

# FOR THE MANAGER

By David R. Dixon and David B. McLaughlin

## Winning the hearts of high-tech OEMs

### A strategy for sheet metal suppliers

High-technology phenomena in California's Silicon Valley have led to a burgeoning sheet metal industry. More than 300 independent suppliers working at or near capacity are keeping the original equipment manufacturers' (OEM) market supplied with chassis, cabinets, frames, and other fabricated components. One of these suppliers is Computer Cabinet Corporation (C3), a producer of complex welded cabinetry with a focus on medical electronics and electronic instrument markets.

#### New Opportunities with World-Class Manufacturing

The owners of this company recognized both the growing demand and the business opportunities associated with applications of Just-In-Time (JIT), total quality management (TQM), and other world-class manufacturing technologies. Some key customers who were successfully crafting their own world-class capabilities requested small lots of products to be delivered at frequent intervals (some-

times daily) at a cost equal to or less than historical levels.

This article documents a world-class manufacturing (WCM) case history in progress. It examines the company's use of WCM technology to address immediate opportunities and to forge a competitive strategy for the long term.

#### Evolution of the Strategy

Step one was to understand clearly the customers' needs. Much earlier, the company had recognized and responded to high-tech OEM requirements for

technical help in the design and prototyping of sheet metal for new products. By combining industrial design and mechanical engineering skills with state-of-the-art computer-aided technology systems, the company established itself as part of several customers' new product development teams. It was in this same spirit that the JIT delivery challenge was addressed.

To better understand the customers' requirement for JIT performance, and to respond appropriately, a formal WCM implementation program was

launched. A manufacturing consulting firm was engaged to provide education, training, and technical support. With this assistance, the company worked through a series of learning events and pilot applications of JIT/TQM technology, including setup reduction, order entry lead time reduction, weld assembly cells, and paint quality improvement.

Concurrent with the pilot projects, the first JIT delivery program was being set up with a key customer. **Figure 1** illustrates the nature and sophistication of the demand pull systems developed in the early stages of the WCM effort. The first application resulted in 17,000 shipments without a single late delivery.

In late 1993, the owners acquired the sheet metal division of an area company. With this acquisition came an aging complement of equipment, 50 long-standing employees, and the opportunity to "earn" the right to continue to supply this company with sheet metal fabrications.

The WCM program ground to a halt as the HP integration began, but as the merger efforts progressed, management turned its attention again to the pursuit of world-class capabilities.

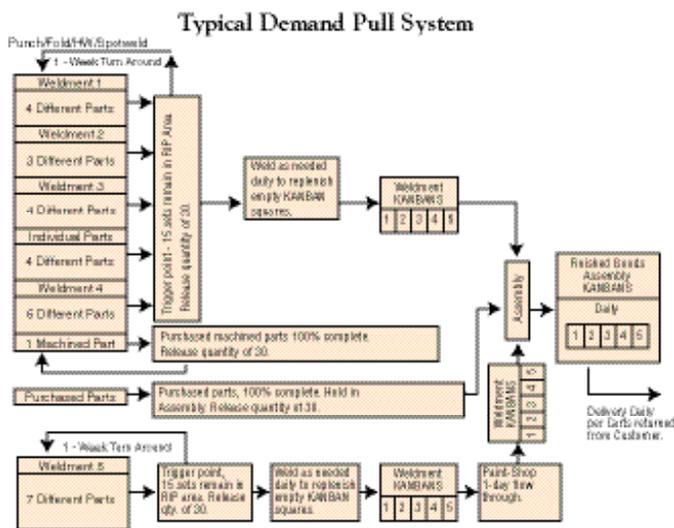


Figure 1

The demand pull systems were developed in the early stages of the WCM effort.

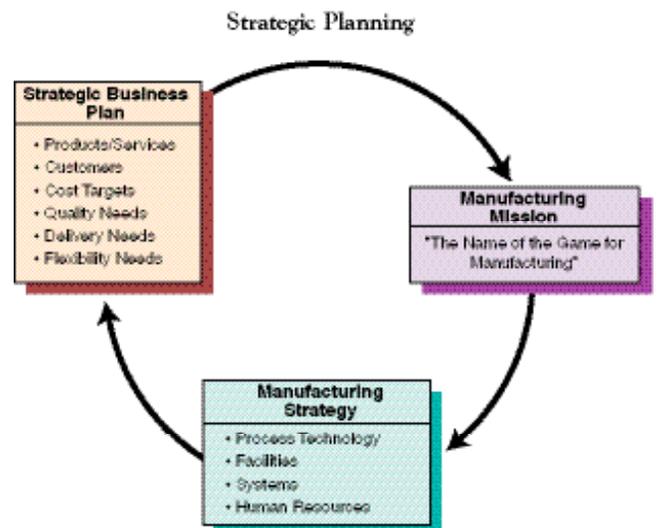


Figure 2

This figure shows the need for a carefully developed business plan.

		Customer Profiles/Manufacturing Mission	
		No	Yes
Highly Repetitive?	Yes	"Convert the Customer ASAP" Focused Factory - JIT Production - Batch Delivery	"Match the Customer Flow" Focused Factory - JIT Production - JIT Delivery
	No	"Solve the Problems" "Specials" Cell	"Manage Capacity, Limit Queuing, Flow the Parts" Quick Turn, Flexible Cells
		No	Yes
		JIT Adopter?	

Figure 3

This shows the relationship of repetitive manufacturing tasks, the customer profile, and the manufacturing mission.

**New Directions**

The integration took a strategic turn as the company gained insight into the needs of high-tech OEMs. This led to the realization that the company was really in more than one business. "JIT" to one customer meant something entirely different from what it meant to another. How frequently orders were placed and the number of units per order varied widely by customer. Clearly, prototypes, infrequent small-lot orders, and pilot runs required fundamentally different manufacturing capabilities than did routine deliveries of repetitive products. To try to meet these diverse requirements in a common manufacturing environment would be a "one-size-fits-all" approach that would probably fail.

Figure 2 shows a carefully developed manufacturing strategy. Specific and specialized market demands drive the manufacturing mission. Adjusting or reconfiguring the four elements of manufacturing—process technology, facilities, systems, and human resources—is essential to this strategy.

What the company discovered is that the manufacturing mission is distinctly different for the diverse market segments that it serves. This diversity is compounded by the classification of customers into those who are adopters of JIT technology and those who are not.

In Figure 3, the relationship of the degree of repetition, the customer profile, and the manufacturing mission is illustrated. With this concept in mind, the company began to plan a "bold stroke" application of WCM technology to enable it to offer high-level performance to every segment of its market. (See also Sidebar.)

**Implementation of the Strategy**

First, the company identified customers fitting the profiles shown in Figure 3. This is typical of most sheet metal job shops.

It is also important to note that several JIT customers place orders for prototypes. In fact, the company's support of custom design and prototyping of new products not only led to partnering, but it also helped the firm to secure the high-volume JIT business as the customers' new products were introduced and began to mature in the marketplace. Early experience with this new product development cycle and the successful pilot JIT programs led to the basic manufacturing strategy illustrated in Figure 4.

The company's JIT-focused factory, standards, and specials proto cell managers are each accountable for meeting specific, well-defined manufacturing missions aligned with the needs of the market (see Figure 4). This strategy fits with the fundamental nature of the high-tech marketplace. As new products are designed and prototyped, the proto team works closely with customer engineers to solve design and process problems. The team objective is to move production to the standards cells which will then produce the small, intermittent lots that satisfy early demand while the product matures. If the product "hits," it is then moved to a JIT-focused factory to be run in daily quantities synchronized with the customer's demand pull.

This strategy also aligns supporting (office) resources with market segments. The approach integrates people into teams with the proper focus and

Basic Manufacturing Strategy			
Office	Production		Accountability
<ul style="list-style-type: none"> <li>- JIT</li> <li>- Order Processing</li> <li>- Purchasing</li> <li>- Estimating</li> <li>- Programming</li> </ul>	JIT Process Flow (Focused Factories) - Punch - Form - Hardware - Weld - Paint - Assembly		JIT Focused Factory Manager
	JIT Parts Flow (Standards Cells) - Punch - Form - Hardware - Weld - Paint - Assembly		Standard Manager
			Cell Leaders
<ul style="list-style-type: none"> <li>- Proto Team</li> <li>- Engineering</li> <li>- Drafting</li> <li>- Estimating</li> <li>- Order Processing</li> <li>- Programming</li> </ul>	Problem Solving (Specials Cells) - Laser - Form - Hardware - Punch - Hardware - Weld		Specials Manager

Figure 4

Basic manufacturing strategies of JIT and Proto team or cell concepts are shown here.

potential for world class performance standards.

**Technical Features**

By mid-1996, the company was committed to implementing a full physical and organizational manufacturing strategy. A fast-track design and implementation program was launched. When a third plant facility was acquired, a planning project was undertaken, resulting in the physical rearrangement of equipment to create the JIT-focused factory, the standards cell, and the proto cell. At the same time, the optimum location of shared resources such as paint and assembly was determined.

Figure 5 shows the conceptual differences between the standards and JIT subsets of the shop. Each employs the technologies of JIT and TQM in a "mix and match" designed to support the objectives of each cell or focused factory. In effect, the JIT/TQM concepts and techniques provide the essential processes, systems, and skills to meet the demands placed on each group.

Characteristics of the cells are summarized:

**Specials cells**

1. Versatile, quick-change computer numerical control (CNC) punch/laser capability
2. Standard CNC brakes used to develop production bending approach
3. Hardware insertion
4. Full spot weld/welding capability
5. Flexible, highly skilled work force ("problem solvers")
6. An integrated front-end support team
7. Work-order-driven production

**Standards cells**

1. Automated CNC punching cell and stand-alone CNC punch capability shared by downstream cells
2. Downstream form/hardware/spot weld/weld cells focused on part families
3. Cross-trained people who are able to balance work loads and maintain flow
4. Emphasis on fast setup, error-proofing, housekeeping, and process improvement
5. Front-end support (office) resources shared with JIT cells
6. Work-order-driven production
7. Queuing limited by physical Kanbans (maximum number of parts or hours of work per Kanban location)

**JIT cells**

1. Dedicated, stand-alone CNC punching
2. Dedicated CNC brakes, hardware insertion, and welding
3. Some cross training, but employees tend to be dedicated to workstations
4. Emphasis on fast setup, error-proofing, housekeeping, and process control
5. Front-end support (office) resource shared with Standards cells
6. Demand-driven Kanban, with no work orders
7. Replenishment of lower-level parts based on pull signals

A common feature of all of the cells is a close-coupled layout that minimizes material handling and facilitates communication and work load balancing.

**Results**

Significant improvements in all key performance metrics were a direct result

## Matching Manufacturing Capability to Market Requirements

C3 market segments are defined by:

1. the degree of repetition; i.e., how frequently the parts are ordered or "pulled" and in what lot sizes.
2. the maturity of the product design.
3. the reliability and maturity of the processes used to produce the parts.

This criteria has driven the related manufacturing missions summarized below:

"Specials" are ordered infrequently and in small lots. The product design may be evolving (e.g., prototypes) and all of the bugs have not been worked out of the tooling, methods, setup guides, and work instructions. Thus the mission for the "Specials" team is to *solve the problems* with the product

and process design so that the parts can be moved to one of the "Standards" cells.

"Standards" are ordered more frequently and usually in lots larger than those processed in the "Specials" cell. Product designs are more stable and the process has been standardized. The mission for the "Standards" cell is to *flow the parts*, i.e., use appropriate JIT/TQM technology to quickly and efficiently process a wide variety of parts in relatively small quantities.

"JIT" products are "pulled" to customer assembly operations, often on a daily basis. Product designs are mature, and processes are finely tuned using JIT techniques to meet the mission of these cells, which is to *match the customer's flow*.

of the company's WCM program and its strategies. These improvements were driven by gains in the metrics at the cell level, including setup time, throughput time, linearity, schedule completions, and first-pass yields.

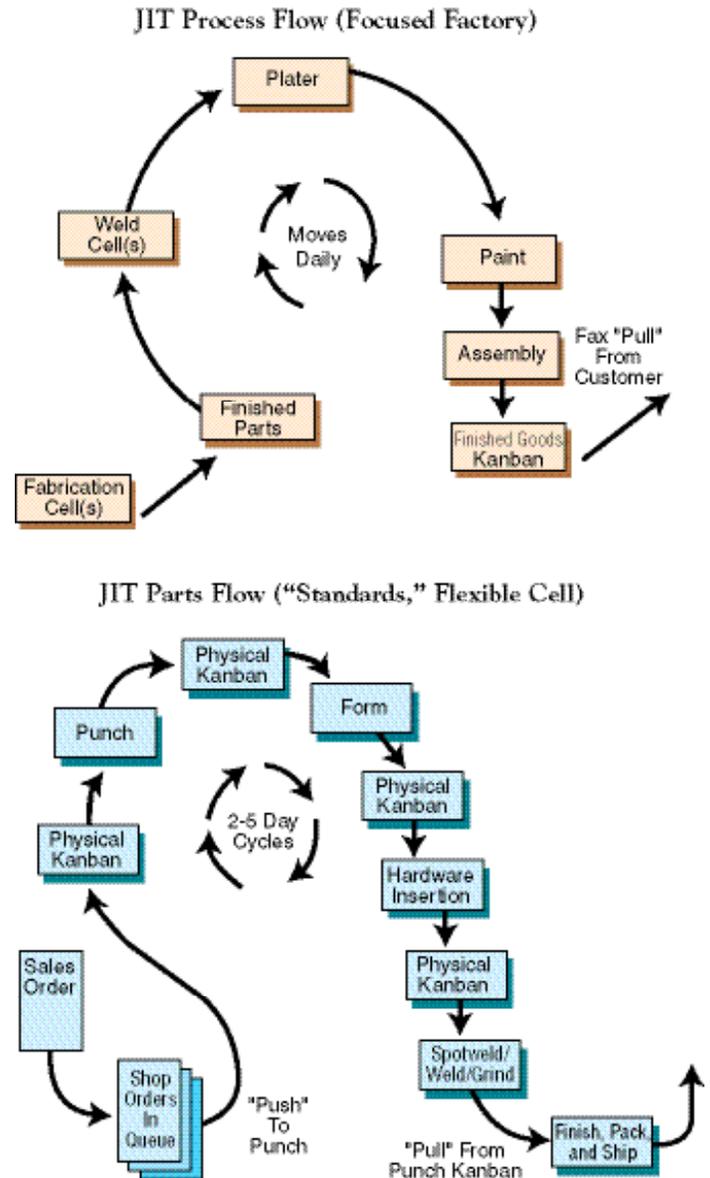
The company has more than tripled its size in the past five years. This growth has come from within a customer base that the company chose to serve.

A few fabrication job shops, including the example company, have come to understand the critical relationship

between good business strategy, manufacturing strategy, and the technologies of JIT/TQM and other current manufacturing tools. In an industry characterized by heavy competition and at times, too much capacity, such a strategy can spell the difference between growth and prosperity and mediocrity and stagnation. ■

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**Figure 5**  
Conceptual differences exist between the JIT and Standards subsets of the shop.