
CONTENTS

1.	Introduction	1-25
2.	Product Development	26-74
3.	Dimensions of Apparel Management	75-108
4.	Sourcing, Development and Production	109-156

INTRODUCTION

STRUCTURE

- 1.1 Learning Objective
- 1.2 Nature of Apparel Industry
- 1.3 Structure of the Apparel Industry
- 1.4 Globalization of Apparel Manufacturing
- 1.5 Organization of the Apparel Firms
- 1.6 Marketing Responsibilities in Apparel Firms
- 1.7 Strategic Marketing Process
- 1.8 Retail and Wholesale Marketing Strategies
- 1.9 Labeling and Licensing
- 1.10 Student Activity
- 1.11 Context of Merchandising
- 1.12 Concepts of Apparel Product Lines
- 1.13 Dimensions of Product Change
- 1.14 Nature and Timing of Manufacturing Responsibilities
- 1.15 Summary
- 1.16 Glossary
- 1.17 Review Questions

1.1 LEARNING OBJECTIVE

After studying this unit you should be able to:

- Examine the role of the marketing division in apparel firms.
- Describe sales forecasting and their role in determining merchandising, production, and distribution schedules.
- Explore retail and wholesale marketing strategies and the apparel market system.
- Discuss product differentiation through product labeling and licensing as a marketing tool.

NOTES

- Examine the role of merchandising in an apparel firm.
- Examine the merchandising process, including line planning, development, and presentation.
- Discuss the relationship of merchandising to sourcing finished goods, materials, and production.

1.2 NATURE OF APPAREL INDUSTRY

The apparel industry was the starting point for the industrialization of the world and the competitiveness of Europe in manufacturing. Today this industry is truly global in nature. Apparel manufacturing, being labor intensive, has been migrating from the high-wage world to developing countries. This migration began earlier than in any other industry, and apparel manufacturing has therefore been at the forefront of globalization for more than four decades. At the same time, strong effort has been put into the efficiency rather than the effectiveness of supply chains. This means that location decisions were mainly based on pure labor cost considerations. The competition has further shifted to the arena of speed and flexibility, where modular, vertically integrated supply chains have gained the lead in being able to react quickly to changes in demand.

Clothes are the need of every human being and the industry that relates to it is known as Apparel Manufacturing Industry. The industry is one of the most important and growth-seeking industries in today's world. The industries affect most of the economies today and have a huge impact on the GDP of the world. The factor which affects the apparel industry is the quality and the way in which the product is marketed throughout the world. If we see around us we will be able to see many companies which have gained huge success and growth rate in past history.

The ways in which the apparel manufacturer circle is being developed, the working and creative demands of the industry too have taken a revolutionary turn. Huge multinational have grown across counties and have created an image for them. The industries have brought about huge changes by directly impacting the economies of some of the countries. As discussed earlier the gross domestic products of various countries have created more job opportunities in recent times. Some of these companies are into the fortune 500 list and numbers of such companies are increasing over the years taking the apparel industries to a new height.

The apparel manufacturer in current times are not only limited to the clothing fields however they have entered a market which touches all the field of the fashion industry. The industry is highly compact and customer centric and the product are today designed keeping the customer's view point in mind. The fashion industry in recent time has seen various changes particularly in term of men and women apparel industry. The apparel industry today hires highly knowledgeable and experience fashion designer to make product for themselves. These acts directly affect the sale output of any apparel manufacturer. Apart from maintaining the fashion

statement, the quality of the product has to be maintained throughout the all manufactured range.

As we know that human needs can never be satisfied; due to this it always look for better options to satisfy its needs. The needs of the human being are the only options that help him to opt for better options and innovates new things. Apparel manufacturer also work on the same policy and hence look for new looks and ways to attracts new customer base. Please note that there no error margin in this field.

The trends of the apparel manufacturer changes a lot and hence have to ensure that they remain dynamic in nature and should always look for the new innovative and attractive product throughout. The trends of the fashion industries are generally dependent on the season and with the end of the season a new design have to be launched. This makes the industry in dynamic in nature. The nature of work that the apparel manufacturer does remain high profit yielding. The market type may change from one location to other. It generally dependent on the geographical location and this remains an important factor in the field of manufacturing.

NOTES

1.3 STRUCTURE OF THE APPAREL INDUSTRY

The clothing sector is both a labor-intensive, low wage industry and a dynamic, innovative sector, depending on which market segments one focuses upon. In the high-quality fashion market, the industry is characterized by modern technology, relatively well-paid workers and designers and a high degree of flexibility. The competitive advantage of firms in this market segment is related to the ability to produce designs that capture tastes and preferences, and even better – influence such tastes and preferences – in addition to cost effectiveness. The core functions of firms servicing this market segment are largely located in developed countries and often in limited geographical areas or clusters within these countries. The Emilia-Romagna district in the so-called Third Italy is one of the most prominent and prosperous textile and clothing clusters in the world, while Italy is the second largest exporter of both textiles and clothing when intra-EU trade is included.

However, this market segment has also seen a significant amount of relocation of production and outsourcing to lower-cost producers, often in geographical proximity to the major market). The other major market segment is mass production of lower-quality and/or standard products such as t-shirts, uniforms, white underwear etc. Manufacturers for this market segment are largely found in developing countries, often in export processing zones and/or under so-called outward processing agreements with major importers. They employ mainly female workers – semi-skilled and unskilled – and outsourcing to household production is quite common in the low end of the market. In the low to middle priced market, the role of the retailer has become increasingly prominent in the organization of the supply chain. The retail market has become more concentrated, leaving more market power to multinational retailers. These have market power

NOTES

to multinational retailers. These have market power not only in the consumer market, but perhaps more importantly they have considerable buying power. In addition, high-volume discount chains have developed their own brands and source their clothing directly from the suppliers, whether foreign or local.

Consumers spend a smaller share of their income on clothing than in the past, although consumers shop more frequently and buy a larger number of clothing items than before. The response from producers to the challenge of slow growth in total demand is to build on consumers' love of variety of sizes, colors, designs etc. at a frequent rate.

The supply chain in the textile and clothing sector is illustrated by figure 1.1. The dotted lines represent the flow of information, while the solid lines represent the flow of goods. The direction of the arrows indicates a demand-pull-driven system. The information flow starts with the customer and forms the basis of what is being produced and when. It is also worth noticing that information flows directly from the retailers to the textile plants in many cases. The textile sector produces for the clothing sector and for household use. In the former case there is direct communication between retailers and textile mills when decisions are made on patterns, colors and materials. In the second case textile mills often deliver household appliances directly to the retailers.

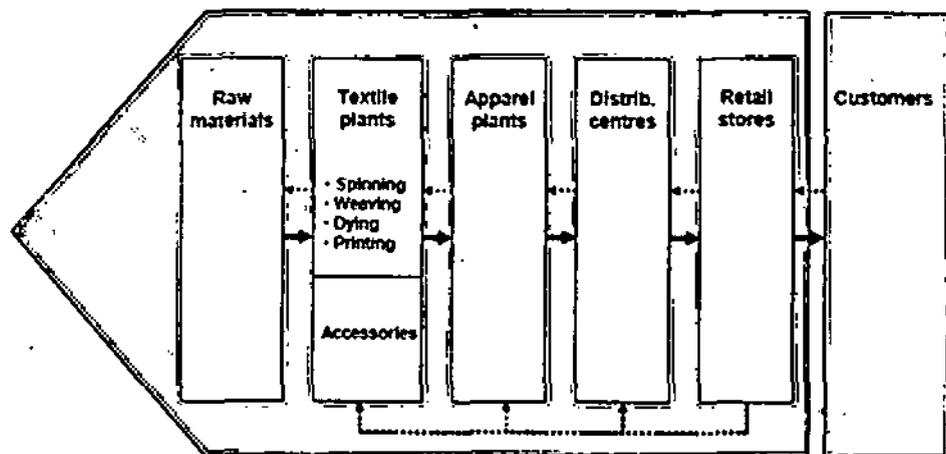


Figure 1.1: The supply chain in the textile and clothing sector

At each link in the production chain to the left of the distribution centre in figure 1.1, there are usually several companies. In order to make goods, information and payments flow smoothly, a number of logistics and business services are needed. Depending on the size and development of the host economy, such services are provided by the lead firm in the supply chain or independent service providers in the more advanced countries.

An illustration of how a supply chain operates is as follows: lean retailers in India typically replenish their stores on a weekly basis. Point of sales data are extracted and analyzed over the weekend and replenishment orders placed with the manufacturer is typically required to fill the order within a week, which implies that the manufacturer will always have to carry

larger inventories of finished goods than the retailer. How much larger depends on his own lead time and demand volatility. The larger the fluctuations in demand, and the larger the number of varieties (e.g., style, size, color) the larger the inventory has to be. On the other hand, the shorter the manufacturer's lead time, the better the demand forecasts and the larger the market, the less the inventory needed relative to sales. The size of the market matters, since the variation of aggregate demand from a large number of consumers are less than the variation over time of a few consumers. Upon receiving the replenishment order, the manufacturer will fill it from its inventory and then on the basis of the gap between remaining inventory and the desired inventory level, will make a production order to the production plant, of which the manufacturer may have several in different locations. The retailers may order large quantities of, say, shirts spread over a number of producers in several low-wage countries. In order to ensure that the shirts are similar and can sell under the same label, the buyer often buys fabric and accessories in bulk and provides its clothing suppliers with these inputs. In addition, buyers often also specify the design and assist the producers in providing the desired quality.

The underlying technological developments of modern supply chain management are discussed below. Given the demand-pull nature of the supply chain, it is natural to start the discussion with the retail sector, followed by clothing and then textiles.

1.3.1 The Retail Sector

Significant changes have been observed in the retail sector in past few decades and modern retailing has been called "lean retailing" in a recent comprehensive study. The technological building blocks of lean retailing are bar codes and uniform product codes, electronic data interchange and data processing, distribution centres and common standards across firms. The change most visible to consumers is the expansion of large shopping malls at the outskirts of the cities at the expense of city centre department stores and boutiques. As already mentioned, the retail sector has become more contracted, particularly in India. Concentration implies more buying power for the retailer and thus increased bargaining power towards suppliers.

The bar code and complementary equipment for reading it are crucial for the retailer to collect point of sales information in real time. Bar codes were first introduced in the food industry in the 1970s and became widespread in the clothing sector from the mid 1980s. The technology allows retailers continuously to monitor which products sell and which do not — down to the details on size, color and other characteristics. The technology also allows retailers to keep track of inventories. Such information is only valuable if it can be used for adjusting the supply of garments to consumer tastes as the information becomes available. Such adjustments require more frequent supply of garments in smaller quantities as opposed to the traditional stocking of the store before the season and clearance sales at the end of the season. In order for suppliers to be able to provide frequent

NOTES

NOTES

supplies and make changes in the product spectre at short notice, retailers need to share point of sales data with suppliers, which requires frequent communication between retailers and their suppliers. For this purpose, EDI and data processing programmes are necessary. These provide a direct and often automated information exchange between retailers and suppliers and require that both parties invest in compatible software. A very crucial technology applied throughout the textile and clothing supply chain is the laser which is used for reading bar codes and transmitting the information content to the EDI and data processing equipment.

Efficient and timely information flows are of little use if not complemented by equally efficient and timely flows of the goods for sale. The emergence of distribution centers, replacing traditional wholesalers and storage facilities ensures efficient and timely flows of goods. A distribution centre consists of bays for trucks to unload or load goods. Incoming goods are packed in standard containers with barcodes that are scanned as they enter conveyor belts. The information on the bar codes is matched with information on purchase orders by means of information processing systems. The goods are then routed to the correct bay for outgoing trucks to the store that has ordered them. Only when the information on the bar code does not match purchasing orders are containers routed to manned stations. The information processing system also process financial information and may be linked to automatic invoicing and thus an equally efficient flow of financial transactions between buyers and suppliers. Distribution centres are usually smaller in terms of floor area than traditional wholesale storage buildings, but the distribution center is much more capital-intensive and automated.

Finally, the integration of information flows, flows of goods, and payments are only possible if all the links in the chain use compatible standards. Suppliers are required to add bar codes that comply with industry standards to garments before they are shipped. Often they are also required to place the apparel on hangers such that it can go straight from the truck to the shop floor. Evidently, lean retailing has a bearing on suppliers and the technology applied in the clothing and textiles sectors.

1.3.2 Clothing

The basic production technology of the apparel industry has not changed much over the past century, and is characterized by the progressive bundle system. Work is organized such that each worker is specialized in one or a few operations. The fabric is specialized in one or a few operations. The fabric is first cut and then grouped by parts of the garment, tied into bundles (pre-assembly) and then sewed together. The individual sewing tasks are organized in a systematic fashion and specialized sewing machines have been developed for the individual tasks. A worker receives a bundle of unfinished garments, performs her single task and places the bundle in a buffer. A buffer of about one day's work has been common at each operation. It takes about operations to complete a pair of pants, which implies that there is about 40 days of in-process inventory. For men's blazers, however, it takes as much as 100 operations. Although a number of improvements in terms of systematizing the

operations and reducing the time at each individual operation has taken place over time, the basic system has remained the same. One explanation for this is that technology changes cannot be implemented in a partial fashion involving only a few operations. This would unbalance the system and any major technological change therefore needs to involve the entire system.

1.3.3 Textiles

The textile industry is usually more capital intensive than the clothing industry and it is highly automated, particularly in developed countries. It consists of spinning, weaving and finishing, and the three functions are often undertaken in integrated plants. Traditionally, and in many markets, it is still long and the capital intensity of the industry results in relatively large minimum orders. The textile industry is therefore less flexible in terms of adjusting to consumer tastes during a season than the clothing and retail sectors. The textile sector is thus in many ways the bottleneck in the supply chain.

The textile sector is less unskilled labor-intensive than the clothing sector. We notice that the import share is in general quite high but some of the richer and larger countries such as China; Hong Kong, China and India rely mainly on locally produced inputs for textiles as well as clothing.

It has been difficult for poor countries to create backward linkages to the local economy in the business environment described in this section. The import content of the clothing industry is therefore typically high in poor countries. But even if local value-added is low, the clothing sector plays a major role in job creation and many countries have been able to upgrade their clothing sectors by moving from assembly of imported cut fabrics and accessories to full-package production over time. Mexico's experience suggests that trade liberalization is important for this upgrading to take place, because a relatively free trade regime provides sufficient flexibility for the production networks to operate and rules of origin become less of a problem.

1.4 GLOBALIZATION OF APPAREL MANUFACTURING

From a business standpoint, the term globalization is associated with viewing multiple sites in the world as markets and/or sources for producing or acquiring merchandise. Global firms use advanced communication and transportation technology to coordinate manufacturing and distribution in multiple locations simultaneously. Both large and small firms are impacted by globalization because both are suppliers and buyers in global market. Many textiles and apparel industry participants believe that globalization favors large firms because of capitalization requirements, economies of scale, breadth of product lines, and sophistication of technology and communications systems. At the same time, globalization factors that favor smaller firms include flexibility; ability to serve niche markets; offering unique, differentiated products; and offering higher-margin products. Dispersed locations of production units have resulted in using more

NOTES

functional, smaller-scale, and less expensive production equipment. Globalization of trade in textiles and apparel is so pervasive that it is nearly impossible for a textile or findings manufacturer, apparel manufacturer, or retailer not to be involved.

NOTES

Globalization of the apparel industry means that most firms are involved in international trade. International trade is the exchange of goods by firms located in different nations, as well as all the issues associated with that exchange. International trade regulations establish barriers and limits on types and quantities of goods that cross political boundaries. There are two primary forms of trade barriers: tariffs and quotas. A tariff is a tax on goods that are exported or imported. A tariff is sometimes called a duty. A quota is a quantitative limit on exports and imports. An embargo stops trade altogether. Trade barriers are usually intended to protect domestic markets from lower-cost foreign goods.

Quantitative relationships between exports and imports determine the trade balance: exports minus imports equals the trade balance. If the trade balance is negative, it is called a trade deficit. The United States has long had a trade deficit in apparel and developed a trade deficit in textiles during the 1980s. This means that the quantity and/or value of apparel imported exceeds the quantity and/or value exported. Nearly all of the more than 200 countries in the world export apparel to the United States.

1.4.1 Illegal Trade Activities

Three types of illegal activities according to World Trade Organization are common in the international trade of textiles and apparel: dumping, transshipment, and government subsidies. Dumping is the practice of selling goods in a foreign country below the domestic price of goods. Sometimes firms use dumping as a means of getting rid of excess inventory. When dumping occurs, the importing country can impose a countervailing duty, a special tax that will increase the price of the goods to a more normal competitive level.

Transshipment involves changing the country of origin of the goods to avoid tariffs or quota limitations. Goods are made in one country and then transported to another where there are lower tariffs or no quota restrictions. New country-of-origin labels are inserted, and the garments are then shipped to the country that has the trade restrictions. The actual quantities of goods that are transshipped are unknown. However, it is clear that the problem increases as trade restrictions increase. The US Customs Service has stepped up surveillance of the problem; however, determining country of origin is increasingly complex with textile and apparel imports coming into the United States from more than 180 of the more than 200 countries in the world.

Government subsidies for industry are also illegal under the WTO. Government subsidies are payments by the government to manufacturers to defray costs of production. Sometimes they are called negative trade taxes because instead of the firm paying the government, as is commonly the case for taxes, the government pays the firm. Government subsidies are regarded as a form of unfair competition because the products can be sold at abnormally low prices.

1.4.2 Corporate Social Responsibility

Exploitation of labor by the apparel industry has had high visibility in recent years. News reports have documented exploitation in apparel manufacturing in the United States, as well as in many other parts of the world. Exploitation, in this sense, is unethical use for one's own advantage; to make a profit from the labor of others without giving just return. The apparel business is extremely price competitive and continually under pressure to reduce costs. The lowest of the lowest labor costs may be offered under sweatshop conditions.

Sweatshop conditions tend to be characterized by extremely low pay, poor working conditions, safety violations, and generally inhuman treatment of employees. Most sweatshop-type operations are not registered as legitimate business and thus do not believe they have an obligation to abide by laws and regulations. Sweatshops exploit the exploitable. In the United States, sweatshop employees tend to be aliens and illegal aliens. Exploited employees in the less developed countries tend to be young women and children, often in their first and perhaps only opportunity for regular employment. With unemployment and poverty rates high, parents often need their children to work so the family can have basic necessities. Under these conditions, deciding on "fair" employment policies by firms operating in global markets is extremely difficult.

Most apparel manufacturing plants are not sweatshops. The few that are sweatshops have created image problems for the entire industry. Legitimate manufacturers are looking for ways to fight back. Many US companies, both manufacturers and retailers, are making comprehensive efforts to improve their business ethics. They have developed ethics statements that encompass decision making and relationships in all aspects of the business. Applying these business ethics in a domestic market is challenging; applying them in the global market is extremely complex.

Each country in the world has a unique mix of customs, laws, values, and ways of doing business. What is regarded as exploitation in one part of the world is standard practice in another. Most countries have laws and regulations regarding exploitation of labor, particularly child labor. For example, according to laws in many countries around the world, it is common for age 14 to be the minimum age for employment. Major differences among countries, however, lie in the effectiveness of enforcement of the law, in the cultural standards and expectations relative to employment, and in the socioeconomic conditions under which people live.

1.5 ORGANIZATION OF THE APPAREL FIRMS

Business organizations are regarded increasingly as teamwork environments with interactive organizational structures. Decision making for a

NOTES

NOTES

manufacturing firm revolves around developing a product line that will meet the needs of the target market. Each area of specialization in a firm has its own objectives and responsibilities. At the same time, areas must interact and coordinate their activities in order to achieve their common goals: serving the target customer, growing and making a profit. The role of each division and the interaction among the divisions of an apparel firm determine how the firm relates to the global apparel business as a whole.

Apparel firms, whether large or small, require expertise in executive leadership, quick response, marketing, merchandising, production, operations, and finance. In a well-run apparel firm, the target market is the central focus of decision making. Firms seek to produce lines of apparel that their target customers will buy each season and each year. Styling, colors, sizing, and quality level are all determined by firms' perceptions of their customers' preferences.

Table: Worldwide Responsible Apparel Production (WRAP) principles.

Laws and workplace regulations	Apparel manufacturers will comply with laws and regulations in all locations where they conduct business.
Forced Labor	Apparel manufacturers will not use involuntary or forced labor – indentured, bonded, or otherwise.
Child labor	Apparel manufacturers will not hire any employee under the age of 14, or under the age interfering with compulsory schooling, or under the minimum age established by law, whichever is greater.
Harassment or abuse	Apparel manufacturers will not provide a work environment free of harassment, abuse, or corporal punishment in any form.
Compensation and benefits	Apparel manufacturers will pay at least the minimum total compensation required by local law, including all mandated wages, allowances, and benefits.
Hours of work	Hours worked each day and days worked each week shall not exceed the legal limitations of the countries in which apparel is produced. Apparel manufacturers will provide at least 1 day off in every 7 day period, except as required to meet urgent business needs.
Discrimination	Apparel manufacturers will employ, pay, promote, and terminate workers on the basis of workers' ability to do the job, rather than on the basis of personal characteristics or beliefs.
Health and safety	Apparel manufacturers will provide a safe and healthy work environment. When residential housing is provided for workers, apparel manufacturers will provide safe and healthy housing.

[Table Contd...

NOTES

Contd...Table]

<i>Freedom of association</i>	Apparel manufacturers will recognize and respect the right of employees to exercise their lawful rights to free association, including joining or not joining any association.
<i>Environment</i>	Apparel manufacturers will comply with environmental rules, regulations, and standards applicable to their operations and will observe environmentally conscious practices in all locations where they operate.
<i>Customs compliance</i>	Apparel manufacturers will comply with applicable customs law and, in particular, will establish and maintain programs to comply with customs laws regarding transshipment of apparel products.
<i>Drug interdiction</i>	Apparel manufacturers will cooperate with local, national, and foreign customs and drug enforcement agencies to guard against illegal shipments of drugs.

1.5.1 Executive Leadership

Executive leadership of apparel firms consists of heads of divisions, owner/managers, and/or chief executive officers. Executive leaders set goals for the organization and make decisions that will help the organization meet those goals. Fundamental leadership decisions include selecting target markets and identifying appropriate product lines, price ranges, and quality levels. Executives provide guidance and motivation for the people in the different areas of expertise. The leadership process for executives requires strategic planning to determine the firm's direction and budgeting to manage the firm's resources.

The Business Plan: Strategic planning by executives is a process for focusing an organization's energy and resources. In the apparel business, strategic planning involves understanding the firm's target customer, its products, and the competition and developing profitable business strategies to operate in its markets. Strategic planning can be geared to either the short run or the long run. In the apparel industry, long-run plans may be made for 5- or 10- year periods. More commonly, plans are short run, involving 1 year, 6 months, or perhaps only a selling period. A strategic plan provides focus and continuity for decision making in all of a firm's divisions by (1) defining a firm's purpose, (2) establishing the priority for budgets, and (3) providing a basis for developing the strategies by the firm's areas of expertise.

The first step in developing a strategic plan is defining a firm's purpose, which includes a statement of mission, description of the target customer, and description of the product line. The mission statement identifies the purpose of the firm relative to service, organization, growth, and profit. It is a statement of the central concept of the firm. "Businesses

NOTES

exist at the discretion of consumers." Businesses can exist only as long as they serve customers; when they cease to serve customers, they appear. A mission statement reflects the firm's purpose related to satisfying customer's needs. The focus may be on timely service to consumers in terms of quality, styling, and value.

The strategic plan determines whether the apparel firm operates primarily at the wholesale level, the retail level, or both. The identification of types of products to be offered, basic assortment strategies (separates, related separates, or coordinates), size ranges, and price range(s) are often included in the strategic plan. The price range in which a firm operates (low-end, budget, moderate, better, bridge, designer) is a policy decision determined by executive leadership after careful consideration of the target market, competition, and growth and profit goals. This provides the merchandiser, in cooperation with other managers, a basis for line planning, line development, and sourcing strategies.

The amount of emphasis placed on fashion innovation and creativity in styling may also be reflected in the business plan. A fashion firm may determine that original designs and creativity are extremely important to the image and market position of the firm. This type of firm must be prepared to invest in being fashion-forward and to deal with rapid product change and short selling periods. Other firms may use knockoffs of the other firms' styles or minor modifications of their own past seasons' lines. In the apparel business, knockoffs are used at nearly all price levels. Firms primarily in the basics business may focus on performance of materials, garment assembly automation, and development of Quick Response.

Budgets: Budgets are comprehensive financial plans that establish the allocation of resources for achieving the goals of a firm. They are based on sales goals, growth goals, cost containment goals, and profit objectives. All of a firm's divisions supply data needed for formulating budgets. Involving employees in budget preparation helps ensure support for the goals reflected. A budget is prepared for each product, line, and functional division for a selling period and/or sold, and revenue to be earned. Comparisons of actual sales and costs to budgets determine the level of success related to execution of the business plan.

Based on resource allocations reflected in the budget, the following leadership/management actions can be taken:

- Prepare sales goals for each line, territory, and/or store.
- Plan shipping volumes and deadlines.
- Project costs of production.
- Make sourcing decisions to determine where, when, and how many of each style will be produced.
- Determine inventory levels for materials.
- Schedule fabric deliveries to coordinate with the production schedules.
- Project sales, shipping, and administrative costs.
- Project timing and dollar value of capital expenditures.
- Determine additional investment in equipment.

- Project timing and dollar value of accounts receivable.
- Project timing and dollar value of accounts payable.
- Evaluate cash flow.

NOTES

1.6 MARKETING RESPONSIBILITIES IN APPAREL FIRMS

In many firms, the marketing division, in cooperation with the other divisions, is instrumental in developing a firm's strategic plans. Marketing personnel are responsible for positioning the firm relative to target markets and the competition. The established market position provides the basis for the marketing division to set advertising and promotional objectives, recommend sales goals, create marketing programs, sell products, and provide feedback from retail buyers and consumers.

Responsibility for the planning, development, and presentation of apparel product lines may be shared by managers in the marketing and production divisions. Because of the speed of product change in today's markets, many apparel firms have created merchandising divisions to manage the product line. In the presence of a merchandising division, marketing personnel focus on the interface between the firm and the market and the development of new marketing opportunities. Marketing is also responsible for continually monitoring markets and recommending modifications when change in strategy is indicated.

1.6.1 Market Segmentation and Target Markets

To market products successfully, firms identify certain groups of customers as a target market(s) for their products. A target market is the select population to whom a group of products and the firm's marketing program are directed. To serve customers' needs, the firm must have a thorough understanding of the likes, wants, and needs of the target market. It is the responsibility of the marketing division to provide necessary data. A market profile provides data about a market segment that is the intended target market. A target market is described in terms of demographic characteristics such as age, sex, income, geographic location, and occupation.

Firms identify a particular group of target customers, a market segment they seek to serve with their products. They define and describe their core customers, customers who are the foundation of their business. Fringe customers occasionally shop or may be attracted to shop the firm's lines and offer potential for business growth. Understanding the core customer is a key step in developing a successful marketing strategy. Manufacturers seek retailers with similar core customers. Both manufacturers and retailers have their core customers in mind as they attend markets and plan assortments. Retail buyers usually create assortments from offerings of various manufacturers according to the buyer's perception of the core customers' needs and desires.

The market segment a firm chooses to serve may be broadly or

NOTES

narrowly defined. A firm may choose to serve may be broadly or narrowly defined. A firm may choose to serve a mass market, a multiple-segment market, or a narrowly defined target market. A mass market usually includes all of the middle-income class and perhaps part of the lower-and upper income classes. For mass market product lines, marketing strategies are designed to appeal to a large portion of the total US population.

A mass-market strategy by a retailer means that their manufacturer suppliers must also have mass-market potential. Manufacturers must have adequate production capability and operating systems to supply hundreds of stores. Quality must be adequately monitored to provide consistent product serviceability. Timely deliveries are of particular importance to prevent stock-outs. When an item a customer wants to buy is not immediately available, a lost sale is often the result. Mass marketers achieve success by having merchandise that customers want in stock.

Firms may develop multiple-segment strategies by directing their appeal to different target markets. For example, a line of junior apparel might be made in a different size range for the preteen market, or a men's sport shirt manufacturer may add a line of women's shirts. In each case, the apparel firm is able to utilize production and marketing capabilities while adding sales potential. Multiple segment strategies provide a cushion for success because of the potential for some part of the merchandise mix to sell well when sales are down in other segments.

When the target market is narrowly defined according to demographic and lifestyle variables, the approach is sometimes called niche marketing or micromarketing. The market may be segmented by type of product offered in relation to gender, price range, size range, and lifestyle variables. With narrow target market definition, a firm might make a number of product lines for the same target market. Over time, a firm may change its conception of the target market because of demographic trends. Two key demographic changes among the US population will impact apparel marketing during the next 10 years: (1) distribution changes among the age groups, and (2) population shifts to the south and west. The population is expected to continue to increase. The largest increases in the number of people will be in the older age brackets (55-74 years of age). Households in which people ages 55 to 75 or older reside spend between \$582 and \$1,833 per year on apparel. The size of the teenage population began to increase in 1992, after 16 years of decline. The number of teenagers is expected to increase until 2010, as kids of baby boomers expand the number of 12-to-19 years olds to 34.9 million. The needs and wants of the older population segment differ markedly from younger consumers, who have been targeted by most manufacturers and retailers over the last 30 years. These strong demographic trends are reflected in the focus on lifestyle variables and marketing strategies of firms that successfully market their products.

Changes in demographics and lifestyles are resulting in the recognition of many more market segments within apparel markets. Companies are

NOTES

positioning and differentiating their products in terms of styling, brands, sizing, service, and/or price to meet the needs of special market segments. For example, there has been a dramatic growth in the offering of petite and large size women's apparel and tall and large sizes for men. These segments represent up to one third of the population, but until recently, have been largely ignored by the apparel industry. Effective service to an underserved market segment can be very profitable. For example, the women's petite size range was developed to serve one of these markets. Serving small market segments involves smaller production runs that may lack economy of scale; thus, good management is required to control costs.

1.7 STRATEGIC MARKETING PROCESS

The marketing strategy is the part of a firm's strategic plan that gives consideration to:

- a. marketing objectives,
- b. analysis of the competition,
- c. positioning and differentiation of the product lines, and
- d. sell-through of the product lines.

1.7.1 Marketing Objectives

The purpose of a marketing strategy is to provide for growth and profitability of the firm. Objectives of marketing plans include the following alternatives:

- **Market penetration:** Expand sales of current products in current markets through effective advertising and promotion. The objective of market penetration is to have current customers buy current products more often. This might be achieved through price promotion, everyday low pricing, developing brand/store loyalty, and/or convenient accessibility for purchase. The Internet is providing a means of penetrating both wholesale and retail markets. Apparel manufacturers are using Web sites for business-to-business sales at wholesale as well as business-to-ultimate consumer at retail. The Internet provides firms another opportunity to serve their target markets.
- **Market Development:** Seek greater sales of current products from new markets or develop new uses for current products. The objective of market development is to find new customers for the current product line. In today's global markets, that may mean reaching domestic customers more effectively and/or marketing in other countries. Finding new uses for current products is another opportunity for marketing development.
- **Diversification:** Develop or obtain new products aimed at new markets. Diversification means learning a new business, including needs and wants of the target market, supplier and customer patterns, and distribution systems.

NOTES

1.7.2 Analysis of the Competition

Firms that offer similar products to similar target markets are competitors. To understand and analyze the nature of the competition in a market, the following points are considered:

- Present and potential firms in the market
- Market positions of competing firms
- Missions and objectives of firms
- Typical patterns of competitive behavior among firms
- Strength of the resource base of competing firms
- Competitive advantages of competing firms
- Key vulnerabilities of competing firms

It is not difficult to determine which firms are already established in the market. Direct competitors can be identified by asking retail customers about alternative suppliers, reading the trade press, consulting industry directories, and participating in industry groups or trade associations. Obtaining specific information about the firm's objectives, size of its market share, and its financial condition may be more difficult, particularly if it is a privately owned company. Customers may be able to relay the competitive advantages and vulnerabilities of the firm's competitors and identify ways the competition is not meeting the market's needs. Knowledge regarding these vulnerabilities may be the key to establishing a market position that could make a particular apparel firm the preferred supplier in a particular market.

Determining potential competition is more difficult. The apparel business is characterized by low barriers to entry. Some firms enter, other change market strategies, and others leave the business every day. It is difficult to predict which ones will be successful and in which markets. Although most new entrants fail during the first 3 years (probably over 90%), some become very successful. The challenge is not only to meet the needs of the market for a selling period or a year but to continue to serve the market better than the competition year after year.

1.7.3 Market Positioning and Product Differentiation

In the apparel business, two of the greatest marketing challenges are positioning the firm in the market and differentiating the firm's products from its competitors'. Most apparel markets have many firms with small market shares and thus a high level of competition. A new firm can become successful and an established firm can be even more successful by carefully developing a positioning strategy in the market. Effective market positioning means the firm is able to provide more benefits to the consumer than the competition can provide.

To make positioning decisions, the firm must know (1) purchase criteria of their target customers, (2) product performance expectations, and (3) customers' perceptions of competing products. Customers' purchase criteria are translated into specific benefits they expect to receive from the product. Conducting a market analysis using trade publications and

other sources can be very frustrating because of great inconsistencies in the data reported. Good market analysis requires a knowledgeable, professional marketing organization.

Through product differentiation, a firm's products and services become distinctive and identifiable from the rest of the products in the market. Products are differentiated by using labeling, price, quality, customer service, fit, fashion, and distinctive styling. Brand advertising is a primary means of communicating product differentiation to target customers.

NOTES

1.8 RETAIL AND WHOLESALE MARKETING STRATEGIES

The *geographic market to be served by an apparel firm is determined by the description of the target market. An apparel firm might seek to serve a regional, national, or international market at the retail level, the wholesale level, or both. These decisions determine the focus of the promotional strategy and the selection of national and/or regional markets where products are sold. The lines offered in each market are edited to make them suitable for customers' needs and preferences in the particular geographic area. The options an apparel firm might choose as a means for distributing merchandise include the following:*

- Manufacturer-owned retail outlets
- Mail-order distribution
- Use of a road sales force for selling to retail buyers
- Use of wholesale apparel markets
- Marketing on the internet
- In-home direct sales
- Combinations of these options

1.8.1 Developing Retail Strategies

The use of manufacturer-owned retail outlets and mail, telephone, and/or Internet as direct outlets to consumers is a growing means of apparel distribution. Manufacturer-owned retail outlets may sell first-quality merchandise in a boutique-type setting and/or sell first- and/or second-quality and/or distressed merchandise through a manufacturer's outlet mall format. Manufacturers first used outlet malls to disperse distressed merchandise that was not salable through regular retail channels. Distressed merchandise includes seconds, samples, production overruns, last season's goods, retailer returns, and so forth. Manufacturers' outlets were so successful that some apparel firms are now manufacturing for their own outlet stores.

1.8.2 Developing Wholesale Market Strategies

The term market has multiple uses; therefore, it must be interpreted according to the context in which it is used. A common meaning of market is the sales potential for a particular type of goods. When estimating

NOTES

potential sales in a particular product market, marketers evaluate income levels, customers' preferences, and other factors to determine how many units might be sold and at which prices.

Another use of the term market applies to the process of getting buyers and sellers together so that ownership of goods can be exchanged. Trade associations provide trade shows or "markets" where apparel manufacturers' representatives display merchandise and retail buyers have the opportunity to examine it and make selections for their stores. When a retail buyer says, "I am going to market," it means that he or she is going to a place where a group of apparel manufacturers is showing their product lines for sale at wholesale. The United States has a system of wholesale markets, organized according to product lines, that facilitates the sale of merchandise from both domestic and foreign apparel manufacturers to retail buyers. The functions of these markets include identifying prospective customers, working with current customers, introducing new products, enhancing corporate image, testing the acceptance of new products, gathering competitor information, and selling current product lines.

Apparel firms often have permanent showrooms in major apparel markets and temporary showrooms in other apparel markets. Permanent showrooms serve the buyers on their regular buying trips. It is common for buyers to make buying trips one week out of every month. Buyers also communicate with sales representatives or showroom managers by telephone on a daily basis regarding orders, fill-ins, delivery, prices, and other matters. Regional markets serve many buyers who might previously have relied on personal calls by sales representatives.

The development and administration of a wholesale market strategy are normally the responsibility of the marketing division. The wholesale strategies used by an apparel firm depend on the types of retail accounts served. If a firm has large corporate accounts, business is usually conducted in the home office showrooms. Principals of the manufacturer and retailer may meet to refine the line to their market needs. Arrangements are made for exclusive, private-label, and other merchandise that will not be available to other retailers. Major accounts such as these are often regarded as corporate or "house" accounts, so commission is usually not paid to sales representatives.

If a firm has hundreds or even thousands of smaller retail accounts, geographic territories are often the basis for selecting and organizing the sales force. The sales force may include both inside and outside salespeople. Inside sales representatives work in the home office showroom and/or permanent showrooms in apparel markets. Outside sales representatives travel and service a territory assigned by the marketing division. Outside salespeople commonly travel 30,000 to 60,000 miles a year calling on retail stores. Inside salespeople may be salaried; outside salespeople are usually paid on commission. Growth of the apparel market system in recent years has slowed as QR partnering arrangements have become more common and retailers have consolidated the number of suppliers they work with.

Although the process of defining the target market involves developing an understanding of the ultimate consumer, the immediate target of the

wholesale sales force is the retailer buyer. The marketing strategy includes target customers and the retailers that are best positioned to sell-through the merchandise. The best retail outlets for goods are growing and profitable firms that have compatible target markets and business strategies.

Maximizing the productivity of manufacturer's sales representatives is a marketing challenge. Sales representatives are challenged to maintain and build existing accounts and open new accounts for the firm. Manufacturers use financial appeals such as seasonal discounts, invoice dating, cooperative advertising, and markdown money among other incentive to encourage retail buyers and divisional merchandise managers to purchase their goods.

Even the best designed and best positioned products produce no revenue until they are sold. The contribution of the marketing function to the success of an apparel firm has created a need for professional manufacturers' representatives. Unfortunately, relatively few firms have sales trainee positions or sales training programs. Many firms rely on hiring salespeople who have gained selling experience with other companies.

NOTES

1.9 LABELING AND LICENSING

Labels are a primary means of conveying product identification and differentiation for consumers. Labels on products may bear nationally advertised brands and trademarks, private brands or trademarks, and labeling information required by law.

National Brands and Trademarks: National Brands are known to customers throughout the country. Retail buyers and ultimate consumers who develop brand loyalty have confidence in the quality, performance, fit, and/or fashion the products represent. Brands have become such a key component of apparel marketing that all merchandise sold at retail has a brand. There is no longer any generic merchandise available.

Trademarks, including brand names, logos, mottoes, or product features, provide recognition and are distinctive means of identifying manufacturers of products. Trademarks assist in differentiating products of one manufacturer from its competitors and are protected by registration in Patent and Trade-mark Office. Owners of nationally advertised names, logos, or other trademarks seek to create a particular product identity and image through advertising and promotion and provide consistent quality, performance, and styling to fit the image. These product differentiation strategies contribute to the cost of manufacturing and marketing the products bearing the national brands. Trademarks often outlive a firm.

Private Brands: Private brands and labels, store brands, and house brands all mean the same thing: they are brands owned and used by specific retail firms. The products bearing private labels are sold primarily by stores owned by or associated with the owner of the brands. Department,

NOTES

specialty, and discount stores use private-brand merchandise to increase customer loyalty, increase exclusivity, decrease costs, and increase gross margin. Private brand goods may have lower marketing costs, lower production costs, and greater variation in quality than national brands because of less rigorous quality control.

Private brands provide names that will not appear in competing stores. The store name may be used as the private brand, or a special name may be created. To support the use of private brands, some retail firms have created product development divisions. Others have expanded the responsibilities of the merchandising division to include product development. For example, many private brand retailers call their buyers and merchandisers product development managers and operate with product development teams. These retailers may employ apparel designers, graphic artists, and international sourcing experts in addition to merchandisers.

Product development divisions in retail firms are performing the merchandising functions that traditionally have been performed by apparel manufacturers. They also may contract production from the same contractors that apparel manufacturers might use to make similar products.

Some retailers are examining the possibility of selling their private-brand lines to retail stores in noncompeting markets. This opens the possibility that a retailer might lease space in an apparel mart to sell goods to other retailers, thus competing directly with apparel manufacturers in the wholesale function.

Licensing is a means of using intellectual property that is protected by copyright and belongs to someone else. Licensing the right to use things that have merchandising value is a proven marketing tool. A licensing agreement is a contract in which the licensee agrees to pay the licensor a royalty or fee for the use of a merchandising property. The licensor is the owner of the merchandising property. The licensee buys the right to use the property for identifying, advertising, and promoting its products. A licensed product is one that bears the merchandising property. Among product categories, apparel is most likely to be licensed with over \$15 billion in retail sales annually.

Licensing is used at all price levels of merchandise. Professional marketers now conceive, develop, and promote properties with an eye on the needs and desires of the ultimate consumer and with the intent of marketing it through licensing. Licensing is growing faster than retailing as a whole; thus, licensed products are increasing as a proportion of total merchandise offered at retail.

At present, there is a very high demand for the upscale designer licenses. For instance, the men's clothing trade believes there are not enough strong designer names to go around. Licensors sell the rights to use their property because it is a source of revenue with little associated risk. The costs of licensing to the licensor depend on the contract and the level of involvement the licensor has with the licensee. Successful licensing agreements usually involve careful monitoring by the licensee. Successful licensing agreements usually involve careful monitoring by the licensor to

NOTES

be sure products meet quality standards and that the terms of the contract are met.

Licensing contracts include descriptions of what is being licensed (label, trademarks, logo, designer name, character, or manufacturing process), a description of the product that can bear the licensed property, the time frame the agreement covers, the responsibilities of the licensor and the licensee, the amount of royalty to be paid, the basis of royalty, the market coverage, and the guarantee and/or minimum royalty. Most licensing agreements are exclusive, meaning that the licensee is the only party that has the right to use the licensed merchandising property on a certain type of product. Therefore, the definition of the product is an important part of the contract. Careful product definition prevents the manufacturer of competing products bearing the same label, especially since some licensors license 50 or more manufacturers for different products.

Fifteen years ago, licensing was regarded as a marketing bonanza, a certain way to increase profits. Licensing is now regarded much more realistically. Joint planning, between the licensee and licensor, is a key to success. A good licensing agreement provides benefits to both parties. Licensees and licensors have different perspectives when selecting cooperating firms. Licensing contracts often extend from 1 to 5 years with or without a renewal option. Since it often takes up to 18 months to plan, produce, and distribute a line, a 1-year contract is extremely limiting in terms of long-term planning. The most successful licenses are the ones in which the licensor of the property maintains some control over the program.

1.10 STUDENT ACTIVITY

1. What is product line?

.....
.....
.....

2. What do you mean by market position and product differentiation?

.....
.....
.....

1.11 CONTEXT OF MERCHANDISING

Strategic business planning is recognized as an essential part of management in today's competitive markets. A firm's mission, goals, and policies reflected in their strategic plan provide the basis on which merchandising decisions are made. Merchandisers work within the context of the firm's strategic business plans that identify the primary product line(s), price range(s), size range(s), fashion emphasis(es), and quality level(s) appropriate to the firm's

mission and target market. It is the merchandisers' responsibility to work creativity within the constraints of the firm and marketplace to meet the needs of the target market.

NOTES

Merchandisers are charged with converting business strategies into product lines, individual styles, units of merchandise, and prices that will meet sales volume and profit goals. The criteria used to evaluate the effectiveness of a merchandiser and merchandising functions include determining which merchandise will sell the best, cost the least, and make the most gross margin and profit. Traditionally, merchandisers have worked with gross margin (GM), the difference between net sales and cost of goods sold, as an indicator of success. Gross margin can be calculated in both rupees and as a percentage for total assortments, individual merchandise groups, individual selling periods, or an entire year.

Manufacturer merchandisers may plan and develop lines that are presented at wholesale apparel markets for sale to retail buyers. If a firm is forward vertically integrated, manufacturer merchandisers may also present directly to ultimate consumers in manufacturer-owned retail stores or manufacturer outlets. Retailer merchandisers work for firms that operate primarily in the retail sector and prepare lines for presentation to retail customers. Merchandisers may buy finished goods at wholesale to develop assortments and/or use product development as a part of line development.

1.12 CONCEPTS OF APPAREL PRODUCT LINES

The term product lines may be used to refer to the total merchandise mix presented for sale by a firm, such as shoes or gloves or men's shirts. This general product line often has several divisions, and each of these may also be referred to as a product line, but a more specific product line often has several divisions, and each of these may also be referred to as a product line, but a more specific product line. In this context, the term product line refers to a category of merchandise in the total merchandise mix that is (1) closely related because it satisfies certain needs, (2) used with other items, (3) sold to the same target market, (4) marketed within the same outlets, and/or (5) priced within similar price ranges. For instance, within a shoe line, many categories of women's shoes, children's shoes, and men's shoes might exist. Each category of shoes may be subdivided into classifications. The category of men's shoes might include classifications of dress shoes, casual shoes, and work shoes at moderate prices.

Within each line/category/classification of merchandise, the merchandiser builds an assortment, the range of choices offered at a particular time. The number of styles, sizes, and colors in which products are offered determines the assortment. A style is an identifiable piece of merchandise characterized by a distinctive appearance. Styles may be modified from one selling period to the next. A design is a specific or unique version of a style that has not yet been accepted into a product line. Designs that are accepted into a line are given a style number and from then on are

simply referred to by manufacturers and retailers as a "style," a "style number," or simply a "number." A style number provides identification of the product throughout the manufacturing and distribution process.

The product line is an apparel firm's source of potential profit; therefore, its content, development, and production require constant analysis and planning. The wrong mix of products may not appeal or meet the needs of the specific target market and thus would limit sales and profits. The number of lines produced in a year and the number of styles in each line depend on the nature of the product(s) and the individual firm's objectives, strategies, size, and projected sales volume. Large apparel firms may have several product lines for each selling period. Each product line may be marketed at a different price range, under a different label, and targeted to a different market segment. This gives the firm broader market coverage. A smaller firm may offer a single product line focused on serving a few defined needs of a particular target market.

NOTES

1.12.1 Merchandisable Groups

The definition of the product line includes a concept of how individual units of merchandise relate to each other and to the line as a whole. Merchandisers and designers, when planning and developing product line, usually think in terms of merchandisable groups rather than individual styles. A merchandisable group provides alternate solutions to solving the same apparel need for the ultimate consumer. Basic concepts of these merchandise groups include separates, coordinates, and related separates.

1.13 DIMENSIONS OF PRODUCT CHANGE

Dealing with the demand for constantly changing products may be one of the most challenging and interesting aspects of apparel merchandising. Fashion results in customer demand for product change. "Fashion is a continuing process of change in the styles of dress that are accepted and followed by segments of the public at any particular time." A second aspect of product change, seasonal change, is often confused with fashion change. The terms seasonal goods and fashion goods are often used interchangeably, as are the terms basic goods and staple goods. However, when fashion change is separated from seasonal change, reasons for product change are clarified.

Some apparel products are highly fashionable, and others are highly seasonal. Some are both seasonal and fashionable; others are neither seasonal nor fashionable. The impact of these aspects of product change on merchandise planning and positioning can be visualized through the use of a perceptual map. The perceptual map is a graphic representation of fashion/seasonal and basic/staple variation in consumer demand. It is based on a 52-week merchandising cycle, the time period commonly used for merchandise planning. A merchandising cycle is divided into selling periods, the number of weeks a particular style or merchandise group is salable to

NOTES

the ultimate consumer. The rate of product change is determined by the number of different selling periods in a merchandising cycle.

Fashion goods are products that frequently experience demand for change in styling. Fashion goods require frequent change in styling to have continued demand from consumers. Styling is the characteristic or distinctive appearance of a product, the combination of features that makes it different from other products of the same type. For example, the salable life of junior dress styles may be only about 8 weeks. This means that the junior dress line must be replanned, developed, produced, and presented with new merchandise six times a year (52-week merchandising cycle divided by 8-week selling period equals 6.5 lines a year). In contrast, products that experience a comparatively long period of fashion acceptance are called basics. Basic goods have less frequent demand for style change than fashion goods. Basic goods may have a selling period of 52 weeks, a whole year, and perhaps several years. Only one or at the most two lines must be planned, developed, produced, and presented during a 52-week merchandising cycle.

1.14 NATURE AND TIMING OF MANUFACTURING RESPONSIBILITIES

A manufacturing manager spends time both in the office and on the factory floor. The job is dual in nature, since a manufacturing manager oversees people and is an expert in the process of manufacturing. Manufacturing managers are also known under the job title industrial production manager, according to the Occupational Information Network.

1.14.1 Responsibilities

A manufacturing manager plans, budgets and monitors a plant's production and manufacturing schedule. This worker takes on management responsibilities such as hiring and firing employees, meeting with other managers and reviewing the job performance of subordinates. Along with management, this worker also oversees manufacturing operations, such as setting production quotas, measuring product quality, overseeing the stock of raw materials, making sure machinery is taken care of, following safety guidelines and meeting deadlines under pressure.

1.15 SUMMARY

The apparel industry is a highly competitive global business. To be successful, manufacturers and retailers must serve their consumer markets. Manufacturers must produce apparel that meets performance, quality, and value expectations of retailers and consumers. Manufacturers produce goods with appropriate intrinsic quality to be merchandised and marketed with the desirable extrinsic appeal.

To stay in business, each firm must grow and make a profit. Apparel

NOTES

firms grow through internal growth, vertical and horizontal integration, and conglomerate mergers. Expertise in executive leadership, marketing, merchandising, production, operations, finance, and Quick Response are essential for operating an apparel firm. Marketing plays a central role in defining an apparel business and in deciding its market scope. Marketing has a unique focus on customers and on the competitive business environment. Strategic planning is a common foundation for marketing strategies. Sales forecasting provides the basis for budget formulation and a firm's financial planning. Marketing strategies may include both wholesale and retail components. Product positioning, differentiation, and use of labeling and licensing are key factors in apparel business success. Infringement of intellectual property rights by counterfeits is an ongoing problem. The apparel firm's marketing calendar provides the time structure for product development, production, and marketing. There is a strong relationship between commitment to a marketing strategy and profitability for apparel manufacturers.

1.16 GLOSSARY

- **Marketing:** The management process responsible for identifying, anticipating and satisfying customer requirements profitably.
- **Retailer:** A business or person that sells goods to the consumer, as opposed to a wholesaler or supplier, who normally sell their goods to another business.
- **Brand:** An identifying symbol, words, or mark that distinguishes a product or company from its competitors. Usually brands are registered (trademarked) with a regulatory authority and so cannot be used freely by other parties. For many products and companies, branding is an essential part of marketing.

1.17 REVIEW QUESTIONS

1. What is the role of the marketing division in apparel firms?
2. Describe sales forecasting and their role in determining merchandising, production, and distribution schedules.
3. What do you mean by retail and wholesale marketing strategies and the apparel market system?
4. What is product differentiation through product labeling and licensing as a marketing tool?
5. What is the role of merchandising in an apparel firm?
6. What is the relationship of merchandising to sourcing finished goods, materials, and production?

PRODUCT DEVELOPMENT

STRUCTURE

- 2.1 Learning Objective
- 2.2 Introduction
- 2.3 Product Standard
- 2.4 Sources of Quality and Performance Standards
- 2.5 Company Standards for Quality, Size and Fit and Performance
- 2.6 Student Activity
- 2.7 Developing and Using Specification, Writing Specifications
- 2.8 Specification Methods
- 2.9 Writing Specification
- 2.10 Role of Garment Analysis
- 2.11 Style Description
- 2.12 Garments Components
- 2.13 Final Assembly and Finishing
- 2.14 Influences on Design Processes
- 2.15 Apparel Design Technology
- 2.16 Summary
- 2.17 Glossary
- 2.18 Review Questions

2.1 LEARNING OBJECTIVE

After studying this unit you should be able to:

- Describe the product standard used in the apparel manufacturing industry.
- Explain about the company standards for quality, size and fit and performance.
- Discuss the use of specification and its writing process and techniques.
- Discuss the role of garment analysis relative to meeting consumer and business needs.

- Relate garment analysis from professional perspectives to analysis from consumer perspectives.
- Describe a system of garment analysis that examines market positioning, sizing and fit, materials selection, component assembly, final assembly and finishing, and garment presentation.
- Proceed, step-by-step, using garment analysis to develop style specifications.

2.2 INTRODUCTION

Today, the world is characterized by macro- and micro-environmental influences. These influences include the rapid evolution of socio-cultural patterns and life styles, self-awareness and decisional autonomy of consumers, a rising significance of mass production and distribution systems, and incessant introduction of technological and managerial innovations, increasing levels of competition and globalization dynamics. These influences are impacting the textile and apparel industry, creating diverse marketplace opportunities and challenges.

The following list shows many of the major trends currently affecting the global textile and apparel industry:

- China dominates apparel and textiles.
- High-tech and smart fabrics proliferate.
- Supply chain management (SCM) evolves to serve the global market.
- The vast majority of shoes sold in the US are now made in China.
- Bricks, clicks, catalogs and living rooms.
- Discount clothing retailers see promise in designer lines.
- Haute couture designers experience conflicts over costs and control.
- Mass designers and retailers speed up for fast fashion.
- European strategies force US department stores to rethink their business models.

In order for companies to effectively build and sustain competitiveness in the global textile and apparel industry, they are implementing several strategies. One key strategy is to develop capabilities in product innovation and new product development. It is also evident that companies require a clearly defined and effective new product development process to compete in the global industry.

2.2.1 Definition of New Product Development

A new product concept, as defined by Crawford and Di Benedetto, is “a statement about anticipated product features (form or technology) that will yield selected benefits relative to other products or problem solutions already available.” According to Belliveau, Griffing and Somermeyer (2002),

NOTES

a new product is defined as "a product (either a good or service) new to the firm marketing it. It excludes products that are only changed in promotion." Cooper (2001) explains that a new product is defined as new if it has been on the market for five years or less, and includes extensions and major improvements.

According to Cooper (2001), Crawford et al. (2003), and Kumar and Phrommathed (2005), a new product can be classified into several different categories. Booz-Allen and Hamilton (1982) have identified approximate percentage of new product types.

The following are commonly accepted new product categories:

(1) New to the world products: Products that are innovations

New to the world products revolutionize existing product categories, or define wholly new ones. These new products may include an innovative technology and require consumer instruction. Cooper states that these new products are the first of their kind and create an utterly new market. This category represents only 10 percent of all new products.

(2) New category entries (New product lines): Products, not new to the world, that take a firm into a new category

The new category is an imitation of an existing product ("me-too") and provides entrance into new markets for a company. Even though the product already exists in the market, if a firm introduces the identical product into the market, it can be considered a new product. About 20 percent of all new products fit into this category.

(3) Addition to product lines: Products that are line extensions

According to Cooper (2001), these categories are new items to the firm, but they fit within an existing product line that the firm already produces. Kumar and Phrommathed (2005) report that these categories are the new products that supplement the firm's established product lines. Thus, this category contains products that are line extensions or flankers. This category is one of the largest categories of new products and accounts for approximately 26 percent of all new product launches in 1982.

(4) Product Improvements: Current product made better

Practically, every product on the market today has been improved. These "not-so-new" products can be replacements of existing products in a company's product line. However, they provide enhanced performance or greater perceived value over the old products.

(5) Repositioning: Products that are targeted for a new use or a new application

Repositioning, a new application for an existing products, is selecting a new market place, solving a new problem and/or serving another need. Aspirin, for instance was the standard headache and fever reliever. However, since a new medical benefit was discovered for

NOTES

aspirin, aspirin is now positioned as a headache reliever as well as a preventer of blood clots, strokes and heart attacks. As one example in the textile field, the American Fiber & Yarns Company applied polypropylene fiber, whose main application has been upholstery and industrial textiles, into new market segment, the knitted apparel market. This repositioned category accounts for about 7 percent of all new products.

(6) Cost reductions: Products that are designed to replace existing products at lower cost

New products that provide a cost reduction, can replace existing products in the line, but can offer similar benefits and performance at a lower cost. They represent 11 percent of all new product launches in 1982. For instance, acrylic fiber that approximates the hand of wool can replace wool and is offered at a lower cost in the market.

Recently, Kumar et al. (2005) surveyed five new product categories including new-to-the-world, new-to-company, addition to existing lines, repositioning, and cost reduction. The study's results found that 31.68 percent of launched products fall into 'addition to existing lines' category. The cost reduction category was in second place with 22 percent of all new launches, followed by new-to-company, market repositioning, and new-to-the-world consecutively.

2.2.2 New Product Development

New product development is essential for exceptional corporate performance, and research about what leads to new product success and failure has been carried out for both goods and services. Ulrich and Eppinger describe New Product Development as the "the set of activities beginning with the perception of market opportunity and ending in the production, sale and delivery of a product." According to Belliveau et al. (2002), new product development is "the overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and commercialization of a new product."

New product development can be rewarding and is critical to maintain a healthy organization. Cooper (2001) indicates, "New product development is one of the riskiest, yet most important, endeavors of the modern corporation." Successful new product development allows market expansion, increases profits, and enhances creativity and leadership. But, new products failure rates are considerable, and cost of failure is high. According to Booz-Allen and Hamilton (1982), the failure rate of new products introduced into the market remained in the 33 percent to 35 percent range between 1963 and 1981. More recently, Crawford et al. (2003) reported that around 40 percent of new products fail. The foremost reasons for new product failure is "no need for the product", and "there was a need, but the new product did not meet that need." Failures also can be linked to poor market research, poor positioning, inadequate support from the distribution channel, poor timing, competitive response, and major changes in technology.

NOTES

New product development can also be costly. Enormous investments in research and development (R&D), engineering, market research, marketing development, and testing are made before the product is launched. These are major investments or major resource allocations for a company including capital resources and human resources; and with today's global competitive marketplace, many companies are closely watching expenditures.

Key New Products Development Functions and Cross Functional Integration

Development of new products is an interdisciplinary activity requiring contribution from nearly all the functions of a company. The following functions are consistently essential to new product development projects:

- (1) **Marketing:** The functions of marketing mediate the interactions between the firm and its customers. Marketing facilitates the recognition of product opportunities, the definition of market segments, and the identification of customers' needs. Marketing also arranges for communication between the firm and its customers, sets target prices, and oversees the launch and promotion of the product. The latest market research has been recognized as important to the success of new product development. It is essential to identify early requirements and to understand the market place. Marketing is related to all stages of the new product development process, from product planning, screening, and testing through launch.
- (2) **Design:** The design function also plays a pivotal role in defining the physical form of the product to satisfy customers' needs. The design function includes engineering design such as mechanical, electrical, software, and industrial design such as aesthetics, ergonomics, and user interfaces. In manufacturing, industrial design has become a key factor in differentiating products from their competitors by providing them a coherent identity or higher levels of perceived value. Engineering design has a critical role in the development of products in the manufacturing industry, solving technical problems using available technology in the most efficient method, and integrating product development with the requirements of effective production.
- (3) **Manufacturing:** manufacturing is responsible for creating and operating production systems in order to produce new products. However, broadly defined, the manufacturing function also often involves purchasing, distribution, and installation. Manufacturing capability can be one technical success factor, and it relates to whether the company has internal or external capability to manufacture higher quality products to satisfy the customer demand.
- (4) **Finance:** Another key function that influences the success of the new product development process is financial activity. Projects need to be suitably supported; yet checks on cost, profit margins and

return on investment must be part of the process. Many companies utilize phase reviews to keep a check on the progress of the projects, the budget and the authorization to spend.

NOTES

2.2.3 Cross Function Integration

Cagan and Vogel (2002) and Urban and Hauser (1993) comment that a true integration of engineering, industrial design, marketing and finance is important as well. Figure 2.1 depicts cross-functional integration with arrows showing the major interactions. According to Urban and Hauser (1993), marketing must offer research and development (R&D) correct customer need inputs, and R&D must design a product to fit customers' requirements. However, research and development must also design a product that can be manufactured at high-quality levels and low cost. Research and development (R&D) and engineering must work to innovate the process of manufacturing as well as design new products. Finally, finance interacts with R&D, manufacturing, and marketing when financial resources are required.

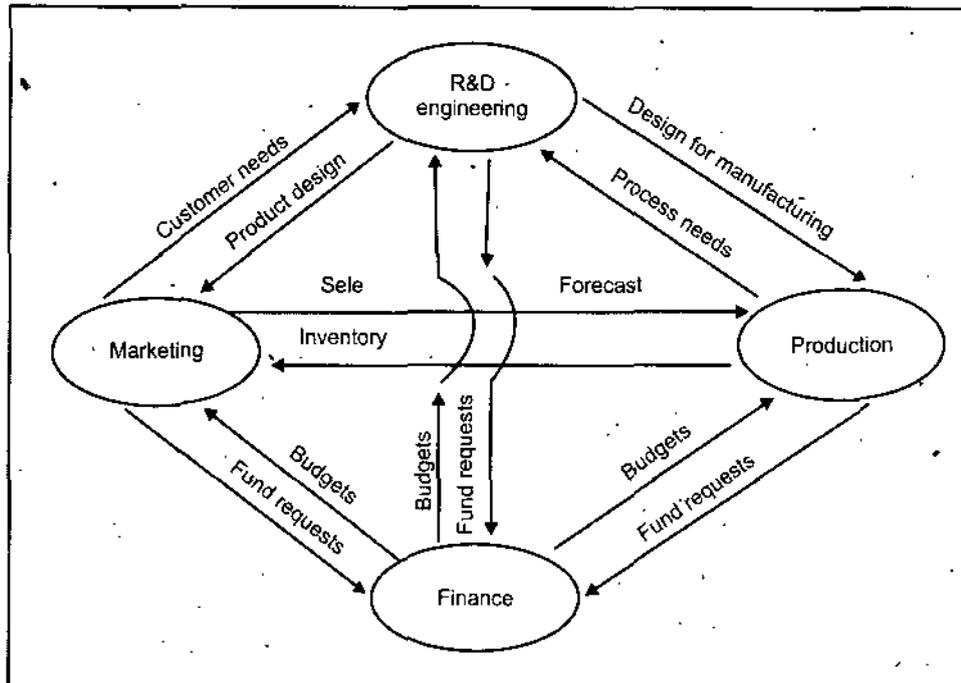


Figure 2.1: Cross-Function Integration

It is essential to note that boundaries between the functions are not always clear. All the functions must work together, and all activities share the responsibility to produce successful product.

2.2.4 Successful New Product Management

The main issues of new product development relate to the need for interdisciplinary inputs, for quality input, for cost input and for speed in the process. The inputs that contribute to the value of new products tend to conflict with each other, but there are synergies.

NOTES

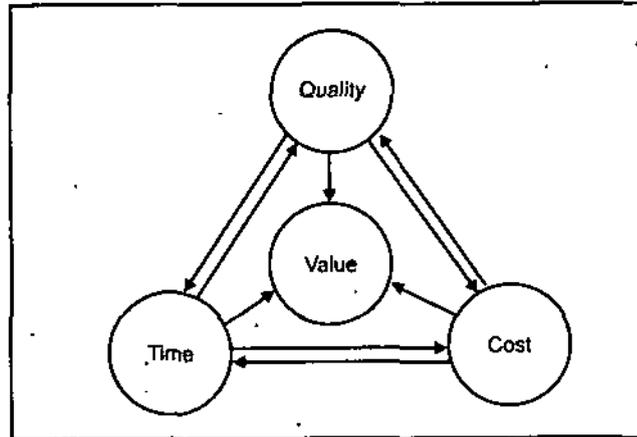


Figure 2.2: The conflicting masters of new products management

- **Product Quality:** Successful product development depends upon how good the product is, whether the product satisfies customers' needs, and whether the product is robust and reliable. Product quality is ultimately reflected in market share and the price that customers are willing to pay.
- **Product Cost:** Successful product development also relies on the manufacturing cost including spending on capital equipment and tooling as well as the incremental cost of producing each unit of the product. Product cost determines how much profit accrues to the firm for a particular sales volume at a particular sales price.
- **Development Cost:** Successful product development also depends on how much the firm has to spend to develop the product. Development cost is usually a critical portion of the investment required to attain profits.
- **Development Time:** How rapidly the team completes the product development effort is also an important issue. "Development time determines how responsive the firm can be to competitive forces and to technological development, as well as how quickly the firm receives the economic returns from the team's efforts."
- **Value:** The inputs of quality, cost, and time contribute to the value of product. The challenge is to optimize the set of relationships in each new product situation to get higher value of the products.

2.2.5 Critical Success Factors for New Product Development

The most important issue in the success of new product development is to understand the voice of the customer in terms of perceived requirements and to set up a relationship between the customer input and how products are designed, produced, and managed. Products can be sold when customers find them to be superior, of higher value, or unique, and when a firm can deliver the perceived benefits more effectively than competitors. Success in new product development also depends on whether the target market segment is sufficiently large and competition is manageable. Therefore, it is crucial to

identify the target market segmentation before the significant activity of designing and producing a product.

Sun and Wing (2005) summarize critical success factors for new product development identified by previous researchers. In general common factors across the four studies include top management support for the team, long term strategy with innovation focus, and a structured new product development process. However, the factors proposed by the four different studies are not all exactly the same. For example, Cooper (1999) has pointed out the significance of "go/kill decision point into the NPD process" as one of the critical success factors while others did not.

2.3 PRODUCT STANDARD

In a consumer-driven society, as shopping via various media increases so do the expectations of the customer. A variety of products are offered with attractive packaging and at reasonable prices. However, customers remain cautious about purchasing these, as they need a guarantee regarding the quality of the product. The customer needs continual assurance of the credibility of a product for sustained relationship with the vendor.

2.3.1 What is a Product?

A product is simply what a company offers to its customers. A product is designed keeping in mind the perceived needs of customers. The main objective of a product is to make the customer feel satisfied or benefited once the product is purchased.

2.3.2 What is a Good Product?

A good product fulfills the following key criteria:

- **Meets the perceived needs of customers:** The design of a product should be based on the perceived requirements of customers. While a product may be well designed, if it does not fit the required or perceived needs of customers, it will fail.
- **Satisfies customers:** Only when customers are satisfied with the product it is considered a success. With their increased levels of awareness, it is difficult to please the customer. Therefore, companies must remain involved in the process of continually improving the quality of the product. A good indicator of customer satisfaction is that customers should feel the product meets their requirements and provides value for money.
- **Is reasonably priced:** A product may meet the needs or specifications of customers, but if it is overpriced in comparison in other products with the same set of specifications, it may still fail.
- **Has good after sales support:** After a product has been sold, the company should provide efficient sale services to retain customers and maintain a good word-of-mouth. Such tactics are an important factor in retaining the existing customers as well as in attracting new ones.

NOTES

A good product has greater probability of becoming popular with customers.

Companies that are successful in international trade know that product quality is of paramount importance. International standards are an important means of accurately quantifying the quality rating of a manufacturer and its products.

Definition of product standard

A published standard that establishes methods of testing, grading, and marking the product. The objective of product standards is to define requirements for specific products in accordance with the principal demands of the trade. Product standards are published by the National Bureau of Standards of the Indian Department of Commerce, as well as by private organizations of manufacturers, distributors, and users.

ISO - International Organization for Standardization

ISO standards contribute to making the development, manufacturing and supply of products and services more efficient, safer and cleaner. They make trade between countries easier and fairer.

Standards permeate all business activities and even the day-to-day life of the man on the street. They play an important role in the manufacturing and service industries and in the sale of their products in national and international markets. One of the characteristics of modern manufacturing is that manufacturing enterprises do not themselves produce all the parts and components they need, but buy these from ancillary industries, often situated in far-off countries. The standardization of parts and components gives enterprises a wider choice of lower-cost supplies. It also enables them to maintain inventories at comparatively low levels and gives them the flexibility to use substitute components on the assembly line. Standards thus help industries to cut costs and improve productive efficiency.

Standards are indispensable for the international marketing of products as they convey consistent and understandable information to the buyer. A foreign buyer who knows the standard to which a product is produced has an insight into its specifications and is able to assess its quality. Standards thus help reduce disputes over specifications and the quality of goods (and services) exported and imported.

Standards are also used by governments to promote its social goals. Government agencies at the national, State and local levels lay down thousands of regulatory standards to protect the health and ensure the safety of the population, and to conserve the environment. Such regulations cover both product characteristics and the materials and processes used in producing them. Compliance with standards imposed by government regulations is obligatory. In practice, the distinction between voluntary and mandatory standards may often become blurred. For instance, from the perspective of suppliers, procurement specifications set by major manufacturers are mandatory for doing business, as are government procurement standards.

NOTES

In promoting trade

While standards facilitate international trade transactions by enabling foreign buyers to assess the specifications and the quality of products offered for sale, they can become barriers to trade if they differ widely from country to country. Buyers are generally reluctant to purchase goods that are based on standards that differ from those of their own countries. Manufacturers wishing to carry out manufacturing operations in other countries may therefore have to adjust their production processes to those countries' specifications. This increases tooling costs and prevents producers from taking advantage of economies of scale. Likewise, where regulatory authorities require product testing in the importing country in order to ascertain compliance with that country's health or safety regulations, foreign suppliers may find themselves at a disadvantage if their products are subjected to stricter tests or higher fees than those required for domestic products.

The solution to these problems lies in harmonizing standards at the international level and in developing guidelines for determining conformity to standards. Work in these two areas in all sectors of industry and technology is being carried out by international standardization organizations.

3.4 SOURCES OF QUALITY AND PERFORMANCE STANDARDS

For every industry or business, to get increased sales and better name amongst consumers and fellow companies it is important to maintain a level of quality. Especially for the businesses engaged in export business has to sustain a high level of quality to ensure better business globally. Generally quality control standards for export are set strictly, as this business is also holds the prestige of the country, whose company is doing the export. Export houses earn foreign exchange for the country, so it becomes mandatory to have good quality control of their products. In the garment industry quality control is practiced right from the initial stage of sourcing raw materials to the stage of final finished garment. For textile and apparel industry product quality is calculated in terms of quality and standard of fibres, yarns, fabric construction, color fastness, surface designs and the final finished garment products. However quality expectations for export are related to the type of customer segments and the retail outlets.

There are a number of factors on which quality fitness of garment industry is based such as - performance, reliability, durability, visual and perceived quality of the garment. Quality needs to be defined in terms of a particular framework of cost. The national regulatory quality certification and international quality programmes like ISO 9000 series lay down the broad quality parameters based on which companies maintain the export quality in the garment and apparel industry. Here some of main fabric properties that are taken into consideration for garment manufacturing for export basis:

- Overall look of the garment.
- Right formation of the garment.

NOTES

- Feel and fall of the garment.
- Physical properties.
- Color fastness of the garment.
- Finishing properties
- Presentation of the final produced garment.

3.4.1 Sourcing of Fabrics

There are certain problems that could be faced by garment manufacturers when sourcing for certain fabrics, so precautions should be taken for it beforehand to minimize the problems. The garment exporters source cotton fabrics mainly from handloom sectors, powerlooms and mills. Each of these sectors presents their own unique set of problems to the garment exporters. Sourcing cotton from handloom sectors might present some set of problems like colour variation, *missing ends and picks, irregular weaves and unreliable supplies*. However, the handloom sector is significant source of heavier cotton. Common problems faced in powerloom cotton sourcing are broken ends and reed marks, thick and thin places, difference in width and massive variation in costing. The major problem in mill-made fabric sourcing is to meet huge demands from the mills. Fabrics have to be ordered well in advance in mills and the long time taken for producing the fabric is a matter of concern for garment exporters: Mills generally hesitate to take small orders which pose a problem for small scale exporters.

It is not that sourcing problems which only confined to cotton fabrics, but also to other fabrics as well. In silk garment industry there are some sorts of problems faced by silk garment exporters. Some of the problems that could be faced by silk garment exporters are as follows:

- Shortage of imported silk yarns in the quantities required, as a result delivery is delayed.
- Silk material is very vulnerable to stains during manufacturing process as well as stocking, staining results in rejection so a lot of care has to taken during these procedures.
- Roll length of the silk yarn is often insufficient.
- Colour fastness of dyed silk material is sometimes not satisfactory.
- There are also chances of warp breakage.

3.4.2 Basic Thumb Rules for Garment Exporters

For a garment exporter there are many strategies and rules that are required to be followed to achieve good business. The fabric quality, product quality, delivery, price, packaging and presentation are some of the many aspects that need to be taken care of in garment export business. Some rules that are advisable for garment exporters are listed below:

- Quality has to be taken care by the exporter, excuses are not entertained in international market for negligence for low quality garments, new or existing exporters for both it is mandatory to use design, technology and quality as major upgradation tools.

NOTES

- Apart from superior quality of the garment, its pricing, packaging, delivery, etc has to be also taken care of.
- The garment shown in the catalogue should match with the final garment delivered.
- *It is important to perform according to the promises given to the buyer, or else it creates very bad impression and results in loss of business and reputation.*
- In international market, quality reassurance is required at every point.
- Proper documentation and high standard labels on the garment are also important aspects as these things also create good impression.
- Timely delivery of garments is as important as its quality.
- If your competitor has the better quality of garment in same pricing, it is better to also enhance your garment quality.
- Before entering into international market, garment exporters have to carefully frame out the quality standards, or else if anything goes wrong it could harm the organization. And after that strictly follow it.
- The garment quality should match the samples shown during taking the orders.
- The garment exporters should know to negotiate a premium price after quality assurance is done.

Quality is a multi-dimensional aspect. There are many aspects of quality based on which the garment exporters are supposed to work.

- Quality of the production.
- Quality of the design of the garment.
- Purchasing functions' quality should also be maintained.
- Quality of final inspection should be superior.
- Quality of the sales has to be also maintained.
- Quality of marketing of the final product is also important as the quality of the garment itself.

There are certain quality related problems in garment manufacturing that should not be overlooked:

- **Sewing defects:** Like open seams, wrong stitching techniques used, same color garment, but usage of different color threads on the garment, miss out of stitches in between, creasing of the garment, erroneous thread tension and raw edges are some sewing defects that could occur so should be taken care of.
- **Color effects:** Color defects that could occur are - difference of the color of final produced garment to the sample shown, accessories used are of wrong color combination and mismatching of dye amongst the pieces.

NOTES

- **Sizing defects:** Wrong gradation of sizes, difference in measurement of a garment part from other, for example- sleeves of 'XL' size but body of 'L' size. Such defects do not occur has to be seen too.
- **Garment defects:** During manufacturing process defects could occur like - faulty zippers, irregular hemming, loose buttons, raw edges, improper button holes, uneven parts, inappropriate trimming, and difference in fabric colors.

Quality is ultimately a question of customer satisfaction. Good Quality increases the value of a product or service, establishes brand name, and builds up good reputation for the garment exporter, which in turn results into consumer satisfaction, high sales and foreign exchange for the country. The perceived quality of a garment is the result of a number of aspects, which together help achieve the desired level of satisfaction for the customer. Therefore quality control in terms of garment, pre-sales service, posts -sales service, delivery, pricing, etc are essentials for any garment exporter.

2.5 COMPANY STANDARDS FOR QUALITY, SIZE AND FIT AND PERFORMANCE

The purpose of the product development process is to certify that the supplier understands and adheres to the specifications established for a specific product. Typically, a retailers objective is to provide their customers with the highest level of quality and service at the most competitive price. Clothing stores can meet this objective most successfully when their supplier fully understands the product development process.

The development process is critical to ensuring customers satisfaction and minimizing customer returns. Most retailers approach to product development consists of a multi-step process that must be completed before finished goods are produced. Here are a few common steps in the product development process.

2.5.1 Product Review Meeting

Apparel buyers, merchandise managers, quality assurance personnel, or other members of the retailers staff can schedule a product review meeting with the supplier. This meeting should be conducted directly after the merchandise manager approves the concept for development. The purpose of the meeting is to review the preliminary product and package specifications and to ensure that the supplier is aware of the companies quality and product development procedures. The meeting should be of a technical nature. Therefore, the supplier should bring to the meeting the appropriate representation from their staff. Expect to discuss the manufacturing process in detail and address any potential manufacturing concerns or limitations in regard to manufacturing the particular item being discussed. In this meeting, the supplier should be provided a preliminary spec file with details of the garment that is to be manufactured. The supplier should be requested within

a short period of time to formally acknowledge their understanding of the requirements. It is a good idea to obtain this in writing.

2.5.1 Submission of Trimming

Before apparel production begins, it is critical that the buyer approves all components that will comprise the finished product. Some buyers will require review of all trimming and others will require the approval of major trim components only. For example, some buyers will want to see examples of the actual sewing thread. However, others may not require to view the thread. It is important to understand what the buying company wishes to review prior to production. Experienced fashion merchants will require that you submit trim submissions on an appropriate form. This allows both the supplier and the purchaser to maintain well organized records. Here are a few examples of items that may need to be submitted for review.

- Lab dips, strike offs (screen printed swatches), reeling of yarn in all colors.
- Production fabric, knit downs, handlooms, etc. Most often required in a large enough size to contain full pattern repeat.
- Care labels & main labels
- *Clothing Components:* Buttons, lace, zippers, interlinings, shoulder pads, elastics, hangers, hangtags, price tickets, etc.
- *Packaging:* ASN labels, chip board, jet clips, tissue paper, polybags, etc.

In addition to trimming, you will most likely be required to submit Fit Samples, pre-production garment samples, testing samples, TOP Samples (Top of Production Samples), etc. You may also be required to submit documents during this phase such as flammability documents etc.

2.5.2 Fit Testing

Some fashion companies will require fit testing as part of the product development process. In order to ensure proper fit, steps must be taken to evaluate the garments comfort. This process is to both monitor the manufacturer, but also to make sure the original size spec developed was proper. Even if the manufacturer follows the spec file perfectly, during the fit process the fit technician may discover that adjustments may be needed. Some companies will conduct the fit testing on live fit models and others will do the testing in fit forms (mannequins). The merchandisers should advise the supplier regarding which size garments they wish to review for fit. Some companies will review only one size, and others like to review the smallest and largest size. For example, if production will be ordered in a scale including small thru double XL, they may require one sample in size small and one in XXL for the fit review. Again, the retailer (or company purchasing your product), should advise you regarding the sizes they require for review. After the Fit testing is complete, the final spec file should be issued in writing.

2.5.3 Photo Samples

Some retailers will require photo samples. These samples are utilized for

NOTES

NOTES

developing catalogs or advertising. Photo samples typically do not require all final trimming such as brand labels, but the outside appearance of the garment must be in correct silhouette and color. The photos must represent exactly what the finished product will look like when shipped (the outside visual appearance; does not need price tickets, hangers, etc.). Unfortunately, retailers cannot wait for bulk production samples because catalog photos and advertising photos are needed far before the finished garments are ready to ship from the factory. Again, not all retailers need photography samples. By the way, some companies use digital fabric printing to make samples more quickly if they have an urgent photo shoot pending.

2.5.4 Performance Testing

This is a very important aspect of the product development process. All products developed must pass performance testing requirements. It is the suppliers responsibility to ensure that all products produced meet or exceed the buyers performance standards. Before entering into an agreement to manufacture apparel, be certain to fully understand the quality standard requirements requested by your buyers. It is normal practice to have both fabric and garments tested before product is delivered. Typically, the testing is done at a third party testing facility such as CTL, MTL, etc. Often times the buyer is the one to assign the testing lab. Sometimes the retailer (buyer) will submit the garments for testing. However, often the buyer will require that the supplier submits the fabric and garments directly to the testing laboratory and then provide them with copies of the test results. Testing will be done prior to production and after final production is complete. Many retailers will also do surprise testing on garments after they arrive into the stores. This technique is used to discourage suppliers from submitting garments for testing that are not actually the same quality as final production.

Some articles of clothing will require more testing than other items. For example, items that claim to flame retardant, water resistant, anti-bacterial, etc., may require additional testing. Also, some children's apparel may require additional safety evaluation.

2.6 STUDENT ACTIVITY

1. What do you mean by the term "Company Standards"?

.....
.....
.....

2. Explain the terms "Fit testing" and "Performance Testing."

.....
.....
.....

2.7 DEVELOPING AND USING SPECIFICATION, WRITING SPECIFICATIONS

NOTES

There are many design decisions which cannot be expressed in drawn form. These must rely on being expressed in words. There are, also, many design decisions which would be too tedious, or too impractical for some other reason, to be recorded in drawings. The specification is thus created to complement the drawings so that together they convey all the design decisions. This is why a apparel manufacturing specification is primarily a design document. It is evidence of many design decisions which are not found elsewhere.

Specification can be defined as both a process and a product. Specifications are written descriptions of the required quality of the built product and its component products. A specification may also include the procedures for determining that the requirements of the specification have been met.

2.7.1 Purpose

The specification links the drawings with the general conditions of contract. It complements, without duplication, the information in the drawings or the general conditions of contract. Drawings are graphic descriptions which primarily define quantity, position and sometimes quality. Specifications are written descriptions which define quality. Together they express the designer's intentions.

The specification has many roles including:

- A document demonstrating compliance with statutory requirements.
- A written record of design decisions, materials used and set standards.
- An estimating document.
- A tendering document.
- A legal, contractual document.
- An on-site working document.
- A dispute settlement document.
- A project management tool.
- A facilities management tool.
- A document to be analyzed for feedback into the office master specification and office procedures.

2.7.2 Users

Designers, clients, certifying authorities, estimators, tenderers, contractors and subcontractors, contract administrators, legal representatives, project managers, construction managers and facilities managers all have an interest in the specification. It is important to ensure the various users interpret the specification in the same way. A good specification will:

- Answer the questions posed by the client, and local requirements.
- Cover the total range of the project elements.

NOTES

- Have a logical structure which is easy to navigate.
- Cite other documents precisely and meaningfully.
- Have a consistent approach to grammar and language.
- Be unambiguous.
- Complement the drawings and be consistent with the other documents and the method of procurement.

2.8 SPECIFICATION METHODS

2.8.1 Types of Specification Clauses

It is not difficult to peruse a sampling of specifications and to discern some basic and distinct styles or methods adopted by different specifiers and even by the same specifier, for differing reasons, in the same specification.

Descriptive: A descriptive specification clause describes in detail the materials, workmanship and installation required to be used by the contractor or tradesperson. In practice, many specification clauses are a combination of descriptive and performance specifications.

Reference: A reference specification clause is a reference to a published document, with which processes and products must comply. It is incorporated by a reference to the title or other identification of the document which may be a standard or often a manufacturer's manual.

Performance: A performance specification clause specifies an item in a construction project by prescribing a desired end result and the criteria by which the result will be judged for its acceptability.

Many companies have both performance requirements and deemed-to-satisfy provisions which it defines as follows:

Performance requirements: a requirement which states the level of performance which an Apparel Manufacturing must meet.

Deemed-to-satisfy: provisions which are deemed to satisfy the Performance requirements.

Direct/Proprietary: A direct or proprietary specification clause nominates an item in an apparel manufacturing by reference to a proprietary trade name.

2.9 WRITING SPECIFICATION

The following is a step-by-step guide on how to produce a specification from NATSPEC Templates.

- Step 1 – *Update files and any office edited master files:* Make sure each project specification incorporates standards and mandatory requirements current at the time of writing.

NOTES

- Step 2 - *Reformat Templates*: Refer to the quick start guide on formatting Templates in line with office policy on document style if required.
- Step 3 - *Office edited worksections*: Collect material such as office policy requirements, client requirements (e.g. preliminaries) and project type supplements (e.g. schools). If possible, obtain electronic copies of client requirements in a suitable format. Draft new text in the company style.
- Step 4 - *Select the working version of Templates for your project*: Decide which updated Template version will best suit the project specification e.g. Company Domestic, Basic or Professional or Office edited worksection templates which have been pre-edited by an office to include office policy, client policy or building type requirements.
- Step 5 - *Select worksections required*: Use SPECbuilder Pro to select worksections required for the new project specification and compile a draft specification.
- Step 6 - *Decide on working medium*: Digital or hardcopy markups: Decide whether to customize the Templates directly on-screen, or by first marking-up paper copies. The first review - at worksection, sub-section and clause level - can be on-screen. Subsequent reviews can be marked up on printed copies. *Print out as late as possible to reduce the bulk of the master document for marking up.*
- Step 7 - *Decide on a working pattern*: Be systematic and keep a record of work which is planned and completed. Take time and resource restraints (budget, number and grade of personnel, access to computers) into consideration when preparing the program. The working pattern will be influenced by the procurement method. For example, in Multiple Contracting, a particular worksection package, such as windows, will be required early in the process (due to lead times off-site) whereas the painting package may commence later.
- Step 8 - *Identify clauses not required*: Delete unnecessary clauses from the worksections. *Highlight uncertain clauses and leave until later.* At this stage, it is often best to concentrate on completing particular worksections rather than jumping from one to the other. Print the edited working document, if not already done, as it may be easier to work on the on the hard copy from now on.
- Step 9 - *Identify subclauses not required*: Delete unnecessary subclauses (and associated prompts) from the worksection. *Highlight uncertain subclauses and associated prompts and leave until later.*
- Step 10 - *Identify paragraphs and subparagraphs not required*: Delete unnecessary paragraphs and subparagraphs (and associated prompts). Refer to the hidden Guidance text.
- Step 11 - *Complete the write-in options*: Complete the options, [complete/delete] prompts and schedules.
- Step 12 - *Add novel material*: Add original material not dealt with

NOTES

by the Company Templates (although sometimes mentioned in the Guidance text) where required. Check against standards and other technical literature, particularly for availability and the variables, which need to be specified. Begin with the worksections about which you know the most. Use the Company style.

- Step 13 - *Edit standard text*: Systematically edit standard (default) NATSPEC Template text where it conflicts with project requirements, the drawings, completed prompts or with added new material. In particular, default standards or descriptions may conflict with proprietary items. If required you may insert hyperlinks (on-screen) into the worksection text for office or client policy requirements. Standard NATSPEC Template text may also be modified to incorporate a preferred style or improve on a perceived lack of clarity for example. A word of warning: the more this is done, the less valuable the standard text becomes and the more work for the specifier.
- Step 14 - *Complete*: Run through from Step 8 as often as required until the project specification is complete. In particular make sure all company text options have been considered, all defaults evaluated and all prompts completed/deleted. Ensure that no uncertain items remain – if in doubt at this stage leave them out.
 - *Styles and formatting*
 - *Company templates have an attached .dot file which holds information about format including headings.*
 - *Company formatting style allows easy reference to the hierarchy of the text within the specification.*
- Step 15 - *Check cross-references*: Check all cross-references in the project specification to other worksections, standards, referenced documents, and contract documents. Ensure, in particular, that cross-referenced material has not been accidentally deleted (thereby creating conflict). Minimise repetition and ensure there is no conflict between drawings and the specification. The Referenced documents file (listing standards cited in the project specification) is intended to assist readers of the specification, by giving the titles of documents which the specification only references by number. It is optional for inclusion in a specification. If using, it should be edited (using the computer search facility to find which standards are included) listing only standards referenced in the project specification, not ones that you think might or should apply.
- Step 16 - *Proofread*: Print and proofread (perhaps several times). Check the format, number the pages, finalize the contents and prepare an index. Delete hidden text using the Toolbar button.
- Step 17 - *Correct*: Check details again. NATSPEC SPECbuilder Pro allows you to easily renumber subsections and clauses. Add headers, footers and issue/revision tables in accordance with office policy. Distribute to the principal, consultants, tenderers and other relevant parties. Retain working and library/archive copies.

2.9.1 Advice for Specifiers

Brevity

- Use the imperative form. For example, Lay tiles.... rather than.... Tiles shall be laid.
- Avoid lengthy verbal descriptions – use NATSPEC style (e.g. colons and keywords), draw it or schedule it instead.

Clarity

- Use precise, consistent language, structure and terminology.
- Avoid legal phraseology or stilted formal terms and sentences.

Content

- Develop an office policy regarding what material will be included in the drawings, schedules and written specifications.
- Do not include material in technical worksections which should be covered in preliminaries, general conditions annexures or the general conditions themselves, e.g., tendering, contractual material, project descriptions, drawing lists.

Compliance

- Establish if any alternative solutions to the BCA are to be pursued.
- Consider preparing a BCA compliance document comprising only those worksections relating to the BCA.

Consultants

- Check specifications and schedules provided by consultants for consistency.
- Do not duplicate material common to various project consultants.

Cross References

- Minimise cross-references between the specification, drawings and other contract documents.
- Do not use phrases such as detailed on the drawings or unless otherwise specified.

Fairness

- Be specific, so that a basis for pricing is clearly set.
- Do not specify anything which can not be verified or which the contract administrator or the principal does not intend to enforce.

Redundancy

- Say it once and in the right place.
- Do not use redundant reference paragraphs at the start of each worksection. The contractor is responsible for all work and must read all documents together.

NOTES

NOTES

Repetition

- Avoid repetition within the specification and between the specification, drawings and other contract documents.
- Do not specify the same thing using a mix of proprietary, descriptive, performance or reference specification – conflict is bound to arise.

Standards

- Do not rely on a blanket instruction to comply with all relevant standards.
- Have access to the standards you need and evaluate their scope and currency.

Structure

- Break long clauses into subclauses, paragraphs and subparagraphs with titles or bullet points in a logical hierarchy, each dealing with one item.
- Standardize text of common clauses and subclauses.

Substitution

- Do not use equal or equal approved – it is an invitation for substitution.

Time

- Start documenting as early as the receipt of the Client's brief.
- Establish the Conditions of Contract and check for items requiring early attention

2.10 ROLE OF GARMENT ANALYSIS

Both consumers and apparel professionals do garment analysis. Consumers engage in garment analysis every time they shop for apparel. The thoroughness of the analysis depends in large part on the type of garment being sought and consumers' product knowledge. Consumers' perceptions of products may be based on intrinsic or extrinsic cues to quality and performance depending on personal preferences or priorities. Purchases made by customers determine the success of the decisions made by apparel professionals.

To satisfy consumers' needs for apparel, apparel professionals must address the following questions:

- What are the target customers' priorities among aesthetics, performance, price, and value?
- What aspects of apparel serviceability are of particular concern to consumers? Comfort? Durability? Care? Functional use?
- Do customers focus on intrinsic or extrinsic cues in making apparel choices?

The answers to these questions provide apparel professionals with priorities for line development, product development, production, and marketing decisions.

NOTES

Professional garment analysis involves the following goals, processes, and limitations:

- Products are examined from a business perspective with the goal of positioning products to satisfy the needs of target customers.
- Decisions are made in the context of the product line and the firm's strategic plan.
- Products are developed and marketed to suit groups of target customers in terms of styling, fit, fashion, quality and value.
- Sound technical knowledge of materials and garment assembly is needed to determine product performance.
- Alternative product development, production, and/or marketing processes are assessed.
- The bottom line, the potential profitability of the product, is always considered in evaluating alternatives.
- Quality standards are based on perceptions of target customers' expectations.
- Analysis may be focused on one particular aspect of a product such as production costs or specifications.
- The results of professional analysis determine what will be available to consumers on the retail sales floor.

Apparel professionals are constantly faced with pressure to control costs of labor, materials, and overheads. These costs are often interrelated; reducing costs in one area may increase costs in another.

For every industry or business, to get increased sales and better name amongst consumers and fellow companies it is important to maintain a level of quality. In the garment industry quality control is practiced right from the initial stage of sourcing raw materials to the stage of final finished garment. For textile and apparel industry product quality is calculated in terms of quality and standard of fibres, yarns, fabric construction, color fastness, surface designs and the final finished garment products. However quality expectations for export are related to the type of customer segments and the retail outlets. There are a number of factors on which quality of garment industry is based such as – performance, reliability, durability, visual and perceived quality of the garment. Quality needs to be defined in terms of a particular framework of cost.

The national regulatory quality certification and international quality Programs like ISO 9000 series lay down the broad quality parameters based on which companies maintain the export quality in the garment and apparel industry. Here some of main fabric properties that are taken into consideration for garment manufacturing for export basis:

- Overall look of the garment.
- Right formation of the garment.
- Feel and fall of the garment.

NOTES

- Physical properties.
- Color fastness of the garment.
- Finishing properties.
- Presentation of the final produced garment.

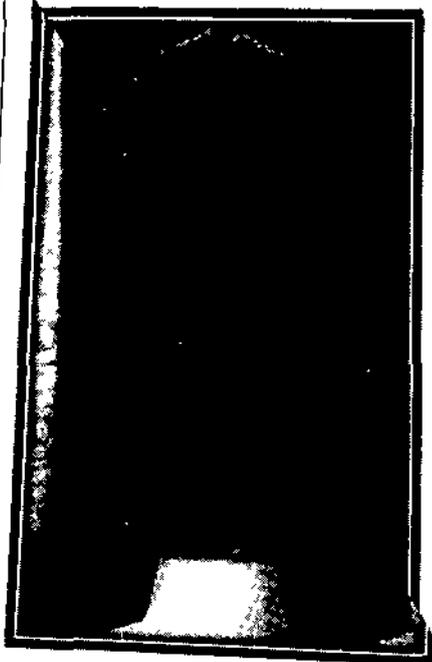
There are certain quality related problems in garment manufacturing that should not be over looked:

- **Sewing defects** - Like open seams, wrong stitching techniques used, same color garment, but usage of different color threads on the garment, miss out of stitches in between, creasing of the garment, erroneous thread tension and raw edges are some sewing defects that could occur so should be taken care of.
- **Color effects** - Color defects that could occur are – difference of the color of final produced garment to the sample shown, accessories used are of wrong color combination and mismatching of dye amongst the pieces.
- **Sizing defects** - Wrong gradation of sizes, difference in measurement of a garment part from other, for example- sleeves of 'XL' size but body of 'L' size. Such defects do not occur has to be seen too.
- **Garment defects** - During manufacturing process defects could occur like faulty zippers, irregular hemming, loose buttons, raw edges, improper button holes, uneven parts, inappropriate trimming, and difference in fabric colors.

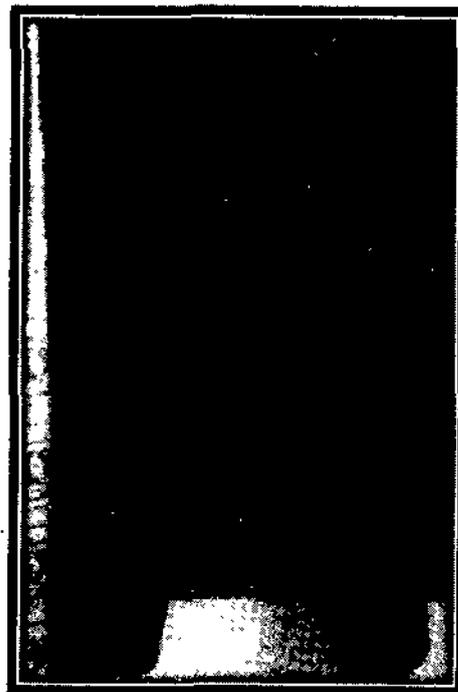
STYLE DESCRIPTION

A Stone-washed Denim Trouser

Front View



Back View



2.10.1 Stone Washed Denim

Stonewashed jeans are jeans that have been treated to produce a faded, worn appearance. This is usually accomplished either by washing the jeans with pumice in a rotating drum, or also by using chemicals to create the appearance without the use of a rotating drum. Stonewashed jeans were a popular fashion trend in the 1970s. In the 2000s stonewashed jeans were heavily distressed, with pre-made holes, frayed edges and extensive fading caused by sandblasting.

Front Panel

- Waist Band
- Front Panel
- Zipper fly Panel
- Front Leg parts

Back Panel

- Waist Band
- Back Panel
- Back Leg Parts

2.10.2 Defect Analysis

Various Probable Defects (including trim defects):

- Broken buttons
- Broken snaps
- Broken stitching
- Defective snaps
- Different shades within the same garment .
- Dropped stitches
- Exposed notches
- Exposed raw edges
- Holes
- Inoperative zipper
- Loose / hanging sewing threads
- Misaligned buttons and holes
- Missing buttons
- Needle cuts / chews
- Open seams
- Pulled / loose yarn
- Stain
- Unfinished buttonhole
- Zipper too short

NOTES

2.10.3 Pre production Defects

Pattern defects in garment:

- Some parts of pattern are missing, probably because the marker did not include the correct number of parts.
- Mixed parts, probably because the marker is not correctly labeled, resulting in a marriage of wrong sized parts.
- Patterns not facing in correct direction on napped fabrics.
- Not all patterns facing in same direction (either way) on a one-way fabric. Patterns not aligned with respect to the fabric grain.
- Poor line definition (e.g. too thick chalk; indistinctly printed line, perforated lay not powdered) leading to inaccurate cutting.
- Skimpy marking, caused by either the marker did not use the outside edge of the pattern; or the pattern was moved or swung after partial marking to squeeze the pattern into a smaller space for economizing the fabric.
- Marking back from miniature markers also can cause trouble unless the miniature marker making is in the hands of experienced operators. Alternatively the full size pattern may be having worn out edges.
- Generous marking, especially in combination with skimpy marking results in components being sewn together with puckering and pleating.
- When the marker is too wide, the garment parts at the edges of the lay get cut with bits missing.
- Not enough knife clearance freedom. Wrong check matching, i.e. lines across the seam are not matching.
- Wrong check boxing, i.e. checks are not showing a full or partial box across the seam.
- Notches and drill marks omitted, indistinct or misplaced.

Spreading defects in garment:

- Not enough plies to cover quantity of garments required.
- Plies misaligned, resulting in garment parts getting cut with bits missing in some plies at the edge of the spread.
- Narrow fabric, causes garment parts at the edge of the lay getting cut with bits missing.
- Incorrect tension of plies, i.e. fabric spread too tight or too loose.
- This will result in parts not fitting in sewing, and finished garments not meeting size tolerances. Not all plies facing in correct direction (whether 'one way' as with nap, or 'one way either way' as with some check designs). This happens when fabric is not spread face-down, face up, or face to face as required.
- Unacceptable damages in the garment parts. Parts not fully included owing to splicing errors.

NOTES

- Spread distorted by the attraction or repulsion of plies caused by excessive static electricity.
- Plies are not spread accurately one above another for cutting. This results in mismatching checks.

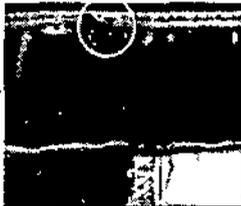
Cutting defects in garment:

- Failure to follow the marker lines resulting in distorted garment parts.
- Top and bottom plies can be a different size if the straight knife is allowed to lean, or if a round knife is used on too high a spread.
- Notches, which are misplaced too deep, too shallow, angled, omitted, or wrong type to suit fabric.
- Drill marks, which are misplaced, wrong drill to suit fabric, omitted, not perpendicular through the spread.
- Frayed edges, scorched or fused edges, caused by a faulty knife, not sharp enough, or rotating at too high a speed.
- Garment part damaged by careless use of knife, perhaps overrunning cutting previous piece. Marker incorrectly positioned on top of spread.
- Garment parts have bits missing at edge of lay.
- If too tight or too loose then garment parts are distorted.
- Slits opened inaccurately or omitted.

2.10.4 Production Defects

Name of the defect	Description	Defect Picture	Cause	Remedy
Broken Stitches	Where the thread is being broken where one seam crosses another seam (ex: bar tacks on top of waistband stitching) resulting in stitch failure.		Needle Cutting	<ul style="list-style-type: none"> ✓ Use a higher performance thread. ✓ Use a larger diameter thread on operations where the thread is being cut. ✓ Make sure the proper stitch balance is being used. (On a chain stitch seam on denim, normally a 60%/40%

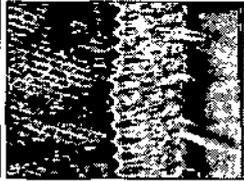
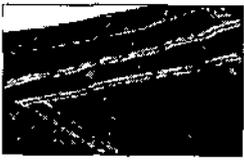
NOTES

				<p>relationship of Needle thread to looper thread in the Seam is maintained).</p> <ul style="list-style-type: none"> ✓ Use needles with the correct needle point. ✓ Change the needles at regular intervals on operations where the Needle Cuts are occurring frequently.
Unraveling Seams	This causes seam failure unless the seam is Re stitched.		Generally occurs on 401 chain stitch seams where either the stitch has been broken or a skipped stitch has occurred.	<ul style="list-style-type: none"> ✓ Use a high performance thread that will minimize broken stitches and skipped stitches; ✓ Insure proper machine maintenance and sewing machine adjustments; ✓ Observe sewing operators for correct material handling techniques.
Re Stitched Seams	Where there is a "splice" on the stitch line. If this occurs on		1. Thread breaks or thread	

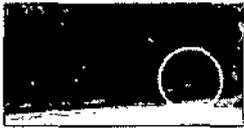
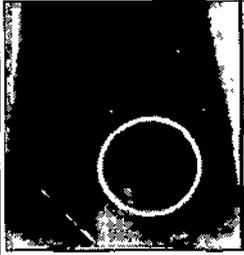
NOTES

	<p>Topstitching, then the seam does not appear to be nice.</p>		<p>run-out during sewing; or 2. Cut or broken stitches during a <i>subsequent</i> treatment of the finished product (I.e., stone washing).</p>	<ul style="list-style-type: none"> ✓ Use a better quality sewing thread. This may include going to a higher performance thread designed to minimize sewing interruptions. ✓ Insure proper machine maintenance and sewing machine adjustments; ✓ Make sure sewing machines are properly maintained and adjusted for the fabric and sewing operation. ✓ Observe sewing operators for correct material handling techniques.
<p>Skipped Stitches</p>	<p>Skips are usually found where one seam crosses another seam and most of the time occurs right before or right after the heavy</p>		<p>thickness. Where the stitch forming device misses the needle loop or the needle</p>	<ul style="list-style-type: none"> ✓ Use core spun thread. ✓ Use <i>minimum</i> thread tension to get a balanced stitch. ✓ Use the ideal foot, feed and plate that help

NOTES

	misses the looper loop.			<p>to minimize flagging.</p> <ul style="list-style-type: none"> ✓ Training sewing operators NOT to stop on the thickness. ✓ Make sure the machine is feeding properly without stalling. ✓ Make sure the machine is not back
feeding. Ragged /	<p>Inconsistent Edge</p> <p>Where the edge of the seam is either extremely "ragged" or "rolls" inside the stitch.</p>			<ul style="list-style-type: none"> ✓ Make sure the sewing machine knives are sharpened and changed often; ✓ The knives should be adjusted properly in relationship to the "stitch tongue" on the needle plate to obtain the proper seam
width or width bite.	<p>Wavy Seams on Stretch Denim</p> <p>Where the seam does not lay flay and is wavy</p>		<p>Due to the fabric stretching as it was sewn or during subsequent laundering</p>	<ul style="list-style-type: none"> ✓ Use minimum presser foot pressure ✓ Instruct sewing operators to use proper handling techniques

NOTES

	and handling operations.			and not stretch the fabric as they are making the seam. Where, available, use differential feed to compensate for the stretch of the fabric.
Ropy Hem	Where hem is not laying flat and is skewed in appearance		Usually caused by poor operator handling.	<p>✓ Instruct the sewing operator to make sure they get the hem started correctly in the folder before they start sewing. Also, make sure they don't hold back excessively as the seam is being sewn.</p> <p>✓ Use minimum roller or presser foot pressure.</p>
Twisted Legs	Is where the side seam twists around to the front of the pant and distorts the appearance of the jeans.		Usually caused by poor operator handling.	<p>✓ Instruct the sewing operator to match the front and back properly so they come out the same length. Sometimes notches are used to insure</p>

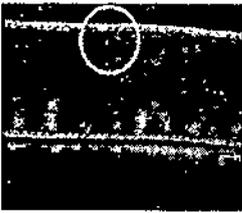
NOTES

				<p>proper alignment.</p> <ul style="list-style-type: none"> ✓ They should NOT trim off the front or back with scissors to make them come out the same length. ✓ Make sure the cut parts are of equal length coming to the assembly operation. ✓ Check fabric quality and cutting for proper skew. ✓ Make sure the sewing machine is adjusted properly for uniform feeding of the top and bottom plies.
Disappearing Stitches in Stretch Denim	Is where the thread looks much smaller on seams sewn in the warp direction than in the weft direction of the fabric.		<ul style="list-style-type: none"> • Shorter stitch length • Poor operator handling 	<ul style="list-style-type: none"> ✓ Use a heavier thread size on topstitching. ✓ Go to a longer stitch length (from 8 to 6 spi). ✓ Make sure the thread tensions are as loose as possible so the thread sits on top of the fabric

NOTES

				rather than burying in the fabric on seams sewn in the warp.
--	--	--	--	--

Post Production Defects

Name of the	Description	Defect Picture	Cause	Remedy
Thread discoloration after Laundry	A common discoloration would be the pick-up of a greenish or turquoise tint.		It is the thread picks up the indigo dyes from the fabric giving the thread a 'dirty' appearance.	<ul style="list-style-type: none"> ✓ Use thread with proper color fastness characteristics. ✓ Correct PH level (too low) and Water Temperature (too low) during laundry. ✓ Use the proper chemicals & laundry cycles. Use Denimcol PCC in wash or similar additive. ✓ Do not overload washers with too many garments at one time.
Poor Colorfastness after Laundry	It changes to a different color altogether.		It is where the thread does not wash down consistently in the garment	<ul style="list-style-type: none"> ✓ Use thread with proper color fastness characteristics. Use threads from the same thread supplier and do not mix threads in a garment.

NOTES

				<ul style="list-style-type: none"> ✓ Always do preproduction testing on denim garments using new colors to assure that they will meet your requirements. ✓ Make sure sewing operators select thread by type and color number and do not just pick a thread off the shelf because it looks close in color.
<p>Sagging or Rolling Pockets</p>	<p>Where the pocket does not lay flat and rolls over after laundering.</p>		<ul style="list-style-type: none"> • Improper cutting of Pocket • Improper folder functioning • Excessive holding back of pocket by the operator 	<ul style="list-style-type: none"> ✓ Make sure the sewing operators are not holding back excessively when setting the front pocket. ✓ Make sure the hem is formed properly and that excessive fabric is not being put into the folder that will cause the hem to roll over. ✓ Check to make sure pocket is cut

NOTES

			<p>properly and that pocket curve is not too deep.</p> <ul style="list-style-type: none"> ✓ Use a reinforcement tape on the inside of the pocket that may help prevent the front panel from stretching along the bias where the front pocket is set. ✓ The type and weight of denim, along with the fabric construction, may contribute to this problem.
<p>Broken Stitches (I)</p>	<p>Where thread is being compromised by the chemicals used during laundering resulting in loss or change of color and seam failure.</p>		<p>Chemical Degradation</p> <ul style="list-style-type: none"> ✓ Use a higher performance thread that has greater resistance to chemical degradation. ✓ It is recommended to go to larger thread sizes when the Denim Garments will be subject to harsh chemical washes.

NOTES

		sanding, etc.		<p>✓ To achieve the best laundering results make sure that the water temperatures and PH Levels are correct and that the proper amounts and sequence of chemical dispersion are within guidelines.</p> <p>✓ Make sure the garments are being rinsed properly to neutralize the chemicals in the fabric.</p> <p>✓ Monitor the drying process, cycle times, and temperatures to make sure they are correct so that the best possible garment quality can be achieved.</p>
Broken Stitches (II)	Where thread on the stitch line is broken during stone-washing, sand blasting, hand sanding, etc. Broken stitches		due to abrasion during stone-washing, sand blasting, hand	<p>✓ Use a higher performance thread;</p> <p>✓ Use a larger diameter thread on operations where</p>

must be repaired by re stitching over the top of the stitch-line.

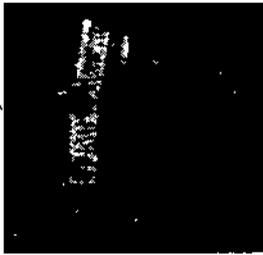
sanding, etc.

excessive abrasion is occurring.
 ✓ Make sure stitches are balance properly, susceptible to abrasion.
 ✓ Monitor the Finishing Cycle for compliance to specifications.

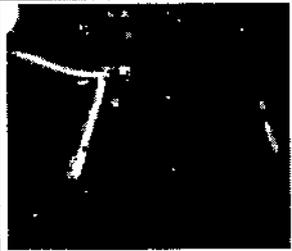
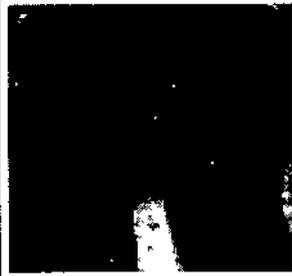
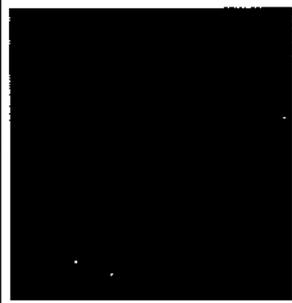
Product Development

NOTES

DEFECT CHECKLIST IN THE GARMENT

Production Defects		
Name of the defects	Present/Absent	
Broken Stitches	Absent	
Unraveling Seams	Absent	
Re stitched Seams	Present	
Skipped Stitches	Present	
Ragged / Inconsistent Edge	Present	

NOTES

Wavy Seams on Stretch Denim	Present	
Ropy Hem	Absent	
Twisted Legs	Present	
Disappearing Stitches in Stretch Denim	Present	
Post Production Defects		
Name of the defect	Present/Absent	
Thread discoloration after Laundry	Present	
Poor Colorfastness after Laundry	Absent	
Sagging or Rolling Pockets	Absent	
Broken Stitches (I)	Absent	
Broken Stitches (II)	Absent	

2.11 STYLE DESCRIPTION

The purpose: Identification and development of a complete description of a style.

Style specifications are being developed:

- Line adoption has taken place
- Assigned a style number, the key identifier of the garment
- Determine body types and size ranges for the style
- To communicate identify of the style using specifications include brand, style number, merchandise group, selling period, body types and size ranges, etc.

2.11.1 Positioning Strategy

The purpose: Foundation for garment analysis.

Factors:

- Example: Functional/Aesthetic priorities
- Factors are useful in describing product's purpose and styling.
- To position a product to make it desirable for a particular target market.

2.11.2 Sizing and Fit

- Size is labeled in a manner that allows customers to find the right size.
- Sizing standards: To offer consistency in fit among styles, product line, and seasonal offerings.
- Sizing systems and size ranges
 - Sizing systems = Sizing standards
 - For apparel sizing, body types are classified by body proportions as related to age and gender
- Indicators of size:
 - General body size (S, M, L, XL)
Numbers (Size 6, 12, 18)
 - Numbers do not indicate the actual garment dimensions.
 - Misses 8, 10, 12/Junior 7, 9, 11.
- Fit indicators:
 - Fit is how a garment conforms to or differs from the body
 - Garment cut.
 - Labels identify the body type that the garment was designed to fit.
Example: Petite, Long, regular, short, etc.
- Fit observation of a garment on body form
 - Silhouette
 - Conforms to body shape, (Example: Stretch fabric)
 - Limiting fit points
 - Collar length, shoulder width, waist band length, or hip line

NOTES

- Fullness
 - Controlled by darts, tucks, pleats, gathers, and seam shape.
 - For comfort and freedom of body movement.
- Industry sizing standards
 - Inconsistent sizing systems.

2.11.3 Materials Selection

- Materials = Fabrics and Findings:
 - Findings: all the rest of materials required to complete garments
 - Support/shaping materials, trims, labels, threads, etc.
- Criteria for analysis of materials
 - Material name, content, yarn type and size, fabrication, count, weight, drapability, structural design, color application, finishes, care, method of application.

2.12 GARMENTS COMPONENTS

The garment components are garment parts that require one or more separate pieces to be assembled as a unit. Garment components are the basic sections of garments including top fronts, top backs, bottom fronts, bottom backs, sleeves, collars / neckline treatments, cuffs / sleeve treatments, plackets, pockets, and waistline treatments. Hems may be completed as a part of a component or as part of final assembly. Stitches, seams, and / or bonding are used to assemble components and final garment structure.

Components such as collars, cuffs, and pockets are small parts that are usually constructed independently for final assembly. Many small parts are attached to the major garment components (tops, bottoms, and sleeves) before final assembly. For example, sleeve plackets may be attached to sleeves prior to final assembly, but cuffs may be added after the sleeve is attached and the underarm seam is sewn. The particular treatment given to a component involves consideration of functional use, aesthetics, quality, complexity, materials, component shape, sequence of assembly operations, and costs.

The garment components are garment parts that require one or more separate pieces to be assembled as a unit. Garment components are the basic sections of garments including top fronts, top backs, bottom fronts, bottom backs, sleeves, collars / neckline treatments, cuffs / sleeve treatments, plackets, pockets, and waistline treatments. Hems may be completed as a part of a component or as part of final assembly. Stitches, seams, and / or bonding are used to assemble components and final garment structure.

Components such as collars, cuffs, and pockets are small parts that

NOTES

are usually constructed independently for final assembly. Many small parts are attached to the major garment components (tops, bottoms, and sleeves) before final assembly. For example, sleeve plackets may be attached to sleeves prior to final assembly, but cuffs may be added after the sleeve is attached and the underarm seam is sewn. The particular treatment given to a component involves consideration of functional use, aesthetics, quality, complexity, materials, component shape, sequence of assembly operations, and costs.

- 1. Top Front, Top Back, Bottom Front, Bottom Back:** Top front, top back, bottom front, bottom back are the major sections of a garment. Fronts and backs may be one or more pieces depending on the styling of the garment. Left and right sections are frequently minor images of each other but may be different if the garment is asymmetrical. Sometimes side seams are eliminated so that fronts and backs are one piece. Fronts and backs often have other components attached to them before the garment is assembled.
- 2. Sleeves:** Sleeves are fundamental parts of a garment design, silhouette and fit. They are functional in covering all or part of the arm. Sleeves also provide opportunities for creative styling, frequently with additional components, such as sleeve plackets and cuffs attached.
- 3. Plackets:** Plackets provide a finished opening in the garment to allow a body part to pass through. Types of placket formations and methods of assembly vary widely in cost, quality, and design. Plackets often require some type of closure.
- 4. Collars:** Collars and other neckline treatments, such as facings and knitted bands, may finish, support, and provide aesthetic emphasis for the neckline of a garment. Neckline treatments may also involve closures and plackets to allow the head to pass through and still maintain a close till at the neck.
- 5. Cuffs:** Cuffs and other sleeve treatments are components used to finish the lower edges of sleeves. Cuff type varies with the style, and function of the component and garment, materials used and methods of assembly and attachment. Other sleeve treatments include casings, facings, and hems.
- 6. Pockets:** Pockets may be functional, aesthetic, or both. They may be sewn onto garment parts, cut into the body of a garment, or incorporated into garment structure. Pocket treatment may also involve a closure. Pockets are sometimes used as a means of differentiating brands of products, particularly on jeans.
- 7. Waistline:** Waistline treatments include components that serve to define the waistline of a garment, provide entrance to a garment, and/or hold a garment in place on the body. Waistline treatments may involve formation or application of brands, casings, facings, and elastic. They may or may not involve a waistline seam.

NOTES

2.13 FINAL ASSEMBLY AND FINISHING

“Finishing” is the addition of special detailing such as pleats, embroidery and screen printing to a garment. This includes hand stitching (unseen handwork done inside collars and lapels to give them shape) and its automated substitutes. This may also include adding buttons, hooks, eyes, or trims, as well as clipping loose threads. All finishing of moderate- and lower-priced garments is done by machine.

For some garments, dyeing is done after final assembly in order to ensure a perfect color match for items intended to be worn together. In jeans manufacturing, washing is often a final stage in finishing in which various washing techniques are used to give denim a ‘stonewashed’ look, or faded, bleached, and aged appearances.

2.14 INFLUENCES ON DESIGN PROCESSES

Design is based on the inspiration of past accomplishments. On that foundation, we can build upon those achievements to shape the future. Design is about life — past, present and future — and the learning process that happens between birth and death. It is about community and shared knowledge and experience. It is the passion to build on what we’ve learned to create something better.

The words “design influences” can be understood as both a plural noun and as subject and verb. The plural noun speaks of those who have come before us and paved the way. The verb speaks of the responsibility of design to lead the way. By understanding where we have come from, we have a better idea of where we are going and, perhaps, where we should be heading.

2.14.1 Factors Influencing Design Process

- **Cost:** The cost of the materials and labor required to manufacture the product. The price potential customers are prepared to pay for the product.
- **Ergonomics:** The product may be designed for human use. As a result ergonomics (sizes etc...) will play a major role.
- **Materials:** The availability of materials and the development of new, hi-technology materials will have an influence on the final design of a product.
- **Customer Requirements:** The customer will have great influence over the way a product is designed and develops. As a product is designed it is normal for potential customers to be questioned about the type of product or design that they prefer. For example, when designing a mobile phone a design team will show potential customers several designs and make changes according to their likes and dislikes.

- **Industrial Production:** All products are manufactured through one of the following manufacturing techniques:

- Single Item / Prototype / One Off
- Batch Production
- Continuous Production
- Just in Time

When designing a product the most desirable production technique may influence the way the final product looks.

- **Company Identity:** The product may have to display the company image. Most companies are proud of their public image. This may determine the color scheme applied to the product, the way it looks or even the materials that are used in its manufacture (i.e. recycled materials).
- **Aesthetics:** The shape and form of the product may determine the layout of circuits or mechanisms etc., inside it. Products are often designed to look stylish. The style applied to the outside of a product can quite easily influence the technology inside it. Aesthetics can also alter the production / manufacturing techniques through which it is made.
- **Fashion:** The fashion of the time influences the design of products. Usually people want to buy up to date items not ones based on 'last year's look'.
- **Culture:** Some products are aimed at different cultures and countries. A product acceptable in one culture may be looked up on as offensive or less desirable in another. The use of colors and color schemes are a good example of this.
- **Functions:** The number of functions a product has to perform will inevitably affect its design. Exactly what is the product going to do?
- **Environment:** Many people (potential customers) are concerned about their environment and the damage to it caused by industrial production. When designing a product it may be wise to ensure that the materials can be recycled or the product itself can be manufactured from a large proportion of recycled material.

2.15 APPAREL DESIGN TECHNOLOGY

The garment industry is based on fashion and invariably goes through short fashion cycles. To survive in the market, there have to be regular innovations in colour, style, design, fabric, finish and fit. Automated machinery and IT solutions are key in such a scenario to be competitive and improve business results.

The growth of garment industry in terms of technology adoption can be traced from pedal operated machines in the 60s. The industry moved on

NOTES

to power-operated machines and steam presses in the mid-80s, started assembly line manufacturing in the late 80s and then entered the phase of using computerized machines. The Industry saw a rapid change with the introduction of computerization in the garment industry Automated machines for cutting, sewing, buttonholes, CAD/CAM for pattern making, etc, have brought down the cost of production considerably. As a result, garment companies now focus on technology to be productive and cost-effective at the same time. In terms of advancements in automation, present generation machines have under bed trimmers, which stitch and trim excess thread simultaneously. This means a huge saving on threads and excess manpower, besides this, there are automated machines for stitching collars and cuffs, finishing machines, pressing machines, etc. Apparel production technologies includes cutting, sewing, fusing, pressing, production, and warehousing employed can vary according to their levels of sophistications. Quality procedures are the main control function of any Apparel Industry. Some of the high-tech machines with high speed and quieter operation offers better quality products within short time. Machine that can combine two or more operations into one helped to increase the efficiency of an operation. Some of them are:

1. **Cutting technology:** Traditionally, long shears and scissor were the only instruments in cutting fabric in garment sector but the scenario has changed a lot, now, High Speed Single/Multi layer cutting machine with straight/round cutter are must in every garment production unit.
2. **Sewing technology:** A traditional sewing machine is a textile machine used to stitch fabric or other material together with thread. It uses needles to form a stitch by interlocking or inter looping thread through the fabric. Since the invention of the first working sewing machine, generally considered to have been the work of Englishman Thomas Saint in 1790, the sewing machine has vastly improved the efficiency and productivity of fabric and clothing industries. Most modern sewing machines employ two separate threads to form a special type of stitch known as the lockstitch. The upper thread is led through an eye formed near the point of a needle. The under thread is carried on a bobbin and is linked or locked to the upper thread by means of a rotary or horizontal motion of the bobbin. In a typical machine employing a rotary bobbin, the sequence of operations is as follows. The needle carrying the upper thread moves downward through the material being sewed, and the thread is engaged above the eye of the needle by a hook on the rim of the bobbin. As the bobbin turns, the upper thread is pulled out to form a loop through which the under thread feeds.

The size of the loop is controlled by a tension device on the upper part of the machine. As the needle withdraws, the locked loop formed by the two threads is tightened by the pull of a lever take-up device to

NOTES

form a stitch. In a machine employing a horizontal bobbin held in a freely moving shuttle, the stitch formed is exactly the same. The shuttle moves through the loop of thread as the needle comes down, and then the shuttle returns to its original position as the needle moves up.

Industrial Sewing Machines

- Industrial sewing machines are larger and heavier than home machines and are designed to perform only one specific function.
- The basic parts of the industrial machine are called the "BIT" or frame. The "BIT" is made of cast iron on a computer numerical control (CNC) machine that creates a casting with appropriate holes for inserting components.
- Industrial machines as per design requirement, apply chain or zigzag stitch rather than lock stitch. But machines may be fitted for up to nine threads for strength.

Examples are- Single/Multi needle, flat bed/cylinder bed, Sewing machines, Interlock stitch machines, over lock stitch machines. Computer controlled, direct-drive, high speed, Lock stitch/Zigzag stitching machine produces high quality seams irrespective of sewing threads and fabrics.

Advantages

- Adjustable stitch width and length control.
- Having a LCD screen with a control panel.
- Easily use on medium to heavy fabric.
- Produce many varieties of designs.
- Well and high quality control.
- Heavy thread capable.
- High productivity.
- High performance.
- Saving energy.
- Easily make different types of stitches like-lock stitch, chain stitch and over lock stitch.

Applications

For commercial uses in garment industry such as-Buttons and Buttonholes, Bar tacking, elastic attaching, Flat lock stitching, Quilting on Upholstery, Decorative Stitching, button attaching, Hemstitching on Jeans, Leather, Plastics, Rubber, Foam, and Other applications.

Features of Modern Sewing Machine: -

- The presser foot pedal makes it very easy for the user to feed any type of fabric into the sewing machine.
- The speed of the sewing machine can be controlled electronically.

NOTES

- freehand embroidery
- There are also buttons that are easy to manage, such as the needle button, which can move your needles either up and down automatically, as well as the start-and-stop button.

3. **Production technology:** Some of the high-speed machines are elastic attaching and flat lock machines with folder for knitted fabric, Automatic Front placketing and fusing machine, buttonhole sewing machine, Button punching, Pleat making machine, Cuff turning and Blocking machine etc.

An overview of different types of Industrial sewing machines is presented below:

Button Sewing Machine : The machine is specially designed to sew metal button on the every kind of clothing, leather and plastic ware, against the different thick material. The sewing is secure, beautiful and safe, never damage the button.

Operation Method: Before sew the button, must adjust the gap between up and down moulds, if the gap is too small will be damage the machine.

- a. Put the metal button into the up and down mould, move the clothing to the position which need sew the button , then press the safety Annulus by hand, step the pedal by foot, the up mould rush to the down mould, finishing a binding action.
- b. Adjust the lowest position of up mould(i.e. adjust the degree of binding tightness): Put off the power and move the big belt wheel by hand, so that the up mould lie the lowest position, loose the Tight nut, adjust the Fix mould Screw to a suitable position, then screw the Tight Nut—try to run.

Button Hole Machine Features:

- The button holing position can be easily adjusted.
- A mechanism in the needle thread trimmer prevents interference with the positioning of buttonholes.
- The shape of the face plate is designed to provide sufficient clearance around the needle entry position.
- The work clamp check can be lifted as high as 12 mm, making the machine easily capable of sewing heavy weight material such as bulky knits.
- The work clamp check can be easily lifted, helping to reduce operator fatigue.
- The pressure required depressing the start pedal and lifter pedal has been reduce. Automatic two or three thread chain stitch buttonhole machine to produce keyhole shaped small, medium, large buttonholes for raincoat, jacket, jeans & work wear etc. This model is recognized in the industry as the best ever automatic keyhole machine ever made& produces a perfectly

NOTES

stitched buttonhole. This machine would produce a buttonhole on a top of the range be spoke suit on Seville row for example. Sew the buttonhole automatically then cuts through the fabric. Can adjust the size of the buttonhole to suit the garment, sale include different size blades. Single phase electric & supplied with the halogen light.

Bar Tacking Machine : For reinforcing the pulling parts on suits, jeans, uniform, fatigue dress, etc. reinforcing the round buttonhole ends. For bar tacking various clothing, snapping the fasteners, attaching the ribbon label etc. Independent thread-trimming improves sewing quality, avoiding efficiently loose stitches of the chemical fiber from the beginning to the end, plays the performances effectively, with excellent stable operation.

USES:

- This machine suitable for general bar taking , from medium-weight materials to heavy weight materials.
 - Also for various uses such as umbrella, beg, belt, and loop etc.
4. **Fusing technology:** An essential item in garment unit, each unit of garment requires stiffening are fused such as neckline, collars, front facing, pockets etc.

In this, all the stitches get merged and fused along with the material for neat and clean finish. The special fusing device with individual top and bottom temperature regulator provides right temperature for quality fusing.

Fabric Fusing Machine: Fusing machines are most common and widely used in any commercial set up of garment industry. In fusing machine, collars, cuffs, front facings etc. are automatically and easily fused with a neat finish.

5. **Surface enrichment technology:** Surface enrichment technology includes High speed Computerized Embroidery Machine, picoting machine and Sequin Attaching Sewing Machine etc.

- **Border Making Machine:** This machine is used to make different types of borders design which can be select from pattern memory. Large embroideries can be machine produced based on design developed using AUTOCAD or other design software. The software allows the designer to shrink, enlarge, rotate , mirror design, and select colors and types of stitches that can then be embroidered on materials ranging from satin to leather to make products like baseball caps and jackets.
- **Computerized Embroidery Machine:** Ideal for both sewing and embroidery, this easy-to-use machine provides an array of convenient features.

NOTES

Machine Features:

- **Simple bobbin winding:** The bobbin can quickly and easily be wound with thread.
- **Quick -set bobbin:** One can start embroidering without pulling up the bobbin thread.
- **Automatic thread cutting:** The thread can be cut automatically after embroidering.
- **Embroidery:** Embroider built-in embroidery pattern, character, framed decorations, and designs from optional embroidery cards.
- Computerized embroidery machine with LCD back-lit touch-screen control panel
- **Computer connectivity** using USB port for transferring patterns from the Internet.
- **Advanced needle-threading;** on-screen editing; full array of accessories included

The unit also supplies a full array of accessories including an embroidery foot, a seam ripper, bobbins, a needle set, a cleaning brush, screw drivers, spool caps, a spool net, scissors, and an accessory bag, plus a dust cover, an operation manual, and a USB cable and reference guide.

Sequins attaching machine; This machine is used to attach the sequin on the fabric. There is a wheel on which a roll of continuous sequin is wound. The fabric is put on under the foot and sequin lace is placed on the fabric with sewing. This is time saving machine and durability of the sequin is also increased.

Picoting Machine: Picoting machine is suitable for sewing holes on the fashion, scarves and shawls and various corresponding cloth. It is equipped with large-hole needle, medium -hole needle and small hole needle. If necessary, it can be equipped with back knife for separation of sewing edge, This machine adopts foreign advanced technology for design and improvement.

Applications: Suitable for decorating stitches on ladies' dress, shirts, handkerchief, necktie, tablecloth, bed-sheet, etc.

Feature: Applied with Timing Belt mechanism, providing smooth & noiseless stitching even in high-speed running. Automatic Presser Foot Lifting design, makes the curved picot stitches smoothly and easily

6. **Finishing Technology:** Once a garment is complete it goes for edge finishing and trimming in over-lock stitch machine and finally steam ironed to give it finished look before packaging and shipment.

Over-lock Sewing machine: This series of flatbed interlock machines can be used to apply various stitches on different accessories to perform many functional stitches. It is necessary machinery for a mass production of garments. And is widely in stretch sewing of knitted materials such as underwear, sports-wares, T-shirts, shorts and knitted fashions, knitted coats and jeans. It is

also applied for functions stitches like hem/collar bound seaming, Lace attaching stitches, fancy stitches.

7. **Pressing technology:** Iron with mini steam generator, Electronic heated steam pressure, Body pressure, Form finisher, Shirt folding tables, Dry cleaning Machines etc.

2.15.1 Steam Iron Table

Vacuum is useful in two key ways. One, the most effective pressing is done by pulling the steam through the layers. Second, blowing up (via a readily accessible switch) reduces seam imprinting by the iron. This is particularly noticeable if you're pressing several layers, the iron maps allowances underneath. This table is reported to be good for napped fabrics like corduroy and velvets because blowing up while pressing doesn't crush the nap.

Today the garment industry cannot survive without the right technology. Leading Garment units are early adopters of technology for improving fabric utilization and pattern generation. The merging of the capabilities of the electronic sewing machine and the software machine and the software industry is creating an ever - widening range of creative features for the versatile machine. Sewing machines have become individual crafting devices and therefore, seem to have a future as promising as the imagination of the operator.

2.16 SUMMARY

Standards are sets of characteristics or procedures that provide a basis for resource and production decisions. Conformance to some standards is mandatory, while conformance to other standards is voluntary. The communication of product standards is accomplished through the use of product specifications. Specifications are brief, written descriptions of materials, procedures, dimensions, and performance for a particular style. They vary in detail and specificity. Specifications establish minimum requirements for acceptability of materials, products, and performance.

Tolerance allow variation from the minimum values specified. The more specific the specification and the less variation allowed, the more consistency there will be in the finished products and the higher the cost of production. Specifications uphold a firm's standards by communicating product information, providing consistency in finished products, and offering a basis for quality control. Adequate specifications result in fewer garment seconds; less fabric waste; reduced labor costs in handling, warehousing, cutting, and sewing; and more satisfied customers.

Many apparel professionals are involved with all aspects of product development, production, merchandising, and management. The responsibilities of each career path are integrated in an effort to meet customer needs and expectations and still produce a profit for the firm.

NOTES

2.17 GLOSSARY

- **Specification:** A specification is an explicit set of requirements to be satisfied by a material, product, or service.
- **Product Standard:** A published standard that establishes dimensional requirements for standard sizes and types of various products.
- **Product cost:** The sum of all costs associated with the production of a specific quantity of a good or service.
- **Positioning:** A marketing strategy that aims to make a brand occupy a distinct position, relative to competing brands, in the mind of the customer. Companies apply this strategy either by emphasizing the distinguishing features of their brand (what it is, what it does and how, etc.) or they may try to create a suitable image (inexpensive or premium, utilitarian or luxurious, entry-level or high-end, etc.) through advertising. Once a brand is positioned, it is very difficult to reposition it without destroying its credibility.

2.18 REVIEW QUESTIONS

1. What is product standard which used in the apparel manufacturing industry?
2. Why companies use company standards for quality, size and fit and performance?
3. What are product specifications and what are its writing process and techniques?
4. What is the role of garment analysis relative to meeting consumer and business needs?
5. How garment analysis is related to the professional perspectives to analysis from consumer perspectives.
6. Explain the system of garment analysis that examines market positioning, sizing and fit, materials selection, component assembly, final assembly and finishing, and garment presentation.
7. What is apparel design technology?

UNIT

3

*Dimensions of
Apparel Management*

NOTES

DIMENSIONS OF APPAREL MANAGEMENT

STRUCTURE

- 3.1 Learning Objective
- 3.2 Systems for Quality Management
- 3.3 Methods of Assuring Quality
- 3.4 Student Activity
- 3.5 Costs and Benefits Of Quality Programs
- 3.6 Costs and Profits
- 3.7 Stages of Costing
- 3.8 Cost Volume Relationship
- 3.9 Pricing Strategies
- 3.10 The Role of Sourcing Decisions
- 3.11 Selecting Fabrics
- 3.12 Evaluating Fabric
- 3.13 Summary
- 3.14 Glossary
- 3.15 Review Questions

3.1 LEARNING OBJECTIVE

After studying this unit you should be able to:

- Examine organizational structures for quality management.
- Explain the concept, purpose, and language of quality assurance.
- Explore product variation and defect classifications.
- Analyze the costs of quality.
- Examine organizational structures for quality management.
- Explain the concept, purpose, and language of quality assurance.
- Explore product variation and defect classifications.

NOTES

- Analyze the cost of quality.
- Explore the relationships among costs, costing, pricing, and profit.
- Examine strategies and stages of costing.
- Evaluate the purposes, uses, and processes of determining product costs.
- Examine the relationship of costs to pricing, volume, and profit.
- Discuss policies and procedures related to pricing.

Consumers want products that meet their needs. They also want protection from product failure in the form of exchanges or guarantees. These consumer expectations have significant implications for the domestic apparel industry. Some apparel firms have always had a strong focus on quality. Even so, in the Indian market, there is a wide range in the quality offered within product lines and price ranges. Expectations for Quick Response business systems include reducing variance and eliminating repetitive inspection of materials and garments. More effective application of quality management systems is essential to meet quality standards and reduce turnaround time.

3.2 SYSTEMS FOR QUALITY MANAGEMENT

Quality is defined as a perceived level of value. Using this concept, quality can be visualized as a range of intrinsic product characteristics and extrinsic quality cues, any combination of which might satisfy a particular customer's needs. Product quality can be evaluated using two different methods:

- By comparing the intrinsic and extrinsic product characteristics to other similar goods in the marketplace.
- By comparing the consistency of a product's intrinsic characteristics to the firm's standards and specifications.

Ultimate consumers and retail buyers often use the first method. They compare the relative quality of one firm's products with others that are available to determine which product or firm offers the best quality, meets needs, and offers the best value relative to the price. Apparel manufacturers also use the first method when selecting fabrics and use the second method to assure fabric quality and performance.

Apparel firms consider the quality preferences of their target customers in establishing quality standards and product specifications. A firm that targets the budget market reduces costs by establishing quality standards and specifications that allow for the use of inexpensive but serviceable materials and simple production processes. A firm that targets the better market establishes standards and specifications that require better materials, more refined fit, more complex garment assembly, more stitches per inch, in-process pressing, and better finishing techniques.

Content of Complete Garment Specifications

Date:

Style number:

Model number:

Sample number:

Complete garment description:

Detailed line drawings of front and back:

Materials including fabric name(s), vendor, fabrics structure(s), weight(s), width(s), color(s), finish(es); interlining(s); zipper(s) lengths, type, color, chain type; button size(s), type(s), number; button hole size(s) and type(s); thread size(s), color(s), type(s); labels, type(s), size(s), shape(s) Breakdown of pattern(s) including pattern piece numbers, names, and number of cut parts

Market instructions:

Spreading instructions:

Cutting instructions:

Breakdown of assembly sequence including stitch and seam types, stitches per inch, top stitching placement, tolerances

Machine type(s) and attachments:

Method description:

Finishing instructions including wet processing if any, pressing, ticketing, folding, and packing

Finished dimensions for each size such as chest, waist, back length, inseam of sleeve or pant, bottom width; location of each measurement

NOTES

Once a firm's quality standards are established and product specifications are developed, quality is measured by conformance to the specific standards and specifications for particular parts, materials, or processes. Specifications establish the intrinsic quality of a style. From a firm's perspective, acceptability of a product is based on the firm's quality standards and whether the style has the characteristics described in the specifications. Regardless of the overall quality level available in the marketplace, within a firm a product of acceptable quality is one that conforms to the style's specifications and the firm's standards.

3.2.1 Product Variation and Classification of Defects

Product variation is a normal result of manufacturing process. It is impossible to make each product exactly like the previous one. Factors that contribute to variation include materials, equipment, operators, manufacturing processes, the environment, and the inspection system. As a result of these factors, variation may occur within a single component of a garment, between components of the same type within a garment, between garments of the same type, and between products in the line. Quality management programs seek to

NOTES

separate chance or normal variation from variation that has identifiable causes that can be corrected. To establish acceptable levels of variation, tolerances are stated as a part of style specifications. The variations in attributes are evaluated to determine whether the amounts and types of variation are within tolerances.

Variations that exceed tolerances or do not meet specifications are called defects. For example, materials defects are measured by size and length and may be classified into three categories:

- Critical: Prevents usability or performance.
- Major: May affect usability or interfere with performance.
- Minor: Will not affect usability.

As a result of evaluating attributes, products are accepted as adequate to meet quality standards or rejected because they are defective. If the quality of a garment is evaluated as acceptable, it is "first" quality. Defectives are evaluated as seconds, thirds, irregulars, or scrap depending on the number and type of defects. Defects may occur in materials, components, assembly, or finishing. An average rate of defective garments is 10 to 12%. Goals for defect reduction may be targeted at less than 5%. Prevention of defects early in the process reduces production of unsalable garments.

3.3 METHODS OF ASSURING QUALITY

Quality management involves integrated systems of checks and balance among a firm's suppliers and customers and within the firm's areas of specialization to assure that finished products meet quality standards. A combination of visual inspection, measurements, laboratory tests, and wear tests may be used to evaluate conformance to standards. Goods are accepted or rejected based on the evaluation. Results are recorded, analyzed, and reported to management. Sources of defects are identified and steps are taken to reduce variation, including evaluating materials before production, evaluating products during production, and postproduction results.

3.3.1 Preproduction Quality Assurance

Preproduction planning for quality assurance requires the cooperation of designers, merchandisers, production managers, and quality specialists. Decisions are made that determine aesthetic appeal, performance, and intrinsic quality of garments. Designers and/or merchandisers, quality management, and production/engineering personnel must understand each other's roles with respect to product evaluation. This ensures that new styles will be both marketable and producible according to the firm's quality standards. Technical designers are frequently responsible to the firm's quality standards. Technical designers are frequently responsible for analyzing fit, evaluating specifications, checking materials specifications, anticipating problems that affect quality, and approving production samples. Materials quality and

NOTES

performance is frequently assured by laboratory analysis.

Laboratory Testing for Quality and Performance: Manufacturing efficiency, garment quality, and percentage of defective garments are directly related to the quality of the materials used. For example, when the required volume for a particular fabric is very large and the sale of the style extends over many months or even years, it is not unusual for the same fabrics to be manufactured by several different plants. When the resulting garments are marketed under a single style number, it is imperative that the fabrics are manufactured to the same specifications. Laboratory testing may be essential to assure consistency of materials used for the style throughout the selling period.

Methods and extensiveness of laboratory analysis vary widely among apparel firms. The primary reasons for laboratory testing is to determine levels of performance needed, establish quality standards, and determine, scientifically, whether products conform to standards. The amount and type of testing used on materials and finished goods depends on the time frame for product development and a firm's emphasis on quality. A product's performance can be judged by the following methods:

- Relying on the tests conducted by materials suppliers.
- Using the services of commercial laboratories.
- Establishing the firm's own testing laboratory.
- Using a combination of testing services.

Regardless of the source of testing, the use of standardized tests is essential for correctly interpreting test results and for accurately communicating within the firm, with suppliers and customers, and with regulatory agencies.

Laboratory services have to meet the needs of a specific apparel firm and the laws and regulations governing the firm's market. The type of laboratory services desired depends on a number of factors:

- Warranties and guarantees the firm offers.
- The size of the company.
- The amount and types of testing conducted by suppliers.
- The quality level of goods being produced.
- The types of tests that must be conducted.

Guarantees are more likely to be offered by producers of basic goods than by producers of fashion goods and are more likely to be offered by large companies than small companies.

Testing sample yardage, materials received for production, garment components, and finished goods is often the responsibility of apparel testing laboratories. It is often beneficial to verify fiber content and care recommendations that are specified on materials. Analysis of performance characteristics and quality facilitates identifying potential performance problems. Items that might be tested include the following:

- Fabrics and findings

NOTES

- Design prototypes
- Product assemblies and components
- Conformance to specifications
- Evaluations of customer requests and feedback
- Returned merchandise
- Competitors' goods

Some materials vendors have excellent testing laboratories staffed with well-trained personnel. Other vendors have no testing facilities and rely on "eye-balling" the product to determine its match with product specifications.

Establishing an in-house testing laboratory demands a considerable financial investment on the part of an apparel firm. Laboratory space, trained personnel, and specialized testing equipment are required, although some tests can be performed with an ordinary washer or dryer. The end use and price levels of products and the quality requirements and expectations of customers are critical factors in determining testing needs. An apparel firm must decide what it wants to test, when it wants to test, and how the data will be utilized before a laboratory is established. A firm's testing needs may be perceived to be intermittent and not of a sufficient level to justify the investment in equipment and facilities. However, if a lab is used effectively, the investment may be easily recovered by reduced costs, better product performance, and customer goodwill.

In the absence of its own testing lab, an apparel firm or vendor may use a commercial testing service. Dozens of commercial "textile/apparel testing laboratories" returns names of companies, their locations, and services available.

Commercial testing services may be more economical and convenient for an apparel firm to use than establishing an in-house testing lab. Apparel firms often need test results in a matter of hours or a few days, and specialized commercial labs often cannot meet this need because of time elements. For instance, many firms may want the results of wear tests before deciding to make an investment in new materials or production processes because wear tests provide consumer views of extended use and care. Testing should always have a purpose, and some action should be taken as a result of performance tests.

3.3.2 Quality Assurance during Production

Assuring quality during the production process requires additional strategies. Firms that use a number of contractors for production in geographically dispersed locations often have a group of quality assurance (QA) engineers or field quality managers. These QA engineers are responsible for communicating quality expectations to the production managers, training the supervisors and operators for production, monitoring output, and accepting or rejecting the finished goods. QA engineers are often based at headquarters but spend several days a week involved in source inspection in the plants. Occasionally, they are stationed in a particular plant for weeks at a time, particularly if a new product is being produced in a remote factory. The importance of

product standards, specifications, production samples, and quality manuals increases since these are the primary tools for communication of expectations for product quality. It is often not possible to maintain close supervision of the actual production process.

Quality management personnel may evaluate outgoing specification sheets and incoming production samples. If necessary, field quality managers oversee the production of samples in the plants to ensure that every feature meets specifications. Field quality managers may live in the country or region where the product is sourced. Source inspection may take the form of visits prior to committing to production, occasional visits during production, and/or a quality audit prior to shipment. It facilitates the process of assuring that products with repairable defects are corrected before they leave the factory. Source inspection expedites the flow of the product into the distribution centers or the retail stores. Field quality managers also evaluate prospective plants for their ability to fulfill production and quality expectations.

Inspection: Inspection is the process of examining materials, garments components, or finished garments to determine acceptability against a standard and to accumulate information about product quality. According to a study conducted through *Bobbin* magazine, finished goods inspection remains the most frequent type of quality control in apparel plants, followed by supervisory inspection, random inspection, and statistical quality control. Inspection has three purposes:

- To determine whether products have been made according to specifications
- To determine whether products meet standards
- To determine whether products are acceptable

Some apparel firms still use quality control systems that depend on 100% inspection of finished goods. Unfortunately, even firms that inspect 100% of the finished goods still ship defective merchandise. Inspection system break down because of human and mechanical errors. If visual inspection is used, the process is dependent on human judgment. If the inspector loses concentration or is distracted for some reason, the consistency of the inspector's work may suffer. Measuring devices may be inaccurately read, incorrectly used, or information may be inaccurately recorded. For these reasons, even with 100% inspection, defective goods may be shipped as first quality.

The inadequacies of 100% inspection of finished goods have stimulated improvements in quality control systems. Effective competition in the world market requires the use of more sophisticated and cost-efficient means of quality control. The production and inspection of defective goods require just as much material and labor as the production of first-quality goods, but the value of the finished product is less. If the defects are corrected, costs of producing defective goods are higher than making first-quality goods. Thus, if the production of defective goods is reduced, production costs are less and there is greater opportunity for profitability.

Quality cannot be inspected into products — it has to be built into

NOTES

NOTES

products. The trend is toward a proactive instead of a reactive approach to quality management. Modern quality management programs seek to prevent errors so that products that meet standards are made right the first time. Inspection may take place before materials are shipped from the supplier, upon receipt of materials, during garment assembly, or after garments are completed. Some firms keep their seconds rate as low as 0.5% of production. If the seconds rate is higher, 2% or more, a quality management program is likely to provide cost savings.

Statistical Quality Control: One hundred percent inspection is tedious and costly because of the time and labor involved. Statistical quality control (SQC) is a means of reducing the amount of inspection. Instead, a specified sample of goods is inspected based on the probability that the proportion and type of defects found in the sample are representative of the proportion and type of defects found in the sample are representative of the proportion and type of defects in the total production run or lot. In the apparel business, the term lot tends to refer to a group of goods making up a single transaction. At any given time it may be bundle, a box, an order, or an entire production run. Statistical sampling for quality control is based on a specified lot. If more numerous or more serious defects are found than are allowed by the quality standards, additional steps are taken to inspect the lot. The cause of the defects must be identified and corrected.

Acceptance Sampling: Apparel firms frequently use a SQC process called acceptance sampling. Acceptance sampling is a commonly used method of statistical sampling. It is a way of determining whether to accept or reject a defined lot of goods on the basis of the evaluation of a selected sample. It can be the basis of determining the number and type of defects per unit and/or the number of defective units per lot. Acceptance sampling is used for evaluation of incoming materials, in-process inspection, and inspection of finished goods. Statistically, in-process inspection reduces the number of defects that appear in finished goods and reduces the dependence of the quality program on 100% inspection of finished goods.

The acceptable quality level is determined by the standards and specifications for the product. The lot size determines the population from which the sample is selected. Lots should be as homogeneous and as large as possible. The sample, to be representative of the entire lot, is selected using random sample techniques so that every piece in the lot has an equal chance of being chosen.

Three types of sampling plans are commonly used: single, double, and multiple. A single sample plan means the decision to accept or reject the lot is made based on a single sample. A double-sampling plan means that, based on the first sample, the decision may be made to accept, reject, or select another sample from the same lot. A multiple sampling plan is a continuation of the double sampling plan in that three or more samples may be the basis of the acceptance decision.

Acceptance sampling is an appropriate quality control technique in the following situations:

- Required tests are destructive.
- Costs of 100% inspection are high in relation to costs of passing defective items.
- Many similar items are to be inspected.
- Information concerning suppliers' quality is not available.
- Automated inspection is not used.

There are many advantages of acceptance sampling over 100% inspection. The most obvious is that inspection costs are less because fewer units are inspected and less handling is required. Fewer inspectors are required; therefore, less hiring, training, and so on are needed. The inspection job is upgraded because of its impact on decision making. Instead of making piece-by-piece decisions, the inspectors determine the acceptability of entire lots through inspection of a few units. If destructive tests such as tearing or breaking strength tests are required, sampling has to be used, or all of the products produced would be destroyed during inspection. Acceptance sampling provides greater incentive to managers and production workers to improve their work. Under 100% inspection, individual items are rejected. Under acceptance sampling, entire lots of goods are rejected, which puts much greater pressure on sewing plants and sewing operators to produce first-quality goods every time. Acceptance sampling has two major disadvantages. The first is the risk of accepting defective lots and rejecting good lots. The second is the time and effort required for planning and documenting the findings of quality control evaluation.

Monitoring the garment Assembly Process: In-process quality management means checking at key points throughout the manufacturing sequence using the product's specifications as the quality standard. Operators may receive detailed quality specifications for the particular operation performed at each machine. The operators may also be actively involved in the quality management process by being instructed not to sew over unacceptable work. Having operators check the work of previous operators and their own work reduces time-consuming repairs that may be required on finished garments. Line supervisors are frequently trained in quality evaluation and are expected to monitor operations in their areas.

In addition, quality management check situations may be established at key points in the production process. Acceptance-sampling techniques are often used to reduce the amount of in-process inspection and minimize the interruption of the production flow. In-process inspection and minimize the interruption of the production flow. In-process sampling allows early detection of out-of-tolerance operations and helps prevent costly rework. Sources of defects can be identified and corrections made to minimize the number of defectives produced. The goal is to do it right the first time.

For example, in a basic jeans plant, quality check stations may be established in three strategic locations during the production process. These stations are treated as manufacturing operations in that they cannot be overlooked or skipped. Statistical acceptance sampling techniques are

NOTES

NOTES

established for each station with the size of the sample varying according to the level of defects normally produced in that area. In addition to examining the operations covered by that station, the inspectors look for fabric defects, shaded parts, spots and stains, and so on. Acceptance numbers are established for each quality station. The acceptance number is the largest number of defective items that can be found in the sample that still allows the lot to pass. For example, if the acceptance number at a particular station is zero, one defective item means the bundle is rejected. Another station may accept minor defects and reject the entire bundle if three items have major or critical defects.

The first quality check may be located in the small parts area where operations such as assembly of zipper plackets, pocket bags, watch pockets, and pocket stitching are completed. Inspectors work with one bundle at a time and select a specified number of pieces at random. The selected items may be evaluated for consistent measurements, evenness of stitching, width of hems, and so on. The second quality station may inspect fronts and backs after the pockets, front join, and seat seams are finished. The third quality station may examine side seams, inseams, and waistbands.

Inspectors use a standard form to record the number of defects found for each operation in each bundle. Each successive inspection station evaluates work that has been added since the last inspection. When finished goods are evaluated, reinspection of certain operations occurs. This type of inspection plan minimizes duplication of effort.

If fabric defects, soiling, or other problems are found, the defect is flagged as a potential irregular with a plastic tag or some other device so successive operators will know that the problem has been identified. In some cases the part may be recut or the garment may be processed as an irregular.

If the bundle is rejected because of poor sewing, it goes back to the operator who created the defect. The operator at fault is expected to reinspect the entire bundle for accuracy of the operation performed and to repair all of his or her unacceptable work.

Taking time for repairs results in a decline in the operator's overall productivity. This is believed to provide incentive to do the work correctly the first time. Defects caused by faulty machines or materials may be sent to a repair station for correction. If nonrepairable defects are found, the garment might be downgraded to a second, sold as scarp, or discarded. Repaired garments are returned to inspectors for reinspection.

Finished Garment Evaluation: Some firms use 100% inspection, some use statistical sampling, and some firms use both 100% inspection and statistical sampling. Finishing processes such as trimming threads and pressing may also assist in identifying glaring defects that have not been previously found. When effective quality management systems are used throughout the manufacturing process, the reliance on finished goods inspection may be reduced.

NOTES

In the jeans example, in addition to in-process inspection, quality management may involve inspection of finished goods before and/or after wet processing. Wet processing involves rinsing, bleaching garment dyeing, stonewashing, enzyme treatment, and so on. These processes frequently damage the garments. Final inspection usually involves inspection of fabric, sewing, wet-processing results, consistency of labels, and measurements according to size.

Mill Flaw and General Repair: Garments with defects caused by failure of equipment or materials may be sent to special repair stations for correction. These defects may be attributed to problems such as defective thread or zippers and malfunctioning machines.

As mentioned earlier, fabric flaws may be flagged during in-process or final inspection. When fabrics are repairable, garments may be sent to a special station called mill flaw repair where fabric flaws may be corrected by pulling extra fibres out of yarn slubs, pulling knots to the back, and recoloring exposed fibers. These relatively simple processes require special training for operators but may allow seconds to be upgraded to first quality.

3.4 STUDENT ACTIVITY

1. What is product variation?

.....
.....
.....

2. What do you mean by Quality Assurance?

.....
.....
.....

3. What is sampling? How is important for apparel manufacturing?

.....
.....
.....

3.5 COSTS AND BENEFITS OF QUALITY PROGRAMS

In general, efficient manufacturing of higher quality goods costs more than efficient manufacturing of lower-quality goods. It costs more to make a higher-quality, better dress than a lower-quality, budget dress. Higher-quality goods tend to require more expensive materials, more time-consuming operations, a larger number of operations, more handling, and greater consistency based on smaller tolerances. (The price that the consumer pays for higher-quality

garments, as has been said many times before, may or may not accurately reflect the production costs because the retail price depends on many factors in addition to production costs.)

NOTES

Generally, higher-quality products cost more than lower-quality products, however, as quality improves for a given product, overall costs are reduced. This is quality paradox. The concern of each apparel firm tends to focus on improving processes to minimize the cost of production at whatever equality level the firm intends to produce. The production of defective merchandise is very expensive regardless of overall quality level. Defective merchandise is evidence of inconsistency in the manufacturing process. Increasing consistency means improving manufacturing processes. Many studies have shown that investment in quality assurance improves consistency and is more than recovered in manufacturing cost savings. Informed apparel managers recognize the costs associated with the production of defective merchandise.

Overall costs are reduced when consistency increases; that is, more desired products are produced whether they are budget, moderate, or better price. More products can be sold at regular price. Less defective products are produced; fewer products are unsalable or sold at less than regular price. The salable value of consistent products is greater than the salable value of inconsistent products. Overall, four types of quality-related costs exist: defect prevention, defect detection and appraisal, internal failure, and external failure. Firms that use only finished goods inspection have high internal and external failure costs such as repair costs (internal) and frustrated customers (external). Firms that have more comprehensive quality management will have higher prevention and appraisal costs but lower costs related to defective finished goods. Effective quality management programs account for all of these costs and the processes related to them.

3.5.1 Quality Cost Index

The cost of quality or lack of it is underestimated by most people, including quality professionals. Realistic estimates range from 10 to 35% of product costs. Quality costs have been broken down in the following manner:

- Inspection: 2 to 15% of labor costs
- Scrap: 2 to 10% of material costs
- Excess material made but not used: 0 to 5% of material costs
- Rework: 0 to 5% of labor and materials costs
- Field service: 0 to 20% of labor and materials costs
- Customer dissatisfaction: Not estimated, but potentially more expensive than all of the preceding

Break-even analysis can be used to analyze the cost-effectiveness of quality management programs. As quality increases, fewer defectives are produced and thus production costs decrease. As quality increases, the costs of the quality program increase. At break-even, the production of fewer defectives reduces production costs to the point at which the costs of administering the quality management system equals the savings that

NOTES

are generated. As quality improves, the need for quality control is reduced. But the commitment to quality production must remain, or production quality will decrease. Each apparel firm and production plant must strike a balance between costs of the quality program and savings generated by the production of first-quality goods.

The value of quality management might be determined by using a series of quality cost indexes. Each index provides a different perspective on trends in quality costs. The measurement base might be direct labor costs, manufacturing costs, defective rate, sales, returns, and/or unit costs. Quality costs per direct labor hour or dollar is a common index. The required information is readily available, but this index is influenced by the level of automation in a plant. Quality costs per manufacturing dollar is another common index. Manufacturing costs are composed of direct labor, direct materials, and overhead. These data are also readily available, and this index is not influenced by automation.

Quality cost per dollar of sales is the most common quality index. This index is commonly used by top management for long-term planning but is less useful in the short run because it is subject to seasonal variations. Quality cost per unit is useful when products and product lines are similar. Thus, its usefulness may be limited for fashion apparel manufacturers.

It is sometimes possible to compare a firm's quality indexes with other firms' indexes in similar businesses. This may give managers an idea how well they are doing with the costs of their quality assurance programs. A firm can also compare its own quality indexes from different points in time to identify trends, necessary improvements, or increases in costs.

3.5.2 Trends in Quality Management

Quality in the 21st century is different than it was in the previous century. Increased use of automation and robotics reduces product variation. An increased emphasis on building quality into products puts greater emphasis on defect prevention through effective product development. Partnering and more effective communication with materials suppliers and retail customers makes quality expectations and performance more consistent. One hundred percent inspection should disappear and statistical quality control is likely to have less significance. Process measurement and automated inspection will partially replace them. Wider use of quality certification programs between buyers and vendors assures quality of materials and finished goods, reduces production of unacceptable goods, and reduces product costs related to quality. The role of quality specialists will evolve to include planning and taking action to avoid quality problems. A quality program acceptable under ISO is required to do business in most international markets.

3.6 COSTS AND PROFITS

Costs have a major impact on a firm's success and thus must be managed. The key to successful cost control is information and the ability to use that

NOTES

information to manage a firm. Advanced computer technology has expanded the amount of cost data collected and has increased the speed and complexity of analysis. Financial statements and performance reports that previously took hours of recording and calculating time can now be ready in a matter of a few hours or minutes. Performance reports provide comparisons of actual costs against budgeted costs. Effective managers utilize this information to make appropriate business decisions for the firms.

An income statement is a financial statement that relates revenue (sales) to costs to determine profit. An income or profit and loss statement, as it is sometimes called, is a summary of revenue, costs, and expenses for a specific period of time. Values may be shown both in dollars and as a percentage of sales to help in understanding the relationships between sales and costs and the relationships among cost and expense categories. In the following discussion, the sections of a simple income statement and the impact that each of these categories of costs has on profit is examined. A detailed version of income statement has each of the sections more finely differentiated for a more thorough analysis of income, costs, expenses, and potential for increased profit.

An income statement has three sections: revenue (sales), cost of goods sold; and general operating expenses. Cost of goods sold represents all expenditures associated with the manufacture of the product line including material costs, labor costs, and factory and administrative overhead expenses. The gross profit margin is the amount of income remaining after cost of goods sold is covered. When general operating expenses are deducted from the gross profit margin, the "bottom line" becomes profit or loss.

Managers are always concerned as to how positive or negative the bottom line will be. In the business community, many references are made to the bottom line as the deciding factor when making business decisions. In the long run, the bottom line has to be positive so as a firm can stay in business.

The different parts of the income statement identify basic areas of profit potential. Careful examination of an income statement can help identify where improvements or changes need to be made in order to improve profits. For example:

1. An increase in sales without an increase in cost of goods sold or operating expenses would result in an increase in income and profit. This might be attained by an increase in price.
2. A reduction in the cost of goods sold without a change in net sales would mean an increase in profit. Cost of goods sold may be affected by changes in costs of materials, labor, and/or overhead.
3. A reduction in general operating expenses would result in larger profits if income and cost of goods sold remain constant. This could occur from a reduction in administrative salaries or expenses of clerical and record keeping services.

Although the income statement is useful in identifying the overall status of a firm, it does not clarify the sources of profits or costs among the products the

firm offers. Each merchandise group and/or style needs to be evaluated separately on its contribution to profits.

3.6.1 Manufacturing Costs

Manufacturing costs include all the expenditures that are incurred in making a finished product available. These costs are summarized as cost of goods sold on the income statement. Manufacturing costs are subdivided into three basic areas: (1) direct materials, (2) direct labor, and (3) factory overhead. Direct materials costs include fabric, thread, trim, and findings used in garments. Direct labor costs include wages of employees who work on the product in the plant, including cutters, sewers, and finishers. Direct materials and labor are direct variable costs. The cost varies with the quantity of goods produced.

Overhead consists of both non-variable and variable indirect manufacturing costs. Overhead cost is unique to each firm, but they generally are subdivided into (1) indirect labor, (2) occupancy, and (3) other overhead. Indirect labor costs consist of service personnel, quality control, material handlers, mechanics and maintenance workers, and security. The work of these individuals is essential to efficient manufacturing of a product line, but none of them work directly on the product. Non-variable or occupancy overhead costs include rent, depreciation, insurance, property taxes, and security. Examples of variable overhead costs are machine parts and repairs, marker paper, and needles. Other overhead costs include materials management, machinery and equipment costs, and cost of compliance with regulations.

In the income statement, general operating expense is deducted from the gross profit margin to determine profit or loss. General operating expenses or administrative overhead are indirect costs that include the costs of operating the general offices and departments that are not directly involved with the product line but are essential to the operation of the firm. Administrative overhead includes engineering, merchandising, marketing, accounting, management information systems (MIS), secretarial and clerical staff, and human resources.

3.6.2 Systems of Costing

Cost information is one basis of a firm's decision making. Decision making is usually related to a time span of activity that may be short range (days or weeks) or long range (months or years). When viewed in the context of a time span, costs that are variable and non-variable change. For example, labor costs and factory costs, when viewed long range, are variable costs that increase or decrease as the demand for product fluctuates. Plants can be opened or closed and employees hired or laid off. The same costs when viewed for short-range decisions become non-variable costs as the investment has been made in the factory and the labor force employed. The type of plant, skill level of the workers, and the type of equipment that is available limit short-range decisions. Decisions impacting the short range should determine how to achieve the most output with the investment that has been made.

When viewed long range, labor, materials, and factory overhead are

NOTES

variable costs. When these same costs are reviewed for immediate decisions they are non variable. Long range, priorities change and variable costs can be changed with appropriate decisions.

NOTES

There are several different types of cost systems that firms use, and each has its benefits and drawbacks. Managers must determine the cost information needed and how the information will be used. Some of the systems generate good product cost data for external reporting but are not relevant for internal management decisions needed by the firm. Others provide incomplete information for accurately differentiating the costs of various products.

The costing process includes assembling data on (1) variable and non-variable costs of materials and labor required to produce a product, (2) overhead necessary to operate the factory, and (3) general operating expenses required to run the firm. To be effective, cost data must be specific, accurate, and timely. The more accurate the costing, the better the business decisions and the greater the potential for business success.

Product costing requires in-depth understanding of product development, materials, production processes, and plant and business operations. Three product costing systems commonly used in the apparel industry are direct costing, absorption costing, and activity-based costing.

3.6.3 Direct Costing

Direct costing is a concept that considers only the variable costs, such as production labor, material costs, and sales commission, to be product costs. Non-variable costs, both manufacturing and non-manufacturing, are treated as time period costs. Because individual product costs are clearly identified, direct costing makes it possible to determine the contribution margin for each product. A contribution margin is the difference between the price of a product and the cost of goods (variable costs). The contribution margin is the amount of revenue available to cover non-variable costs and profit. Direct costing makes it possible to compare the cost administrative costs and profit. Direct costing makes it possible to compare the cost of production and the contribution each product makes to non-variable selling and administrative costs and profit. Direct costing also makes it possible to identify individual styles and their level of contribution. It is useful in determining whether to make or buy a product.

3.6.4 Absorption Costing

Absorption costing is a costing system that recovers overhead costs by assigning a percentage to some element of direct labor. It considers all manufacturing costs, both variable and non-variable, to be product costs that can be allocated to products. An overhead application rate is a percentage determined to be representative of all the overhead costs. It would be applied to a measurable direct cost driver such as labor hours or machine time. Determination of a realistic overhead application rate is difficult, especially in today's plants when direct labor may be only 15% of a product's cost. Firms often project the expected total overhead application

NOTES

rate may be determined by dividing the total factory overhead by the total direct labor costs for the period.

Absorption costing makes it difficult to focus on the actual variable costs and to analyze specific non-variable costs because overhead costs are generally allocated from a single cost pool. The profit potential associated with a particular product or product line is often distorted by the overhead application rate.

Several risks are associated with using absorption costing. Are direct labor costs accurate? Is the overhead application rate accurate? Does the overhead application rate really reflect true product costs? The first risk is the dependency of the costing system on the accuracy of costing direct labor. The second risk is the determination of the overhead application rate, which is arbitrary.

3.6.5 Activity Based Costing

Activity based costing (ABC) assigns manufacturing overhead costs to products in a more logical manner than the traditional approach of simply allocating costs on the basis of machine hours. Activity based costing first assigns costs to the activities that are the real cause of the overhead. It then assigns the cost of those activities only to the products that are actually demanding the activities.

Let's discuss activity based costing by looking at two products manufactured by the same company. Product 124 is a low volume item which requires certain activities such as special engineering, additional testing, and many machine setups because it is ordered in small quantities. A similar product, Product 366, is a high volume product—running continuously—and requires little attention and no special activities. If this company used traditional costing, it might allocate or "spread" all of its overhead to products based on the number of machine hours. This will result in little overhead cost allocated to Product 124, because it did not have many machine hours. However, it did demand lots of engineering, testing, and setup activities. In contrast, Product 366 will be allocated an enormous amount of overhead (due to all those machine hours), but it demanded little overhead activity. The result will be a miscalculation of each product's true cost of manufacturing overhead. Activity based costing will overcome this shortcoming by assigning overhead on more than the one activity, running the machine.

Activity based costing recognizes that the special engineering, special testing, machine setups, and others are activities that cause costs—they cause the company to consume resources. Under ABC, the company will calculate the cost of the resources used in each of these activities. Next, the cost of each of these activities will be assigned only to the products that demanded the activities. In our example, Product 124 will be assigned some of the company's costs of special engineering, special testing, and machine setup. Other products that use any of these activities will also be assigned some of their costs. Product 366 will not be assigned any cost of special engineering or special testing, and it will be assigned only a small amount of machine setup.

NOTES

Activity based costing has grown in importance in recent decades because (1) manufacturing overhead costs have increased significantly, (2) the manufacturing overhead costs no longer correlate with the productive machine hours or direct labor hours, (3) the diversity of products and the diversity in customers' demands have grown, and (4) some products are produced in large batches, while others are produced in small batches.

3.7 STAGES OF COSTING

Managers use costing to determine (1) the productivity of a design within an established price range, (2) the profit potential in a design, and (3) whether a design should be added to the line. Inaccurate costing may cause cancellation of a style with good profit potential or allow sale and production of styles that ultimately prove too costly to manufacture. Once a style is indicated in a line, specific cost information is used to plan line budgets and to establish a base for the selling price. Cost estimators, industrial engineers, designers, merchandisers, production managers, or a combination of individuals involved with the product line may do costing.

Costing may be done at several different stages throughout manufacturing (1) preliminary or precosting is done during the creative design phase of product development before samples are made; (2) cost estimating is done prior to line adoption; (3) detailed costing is done during the technical design phase prior to production; and (4) actual costs are determined during and following production.

3.7.1 Preliminary Costing for Creative Design

Manufacturers of fashion goods may use preliminary costing early in the development stage to determine whether the designers' sketches are producible and marketable within the established price range. Preliminary costing is a rough estimate of costs of producing a particular style. Fabric type, yardage, and quantities are estimated, as are trims and other material costs. Labor costs are estimated based on production of similar styles. Costing at this early stage of product development is particularly necessary for the fashion manufacturer because of the broad range of styling ideas a designer may use. Preliminary costing helps weed out designs that would be too costly for the line before additional time and resources are invested. If it appears a design has potential but is too costly to produce, it may be modified to meet cost limitations.

Costing at this stage may not be a formal process for all firms. A knowledgeable designer can edit ideas and sketches based on cost information from past experiences and current market information. Previous experience will help a designer focus on fabrics and processes that are realistically suited to the firm's particular point.

3.7.2 Cost Estimating for Line Adoption

Cost estimating may be done just prior to line adoption. Cost estimating

NOTES

determines the expected investment in materials, direct labor, and overhead required to produce a single unit of a style. Specific materials have been determined, and fabric yardage requirements must be refined. Labor costs are estimated based on the time required to produce a style and the average hourly wage. Decisions relating to producibility at a specific price point rely on cost estimates, which require more detail and greater accuracy than preliminary costing. Costing, at this stage, is based on a firm's samples and standard data. Cost information is often justification for accepting or rejecting a style in the line.

3.7.3 Detailed Costing for Technical Design

Detailed costing is done after styles are adopted into the line and refined for production. It provides the opportunity to pick up any costs that may have been missed during cost estimating, such as an overlooked label or an extra button.

3.7.4 Materials Costing

Effective materials management is essential in order to (1) provide the best service to customers, (2) produce at maximum efficiency, and (3) manage inventories at predetermined levels to stabilize investments in inventories.

Successful materials management requires the development of a highly integrated and coordinated system involving sales forecasting, purchasing, receiving, storage, production, shipping, and actual sales. Both the theory of costing materials and inventories and the practical mechanics of cost calculations and record keeping must be considered.

Costing materials present some important, often complex, and sometime highly controversial questions concerning the costing of materials used in production and the cost of inventory remaining to be consumed in a future period. In financial accounting, the subject is usually presented as a problem of inventory valuation; in cost accounting, the primary problem is the determination of the cost of various materials consumed in production and a proper charge to cost of goods sold.

The discussion of materials management in this chapter deals with:

1. Procedures for materials procurement and use.
2. Materials costing methods.
3. Cost of materials in inventory at the end of a period.
4. Costing procedures for scrap, spoiled goods, and defective work
5. Summary of materials management

Procedures for Materials Procurement and Use: Although production processes and materials requirements vary, the cycle of procurement and use of materials usually involves the following steps:

1. Engineering and planning determine the design of the product, the materials specifications, and the requirements at each stage of operations. Engineering and planning not only determine the

NOTES

maximum and minimum quantities to run and the bill of materials for given products and quantities but also cooperate in developing standards where applicable.

2. The production budget provides the master plan from which details concerning materials requirements are eventually developed.
3. The purchase requisition informs the purchasing agent concerning the quantity and type of materials needed.
4. The purchase order contracts for appropriate quantities to be delivered at specified dates to assure uninterrupted operations.
5. The receiving report certifies quantities received and may report results of inspection and testing for quality.
6. The materials requisition notifies the storeroom or warehouse to deliver specified time or is the authorization for the storeroom to issue material to departments.
7. The materials ledger cards record the receipt and the issuance of each class of materials and provide a perpetual inventory record.

Accounting procedures for materials procurement and use involve forms and records necessary for general ledger financial accounting as well as those necessary for costing a job, process or department, and for maintaining perpetual inventories and other statistical summaries. The purchase requisition, purchase order, receiving report, materials requisition, bill of materials, scrap report, returned materials report, materials ledger cards, and summary of materials used are some of the forms used for materials control under a cost system. The purchases journal, the cash payments journal, the general journal, and the general ledger control accounts are also used.

The discussion here is not based on any particular type or size of industry. It is, rather a general description of the accounting and controlling procedure involved in the procurement and use of materials. To understand the detailed procedure of purchasing, receiving stocking, and using materials (materials procurement and use) click on the following links:

- Purchases of productive material.
- Purchases of supplies, services, and repairs.
- Materials purchasing forms.
- Receiving materials.
- Invoice approval and data processing.
- Correcting invoices.
- Electronic data processing (EDP) for materials received and issued.
- Cost of acquiring materials.
- Storage and use of materials.
- Issuing and costing materials into production.
- Materials ledger card - perpetual inventory.

NOTES

Materials Costing Methods

The ultimate objective in cost accounting is to produce accurate and meaningful figures. These figures can be used for purposes of control and analysis and eventually matched against revenue produced in order to determine net operating income.

After the unit cost and total cost of incoming materials are entered in the received section of a materials ledger cards, the next step is to cost these materials as they move either from storeroom to factory as direct materials or indirect materials or from storeroom to marketing and administrative expense accounts as supplies. The more common methods of costing materials issued and inventories are:

1. First-in-First-Out (FIFO) Costing Method
2. Average Costing Method
3. Last-in-First-Out (LIFO) Costing Method
4. Other Methods-Month end average cost, last purchase price or market price at date of issue, and standard cost.

These methods relate to assumptions as to flow of costs. The physical flow of units may coincide with the method of cost flow, though such a condition is not a necessary requirement. Although this decision deals with materials inventory, the same costing methods are also applicable to work in process (WIP) and finished goods inventories.

Cost of Materials in Inventory at the End of a Period

When the cost basis is used in costing inventories for financial statements and income tax returns, the sum total of the materials ledger cards must agree with the general ledger materials control account which, in turn, is the materials inventory figure on the balance sheet. Unless a shift from the cost basis is made in valuing the year end inventory, the method used for costing materials issued is the method used for assigning dollars to inventory.

- Inventory valuation at cost or market whichever is lower
- American Institute of Certified Public Accountant (AICPA) cost or market rules
- Adjustments for departures from the costing method used
- Inventory pricing and interim financial reporting
- Transfer of materials cost to finished production
- Physical inventory
- Adjusting Materials Ledger Cards and Accounts to Conform to Inventory Accounts

Costing Procedures for Scrap, Spoiled Goods, and Defective Work

Generally, manufacturing operations cannot escape the occurrence of certain losses or output reduction due to scrap, spoilage, or defective work management and the entire personnel of an organization should cooperate

NOTES

to reduce such losses to a minimum. As long as they occur, however, they must be reported and controlled.

- Scrap and waste
- Spoiled goods
- Defective work

Materials managers are constantly confronted with these problems and requirements:

1. Inventories account for a large portion of the working capital requirements of most businesses. This fact makes materials or inventory management a major problem requiring constant attention by all three management levels (top, middle and low).
2. At present, the problem of materials management has become even more acute due to market conditions and inflation.
3. Effective materials management and materials control is found in an organization in which individuals have been vested with responsibility for, and authority over, the various details of procuring, maintaining, and disposing off inventory. Such a person or persons must have the ability to obtain, coordinate, and evaluate the necessary facts and to take actions when and where needed.

3.8 COST VOLUME RELATIONSHIP

The level of activity of a company with regard to a product can be measured in terms of the volume of output or the volume of input needed to produce that product. Once this volume is defined and the unit of measure of the volume is fixed the relationship between cost and volume can be established. Such a relationship can be used to determine the activity level of the product that is most economical for the company. This problem is commonly known as the optimization problem. The solution to this problem is the optimum level of production of the product for that company.

While dealing with costs it helps to understand various cost components or cost types that make up the total cost of production of a product. The different cost components or types discussed here are fixed, variable, and semi-variable costs. Fixed costs do not depend directly on the volume of production while variable costs are linked to it. Semi-variable costs, as the name signifies, have fixed as well as variable components.

Two other cost types that are of importance are the average and the marginal costs. Average cost is the cost per unit of production while the marginal cost is the cost per unit of production at a given level (volume) of production. As the volume of production changes so do average and marginal costs. Both average and marginal costs have a close relationship with the total cost.

NOTES

1. *Contribution Margin*: If all variable expenses are deducted from sales revenue the resulting figure is contribution margin or contribution margin is equal to sales revenue minus variable expenses (manufacturing and non-manufacturing).
2. *Contribution Margin Ratio (CM Ratio)*: The contribution margin as a percentage of total sales is referred to as contribution margin ratio (CM Ratio).
3. *Contribution Margin Income Statement*: Contribution margin income statement is an income statement that is prepared to show the contribution margin figure in the income statement. A contribution margin income statement is prepared for the use of internal management.
4. *Break-even Point Analysis*: Break-even point is the level of sales at which profit is zero. At breakeven point total sales are equal to total cost (variable + fixed).
5. *Target Profit Analysis*: Management desires to achieve a specific amount of profit at the end of a business period. The net operating income or profit that management desires to achieve at the end of a business period is called target profit.
6. *Margin of Safety (MOS)*: The excess of actual or budgeted sales over the break even volume of sales is called margin of safety. At breakeven point costs are equal to sales revenue and profit is zero. Margin of safety, therefore, tells us the amount of sales that can be dropped before losses begin to be incurred.
7. *Operating Leverage*: Operating leverage is a measure of how sensitive net operating income is to percentage change in sales. Operating leverage is high near the breakeven point and decreases with the increase in sales and profit.
8. *Break even Analysis with Multiple Products-Sales Mix*: The term sale mix refers to the relative proportion in which a company's products are sold. The concept is to achieve the combination, that will yield the greatest amount of profits. Most companies have many products, and often these products are not equally profitable.
9. *CVP Consideration in Choosing a Cost Structure*: The relative proportion of fixed and variable costs in an organization is referred to as cost structure. An organization often has some latitude in trading off between these two types of costs. For example labor costs can be reduced by investments in automated equipments.
10. *Importance of Cost Volume Profit (CVP) Analysis*: The most profitable combination of variable cost, fixed cost, selling price and sales volume can be found with the help of cost volume profit analysis.

3.9 PRICING STRATEGIES

NOTES

There are many ways to price a product. Let's have a look at some of them and try to understand the best policy/strategy in various situations.

- *Premium Pricing:* Use a high price where there is a uniqueness about the product or service. This approach is used where a substantial competitive advantage exists.
- *Penetration Pricing:* The price charged for products and services is set artificially low in order to gain market share. Once this is achieved, the price is increased.
- *Economy Pricing:* This is a no frills low price. The cost of marketing and manufacture are kept at a minimum.
- *Price Skimming:* Charge a high price because you have a substantial competitive advantage. However, the advantage is not sustainable. The high price tends to attract new competitors into the market, and the price inevitably falls due to increased supply. Manufacturers of digital watches used a skimming approach in the 1970s. Once other manufacturers were tempted into the market and the watches were produced at a lower unit cost, other marketing strategies and pricing approaches are implemented.
- *Psychological Pricing:* This approach is used when the marketer wants the consumer to respond on an emotional, rather than rational basis.
- *Product Line Pricing:* Where there is a range of product or services the pricing reflect the benefits of parts of the range.
- *Optional Product Pricing:* Companies will attempt to increase the amount customer spend once they start to buy. Optional 'extras' increase the overall price of the product or service. For example airlines will charge for optional extras such as guaranteeing a window seat or reserving a row of seats next to each other.
- *Captive Product Pricing:* Where products have complements, companies will charge a premium price where the consumer is captured.
- *Product Bundle Pricing:* Here sellers combine several products in the same package. This also serves to move old stock.
- *Promotional Pricing:* Pricing to promote a product is a very common application. There are many examples of promotional pricing including approaches such as BOGOF (Buy One Get One Free).
- *Geographical Pricing:* Geographical pricing is evident where there are variations in price in different parts of the world. For example rarity value, or where shipping costs increase price.
- *Value Pricing:* This approach is used where external factors such as recession or increased competition force companies to provide 'value' products and services to retain sales.

Pricing is an important strategic issue because it is related to product positioning. Furthermore, pricing affects other marketing mix elements such as product features, channel decisions, and promotion.

NOTES

While there is no single recipe to determine pricing, the following is a general sequence of steps that might be followed for developing the pricing of a new product:

- *Develop marketing strategy:* Perform marketing analysis, segmentation, targeting, and positioning.
- *Make marketing mix decisions:* Define the product, distribution, and promotional tactics.
- *Estimate the demand curve:* Understand how quantity demanded varies with price.
- *Calculate cost:* Include fixed and variable costs associated with the product.
- *Understand environmental factors:* Evaluate likely competitor actions, understand legal constraints, etc.
- *Set pricing objectives:* For example, profit maximization, revenue maximization, or price stabilization (status quo).
- *Determine pricing:* Using information collected in the above steps, select a pricing method, develop the pricing structure, and define discounts.

These steps are interrelated and are not necessarily performed in the above order. Nonetheless, the above list serves to present a starting framework.

3.10 THE ROLE OF SOURCING DECISIONS

A basic decision in sourcing either materials or production is to whether to make or buy the desired product. Here the importance of sourcing types and its various dimensions are discussed and the relationships of key business functions to material sourcing are also discussed.

3.10.1 Make-Or-Buy Decisions

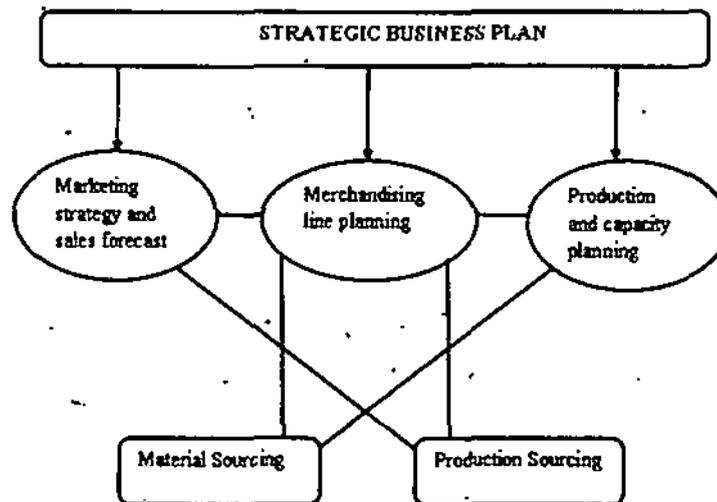
Making involves manufacturing their own raw materials and/or finished products in the firms own production facilities and buying involves sourcing from vendors. So the decision to make a product involves the capacity available in-house of the manufacturer and desire to reduce costs, availability of technology and unsatisfactory supplier or vendor performance. The decision to buy a product from the vendors arise when there is availability of a product at a cheaper cost, non availability of latest technology and inability to manufacture such volumes in in-house facility.

Whether to make or buy a product is based on the four important parameters like:

- cost
- production capacity
- quality and
- timing

NOTES

The below chart gives the relationship of key business function to material and production sourcing. Merchandise plan determines the number of styles, sizes and colors that are appropriate according to sales forecasts and other data. Production capacity planning are translations of merchandise plans into numbers and types of plants, machines and operators required to produce the line. The combination of sales forecast, merchandise plans, production specifications and production capacity estimates provided a basis for developing an effective materials and production sourcing network.



3.10.2 Material Sourcing Responsibilities

The people responsible for acquisition or procurement of materials may include buyers, designers, merchandisers, sourcing specialists or purchasing agents. The responsibilities of persons responsible for sourcing are given below.

- Provide an uninterrupted flow of materials and services necessary for maximizing the efficiency of the manufacturing process.
- Source the materials that are suitable to the purpose at the best possible prices.
- Minimize inventory investment.
- Minimize inventory shrinkage and losses caused by theft, damaged and obsolete materials.
- Develop good vendor relationship.
- Develop reliable alternate source of supply.
- Develop personnel and execute policies and procedures that provide materials at the lowest possible prices.

3.10.3 Retail Buyers versus Material Buyers

Retail buyers are usually involved in consumer goods wholesale markets. The chief responsibility of the retail buyer is to form a select assortment of finished goods to offer the stores customers. Fashion shows help the retail buyers to understand fashion trends, silhouettes and color systems. Material

buyers are usually involved in purchasing producer goods in primary markets at the mill level. They tend to purchase in high volumes from few suppliers than retail buyers. Both the retail and material buyer are limited by budgets, contract terms and inventory space.

3.10.4 Purchasing Criteria

The materials to be sourced are checked for the following criteria:

1. *Samples*: The materials intended for purchase are assessed by the samples received from the vendors. The samples should be accompanied with its specifications
2. *Certifications*: Some vendors provide certification of product quality. It is intended to provide assurance to the buyer of the quality of goods shipped and eliminate the need for receiving inspection. The certification may include the following,
 - Documentation of flaws and their locations.
 - Test reports
 - Date of testing and the laboratory details
3. *Order minimum*: The decision to source a material from a particular vendor is decided on the order minimum which is nothing but the minimum or smallest quantity a vendor shall supply on a single purchase order. Import goods may require longer lead time but often have low minimums when compared to domestic suppliers. Minimums also relate to availability, order processing, packaging and shipping costs.
4. *Mode of Packing*: The mode of packing is also important when a material is sourced from the vendor. If for example a firm wish to purchase woven fabrics it will be supplied in rolled full width on a cardboard tube. The buyer should source goods based on the mode of packing so that the goods are not damaged in transit.
5. *Delivery and Payment Terms*: The buyer should clearly define the mode of payment and the delivery conditions so that there is no misunderstanding between the vendor and the buyer.
6. *Professional Credibility of the Vendors*: A vendors reputation in the trade is often a strong factor in determining whether the materials can be sourced from him. The buyer may check with the vendors client list and enquire about his quality of service and timing of delivery.

From the above discussions the material sourcing person should try to assess all the parameters that are necessary to select a proper vendor because time is the essence of contract between the garment exporter and the overseas buyer.

3.10.5 Materials Sourcing Process

Once the firm has decided on the foremost issues of which product it wants to produce and the location of the industry, the next important step is to select appropriate technology and equipment to produce the same. In

NOTES

addition to this, the source of raw material has to be decided upon. The requirements of all these can either be met through domestic sources or can be imported subject to the regulatory requirements of the Government.

NOTES

The firm should do a careful cost and benefit analysis before going ahead with the process of placing the orders to minimise the production costs and hence increasing the profit margins. Various sources of Capital should be explored and the cost of capital should be analysed cautiously.

3.10.6 Process Selection

Once the choice of the product is made, selection of the right process technology becomes important. The process technology required may be:-

- *Indigenously developed*:- In India, technologies are being developed at CSIR and Defence Research Labs. There are some intermediaries like APCTT (Asian and Pacific Centre for Transfer of Technology), TBSE (Technology Bureau for Small Enterprises) which can help you to locate the relevant technologies. Besides there are some In-house R&D centres of companies which develop technologies and sell them to interested parties. Indigenously developed process know-how has intrinsic benefits like appropriateness, relative inexpensiveness and possibility to work with technology developer.
- *Imported*:- For some complex products, process know-how has to be imported. In such cases agreements for technology transfer should be made with due care in order to safeguard nation's interest. Government of India facilitates foreign technology induction both through FDI and through foreign technology collaboration agreements. FDI and Foreign technology collaboration agreements can be approved either through the automatic route under the powers delegated to the Reserve Bank of India or otherwise by the Government.

While choosing the process technology, the following considerations are essential:-

- The level of skilled workers or complex machines required by the process.
- The quantity of water and / or power required.
- If any process or product patent is needed in order to utilize the selected process technology.
- Any special Pollution or Environmental regulation is to be followed.
- The appropriateness of the technology to the Indian environment and conditions.

3.10.7 Raw Materials

Raw Material procurement and planning are critical to success, of a start-up unit. The raw materials required may be:-

- *Domestically available (within the country)*:- As we know that our

country is a resource rich country with abundance of specific raw materials in different States. Accordingly appropriate suppliers of raw materials have to be selected.

- *Imported from abroad:-* For importing the raw materials the Government rules and regulations have to be followed. The imports are regulated by the Foreign Trade (Development and Regulation) Act, 1992. The Act provides for the appointment by the Central Government, of a Director General of Foreign Trade for the purpose of the Act. The DGFT shall advise Central Government in formulating export and import policy and implementing the policy. (For details, please refer to 'Legal Aspects' section).

Whatever be the source of raw materials it must be bought from reputed dealers and agencies only. Before ordering, compare the prices and get quotation from at least 3-4 places and also check whether price is inclusive or exclusive of transportation costs. While receiving the delivery, check the quality and quantity of the materials.

Proper planning is essential because non-availability of the required raw material may result in production hold-ups, idle machinery and manpower. On the other hand if too much is ordered too soon considerable amount of working capital gets locked up. All this will lead to increased production costs. But proper inventory management can lead to manageable cash flow situations. For imported raw material whose lead time are large, proper planning is all the more essential.

2.10.8 Machinery and Equipments

The next important step is choosing and ordering of right machinery and equipments. The machinery and equipments required may be either domestically available or imported from abroad. For importing machinery and equipments, the Government rules and regulations have to be followed. The imports are regulated by the Foreign Trade (Development and Regulation) Act, 1992. The Act provides for the appointment by the Central Government, of a Director General of Foreign Trade for the purpose of the Act. The DGFT shall advise Central Government in formulating export and import policy and implementing the policy. (For details, refer to 'Legal Aspects' section).

Generally, technology or process provides with the necessary specifications relating to machinery and equipment required. Otherwise, an extensive techno-economic survey of the available machinery and equipment may be carried out. International trade fairs and engineering fairs are good places to look at available options. The entrepreneur may also consult experts, dealers / suppliers as well as users, prior to making a selection of equipment and machinery. Many entrepreneurs buy second hand machines and equipments. But this leads to the problem of prevalence of outdated production and management methods hindering the efficient operation of business units. The advice of SISI and NSIC can also be sought.

NOTES

NOTES

There are 30 SISIs (Small Industries Services Institutes) set up in state capitals and other industrial cities all over the country. The main objective of National Small Industries Corporation (NSIC) is to provide machinery and equipment to small industrial units offering them long repayment period with moderate rate of interest.

It has been found that small industrialists are unable to install modern machinery and equipment due to lack of investable funds. Hence, many schemes and incentives are available to assist them. Now, small scale firms can acquire industrial machinery, office equipment, vehicles, etc, without making full payment through hire purchase. With the help of assets acquired through hire purchase, they can produce and sell. From the earning of production, they can make payments in installment. Ultimately the ownership of assets can be acquired.

National Small Industries Corporation (NSIC) provides machinery and equipment to small scale units on hire purchase basis and on lease basis.

3.11 SELECTING FABRICS

The garment finisher usually does not manufacture his own fabric and he may be faced with unacceptable losses in tensile strength, tear strength and abrasion resistance in the fabric when cross-linking. Because of the added value, garments rejects due to low strength may prove to be more expensive than fabric rejects.

For producing an acceptable wrinkle-free garment, several precautions must be taken in fabric selection:

- The base fabric must have sufficient strength to withstand 40-60% loss in tensile and tear strength and still maintain sufficient strength to provide a garment of acceptable wear life and durability
- It must also have excellent absorbency to allow resin to penetrate into the very interior of the fibres and form crosslinks. Surface adhering resins do not serve any useful purpose and are inefficient and wasteful
- If the fabric is dyed the dye must be fast to acid catalysis and high temperatures. Sulphur dyes, which are known to generate acid upon storage, are to be strictly avoided
- Residual extractable on the fabric (like starch from size) can react with resin and lower its effectiveness, a high degree of size removal is thus essential
- Fabric pH should be between 6.5 to 7.0 with an alkalinity of less than 0.05% expressed as sodium hydroxide

3.12 EVALUATING FABRIC

Designers specify the fabric as part of their design concept. Designers may

NOTES

develop new styles for fabrics that have been successful. In other cases, untested fabrics may inspire new designs.

Once the final fabric has been determined, the manufacturer contacts a textile supplier and places a tentative order for that fabric (also called "taking an early position"), based on estimates of the line's sales.

Apparel manufacturers inspect the fabric stock upon arrival, so that any fabric irregularities are caught early in the production process. Textile producers also generally inspect fabrics before sending them to manufacturers. These inspections are an important part of quality control, which takes place at nearly every stage of apparel production.

New fabric printing technologies have dramatically decreased the amount of time between ordering a fabric sample and receiving it, if the yarn and base fabric are available. For short-run, limited volume apparel, man-made fabric sample prints can be designed and printed in less than 48 hours. For larger volume orders, fabric printing can take up to 10 weeks.

3.12.1 Fabric Quality Inspection

The quality of a final garment depends on the quality of a fabric when it is received as a roll. Even the most outstanding manufacturing methods cannot compensate for defective materials. Normally they inspect 10% of the rolls they receive and evaluate them based on a four-point system. This way, fabric related quality problems can be avoided before it is put into production.

If you want to produce high quality garments, you need high quality piece goods. When a sewing factory receives fabric from the mill, it is difficult to conduct a full 100% inspection of the fabric. A minimum 10% inspection of all piece goods prior to spreading the fabric is recommended. Many factories attempt to inspect the fabric during the spreading, but this is probably unrealistic to depend on the spreader to control the fabric quality evaluation. The fabric should be inspected prior to the fabric reaching the cutting tables.

There are different procedures followed for detecting fabric defects. It includes 10 point system, Dallas System, 10 point system

3.12.2 The Ten-Point System

It was developed in the 1950's. This system assigns penalty points to each defect, depending on the length of the defect. The system is a bit complicated because the points per length vary for warp and filling defects.

3.12.3 Dallas System

It was developed in the 1970's. This system was developed specifically for knits. According to this system, if any defect was found on a finished garment the garment would then be termed a second. In regard to fabric, this system defines a second as "more than one defect per ten linear yards, calculated to the nearest ten yards." For example, one piece 60 yards long would be allowed to have six defects.

NOTES

3.12.4 Four-Point System

In this system, you should inspect at least 10 percent of the total rolls in the shipment. Make sure to select at least one roll of each color way. The defect classification works as follows.

Amount to select: Inspect at least 10% of the total rolls of the shipment.

Selection of rolls: Select at least one roll of each color. If more than one role must be selected, then choose the additional roles in proportion to the total number of roles per color received.

3.12.5 Defect Classification (Four- Point System)

Size Defect Penalty

3 inches or less	1 Point
Over 3 inches, but less than 6	2 Points
Over 6 inches, but less than 9	3 Points
Over 9 inches	4 Points

The length of the defect is used to determine the penalty point. Only major defects are considered. No penalty points are assigned to minor defects. (A major defect is any defect that would cause a final garment to be considered a second.)

3.12.5 Major Defects

- Major woven fabric defects include but are not limited to slubs, holes, missing yarns, yarn variation, end out, soiled yarns, and wrong yarn.
- Major dye or printing defects are out of register, dye spots, machine stop, color out, color smear, or shading.

3.12.6 Acceptance Criteria and Calculation

40 points per 100 yards is the acceptable defect rate

No. of Points per 100 yds = No. of penalty points x 100 /Yds inspected

Inspection Procedure

- Determine the amount to inspect (10%)
- Select the rolls to inspect.
- Put the rolls on the inspection machine or other viewing device.
- Cut off a 6 inch piece across the width off the end of the roll. Mark the right and left side of the strip. Stop the inspection process every 50 yards and use the strip to check for any shading problems. Also make sure to check the end of the role.
- Inspect for visual defects with the light on at a speed slow enough to find the defects. (The fabric must be checked at a slow rate in order to effectively find flaws). Sometimes you may have to turn the light off to see how a flaw will affect the appearance of a garment.
- Check that the roll contains the correct yardage as stated by the

piece goods source.

- Check for skewed, biased, and bowed fabric.
- Mark any defects to the side with colored tape so that they can be easily found and noted.
- Record any defects.

NOTES

3.12.7 Fabric Shading

Shading is an important defect to catch prior to production. The bundler has the responsibility to check for shade problems prior to allowing the bundles to be put into the line. Both rolls and cuts should be checked for shading problems.

- A 4 inch square swatch from every roll received should be cut. (It is important to obtain a sample from every roll so that the rolls are checked 100%.)
- All samples should be laid out and grouped by shade. This area must be well lit in order to properly shade the rolls.
- Rolls should be grouped together accordingly by shade.

The quality of a final garment depends on the quality of a fabric when it is received as a roll. Even the most outstanding manufacturing methods cannot compensate for defective materials. If you want to produce high quality garments, you need high quality piece goods. When a sewing factory receives fabric from the mill, it is difficult to conduct a full 100% inspection of the fabric. "Apparel Search recommends a minimum 10% inspection of all piece goods prior to spreading the fabric. Many factories attempt to inspect the fabric during the spreading, but this is probably unrealistic to depend on the spreader to control the fabric quality evaluation. The fabric should be inspected prior to the fabric reaching the cutting tables.

There are different procedures followed for detecting fabric defects. It includes 10 point system, Dallas System, 10 point system.

3.13 SUMMARY

Quality is perceived value of a product. Two different aspects of quality must be identified in order to manage quality: (1) perception of quality of a product relative to other similar products offered in the market, and (2) conformance of a product to a firm's quality standards. In the first context, retail buyers and consumers evaluate quality of the array of goods offered in the market. In the second context, products are judged as acceptable or unacceptable according to a defined set of quality standards. Product variation is normal but must be controlled to fall within a firm's tolerances.

One hundred percent inspection is still the most common form of quality control used in apparel firms. Unfortunately, quality cannot be inspected into a garment. It has to be built into the garment. Many apparel firms are upgrading their quality control procedures to be more competitive

NOTES

in the world market. In general, better-quality garments cost more to produce than budget-quality products. However, for a given product and quality level, improving production processes increases consistency of output and thus improves product quality at lower cost.

3.14. GLOSSARY

- **Quality Management:** Management activities and functions involved in determination of quality policy and its implementation through means such as quality planning and quality assurance (including quality control).
- **Cost:** An amount that has to be paid or given up in order to get something. In business, cost is usually a monetary valuation of (1) effort, (2) material, (3) resources, (4) time and utilities consumed, (5) risks incurred, and (6) opportunity forgone in production and delivery of a good or service. All expenses are costs, but not all costs (such as those incurred in acquisition of an income-generating asset) are expenses.
- **Material:** The matter from which something can be made. Material can include but is not limited to raw and processed material, components, parts, assemblies, sub-assemblies, fuels, lubricants, coolants, cleaning agents, and small tools and accessories that may be consumed directly or indirectly.
- **Sourcing:** The process of obtaining goods and services from preparation and processing of a requisition through to receipt and approval of the invoice for payment. It commonly involves: (1) purchase planning, (2) standards determination, (3) specifications development, (4) supplier research and selection, (5) value analysis, (6) financing, (7) price negotiation, (8) making the purchase, (9) supply contract administration, (10) inventory control and stores, and (11) disposals and other related functions.

3.15 REVIEW QUESTIONS

1. What is the basis of acceptable quality during quality control inspection?
2. Identify and discuss the advantages and disadvantages of 100% inspection of finished goods as the primary technique for quality control. Identify and discuss the advantages and disadvantages of acceptable sampling as the primary basis of quality control.
3. What is the role of the lot in acceptance sampling? How is the lot determined?
4. How can a quality program that requires investment in planning, people, space, and equipment reduce costs and increase profitability?
5. Quality management is the effort applied to ensure that end products/services meet the intended requirements and achieve customers' satisfaction. Who is responsible for quality?

UNIT

4

*Sourcing,
Development
and Production*

NOTES

SOURCING, DEVELOPMENT AND PRODUCTION

STRUCTURE

- 4.1 Learning Objective
- 4.2 Introduction
- 4.3 Sourcing Issues
- 4.4 Global Sourcing
- 4.5 Costing Imported Goods
- 4.6 Productivity Concepts
- 4.7 Student Activity
- 4.8 Production Strategies
- 4.9 Work Flow
- 4.10 Apparel Production Systems
- 4.11 Production Process
- 4.12 Production Planning
- 4.13 Human Resource Management
- 4.14 Ergonomics
- 4.15 Inventory Management
- 4.16 Summary
- 4.17 Glossary
- 4.18 Review Questions

1.1 LEARNING OBJECTIVE

After studying this unit you should be able to:

- Understand what sourcing means in Apparel
- Explain how is sourcing being managed currently in Apparel?
- Describe what processes are manually managed and what processes are digitized?
- Understand the challenges faced while managing sourcing in Apparel
- Explain the concept of productivity, production strategy and work flow
- Explain the ergonomics, production planning, human resource management and inventory management

4.2 INTRODUCTION

NOTES

The Apparel manufacturing undergoes different segments of Processes. The steps of development are a guideline to help you, to know, how the process can help you for importing garments and its functions.

1. **Season:** The process by which a particular design, activity, color, etc., comes into some popularity and then phases out. This cycle of adoption and rejection is quite similar to the product life cycle.

The Apparel Fashion cycle uses different terms to describe its phases:

(e) *Distinctiveness phase, in which the style is eagerly sought;*

(b) *Emulation stage, in which its popularity grows; and*

(c) *Economic stage, in which it becomes available at lower prices to the mass market.*

2. **Budgeting:** The detailed financial component of the strategic plan that guides the allocation of resources and provides a mechanism for identifying deviations of actual from desired performance so corrective action can be taken. A budget assigns a money figure to each revenue and expense related activity. A budget is usually prepared for a period of six months by each component of an organization. A budget provides both a guide for action and a means of assessing performance.

A statement prepared by management containing planned financial commitments for all the components of the merchandise plan (Designing, Sampling, Advertising, Material Procurement, Pre-sales, Pre-production, Production, Shipping, Reductions, Stocks, Profit Margins, and purchases) at a seasonal period.

3. **Designing:** Apparel product design models are often based on consumers' perceptions and preferences have typically formulated in the context of multidimensional measurement analysis. In this case, various optimization programs have to be used such as color, measurements, sex categories, trims and quantities in percentage.

The designing team also works with possessed ideas in order a product fulfilling the desirability/durability of that product content for each set of potential customers. The level of market demand for any potential product is estimated by aggregating the individual preference models across customers.

4. **Sampling:** Sampling requires performing prototypes with detailed sketches transformed into virtual reality effects of the customers need. This Sample product enables them to produce a screen idea of the market survey and give a idea in selling the products within the season changes.

We, sample developers always look at new dye effects, blends of

NOTES

fibers and yarns and textiles for specialized end uses computers to analyze test results and draw on statistical figure to enable them to evaluate the performance of a new sample without spending time reproducing it several times before achieving the desired effect.

The first sample is produced by the vendor but our team often works with a technician or sample machinist who interprets and executes the concept on sample or production machinery. Design team finalize the first sample submitted to the customer for approval and gives a costing out as accurately as possible.

Any amendments to the sample will then be carried out and the sample resubmitted for approval. This process may be repeated several times before the sample receives final approval and is 'sealed'.

5. **Attending Fairs:** Why is it that all businesses, no matter whether they produce, manufacture, market products and services should be involved in sales promotion activities or attending business fairs? There are many reasons and the ones that apply to you will do so because of your specific product or service, location, business arrangement, amount of marketing activity you perform, etc.

How promotion activities like Sampling benefits the business:

- (a) New products will be reminded to your commodity merchants, processors, retailers & consumers systematically;
 - (b) you sell seasonal and fashionable products which require some degree of reintroduction & promotion from year to year;
 - (c) New Brands from your sampling will attract new consumers that must learn to make buying decisions about your products;
 - (d) To develop sales volume required to maintain low-cost mass production operation dealing in consumer goods;
 - (e) An opportunity to increase sales of your product by some means other than pricing strategies.
6. **Pre Production Approvals:** All products and promotions undergo a rigorous approval process to ensure faithful representation and reproduction of each property with a consistently high standard of quality procedures.
 7. **Production & Shipping:** The production process involves myriad steps and depends on the talent and skill of many individuals. It is a team effort. Apparel making is not conducive to precision mass production. Frequent style changes and varying degrees of fabric workability force continual adjustments in the manufacturing process.

Standardized equipment is difficult to design and implement, and production is therefore dependent on skilled workers.

A manufacturer's reputation for good fit, wear ability and few customer returns is a valuable sales aid. Therefore, detection of imperfect garments is essential.

NOTES

Quality control begins at the yarn selection stage itself, and then it is processed as a fabric where it is inspected for defects of material, dyeing and finishing.

Minor irregularities are marked on the fabric with little red flags or strings and the total roll price is discounted accordingly. When the fabric is laid out on the manufacturer's cutting table, it is inspected again - usually by the cutter - and any defects are cut out. If too much of the fabric is imperfect, it is returned to the mills.

Quality of work is checked during each step of production. If errors are discovered early in the process, they can usually be corrected. Inspection is done by the workers themselves and also by the factory production manager or a floor worker who supervises production flow. In addition, the quality inspectors usually spot checks quality on a daily basis. Completed garments are examined again by the finishers and by the shipping clerk as they are pulled for delivery on time.

Garments will be carefully scrutinized to be sure that the size, color and style number on the cutting ticket correspond to the garment itself. They will be inspected for quality of material, stitching, trimming, correct labels and even the right color of thread. Finally, any garments returned to the manufacturer by retailers should be analyzed to determine the source of error in production.

Shipping methods are considered as archaic by most industry members. All orders are hand picked. If a store orders certain styles in different colors and in progressive sizes, it will be hand-selected and consolidated for one shipment. Vendors will normally ship by parcel post, freight and air freight. Rates are charged by shipment weight only.

Carriers will provide specific packing instructions and suggestions for economic use of their services. For local pick-up and delivery of materials and finished garments, good shipping person for quality control, proper and efficient filling of orders, meeting delivery dates and avoiding shortages.

4.2.1 Challenges while managing Sourcing in Apparel

Designing, sourcing and buying goods can be a complex process that is typically hampered by the extensive use of spreadsheets, emails and phone calls. The need to key and re-key data from paper to system or between disparate systems is inefficient and can lead to unnecessary errors. Errors in processing or having to make simple changes to product specifications such as color or measurements, can incur costly time delays and unnecessary costs. Updating and sending out multiple versions of documents

to suppliers requires a significant amount of human resource, and can lead to duplication and misunderstandings.

Throwing more resources at the problem might help, but it's not the long-term answer. Until now, the ability to help apparel retailers manage these critical functions effectively has been an issue largely unaddressed by IT vendors. But the desire to take advantage of innovative software to help formalize best practices and help under-pressure apparel retailers' scale their businesses effectively is clearly there. Today, leading retailers around the world are looking to technology to help them manage the global sourcing process.

4.2.2 Challenges faced by the Customers

- (1) Any merchant nowadays has to manage numerous details on how private label brands are sourced, produced, and delivered, which can be quite daunting to deal with, especially when trading partners are scattered all over the world.
- (2) How to assimilate and communicate multiple data points effectively into a unified operation on a single screen? Many still share product information over the phone, or via email and faxes, or through physical communication, and the difficulty is thus to consolidate all these diverse data points.
- (3) The key in global sourcing today is to minimize the overall cycle and disruptions, and the most important way to do that is to have live, accurate, immediate information.
- (4) The current (mainly manual) systems still typically require information to flow via scattered spreadsheets, phones, faxes, mail, and e-mails within the retailer's different groups, and when it is the time to place the order, the data is usually no longer timely or accurate. The information then has to be revised during the ordering phase, which leads to the possibility that the vendor may respond incorrectly—and one then has to go through the vicious cycle again.
- (5) Determining the true costs of above activities can also be complex, since in addition to a nominal purchase price, one has to add freight, tax, duties, and cost of inventory, inevitable quality issues, and the buyers' time. Landed costs also vary tremendously, depending on how the merchandise is shipped. For all the above reasons, the issue of achieving more transparent and cohesive sourcing processes has become a frontline concern for many retailers, driven by boardroom directives to boost margins through direct sourcing of international products.

NOTES

4.3 SOURCING ISSUES

Globalization trends, trade liberalization in developing countries, quantum improvements in worldwide telecommunications infrastructures, and cost-cutting pressures have together compelled many companies to examine global opportunities for sourcing some of their operations. Such global sourcing, whether it involves insourcing or outsourcing, requires project managers to deal with issues unique to operating in heterogeneous international environments.

Some of the most advanced uses of Supply Chain Management (SCM) technologies and methodologies can be found in the retail industry. From the early uses of planning and optimization software and Electronic Data Interchange (EDI) to more recently the Internet, the retail sector showcases many examples of successful SCM technologies. The apparel sector of this industry, however, has been unable to use solutions that have shown widespread success in other industries when executing its supply chain plans. It has paid a high price. Imagine the profitability of other industries, even the retail industry in general, without advanced supply chain strategies and the software technology to enable them. Apparel industry companies must begin to address this issue to regain their profitability.

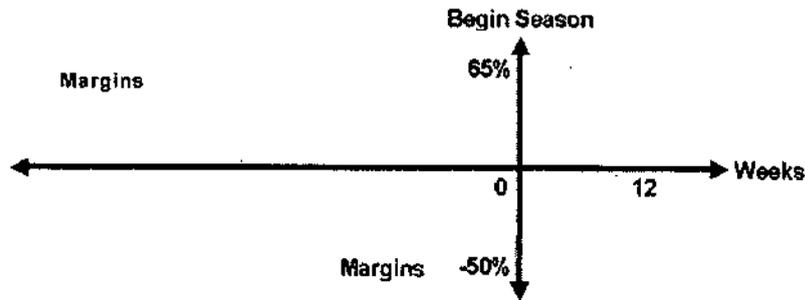
4.3.1 A Windfall Waiting to Happen

In the last five years, the apparel industry, has faced ever-decreasing margins and currently less than 5 percent net margins. With only a few notable exceptions, their traditional focus on consumer preferences and marketing has been insufficient to address this dismal performance. In fact, these poor financial results have occurred during a period when unit volumes and prices have increased. While indications that sourcing plans and software for demand planning and merchandising is gaining acceptance, a new approach to address the unique supply chain structure of the apparel industry and allow them to execute to plan is needed.

In order to recapture its profit potential, the apparel industry must immediately bring appropriate technology to bear on its supply chain challenge. The costs of inadequate management of apparel sourcing and supply chains are especially onerous since price and demand for an individual fashion garment are largely time-dependent. When the product is delayed beyond the beginning of a season, the margins for fashion apparel "perish" even if the garment does not. For example, a seasonal garment for the holiday season or bathing suit for summer might sell at full price for two weeks or even less, a 30-40% markdown or zero margin for another two weeks, and then have to be sold to another channel for 10% of the original price at a large loss.

NOTES

When inefficiency in the traditional “manual” systems now in place cause delivery delays, gross margins are further reduced due to expediting costs, such as additional air freight or discounts on merchandise. Additionally, industry practice often permits charge backs for delays or mistakes, which directly affect revenues and net profit. With so much at stake, what supply chain complexities have prevented adoption of solutions proven in other industries? The increased profit potential for the industry is enormous.



4.3.2 The Magnitude of the Sourcing Problem

The manufacturing of apparel is a “make to order” manufacturing environment with innumerable steps. Production is outsourced in much of the industry. The sourcing supply chain varies from style to style, season to season and even the same style within a season. Even if the steps are the same, the groupings of steps into multiple tiers can be different depending on individual supplier capabilities and capacity or due to quota considerations. Consequently, the same style can have a different multi-tier supply chain for different seasons. Shown below is the typical number of events that need close monitoring in order to identify and address delays to ensure on time delivery:

	High	Low
Seasons	12 or more	4
Apparel Sub-Divisions	200	50
Items per Sub-Division	30	10
Process Steps	300	300
Events to monitor	21,600,000	600,000

The total number of events in a typical sourcing environment overwhelms any management approach. And while this may align with typical manufacturers in other industries, sourcing executives have no direct control over these outsourced operations and have no system analogous to Enterprise Resource Planning/Manufacturing Resource Planning (ERP/MRPII) with which to address them. Manual approaches are compromised by geographical and time zone differences, language

NOTES

barriers or communication mechanisms, such as fax, that may be unreliable and do not leave an audit trail of the chain of events. In addition, many of these critical events have no place in any transaction system of record, such as ERP. And there is no ability to communicate and track unstructured information, such as the response to “is the new fabric working well with our sewing equipment in your factory.”

4.3.3 Global Sourcing Complexity: Delays Waiting to Happen

The opportunity to dramatically decrease labor costs drove much of apparel manufacturing offshore during the last decades. Due to the need for specialized machinery and labor skills, quota and customs considerations, and political factors, the supply chain for apparel went from a somewhat vertically integrated domestic process to a multi-tier, distributed global process that spans time zones, languages, cultures and geography. Apparel retailers and manufacturers supply chains address a worst case “Made-to-order” or Project/Job Shop manufacturing challenge. It is an environment characterized by:

- Entire demand for a given season/style order must be fulfilled by one lot
- Demand and pricing for seasonal and/or fashion items is uncertain and time-sensitive
- Multi-tier, disaggregated suppliers, due to specialization/cost structures/quota constraints, erode loyalty and make supply chains fragile and dynamic
- Moderately high set up or changeover costs, so cost is lot size dependent
- Distributed, global suppliers; most with little infrastructure
- Plans based on rules of thumb for production and transit lead times, cumulative rollups/padding very inaccurate—low confidence in on-time delivery creates buy and sell side date padding
- Delays in determining status and no easy mechanism to notify downstream suppliers or participants
- Lack of documented accountability and genealogy of communications
- Externally imposed finite capacity, e.g. time-dependent quotas, with no visibility over other competitor’s shipments for same quota category
- Supply chain cycle time is 2-3X total season cycle times and 6-9X profit season cycle times for many styles. Consequently, consumer demand for popular styles is frequently not satisfied and margin opportunities are lost

As we have already seen the number of permutations of projects, tasks and seasons are too great for any manual approach and can only be handled on a prioritized management by exception basis. Apparel manufacturing represents a formidable manufacturing and supply chain challenge.

4.3.4 Links in the Chain: Manufacturing Competence, but little IT infrastructure

When money is no object, supply chain processes can be optimized using analytical tools such as ERP or SCM solutions to improve performance. If every tier or factory had such tools, they could be integrated together either on a point-to-point basis or using a Supply Chain Events Management (SCEM) system throughout the supply chain. However, ERP and SCM products are not designed to handle style, size and color specifications for apparel, and width for footwear. The costly and time consuming customizations required to make these solutions, such as demand planning, work are a barrier to their adoption and represent a large risk.

Many factories, however, do not have the capital to invest in any IT infrastructure such as ERP and SCM; capital that does exist may be better invested in equipment to perform additional manufacturing operations. Additionally the global nature and distribution of their supplier base makes even normal communications difficult at times. As noted, the supply chains in the apparel industry are very volatile, changing from season to season and style to style. Verbal communications are insufficient to knit together the multiple tiers of a global supply chain into a cohesive, managed supply chain where delays are identified and communicated to all downstream participants in time to address them.

4.3.5 A Powerful Solution for Multi-tier Supply Chain Execution

Apparel retailers and manufacturers need the right tools to address their unique challenges. They need a solution that allows each distributed, global, multi-tier supply chain to function as if it were a single, local virtual factory. This type of supply chain execution system would use technologies, like the Internet, to overlay the entire supply chain for each project/product and would require no investment by the suppliers, which is especially important due to the number of suppliers in the chain. The solution must allow sourcing professionals to identify and prioritize problems so they can be addressed on a management by exception basis cannot require intensive training or significant capital at supplier sites.

A solution designed to solve the supply chain execution problem for the apparel industry would encompass the following functions:

- Define each order/project for a style with quantities, sizes and colors with specific tasks and completion dates with interdependencies or precedence relationships

NOTES

- A master calendar tying all corporate, customer and supplier-related tasks and events
- Task accountability with an "owner" responsible for the task, notifying affected participants
- A genealogy of all closed-loop communications allowing each task owner to proactively check on the status of tasks, events, quantities, etc.
- Automatic notification of delays to all downstream owners and participants
- Priorities will be based on the gross margin impacted by the delay and projected decrease in gross margin for that style
- Schedule revision validated for quota constraints and current projected imports
- Preformatted response capabilities to reduce errors and allow easy responding by noting only exceptions or deviations. This allows even remote or mobile devices such as cellular phones and hand held devices to be used to communicate status.
- Participants/owners communication for continuous personal real-time updates and rescheduling

The key requirement is that the system support process-embedded communications, allowing contextual messages to be sent that support both structured and unstructured information.

This solution, an operations network (OPN), would enable proactive monitoring of activities versus schedule just before and at the due date and enforce closed-loop communication so that individual task owners function as a cohesive team while maintaining individual accountability. Changes and delays are communicated automatically to all affected downstream owners and participants. The OPN facilitates a "management by exception" and "management by key criteria" approach. Promotions and advertising tied to each project are also identified for change prioritization. Sourcing professionals can focus their efforts to realize the greatest margin impact.

One such manufacturer using this solution is Karen Kane. Karen Kane, Inc., an innovator in the apparel industry is using Fasturn's Operations Network (OPN) as a way to help improve the efficiency of its sourcing operations. Karen Kane, Inc. has been a leader in the use of technology to improve its operations and allow personnel to focus on value-added activities and opportunities. To maintain profitability and growth Karen Kane looks for proven technologies that streamline or simplify day-to-day operations thereby freeing up its staff to focus on value-add decision-

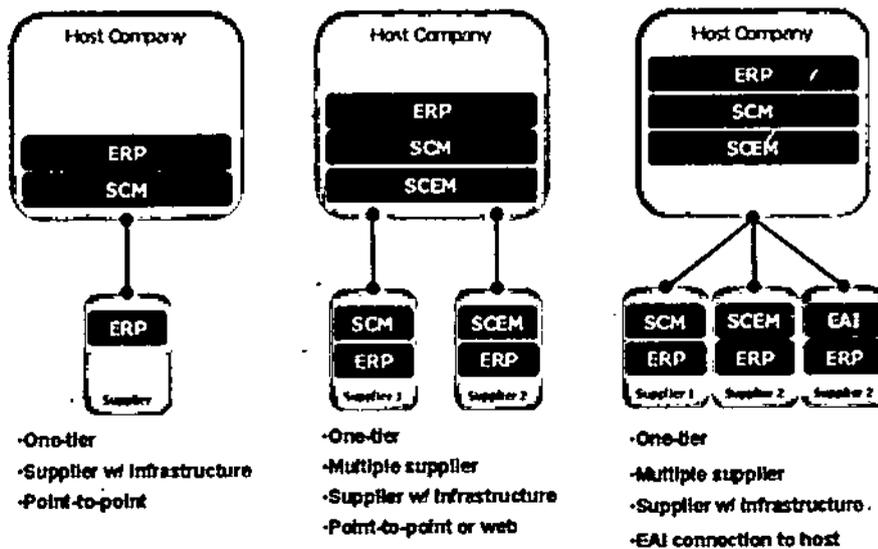
NOTES

making and management by exception activities. They also look to technology to help them manage their global supply chain and put structure to their communication internally and with suppliers.

Since implementing the OPN, Karen Kane has experienced numerous benefits. From the production side, complete and accurate information is received. Arming the production crew with full historical data enables increased efficiency in production planning and execution. Additionally, customized design and production templates enforce consistency in operations and allows teams to focus more fully on their task. With the OPN, the production team has been able to capture and document the twenty or so production, 12 design steps and dozens of data elements on average for each style.

Flexibility in the Fasturn application has allowed for adjustments in Karen Kane's business model. For example, Karen Kane currently has a straightforward supply chain model, but if they decide to go factory direct and/or open company-owned buying offices, the OPN can easily be configured to manage such a business model.

Apparel retailers and manufacturers need the right tools to address their unique challenges.



With the OPN, apparel manufacturers and retailers have the communications infrastructure to dramatically reduce product delays and expediting costs. Selling more products at planned margins can help double or triple the modest net profitability of the past five years. This OPN infrastructure works successfully by itself, but also coexists or synchronizes well with any products used for optimization or planning throughout the supply chain.

"The apparel industry's supply chain is one of the most complex of all," said Bruce Richardson, senior vice president, Research Strategy. "Until this

NOTES

new solution, the Operations Network, they had to try to manage it with brute force. Unfortunately, any delays not only reduced revenue like in other industries, but often caused margins to plummet. The potential for improvement is enormous.”

4.4 GLOBAL SOURCING

Global sourcing is a strategic sourcing strategy that effectively broadens the scope of the procurement process to include companies that operate in other countries. Strategic sourcing is the internal business process used to manage the bidding and vendor selector process. Procurement is also known as purchasing and refers to the laws surrounding fair and equitable bidding opportunities.

The use of global sourcing has been the driving force behind the development and expansion of the global economy. Including suppliers from around the world in the bidding process for large contracts reduces prices and increases competition. The creation of this type of infrastructure allows firms to create subsidiary offices in locations around the world. There are three main industries that are ideal for global sourcing: manufacturing, skilled services and telephone call centers.

Manufacturing costs vary internationally due to currency conversion and the cost of living in different countries. The costs of labor and materials are lower in developing nations than in North America. This difference translates into significant savings in salary and benefit costs.

Skilled services such as purchasing, engineering, information technology professionals and consultants are a growing area of global sourcing. The level of skill and knowledge held by these professional allows them to provide high quality services to their employers. Due to the lower cost of living in different nations, many firms are building their professional services departments outside North America.

Telephone call centers have grown exponentially in India and other countries where English is the primary language. The staff, equipment and construction costs for these facilities are significantly less than in North America. In addition, there is a large pool of potential employees who are interested in this type of employment opportunities.

Global sourcing has both benefits and risks. The benefits of sourcing for the employer include lower labor costs, less government oversight and a larger pool of potential employees and customers. For the employees, the benefits include a higher wage, improved working conditions and learning transferable skills. The risks of global sourcing include higher costs due to cultural and language related issues.

Diversifying business operations across different countries increases business travel and local management issues. Most companies prefer to transfer knowledgeable staff to global locations for senior management positions. In addition, they limit local management hiring to the supervisory levels.

Logistics and transportation issues are critical to sourcing decisions. Any company considering international suppliers must create an infrastructure of staging and storing locations in these nations. Contracts with shipping and transportation companies add to the costs of global sourcing for manufacturing plants.

4.5 COSTING IMPORTED GOODS

Calculating import costs is a tricky exercise, where mistakes can lead to disastrous financial consequences. Here we are discussing 5 essential steps, with tips, of the import costing process.

1. **Get your product purchasing cost (PPC) straight:** You must make sure of what is and what isn't included in the price you got from your supplier. The first, obvious verification is to ensure that the price actually corresponds, point by point, to your product as specified: make sure that no option is left un-covered and that the quotation is really all-inclusive. Classic mistakes here are: not checking that the packaging or labeling are included, or that additional expenses will be needed such as mould setup. Another important point to agree upon with your supplier is the incoterm included in the quotation. Are you supposed to take property of the goods right from the factory (ex-works pricing), or once the products are loaded onto the boat (FOB pricing)? This obviously greatly impacts your costs - be careful, as a lot of different terms can be used.
2. **Calculate your freight cost:** Here you will need to get quotations from Freight Forwarders. The first thing is for you to decide what freight mode you need. The 3 main options are: sea freight (cheapest, longest mode), air freight (most expensive, quickest mode) and sea & air (a mix of both, less used). Consider your shipment volume and weight as well: air freight can be cost-efficient if you have low quantities or very light products. Once decided on the freight mode, make sure you get the origin and destination addresses correct; most forwarders are able to quote based on a region and not necessarily a specific city. Ask for quotations, and make sure to check all the details; here as well, it is important to check that everything is included. Freight forwarders have to include in their quotation the basic freight cost as well as a number of taxes and fixed charges incurred when dealing with international logistics. You may also

NOTES

- ask forwarders to include insurance in the quotation.
- 3. Estimate duties:** This is where it becomes tricky. Importing products is subject to custom duties levied by the country where you plan to ship your goods. To get the applicable duty, you need to know what category your products fall in, under the Harmonized Tariff Schedule (HTS codes). Your Forwarder can help, your local custom bureau can help, and online services can help as well. From one product category to the other, even for very similar products, duties may vary from 0 to 10% of the imported cost! Remember that Custom duties apply to the total value of your imported goods as they enter the territory (e.g.: purchasing cost + freight + insurance).
 - 4. Be sure to include all costs:** Make sure you don't forget to include any side cost into your landed cost calculation. Side costs may come from the quality control and testing you will need to implement, the specific logistic operations that will happen once the goods land at destination (ex: palletizing, storage...) or additional costs incurred at the source for your product manufacturing (design, moulding...).
 - 5. Add up your margin:** Once you have a proper and accurate sum of all your costs, it is time to make money! Add up your sales margin, and get your selling price. It is wise to add up an extra few percent to your margin, to cover up for unexpected events such as currency exchange fluctuation, or raw material costs rise. This is also why it is strongly advised to set a validity date to your sales quotation - 30 days is usually enough.

4.6 PRODUCTIVITY CONCEPTS

Productivity is an overall measure of the ability to produce a good or service. More specifically, productivity is the measure of how specified resources are managed to accomplish timely objectives as stated in terms of quantity and quality. Productivity may also be defined as an index that measures output (goods and services) relative to the input (labor, materials, energy, etc., used to produce the output).

Hence, there are two major ways to increase productivity: increase the numerator (output) or decrease the denominator (input). Of course, a similar effect would be seen if both input and output increased, but output increased faster than input; or if input and output decreased, but input decreased faster than output.

Organizations have many options for use of this formula, labor productivity, machine productivity, capital productivity, energy productivity, and so on. A productivity ratio may be computed for a single operation, a department, a facility, an organization, or even an entire country.

NOTES

Productivity is an objective concept. As an objective concept it can be measured, ideally against a universal standard. As such, organizations can monitor productivity for strategic reasons such as corporate planning, organization improvement, or comparison to competitors. It can also be used for tactical reasons such as project control or controlling performance to budget.

Productivity is also a scientific concept, and hence can be logically defined and empirically observed. It can also be measured in quantitative terms, which qualifies it as a variable. Therefore, it can be defined and measured in absolute or relative terms. However, an absolute definition of productivity is not very useful; it is much more useful as a concept dealing with relative productivity or as a productivity factor.

Productivity is useful as a relative measure of actual output of production compared to the actual input of resources, measured across time or against common entities. As output increases for a level of input, or as the amount of input decreases for a constant level of output, an increase in productivity occurs. Therefore, a "productivity measure" describes how well the resources of an organization are being used to produce input.

Productivity is often confused with efficiency. Efficiency is generally seen as the ratio of the time needed to perform a task to some predetermined standard time. However, doing unnecessary work efficiently is not exactly being productive. It would be more correct to interpret productivity as a measure of effectiveness (doing the right thing efficiently), which is outcome-oriented rather than output-oriented.

Productivity is usually expressed in one of three forms: partial factor productivity, multifactor productivity, and total productivity. Each one is now discussed.

4.6.1 Partial-Factor Productivity

The standard definition of productivity is actually what is known as a partial factor measure of productivity, in the sense that it only considers a single input in the ratio.

Managers generally utilize partial productivity measures because the data is readily available. Also, since the total of multifactor measures provides an aggregate perspective, partial factor productivity measures are easier to relate to specific processes. Labor-based hours (generally, readily available information) is a frequently used input variable in the equation. When this is the case, it would seem that productivity could be increased by substituting machinery for labor. However, that may not necessarily be a wise decision. Labor-based measures do not include mechanization and automation in the input; thus when automation replaces labor, misinterpretation may occur.

Other partial factor measure options could appear as output/labor, output/machine, output/capital, or output/energy. Terms applied to some other partial factor measures include capital productivity (using machine hours

or dollars invested), energy productivity (using kilowatt hours), and materials productivity (using inventory dollars).

NOTES

4.6.2 Multifactor Productivity

A multifactor productivity measure utilizes more than a single factor, for example, both labor and capital.

A subset of inputs might consist of only labor and materials or it could include capital. Obviously, the different factors must be measured in the same units, for example dollars or standard hours.

4.6.3 Total Factor Productivity

A broader gauge of productivity, total factor productivity is measured by combining the effects of all the resources used in the production of goods and services (labor, capital, raw material, energy, etc.) and dividing it into the output.

One example, is a ratio computed by adding standard hours of labor actually produced, plus the standard machine hours actually produced in a given time period divided by the actual hours available for both labor and machines in the time period.

Total output must be expressed in the same unit of measure and total input must be expressed in the same unit of measure. However, total output and total input need not be expressed in the same unit of measure. Resources are often converted to dollars or standard hours so that a single figure can be used as an aggregate measure of total input or output. For example, total output could be expressed as the number of units produced, and total input could be expressed in dollars, such as tons of steel produced per dollar input. Other varieties of the measure may appear as dollar value of good or service produced per dollar of input, or standard hours of output per actual hours of input.

Total productivity ratios reflect simultaneous changes in outputs and inputs. As such, total productivity ratios provide the most inclusive type of index for measuring productivity and may be preferred in making comparisons of productivity. However, they do not show the interaction between each input and output separately and are thus too broad to be used as a tool for improving specific areas.

Total Factor Productivity is a measure favored by the Japanese, whereas labor productivity is the measure favored by the United States. As such, the individual "productivity" of the American employee tends to be the best in the world, in that an American employee can purchase more eggs per one hour of work than anyone else in the world. But as a measure of national productivity, the Japanese have, in the past, tended to be better performers.

4.6.4 Productivity Measures

It has been said that the challenge of productivity has become a challenge of measurement. Productivity is difficult to measure and can only be

NOTES

measured indirectly; that is, by measuring other variables and then calculating productivity from them. This difficulty in measurement stems from the fact that inputs and outputs are not only difficult to define but are also difficult to quantify.

Any productivity measurement system should produce some sort of overall index of productivity. A smart measurement program combines productivity measurements into an overall rating of performance. This type of system should be flexible in order to accommodate changes in goals and policies over time. It should also have the ability to aggregate the measurement systems of different units into a single system and be able to compare productivity across different units.

The ways in which input and output are measured can provide different productivity measures. Disadvantages of productivity measures have been the distortion of the measure by fixed expenses and also the inability of productivity measures to consider quality changes (e.g., output per hour might increase, but it may cause the defect rate to skyrocket). It is easier to conceive of outputs as tangible units such as number of items produced, but other factors such as quality should be considered.

Experts have cited a need for a measurement program that gives an equal weight to quality as well as productivity. If quality is included in the ratio, output may have to be defined as something like the number of defect-free units of production or the number of units which meet customer expectations or requirements.

The determination of when productivity measures are appropriate performance measures depends on two criteria. The first is the independence of the transformation process from other processes within the organization. Second is the correspondence between the inputs and outputs in the productivity measurement process.

4.6.5 Use of Productivity Measures

Productivity is a required tool in evaluating and monitoring the performance of an organization, especially a business organization. When directed at specific issues and problems, productivity measures can be very powerful. In essence, productivity measures are the yardsticks of effective resource use.

Managers are concerned with productivity as it relates to making improvements in their firm. Proper use of productivity measures can give the manager an indication of how to improve productivity: either increase the numerator of the measure, decrease the denominator, or both.

Managers are also concerned with how productivity measures relate to competitiveness. If two firms have the same level of output, but one requires less input thanks to a higher level of productivity, that firm will be able to charge a lower price and increase its market share or charge the same price as the competitor and enjoy a larger profit margin.

NOTES

Within a time period, productivity measures can be used to compare the firm's performance against industry-wide data, compare its performance with similar firms and competitors, compare performance among different departments within the firm, or compare the performance of the firm or individual departments within the firm with the measures obtained at an earlier time (i.e., is performance improving or decreasing over time?).

Productivity measures can also be used to evaluate the performance of an entire industry or the productivity of a country as a whole. These are aggregate measures determined by combining productivity measures of various companies, industries, or segments of the economy.

4.6.6 Productivity Index

Since productivity is a relative measure, for it to be meaningful or useful it must be compared to something. For example, businesses can compare their productivity values to that of similar firms, other departments within the same firm, or against past productivity data for the same firm or department (or even one machine). This allows firms to measure productivity improvement over time, or measure the impact of certain decisions such as the introduction of new processes, equipment, and worker motivation techniques.

In order to have a value for comparison purposes, organizations compute their productivity index. A productivity index is the ratio of productivity measured in some time period to the productivity measured in a base period. For example, if the base period's productivity is calculated to be 1.75 and the following period's productivity is calculated to be 1.93, the resulting productivity index would be $1.93/1.75 = 1.10$. This would indicate that the firm's productivity had increased 10 percent. If the following period's productivity measurement fell to 1.66 the productivity index of $1.66/1.75 = 0.95$ it would indicate that the organization's productivity has fallen to 95 percent of the productivity of the base period. By tracking productivity indexes over time, managers can evaluate the success, or lack thereof, of projects and decisions.

4.6.7 Factors Affecting Productivity

There is quite a variety of factors which can affect productivity, both positively and negatively. These include:

1. capital investments in production
2. capital investments in technology
3. capital investments in equipment
4. capital investments in facilities
5. economies of scale
6. workforce knowledge and skill resulting from training and experience
7. technological changes

NOTES

8. work methods
9. procedures
10. systems
11. quality of products
12. quality of processes
13. quality of management
14. legislative and regulatory environment
15. general levels of education
16. social environment
17. geographic factors

The first 12 factors are highly controllable at the company or project level. Numbers 13 and 14 are marginally controllable, at best. Numbers 15 and 16 are controllable only at the national level, and 17 is uncontrollable.

4.6.7 Improving Productivity

Productivity improvement can be achieved in a number of ways. If the level of output is increased faster than that of input, productivity will increase. Conversely, productivity will be increased if the level of input is decreased faster than that of output. Also, an organization may realize a productivity increase from producing more output with the same level of input. Finally, producing more output with a reduced level of input will result in increased productivity.

Any of these scenarios may be realized through improved methods, investment in machinery and technology, improved quality, and improvement techniques and philosophies such as just-in-time, total quality management, lean production, supply chain management principles, and theory of constraints.

A firm or department may undertake a number of key steps toward improving productivity. William J. Stevenson (1999) lists these steps to productivity improvement:

- Develop productivity measures for all operations; measurement is the first step in managing and controlling an organization.
- Look at the system as a whole in deciding which operations are most critical, it is over-all productivity that is important.
- Develop methods for achieving productivity improvement, such as soliciting ideas from workers (perhaps organizing teams of workers, engineers, and managers), studying how other firms have increased productivity, and reexamining the way work is done.
- Establish reasonable goals for improvement.
- Make it clear that management supports and encourages productivity improvement. Consider incentives to reward workers for contributions.
- Measure improvements and publicize them.

NOTES

- Don't confuse productivity with efficiency. Efficiency is a narrower concept that pertains to getting the most out of a given set of resources; productivity is a broader concept that pertains to use of overall resources. For example, an efficiency perspective on mowing the lawn given a hand mower would focus on the best way to use the hand mower; a productivity perspective would include the possibility of using a power mower.

As a cautionary word, organizations must be careful not to focus solely on productivity as the driver for the organization. Organizations must consider overall competitive ability. Firm success is categorized by quality, cycle time, reasonable lead time, innovation, and a host of other factors directed at improving customer service and satisfaction.

4.7 STUDENT ACTIVITY

1. What is Electronic Data Interchange?

.....
.....
.....

2. What is multifactor productivity?

.....
.....
.....

3. What is productivity Index? Why is it used?

.....
.....
.....

4.8 PRODUCTION STRATEGIES

Apparel production involves the conversion of raw materials into completed saleable garments, and the manager must focus on the different types of production strategies, evaluation and critical comparison of different types of production systems.

The garment industry is undergoing enormous change which ends up in increased pressures on retailers and apparel manufacturers. Both retailers and manufacturers are challenged to compete, not just in terms of price, but also in delivery times and services offered. Recently, the apparel industries are market driven. To meet market demands and generate profit, firms must fully utilize their resources and successfully expand their productivity. The demands of today's market require the flexibility and fast throughput implied to

quick response (QR) strategies. Consumers' demand for timely fashion, quality and value has made the manufacturers think of their production strategies.

The four identified production strategies are:

- **Flexible Manufacturing Strategy:** This strives to be responsive to consumer demand for small orders and short lead times. Flexible Manufacturing Strategy means the capability to quickly and efficiently produce a variety of styles in small production runs with no defects. Industry adopting this strategy should effectively use the new technology and resources. In simple words the manufacturing firm adopting this strategy will operate with the flexibility needed to meet the demands of its consumers and the inherent ability to adapt immediate changes in the apparel market.
- **Value-Added Manufacturing Strategy:** This is a quick response strategy that focuses on eliminating any unnecessary operations or handling that do not increase the value of a product which will lead to delay in production. The rationale of this strategy is that each operation performed on a style should add value. Operations such as inspection, bundling and sorting warehousing requires extra time, handling and personnel but the activities do not add any value to the product. Any industry which adopts value added environment needs to evaluate processes and find more efficient ways to produce a product.
- **Agile Manufacturing Strategy:** Agility is the dynamic ability of the firm to strategically use change as a vehicle to grow in the new markets, with new products and to develop new competencies. It requires openness to change and flexibility to pursue change. The real strength of an agile manufacturer is its ability to anticipate consumer needs and through innovation lead the emergence of new products.
- **Mass Customization:** The goal of mass customization is to produce products that can be made-to-order rather than made to plan. Products life cycle are short and the strategy requires processing single orders with immediate turn around. Considering the complexity of many apparel products and the number of processes that a style may require, the equipment, skills, information and the processes must be highly integrated. This may involve single ply cutting, single piece continuous floor manufacturing and integral information technology. Apparel consumers will soon have the opportunity to have garments fully customized including style, fit, fabric and trim with delivery direct to their home in a few days at a price similar to the mass produced garments. Body scanning technology will be the basis of custom fit. A combination of computer aided design, single ply cutters, team based assembly will facilitate shipping the garment the same day it is ordered. Mass customization will reduce the risk associated with trying to

NOTES

anticipate consumer demand months ahead of point of sale to the ultimate consumer.

NOTES

4.8.1 Production Systems

Another characteristic of the apparel manufacturer in the conceptual framework is the production system. An apparel production system is an integration of material handling, production processes, personnel, and equipment that directs work flow and generates finished products. Apparel manufacturers are adopting several types of production systems and the product characteristic is highly related to the type of production system. The best apparel production will depend on the mission and policies of the manufacturing firm as well as the capacities of the personnel engaged in the production departments; it also depends on the volume of production.

Three types of production systems commonly used in mass production apparel are:

Each system requires an appropriate management philosophy, materials handling methods, floor layout, and employee training. Firms may combine or adapt these systems to meet their specific production needs. Industries may use only one system, a combination of systems for one product line, or different systems for different product lines in the same plant.

Progressive Bundle System: The progressive bundle system (PBS) as the name implies the bundles of garment parts are moved sequentially from operation to operation. This system, often referred to as the traditional production system, has been widely used by apparel manufacturers for several decades and still is today. It was reported by the AAMA Technical Advisory Committee that 80 per cent of the apparel manufacturers used the bundle system and also predicted that use of bundle systems would decrease as firms seek more flexibility in their production systems. Bundles consist of garment parts needed to complete a specific operation or garment component. For example, an operation bundle for pocket setting might include shirt fronts and pockets that are to be attached. Some firms operate with a standard bundle size, while other firms vary bundle sizes according to cutting orders, fabric shading, size of the pieces in the bundle, and the operation that is to be completed. Bundles are assembled in the cutting room where cut parts are matched up with corresponding parts and bundle tickets. Bundles of cut parts are transported to the sewing room and given to the operator scheduled to complete the operation. One operator is expected to perform the same operation on all the pieces in the bundle, retie the bundle, process coupon, and set it aside until it is picked up and moved to the next operation.

Advantages: This system may allow better utilization of specialized machines, as output from one special purpose automated machine may be able to supply several operators for the next operation. Small bundles allow faster throughput unless there are bottlenecks and extensive waiting between operations.

Disadvantages: It is driven by cost efficiency for individual operations.

NOTES

As the operators perform the same operation on a continuing basis, and are compensated by piece rates become extremely efficient at one operation and may not be willing to learn a new operation because it reduces their efficiency and earnings. Individual operators that work in a progressive bundle system are independent of other operators and the final product. Slow processing, absenteeism, and equipment failure may also cause major bottlenecks within the system. Large quantities of work in process. This may lead to longer throughput time, poor quality concealed by bundles, large inventory, extra handling, and difficulty in controlling inventory.

Unit Production System: A unit production system (UPS) is a type of line layout that uses an overhead transporter system to move garment components from work station to work station for assembly. All the parts for a single garment are advanced through the production line together by means of a hanging carrier that travels along an overhead conveyor. The overhead rail system consists of the main conveyor and accumulating rails for each work station. Carriers are moved along the main conveyor and switched to an accumulating rail at the work station where an operation is to be performed. At the completion of an operation the operator presses a button, and the carrier moves on to the next operation. Most unit production systems are linked to a computer control center that routes and tracks production and provides up-to-the-minute data for management decisions.

The unit production system transports all the pieces of one complete product through the manufacturing process. An addressable product carrier takes all the pieces of one entire unit (i.e., for trousers - backs, fronts, pockets, etc) through the different steps of production. Operations are performed at individual workstations. The end result is a cost-efficient product, processed from pieces to completion.

Workflow in Unit Production System

Load all the pieces in a product carrier

- The product carrier with the pieces will be routed through the different operation steps
- At every machine/operation the patented chain will position the product ideally
- Completed the product arrives to an unloading station. The empty product carrier returns to the loading station.

Advantages:

- Improved lead times - less Work In Process.
- Improved space utilization,
- Increased productivity
- Throughput time in the sewing room can be drastically reduced.
- Direct labor costs are reduced
- Indirect labor costs may be reduced by elimination of bundle handling

NOTES

and requiring fewer supervisors.

- Improved production and quality monitoring.
- Reduced space utilization.
- Improved ergonomics.

Disadvantages:

- Highly expensive - buying equipment and Cost of installing
- Specialized training for the system.

Modular Production System

A modular production system is a contained, manageable work unit that includes an empowered work team, equipment, and work to be executed. The number of teams in a plant varies with the size and needs of the firm and product line. Teams may be used to perform all the operations or a certain portion of the assembly operations depending on the organization of the module and processes required. Before a firm can establish a modular production system, it must prioritize its goals and make decisions that reflect the needs of the firm. With a team-based system operators are given the responsibility for operating their module to meet goals for throughput and quality. The team is responsible for maintaining a smooth work flow, meeting production goals, maintaining a specified quality level, and handling motivational support for the team. Team members develop an interdependency to improve the process and accomplish their goals. Interdependency is the relationship among team members that utilizes everyone's strengths for the betterment of the team.

Workflow in Modular Production

A Modular Production System operates as a Pull System, with demand for work coming from the next operator in line to process the garment. Wastage is normal, and workflow is continuous and does not wait ahead of each operation. This increases the potentials for flexibility of styles and quantities of products that can be produced.

Workflow within a module may be with a Single-piece hand-off, Kanban, or Bump-back system. If a single-piece hand-off is used, machines are arranged in a very tight configuration. As soon as an operation is completed the part is handed to the next operator for processing. Operations need to be well balanced as there is usually only one garment component between each operation. Some modules may operate with a buffer or small bundle of up to ten pieces of work between operators. If a small bundle is used, an operator will complete the operation on the entire bundle and carry the bundle to the next operation. An operator may follow a component or bundle for as many operations as they have been trained or until the adjacent operator is ready to assume work on the bundle.

A Kanban uses a designated work space between operations to balance

NOTES

supply with demand. The designated space will hold a limited number of completed components (two or three) in queue for the next operation. If the designated space is full, there is no need to produce more until it is needed or the space empties. This limit builds up of product ahead of the next operation. When the space is full the operator can assist with other operations that may be slow.

The bump-back or TSS (Toyota Sewing System) approach was developed by the Toyota Sewn Product Management System and is probably the most widely used type of team-based manufacturing. It is a stand-up module with flexible work zones and cross-trained operators. Operators may be cross-trained on up to four different successive operations. This enables operators to shift from operation to operation until the next operator is ready to begin work on the garment. The operator needing work steps to the beginning of the zone and takes over the processing at whatever point it is in the production process. The operator who has been relieved of the garment will then move back to the beginning of the work zone and take over work on another garment. This approach enables continuous work on a garment and allows each operator to perform several different operations. This arrangement frequently uses a 4-to-1 ratio of machines to operators.

Advantages:

- High flexibility
- Fast throughput times
- Low wastages
- Reduced absenteeism
- Reduced Repetitive Motion Ailments
- Increased employee ownership of the production process
- Empowered employees
- Improved Quality

Disadvantages:

- A high capital investment in equipment.
- High investment in initial training.
- High cost incurred in continued training

The main aim of any production system is to make the total production time as small as possible. The choice of the production system highly depends on the volume of production and the strategy of production. Basic goods can be manufactured in large quantities, with large cuttings, work bundles, and limited fabric, color, and trim variation. For basic goods, a traditional production system such as progressive bundle system can be adopted. The modular system or some type of flexible manufacturing can be adopted for the production of fashion goods.

Considering the required capital and training for production system

NOTES

changes, transition from the traditional production system to a flexible manufacturing system is limited for most apparel manufacturers. Some firms may also use the combination of the production systems — the progressive bundle system for producing small parts combined with modular production for garment assembly. This reduces the investment in specialized equipment and reduces the team size needed. Some industry consultants believe that a modular system combined with a unit production system provides the most flexibility, fastest throughput, and most consistent quality. This would be particularly useful for large items such as coveralls or heavy coats. The UPS would move the garment instead of the operators. Each manufacturer needs to determine what is best for its product line and production requirements.

4.9 WORK FLOW

Merchandising & Sampling

- Communication with the Buyer
- Identifying Their Need and Choices
- Sampling Based on the Buyer's Preferences
- Approval of Sample by Buyer
- Getting Buying Order
- Making Pattern of the Approved Sample for Final Production
- Developing & Maintaining production [Merchandiser's File]

Sourcing and Store Processes

- Getting Requisition for Sourcing the Fabric and Accessories
- Communication With Suppliers for Getting the Best Quality at Competitive Prices And Placing the Order
- Follow Up for Timely Delivery of Goods
- Receiving and Unloading the Fabric and Accessories
- Quality Checking of Material
- Dying and Printing
- Getting Requisition from Production Department
- Issuing the Material According to the Requisition
- Managing Records at Every Level

Production

- Layering and Cutting of the Fabric
- Layering
- Setting the Pattern

NOTES

- Cutting
- Making Bundles OF Different Pieces
- Numbering of all Layers of Each Bundle
- Issuing the Pieces for Stitching
- Stitching
- Assembly Line Stitching
- Full Piece Stitching
- Measurement Checking of Stitched Garment
- Alteration if any Required
- Fixing of Kaj-Button and any other Accessories as Per Need With the Help of Machines

Finishing

- Cutting of Extra Threads
- Washing
- Ironing
- Initial Quality Checking
- Finishing
- Spotting
- Mending
- Alteration of Sequins/ Embroidery or Any Other Accessories
- Final Checking
- Ironing

Packaging and Dispatch of Goods

- Folding
- Putting Packing Accessories Like Clips, Tags etc.
- Putting Folded Garment Into Polythene
- Making Blister Pack of Packed Garments
- Putting Blister Packs into Boxes
- Stripping of Boxes
- Weighing of Boxes
- Handing Over to the Shipper

Documentation

Quality Control

Administration and Accounts

- Accounts Officers

- Administration
- Personnel and Administration Officers
- Telephone Operators
- Office Assistants

NOTES

4.10 APPAREL PRODUCTION SYSTEMS

The choice of best apparel production system will depend on the product and policies of the company and on the capacities of manpower. Most of the production systems employed in clothing factories are derived from the following manual or mechanical systems. Each production system has its own specific operational characteristics. This article discusses the features, merits and demerits of different garment production systems.

4.10.1 Individual system/Make through/Whole garment system

This is essentially the traditional method of production whereby one operator assembles the entire garment. In men's bespoke wear, it is not uncommon for a tailor to perform nearly every operation required to make the garment, including machining, hand work and pressing.

With this production system the operator would be given a bundle of cut work and would proceed to sew it according to his or her own method of work. of necessity, the labor required by this system must be highly skilled and versatile, a combination which is becoming exceedingly rare and increasingly expensive.

This type of system is effective when a very large variety of garments have to be produced in extremely small quantities. A typical application would be in the sewing room of a boutique, which produces its own merchandise.

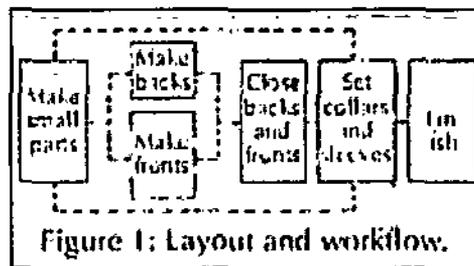


Figure 1: Layout and workflow.

4.10.1 Whole Garment Production System

There are two types of Whole Garment Production Systems: (1) complete-whole garment and (2) departmental whole garment. In the whole garment system one individual makes the entire garment from cutting the cloth to sewing and pressing the garment. The garment is ready for dispatch once

NOTES

the operator completes the final operation. This type of system is used in a few places, which are engaged in custom-wholesale. They are normally high priced and exclusively made for a particular customer. They are limited in number and distribution; normally about 10-20 garments are made.

The departmental whole garment system is also used by custom wholesale manufacturers as well as high price or better dress manufacturers. In the departmental whole garment system one individual does all the work with the equipment allocated to a department. For example, one person does all the cutting work in cutting department, second person does all the sewing work in sewing department, and the third person does the pressing and packing work. The workers in this system may use more than one equipment to complete their respective job.

Advantages

1. This system is more effective when a very large variety of garments have to be produced in extremely small quantities.
2. In Individual piece rate system the operators will do with full involvement: To finish more pieces, to earn more money.
3. Operator will be specialized in his own working area.
4. As the pay depends upon the complication of the operation, the operator will try to finish the complicated operation also without any difficulties.
5. The Work in Progress (WIP) is reduced, at a time one cut garment to one operator and so the amount as inventory is reduced.

Disadvantages

1. Highly skilled laborers are used, so the cost of labor is high.
2. The operator is more concerned on the number of pieces finished rather than the quality of work.
3. Productivity is less due to lack of specialization.
4. For long run/bulk quantity of same style is not effective in this system.

4.10.2 Section or Process System - Group System

This is a development of the making through system, with the difference that the operators specialize in one major component and sew it from beginning to end. For example, an operator specializing in fronts would assemble the front, set the pockets, etc and perform all the operations required to finish that particular component.

The sewing room would have a number of sections, each containing versatile operators capable of performing all the operations required for a

NOTES

specific component. The sections are built according to the average garment produced, and include:

- Pre-assembling (the preparation of small parts)
- Front making
- Back making
- Main assembly (closing, setting collars and sleeves, etc)
- Lining making
- Setting linings
- Finishing operations (buttonholes, blind-stitching, etc)

All in all, this is a very efficient system for producing a variety of styles in reasonable quantities. Figure above shows a typical layout and workflow for this type of system.

Advantages

1. As the labor of all levels, i.e., semi skilled, skilled, trainee can be used in this system, the labor cost is less compared with individual system.
2. Productivity is higher compared to individual system, because of the use of special machine and all types of labor.
3. This system is very efficient for producing a variety of styles in reasonable quantities.
4. Automation and specialization can be done.
5. Absenteeism and machine breakdown problems will not cause serious problems.

Disadvantages

1. All the levels of operators are involved in the work, so the quality of garment should be strictly maintained.
2. Even though productivity is high still the highly skilled operators are required to perform simple operation within the section.
3. Group of people involved in each section and so we require more WIP, which increases the inventory cost.
4. As this is not a bundling system, there are more chances to mix up of lost, shade variation, sizes, so quality and production will be affected.

4.10.3 Progressive Bundle System - Batch System

This system is exactly what its name implies, a system whereby the garments are gradually assembled as they move through successive sub-

NOTES

assembly and main assembly operations in bundle form. The principles of this system are:

The various sections are positioned according to main operation sequence, with each section having a layout according to the sequence of operations required to produce a particular component. For example, the sleeve section could contain the following sequence of operations:

- Run stitch collar
- Collar turn/iron
- Collar top stitch, etc

The amount of machinery for each operation would be determined by the output required.

- A work store is positioned at the start and end of every section of these buffers is used to store work received from a preceding operation, and to hold work completed by that section.
- Due to these work stores or buffers, each section is not directly dependent on the preceding section, but can absorb slight variations in output via the stocks held within the section.

The progressive bundle system, while being somewhat cumbersome in operation and requiring large quantities of work in progress, is probably one of the most stable systems as regards output. Unless there is serious absenteeism or prolonged special machine breakdowns, most of the usual hold-ups can be absorbed because of the amounts of work in progress.

Balancing and the changeover to new styles are also somewhat simplified, due to the amount of work held in reverse. When properly managed, the progressive bundle system is versatile and efficient.

Advantages

1. Labors of all levels, i.e., unskilled, skilled, semi skilled labors are involved in this system where the operations are broken into small simple operation. Hence the cost of labor is very cheap.
2. Here the quantity of each component is checked during the individual operation itself, so the quality is good.
3. The components are moved in bundles from one operation to next operation, so there is less chance for confusion like, lot mix-up, shade variation, size variation, etc.
4. Specialization and rhythm of operation increase productivity.
5. As the WIP is high in this system, this is stable system. Because of the buffer, the breakdown, absenteeism, balancing of line, change of style can be easily managed.
6. An effective production control system and quality control system can be implemented.

NOTES

- a. Time study, method study techniques.
 - b. Operator training programme.
 - c. Use of material handling equipment, such as centre table, chute, conveyor, trolley, bins, etc.
7. Bundle tracking is possible, so identifying and solving the problems becomes easy.

Disadvantages

1. Balancing the line is difficult and this problem is solved by an efficient supervisor.
2. Proper maintenance of equipment and machinery is needed.
3. Proper planning requires for each batch and for each style, which takes a lot of time.
4. Improper planning causes labor turnover, poor quality, less production, etc.
5. Increase in WIP in each section increases the inventory cost.
6. Planned and proper layout should be made to make the system effective, i.e., smooth flow of material.
7. Variety of styles & less quantity are not effective in this system.
8. Shuttle operators and utility operators needed in every batch to balance the line effectively.

4.10.4 Straight-line or 'Synchro' System

As its name suggests, this system is based on a synchronized flow of work through each stage of producing a garment. Time-synchronization is the most important factor of this system because the flow of work cannot be synchronized if there are considerable variations in the standard times allowed for all the operations performed on the line.

For example, if one operation has a value of 1.5 minutes SAM, then all the other operations in the line must have the same, or a very close, value. The manipulation required to balance the standard time for each operator can sometimes lead to illogical combinations of whole or part operations which are not always conducive to the overall efficiency of individual operators.

Layout for full sleeve shirt - Batch System

PBS - Synchro Straight Line System

NOTES

	CUFF HEM	BOTTOM HEM	
CUFFS	CUFF R/S	CUTT T/S	
	CUFF TURN/TRIM	CUFF FINISH	
	SLEEVE OPEN	CUFF SETTING	ASSE
	SLEEVE FLK ATTACH	CUFF SETTING	MBLY
SLEEVES	SLEEVE PCK FINISH (B)	SIDE TOP STITCH	11
	SLEEVE PCK FINISH (S)	SIDE ATTACH	
	COLLAR R/S	SLEEVE T/S	
	COLLAR TURN	SLEEVE ATTACH	
	COLLAR TOP IRON	SLEEVE SETTING	
	COLLAR T/S	COLLAR FINISH	ASSE
COLLARS	PICK A HEM	COLLAR FINISH	MBLY
	PICK ATTACH	COLLAR ATTACH	1
	PICK CUTTING	COLLAR SETTING	
	PICK IRON	SHOULDER T/S	
	POCKET HEM	SHOULDER ATTACH	
	POCKET MARKING	SHOULDER JOIN SET	
FRONTS	POCKET IRON	POCKET ATTACH	FRONT
	FRONT BUTTON FLK HEM	BACK YOKE LABEL	
	FRONT KAJA FLK HEM	BACK YOKE T/S	BACKS
	FRONT PLACKET FUSING	BACK YOKE ATTACH	

The synchro system by its very nature is rigid and particularly vulnerable to absenteeism and machine breakdowns. At all times reserve operators and machines must be available to fill the gaps. In addition, this system requires a sufficient volume of the same type of garment to keep the line in continuous operation.

4.10.5 Unit Production System (UPS)

As a mechanical system this has been in use for many years, but a major advance was made in 1983 when computers were first used to plan, control and direct the flow of work through the system.

The essential features of this type of system are:

1. The unit of production is a single garment and not bundles.
2. The garment components are automatically transported from workstation to work station according to a pre-determined sequence.
3. The work stations are so constructed that the components are presented as close as possible to the operator's left hand in order to reduce the amount of movement required to grasp and position and component to be sewn.

NOTES

The operational principles are as follows:

All the components for one garment are loaded into a carrier at a workstation specially designed for this purpose. The carrier itself is divided into sections, with each section having a quick-release clamp, which prevents the components from falling out during movement through the system. When a batch of garments has been loaded into carriers they are fed past a mechanical or electronic device, which records the number of the carrier and addresses it to its first destination. Some of the more intelligent systems address the carriers with all the destinations they will have to pass through to completion.

The loaded carriers are then fed onto the main powered line, which continually circulates between the rows of machines. This main, or head, line is connected to each workstation by junctions, which open automatically if the work on a carrier is addressed to that particular station. The carrier is directed to the left side of the operator and waits its turn along with the other carriers in the station.

When the operator has completed work on one carrier, a push button at the side of the sewing machine is pressed and this actuates a mechanism, which transports the carrier back to the main line. As one carrier leaves the station, another is automatically fed in to take its place. When the carrier leaves the station it is recorded on the data collection system, and then addressed to its next destination.

Unit Production System requires substantial investments, which are not always justified by conventional payback calculations. Apart from the measurable tangible benefits, UPS also have many intangible benefits such as a more orderly and controlled flow of work, and the ability via the control computer of simulating the production situation some time in advance. These intangibles are difficult to measure, but in themselves make a very positive contribution to the overall viability of the unit.

All things considered, unit production systems have major advantages over all the other manual and the mechanical systems used for the mass production of clothing. Most importantly, they provide a clothing factory with the capability to respond quickly to any changes, which might occur. In the fast moving fashion business, this is essential.

Advantages

1. Bundle handling completely eliminated.
2. The time involved in the pick-up and disposal is reduced to minimum.
3. Output is automatically recorded, eliminates the operator to register the work.
4. The computerized systems automatically balance the work between stations.
5. Up to 40 styles can be produced simultaneously on one system.

Disadvantages

1. Unit production system requires high investments.
2. The payback period of the investment takes long time.

3. Proper planning is required to be effective.

*Sourcing,
Development
and Production*

4.10.6 Quick Response Sewing System

This system was first developed in Japan to enable quick responses to be made to market changes, especially when orders for individual styles were in small lots. Each workstation is equipped with two or four machines and the operator will take the garment through the required operations, including pressing, before it is transported to the next workstation.

4.10.7 Quick Response System Layout

Some of the basic machinery is duplicated in different stations and if there is a bottleneck in one section the overload is automatically transported to other stations where operator capacity is available.

All the parts of one garment are loaded into a hanging clamp attached to the trolley and in theory, there should only be one garment at each workstation. Work is transported by a computer controlled, overhead-trolley system and each station has an individual controller, which provides the operator with information on the style being worked on. This information comes from an information card, which accompanies each trolley.

A less sophisticated version of QRS uses a wheeled trolley, which contains the components for one garment and is pushed along the floor from operator to operator.

Another feature of QRS is that all the operators work in a standing position so that they can move quickly from one machine to another within their own workstation. Machine heights are adjusted accordingly and touch-pads and knee-pads controls are used instead of conventional foot pedals.

4.10.8 Features

- *Supervision:* Freed to work with the operators.
- *Labor:* Of necessity the operators must be highly skilled in the operation of all the different machines in one workstation.
- *Quality:* In-process inspection stations are built into the line and the inspector is able to return faulty work via the system to the operator concerned.
- *Productivity:* This is very high because the operator handles the garment once only for a number of operations, instead of once for each operation.
- *Throughput time:* As there are so few garments on the line throughput time is extremely short, which is the objective of this system.
- *Layout:* A typical unit would have eight work stations arranged around the transport system.

There is no doubt that this type of system is one of the best answers to the garment production revolution, which is becoming more apparent every day. Fashion changes are becoming more frequent and as a

NOTES

consequence order lots are proportionately smaller. A production system, which enables changeovers to be made in the minimum of time is ideally suited to this new and dynamic situation.

NOTES

4.10.9 Evaluation of Production Systems

Any production system has four primary factors, which make up the system. Processing Time + Transportation Time + Temporary Storage Time + Inspection Time = Total Production Time.

Processing time is sum total of working time of all operations involved in manufacture of a garment. Transportation time involves the time taken to transport semi-finished or finished garments from one department to another or from one operation/machine to another. Temporary storage time is time during which the garment/bundle is idle as it waits for next operation or for completion of certain parts. Inspection time is time taken for inspecting semi-finished garments for any defects during manufacturing or inspecting fully finished garments before packing.

The main aim of any production system is to achieve minimum possible total production time. This automatically reduces in-process inventory and its cost. The sub-assembly system reduces temporary storage time to zero by combining temporary storage time with transportation time.

The choice of best apparel production system will depend on the product and policies of the company and on the capacities of manpower. Where style changes are frequent and lot sizes small, it may be advantageous to use skilled labor who can make whole garment and use one of the whole garment system. As the lot size increases it is advisable to use section production system.

The sub-assembly system is superior to the progressive bundle system as it takes less time. That is the processing time for a garment in both system is same but sub-assembly system has less waiting or temporary storage time. However the space requirement, machinery requirement and labor costs are high for sub-assembly system.

In most cases the choice of a production system depends on the cost of the inventory-in process. Inventory-in process is the total number of garments in the production line. This consists of all garments being processed at sewing machines, under inspection and in temporary storage between operations. When material, labor, space and interest costs are high, synchronized sub-assembly system which yields the least possible in-process inventory is more suitable.

One of the aims of any production system is to make total production time as minimum as possible. This automatically reduces inventory cost to a minimum. Sub-assembly system provides many opportunities to economize on temporary storage and transportation space and time. No definite answer can be given as to which is the best, as it depends on garment style, specifications, machinery and manpower and manufacturing policies.

4.11 PRODUCTION PROCESS

The basic processes of textile manufacturing viz. spinning, weaving, knitting, finishing processes, dyeing, printing and others are all involved in fabric manufacturing. However, the actual ready to wear apparel involves many more processes right from pattern drafting to garment construction which include pattern designing and pattern making, grading, marker making, apparel cutting, sewing, pressing and finishing. Lets have an overview of the basic processes as well as the latest trends in the making of an apparel.

4.11.1 Pattern Making

The basic procedure for apparel making is to design a pattern and put it into an identifiable form. The traditional method of pattern making includes creation of *hard paper patterns*. The modern apparel making system has adopted the digitization of pattern making process. These days many clothing firms provide the most modern and technical services for garment construction. They can create fresh computerized patterns or make modifications to existing hard paper patterns or digitize the available data. These patterns can be made from their own samples or specifications provided by the apparel manufacturers. Most of these firms try to provide patterns that will sew properly without confusion in the production line.

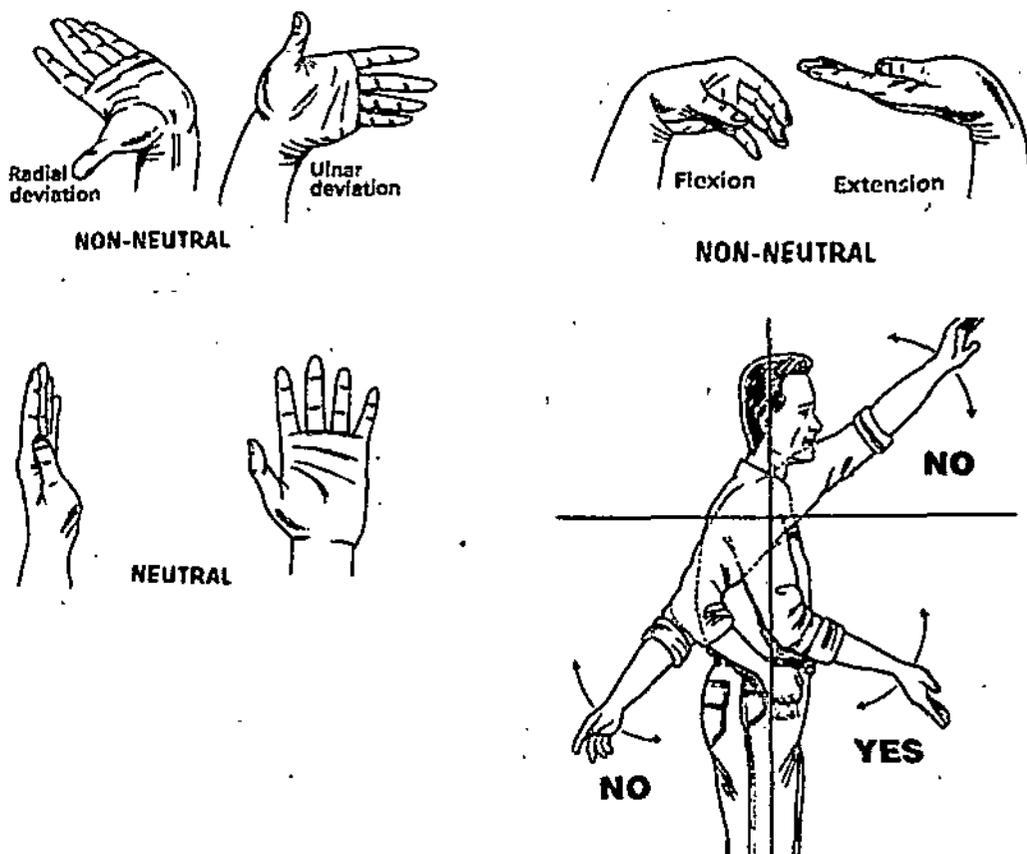
4.11.2 Pattern Grading

Grading is the process used for creating sized patterns. There are certain proportional rules and set increments that form the basis of grading. These rules are set on the basis of analysis on body measurements of the general population. The clothing firms also help in pattern grading using the specifications provided by the apparel manufacturers and some of them also assist the manufacturers in establishing specifications for their product. The grade rules are developed keeping in view the market segment for which the product is intended such as men, women, youth, child, toddler etc. These firms mostly use the softwares available in the market for checking the accuracy of the grades.

4.11.3 Marker Making

Fabric is the most important basic material for apparel making and it accounts for around 50 per cent of the ex-factory cost of a garment. Thus, *material optimization or maximizing fabric utilization* is the fundamental factor for every apparel firm. Marker making is done to avoid material wastage. While making markers, fabric width, length, fabric type and subsequent cutting method, all are taken into account. Both single size and multiple size paper markers are made using automated marker making tools and Computer Aided Design Computer Aided Manufacturing (CAD/CAM) along with traditional manual methods. The firms providing this service use previously graded pattern or the digitized copy of styles

NOTES



provided by the apparel manufacturers.

4.11.4 Apparel Cutting

Apart from using traditional tools such as straight knife, band knife, shears etc. nowadays, automatic spreading equipment and computerized cutting systems are widely used for apparel cutting. Pattern specifications are kept into consideration while cutting which ensures that the constructed garment is exactly similar to the sample produced. The use of markers ensures as little textile waste as possible.

4.11.5 Apparel Sewing

The sewing operation in most of the garment construction companies is closely supervised for quality control. A variety of apparel styles and fabrics are sewn these days. There are a large number of sewing machines available for almost any sewing operation. Some of the examples of such machines are single needle, double needle, safety stitch, automatic meter, automatic multi stitch, loop tacker, pocket welt, keyhole buttonhole, automatic button sewer, round eyelet etc.

4.11.6 Pressing and Finishing

After the sewing operation, the constructed garments are examined, pressed, tagged and bagged in the pressing and finishing department. The

automated processes adopted these days prevent the possibility of wrinkling of the sewn garments throughout the finishing process.

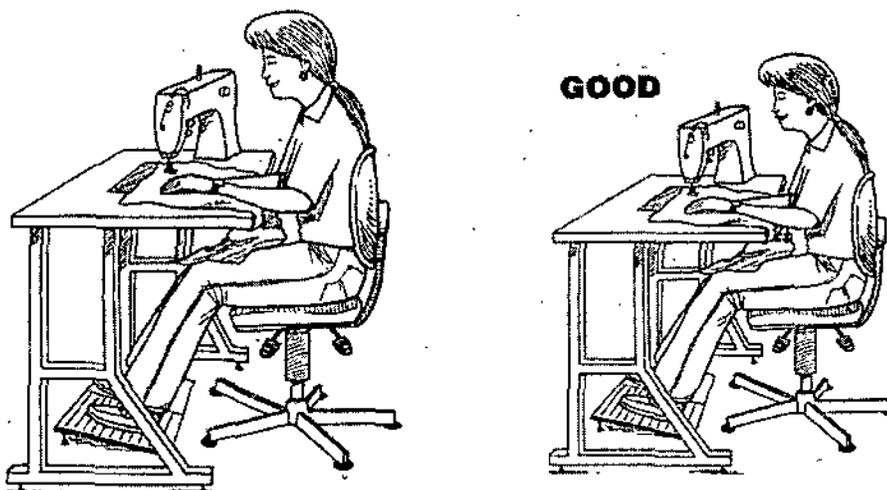
4.12 ERGONOMICS

NOTES

Ergonomics is the study of the relationship between a person and their work environment. The objective is to adapt the workplace for the worker in order to decrease the risk of injury and improve the link between the worker and their environment.

Awkward body postures are a major ergonomic concern in the garment industry. Awkward postures take the body away from a comfortable position, which reduces efficiency and increases the use of energy. Another major concern are static postures. Static means to hold in place, so these are postures where the body is held in one position for a long period of time. An example is when you work with your arms above shoulder height for long periods of time. These types of postures require constant muscle use for the time the body is held in the position. This reduces rest and recovery time, which leads to muscle tiredness. The following are recommendations which will help to reduce the risk of injury due to the above concerns.

For seated and standing work, the height of the workstation should allow workers to function with elbows at 90 degrees. If the workstation is too low, the worker is forced to bend at the waist to reach the work being done. This puts stress on the lower back. If the station is too high, the worker is forced to lift their shoulders or move their elbows away from the body to reach their work. This puts increased stress on the shoulders which may lead to injury.



During seated work, if a good back support is not present or used, static postures occur which results in constant use of the back muscles. It is important to adjust the workstation in order to allow the worker to use

NOTES

the backrest. It is also important to adjust the worker's chair to allow duties to be performed with their bodies in comfortable positions. The workstation and chair should be positioned so that the worker's knees, hips, and elbows are at 90 degrees, which will reduce stress on the body. There should also be enough room to allow the worker to change their sitting position throughout the day.

Static postures can also occur during standing work. If the worker stands in one position for long periods of time, muscles of the back and legs will be constantly activated. This can lead to increased fatigue, and decreased blood circulation to the legs. During the day, workers should try to walk around to allow their blood to flow. As well, workers should try and sit for short periods of time while working to give their leg and back muscles a rest.

Awkward wrist postures are one of the major causes of cumulative trauma disorders (CTD) such as carpal tunnel syndrome (CTS), tendinitis, and muscle strains. Awkward wrist postures are those which take the wrist away from the neutral position. Neutral position is when the hand is in line with the forearm. The workstation should be adjusted and the worker educated on awkward wrist postures, their harmful effects, and the signs and symptoms of CTD's.

Workers should not constantly work with their arms above shoulder level. Work above the shoulders increases the use of the shoulder muscles. With this constant use, the muscles do not have time to rest and thus tire more rapidly. The majority of work should be done between knuckle height and shoulder level.

Workers should try not to twist their upper body when placing objects besides them. By keeping their feet in place and only moving their upper body, workers are putting large stresses on their backs, which may lead to injuries. Workers should move their feet, instead of twisting at the waist, in order to face the area where the object is going to be placed. If the worker is sitting, they should try to swivel in their chair, instead of twisting their upper body.

4.13 PRODUCTION PLANNING

Global sourcing in the clothing industry brings cost advantages as labor costs can be drastically reduced. In an industry that is still very labor intensive and with retailers squeezing margins, this is very important. But lead times, responsiveness, and control can sometimes suffer as a consequence of distance.

The pressures in this dynamic marketplace include:

- Customers demanding more new fashions than ever before at lower prices
- More styles per season leads to fragmentation - more styles to control in smaller quantities
- Smaller order quantities lead to increased volume of orders

NOTES

- Small orders need smaller sewing teams, which leads to increased management and planning
- Shorter lead times - commitment to production takes place later each season
- Changing customer requirements
- Demands for accurate order information.

As in any other industry, to remain competitive manufacturers need to:

- Deliver on time
- Improve productivity
- Respond quickly
- Reduce WIP
- Deliver to a price
- Reduce excess costs such as overhead
- Introduce best practices
- Achieve accurate and consistent information.

Fire-fighting is no longer an option. Change is essential in order to survive, and good control is fundamental. Failing to plan results in bottlenecks, unnecessary style changes, lack of prioritization, and unclear order status. The result is loss of customer confidence and loss of future orders.

"The key word is value. How can a company create the most value for its customers and thus reap the profit growth needed to sustain the company?"

The solution is to install a systematic and detailed approach to production planning, but the textile industry is notoriously traditional. In too many businesses, departments still operate as functional 'islands'. Managers may talk to each other but work is unco-ordinated and ineffective.

4.13.1 The Planning Process in Clothing Manufacture

The basic process includes the following stages:

1. Receive the order
2. Plan to check if there is available capacity in sewing to achieve the delivery date required
3. Plan to check the available capacity in non-sewing areas (cut, embroidery; print, wash and pack)
4. Plan to check sufficient lead time to order and receive fabric, trims, approve sample, carry out lab tests
5. Confirm delivery date to customer and reserve capacity
6. Communicate plan to all departments
7. Monitor progress against plan
8. Re-plan as required and return to Point 5.

NOTES

In an ideal world, this cycle would be carried out in a systematic way. No plan is ever perfect, but all that we have learned about total quality management reminds us that we must aim at the ideal rather than settle for 'Acceptable Quality Levels' that have a built-in failure rate. Although the first priority is the customer delivery date, the factory must also consider the best place to make each product, taking into account both skill and machine constraints. Production efficiency depends upon this. In the clothing industry, planning will typically focus on sewing, as it can account for up to 80% of the skill and resources required. However, the capacity constraints of supporting areas also have to be assessed. In particular, the pre-production events must be planned to ensure that production begins on schedule.

4.13.2. Basic Capacity Calculations

In the clothing industry, most companies still work to standard minutes, which is the calculated or measured standard time to produce a garment. A basic calculation may be as follows:

- 8 working hours per day = 480 minutes
- 10 operators per team
- Capacity = 4800 minutes per day
- Standard Minutes for T-shirt style a = 12 std min @ 100% efficiency = $4800/12 = 400$ pieces per day

However, it may be necessary to take into account the skills and efficiency of different teams, or the ability of a team to make different products. For instance, if a team normally makes woven garments, to change to a knitted T-shirt means that they are less skilled at handling that item of clothing. If they can only achieve 75% efficiency, the output is only 300 pieces per day. The impact on the production plan is huge.

Many readers will be used to volume manufacturing of widgets and know about the steady automation of their industries. The clothing industry is still very heavily dependent on human labor, despite increasing use of automated processes. Add to this the whims of the fashion market, which cause constant style changes (equivalent to the constant engineering changes that manufacturing engineers so hate), and you have huge difficulty in achieving efficiencies and optimizing operator skills. If you can keep a team of operators making the same type of product as long as possible, production loss is minimized.

The plan must also consider the specialist support areas. Working back from the sewing plan, it is necessary to calculate where the loading will impact resources. The plan must then allow for post-sewing operations such as garment washing (where relevant), otherwise the sewing plan will be acceptable but WIP builds up in the other areas. Critical path analysis is a vital tool in this process - if the plan moves, so must the priorities.

4.13.3 Coping With Planning

Most business systems offer some capacity planning, often limited to rough cut capacity planning. Many of these systems are not graphical, are complex to use, and not user-friendly. Many use spreadsheets, which are often well-applied but they have several drawbacks:

- They are designed by one person and not transparent
- They are not visual
- They cannot be shared on a network and therefore limit co-ordination
- They do not highlight problems clearly
- They are cumbersome and difficult to manage with large numbers of orders
- They are very difficult to amend when customer requirements change.

These systems therefore do not give answers quickly enough for the dynamic world of the fashion industry. A system named Fast React designed to overcome these problems is now used in over 25 countries world-wide. The case study described here demonstrates how the implementation of a comprehensive planning system can contribute to efficiency and productivity gains.

4.13.4 Setting up the System

To set up production, certain information must be entered.

1. Product reference
2. Order reference
3. Order quantity
4. Delivery schedule required by customer- dozen garments per week
5. Selling price per dozen
6. Cost per dozen
7. Return per dozen
8. Work content- standard hours per dozen.

This order then appears in a load list (an order book) listing the order reference and the quantity to be loaded onto the plan. The order can then be lifted from the load list and placed appropriately onto the planning board. This board is set out as per the factory i.e., line 1, 2, 3 etc., with the number of operators on each line specified. As the order is dropped onto the board, the system works out automatically the rate of production, based on the information already in the system. The strip will then turn a certain color, giving the Planner information about the implications of their actions. If the strip color is grey, no delivery problems are forecast. The color changes as appropriate indicating potential late and very late schedules. The display on the board can be changed, and instead of delivery information being relayed via color, it can be product information, or customer information for example.

NOTES

Once the board is loaded up completely, an operator reconciliation is completed, showing how many operators are available against the number needed to complete the plan. A plan can then be printed, which provides the work instructions. Responsibility then devolves to the factory manager and the planner/buyer to ensure the plan is achieved.

The factory works until 11:30 on a Friday, at which time all production stops and a weekly total is calculated for each line and style. This information is then used to update the planning system. The strip size will then be reduced to take account of the previous week's production and the whole process then starts again, responding to the ever changing customer demands.

4.13.5 Management of the Critical Path

Before a garment can go onto a production line, there is an enormous amount of pre-production activity that must take place. This is some-times dictated by the customers' way of working, or by common sense and good practice.

Each activity or event is allocated to a responsible person. Only key events - things that must happen before a garment can go into production - are included. For example:

- Label Information- unique product numbers used to control products throughout the whole client system
- Quality Seals from customer (standards- aesthetics, fit, durability etc)
- Wearer trials
- Fabric approved- color, print etc.

Each week the Planning Executive produces a 'to do list' for each responsible executive. This list relates exactly to where the order is on the planning board. If the order moves forward, or backward, so too do the dates on the Critical Path. The anchor date is the production start date.

The first event might need to take place 4 weeks before the production start date. If the production start date is pulled forward for whatever reason, the system automatically highlights the potential problem. The Planning Executive is then required to make a decision to

- postpone the start date
- pull strings
- rush the pre-production process along!

The difference now is, that the managers know what the decision has been. Instead of getting the production line set up; the operators trained; the fabric in; before finding that the label information is unavailable for the next 2 weeks, this total waste of effort can now be avoided. Each week the responsible executive returns the list to the Planning Executive who inputs the completed events on the system. This changes the status of the order on the planning board.

Only the fittest and leanest operations in this country will survive. If you are still mass manufacturing clothing in the UK, then you are doing so:

- Efficiently
- Cost effectively
- Responsively
- Flexibly
- With a huge amount of effort on Planning and Control.

The new software system contributed enormously to this particular company's success by integrating essential information. However, it must be combined with the very real understanding the planners have of the organization's objectives and the customers' requirements. It is this combination, together with a willingness to change, that has helped them to survive.

4.14 HUMAN RESOURCE MANAGEMENT

For performance and profitability improvement of any company, a proper strategy, covering aspects like technical (productivity, product quality, wastages etc.) Improvements, image & marketing improvements etc needs to be formulated & implemented. For successful implementation of those formulated strategies needs to be done by employees (humans) and HRM plays a very vital role in success of this. In the following case study, how a proper HRM has helped company to implement its strategies and come out of red.

Profitability of any industry depends on money (financial Inputs), material (raw material & other store spares inputs), machinery (technology used and its level of upkeep), man (employees - human resources), systems/procedures and market (demand and price position). But over & all above there is one most important aspect and that is culture - ethics of company and people working there. It must help to create in the mind of all employees, a bond of togetherness & belongings to the company and every one in company must feel this. This is real HRM and most important for the better and smooth functioning of the industry. It is understanding of human/labor psychology).

It is the responsibility of line managers and the human resource department in an apparel industry to analyze human resources' information so that they can make decision on whether they have sufficient employees, machines and other resources or not. Alternately, they can also hire people with the requisite skills to build an inventory of skilled employee and maintain resource information. For this purpose, HR manager has to handle a large number of data associated to present and prospective employees. An essential component in the success of managing this data is the human resource information system, a data base of personal information about each employee. The nature of HR itself demands that organizations develop new capabilities and that HR's role is to reevaluate its competencies and develop new ones to help in the overall strategic redesign of organizations.

In most organizations, information flows at the heart of workplace

NOTES

activities. The effective management of information requires information technology, and that technology is therefore crucial to organizational success. Information technology comes in many forms—networked personal computers, software applications, the internet, and more. People put the technology to work in managing information, and people are ultimately responsible for whether information technology succeeds or fails. Almost all organizations that use information technology in any substantial way are also struggling to maintain effective information security. Integration of information technology and management information system shows a great effect on employee, process and accounts in the garments industries. A resource information system is essentially a checklist or database of organizational capabilities that can help a company determine whether it can deliver a right thing in the right place at the right time. In a globally competitive business environment, it is necessary for an organization to know its competitive strength. The ways employees handle information, communicate, as well as execute business processes have significantly changed with the emergence of web-based technologies and the subsequent emergence of employee portals. In this research, a conceptual model of integration of employee information system (EIS), machines information and skill inventory is developed, which considers the specific requirements of employee portals. The expected result of this work is to easily maintain employee information system and get hard copy of EIS document.

4.15 INVENTORY MANAGEMENT

Inventory management is the process of efficiently overseeing the constant flow of units into and out of an existing inventory. This process usually involves controlling the transfer in of units in order to prevent the inventory from becoming too high, or dwindling to levels that could put the operation of the company into jeopardy. Competent inventory management also seeks to control the costs associated with the inventory, both from the perspective of the total value of the goods included and the tax burden generated by the cumulative value of the inventory.

Balancing the various tasks of inventory management means paying attention to three key aspects of any inventory. The first aspect has to do with time. In terms of materials acquired for inclusion in the total inventory, this means understanding how long it takes for a supplier to process an order and execute a delivery. Inventory management also demands that a solid understanding of how long it will take for those materials to transfer out of the inventory be established. Knowing these two important lead times makes it possible to know when to place an order and how many units must be ordered to keep production running smoothly.

Calculating what is known as buffer stock is also key to effective inventory management. Essentially, buffer stock is additional units above and beyond the minimum number required to maintain production levels. For example, the manager may determine that it would be a good idea to keep one or two extra units of a given machine part on hand, just in case

NOTES

an emergency situation arises or one of the units proves to be defective once installed. Creating this cushion or buffer helps to minimize the chance for production to be interrupted due to a lack of essential parts in the operation supply inventory.

Inventory management is not limited to documenting the delivery of raw materials and the movement of those materials into operational process. The movement of those materials as they go through the various stages of the operation is also important. Typically known as a goods or work in progress inventory, tracking materials as they are used to create finished goods also helps to identify the need to adjust ordering amounts before the raw materials inventory gets dangerously low or is inflated to an unfavorable level.

Finally, inventory management has to do with keeping accurate records of finished goods that are ready for shipment. This often means posting the production of newly completed goods to the inventory totals as well as subtracting the most recent shipments of finished goods to buyers. When the company has a return policy in place, there is usually a sub-category contained in the finished goods inventory to account for any returned goods that are reclassified as refurbished or second grade quality. Accurately maintaining figures on the finished goods inventory makes it possible to quickly convey information to sales personnel as to what is available and ready for shipment at any given time.

In addition to maintaining control of the volume and movement of various inventories, inventory management also makes it possible to prepare accurate records that are used for accessing any taxes due on each inventory type. Without precise data regarding unit volumes within each phase of the overall operation, the company cannot accurately calculate the tax amounts. This could lead to underpaying the taxes due and possibly incurring stiff penalties in the event of an independent audit.

4.16 SUMMARY

The Apparel Industry is growing at a very high rate but still there are some barriers, which are hindering the growth of this industry. Though the demand for garments is increasing day by day but the production rate has still not been able to match with the ever rising demand. More production facilities are needed to meet the demand. Most of the raw material needed for apparel manufacturing is available in the developing or under developed countries and these countries do not have enough resources and manpower to explore them. These countries also do not have finance to set up factories for clothing and garment production. Globalization has helped the trade in many ways but due to globalization the competition has increased and so it is not very easy for the firms to cope up with so much competition, as they have to meet the deadlines and also maintain quality. The importers of developed economies are facing very stiff competition as countries like China are producing good quality

NOTES

products in low prices due to availability of very cheap labor. Some trade laws still are very much in favor of developed countries and they need to be reviewed, to facilitate imports from the developing countries. As apparel industry is fashion driven, and fashion keeps changing, the firms have to cope with the changing apparel industry trends and still complete orders in time.

4.17 GLOSSARY

- **Global sourcing:** A procurement strategy in which a business seeks to find the most cost efficient location for manufacturing a product, even if the location is in a foreign country. For example, if a toy manufacturer finds that manufacturing and delivery costs are lower in a foreign country due to lower wages of foreign employees, the company might close the domestic factory and use a foreign manufacturer.
- **Production System:** Manufacturing subsystem that includes all functions required to design, produce, distribute, and service a manufactured product.
- **Production Process:** Mechanical or chemical steps used to create an object, usually repeated to create multiple units of the same item. Generally involves the use of raw materials, machinery and manpower to create a product.
- **Inventory:** An itemized catalog or list of tangible goods or property, or the intangible attributes or qualities.
- **Ergonomics:** Study of capabilities and limitations of mental and physical work in different settings. Ergonomics applies anatomical, physiological, and psychological knowledge (called human factors) to work and work environments in order to reduce or eliminate factors that cause pain or discomfort.

4.18 REVIEW QUESTIONS

1. What are the sourcing issues in apparel industry?
2. How costing is done for the imported goods in the apparel industry?
3. What are the productivity concepts in apparel industry?
4. What is apparel production system? Explain.
5. What is the significance of ergonomics in the apparel manufacturing industry?
6. Explain the significance of production planning in the apparel manufacturing.
7. What is significance of inventory management in apparel industry?