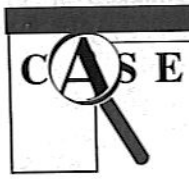
TABLE 3-12

TRANSPORTATION COSTS PER UNIT IN CENTRALIZED SYSTEM

Warehouse	Atlanta	Boston	Chicago	Dallas	Los Angeles
Atlanta	13	14	14	15	17
Boston	14	13	8	15	17
Chicago	14	8	13	15	16
Dallas	15	15	15	13	8
Los Angeles	17	17	16	8	13

Suppose you are to compare the two systems for Product A only, what is your recommendation? To answer this question, you should compare costs and average inventory levels for the two strategies assuming demands occur according to the historical data. Also, you should determine which regional warehouse will be used as the centralized warehouse.

c. It is proposed that in the centralized distribution strategy, that is, the one with a single warehouse, products will be distributed using UPS Ground Service, which guarantees that products will arrive at the warehouse in three days (0.5 week). Of course, in this case, transportation cost for shipping a unit product from a manufacturing facility to the warehouse increases. In fact, in this case, transportation costs increase by 50 percent. Thus, for instance, shipping one unit from the manufacturing facility to Atlanta will cost $18. Would you recommend using this strategy? Explain your answer.



Sport Obermeyer

Aspen, Colorado

Wally Obermeyer deftly balanced his office keys and a large printout of forecasting data as he wheeled his mountain bike through the front entrance of Sport Obermeyer's headquarters in Aspen, Colorado. It was a crisp November morning in 1992; Wally paused for just a moment to savor the fresh air and beauty of the surrounding mountains before dosing the door behind him.

Wally had arrived at work early to start one of the most critical tasks Sport Obermeyer, a fashion skiwear manufacturer, faced each year—committing to specific production quantities for each skiwear item the company would offer in the coming year's line. The task required carefully blending analysis, experience, intuition, and sheer speculation. This morning Sport Obermeyer would start to make firm commitments for producing its 1993–1994 line of fashion skiwear with scant information about how the market would react to the line. In fact, no clear indications had yet emerged about how end-consumers were responding to the company's current 1992–1993 line. Despite the attraction of waiting for market information, Wally knew that further procrastination would delay delivery to retailers and that late delivery would reduce the exposure consumers would have to Obermeyer products.

As usual, Obermeyer's new line offered strong designs, but the ultimate success of the line was highly dependent on how well the company was able

Source: Copyright © 1994 by the President and Fellows of Harvard College. This case was written by Janice H. Hammond and Ananth Raman of Harvard Business School.

to predict market response to different styles and colors. Feedback from retailers on the 1993–1994 line wouldn't begin to surface until the Las Vegas trade show next March, long after many of Obermeyer's products had entered production. Wally mused:

> How appropriate that our fate is always determined in Las Vegas. Like most fashion apparel manufacturers, we face a "fashion gamble" each year. Every fall we start manufacturing well in advance of the selling season, knowing full well that market trends may change in the meantime. Good gamblers calculate the odds before putting their money down. Similarly, whether we win or lose the fashion gamble on a particular ski parka depends on how accurately we predict each parka's salability.

Inaccurate forecasts of retailer demand had become a growing problem at Obermeyer: in recent years greater product variety and more intense competition had made accurate predictions increasingly difficult. Two scenarios resulted—both painful. On one hand, at the end of each season, the company was saddled with excess merchandise for those styles and colors that retailers had not purchased; styles with the worst selling records were sold at deep discounts, often well below their manufactured cost. On the other hand, the company frequently ran out of its most popular items; although popular products were clearly desirable, considerable income was lost each year because of the company's inability to predict which products would become best-sellers.

Wally sat down at his desk and reflected on the results of the day-long "Buying Committee" meeting he had organized the previous day. This year Wally had changed the company's usual practice of having the committee, which comprised six key Obermeyer managers, make production commitments based on the group's consensus. Instead, hoping to gather more complete information, he had asked each member independently to forecast retailer demand for each Obermeyer product. Now it was up to him to make use of the forecasts generated by the individuals in the group. He winced as he noted the discrepancies between different committee members' forecasts. How could he best use the results of yesterday's efforts to make appropriate production commitments for the coming year's line?

A second issue Wally faced was how to allocate production between factories in Hong Kong and China. Last year, almost a third of Obermeyer's parkas had been made in China, all by independent subcontractors in Shenzhuen. This year, the company planned to produce half of its parkas in China, continuing production by subcontractors, and starting production in a new plant in Lo Village, Guangdong. Labor costs in China were extremely low, yet Wally had some concerns about the quality and reliability of Chinese operations. He also knew that plants in China typically required larger minimum order quantities than those in Hong Kong and were subject to stringent quota restrictions by the U.S. government. How should he incorporate all of these differences into a well-founded decision about where to source each product?

Tsuen Wan, New Territories, Hong Kong

Raymond Tse, managing director, Obersport Limited, was anxiously awaiting Sport Obermeyer's orders for the 1993–1994 line. Once the orders arrived, he would have to translate them quickly into requirements for specific components and then place appropriate component orders with vendors. Any delay would cause problems: increased pressure on his relationships with vendors, overtime at his or his subcontractors' factories, or even late delivery to Sport Obermeyer.

Obersport Ltd. was a joint venture established in 1985 by Klaus Obermeyer and Raymond Tse to coordinate production of Sport Obermeyer products in the Far East. (See Figure 3-14.) Obersport was responsible for fabric and component sourcing for Sport Obermeyer's entire production in the Far East. The materials were then cut and sewn either in Raymond Tse's own "Alpine" factories or in independent subcontractors located in Hong Kong, Macau, and China. Raymond was owner and president of Alpine Ltd., which included skiwear manufacturing plants in Hong Kong as well as a recently established facility in China. Sport Obermeyer's orders represented about 80 percent of Alpine's annual production volume.

Lo Village, Guangdong, China

Raymond Tse and his cousin, Shiu Chuen Tse, gazed with pride and delight at the recently completed factory complex. Located among a wide expanse of rice paddies at the perimeter of Lo Village, the facility would eventually provide jobs, housing, and recreational facilities for more than 300 workers.

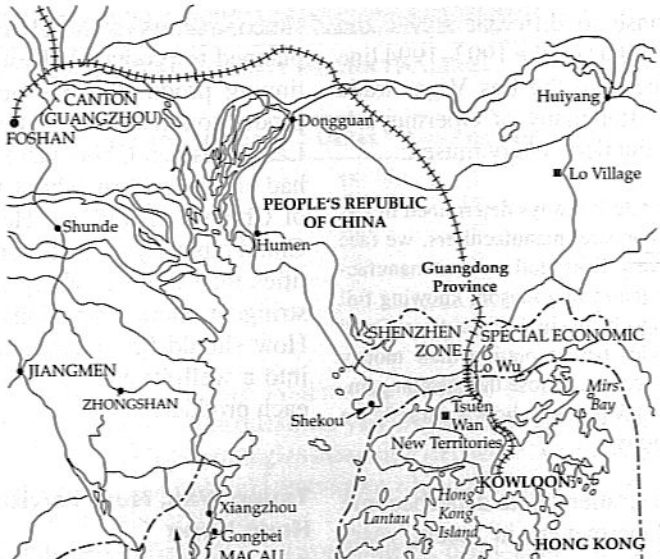


FIGURE 3-14 Map of Facilities (Hong Kong and Guangdong).

This facility was Alpine's first direct investment in manufacturing capacity in China.

Shiu Chuen had lived in Lo Village all of his life—the Tse family had resided there for generations. Raymond's parents, former landowners in the village, had moved to Hong Kong before Raymond was born, returning to the village for several years when Raymond was a young boy during the Japanese occupation of Hong Kong in World War II. In 1991, Raymond Tse had visited Lo Village for the first time in over 40 years. The villagers were delighted to see him. In addition to their personal joy at seeing Raymond, they hoped to convince him to bring some of his wealth and managerial talent to Lo Village. After discussions with people in the community, Raymond decided to build the factory, so far investing over US$1 million in the facility.

Working with Alpine's Hong Kong management, Shiu Chuen had hired 200 workers for the factory's first full year of operation. The workers had come from the local community as well as distant towns in neighboring provinces; most had now arrived and were in training in the plant. Shiu Chuen hoped he had planned appropriately for the orders Alpine's customers would assign to the plant this year; planning had been difficult since demand, worker skill levels, and productivity levels were all hard to predict.

SPORT OBERMEYER, LTD.

Sport Obermeyer's origins traced to 1947, when Klaus Obermeyer emigrated from Germany to the United States and started teaching at the Aspen Ski School. On frigid, snowy days Klaus found many of his students cold and miserable due to the impractical clothing they wore—garments both less protective and less stylish than those skiers wore in his native Germany.

During summer months, Klaus began to travel to Germany to find durable, high-performance ski clothing and equipment for his students. An engineer by training, Klaus also designed and introduced a variety of skiwear and ski equipment products; he was credited with making the first goose-down vest out of an old down comforter, for example, in the 1950s. In the early 1980s, he popularized the "ski brake,"

a simple device replacing cumbersome "run-away straps"; the brake kept skis that had fallen off skiers from plunging down the slopes. Over the years, Sport Obermeyer developed into a preeminent competitor in the U.S. skiwear market: estimated sales in 1992 were $32.8 million. The company held a commanding 45 percent share of the children's skiwear market and an 11 percent share of the adult skiwear market. Columbia Sportswear was a lower-price, high-volume-per-style competitor whose sales had increased rapidly during the previous three years. By 1992 Columbia had captured about 23 percent of the adult ski-jacket market.

Obermeyer offered a broad line of fashion ski apparel, including parkas, vests, ski suits, shells, ski pants, sweaters, turtlenecks, and accessories. Parkas were considered the most critical design component of a collection; the other garments were fashioned to match their style and color.

Obermeyer products were offered in five different "genders": men's, women's, boys', girls', and preschoolers'. The company segmented each "gender" market according to price, type of skier, and how "fashion-forward" the market was. For example, the company divided its adult male customers into four types, dubbed Fred, Rex, Biege, and Klausie. A Fred was the most conservative of the four types; Freds had a tendency to buy basic styles and colors and were likely to wear the same outfit over multiple seasons. High-tech Rex was an affluent, image-conscious skier who liked to sport the latest technologies in fabrics, features, and ski equipment. In contrast, Biege was a hard-core mountaineering-type skier who placed technical performance above all else and shunned any nonfunctional design elements. A Klausie was a flamboyant, high-profile skier or snowboarder who wore the latest styles, often in bright colors such as neon pink or lime green.

Within each "gender," numerous styles were offered, each in several colors and a range of sizes. Figure 3-15 shows how the variety of Obermeyer's women's parkas had changed over time, including the total number of stockkeeping units Obermeyer offered during the preceding 16-year period, as well as the average number of styles, colors per style, and sizes per style-color combination offered.

Obermeyer competed by offering an excellent price/value relationship, where value was defined as both functionality and style, and targeted the middle to high end of the skiwear market. Unlike some of its competitors who made outerwear for both skiing and casual "street wear," Obermeyer sold the vast majority (over 85 percent) of its products to customers for use while skiing. Functionality was critical to the serious skier: products had to be warm and waterproof, yet not constrain the skier's ability to move his or her arms and legs freely.

Management believed that the effective implementation of its product strategy relied on several logistics-related activities, including delivering matching collections of products to retailers at the same time (to allow consumers to view and purchase coordinated items at the same time) and delivering products to retail stores early in the selling season (to maximize the number of "squarefootage days" products were available at retail).

Management Approach

Throughout the company's history, Klaus Obermeyer had been actively involved in company management. Klaus believed that a company should run "free of tension." Klaus's personal philosophy was at the core of his management style; in both his personal life and his professional life he sought to "achieve harmony." He observed:

> We're blending with the forces of the market rather than opposing them. This leads to conflict resolution. If you oppose a force, you get conflict escalation. It is not money, it is not possessions, it is not market share. It is to be at peace with your surroundings.

In accordance with his philosophy, Klaus believed that the skiwear industry should be left to people who were "comfortable with an uncertain bottom line." Klaus's management style emphasized trust in people and providing value to customers. He believed many aspects of the business fell into the artistic realm; in making decisions, one should be guided by one's judgment and intuition. In his joint venture with Raymond Tse, Klaus relied on his trust of Raymond and had always left production and investment decisions to Raymond.

Although Klaus was the "heart and soul" of the company, other members of the family had played key roles in the company's growth as well. Klaus's wife, Nome, a successful designer, was actively involved in developing new products for the company. In Klaus's judgment, Nome had a "feel" for fashion—Klaus

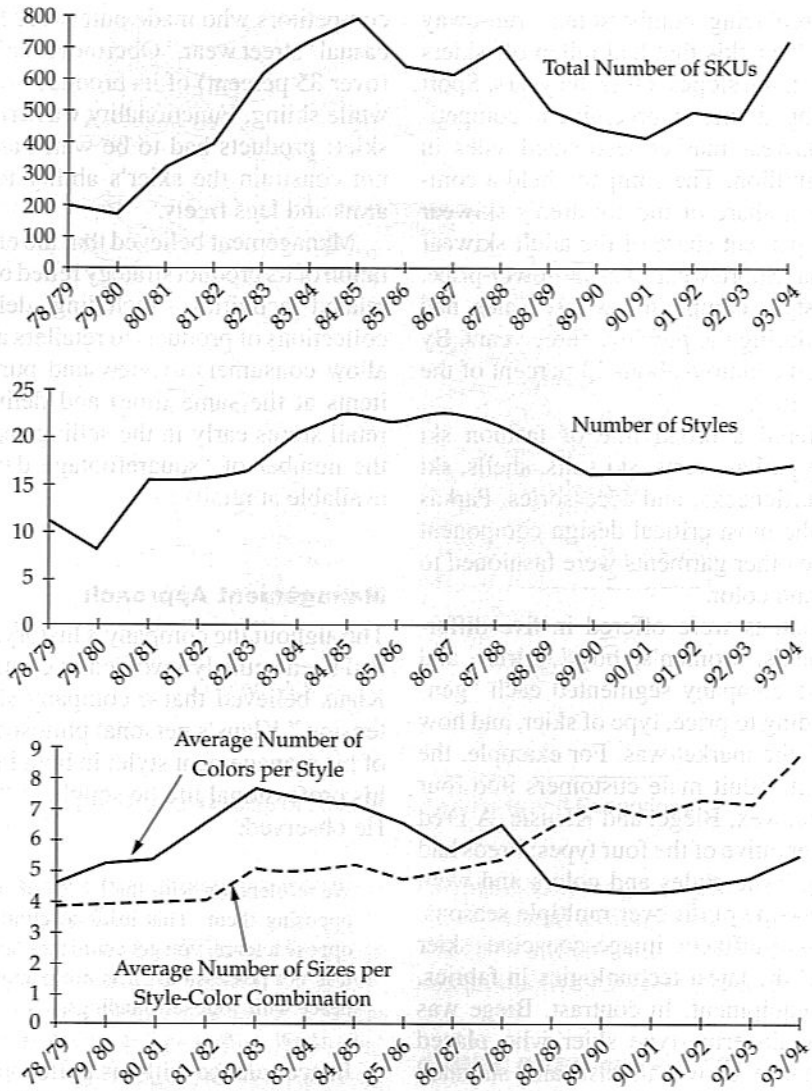


FIGURE 3-15 Product variety, Obermeyer women's parkas.
Note:
An example of a "style" is a Stardust parka.
An example of a "style-color combination" is a red Stardust parka.
An example of an "SKU" (stockkeeping unit) is a size 8, petite, red Stardust parka.

had relied heavily on her judgment in assessing the relative popularity of various designs.

In recent years, Klaus's son Wally had become actively involved in managing the company's internal operations. After completing high school, Wally combined working part time for the company with ski-patrolling on Aspen Mountain for six years, before entering college in 1980. After graduating from the Harvard Business School in 1986, Wally initially focused his efforts on developing a hydro-electric power-generating plant in Colorado. By 1989, the power plant was established and required less day-to-day involvement. He joined Sport Obermeyer full time in 1989 as vice president.

As is often the case, the company founder and his MBA son had different management approaches: Wally relied more heavily on formal data-gathering and analytical techniques, whereas Klaus took a

more intuitive style that was heavily informed by his extensive industry experience.

THE ORDER CYCLE

Sport Obermeyer sold its products primarily through specialty ski-retail stores, located either in urban areas or near ski resorts. Obermeyer also served a few large department stores (including Nordstrom) and direct mail retailers (including REI). In the United States, most retail sales of skiwear occurred between September and January, with peak sales occurring in December and January. Most retailers requested full delivery of their orders prior to the start of the retail season; Sport Obermeyer attempted to deliver coordinated collections of its merchandise into retail stores by early September. Nearly two years of planning and production activity took place prior to the actual sale of products to consumers. (See Table 3-13.)

The Design Process

The design process for the 1993–1994 line began in February 1992, when Obermeyer's design team and senior management attended the annual international outdoorswear show in Munich, Germany, where they viewed current European offerings. "Europe is more fashion-forward than the United States," Klaus noted. "Current European styles are often good indicators of future American fashions." In addition, each year, a major trade show for ski equipment and apparel was held in Las Vegas. The March 1992 Las Vegas show had provided additional input to the design process for the 1993–1994 line. By May 1992, the design concepts were finalized; sketches were sent to Obersport for prototype production in July. Prototypes were usually made from leftover fabric from the previous year since the prototype garments would be used only internally by Obermeyer management for decision-making purposes. Obermeyer refined the designs based on the prototypes and finalized designs by September 1992.

Sample Production

As soon as designs were finalized, Obersport began production of sample garments—small quantities of each style-color combination for the sales force to show to retailers. In contrast to prototypes, samples were made with the actual fabric to be used for final production; dyeing and printing subcontractors were willing to process small material batches for sample-making purposes. Sales representatives started to show samples to retailers during the week-long Las Vegas show, typically held in March, and then took them to retail sites throughout the rest of the spring.

Raw Material Sourcing and Production

Concurrent with sample production, Obersport determined fabric and component requirements for Obermeyer's initial production order (typically about half of Obermeyer's annual production) based on Obermeyer's bills of material. It was important that Obersport place dyeing/printing instructions and component orders quickly since some suppliers' lead times were as long as 90 days. Cutting and sewing of Obermeyer's first production order would begin in February 1993.

Retailer Ordering Process

During the Las Vegas trade show, most retailers placed their orders; Obermeyer usually received orders representing 80 percent of its annual volume by the week following the Las Vegas show. With this information in hand, Obermeyer could forecast its total demand with great accuracy (see Figure 3-16). After completing its forecast, Obermeyer placed its second and final production order. The remainder of retailers' regular (nonreplenishment) orders were received in April and May. As noted below, retailers also placed replenishment orders for popular items during the peak retail sales season.

Shipment to Obermeyer Warehouse

During June and July, Obermeyer garments were transported by ship from Obersport's Hong Kong warehouse to Seattle, from which they were trucked to Obermeyer's Denver warehouse. (Shipment took approximately six weeks.) Most goods produced in August were air-shipped to Denver to ensure timely delivery to retailers. In addition, for goods manufactured in China, air freighting was often essential due to strict quota restrictions in certain product categories. The U.S. government limited the number of units that could be imported from China into the United States. Government officials at the U.S. port of entry reviewed imports; products violating quota restrictions were sent back to the country of origin. Since quota restrictions were imposed on the total amount of a product category all companies imported from China, individual companies often rushed to get

TABLE 3-13

PLANNING AND PRODUCTION CYCLE, OBERMEYER 1993–1994 LINE

Month	Design activities	Order receipt and production planning	Materials management	Production	Retail activities
Jan 92					
Feb 92	Design process begins				
Mar 92	Las Vegas show for 92–93.				
Apr 92					
May 92	Concepts finalized				
Jun 92					
Jul 92	Sketches sent to Obersport		Order greige fabric		
Aug 92				Prototype production	
Sep 92	Designs finalized			Prototype production	
Oct 92				Sample production	
Nov 92		*Place first production order with Obersport*	Receive first order • Calculate fabric and component requirements • Order components • Place print/dye orders	Sample production	
Dec 92				Sample production	
Jan 93			Chinese New Year vac.	Chinese New Year vac.	
Feb 93				Full-scale production	
Mar 93		Las Vegas Show for 93–94 line (80% of retailers' initial orders received) *Place second production order with Obersport*	Receive second order • Calculate fabric and component requirements • Order components • Place print/dye orders	Full-scale production	
Apr 93		Additional retailer orders received		Full-scale production	
May 93		Additional retailer orders received		Full-scale production	
Jun 93		Additional retailer orders received		Full-scale production Ship finished goods	
Jul 93				Full-scale production Ship finished goods	
Aug 93				Full-scale produciton Air freight finished goods	93–94 line delivered to retail
Sep 93					Retail selling period
Oct 93					Retail selling period
Nov 93					Retail selling period
Dec 93		Retailer replenishment orders received			Peak retail selling period
Jan 94		Retailer replenishment orders received			Peak retail selling period
Feb 94		Retailer replenishment orders received			Retail selling period
Mar 94					Retail selling period
Apr 94					Retail selling period

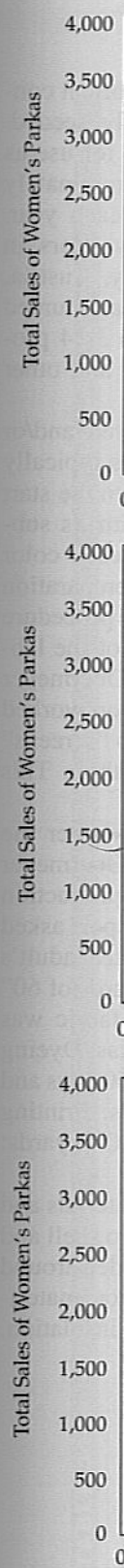
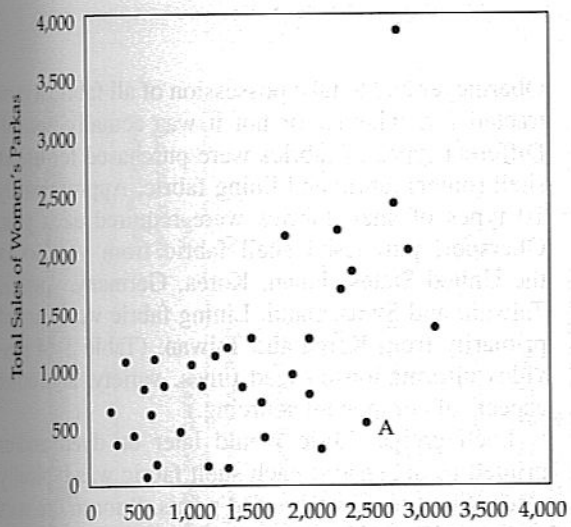
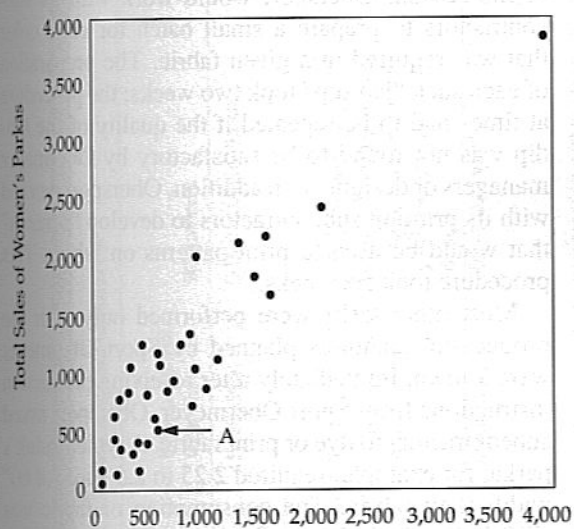


FIGURE 3-



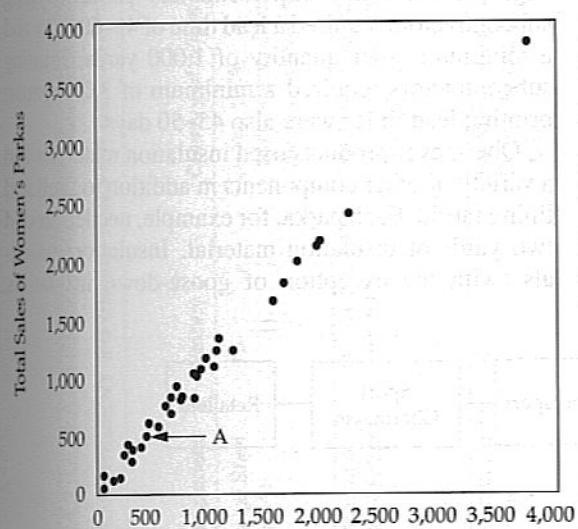
Initial Forecast

Each data point represents the forecast and actual season sales for a particular parka (at the style-color level). For example, parka A had an initial forecast of 2,500 units and season sales of 510 units.



Updated Forecast, Incorporating First 20% of Sales Data

After observing 20% of demand, the revised forecast for parka A was 575 units.



Final Forecast, Incorporating First 80% of Sales Data

After observing 80% of demand, the final forecast for parka A was 500 units.

FIGURE 3-16 How demand forecasts improve with increasing information.

their products into the country before other firms had "used up" the available quota.

Shipment to Retail; Retail Replenishment Orders

Toward the end of August, Obermeyer shipped orders to retailers via small-package carriers such as UPS and RPS. Retail sales built gradually during September, October, and November, peaking in December and January. By December or January, retailers who identified items of which they expected to sell more than they currently had in stock often requested replenishment of those items from Obermeyer. This demand was filled if Obermeyer had the item in stock.

By February Obermeyer started to offer replenishment items to retailers at a discount. Similarly, retailers started marking down prices on remaining stock in an attempt to clear their shelves by the end of the season. As the season progressed, retailers offered deeper discounts; items remaining at the end of the season were held over to the following year and sold at a loss. Obermeyer used a variety of methods to liquidate inventory at year-end, including selling large shipping containers of garments well below manufacturing cost to markets in South America and engaging in barter trade (for example, trading parkas in lieu of money for products or services used by the company, such as hotel rooms or air flights).

THE SUPPLY CHAIN

Obermeyer sourced most of its outerwear products through Obersport. (See Figure 3-17.) In recent years, Wally had worked with Obersport to "pre-position" (purchase prior to the season and hold in inventory) greige fabric[3] as part of a wider effort to cope with manufacturing lead times. To preposition the fabric, Obermeyer would contract with fabric suppliers to manufacture a specified amount of fabric of a given type each month; Obermeyer would later specify how it wanted the fabric to be dyed and/or printed. Obermeyer had to take possession of all fabric it contracted for, whether or not it was actually needed. Different types of fabrics were purchased for use as shell (outer) fabric and lining fabric. Approximately 10 types of shell fabrics were required each year. Obersport purchased shell fabric from vendors in the United States, Japan, Korea, Germany, Austria, Taiwan, and Switzerland. Lining fabric was sourced primarily from Korea and Taiwan. (Table 3-14 provides information on lead times, variety, and other aspects of component sourcing.)

Each greige fabric would later be dyed and/or printed as necessary; each shell fabric was typically offered in 8 to 12 colors and prints. Prior to the start of the season, Obersport would work with its subcontractors to prepare a small batch for each color that was required in a given fabric. The preparation of each such "lab-dip" took two weeks; the procedure at times had to be repeated if the quality of the lab-dip was not found to be satisfactory by Obermeyer managers or designers. In addition, Obersport worked with its printing subcontractors to develop "screens" that would be used to print patterns on fabric. This procedure took six weeks.

Most other tasks were performed only after the production quantities planned by Sport Obermeyer were known. Immediately after receiving production instructions from Sport Obermeyer, Obersport asked subcontractors to dye or print fabric. A typical adult's parka, for example, required 2.25 to 2.5 yards of 60" width shell fabric. The consumption of fabric was slightly less for kids' or preschoolers' parkas. Dyeing subcontractors required a lead time of 45–60 days and a minimum order quantity of 1,000 yards. Printing subcontractors required a minimum of 3,000 yards; printing lead times were also 45–50 days.

Obermeyer products used insulation materials and a variety of other components in addition to shell and lining fabric. Each parka, for example, needed around two yards of insulation material. Insulation materials (with the exception of goose-down insulation,

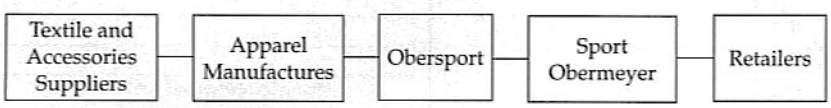


FIGURE 3-17 The supply chain.

[3]Greige fabric is a fabric that has been woven or knitted but not yet dyed or printed.

TABLE 3-14

PROCUREMENT INFORMATION FOR OBERMEYER'S PARKA COMPONENTS

Component	Variety	Country of origin	Procurement lead time	Minimums	Usage per parka	Avg. % of total parka material cost
Greige Shell Fabric	10	Japan, USA, Switzerland, Germany, Austria, Korea, Taiwan	45–90 days	5,000–10,000 yards	2.2–2.5 yards per adult parka 1.5–2 yards per child's parka	30
Finishing of Shell Fabric	8–12 color-prints per fabric	Finishing takes place in country of origin (see above)	Dyeing or Printing: 45–60 days	Dyeing: 1,000 yards Printing: 3,000 yards per design, at least 1,000 yards per color in any design	2.25–2.5 yards per adult parka 1.5–2 yards per child's parka	13
Finished Lining Fabric	6	Nylon: Korea, Taiwan Fleece: Korea, Taiwan, USA	45–60 days	600–1,000 yards	2–2.25 yards per adult parka 1.25–1.75 yards per child's parka	13
Insulation	3–4 different weights used (from 80–240 grams/meter)	Hong Kong, Korea, Taiwan, China	2–3 weeks	50–100 yards	~2 yards per adult parka ~1.2–1.5 yards per child's parka	16
Zippers	400 standard tape colors 4 teeth gauges 4–5 teeth colors 2–3 teeth materials 5–6 slider types	Hong Kong, Japan	Standard (from Hong Kong): 60 days Custom (from Japan): 90+ days,	500 yards (standard colors) 1,000 yards (custom colors)	~1 yard	12
Thread	80 colors	Hong Kong	30 days	5,000 yards	2,000–3,000 yards	2
Logo Patches, Drawcords, Hang Tags, etc.	various	Mostly from Hong Kong	15–30 days	various	various	10
Snaps (undyed)	10	Germany, Italy, Hong Kong	1–2 months	1,000 pieces	5–10 pieces	3
Dyeing of Snaps	50 colors	Hong Kong	15–30 days	1,000 pieces per color	5–10 pieces	1
						100

which was purchased in China and Korea) were purchased from DuPont, whose licensees in Hong Kong, Taiwan, Korea, and China could provide them within two weeks. At the beginning of each year, Obersport gave DuPont an estimate of its annual requirement for each type of insulation.

Obersport also had to ensure the availability of a variety of other components such as D-rings, buckles, snaps, buttons, zippers, pull-strings with attached castings, and various labels and tags. Buckles, D-rings, pull-strings, and buttons were procured locally in Hong Kong and had a 15- to 30-day lead time. Many snaps were purchased from German vendors; since snap lead times were long, Obersport kept an inventory of snaps and dyed them locally as needed. Labels and tags had short lead times and were relatively inexpensive; Obersport generally carried excess stock of these materials.

Most zippers were purchased from YKK, a large Japanese zipper manufacturer. Obersport used a wide variety of zipper types each year. Zippers varied by length, tape color, and slider shape as well as the gauge, color, and material of the zipper teeth. Approximately 60 percent of Obersport's zipper requirements were sourced from YKK's Hong Kong factory, where standard zippers were manufactured. The lead time for these zippers was 60 days. The remainder was nonstandard zippers, which were sourced from Japan with at least 90-day lead times—sometimes longer. YKK required a minimum order quantity of 500 yards if the dyeing color was a standard color from its catalog; if not, the minimum order quantity was 1,000 yards. All production materials were received by Obersport; materials for any given style were then collected and dispatched to the factory where the particular style was to be cut and sewn. Obermeyer products were produced in a number of different factories in Hong Kong and China.

Cut and Sew

A typical Obermeyer product required many cutting and sewing steps. (Table 3-15 shows the sequence of sewing operations for the Rococo parka.) The allocation of operations to workers differed from one factory to another depending on the workers' level of skill and the degree of worker cross-training. Workers in Hong Kong worked about 50 percent faster than their Chinese counterparts. In addition to being more highly skilled, Hong Kong workers were typically trained in a broader range of tasks. Thus, a parka line in Hong Kong that required 10 workers to complete all operations might require 40 workers in China. Longer production lines in China led to greater imbalance in these lines; hence, a Hong Kong sewer's actual output during a given period of time was nearly twice that of a Chinese worker. (See Table 3-16 for a comparison of Hong Kong and China operations. The cost components of the Rococo parka, which was produced in Hong Kong, are shown in Table 3-17. Table 3-18 shows the estimated cost of producing the Rococo in China. Obermeyer sold the Rococo parka to retailers at a wholesale price of $112.50; retailers then priced the parka at $225.)

Workers were paid on a piece-rate basis in both China and Hong Kong: the piece rate was calculated to be consistent with competitive wage rates in the respective communities. Wages in China were much lower than in Hong Kong; an average sewer in a Guangdong sewing factory earned US$0.16 per hour compared with US$3.84 per hour in the Alpine factory in Hong Kong.

Workers in Hong Kong were also able to ramp up production faster than the Chinese workers. This ability, coupled with shorter production lines, enabled the Hong Kong factory to produce smaller order quantities efficiently. For parkas, the minimum production quantity for a style was 1,200 units in China and 600 units in Hong Kong.

Obermeyer produced about 200,000 parkas each year. The maximum capacity available to the company for cutting and sewing was 30,000 units a month; this included the production capacity at all factories available to make Sport Obermeyer products.

Obersport was responsible for monitoring production and quality at all subcontractor factories. Workers from Obersport inspected randomly selected pieces from each subcontractor's production before the units were shipped to the United States.

PRODUCTION PLANNING

Wally's immediate concern was to determine an appropriate production commitment for the first half of Obermeyer's projected demand for the 1993–1994 season. He had estimated that Obermeyer earned 24 percent of wholesale price (pre-tax) on each parka it sold, and that units left unsold at the end of the season were sold at a loss that averaged 8 percent of wholesale price. Thus, for example, on a parka style such as the Rococo, which had a wholesale selling

TABLE 3-15

SAMPLE—PARKA ASSEMBLY OPERATIONS FOR THE ROCOCO WOMEN'S PARKA

	HK$/Piece	Operation
1	$0.05	Male belt loop (×1).
2	$0.20	Sew front shoulder seam with invisible stitching. Quilt all over: lining (×5), front placket (×1), and collar (×2).
3	$0.50	Invisible-stitch front bellow facing (×2).
4	$0.50	Double top-stitch front bellow facing (×2).
5	$0.70	Zig-zag stitch front bellow seam (×2).
6	$2.40	Set double-jetted zipped pocket (×2) and insert D-ring (×1).
7	$0.25	Five-stitch overlock pocket bag (×2).
8	$1.00	Invisible-stitch the bottom facing of bellow, sew front shoulder pleat (×2), insert front body facing.
9	$0.40	$\frac{1}{4}''$ double stitch the front and back shoulder seam (×4).
10	$0.30	Single top stitch (the middle of double top-stitching) the front and back shoulder seam (×4).
11	$4.50	Turn over the body and attach collar, sew zipper; invisible-stitch bottom and sleeve opening, leave a small opening at the bottom of left front zipper.
12	$1.00	$\frac{1}{4}''$ double stitch the front zipper seam from bottom to collar top.
13	$0.50	Invisible stitch the back bellow seam (×2).
14	$0.50	$\frac{1}{4}''$ double stitch the back bellow seam.
15	$0.70	Zig-zag stitch back bellow seam (×2).
16	$1.00	Join under facing of back bellow seam with invisible stitching (×2). Join front and back shoulder seam with invisible stitching (×4).
17	$0.50	Close side seam with invisible stitching, match seaming (×6).
18	$0.25	Three-stitch overlook the side seam.
19	$1.00	Sew sleeve opening, bottom hem with invisible stitching.
20	$0.80	Invisible stitch front placket seam, then $\frac{1}{4}''$ double top-stitch the placket seam.
21	$1.10	Invisible stitch the sleeve seam (×4); invisible stitch sleeve panel seam, sew pleats at sleeve panel seam (×2).
22	$0.90	$\frac{1}{4}''$ double top-stitch raglan sleeve seam and sleeve panel seam (×6).
23	$0.70	Single lockstitch raglan sleeve seam and sleeve panel seam, double stitch the center of sleeve panel seam (×6).
24	$0.70	Invisible stitch the armhole seam (×2), match the notch of armhole seam (×2).
25	$0.50	Double stitch armhole seam (×2).
26	$0.40	Single lockstitch raglan sleeve seam and sleeve panel seat, double stitch the center of sleeve panel seam (×6).
27	$0.60	Single lockstitch to close bottom hem facing (×1), insert the drawstring to bottom hem.
28	$0.60	Invisible stitch sleeve opening, insert/sew elastic to sleeve opening (×2).
29	$1.00	Sew collar facing (×1), invisible stitch the collar top, close bottom of collar, insert belt loop, change thread.
30	$0.25	$\frac{1}{4}''$ double needle stitch at middle part of placket (×1).
31	$0.35	Zig-zag stitch at the center of double needle stitch at placket (×1).
32	$0.80	Running stitch to close the end of filled placket (×1).
33	$0.20	Sew main label, and insert the label at side seam, and then sew size label.
34	$0.80	Sew the inside pocket: pocket with zipper at left, pocket with velcro at right.
35	$0.20	Set front facing with $\frac{1}{16}''$ edge stitching (×2).
36	$1.70	3 stitch overlock lining pocket bag (×2).
37	$1.60	Sew triangular stitching at ends of zipper facing, invisible stitch at zipper facing seam, turn out and $\frac{1}{16}''$ edge-stitching (×1).
38	$1.30	Sew 13 top stitching at the lining body.
39	$1.40	Five stitch overlock the lining body.
40	$0.80	Set shoulder pad (×2).

Total Average Labor Cost for the Rococo parka = HK$78. (Column does not add—some operations were performed multiple times to completely assemble one parka.)

*For this parka, the subcomponents described in steps 1 and 2 were completed by outside subcontractors.

TABLE 3-16

COMPARISON OF OPERATIONS IN HONG KONG AND CHINA

Topic	Hong Kong	China
Hourly Wage	HK$30	RMB 0.91
Exchange Rate	HK$7.8 = US$1	RMB (Renminbi) 5.7 = US$1
Working Hours	8 hours/day, 6 days/week	9 hours/day, 6.5 days/week
	⇒ Total = 48 hours/week	⇒ Total = 58.5 hours/week
	Maximum overtime allowed = 200 hours/year	During peak production periods, workers work 13 hours/day, 6.5 days/week
Weekly (Nonpeak) Output/Worker	19 parkas	12 parkas
Actual labor content per parka (including repair work)	~2.35 hours	~3.6 hours
Paid labor time per parka (including repair work)	~2.53 hours/parka	~4.88 hours/parka
Labor Cost/Garment	HK$75.6	RMB 4.45
Line Configuration	10–12 people/line	40 people/line
Training	Cross-trained	Trained for single operation only
Minimum Order Quantity	600 units in same style	1,200 units in same style
Repair Rate	1–2%	~10%

Challenges	• Wage Rate
	• Workforce:
	  • Low unemployment (~2%)
	  • Younger workers prefer office jobs
		• Workforce:
		  • Less quality and cleanliness conscious
		  • Training requirements

TABLE 3-17

COST INFORMATION FOR ROCOCO PARKA (MADE IN HONG KONG)

Obermeyer Landed Cost	
Cost FOB Obersport[a]	$49.90
Agent's Fee (to Obersport, 7%)	$3.49
Freight (Ocean Carrier)[b]	$1.40
Duty, Insurance, and Miscellaneous	$5.29
Total Landed Cost	**$60.08**
Cost FOB Obersport:	
Material	$30.00
Labor	$10.00
Hong Kong Quota, Obersport Profit and Overhead	$9.90
Total	$49.90

All figures in US Dollars.
[a]FOB (free on board) Obersport means that Obermeyer paid for freight and owned the products while they were in-transit.
[b]If transportation by air, cost would be approximately $5.00 per parka.

price of $112.50, Obermeyer's expected profit on each parka sold was approximately 24%($112.50) = $27, and its expected loss on each parka left unsold was approximately 8%($112.50) = $9.

A Sample Problem

To build his intuition about how to make production decisions, he decided to look at a smaller version of the company's problem. He looked at the Buying

TABLE 3-18

ESTIMATED COST INFORMATION FOR ROCOCO PARKA (IF ASSEMBLED IN CHINA)

Obermeyer Landed Cost	
Cost FOB Obersport[a]	$42.64
Agent's Fee (to Obersport, 7%)	$2.98
Freight (Ocean Carrier)[b]	$1.40
Duty, Insurance, and Miscellaneous	$4.90
Total Landed Cost	**$51.92**
Cost FOB Obersport:	
Material	$30.00
Labor	$0.78
Transportation within China and China Overhead	$2.00
China Quota, Obersport Profit and Overhead	$9.90
Total	$42.68

All figures in US Dollars.
[a]FOB (free on board) Obersport means that Obermeyer paid for freight and owned the products while they were in-transit.
[b]If transportation by air, cost would be approximately $5.00 per parka.

TABLE 3-19

SAMPLE BUYING COMMITTEE FORECASTS, 10 STYLES OF WOMEN'S PARKAS

		Individual forecasts						Average	Standard	2×standard
Style	Price[a]	Laura	Carolyn	Greg	Wendy	Tom	Wally	forecast	deviation	deviation
Gail	$110	900	1,000	900	1,300	800	1,200	1,017	194	388
Isis	$99	800	700	1,000	1,600	950	1,200	1,042	323	646
Entice	$80	1,200	1,600	1,500	1,550	950	1,350	1,358	248	496
Assault	$90	2,500	1,900	2,700	2,450	2,800	2,800	2,525	340	680
Teri	$123	800	900	1,000	1,100	950	1,850	1,100	381	762
Electra	$173	2,500	1,900	1,900	2,800	1,800	2,000	2,150	404	807
Stephanie	$133	600	900	1,000	1,100	950	2,125	1,113	524	1,048
Seduced	$73	4,600	4,300	3,900	4,000	4,300	3,000	4,017	556	1,113
Anita	$93	4,400	3,300	3,500	1,500	4,200	2,875	3,296	1,047	2,094
Daphne	$148	1,700	3,500	2,600	2,600	2,300	1,600	2,383	697	1,394
Totals		20,000	20,000	20,000	20,000	20,000	20,000	20,000		

[a] Obermeyer's wholesale price.
Note:
Laura Kornashiewicz was marketing director; Carolyn Gray was customer service manager; Greg Hunter was production manager; Wendy Hemphill was production Coordinator; Tom Tweed was a sales representative; Wally Obermeyer was vice president.

Committee's forecasts for the sample of 10 women's parkas[4] (see Table 3-19.) Since these 10 styles represented about 10 percent of Obermeyer's total demand, to make this smaller version representative of the larger problem, he assumed he had cutting and sewing capacity of 3,000 units per month (10 percent of actual capacity) during the seven-month production period. Using these assumptions, Wally needed to commit 10,000 units for the first phase of production. The remaining 10,000 units could be deferred until after the Las Vegas show.

Wally studied the Buying Committee's forecasts, wondering how he could estimate the risk associated with early production of each style. Was there

[4]When the Buying Committee convened, Wally had asked each member to forecast sales so that each member's total forecast summed to a specified aggregate figure (for parkas, 200,000 units). Similarly, the forecasts in the sample problem had been scaled to sum to 20,000 units.

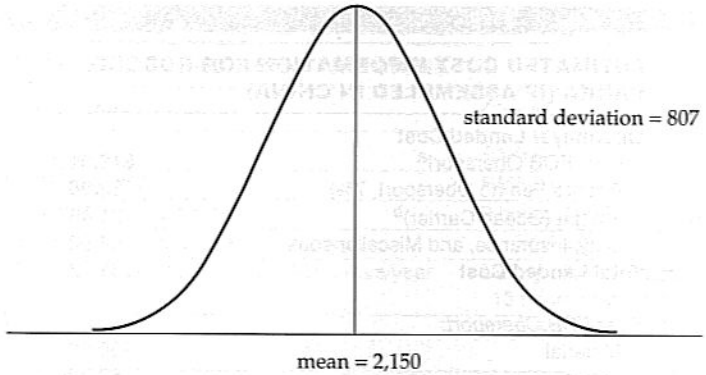


FIGURE 3-18 Forecast distribution for the Electra parka.

some way he could use the differences among each member's forecast as a measure of demand uncertainty? An examination of demand from previous years indicated that forecast accuracy was the highest for those styles for which the Buying Committee had the highest level of agreement. (Technically, he found that the standard deviation of demand for a style was approximately twice the standard deviation of the Buying Committee's forecasts for that style.) With this in mind, he constructed a forecast distribution for each style as a normal random variable with the mean equal to the average of the Buying Committee member's forecasts and standard deviation twice that of the Buying Committee's forecasts (see Figure 3-18).

Where to Produce

To complete the planning decision, Wally would also need to decide which styles to make in Hong Kong and which would be better to produce in China. This year, Obermeyer expected to produce about half of all its products in China. Longer term, Wally wondered whether producing in China would constrain Obermeyer's ability to manage production and inventory risks. Would China's larger minimum order sizes limit the company's ability to increase the range of products it offered or to manage inventory risk? Was Obermeyer's trend toward increased production in China too risky given the uncertainty in China's trade relationship with the United States?

CASE DISCUSSION QUESTIONS

1. Using the sample data given in Table 3-19, make a recommendation for how many units of each style Wally should make during the initial phase of production. Assume that all of the 10 styles in the sample problem are made in Hong Kong and that Wally's initial production commitment must be at least 10,000 units. Ignore price differences among styles in your initial analysis.
2. Can you come up with a measure of risk associated with your ordering policy? This measure should be quantifiable.
3. Repeat your methodology and assume now that all 10 styles are made in China. What is the difference (if any) between the two initial production commitments?
4. What operational changes would you recommend to Wally to improve performance?
5. How should Wally think (both short-term and long-term) about sourcing in Hong Kong versus China? What kind of sourcing policy do you recommend?