HARVARD | BUSINESS | SCHOOL

BRIEF CASES

4208

REV: JANUARY 4, 2011

STEVEN C. WHEELWRIGHT

WILLIAM SCHMIDT

Scientific Glass, Inc.: Inventory Management

In January 2010, Ava Beane, the newly hired Manager of Inventory Planning for Scientific Glass (SG), contemplated the critical nature of her first big project with the company. During her interviews for the job, several executives had told her very directly that the company's need for a more effective way to manage its inventory was urgent. At the time, Beane had felt confident she could address the problem quickly and meaningfully. Now on the job for several weeks, Beane was gaining a fuller appreciation of the difficulties of the task.

Until recently, SG had treated inventory management as largely an afterthought. As a fast-growing organization with annual sales of $86 million, the company historically emphasized the twin goals of continued sales growth and high customer satisfaction. During the past year, however, executives at the company had identified a disturbing trend: Inventory balances were increasing substantially, which tied up extra capital the company needed to fund its growing operations. In recent years the company exceeded its target debt to total capital ratio of 40%. If this trend persisted, it could jeopardize SG's ability to fund a planned expansion into new international markets.

Beane was given four weeks to come up with recommendations on how to make the inventory plan support the company's sales and customer-service objectives without requiring a large capital investment. Faced with such a tight deadline, she hit the ground running on her first day at the company, interviewing relevant staff and gathering data. Three and a half weeks later, Beane felt that she had most of the information she needed to develop recommendations. In two days, she was scheduled to discuss her findings with Eric Gregory, the head of sales, and her new boss, Melissa Hayes, Chief Operating Officer and the executive owner for this project. Beane turned to her computer to review the information that she had collected.

Company Background

SG, founded in 1992, was a privately held company that provided specialized glassware for laboratory and research facilities. A midsize player in this increasingly competitive space, the company had successfully carved out a niche by focusing on providing durable products, innovative

HBS Professor Steven C. Wheelwright and writer William Schmidt prepared this case solely as a basis for class discussion and not as an endorsement, a source of primary data, or an illustration of effective or ineffective management. The authors thank Patricia Brodkey (HBS MBA 1989) of PMB Consulting and Greg Herrema (HBS MBA 1998) of Thermo Fisher Scientific for their valuable contributions to the development of this case. This case, though based on real events, is fictionalized, and any resemblance to actual persons or entities is coincidental. There are occasional references to actual companies in the narration.

designs, and superior customer service. (See **Exhibit 1** for a summary of SG's 2008 and 2009 financials.)

The global scientific glassware market had estimated annual sales of over $2 billion: approximately 40% in North America, 30% in Europe, 20% in the Asia Pacific region, and 10% in the rest of the world. Annual sales growth for the industry over the past decade ranged from 3% to 5%, reflecting remarkable resilience to regional and global downturns. SG originally focused most of its sales efforts on North American markets, but in 2002 the company developed relationships with a distributor in Germany to serve the European market, and another in Singapore to serve the Asia Pacific market. Now approximately 20% of the company's sales came from Europe, 10% from the Asia Pacific region, and the remaining 70% from the United States and Canada.

Product Information

Like other providers in the market, SG was selling its products to a variety of organizations, including pharmaceutical companies, biotechnology firms, hospitals, academic and government research labs, environmental testing facilities, industrial research and development facilities, and quality-control sites. Unit prices for SG's products ranged from less than $3 to more than $200, with most falling between $4 and $20. Although the products were traditionally made of glass, some were made of plastic or specialty metals, either for durability or to handle specific chemicals. In addition to manufacturing more than 3,000 different standardized products, the company offered custom glassblowing services to customers who required specialized solutions. (See **Exhibit 2** for a breakdown of 2009 sales into the major product categories.)

Beane knew that she could not hope to do a thorough inventory analysis on each of SG's 3,000 standardized products. Instead, she collected detailed information on two products that were representative of the types of products that SG sold (see **Exhibit 3**). This information included data on average bi-weekly demand for the products in each region. The demand for all of SG's products was assumed to follow a normal distribution; therefore, Beane needed only the average demand and the standard deviation of demand in order to fully define the demand distribution. Demand patterns across each of SG's sales regions were remarkably similar. As a result, Beane distilled her analysis down to the assumption that the demand for a product followed the same distribution in each region.

For both products, Beane collected average North American biweekly demand and the standard deviation of biweekly demand for three different situations. The first situation assumed that customer demand in each sales region was realized separately and was filled entirely by the warehouse in that region. This was a good approximation of the current situation at SG, in which each warehouse responded to the demand in its region independent of all the other warehouses. The second situation assumed that demand in the East could be pooled and demand in the West could be pooled. This was a good approximation of a situation in which SG maintained a warehouse in the East and a warehouse in the West, each of which independently served its half of North America. The third situation assumed that all demand was pooled. This was a good approximation for a situation in which SG maintained a single warehouse to serve all of North America, or in which SG's warehouses provided integrated service to meet customer demand. (**Exhibit 3** summarizes all of this demand information.)

Competitive Pressures

SG had several formidable competitors in the laboratory glassware industry, including large, diversified laboratory equipment providers such as Thermo Fisher Scientific and smaller providers

such as Ace Glass. The larger firms often provided a full range of lab equipment and specialized laboratory glassware. Smaller firms, on the other hand, often offered broad ranges of laboratory glassware but had limited offerings in other categories of laboratory equipment.

SG enjoyed above-average growth in the industry because it realized early on that the market would demand more-creative product designs and lower lifecycle costs. The firm was an early innovator on new features such as external etchings on glassware that changed colors when the contents were heated above a certain temperature, stacking systems that allowed glassware to be securely stored using less space, and external coatings that minimized leakage and shattering if the glassware were dropped or impacted.

Most competitors now offered the same types of features that SG had helped to pioneer, and staying ahead of the competition was a constant challenge. The last few years brought several new trends in the market that had an impact on the firm's strategy and execution, including:

1. Increased entry of low-end competitors
2. Relative saturation in the North American and European markets, but relative growth in the Asia Pacific and Latin American markets
3. An increase in the number of industrial quality-control laboratories, particularly overseas

Sales and Distribution

SG focused on landing long-term supply contracts with its customers that ranged from 1 to 3 years and often had automatic rollover provisions. The sales cycle ranged from 3 to 6 months, depending on factors such as the sales representatives' access to the decision makers, existing contracts in place by competitors, and the effort required to negotiate prices and minimum commitment levels. As an enticement to sign long-term supply contracts, the firm regularly agreed to pay for ground shipping on all orders in excess of $200. As a result, the vast majority of orders received by SG exceeded that threshold.

Building a Dedicated Domestic Sales Force

To maintain growth, SG had pursued two major initiatives over the past three years. Both initiatives had been championed by Eric Gregory, who strongly believed that to maintain an edge on the competition, the company had to provide the "gold standard" for customer responsiveness in the industry. The first initiative was to build a dedicated sales force in North America. For many years SG had relied on relationships with independent distributors whose sales representatives visited prospective accounts to promote SG's products alongside products from other firms. In 2006, at Gregory's urging, the firm concluded that the distributor's sales representatives focused on selling products that were already well established and that a dedicated sales force could do a better job of educating the market about SG's new product features. Over the next eight months, the company established its direct sales force along geographical lines with eight territories in the U.S. and Canada. SG paid each of its 32 salespeople $33,000 plus a tiered commission structure based on the revenue they generated in each quarter. The company decided to maintain its distribution partners only in Europe and the Asia Pacific region, primarily due to the difficulty associated with managing an overseas sales and distribution function.

Increasing Customer Service Levels

The second major initiative SG undertook was to reduce the amount of time that elapsed between securing an order and delivering the product. SG initiated this effort in 2008 using a combination of

forecasting demand more accurately, improving customer service levels, and placing more products closer to large customer concentrations by increasing the number of warehouses operated by the company. Previously, SG's service level—or the probability of not stocking out using available inventory—had been 93%. This was only marginally better than the industry average service level of 92%. The sales leadership believed it was critical for SG to differentiate itself by having the highest possible service level.

SG followed a two-week order cycle and had a one-week in-transit time on most of its products, so if a product was not available at a warehouse a customer might have to wait as long as three weeks for the next shipment to arrive. The sales leadership noted that, on average, SG incurred costs of 10% of the gross margin for any product a customer ordered that was not available in the inventory of that region's warehouse. Costs from these unfilled orders were termed "underage" costs and potentially included lost revenue from canceled orders, backorder administration, shipment of product from other warehouses, and customer ill-will. SG also incurred costs for units that were in stock but not purchased during the demand period. These costs were termed "overage costs," and SG estimated that they amounted to approximately 0.54% of the unit cost of any product that was held in inventory without being sold.

Beane knew that it was possible to calculate the optimal service level for a product by using its underage (C_u) and overage (C_o) costs in the following formula:

$$\text{Service Level} = \frac{C_u}{C_u + C_o}$$

Beane also knew that since demand for SG's products followed normal distributions, she could calculate the optimal order-up-to level (Q*) for a product using the following formula:

$$Q^* = F^{-1}\left(\frac{C_u}{C_u + C_o}\right),$$

where F^{-1} denotes the inverse of the cumulative distribution function for the demand of the product being evaluated.

In 2008 the company put a compensation program in place that provided strong incentives for manufacturing, operations, and warehousing staff to achieve a 99% customer service level, by far the best in the industry. In spite of this already very high target, some of the warehouse managers began ordering even more inventory to provide greater assurance that they would exceed the target service level for their region. Beane learned that for approximately 10% of SG's product lines, warehouse managers maintained even higher inventory levels than required by the 99% service level target.

Adding Warehouses

In addition to increasing customer service levels, SG attempted to improve customer response times by adding regional warehouses. SG's largest warehouse was next to its manufacturing plant in Waltham, Massachusetts. Prior to 2008, the company operated only one other warehouse, located outside of Phoenix, Arizona. This warehouse was considerably smaller than the Waltham warehouse and primarily served customers in Arizona and central and southern California. By the end of 2008, SG brought on line six other leased warehouses, strategically situated near Toronto, Seattle, Denver, Dallas, Atlanta, and Chicago. Each of the warehouses was dedicated to a sales territory and was sited so that it handled approximately 1/8 of SG's total customer orders. Salespeople, who were also

allowed to check out up to $10,000 worth of "trunk stock" from the warehouse in their territory, typically kept trunk stock in their homes and cars and could deliver this inventory on short notice to any customer who was within driving distance.

The company's European and Asian distributors each operated a central warehouse in their regions that SG supplied. SG was not paid for any product delivered to the foreign warehouses until after the product was sold and delivered to a customer. As a result, SG tried to keep inventory balances as lean as possible without jeopardizing the distributors' ability to promptly meet customer demand.

Some of the executives at SG, particularly those not in sales and marketing, were skeptical of the need for the expanded warehouse network. In 2006, prior to the decision to add more warehouses, SG made a significant investment to expand the original Waltham warehouse in anticipation of continued growth. The warehouse was operating at a fraction of its capacity ever since the regional warehouses had been brought online. The annual rental and operation costs for all of the North American warehouses were about 15% of the cost of the warehoused inventory.

Expansion Plans

In light of the recent market trends identified above, SG committed to increasing its international footprint in 2010 by securing a distributor in Latin America and adding a second distributor in both Europe and Asia Pacific. Each new distributor required approximately $750,000 in inventory by the end of 2010 in order to start generating sales in 2011. SG learned from experience that distributors were often reluctant to push products from new partners unless they had adequate inventory in hand.

SG's manufacturing operations were under a heavy strain over the past two years, trying to keep up with SG's sales growth and producing sufficient inventory to fully stock the six new warehouses. The operations managers believed that an investment of $10 million would be required in 2010 to replace worn equipment and to provide the company with sufficient capacity to meet future growth projections. Sales were forecast to increase by 20% in 2010.

Inventory Control System

The sales and finance teams historically set the inventory control policies at SG, and this continued after SG expanded the warehouse network. Company policies regarding target inventory levels at the warehouses were regularly violated. Any trunk stock allocated to individual sales representatives counted against the target inventory level for the originating warehouse.

SG used two separate computer systems to manage the flow of inventory: one for ordering and inventory tracking and another for manufacturing and warehousing operations. Inventory-control policies at the warehouses included minimum stock orders, which SG established for every product. If at the end of the 2-week review cycle a product warranted reordering, the ordering system would automatically generate a manufacturing order. Stock levels were based on on-hand plus in-transit inventory. Inventory write-offs due to theft, loss, or damage have historically been about 1% of total product costs.

Once a customer signed a contract, the customer could place orders directly with a sales representative, online, or through the customer's own materials management software, provided it was configured to send orders to SG. In 2009, SG processed 119,855 orders.

Customer orders were routed to the warehouse serving the appropriate sales territory. If the products were in stock, the warehouse typically had each order ready for shipment within 1 day. A requested product that was not in stock at the warehouse represented an unfilled order and counted against the service level for the warehouse. The inventory management system would identify whether any planned shipments from the manufacturing facility included the product or if other warehouses in the network had the product in stock. SG attempted to optimize delivery costs and customer responsiveness by determining whether it was more effective to wait for delivery from the manufacturing facility, transfer inventory from another warehouse, or make separate shipments to the customer from other warehouses. Several factors were taken into account in this evaluation, including the size of the customer order, the importance of the customer account, the time until the next shipment from the manufacturing facility, and whether the missing product could be included in existing shipments between warehouses. (See **Exhibit 4** for a summary of the order fulfillment process.)

The warehouses placed orders with the manufacturing facility once every two weeks. Once an order was received from a warehouse, the inventory was considered "in-transit" and was assigned to the ordering warehouse. The "in-transit" period typically lasted five business days during which time the product was prepped, loaded, shipped, unloaded and stocked at the destination warehouse. Currently stock was being delivered from the manufacturing facility to the seven regional warehouses by a third-party bulk shipper at a cost of $0.40 per pound. SG did not have to pay for third-party bulk shipping to the Waltham warehouse since it is adjacent to the manufacturing facility.

Inventory was delivered from the warehouse to customers by a ground delivery service called Winged Fleet. Typical shipping weights, shipping value, and shipping costs for case-packed products are shown in **Exhibit 5**.

Inventory Challenges

Shipping costs and inventory holding costs were steadily rising at the company. In January 2009, Melissa Hayes sent a memo to all sales and warehouse managers to reinforce the objectives of the expanded warehouse network:

1. Improve order fulfillment times for new and existing customers.
2. Reduce the number of customer backorders.
3. Reduce the number of times the sales team needed to get involved to track down or otherwise attempt to expedite delayed customer orders.
4. Increase inventory turns to improve the use of the firm's financial resources.

SG monitored all inventory transfers from the Waltham warehouse to other warehouses. When SG shipped inventory to customers, it used the data to generate invoices, compute commission payments, conduct sales analyses, and update inventory records. Executives at SG believed that the central inventory records were, at best, an approximation of the actual inventory across all warehouses. In addition to record inaccuracies caused by damaged, lost, and stolen goods, there were opportunities for human error, including inaccurate returns processing, improperly tracking of warehouse transfers, and erroneous order fulfillment. These factors led to a mismatch between computer records and actual inventory.

In March 2009, SG attempted to gain a better tally of the inventory balances by taking physical counts of inventory at all warehouses and of the stock in the hands of salespeople. Without any improvements in the warehouse processes, however, the problems continued and errors gradually crept into the inventory records. Salespeople regularly asked warehouse managers to perform

manual inventory checks to confirm that product was available before customers placed large orders, or to try to locate products that were on backorder in other warehouses. Even if a warehouse manager was able to locate sufficient amounts of the backordered product, the time required to track it down, plus the time and cost of the inter-warehouse transfer, absorbed much of the profit from the sale.

Addressing the Inventory Management Challenge

Gregory and Hayes knew they could not afford to maintain the high rate of growth in inventory. SG's plans to expand its international distribution network would have to be complemented by the development of an effective inventory management system. The severity of the inventory problems highlighted the importance of distributing available inventory as efficiently as possible.

Proposed Policy Changes

Gregory and Hayes gathered the warehouse managers to brainstorm ideas. They developed several proposed policy revisions to alleviate the company's inventory problems. They also decided to create the Manager of Inventory Planning position, reporting to Hayes, which Beane was hired to fill. This position would be responsible for conducting a more detailed analysis of the situation and implementing any approved initiatives. The proposed policy revisions included:

1. greater enforcement by the warehouse managers of maintaining only sufficient inventories in the warehouses to meet the company's target service level of 99%
2. discontinuation of the practice of allowing salespeople to maintain trunk stock
3. creation of daily reports and weekly summaries on inventory movements for every warehouse
4. periodic physical audits and control procedures for all warehouse stocks.

During her due diligence effort, Beane learned that the proposed policy revisions were not popular with the sales managers. They were concerned about losing their trunk stock and having less influence on how inventory was allocated across the warehouses and, therefore, the sales territories. Several of the sales managers believed that these policies would undermine their ability to maintain hard-won customer accounts.

Centralizing the Warehousing Function

In addition to assessing the impact of the proposed policy changes, Beane considered new options to address the inventory issues. One possibility was to recentralize the North American warehousing function in Waltham and close down all or some of the regional warehouses. North American customer orders would be filled from fewer locations, possibly even one location. This would allow SG to pool its inventory in order to meet demand. Winged Fleet had already provided rates for customer delivery across multiple regions.

Outsourcing the Warehousing Function

In a late-night discussion with a former college classmate who ran a business importing shoes from Asia, Beane learned about Global Logistics, a competitor to Winged Fleet, which provided a delivery service that included centralized warehousing in Atlanta. Beane gathered preliminary rates and service information from Global Logistics. Based on SG's daily volume of orders, Global Logistics offered the company discounted rates and agreed to cover all warehouse rental charges. All order-fulfillment and inventory-control functions would be administered by Global Logistics

personnel. SG would still be responsible for customer order processing and billing. Global Logistics' prices were for guaranteed 3-day delivery, but for a substantial premium, 1-day delivery could also be provided. (See **Exhibit 5** for a listing of Global Logistics' rates.)

The advantages of using Global Logistics were attractive: By outsourcing warehousing, inventory management, and order fulfillment (including picking, packing, and shipping), SG's senior managers would be able to focus on increasing sales, understanding emerging customer needs, and developing the next generation of the firm's products. However, the advantages of the Global Logistics option were mitigated by the fact that all goods would have to first be shipped from Waltham to Atlanta. Goods could be transported to Atlanta using the same bulk shipment option used to deliver inventory to SG's regional warehouses.

Preliminary Analysis

To assess the impact of utilizing Global Logistics, Beane performed some preliminary calculations of the impact on shipping costs by employing the numbers in **Exhibit 5**. Using Global Logistics, transporting one 10-pound shipment of glassware from Waltham to Dallas involved shipping the package from Waltham to Atlanta for $4 (at $0.40 per pound) and then from Atlanta to Dallas for $22.25. The total shipping cost was $26.25. If SG used the regional warehouse in Dallas, the total shipping cost was $20.60. If SG centralized warehousing in Waltham and used Winged Fleet, the total shipping cost was $23.60. At first glance, Global Logistics seemed to be an expensive option, but Beane believed it would be worthwhile to conduct a more detailed evaluation of the different options that included all the other potential cost impacts.

SG's finance department provided Beane with several additional critical facts for her analysis:

- The company had a 14% cost of capital.
- Customer orders were spread approximately evenly across all of the delivery regions.
- The average customer shipment weighed 9.8 pounds.
- Prior to the recent inventory problems the company had typically achieved an inventory turnover ratio close to 6.0.
- 25% of the 2009 inventory balances was raw materials / work in process, whereas the rest was finished-goods inventory across the North American and international regions (see **Exhibit 6**).
- Prices are budgeted to stay flat in 2010, and the forecast 20% growth in sales in 2010 is entirely due to a forecast increase in the number of orders.

As daylight faded, Beane leaned back in her chair. She knew it was imperative that the company have sufficient capital to expand its international distribution network and make the $10 million investment in plant equipment. Rapid growth, innovative product features, and a broad customer base were no guarantee that SG's future was secure, however. Faced with the inventory challenges, senior management had to make important decisions. What were the merits and risks of implementing the proposed policy changes, of reverting back to fewer warehouses, and of centralizing and outsourcing inventory management with Global Logistics? Were there other creative options the team should consider? Beane reached for her coffee as if the rich brew might contain the answers.

Exhibit 1 Select Income Statement and Balance Sheet Values ($MM)

Income Statement Accounts	2008	2009
Net sales	65.0	86.3
Expenses		
Cost of goods sold	29.0	38.9
Sales, general and administrative	10.1	14.0
Research and development	13.5	17.0
Depreciation	2.9	3.1
Other expenses	0.6	1.0
Operating expenses	56.1	74.0
Interest expense	2.4	3.0
Taxes	2.0	2.9
Net earnings	4.5	6.5

Balance Sheet Accounts	2008	2009
Assets		
Cash	3.2	3.4
Receivables	3.0	4.0
Inventory	4.9	8.7
Prepaid expenses	4.8	6.1
Current assets	15.9	22.2
Plant property and equipment	28.5	32.9
Other long term assets	2.7	4.3
Total long term assets	31.2	37.2
Total assets	47.1	59.4
Liabilities & Equity		
Short term debt	2.7	3.2
Accounts payable	2.3	3.0
Accrued liabilities	0.4	0.5
Current liabilities	5.4	6.7
Long term debt	17.2	21.7
Owners equity	24.5	31.0
Total capitalization	41.7	52.7
Total liabilities & equity	47.1	59.4
Months of inventory	2.028	2.690
Cost of goods sold / sales	0.446	0.451
Long term debt / total capital	0.412	0.412

Exhibit 2 2009 Sales by Product Category

Product category	Units sold (000's)	Average price ($)	Sales ($ 000's)	% of total sales
Containers (bottles, flasks)	2,321	15.89	36,881	43%
Measuring devices (beakers, pipettes, cylinders)	1,283	8.98	11,521	13%
Fittings (stoppers, adapters)	442	11.01	4,866	6%
Funnels	185	12.63	2,337	3%
Handlers (stirrers, forceps, trays)	1,732	5.89	10,201	12%
Tubes	4,420	4.55	20,111	23%
Other	18	23.41	421	0%
Total	10,401	8.30 avg.	86,338	100%
Number of orders	119,855			
Average number of units per order	87			
Average sales per order	$ 720.36			
Average weight per order (pounds)	9.8			

Exhibit 3 Information on Representative Products

	Griffin 500ml Beaker	Erlenmeyer 500ml Flask
2009 units sold	11,268	3,389
Percent of all units sold	0.1%	0.03%
Annual carrying cost (%)	14%	14%
Unit price	$ 8.80	$ 9.50
Unit cost	$ 3.96	$ 4.56
Cost of underage	$ 0.48	$ 0.49
Cost of overage	$ 0.021	$ 0.025
Optimal service level	95.8%	95.3%
Average bi-weekly demand (8 warehouses)	54.2	16.3
Standard deviation of bi-weekly demand (8 warehouses)	21.4	10.9
Average bi-weekly demand (2 warehouses)	216.7	65.2
Standard deviation of bi-weekly demand (2 warehouses)	38.3	19.5
Average bi-weekly demand (1 warehouse)	433.4	130.3
Standard deviation of bi-weekly demand (1 warehouse)	51.0	26.0

Exhibit 4 Key Order-Fulfillment Steps

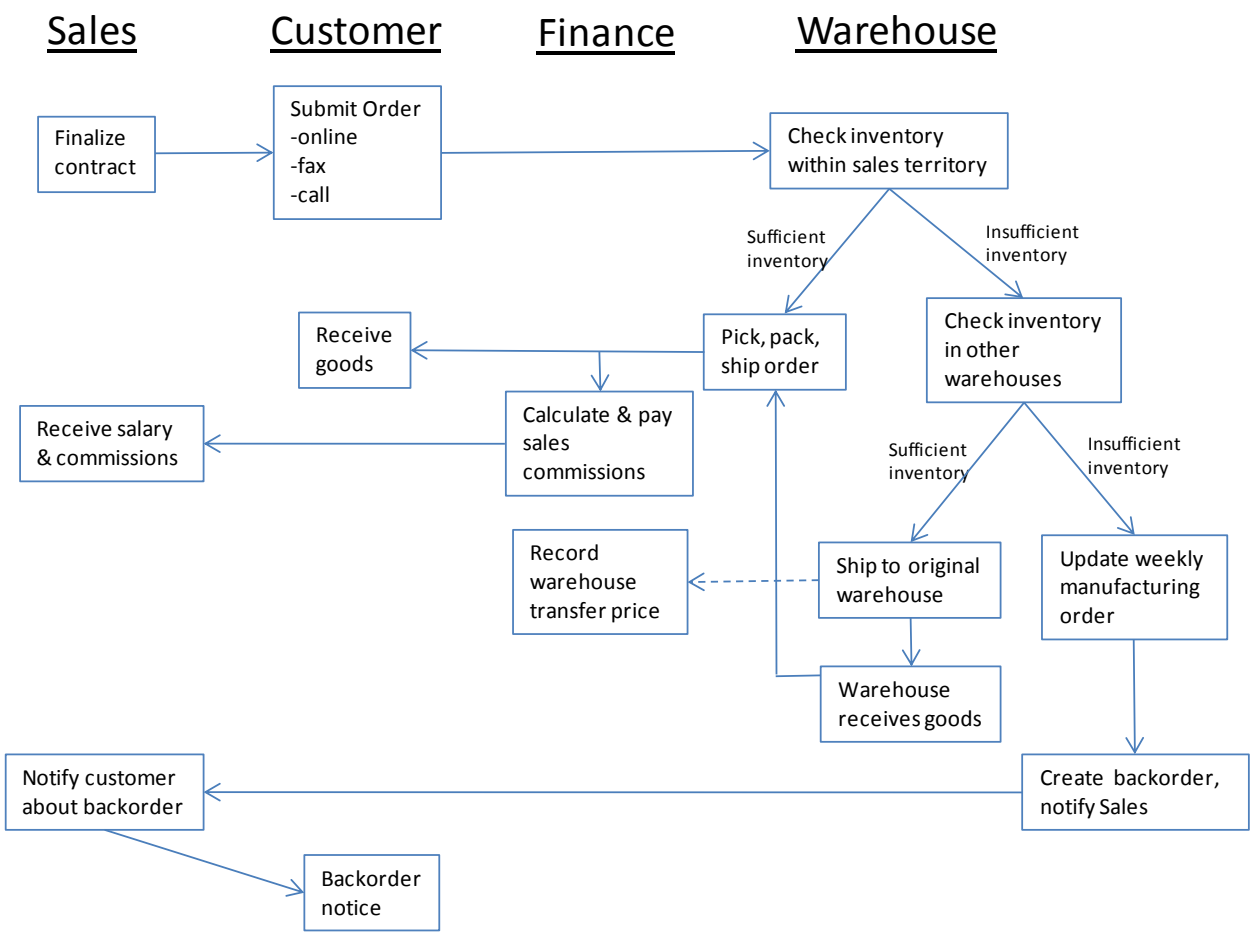

Exhibit 5 Weight and Shipping Costs for Typical Products (2009)

Product category	Pounds/case	Units/case	Average price/case	Total pounds shipped in 2009	Forecast pounds shipped in 2010
Containers (bottles, flasks)	3.00	12	190.7	580,250	696,300
Measuring devices (beakers, pipettes, cylinders)	0.75	6	53.9	160,375	192,450
Fittings (stoppers, adapters)	1.88	20	220.2	41,438	49,725
Funnels	1.88	12	151.6	28,906	34,688
Handlers (stirrers, forceps, trays)	0.94	20	117.8	81,188	97,425
Tubes	1.25	20	91.0	276,250	331,500
Other	0.13	1	23.4	2,250	2,700
Total				1,170,656	1,404,788

Shipping costs for Global Logistics and Winged Fleet

Global Logistics

(3 day rates)	Delivery from Atlanta to:				
Weight (pounds)	**Southeast**	**Northeast**	**Central**	**Southwest**	**Northwest**
2.5	$ 6.45	$ 7.31	$ 8.60	$ 9.46	$ 9.89
5	$ 10.28	$ 11.65	$ 13.70	$ 15.07	$ 15.76
10	$ 16.69	$ 18.91	$ 22.25	$ 24.48	$ 25.59
20	$ 27.38	$ 31.03	$ 36.50	$ 40.15	$ 41.98

Winged Fleet

3-day rates are calculated using region, fixed fee and weight fees
The regions are West (equivalent to Northwest and Southwest regions for Global Logistics), Central, and East (equivalent to Northeast and Southeast regions for Global Logistics)

Within region fee	$5.00
Across 1 region fee	$12.00
Across 2 regions fee	$16.00
Weight fee	$1.16 per pound

Shipping Comparison

Centralized warehousing in Waltham	
Winged Fleet: Waltham warehouse to Dallas customer	$ 23.60
Total	$ 23.60
Decentralized warehousing	
Bulk transport: Waltham to Dallas warehouse	$ 4.00
Winged Fleet: Dallas warehouse to Dallas customer	$ 16.60
Total	$ 20.60
Centralized warehousing in Atlanta with Global	
Bulk transport: Waltham to Atlanta	$ 4.00
Global Logistics: Atlanta to Dallas customer	$ 22.25
Total	$ 26.25

Notes:
Cost for bulk shipments $0.40 per pound
Aside from the capital cost to carry inventory in Atlanta, SG would not have any operating costs for Atlanta.
Global Logistics rates cover warehousing, insurance and delivery costs.
Regional warehousing costs are 15% of annual inventory in the regional warehouses.

Exhibit 6 Inventory Balance Detail ($MM)

	December 2009
Raw materials / work in process inventory	2.18
Finished goods inventory	
Manufacturing site	0.20
North American warehouses and in transit	4.44
Overseas warehouses and in transit	1.90
Total finished goods	6.54
Total inventory	**8.72**