enterprise are committed and changes are very expensive.
- **Accurate data**: Without accurate input data, the best hardware and software will be nothing more than a big money pit and provide no return on investment. The management oversight of the sales and operations planning process is required to ensure feasibility of the business solution not just a mathematically feasible solution.
- **Manage cycle time**: Cycle time is the amount of time that elapses between material entering and exiting a production facility. Given the stress to get orders to customers on time, it is easy to get into the vicious order release cycle. Since orders are late, the desire is to release orders earlier. The belief is that if the orders are released earlier, then there is more time to complete the work and the order should ship on time. The reality is that when more orders are released, there is more work to be managed and there are longer queues at each operation. The systems become more complex and the resources needed to manage the inventory increase. This directly results in more late orders and greater increases in expediting.
- **Eliminate nonvalue-added activity**: Nonvalue-added activity is anything that the customer does not want. Too many ERP and supply chain implementations begin with the best intentions only to succumb to the desire to modify the system to reflect current business process. Eliminating nonvalue-added activity means that one should not automate bad processes.

- **Fully qualified people**: Many companies will invest in the very best systems, hardware, and software. Managers spend a great deal of time researching and interviewing integration and consulting suppliers. Extreme care is taken before committing to the final purchase. The following questions should be asked when hiring qualified people:
  - What business are they themselves in?
  - Where does their work fit into the total business?
  - Who are their customers? What do their customers need? What are their problems?
  - Who are suppliers? What are their problems?
  - What are their tools (systems, data, machinery)? How will they use them?
  - Who is on their team?
  - Who are not yet fully qualified?

8.5 SUPPLIER PARTNERSHIP CHARACTERISTICS

As the company moves to effective supply chain management, supplier partnerships are formed to provide a win-win relationship between customer and supplier. Supplier characteristics are characterised by the following:

- **Longer contracts**: No longer are parts purchased as commodities or with annual contracts. Having contracts in excess of 3 years is not uncommon.
- **More exclusivity in agreements**: The company's total requirement for one part is purchased from a single supplier. This eliminates the variability introduced from multiple suppliers.
- **Fewer suppliers**: The best suppliers will be kept while the poor performing ones will be eliminated. This reduces the sheer number of suppliers that must be coordinated, and reduces overall supplier management overhead cost.
- **Higher volume between buyer and supplier**: Since many of these relationships are exclusive, the volume typically increases. This increased volume also should decrease production cost.
- **Lower prices**: Since the suppliers do not have to incur additional selling expense to maintain the partnership customer, they can afford to focus on improving manufacturing processes. This should reduce their costs and improve profits simultaneously.
- **Frequent delivery of small lots**: Rather than shipping large lots infrequently, small lots are shipped more frequently. The shipment of large lots usually comes from pricing policies. As the sales batch size increases, the price decreases. Having a long-term relationship allows the supplier to synchronize their production with their customer's needs and both companies win.

- **Delivery to point of consumption**: As supply chain management becomes more sophisticated and the two companies become more tightly linked, receiving inventory at the receiving dock, putting it into a stockroom only to pull it against an order to be moved to the shop floor, takes too much time and costs too much money. The supplier can be expected to deliver in containers that can move directly to the point of use on the shop floor.

8.5.1 STRATEGIC SOURCING

Successful strategic sourcing is dependent on a number of different factors. These include the following:

- Financial stability;
- Management commitment to excellence;
- Design and technology strength;
- Quality capability;
- Cost leadership;
- Service and flexibility;
- Manufacturing skills;
- Employee participation.

8.6 DISTRIBUTION NETWORKS

On the other side of the supply chain link are the distribution networks. A single level of distribution centres may be able to provide adequate service to the customer. In more complex distribution, a network hierarchy of centres could be utilised.

8.6.1 DISTRIBUTION REQUIREMENTS PLANNING

Supply chain management is critical in ensuring that the appropriate inventory is in the right place at the right time. A process known as distribution requirements planning is used to determine the need to replenish inventory at branch warehouses.

9 PRACTICES IN SCM

9.1 INTRODUCTION

In the recent past numerous projects on supply chain collaboration were done to analyse how firms could use their suppliers' and customers' processes, information, technology, and capability to enhance competitive advantage. Manufacturers have been instigated to focus on core business resulting in the outsourcing of non-core activities such as transportation and centralisation of manufacturing activities. The practical experiences can be categorised into three distinct areas:

- **Collaborative demand planning and replenishment**: Retailers and manufacturers work together to assess consumer demand and to determine the most appropriate supply management and replenishment approach to meet this consumer demand.
- **Collaborative production**: Manufacturers and suppliers work together to harmonise the supply of raw materials and the production of end products in such a way as to minimise the stocks within the supply chain and maximise the responsiveness.
- **Collaborative logistics planning**: Coordinating transport and warehousing between the various parties involved, including transhippers, logistic service providers, carriers and recipients. A precondition for supply chain coordination is the establishment of connectivity and transparency, i.e. interconnecting the information systems of the successive partners in the supply chain and exchange information via this infrastructure.

Although a lot of research and practical experience with SCM issues has been obtained, we have to acknowledge that few companies have actually established a management environment that supports the integration required for effective SCM. Instead, many chains are still functionally oriented and are characterised by a lack of trust and credibility among the supply chain organisations.

9.2 COLLABORATIVE DEMAND PLANNING AND REPLENISHMENT

Vendor Managed Inventory (VMI) is a technique developed in the mid-1980s, whereby the supplier has the sole responsibility for managing the customer's inventory policy, including the replenishment process. VMI was adopted by many companies in different business sectors. The major weakness of VMI lies in the insufficient visibility of the whole supply chain. This has led the search for alternative, more effective, techniques.

Practice shows that the true benefits are realised only when collaborative plans are linked to operational change; the information must also be used for production and distribution planning. Accurate demand planning enables manufacturing to postpone production of anticipatory stock and can also result in shorter, more predictable order cycles. Guaranteed sales targets allow logistics and distribution managers to make better use of storage and delivery resources to reduce costs as well as to increase customer service by tailoring operations.

9.3 COLLABORATIVE PRODUCTION

The second area where a lot of SCM practices are achieved is collaborative production. The need for customer-driven supply chains that are responsive at low cost has placed a high demand on the flexibility and efficiency of the manufacturing processes. These are enhanced by several practices:

- Product standardisation;
- Re-allocation of production and warehousing facilities;
- Outsourcing of production volume;
- Sharing capacity of a single plant; and
- Supplier partnerships/contracting.

9.4 COLLABORATIVE LOGISTICS PLANNING

The third area for SCM projects is related to the transportation of goods between stages in the supply chain. Whereas in the past every actor organised its own transport, technological advances in logistics and ICT enable the development of new paradigms based on cooperation. This facilitates the consolidation of goods which decreases costs and increases responsiveness.

One of the latest trends is called Factory Gate Pricing (FGP) which makes the retailer the orchestrator of transportation. The manufacturer makes its products available at its warehouse and get the price of goods without transportation costs. The logistic service providers that also take care of the distribution from retail warehouse to outlets and returns flows, can optimize the total flows by incorporating the flows from suppliers.

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