



BRIEF CASES

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FoldRite Furniture Co.: Planning to Meet a Surge in Demand

On a Friday afternoon in February 2010, Jose Ramos, VP of Manufacturing at FoldRite Furniture Company of Aurora, Colorado, stopped by the office of Martin Kelsey, the recently hired production manager, to discuss developments revealed in a conference call with sales managers that morning. The call had been upbeat; market demand for FoldRite's products was unexpectedly high—and heightened demand, even if temporary, was welcome news during a deep recession. However, the news placed a burden on the firm's operations management, which had to optimize the use of manufacturing resources while meeting product quality standards and delivery schedules. Ramos looked to Kelsey to develop a production plan for the next six months based on the new forecast.

Traditionally, end-customer demand for FoldRite products increased in the spring and summer, due to the increased number of social functions that required folding tables and stackable chairs. These events normally started in May, with proms, graduations, and weddings, and continued through the summer with conventions and business meetings. Distributors' requests for delivery by early May meant that FoldRite needed to increase shipments to distributors in April.

Ramos believed the increased demand was the result of strategic decisions that management had made a year earlier: FoldRite had replaced the company's lines of simple, functional folding and stackable furniture—which were easily imitated by low-cost foreign competitors—with a smaller set of stylish, innovative, and environmentally friendly products. The projected demand included the stocking requirements for the company's new, high-comfort folding chair, the CloudChair, as well as a normal seasonal demand surge for other FoldRite products. The early demand for CloudChair was especially strong. The chair had won a number of design awards when introduced at an industry show in October 2009, and the company quickly received inquiries from event planners and industry distributors. Now, the sales force was signaling that initial orders would swiftly exceed the firm's expectations.

"Make sure your plan puts all the pieces together," Ramos told Kelsey, "and get it to me by 8 AM Wednesday. We can discuss it, and you can make any needed changes in time for Thursday's upper management meeting."

HBS Professor Steven C. Wheelwright and writer Afarin Bellisario, Ph.D., 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 Stan Askren of HNI and Brian Bowers of MityLite 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.

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Kelsey knew that getting this plan right was critical for the gradual rebuilding of his new company, which had experienced plenty of turbulence. In 2006, a combination of rising raw material costs and the use of inexperienced, less productive workers had eroded margins and lost sales opportunities. Soon thereafter the firm began a recovery, led by new management; however, the recession of 2008–2009 hit the industry hard, and FoldRite—a \$60 million firm—had laid off 15% of its manufacturing and support employees and reduced hours for hourly workers.

Kelsey had been working at FoldRite for only one month. Although he had substantial experience in product development, production, and manufacturing processes, this was his first position as a production manager. He was hoping his knowledge of workflow, as well as his experience with design, component selection, and CAD/modeling, would help him in his new assignment. He knew that in a small company like this one, it was everybody's job to make sure the bottom line was met. He also wanted to please Jose Ramos.

Background of FoldRite

Growth, Then Decline: 1987-2006

Founded in 1987, FoldRite's first product was a light but strong folding banquet table designed for school and church functions. Soon the company developed a reputation for innovation with the introduction of light and durable folding tables and stackable chairs. Throughout the 1990s, the company grew organically. By the late 1990s FoldRite sold three product lines into a range of markets, including business and government offices, hotels, convention centers, schools, and colleges. Revenue increased from \$47.5M in 1999 to \$60.3M in 2006, representing an annual aggregate growth rate of approximately 3.5% in this period. This was above average in the industry. During the same time frame, some larger competitors suffered declines in revenue, although one smaller competitor had aggregate annual growth closer to 6%.

The year 2006, however, brought financial turmoil. One major cause, management later concluded, was the loss of productivity and yields caused by high turnover among factory workers and the increasing proportion of inexperienced workers. This resulted in reduced margins as well as increased lead-time. By the end of 2006, the lead-time reached 6–8 weeks—up from a norm of 4 weeks—and on-time delivery dropped to 30%–40% from an average of over 90%. In an increasingly competitive marketplace, the missed deliveries resulted in the loss of orders. Meanwhile, continuing acquisitions of small firms (whose products were at times unrelated to FoldRite's core businesses) depleted the company of cash and distracted management attention. Eventually a group of private investors took over the company in early 2007 to provide fresh capital as well as management expertise.

Transformation Begins in Early 2007

Shortly after the takeover, the investors recruited a new CEO—Marshal Epstein—from a major consumer products company. Epstein had substantial skills in sales, marketing, and executive management, including international work experience. Coming from a consumer products background, he was quick to emphasize the need for innovation and customer service. Quickly recognizing that manufacturing needed a re-tooling, he hired a new Manufacturing VP—Jose Ramos. Together, Epstein and Ramos established a set of strategic policies to achieve four major goals for the company:

- Continued innovation in both products and processes,
- Customer responsiveness: producing high quality products that fulfilled market needs, and providing quick service,

- Lean manufacturing, and
- Retention of a well-trained, stable, and productive workforce, with reduced turnover.

Two changes would be especially important in the pursuit of these goals, Epstein believed: reducing the number of products and consolidating manufacturing. Reducing the number of products facilitated the delivery of higher quality products at a lower price and a more productive use of manufacturing resources. Starting in 2007, Epstein and Ramos sharply trimmed product lines by discontinuing commodity products. Moreover, FoldRite rapidly consolidated manufacturing from four smaller facilities into one. This freed up capital that enabled the purchase of new automation tools. Streamlining manufacturing processes and trimming product lines reduced delivery times and improved margins.

Ramos reduced lead-time to a maximum of two weeks, and established a two-day shipping policy for many of the products. This proved to be a key success factor during the recession, as many customers delayed purchasing decisions to the last minute, and distributors maintained very lean inventory. The policy also reduced the probability of order cancellation. Despite the recession, in 2009 the company had approximately \$60M in revenues and was profitable (see **Exhibit 1** for a simplified income statement).

FoldRite's Markets

The hospitality market generated 62% of FoldRite's revenue. Sales to corporate offices, governments, schools, colleges, hospitals, and clinics accounted for another 29%. The remaining 9% derived from sales to individual consumers, mostly through mass merchandisers such as Target and Staples, with a small portion selling through FoldRite's web site and catalog. The hospitality sales included rental companies and large event organizers such as hotels and function halls. The company maintained a small direct sales force to service distribution channels (which mostly served hospitality markets) and major customers.

Demand for FoldRite products was seasonal. Folding chairs were in high demand in the summer; stackable chairs and folding tables were also popular around the holidays. The recession had reduced demand in all of FoldRite's markets; for example, the number of events such as business meetings and reunions declined by more than 20% in 2008. However, market research firms had predicted the office market would begin growing in 2010 after bottoming out in 2009, and indeed, by the start of 2010 FoldRite's sales force had started to see an uptick in the types of inquiries that traditionally resulted in orders.

One bright spot during this period was growing market enthusiasm for "green" products, which were manufactured using materials and processes that had relatively slight impact on ecological systems. Based on conversations with market observers and other manufacturers, Epstein believed this green segment would grow 20% or more yearly over the next five years. Many manufacturers advertised the benign qualities of their products, but FoldRite had been among the quickest to capitalize on this "green opportunity."

Strategic Changes to Company Products

Epstein sharpened his focus on environmentally friendlier products with help from market research and customer feedback. After consulting with materials experts, he asked his designers to replace foam and plastic parts with recyclable materials, including plant-based polymers, and to use water-based and low- or non-volatile organic compound (VOC) paints and coatings. He was

particularly keen on eliminating use of PVC (Poly Vinyl Chloride)—a material associated with multiple environmental and health hazards.

At the start of 2010, FoldRite had just one product in each of its product categories:

1. **AlStrong**, a folding table in which recycled aluminum replaced the plastic top of the preceding generation of tables. Introduced in 2007, AlStrong was suitable for both indoor and outdoor functions, and was expected to provide close to 42% of total company revenues in 2010 (see **Exhibit 1**).
2. **GreenComfort**, a washable and stackable chair employing an established frame but upholstered with a specially coated washable fabric instead of PVC. GreenComfort, introduced in 2008, was expected to generate 34% of total revenues in 2010.
3. **CloudChair**, a folding chair that conformed to a wide variety of body shapes and provided comfortable seating even for overweight people (a growing market in most of the world). The chair was suitable for both indoor and outdoor use, although its lack of an upholstered seat made it more suitable for outdoors. Replacing the older generation of folding chairs, CloudChair was expected to provide the rest of the firm's revenue as well as a large portion of its growth.

Reducing the number of products enabled the company to offer customization, which Epstein regarded as a competitive advantage, especially over offshore manufacturers. FoldRite allowed customers to select seat cover patterns and colors for GreenComfort chairs as well as the color of the frame and the seat for CloudChair. Many customized products shipped in less than a week, often within 48 hours, making it impossible for offshore manufacturers to match FoldRite's combination of customization and quick delivery.

Based on his extensive international experience, Epstein believed Europeans would respond to high-quality, stylish furniture that could be stacked away, making it more practical for smaller event spaces typical in Europe. Moreover, the weak dollar had made American products price competitive. Following years of disappointing performance by local distributors in international markets, FoldRite established an office and a warehouse in Gottingen, Germany, at the start of 2008 to provide better customer service and faster delivery. The strategy was successful: international sales grew faster than domestic and accounted for 15% of sales in 2009.

Operations and Manufacturing Process at FoldRite

To achieve short lead-times, the company maintained a strategic inventory of fully assembled products and partially assembled parts to cover two weeks of forecasted demand. The partially assembled inventory included chair seats and frames in the most popular colors to enable quick assembly for expedited shipping. In addition, the company kept a stock of unpainted frames to allow last-minute customization.

The raw materials were standard and did not require long lead-times. The company had established purchasing contracts to eliminate the cost of carrying raw materials inventory. There were two suppliers for each raw material, and the purchasing contracts specified delivery of material with a lead-time of less than three days. A weekly joint meeting of Sales and Operations finalized the production schedule for the next week and triggered the ordering of raw materials. Based on these plans, the Purchasing department could confirm the quantity of raw materials needed from each source and schedule delivery.

The factory in Aurora operated in 10-hour shifts four days a week, for a total of 40 hours a week. Fridays were set aside to increase production using overtime and/or extra labor if necessary, or to perform maintenance on machinery. Accounting for holidays, the company planned 200 regular production days per year (the number of production days for each month in 2010, and annual production for each product, is given in **Exhibit 2**). Because of the increased productivity and weak demand, the company had idle machinery and tools, adequate to double the capacity with additional workers.

Workforce

Skilled laborers performed tasks such as thermal forming and robotic welding. The skilled workers were capable of performing a variety of tasks, and their flexibility allowed management to change the product mix in response to market demand. Unskilled workers also performed a variety of tasks, including assembly, warehousing, and inventory control. In 2010, skilled workers made an average of \$19 per hour plus benefits¹ that cost the company an extra 33%. The unskilled workers earned an average of \$9 per hour, and the company spent an extra 10% in mandatory benefits² for these workers.

Under Epstein and Ramos, the company emphasized good labor relations and continuous improvement through incentives such as allocating a portion of annual profits to a bonus pool for workers, paying special bonuses for reduced absenteeism and improved yield, and providing training opportunities to help unskilled workers become skilled and earn higher wages. Multiple members of some local families worked in the factory. Many workers appreciated the opportunity to complete a typical workweek in four days, leaving them with three days per week in off time.

The combination of lean manufacturing, high-tech tools, and increased productivity had made the plant highly efficient. When management considered using offshore facilities to manufacture CloudChair in 2008, the workers convinced them to keep the manufacturing in the United States by showing that total costs could be comparable when the cost of quality control and shipping was factored in.

Manufacturing and Assembly Process

The products used similar materials, which reduced the number of suppliers and the procurement overhead, and increased quality. For all types of production, the tasks that generated the components proceeded simultaneously and were carefully coordinated to bring components together for subassembly, and subassemblies together for final assembly, to minimize work-in-progress inventory. These tasks included metal fabrication (cutting, welding, and shaping of tubing and surfaces), injection molding of seats for folding chairs, and thermal molding of stackable chair covers. On-site paint booths were used to paint frames. The top part of the GreenComfort chair was thermally formed and attached to the bottom part, before filling with foam.

Final assembly of the products took place on moving conveyers, with the exception of customized products such as chairs with unusual color combinations. The company employed multiple assembly lines for the final assembly of tables and chairs. Quality control people visually inspected all products before final assembly and prior to shipping. The company had an average yield of 95%.

¹ Benefits usually had two components: mandatory, which included employer contributions to Social Security, Medicare, and state and federal unemployment insurance; and voluntary, which included items such as health benefits and life insurance.

² Mandated as described above

All production planning was highly centralized. The production supervisor assigned workers to various tasks based on daily production plans derived from the weekly plan. Daily production goals were set to fulfill confirmed orders and keep inventory constant. The company had sufficient workers to manufacture the annual product forecast (**Exhibit 2**) over the 200 production days in 2010. The actual number of hours each worker worked was determined based on actual demand.

Gathering Information from Colleagues

Forecast

Monday morning, Kelsey began collecting information for his report from a number of FoldRite managers. He started with Anthony Fasano, the VP of sales. Even though Kelsey needed to plan only for the next six months, Fasano gave him his forecast for the rest of the year for all three products—AlStrong, GreenComfort, and CloudChair—as well as the actual volume of products shipped in 2009 (see **Exhibit 2**). The forecast was based on a number of factors, including the large number of requests for quotations from potential customers (historically, half of these would turn into actual sales), the traditional surge in demand during summer months, and the stocking requirements for CloudChair.

Fasano was especially concerned about CloudChair. He told Kelsey, “The chair has generated great buzz in the market. The distributors can easily demonstrate the superiority to competing products, in both construction and comfort.” Fasano added that a major supplier to outdoor events, having seen CloudChair at the industry show where it was launched, planned to promote the chair heavily to event organizers, but wanted to have ample supplies first. “Martin,” Fasano said, “manufacturing has got to meet productivity goals because this kind of opportunity might not come again for a long time.” He added that customers were likely to cancel orders if the company failed to deliver within two weeks. “Our competitors are gunning for us on this product. They’ll take advantage of any delay.”

Financial Issues

Next Kelsey talked to Alice Yung, the CFO. Yung reminded him that credit was tight and the firm needed to run off of internally generated cash flow or rely on expensive alternatives such as a cash draw from a line of credit at a cost of 12% per annum. A large outlay of cash for inventory would not only add cost in terms of borrowing from the credit line but might also have to come at the expense of product development and R&D budgets. Yung provided Kelsey with the average labor and materials costs for all products (**Exhibit 3**), which included quality inspection. Yung’s closing message was: “Remember, Martin: Margins and profitability.”

Hiring and Human Resource Issues

Kelsey then discussed hiring factory workers with Mary Jane Montague, the HR manager. Montague said hiring a skilled worker would cost \$1,500 in recruiting and administrative expenses. Two supervisors interviewed unskilled workers, each spending one hour per worker; supervisors at FoldRite earned \$25 an hour, plus 33% for benefits. All newly hired staff, including rehired laid-off workers, exhibited an average efficiency of 80% in their first four weeks on the job.³ Training unskilled staff to qualify for a skilled position required four weeks of training, during which the workers earned full wages.

³ The average efficiency over the four weeks is 80%. The efficiency would be lower at the start of employment and would increase gradually to reach 100% by the end of four weeks.

Design Change

Kelsey's last stop was the office of Susan Minkus, the chief designer. Based on his familiarity with product design, Kelsey was considering an option to change the design of the CloudChair slightly to require one minute less in assembly—a task normally performed by unskilled labor. Minkus told him the change would cost the company a one-time charge of \$15,000, and would take about one month to implement fully on the factory floor. However, the changes would not affect product aesthetics or durability.

Production Planning

Later on Monday, Kelsey shared all the data he'd gathered with his team of two production planners—Sarah Bolling and Francisco Martinez. Kelsey asked them to help him develop an aggregate production plan for the next six months so that he could share that with Ramos on Wednesday. The aggregate plan, he said, had to demonstrate cost-effective ways to meet demand while maintaining productivity, quality, and reliability, and providing on-time delivery at effective yields.

Viable options to meet demand included use of overtime by asking staff to work an extra shift (including a 10-hour shift on Fridays), increasing staff temporarily to take advantage of idle production capacity, changing the designs, and increasing the amount of inventory using a constant level of production. As a last resort, the company could allow the level of strategic inventory to fall below the two-weeks minimum for a short period. Kelsey also considered subcontracting part of the work, such as the manufacture of seats for stackable chairs. This option would add an extra 20% to the cost of labor for the products, but given the current economy, FoldRite would not need to pay a set-up fee or commit to minimum orders. The team could also consider a combination of these options to meet the forecast.

Each of the options had drawbacks. Continued overtime for more than a few weeks was expensive: overtime wages were 1.5 times the normal fully loaded rates, which included benefits. Overtime also introduced fatigue, leading to declines in quality and yield. Similarly, hiring and training workers was costly and required management and supervision resources. If demand did not materialize, laying off these new workers would demoralize the remaining workforce and cost the company in added unemployment insurance. In any case, given the scarcity and expense of credit, the cost of carrying inventory beyond the normal two weeks' demand was a major concern.

Early Wednesday afternoon, Ramos stopped by Kelsey's office. Ramos was pleased with the quantitative analysis Kelsey had given him that morning, but he wanted Kelsey to go further and create a final plan to share with upper management Thursday morning. Ramos asked Kelsey to add a section to address specific non-quantitative issues arising from the new plan, including effects on short- and long-term profitability and competitiveness of the company, relationships among various functional units, labor morale, sales, marketing, and future product development. Specifically, Ramos wanted Kelsey to gauge the plan against the four major objectives that Epstein and he had established for FoldRite. Finally, Ramos wanted Kelsey to show how the company could minimize expenses and risk in case the expected demand did not materialize.

Kelsey returned to his computer and went to work.

Exhibit 1 FoldRite Simplified Income Statement, 2009 and Estimated 2010

	2009		2010 (estimate)	
	(\$1000's)	% of Rev	(\$1000's)	% of Rev
Sales				
Folding Tables (AlStrong)	\$27,009	44.3%	\$27,622	42%
Stackable Chairs (GreenComfort)	\$21,567	35.4%	\$22,314	34%
Folding Chairs ^a	\$12,340	20.3%	\$15,728	24%
Total Sales	\$60,916		\$65,665	
Cost of Goods:				
Raw Materials	\$34,295		\$35,940	
Labor	\$6,404		\$7,345	
Gross margin	\$20,217	33%	\$22,380	34%
Expenses				
Sales & Marketing Expense	\$9,137	15%	\$9,850	15%
Product Development	\$2,767	5%	\$2,100	3%
Continued Engineering	\$600	1%	\$650	1%
G&A	\$2,409	4%	\$2,499	4%
Facilities: Rent & Utilities	\$430	1%	\$530	1%
Repair & Maintenance	\$132	0%	\$133	0%
IT & Supplies	\$101	0%	\$121	0%
Shipping	\$1,980	3%	\$2,699	4%
Office Supplies	\$12	0%	\$12	0%
Legal & Professional	\$108	0%	\$112	0%
Insurance	\$178	0%	\$198	0%
Licenses & Permits	\$10	0%	\$10	0%
Travel & Entertainment	\$788	1%	\$821	1%
Depreciation	\$397	1%	\$397	1%
Operating Expenses	\$18,652	31%	\$19,735	30%
Operating Income	\$1,565	3%	\$2,645	4%
Interest Income (expense)	(\$163)	0%	(\$173)	0%
Taxes (estimate)	\$330	1%	\$850	1%
Net Income	\$675	1%	\$1,225	2%

^a Mostly older folding chairs in 2009; all CloudChair in 2010

Exhibit 2 Production of Units: Daily Averages and Annual Production

Average Daily Production															Annual Volume
	2010	2010 Forecast												Forecast	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec.		
CloudChair		280	1000	2500	4100	4350	4400	4800	3950	2000	1500	900	900	524,280	
AIstrong		1176	1190	1500	1650	1900	2000	1800	1750	1500	1400	1300	1100	306,916	
GreenComfort		1060	1102	1260	1400	1500	1550	1400	1250	1250	1250	1100	1000	253,570	
Production days in month		16	15	18	18	15	18	18	17	17	18	16	14	200	
2009 Actual														Annual	
Folding chairs (precursor to the CloudChair)	2609	2810	2706	3140	3906	3901	3820	3508	2840	2148	1906	1898	587,619		
AIstrong	1160	1260	1470	1590	1820	1760	1798	1630	1500	1480	1330	1208	300,100		
GreenComfort	1006	1110	1180	1290	1304	1420	1406	1298	1254	1220	1136	1080	245,080		

Exhibit 3 Average Manufacturer's Price (AMP) and Cost of Manufacturing for FoldRite Products

	AMP	Raw Material	Required Labor				Labor Cost			Total Cost	Margin
			Skilled	Unskilled	Mins/item		Skilled	Unskilled	Total		
CloudChair	\$30	\$11.73	2	9			\$0.84	\$1.49	\$2.33	\$14.06	53%
AIStrong	\$90	\$49.70	12.8	28			\$5.39	\$4.62	\$10.01	\$59.71	34%
GreenComfort	\$88	\$50.24	13	31			\$ 5.48	\$5.12	\$10.59	\$60.83	31%