

## Macrologistics In Action

### **BOSE USES JIT II FOR COMPETITIVE ADVANTAGE**

BOSE is a company on a mission: To provide outstanding sound experience to everyone in the whole world. It is a privately held corporation that is the world's largest manufacturer of component-quality speakers. Its headquarters are located 23 miles west of Boston. BOSE has three manufacturing facilities located in Westboro, Massachusetts; Ste. Marie, Quebec; and Carrickmacross, Ireland; with planned facilities in Hillsdale and San Luis, Mexico.

Speakers are the most competitive of the components of the audio business, with dozens of manufacturers in the United States, Europe and the Far East. A diverse array of designs and technologies revolve around three critical sub-assemblies to all speakers:

- **Transducer:** The traditional speaker had at least two--'woofers' that are low frequency bass sounds and 'tweeters' that are high frequency.
- **Electronics:** Featuring increasingly more sophisticated integrated circuit boards that managed amplification and maintained system balance.
- **Cabinet:** Whose role of soundwave director in an attractive suit BOSE understood only too well. The exterior surface on the cabinet had to be perfect in all aspects.

BOSE is an excellent example of an organization using a combination of Macrologistics strategies to achieve competitive advantage. Central to their strategy is the use of JIT II to fully mobilize their logistics operations. Information Systems provided the interconnectivity, while their use of Process Management helped them redefine the marketplace they serve. Their innovative strategies for maximizing their supply chain resulted in substantial cost reductions while shortening the delivery cycle.

## PROFILE IN DETAIL

### Background Information

Bose Corporation was founded in 1964 by Dr. Amar Bose, a professor of Electrical Engineering and Computer Science at MIT. He befriended a man by the name of Sherwin Greenblatt, who, as Bose Corp first employee, planned to build a company based upon innovation in acoustics and electronics. For three years, they focused upon the 'hobby side of the business.' Then, in 1968, Bose launched the 901 speaker, which simulated the feelings of the live sound by radiating the waves to the listener directly, as well as off walls, ceilings, etc.. Over the next ten years, this resulted in a dramatic expansion of this line of speakers, which got smaller and smaller and better and better.

The decade of the 80s saw the introduction of the BOSE speaker line into the automobile industry. Cadillac was the first to use them in their top of the line models in 1982, followed by Toyota, Nissan, Acura, and others. In 1990, the company embarked upon a three pronged strategy, according to Lance Dixon, Vice President of Logistics:

**“First, the company sought out new markets around the world. By 1990, we were the highest selling manufacturer of stereo component-quality speakers in Japan, as well as in Holland, France, Australia, and other countries. Management at Bose believes that the desire for quality sound is universal and plan to continue opening new markets around the world.**

During the early 1980s, BOSE hired Lance Dixon to help run the procurement operations, and his background suited him well for the challenges ahead. He was an ex-marine who began his career at Honeywell Corporation, where he managed an engineering support facility that performed printing and photographic work. Responding to his suggestions of how to get more out of the purchasing dollars, management put him in charge of centralizing the purchasing of printed materials. When Honeywell bought GE's computer division, Dixon established a network of twelve warehouses to provide promotional support for the combined Honeywell/GE sales force.

After spending three years tying together the procurement process, he standardized prices with vendors and established consistent procurement practices for multiple Honeywell divisions. One of the breakthroughs for Lance Dixon was the understanding that the company produced systems as well as components and was open to new systems approaches. In the early days, good hi-fi was available only to those consumers willing to invest a lot of time, money, and patience in their systems. By 1992, however, they expected hassle-free sound. Accordingly, the marketplace for integrated audio equipment had grown to more than twice its size of the market for separate audio components. In 1987, after 14 years of development, BOSE introduced the 'Acoustic Wave Music System', a completely integrated, portable, high-performance music system incorporating speakers, an AM/FM receiver and a cassette tape deck (to be followed by a digital disc player). This meant that a radically new approach needed to be taken with the JIT process already in operation.

Frustrated by his inability to secure adequate resources to run an expanded purchasing function of the future, Dixon developed a 'profit center approach' where he was allowed to reinvest half of the 'savings' he achieved below standard cost. He also instituted a program to pay cash incentives to buyers for savings achieved on purchased items. The program was successful, and in 1990 Dixon proposed to change the relationship between BOSE and certain suppliers under a program he dubbed 'JIT II,' under which the

vendor replaced the salesperson, the buyer, and the materials planner. These 'reps' were stationed full-time at BOSE but were paid for by the vendor. According to Dixon:

**“I told management that I could get the people I needed to get the job done and not add anything to the Payroll! Well, this really got some attention. I told them about my plan to locate JIT II in-plant supplier representatives integrated with the various Purchasing sections. The response was predictable and I was asked ‘It seems like putting the fox in charge of the hen-house, does it not?’ by a senior executive. My response was the same then as it is now, JIT II actually improves the controls and builds a collaborative work environment. The supplier has a legal, bonded responsibility to Bose and pilferage and loss will be reduced, not heightened. If we were to find problems of mismanagement or corruption, and we never have, our legal remedies are much cleaner and swifter in judgment. The JIT II rep works for the supplier and, once trust is established, the results and rewards of shorter cycle time and reduced costs are enormous, as the following JIT II suppliers found:**

- **Doranco: in mechanical New Product Purchasing**
- **G&F Plastics: In Corporate Purchasing and Bose plant locations**
- **United Printing: In MRO Purchasing and plant locations**
- **Monroe Stationers: In MRO Purchasing**
- **American Presidents Lines: In Transportation**
- **Roadway Express: In Transportation**
- **Proctor Inc. Import: In Transportation”**

Until 1988, no purchasing at BOSE had been done by the plants; instead, all items had been purchased by the corporate procurement department. By 1990, much had been decentralized, and the plants

did their own day-to-day purchasing, typically in line with contracts that were negotiated by Dixon's central unit. A typical plant spent about \$100,000 million per year on items purchased from an active base of about 200 vendors. Westboro spent about \$140 million per year on items purchased from an active base of about 200 vendors. About 50% of the plant's purchasing dollars were spent in five categories: electronic components, plastics, printing, corrugated boxes/packaging, and cables/cords. Purchasing was planned in a three-stage cycle, as outlined by Dixon:

- **Stage I: Business planning.** The marketing department at BOSE Corporation prepared multi-year plans.
- **Stage II: Aggregate production planning.** Based on the business plan, Westboro prepared a production plan that specified the capacity, tooling, and material volumes that would be needed over the next one to two years.
- **Stage III: Production scheduling.** Based on the aggregate production plan, schedulers at Westboro prepared a detailed "master schedule" outlining requirements for capacity, personnel, and material over the coming 12 months. Production of earlier months was scheduled at a greater level of disaggregation than for later months.

The Westboro materials manager coordinated scheduling, purchasing, and inventory. Five people reported directly to him: an inventory manager, a warehouse manager, and three materials managers. The inventory manager was responsible for tracking and managing overall inventory levels at Westboro, while the warehouse manager oversaw the operation of the plant warehouse. Each materials manager performed the planning and purchasing to support one production line and was assisted by a production control supervisor, a master scheduler, and a purchasing supervisor.

## **Inventory Problems**

Dixon describes the overall inventory situation at Bose in this manner:

**“Purchasing supervisors supervised a group of buyers who procured all materials for one production line. Buyers were responsible for managing quality, cost, and delivery. Unlike Corporate Procurement, most buyers at Westboro were not engineers and instead had come up through the ranks as administrators or expeditors. Buyers at Westboro typically started on easier commodities, such as hardware or operating supplies, and then moved on to more difficult categories such as plastics and electronics.**

**Most of the buyers’ time at Westboro was taken up by inventory planning, which encompassed three activities: deciding what to order, placing new orders with vendors, and adjusting delivery schedules to accelerate or delay delivery on ordered parts. Another 15% of buyers’ time was spent on revisions to existing parts; usually this entailed updating documents or ensuring that revised parts met quality levels. The remaining 10% of buyers’ time was devoted to renegotiating contracts with existing vendors or, occasionally, switching to new vendors”.**

Westboro buyers preferred vendors who maintained a secure financial position, were located close to Westboro, could provide fast delivery, maintained consistent production processes (as measured by the use of statistical process control and a quality rating system) and provided good references through Corporate Procurement or other customers. The average lead time on purchase orders placed by BOSE Corporation was four to six weeks, but one-third of all

purchase orders had less than 10 days' lead time. About 35% of all orders were changed within 30 days after placement.

### **Dixon's Vision**

Dixon's vision was to combine partnering with information systems and concurrent engineering in a three-legged-stool fashion. A great deal of his philosophy centers around the 'Partnering Principle:'

**“People have bought into the idea of partnering, they just don't know how to implement it. It's a philosophy in search of substance. Most people will tell you, 'Yes, I love motherhood and apple pie and partnering.' But when you ask them what they mean and have done, you generally get an awkward silence. JIT II brings our vendors into the company--literally. The vendor places purchase orders on himself. Therefore, he is empowered by BOSE. It's like a blank check, but with the proper controls and monitoring at buyer level to see that the partnership (alliance) endures and prospers. In fact, Dixon claims, It was actually catalytic in that it changes your perspective and allows you to realize unforeseen benefits”.**

As a starting place, the commodity area of plastics and printing were the initial candidates. BOSE spends about \$15 million on purchases of plastics components, which originally involved five vendors having 60% of the volume. BOSE chose G&F Industries, a 60-person, \$12 million operation, as their JIT II plastics vendor. On the printing side, BOSE chose United Printing as their JIT II supplier of instruction booklets, warranty cards, and promotional materials. They then expanded the concept into other areas such as transportation, metals, and export/import.

### **The Transportation Cycle at Bose**

Transportation is divided into two categories: boat/plane and truck. W.N. Proctor was chosen as the JIT II in-plant for the boat/plane

area. The trucking was staffed by a P-I-E representative until their bankruptcy, when Roadway became the JIT II vendor. Like all BOSE in-plant personnel, these reps were free to follow a career path at either the vendor company or at BOSE. The reps' best weapon for fighting glitches in the movement of goods and materials was a computer system that tracked the merchandise and allowed them to clear goods with customs before leaving the ship or plane. The result was that more than 50% of Bose's inbound freight enjoyed paperless clearance through the US Customs, putting them in the top 1% of all companies, according to American Shipper magazine.

### **JIT II and EDI at BOSE**

When Dixon first implemented JIT II, he also wanted to include a less-than-truckload carrier. Since he wanted EDI links, he looked around for someone who had the best EDI available. This turned out to be P-I-E, and they were selected despite their unknown track record with BOSE. The system worked fine, and when P-I-E went out of business, BOSE again selected a vendor with EDI capability-- Roadway. When there was a problem with a delivery, the in-house rep fixed the situation in a matter of minutes (literally) instead of following a convoluted process in which the consignee called BOSE, who called the vendor, who investigated and called back, and so on. Dixon describes the system in the following manner:

**“This is the logistics transportation version of ‘one stop shopping,’ and even allows BOSE people to examine damaged materials using the Roadway terminals in order to target a specific problem area (instead of berating Roadway in a general way). BOSE has been known to visit a warehouse to perform a management visit, especially if it was experiencing a heavy loss due to theft. The idea of the connected information systems allowed people to swing into action before small problems became bigger ones. Future plans call for applying more EDI links on**

**the outbound tracking operations as well, but to date many of the shipping lines are behind the times when it comes to automation, although some are currently changing, e.g. both American President Lines and Sea-Land have integrated the application of JIT II to their operations”.**

## **Summary**

In the future world of Macrologistics Management at BOSE, there is a natural evolution in the products produced by each plant. Initially, plants only produced components for other plants, but then became increasingly self-sufficient. Over time, plants are expected to expand their range of manufacturing capabilities, integrating forward to produce finished products and backward to produce as many of the components requires for these products as possible. Lance Dixon describes controlled integration as follows:

**“If Bose were big enough, we’d do everything ourselves. Obviously, there are some areas we’d never integrate into, such as owning the steamships or the trucking lines that transport our speakers. However, if its fundamental to the quality or performance of BOSE products, then we want to control it”.**

Because of this natural desire to control the integration when pursuing an expanded range of operations, management has cited a few potential problem areas. One is that the vendor and BOSE have different priorities and agendas, which could lead to misfits if not carefully monitored. Also, relying upon the vendor might preclude BOSE from developing internal capabilities in manufacturing parts expertise. Finally, vendors can never understand BOSE operations and needs as well as company employees. Overall, though, management is very excited about JIT II and has helped a number of other

companies understand and begin to integrated this key concept of Macrologistics Management for themselves.

The concept works well in either sole source or multiple vendor per commodity situations. For the most part, Bose only implements one JIT II vendor in a given commodity. Dixon summarizes this point as follows:

**“We have found that it is not a problem to have one ‘most favored nation’ status vendor relationship, and still carry on a professional, mutually satisfying, fair relationship with other competing vendors in the same commodity. We use the following criteria to detect the possible vendors:**

- **An excellent vendor: with volume over \$1 million**
- **Current good quality: based upon a substantial number of purchase order transactions**
- **Current good delivery: using evolving technology, but not at a revolutionary change pace**
- **Current good cost levels and engineering support: and not be involved in company non-trade secret or sensitive technology area**

**Our JIT II vendors are using JIT II as a sales tool and have implemented it with other customers, with our guidance. This concept provides a built-in competitive advantage and is presently being licensed to a number of large organizations throughout the US.**

**For Bose to be able to continue to grow at 25 percent per year compounded rate, bridging and teamwork will be crucial. If the retailers and Bose collaborate, they might be able to cut one level and**

**reduce inventory for the mutual benefit. Supply chain simplification requires information sharing and joint planning. But the end result can be substantial reductions in the cycle time due to the flexibility of early ordering and the system interconnections worldwide. We believe this puts us on the threshold of redefining cycle time in a breakthrough manner.”**

In answer to queries about the acceptance of the concept in the manufacturing community, Dixon proudly points to the fact that Bose has had to create a ‘Visitor Orientation’ day once a month, where a special JIT II team conducts seminars and tours for executive from around the world. Concludes Dixon:

**“Up until a few years ago, the company was content to give this concept away as a matter of good public relations. Our approach now is to offer the services on a break-even basis, with any remaining funds going to provide scholarships for needy student individuals. In recent years, it has been the cornerstone of the Bose vision ‘to provide outstanding sound experience to everyone in the whole world’, the world of JIT II.”**

**Profile in Action:**  
**A Day In The Life**

**JIT II Reps in the Transportation Process**

A typical day for our in-plant JIT II Rep Penny Archer , is quite different. Quite a bit of it is spent controlling movement of freight by truck, sea and air on a world-wide basis. Let's follow Penny as she interacts with the Roadway Express and the Proctor mainframes on an international order she is expediting.

She enters both systems through terminals provided by these 'JIT II partners' and finds what she is looking for. (Last week she was stymied by a problem, which the part-time vendor system support professional was able to fix quickly). As she passed the Stats Control Room, she couldn't help but notice the latest measure: an excess of 50% paperless EDI clearance through customs for the seventh month in a row. It sure feels good to be #1 in that category and in the top 1% for the year. What's our JIT II secret? We link our computer systems with the Customs computer systems! We call this Breakthrough Thinking at Bose.

Next, it's 11am and time to check on the Bose container leaving on a boat from Kaoshung, Taiwan and the connected package on a plane from Japan. This info is available in a 'common record' profile format by the location freight forwarder and is easily accessible. The profile contains every aspect of the shipment and is forwarded to and from the Boston location of Proctor, Inc.. This data is also made available to all Bose terminals as needed.

At 2pm another visit was paid by Penny to the interconnected mainframe network. Boy, the fingertip availability of that data is so powerful, it changes the way we do business. Because it is real-time, we have daily opportunities to redefine cycle time. When a day or two is the difference between impacting a Bose factory production schedule, the Transportation rep provides Bose Procurement with the extra margin to avoid the roadblock or problem.

It's 3pm, and here comes the boss. (I wonder if he noticed the progress we've been making with JIT II?). "Good morning, Penny. Your good work of 'fine tuning' between our Procurement people, Transportation, and our plant engineers made a difference last month once again! We saw an immediate material cost reduction our communication

process is now two-step instead of the four. Penny couldn't help smile at his reference to the 'four horsemen' of logistics: planner-to-buyer-to-salesman-to-plantperson."

Well, it's 4pm and almost time for Penny to call it a day. It sure is nice to know you made a difference with the JIT II system once again. And she can't wait for tomorrow, for she has a meeting on the Living, Breathing Standards program and will be sitting in on an early design meeting with the engineers and others. So, let's follow Penny to visit with Cliff LaBonte, the In-Plant Rep from G&F Industries, and contrast his workday to Penny's (Cliff is getting ready for his trip to Mexico and is just getting ready to leave, so we only have time for a quick visit).

By the way, G&F Industries supplies plastic injection molding tooling, plastic parts and metal parts to BOSE, shipping to various BOSE plants worldwide, or utilizing the G&F Ireland facility.

Chris starts some days at his plant in Sturbridge, MA, where he controls various production schedules with a status review of BOSE in-process parts. He arrives at the BOSE Westboro manufacturing plant where he confers with John Argitis, Jr., the other G&F In-Plant. John is heavily involved in the daily planning and ordering of G&F material for this particular BOSE plant, using BOSE purchase orders, from his location in the plant purchasing department. (G&F is one of two companies who have asked to place two persons to keep up with all aspects of the business.)

At 11am, Chris arrives at his office in the Corporate Purchasing Department where he confers with the BOSE Framingham plant material planners and receives related material requisitions. He "calls them in" to his plant after sign off by BOSE Purchasing Manager on orders that exceed his dollar authorization per order, the same as any BOSE buyer. At one o'clock, he attends a BOSE New Product Project review at the BOSE Mountain Headquarters location, gathering information of any importance on parts G&F will be supplying. Two o'clock brings Chris into contact with BOSE design engineers who have questions on process possibilities and cost tradeoffs on a plastic part and various materials. At 3pm, a quality control issue is addressed with Corporate & Plant Quality personnel.

Today, Chris is leaving early for the airport to fly to the BOSE San Luis, Mexico, facility where a new product start-up is to take place with various G&F parts. He is versed in all aspects of the product start-up and possible difficulties having participated in the pilot production in the BOSE

Westboro plant. It sure is nice to have an in-house advantage and the JIT II 'evergreen' contract has no end date and needs no rebidding, thinks Chris as he flies off into the sunset once again.