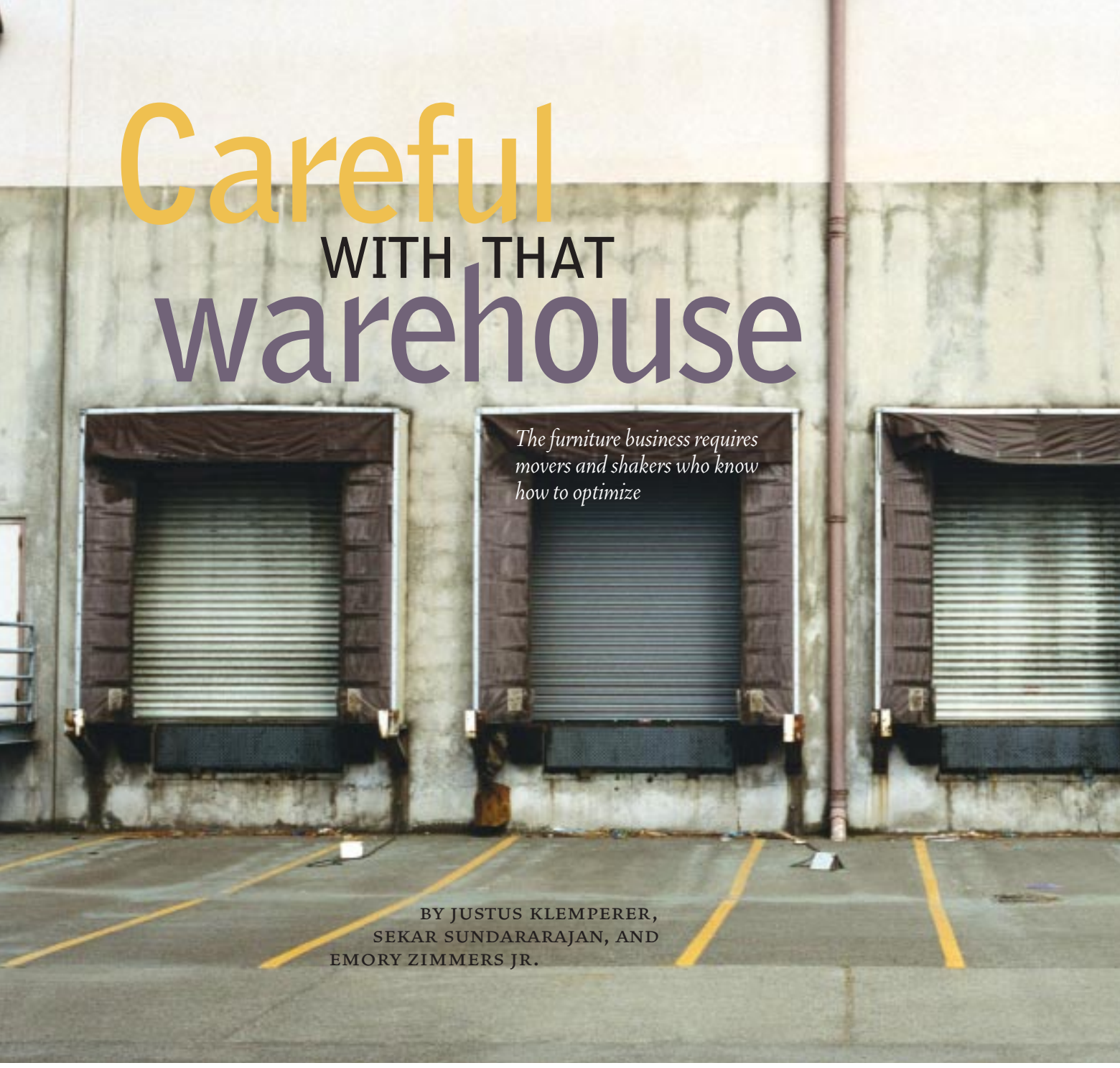

Careful WITH THAT warehouse

The furniture business requires movers and shakers who know how to optimize

BY JUSTUS KLEMPERER, SEKAR SUNDARARAJAN, AND EMORY ZIMMERS JR.

Warehouse management is frequently treated as an operational issue, its strategic importance largely overlooked. But as price and quality become indistinguishable from one company to another and distribution cost becomes a significant part of a product's value, the invisible hand of logistics becomes a key competitive advantage, and warehouse optimization becomes critical to the logistics chain from supplier to customer.

One home furniture manufacturer recognized the strategic necessity of maintaining easy access to its finished products and was able to turn its strategic business purpose into the operational details of a warehouse optimization process. This article describes the optimization journey of this 50-year-old company of nearly 1,000 employees.

Situation

Because it had no central distribution center, this furniture manufacturer and importer was operating 13 satellite warehouses ranging from 8,600 square feet to 100,000 square feet within a 100-mile radius. Domestically manufactured products were stored at the producing facility's warehouse. In total, each warehouse was handling more than 150 incoming and outgoing

pieces of furniture on a daily basis — both domestically manufactured and imported products from suppliers in Asia were shipped to customers. More than 100 containers were received from suppliers through a freight forwarder using multiple ocean carriers. What was the result of all this activity?

First, the company suffered from reduced throughput due to split, partial, and wrong shipments. Shipping became a major challenge and a large part of the corporate overhead. A special traffic department was created to consolidate shipments, route trucks, and schedule pickups at different locations. Split or partial shipments that were unnecessary and unrequested occurred frequently.

Second, operating costs rose due to three factors:

- **Handling damage.** Unnecessary product moves were creating major damages, which were having a significant impact on the company's financial situation. Customer returns and allowances had reached 10 percent of net sales. A large number of pieces were put on hold and could not be shipped due to internally inflicted damage, delaying customer order fulfillment and increasing repair costs.
- **Exception charges.** Demurrage and per diem charges were a major financial hit to the company. Demurrage charges were incurred due to lack of space in warehouse facilities. Entire shipments were voluntarily held at port to avoid an overflow situation, not only increasing operating expenses but also delaying customer response time. Per diem charges (incurred when a container is not unloaded in a timely manner and held at the facility) were common due to the lack of a scheduling system for incoming containers.
- **Inefficient product flow.** Direct labor cost was becoming a major part of the company's cost structure. Excess handling, along with not being able to make good use of economies of scale, were driving inefficiencies up.

These poor warehouse management practices resulted in excess operating costs. The lack of an adequate inventory method and the relatively short product life cycles created an obsolescence problem.

Another problem was insufficient inventory turns due to the absence of first-in, first-out principles. Typically, pieces were received and warehoused in no orderly fashion, which did not allow the space required for a FIFO system and causes new and old products to be mixed. The jumble of products was generating color mismatches that were attributed to different supplier cuttings or even sourcing changes. The lack of an adequate information system worsened the situation because there was no way to track inventory location inside and outside each warehouse. Employees had to keep track of product locations manually or mentally, often creating duplicate locations and excess handling.

Approach

The warehouse optimization design was based on the principles of agility, lean manufacturing, and the theory of constraints. The goal was to be an agile company by being responsive to the customer. The material flows and storage concepts were designed to streamline flow and maximize throughput.

In a time when every furniture company is importing from the same suppliers, there is little room to be creative and differentiate a company's product because cost and quality end up the same. Cost and service become key aspects in the differentiation effort. Typically, consolidating and optimizing a warehouse can help both factors, which are translated into the following objectives:

- **Maximize throughput** by providing agile response to customer orders because they do not have to be consolidated from different warehouses.
- **Minimize operating costs** and be better than the industry benchmark by streamlining material handling in the warehouse, reducing handling damage by eliminating unnecessary shipping steps, decreasing exception charges, and reducing rent expense by consolidating warehouses.
- **Maximize inventory** turns through FIFO inventory practices to reveal inventory problems to management quickly.

Because products, their characteristics, and the global

supply chain are rapidly changing in the furniture industry, today's solution will not necessarily fit tomorrow's needs. New product introduction or changing demand patterns could throw a perfectly optimized warehouse off balance. The company wanted to implement a solution that could support changing business conditions.

Operational steps

There are two major phases of warehouse optimization: planning and implementation. A project that involves and affects so many people requires an extraordinary effort to bring people on board at the start. Without the buy-in and cooperation of employees, this project would not have been successful, even with a flawless analysis and implementation. Steps taken are represented in Figure 1.

Planning phase. Cross-functional teams representing each affected unit were formed to ensure project success and feasibility. The teams crossed organizational and functional boundaries, including personnel from safety, warehousing, information technology, finance, traffic, and senior management, which made the project a popular companywide effort.

Data collection was an important piece that would help determine factors such as space requirements, products rate of sale, and inventory levels. Because of the seasonality of certain product lines, it was important to determine which periods were representative to use as a sample.

The next step was to assign the product groups priorities and proximity to the shipping and receiving docks (Figure 2). An analysis of customers' shipments helped the team establish a shipping pattern, which was typically a particular bedroom or dining group. Considering incoming product from the suppliers in Asia revealed the same conclusion — incoming and outgoing products move in sets (bed, nightstand, dresser, armoire, and mirror together) as opposed to individual pieces. It would not make sense to store the nightstand far from the dresser and bed of the same set. Therefore, a priority rating based on rate of sale for each collection as a whole was established. For cases in which the product weight was extreme, the rate of sale rule was overridden and the product was placed closer to shipping and receiving docks.

The next phase of the optimizing process involved analyzing the warehouse capacity and managing the available space. Based on the space requirements and space available, the strategy for storing and managing inventory would vary. The requirements fell into three main categories: space required for peak inventory season, space required for temporary overflow situations, and space required for implementing the FIFO system.

The amount of inventory required during peak periods for every product, not just at the collection level, was established. Allocating space for overflow situations required understanding the product's inventory level fluctuation. Based on its variance, each product was assigned an extra percentage — ranging from 3 percent to 15 percent — of the total inventory required for peak season. The selected execution method for implementing a FIFO system was to allow extra space for product rotation. Product was to be pulled for customer shipments from one end and stored from supplier shipments at the other end. This required the product to be rotated within its assigned space. To facilitate the product rotation, an extra 5 percent (based on the space required for peak inventory) was allowed.

With the help of the warehouse manager, stacking rules for each product category were determined, which would later become a guideline for how many of each product could be stacked without incurring damage. The main criteria for the stacking rules were product weight

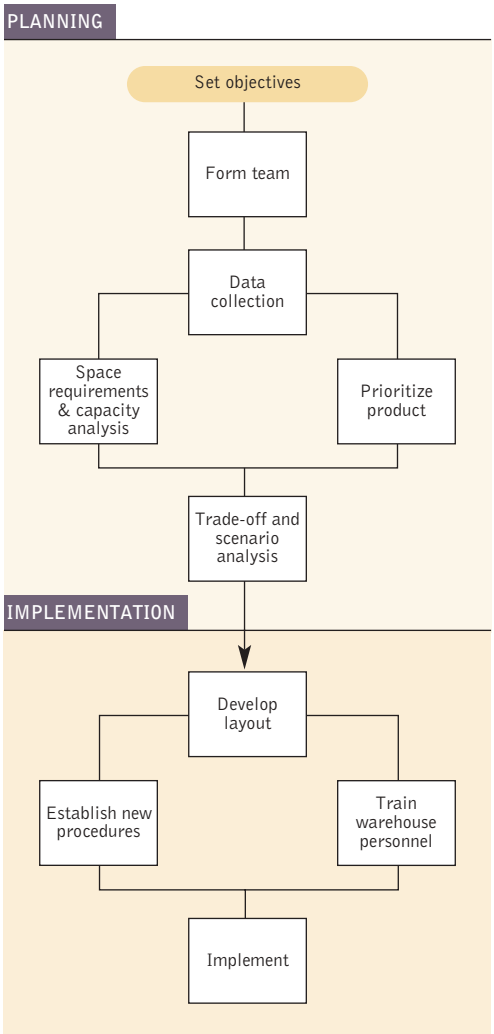

Figure 1. The two major phases of warehouse optimization

THE CHALLENGES OF A GLOBAL INDUSTRY

The American Furniture Manufacturers Association launched a multidiscipline conference in August that addressed the increasing competitiveness of the global market. The conference, held in Savannah, Ga., under the title Accelerating Competitiveness: Global Leadership through Innovative Supply Chain Management, covered global e-commerce, international purchasing, and trans-Pacific logistics.

Global issues in the furniture manufacturing industry have been in the news recently due to concerns in the American manufacturing community about China's currency manipulation. The AFMA and other manufacturing groups contend that because China has not allowed the market to determine its currency exchange rates, intentionally undervaluing the yuan, it is gaining a competitive advantage for its exports.

In July, Bloomberg News reported that U.S. Treasury Secretary John W. Snow told a group of factory workers in Milwaukee that the Bush administration plans to use quiet diplomacy to encourage the Chinese government to allow its currency to strengthen by widening its trading band against the dollar. The article also noted that the European Union and Japan have appealed to China to abandon its currency undervaluing strategy.

According to the AFMA, furniture industry representatives have testified before Congress' Small Business Committee in the past few months at hearings analyzing the challenges facing small and medium-sized domestic manufacturers.

The AFMA is based in High Point, N.C., and represents more than 350 leading U.S. furniture manufacturers.

and height. The analysis resulted in warehouse utilization of a little more than 85 percent (already applying ample spaces for product). Another 5 percent was used for offices as well as incoming and outgoing quality control staging areas (Figure 3).

When space is scarce, there are other techniques that could be applied to reduce space requirements at the expense of some handling. Combining product groups by their seasonality is one of them. If, for example, a particular category's seasonality is offset from another by a given period of time, it would be wise to put each category next to each other and reduce the overall space required to handle peak season. Another option for reducing space requirements is dealing with overflow at a macro level by assigning an overflow space for a sector of the warehouse or group of products, not every individual product (Figure 4).

Scenarios and trade-off analyses were developed after priorities were established and space allocated. A warehouse draft layout was created to visualize the results of the analysis and develop the alternate scenarios. This draft included all relevant product information (rate of sale, physical parameters, stacking rules, etc.) for understanding and handling ease. The warehouse manager and staff brought qualitative information to the decision-making process. An alternate scenario was developed to optimize the solution even further. Based on current business projections and anticipated

	Proximity rating*	Weight	Assigned priority
Product Group A	1.1	860	2
Product Group B	1.1	1,050	1
Product Group C	1.7	710	4
Product Group D	1.9	1,220	3
Product Group E	2.3	980	5

*Lower rating means higher rate of sales

Figure 2. The engineers assigned each product group priorities and designated their proximity to the shipping and receiving docks.

Product	Stacking rule
Dresser	2
Mirror	1
Armoire	1
Nightstand	3
Bed headboard	1
Bed footboard	2

Figure 3. With the warehouse manager's help, the team determined "stacking rules," which became a guideline for how many of each product category could be stacked without incurring damage.

	Quantity (pieces)	Base (sq. ft.)	FIFO (sq. ft.)	% overflow	Overflow (sq. ft.)	Total (sq. ft.)
Product Group A	16,401	37,010	1,851	6%	2,221	41,081
Product Group B	5,534	17,877	894	4%	715	19,486
Product Group C	681	2,289	114	14%	320	2,724
Product Group D	4,179	9,514	476	8%	761	10,751
Product Group E	10,286	24,519	1,226	9%	2,207	27,952
Product Group F	2,853	7,340	367	11%	807	8,514

Figure 4. A sample space requirements breakdown for six product groups

product mix changes, the team increased the long-run potential savings.

Implementation phase. A complete layout — including product positioning, space breakdown (baseline, FIFO, and overflow space), and quality control and staging areas — was developed and shared with the people involved. Safety and environmental personnel were asked to help develop escape routes and any other protection measures.

The next part of the implementation phase was to develop operating procedures with the customer in mind. The three main issues addressed were training, exception charges, and pickups by appointment. Employees were trained on how to care for the product. Proper storage and product pickup (while keeping the FIFO mechanism working) was emphasized. A 15-minute-window appointment system was developed through which customers could schedule the truck to pick up orders. This reduced wait time and its associated cost and ensured that the product was available at the time of the appointment and under one roof.

Implementation took place in phases. Based on incoming container schedules, incoming product was mainly stored at the new location, while shipments took place out of the satellite warehouses. Within two months, most satellite warehouses were closed, and all the shipping and receiving operations were moved to the new 800,000-square-foot warehouse.

Results

Within three months, the company began seeing benefits. The results over the two years since the implementation are shown in Figure 5. The total warehouse space was reduced by 28 percent, which directly affected the amount of rent paid. In fact, the rent savings were around 36 percent.

Operations-related exception charges were decreased. The new warehouse had enough capacity to sustain the peak inventory situation that would have previously caused product overflow and, therefore, demurrage charges. The newly implemented pick-up appointment system eliminated per diem charges.

Labor efficiency improvements were achieved by eliminating unnecessary steps while handling the product in receiving and shipping. Excess internal transfers of product for consolidation also played a mayor role in reducing operating expenses.

The implemented FIFO inventory practices brought to light existing inventory problems. Line-of-sight visibility allowed management to be aware of the problem and quickly devise a solution, which helped avoid obsolescence and improve inventory turns.

Among other reasons, reduced material handling was responsible for decreased customer complaints and chargebacks. Handling-related returns and allowances were reduced significantly, creating a major boost in company profits.

	Before	After	Savings
Warehouse square feet (proxy for rent expense)	1.1 million	800,000	28%
Exception charges	$700,000	$100,000	85%
Labor (# people)	103	53	51%
Inventory turns	2	2.5	-
FIFO	No	Yes	-
Returns & allowances (handling related)	3.5%	1.8%	-

Figure 5. The results of the implementation over the past two years

Conclusion

There is a systematic process that can be used to optimize warehouses to create a lean, agile organization. It is important first to identify all elements required for success, like this furniture company did. No matter what the space constraints are or which methodology is used, the strategic value to the company must be identified and the right people must be involved if the project is to be successful.

There are four key factors to a successful implementation of any project, regardless of the methodology, approach, or assumptions used:

- **Business purpose.** Always start with the strategic business goal in mind. The company needed a long-term plan to compete in the global market. Warehousing is an unavoidable activity incurred by organizations. It is becoming a way to differentiate products and services from competitors.
- **Involve key personnel.** Moving into a new workplace and operating under new procedures is not easy for employees. To make the transition easier and to get full support at all levels of the organization, involve key personnel from the start. Such action breaks existing boundaries and generates a sense of ownership, which will help during the implementation process as well as future success.
- **Design with the customer in mind.** Consolidating products under one roof, implementing a FIFO technique for inventory management, and establishing an appointment-driven pick-up system are not just approaches to reduce operating costs. The intangible benefits of becoming more customer-friendly (which are key in a world driven by inter-

mediaries) are tough to measure, but in the long run, they surely surpass the benefits of reducing operating expenses.

- **Develop flexible, qualitative, and experience-driven models.** The model developed was not created simply from data. Involving experience-driven people added a qualitative element that cannot be captured by pure data in an analysis. Furthermore, it was important to keep the model flexible for the changing market environment and operating conditions.

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