



## **Solectron Corporation**

847 Gibraltar Drive, Milpitas, California 95035 USA  
Web site [www.solectron.com](http://www.solectron.com)

### **Introduction**

Founded in 1977, Solectron Corporation provides integrated solutions that span the entire product cycle — from pre-production planning and design, to manufacturing, distribution and end-of-life product service and support — for the world's leading electronics original equipment manufacturers (OEMs).

Solectron offers its customers competitive outsourcing advantages, such as access to advanced manufacturing technologies, shortened product time-to-market, reduced cost of production and more effective asset utilization. The company is well known for its printed circuit board assembly (PCBA) business but also delivers a full-range of systems manufacturing solutions for its customers in a variety of industries.

The company has received 200 quality and service awards from its customers in addition to the 1997 and 1991 Malcolm Baldrige National Quality Awards, and it's the only company to win the Baldrige award twice.

Solectron is a global leader in the electronics manufacturing services (EMS) industry. According to *Technology Forecasters*, an independent industry analyst, the 1998 EMS industry is projected to be US\$89.6b and is expected to grow 25% per year, which will result in a US\$178b market by the year 2001.

Solectron partners with its customers at the earliest stages of a product's design to ensure a smooth, rapid and cost-effective transition from product concept to volume manufacturing. Solectron can analyze a product's design, materials, processes and testing methods to ensure manufacturing efficiency and lowest total cost in the supply chain. The company offers cutting-edge manufacturing equipment and processes from ball-grid-array technologies to high-velocity, high-volume systems operations to meet its customers' most demanding manufacturing challenges.

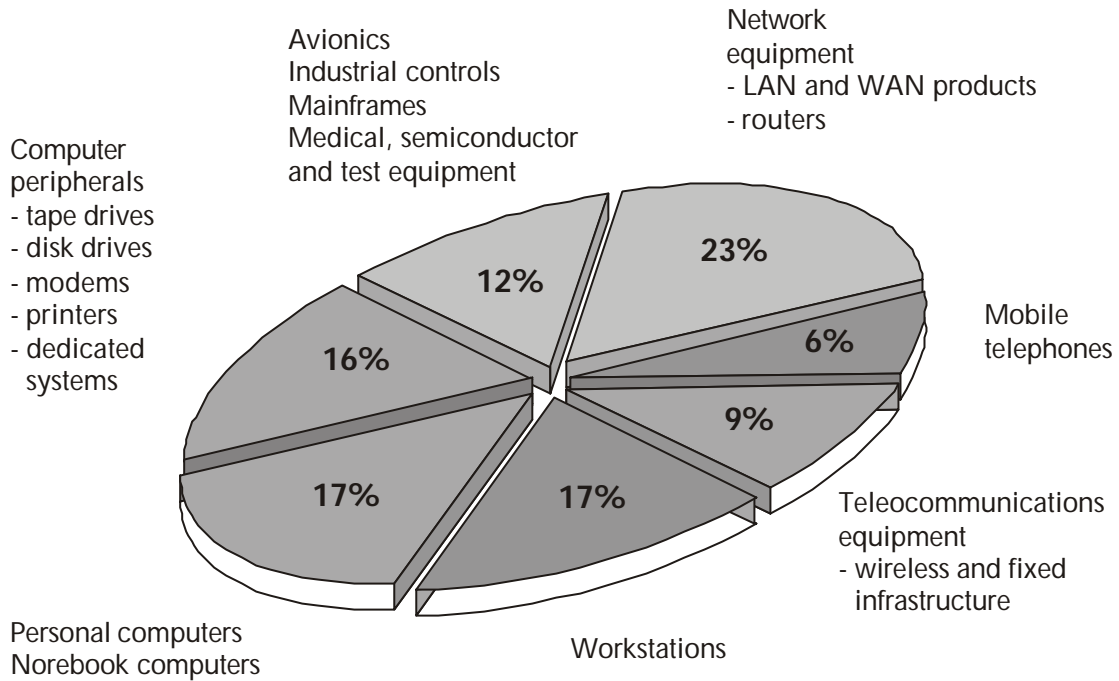
A centralized supply-base management structure, in conjunction with local site commodity teams, enables the company to provide the global leverage in total cost, supply assurance, local responsiveness, flexibility and time-to-volume that its customers require to compete in the global marketplace. Solectron's partnership with its customers does not end at the assembly line. This ongoing relationship enables customers to devote more resources to developing their next generation of products while Solectron serves their current products' needs.

For additional material see the exhibits **[Solectron Business Excellence Roadmap](#)**, **[customer relationship management at Solectron](#)**, **[NPI at Solectron](#)**, and **[Mission to metrics at Solectron](#)**

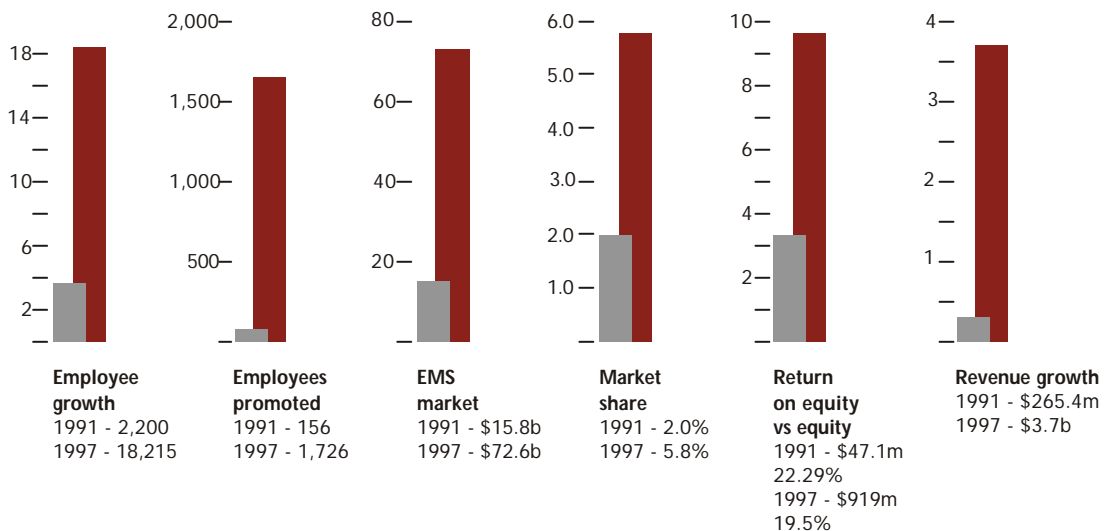
## Solectron

"Serving diverse industry needs"

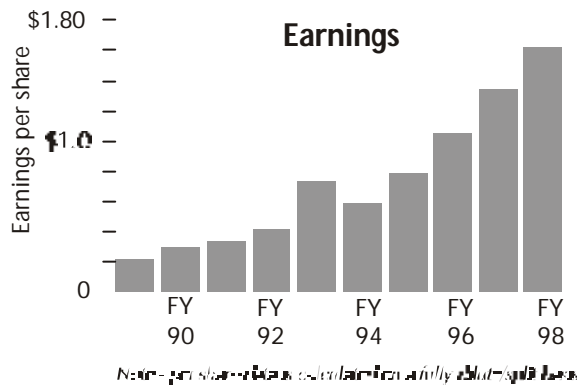
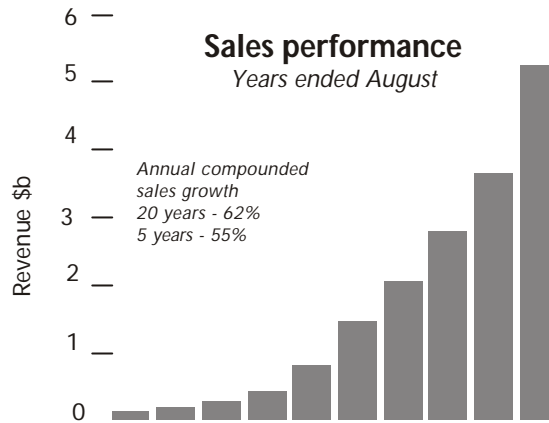
Percent of sales, first quarter FY1999



## Solectron at a glance



Solectron won the Malcolm Baldrige National Quality Award in 1991 and 1997 (the only firm ever to win the award twice). The key indicators above highlight how the firm grew during the six years between the 2 awards. In 1991 there was just one site, in California. By 1997 there were 16, world-wide.



### What the Baldrige means to Solectron

In an October 1997 press release to announce its second Baldrige Award, Thomas Kennedy, Solectron's vice president of quality, said "Focus on the Baldrige process has created a shared vision for Solectron worldwide.

"We adopted the Malcolm Baldrige National Quality Award criteria back in 1989 and have been using it to drive our business processes worldwide. The positive results of using the Baldrige processes are evidenced by our continual business growth and record financial performance.

Solectron's commitment to quality and customer satisfaction goes much deeper than just preparation for the Baldrige application process. In 1993, Solectron adopted a comprehensive internal assessment process, the Solectron Total Quality Excellence Award (STQEA) program, used to help sustain the company's commitment to the Baldrige process. As part of the STQEA, each of Solectron's sites worldwide writes a self-assessment based on the current Baldrige criteria. This is then reviewed by a team of 37 internal examiners at Solectron, who do scoring, consensus assessment, site visits and feedback reports. The company then uses the results as a method to foster continuous improvement and as input for its long-range strategy and planning processes.

“Winning the Baldrige Award for the second time reinforces our quest for excellence. We entered into the Baldrige competition because quality is fundamental to our core beliefs and we use the Baldrige processes as a benchmark to drive our company — we did not enter to just to win another award,” said Dr Ko Nishimura. “At Solectron, we believe that we must continue to look at everything we do as a process that must be improved. In order to maintain our leadership role within the business community and the EMS industry we must never stand still and will continue to seek input and recommendations from our 18,000 plus employees, suppliers and customers on how we can do the job better.”

### **Solectron’s mission and beliefs**

***“Our mission is to provide world-wide responsiveness to our customers by offering the highest quality, lowest total cost, customised, integrated design, supply chain and manufacturing solutions based on integrity and ethical business practices”***

Solectron’s mission statement is the foundation on which the company runs its business. All associates follow it to the letter, which allows Solectron to maintain successful partnerships with its customers and suppliers. Solectron updated its mission statement in 1997 to reflect its expanded capabilities as a global provider of total design, supply-chain and manufacturing solutions.

Solectron’s director of quality assurance Rich Allen says (visit, March 1999) the mission hasn’t changed since the firm was founded, and it’s belief system — based on customer first, respect for the individual, quality, supplier partnerships, business ethics, shareholder value and social responsibility are all equally important — with the management challenge being to manage the equality and trade-off the inevitable internal stresses and conflicts.

Solectron’s beliefs are reinforced with robust processes for determining customer requirements, managing customer relationships and measuring customer satisfaction. Winston Chen, Solectron’s first CEO, was instrumental in forming Solectron’s vision of what a quality company should be. He instilled in his associates the idea that the customer is first, the need to work relentlessly to satisfy that customer, to always work to improve the manufacturing process, and to satisfy the stockholders. To accomplish these objectives, he created the Solectron Beliefs, which all associates use as a model for behaviour:

- **Customer First:** strengthen customer partnerships by providing products and services of the greatest value through innovation and excellence
- **Respect for the Individual:** emphasise associate dignity, equality and individual growth
- **Quality:** execute with excellence; drive to six-sigma capability in all key processes; exceed customer expectations
- **Supplier Partnerships:** emphasise communication, training, measurement and recognition
- **Business Ethics:** conduct business with uncompromising integrity
- **Shareholder Value:** optimise business results through continuous improvement
- **Social Responsibility:** be an asset to the community

## **Vision**

***“To be the best and continuously improve”***

Solectron’s vision statement is a reflection of its fundamental beliefs.

The company recognises that in order to maintain its position as an industry leader, it must always work to improve its business and processes. This is something Solectron takes very seriously, as evidenced by the internal and external review processes that it uses to constantly better itself.

Dr Chen’s vision in the 1970s and 1980s was to ‘revitalise US manufacturing competitiveness’ by making Solectron a world class electronics manufacturing company and setting an example for others to follow. His approach to achieving this vision was to benchmark Japanese manufacturing companies and combine American innovation with Japanese techniques.

The Five Ss are means to achieving that vision:

### **Seiri/Organization**

- Distinguish between those things that are needed and not needed
- Keep only needed materials at the job site
- Throw away all unneeded items immediately

### **Seiton/Orderliness**

- Put things in right order in designated areas
- Store all materials and information in an orderly fashion at all times
- Tidy Ready for use
- Organised according to frequency
- A place for everything and everything in its place

### **Seiso/Cleanliness**

- Problems are more visible when everything is neat and clean
- Find minor defects while ‘sweeping clean’

### **Seiketsu/Standardized Cleanup**

- Clean tools, equipment and job site immediately after use
- Equipment that is kept clean runs better

### **Shitsuke/Discipline**

- Use and follow standard procedures
- Follow company rules and regulations
- Follow safety procedures at all times

Solectron is committed to total quality management and to providing a full range of manufacturing and design solutions that exceed customers’ expectations. To better achieve the level of quality demanded by the company and its customers, Solectron has combined the focus of the Malcolm Baldrige National Quality Award criteria on customer-driven results with the procedural discipline of the International Standards Organization (ISO) 9000 standards. With this combination, the company has put in place a quality system that is woven throughout the entire organization, from the associates on the assembly line to executive management.

**“Solectron believes that ISO certification and compliance are necessary to maintain its industry-wide leadership and position”**

In 1987, ISO 9000 standards were developed to ensure that companies' products and services have consistent, documented approaches that meet the European community's quality requirements. Certification to these standards became a corporate imperative for Solectron in 1992. To improve the level of quality and consistency of operations on a global scale, Solectron seeks ISO certification for all manufacturing locations and believes that ISO certification and compliance are necessary to maintain its industry-wide leadership position. ISO 9002 certifies the company's manufacturing processes while ISO 9001 certifies the design and manufacturing processes.

In 1988, Ko Nishimura, Solectron's chairman, president and chief executive officer, brought to the attention of management the criteria for the Malcolm Baldrige National Quality Award (MBNQA), which is an integrated, results-oriented framework for implementing and assessing processes.

The company adopted these standards in 1989 and was awarded its first Malcolm Baldrige National Quality Award for manufacturing in 1991. In 1997, after waiting the required five years, Solectron reapplied for the award.

On October 15, 1997, Solectron was awarded a second Malcolm Baldrige National Quality Award. In the 11-year history of the national program, no other company has applied for and won the award two times.

The discipline of the ISO registration process, reinforced by semi-annual audits and re-certification every three years, complements the quality rigor of the Malcolm Baldrige National Quality Award criteria, both of which demonstrate Solectron's commitment to quality.

### **Awards**

Solectron's dedication to our customers' success is embodied by our enterprise-wide focus on continuous improvement in everything we do. In financial year 1997-1998, Solectron receive a number of awards, including:

#### **Quality awards**

In October 1997, and in 1991, Solectron won the Malcolm Baldrige National Quality Award for Manufacturing. Solectron is the first company to win the award twice in the 10-year history of the program.

#### **Community awards**

- 1998, Solectron's facility in North Carolina was given the Blue Diamond Award for its contributions to the community. This is the sixth Blue Diamond Award the site has won.
- 1997, the Peninsula Conservation Centre awarded Solectron a special recognition award for environmental, pollution prevention and recycling programs.
- 1997, Solectron California was honoured with Susanne Wilson Environmental Achievements Meritorious Recognition award for pollution prevention.
- 1997, Solectron Technology earned the Hibiscus award for notable achievement in environmental performance.
- 1997, Solectron France is the first French company to have its Environmental Management and Audit system certified by the European Economic Committee.

### **Business awards**

- October 1998, IndustryWeek named Solectron's facility in **California Best Plant in North America**. The facility was chosen from among 170 plants nominated, and is the only company representing the electronics manufacturing services industry.
- August 1998, IndustryWeek named Solectron one of the **World's 100 Best Managed Companies**. This is the third consecutive year Solectron has been on the list.
- August 1998, Money Magazine ranked Solectron number 16 on its list of the Top 50 Stocks of the 1990s. Had you invested US\$1,000 in Solectron on January 1<sup>st</sup> 1990, your investment would now be worth US\$45,627.
- May 1998, Computerworld magazine chose Solectron as number 1 in its **100 Best Places to Work in Information Systems**. In 1997, Solectron was ranked number 3.
- April 1998, Fortune ranked Solectron number 393 on its list of the **Fortune 500**, up from number 470 last year. Fortune ranked Solectron number 94 for total return to investors, which climbed to 55.7%, number 347 in profit, which grew 38%, and number 324 in market value, which reached US\$4.5b as of March 18, 1998, the date of the evaluation.

### **Community involvement**

The company's commitment to long-term partnerships extends beyond customers, into its communities, demonstrating its belief in social responsibility. Striving to be an asset to its communities, the company directs much of its community involvement efforts to education, environment, human services and the arts.

Solectron's employee volunteerism is evident through their participation with local community groups. The company's sites world-wide are involved in programs that reflect its commitment to the community. Below are some highlights of the company's community activities.

Solectron continues to support the United Way and the Second Harvest Food Bank through annual campaigns. With the company's support, California Polytechnic at San Luis Obispo developed a new computer-aided design/computer-aided manufacturing (CAD/CAM) lab at the School's College of Engineering. The Milpitas, California site has actively partnered with the Centre for Training and Careers since 1993.

Through this partnership, an electronics classroom was developed in 1994, which offers electronics assembly training and a program on surface mount technology. The California site also established a partnership with the local high school, Milpitas High School, in 1994. Through this partnership, Solectron has assisted with partial funding for two new computer labs for students.

Solectron also strives to support the community within the company. English as a Second Language classes are held in California to help employees both on and off the job. Citizenship classes were also held in 1996 and 1997, resulting in many employees applying for citizenship.

Georgia associates worked on the 1998 5k Mitsubishi Miracle Miles, benefiting CURE, an organization for children with cancer and leukaemia. In 1998, Georgia associates collected gifts for the Toys for Tots program and for local foster children through the Department of Family and Children Services. Also in Georgia, associates hosted a holiday part at a local nursing home and donated gifts to area nursing homes.

Solectron in North Carolina provides job skill workshops for the local Urban League. In North Carolina, Solectron is also active with the local high school, Garinger High, and supports the school's Academy of Electronics

Solectron's facility in Texas is a founding supporter (with the University of Texas) of **Neighbourhood Longhorns**, an award program to encourage local youths to read, achieve good grades and stay in school. The company's branch in Texas is also a major sponsor of Expanding Your Horizons, a conference to present math and science career possibilities to girls in junior and senior high school.

Solectron's Washington site supports the University of Washington's co-op education program, giving students work experience. Solectron in Scotland provides prize for achievement in various university and school curricula.

In Malaysia, the Solectron site worked with the Penang State Education Ministry to set up a computer centre for training school teachers. Solectron contributed equipment and funds to the project as well as instructs the classes.

### **Environment**

In addition to complying with all national, state and local laws concerning environmental health and safety, Solectron also prides itself on:

- an aggressive water recycling program
- recycling of hazardous waste
- recycling of solid waste
- technology development to establish environmentally-friendly manufacturing processes and implement them in Solectron factories
  
- **Solectron California** was awarded a special recognition this year by the San Francisco Bay Area's Peninsula Conservation Centre Foundation for its environmental, pollution prevention and recycling programs.
- **Solectron California** also won the meritorious achievement recognition of Santa Clara County's Susanne Wilson Environmental Achievement Award.
- Solectron Texas has participated in the Clean Texas 2000 Program to help set reduction goals for hazardous waste and toxic releases.
- **Solectron France** is the first French company and one of the first six European firms to have its Environmental Management and Audit System certified by the European Economic Community (ECO-LABEL). This is equivalent to the ISO 14001 with the further requirement that the company is obliged to publish all environmental results.
- At **Solectron's Penang** facility, environmental control and protection also get great emphasis. In 1996, the company participated in the first Malaysian National Environmental Award program. Solectron Penang was recognized in the Electrical/Electronics segment with notable achievement.
- At the company's sites in **Malaysia** and **China**, employees have helped train the local governments in best practices for recycling, hazardous material handling and auditing.

Financial assistance to benefit the arts and culture is ongoing. Solectron has assisted some of the following organizations in California:

- San Jose Repertory Theatre
- Opera San Jose
- El Teatro Campesino
- San Jose Children's Musical Theatre
- Mexican Heritage Corporation's Fiesta de Navidad.

Solectron's corporate headquarters in California continues to support a variety of community groups, such as:

- Asian Pacific Community Fund
- Junior Achievement
- The Tech Museum
- South Bay Black Nurses Association
- YWCA Workforce Silicon Valley,
- Yu-Ai-Kai Community Centre
- Hispanic Charity Ball
- Teach for America

### **Visit notes**

*By Malcolm Macpherson*

I was a member of a New Zealand tour party which visited Solectron's Silicon Valley headquarters in Milpitas, CA, in March 1999. Rich Allen, director of quality assurance, and Denise Co hosted the team, with contributions by Ali Hassanzadeh, senior manager strategic organisation development, and by Phil Fok and Sae Jae Cho.

### **Items**

- Solectron has a total of 6 million square feet of factory space and 32,000 employees world-wide
- Americas — 11 locations, 19,000 employees, 4.8 million square feet of factory space. Europe — 8 locations. Asia — 6 locations
- The company will do \$6-7b worth of business in fiscal 1999, growing at \$2b per year. Earnings per share are about 0.82c.
- Solectron operates in an \$800b sector — 'there's no problem with the size of the sandbox — it's huge,' said Rich Allen.
- New business acquisitions are sometimes turned down because they don't fit the Solectron way of working ... "executives say they choose clients carefully because of the effort they put into each relationship. For example, to Terayon Communications Inc (a start-up cable-modem company, which has Solectron buy the parts and assemble, test and ship modems to cable TV companies) that means daily huddles with some or all of the eight Solectron managers on the account. Solectron employees know Terayon's production schedule, revenue targets and plans for new modems. For a young company still learning its business and tweaking its designs, the help is more valuable than any savings from manufacturing overseas, says Dennis Picker, Terayon's COO. 'We might be able to get a slightly better price in Asia, but the proximity is worth its weight in gold' (according to Scott Thurm in The Wall Street Journal, August 18, 1998).

- The industry is evolving towards transparent boundaries, and outsourcing
- And the Solectron business is changing — expanding into pre- and post-production areas and fulfilment (a process that supplies a finished manufactured product directly from a manufacturing facility to a distributor or end user without the finished product going back through the company that has created the product. The fulfilment cycle may include receiving customer orders, configuring products to order, shipping and invoicing products to distribution outlets or end users around the world).
- There are 4-5 major competitors in the EMS industry, Solectron is the largest supplier to the industry. It's long been the number one in profit margin and EPS, now it's the largest supplier as well.
- Solectron's edge is total solutions — the firm is able to perform in almost every area and do it well
- While the firm has aligned itself with customers in key growth areas — a major proportion of Fortune 500's electronics companies are Solectron's customers, it traditionally has not aligned itself with any one customer — no individual sector accounts for more than 15% of its total business, making the firm 'recession-proof.'
- Solectron has 115-120 customers, and this number has stayed more or less constant over the years
- Solectron is a commodity company, with low margins, and is very cost-conscious — profit before tax is 7-9%, after tax about 3% — and it operates on much thinner profit margins than its customers do. On average, it spends almost 90c to make products it sells for \$1, compared with 66c for HP and 35c for Cisco. It relies on high volume and low overhead.
- By keeping assembly lines running 24 hours a day, Solectron spreads the costs of its buildings and machines across more products. As a \$3 billion-a-year purchaser of electronic components, Solectron gets low prices and precisely scheduled deliveries that minimise inventory. Efficiency and expense is meticulously recorded; profits are tracked weekly for the entire company. 'We measure the hell out of things,' says Jim Daly, manager of the complex-systems division (according to Scott Thurm).
- Solectron first applied for a Baldrige award in 1989, when it was about a \$150m business, and the application probably scored about 200 points. But key staff were impressed by the potential of the approach, and by the 'tremendous' feedback, and so the firm entered again, turning the feedback report into their strategic plan.
- Solectron also began using the Baldrige criteria as a tool for transferring their processes and culture to new plants.
- 'Linkages' and alignment is the hardest part to explain and get right in a Baldrige application, but is very important — Solectron didn't understand the significance of this in their early applications, only getting on top of it in later applications.
- After winning, what? Solectron continues to use the Baldrige process as an internal improvement methodology — all sites create applications, all senior executives become Baldrige examiners (and are trained against the Baldrige criteria), each site completes a full application, with consensus conferences, site visits and feedback reports just as in the Baldrige system. All this is done on a 2-year cycle, and the organisation is into its third cycle this year, with 18 applications being prepared around the company
- Individual sites also seek local and regional excellence awards.

- The Baldrige process has worked for Solectron, and the firm uses the Baldrige system for replicating itself at new sites, especially at start-up sites — it facilitates fast starts, allowing new sites to move quickly into profit, and it accelerates the learning process. To maintain its corporate-wide emphasis on quality as it expands globally, the company has designed a 'new site start-up process' based on the Baldrige award criteria, helping to ensure that the new facilities are aligned tightly with regional customers' requirements and expectations. Opportunities for improvement are identified through the Solectron Total Quality Excellence Award Program, an internal version of the Baldrige award process.
- Solectron is a publicly traded company on the NYSE under the symbol SLR.
- Revenues for fiscal year ended August 31, 1998, were US\$5.3 billion.
- Over the last seven years the company has grown rapidly, averaging a compound annual sales growth rate of 53% per year
- Solectron's three-pronged planning process encompasses an annually updated three-year strategic plan, an annual operating plan, and an annual improvement plan that sets, among other goals, stretch targets for all units and processes within the company. CEO Nishimura sets annual corporate business goals and improvement targets, while regional executives and the general managers at each production site determine their targets on the basis of their knowledge of customer requirements. Another round of planning aligns corporate goals with regional and site targets, while the company's global account managers ensure that the requirements of customers served by several Solectron facilities will be met. The result is an 'entrepreneurial' annual operating plan. Individual plans for each account and each site support Solectron's strategic objectives for building markets and strengthening capabilities. Yet, managers have considerable freedom in determining how best to achieve goals for financial performance, customer satisfaction, and employee satisfaction.

### **Growth by merger and acquisition**

To illustrate Solectron's aggressive acquisitions policy, and its strategic interests in extending across the value chain in its areas of interest, here are four recent acquisitions:

#### **Second quarter of financial year 1999**

Solectron assumed world-wide manufacturing responsibilities for the motherboards used in IBM's mobile products, and acquired IBM's Electronic Card Assembly and Test operations in Austin, Texas, enhancing development and high-end PCB assembly capabilities through access to IBM's intellectual property and more than 100 patents covering a wide spectrum of technologies and capabilities included in the design and manufacture of notebook motherboards.

#### **First quarter of financial year 1999**

Solectron and Mitsubishi Consumer Electronics America (MCEA) formed a manufacturing partnership in the cellular telephone market in North America, and Solectron acquired the manufacturing assets of MCEA Cellular in Braselton, Georgia. MCEA is the first Japanese OEM to divest manufacturing assets to a contract manufacturer. The acquisition further strengthens Solectron's build-to-order, configure-to-order and new product introduction capabilities.

Solectron and Ingram Micro (IM) announced a strategic alliance to create the first truly global channel configuration solution to provide build-to-order and configure-to-order assembly services for PCs, servers and other related products in the United States, Canada, Europe, Asia and Latin America. By leveraging IM's ability to generate product demand, Solectron will be able to expand its market access into the channel.

#### **Fourth quarter of financial year 1998**

Solectron acquired IBM's Electronic Card Assembly and Test Operations in Charlotte, North Carolina, enhancing Solectron's high-end PCBA and test development capabilities including failure analysis and surface mount technology. Solectron also gained access to 115 patents and 51 disclosures from IBM covering a wide spectrum of technologies in the area of electrical test.

#### **The Common Processes initiative at Solectron**

*From notes of a presentation by Phil Fok*

A pre-common process call for examples of poorly co-ordinated practices yielded 24 different sample quotations (all different), which could almost have been from 24 different companies. The firm could have been bidding against itself. These were simplified and unified, and customers have expressed great appreciation of the consistent approach. "Big customers like DELL can't tolerate five different ways to place an order," said Fok, so there was a need to establish common, and internally consistent, processes.

The strategic objectives of the common process initiative are:

- A single point of contact for each customer and supplier
- To enable fast, simple product transfers between sites
- To provide a template for new site start-ups and site integration

Common elements of the common processes initiative are:

*Processes - People - Systems, with data tying all three together*

#### **Common process co-ordination**

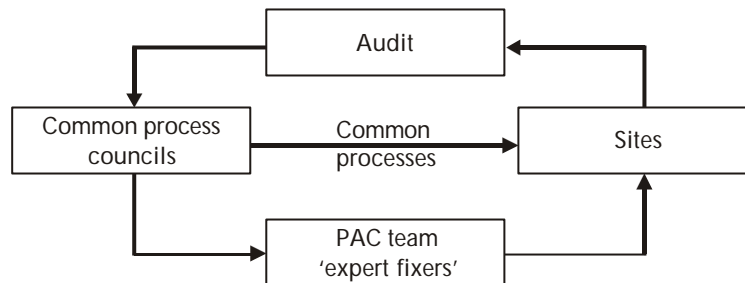
- Prioritise activities (customer first)
- Specify the organisation's requirements
- Define terminology
- Each common-process council needs to include representatives from other key areas
- Recognise how information flows upwards and downwards through the organisation

#### **Common process data**

- Select metrics
- Sort metrics into what vs why
- Dissect each into basic elements
- Define each element
- Maintain central control of complex calculations (46-element scorecards, team reviews every quarter, especially look at trend charts for each metric)

## Councils

There are 36 'functional' council (ie materials, IT, quotations, supplier quality ...), each responsible for common process initiative in their area of interest, and 36 critical common processes. There's a process for implementing, auditing, and 'fixing,' common processes:



Every aspect of the firm's operations are involved in the common process initiative—from finance to equipment standards through to ISO registration, customer complaint resolution, and so on

Trade-offs against an 'entrepreneurial, free spirit' approach are needed, there has to be a compromise between the need for consistency and innovation, and this means 'walking a fine line,' to make the best choices.

Does it work? Terayon Chief Executive Zaki Rakib praises what he calls Solectron's 'incredible discipline. Every line looks exactly the same everywhere in the world.' The result: Solectron can shift jobs or add capacity quickly.

## Media commentary

Solectron gets its share of media attention. Below is a sampling of recent stories, which capture a variety of views of the corporation:

### Solectron proves it's a trendsetter

*From an editorial by Matthew Sheerin, EBN, 19<sup>th</sup> June 1998*

By teaming with Ingram Micro to provide "channel assembly" services for OEMs and their resellers Solectron this week demonstrated once more that it is an innovative, forward-thinking company that can expand its revenue base in more ways than by simply taking over its customers' manufacturing operations.

Among the first in the business to grow through plant acquisitions, to set up operations around the globe, and to expand its offerings beyond traditional printed-circuit-board assembly, Solectron has joined Ingram Micro, the world's largest computer wholesaler. Together, the two will build PCs to spec for Ingram's 100,000 resellers around the world, with 48-hour turnaround.

Moving to channel-assembly has been fast and furious among the PC companies that don't sell directly to customers. In addition to giving customers exactly what they want in a timely manner, cutting costs and reducing the supply chain have been the key reasons behind the initiatives. All the major OEMs, distributors, and value-added resellers have adopted some sort of build-to-order and channel- assembly program.

With the Solectron alliance, Ingram will have access to 11 assembly plants, eliminate yet another step in its supply chain, reduce time to market and inventory costs, and better serve end customer. When the program is in full gear, it will also have a direct link to component suppliers, helping that segment get a better handle on customers' needs.

"My guess is that the Solectron-Ingram alliance will be the start of a hot industry trend," wrote Sheerin, "with similar arrangements coming in the future. There are probably four or five global OEMs capable of pulling this off, and a few commercial distributors as well. But, as we've learned from other industry partnerships, capability is one thing, and corporate compatibility is another. OEMs and distributors, and their OEM customers, should look long and hard before committing to a long-term affiliation."

### **Solectron: A big-time company with a small-time feel**

*From an article by Alice LaPlante, 25<sup>th</sup> May 1998*

"They came out of nowhere last year, nabbing the impressive number three spot in Computerworld's 1997 Best Places to Work ranking. The previous year, they hadn't even made the Top 100," wrote LaPlant, "now they're number one in the IT category, in a year in which they became the first company in history to be a two-time winner of the Malcolm Baldrige award for quality."

"The company's name is Solectron Corporation, and although it currently employs more than 20,000 people world-wide and realised revenue for the 1997 fiscal year totalling \$3.7 billion, it has little brand-name recognition. You'll probably never see Solectron's name on a CPU or monitor box or circuit board, yet it's a leading manufacturer of all these electronic components.

"Telephone Ken Ouchi, Solectron's CIO, for an appointment, and he'll answer the phone himself, LaPlant wrote, "no personal assistant screening calls, no formidable corporate bureaucracy to swim through. Drive up to a plain white building on Solectron's Milpitas, CA, campus, and walk directly into a grey, undecorated lobby. There's no security guard or receptionist. A printed list of employees and their respective telephone extensions sits on a counter by a telephone. Once you are escorted past the 'self-service' reception room, you enter a vast open space that looks more like an airplane hangar than an office; in fact, half of the space is a working factory, where prototypes of customer products are built.

"From Ouchi's cramped cubicle— like everyone else at Solectron, he doesn't have a private office, or anything remotely approaching luxury— you can see white-coated factory workers at stations busily compiling manufacturing plans for future Solectron customer products. 'We run lean,' Ouchi says, pointing to the stark surroundings. 'We're not a start-up anymore, but we still act like one.'

"Despite this rather sterile environment, there's an energy infusing the activities of everyone from top technologist Ouchi to software engineers Tanya Tran and Carolyn-Oanh Nguyen. 'This is a very exciting place to work,' Tran says. 'Whatever technology we need, they give it to us. There's always something new going on.'

Ouchi's credentials are impressive: a bachelor's degree in electrical engineering from the University of California at Berkeley; a master's degree in electrical engineering from Santa Clara University and a PhD in electrical engineering from Stanford University. He went to IBM right out of school, eventually managing a 400-person development facility.

Ouchi faced 'an MRP museum,' and the challenge that Solectron was a pioneer in interfacing with customer systems when he began. Because there was no way of guaranteeing consistency between the customer system and the remote Solectron site, much of Ouchi's efforts have been to create a processing 'wrapper' that enables different manufacturing and purchasing systems to talk to each other, regardless of vendor or operating system or source of data, with stringent error detection and quality-control filters. Mistakenly entered data on the customer end could result in thousand-dollar cost overruns on Solectron's part, so data is checked and rechecked. A new challenge for Ouchi's team, now that customers are asking for a broader array of services that may involve more than one plant, is designing ways for the entire enterprise to have immediate real-time access to customer and manufacturing data.

Although he originally worked for the CFO, Ouchi now reports directly to the CEO, in recognition of how essential IT is to Solectron's future. It's routine for Ouchi to be called in to help close a new customer sale. Of prime importance is how Solectron's systems can interface with a customer's systems to ensure manufacturing and distribution efficiencies. Previously it would take three to four workers at the customer site three to four days to get the appropriate paperwork together to initiate a manufacturing run. 'That's 12 to 16 person hours that we can now do in less than two hours through our documentation control applications,' he says.

*LaPlante is a freelance writer in Woodside, CA.*

### **Solectron manages growth with client/server system**

*From Quality at Work, January 1996*

Topping \$800 million in sales within a three-year period can be overwhelming. For Solectron, rapid growth also meant reaching an uncomfortable level of potential growing pains. In addition to sales growth, Solectron expanded geographically. During a two-year period, the company expanded its California facility and added manufacturing sites in North Carolina, Washington, Malaysia, France, and Scotland.

"It was through the very diligent work of our employees that we shipped on-time, quality products. However, we could have done a better job at a lower cost," said Ken Ouchi, Solectron's vice president and chief information officer.

As Solectron began to identify cost savings, it realized that the opportunity for an integrated, cross-site manufacturing information system had slipped through the cracks during the company's growth.

"Each of our half-dozen divisions had automated as best it could. But each acted independently of one another or any central plan," explained Roland Chan, director of information systems for Solectron California.

Problems arose as growth escalated and the company continued to run its material-requirements-planning (MRP) system on a minicomputer and division-specific, shop-floor systems that operated on networked personal computers (PC).

Nothing was linked. "There was a lot of re-keying of data to get information from one system to another. There was no way to put all the results into a common database or to track circuit-board assemblies across divisions, Chan said.

Providing customers, who were demanding higher levels of integration, with the information they required also was a concern. "A customer's order could be scattered between two or three divisions, and we had no idea where it was unless we called each division," Chan said.

"All of a sudden, our business units became more reliant on one another. Assemblies in one business unit became subassemblies in another. We had all sorts of work-load balancing and cross-divisional quality issues we didn't have before," Ouchi added.

"Solectron began searching for an information system that could grow with the company. "We also needed to quickly develop and integrate new applications," Chan said. His experience at other organizations moved the company toward a client/server system. Solectron selected a database model based on stored procedures. "Stored procedures were important to us because they allow very rapid development and easy integration with our existing systems," he added.

"For the information-system platform, Solectron decided to go with processor-based servers from Intel Corp., Santa Clara, CA. Solectron chose to pilot the client/server project with its most important application: the custom-developed Shop Floor Tracking and Reporting System (STARS). 'We knew this was a mission-critical area where we would need to prove the technology. We decided to tackle it sooner rather than later,' Ouchi said. In four months, Solectron rolled out its first version of STARS to replace the old PC-based, shop-floor systems.

"Shop floor workers now use STARS to record the movement of circuit boards through the assembly process. Bar-coded subassemblies are recorded as they go through each division's 25 to 50 work centres. Prior to the client/server system, information was recorded manually or on a stand-alone PC. Test results, quality information, and a variety of other data, specific to the assembly of each board, now are tracked.

"Externally, the STARS client/server system means better customer service because employees don't have to take 45 minutes to one hour to track down an order. 'As contract manufacturers, we're our customers' factory. It's essential that they be able to change their business response in view of what's going on in 'their' factory. Now, customers and employees have immediate access to the relevant production data.

"Another client/server application called CADDIE (CAD Data Integration Environment) allows Solectron to take test routines off of diskettes stored in employees' drawers and integrate CAD data and customer bill of materials (BOM) information with shop-floor equipment. 'We take CAD and BOM data on disk over the network, and use CADDIE to automatically create in-circuit test routines and programs to run surface-mount and other assembly machines,' Ouchi said. The centrally maintained files have streamlined a 100 -man-hour job to seven man hours and make this operation two to three times easier for employees, he added.

"Another benefit is that people can work in parallel, rather than waiting for one another. Buyers can start requisitioning parts, manufacturing can tool the assembly line, and engineers can start layout.

'Literally running all of the documentation through the photocopier was a bottleneck. With the client/server system, what used to take eight to 10 hours has been reduced to five hours,' Ouchi said.

Solectron has built a number of other client/server applications that connect to its central applications. For example, it created a quotation system that works with the electronic BOM data received from customers. In addition, work-in-progress accuracy is very close to 100% these days, Ouchi said.

### **A new breed of American company is arising out of the relentless drive to reach global markets more quickly <sup>¾</sup> the stealth manufacturer**

*From an article by Scott Thurm in The Wall Street Journal, August 18, 1998*

Overseas contractors have been doing such work for years. But Solectron's biggest plant isn't in Asia, it's in Silicon Valley. More than 5,600 people work for it in California, in jobs that were supposed to have fled the USA a decade ago.

The US contract manufacturers are helping hollow out America's corporations while bolstering its manufacturing base. They land orders because they are considered among the world's most efficient manufacturers, and their proximity is prized because it facilitates quick product development. As a result, electronics manufacturing is thriving in US.

The US contractors are the leaders of a \$90 billion global business that is growing about 25% a year, almost twice as fast as the industry they serve. They are so efficient that companies such as HP, IBM and Texas Instruments are, in effect, handing over to them their factories.

European companies such as Telefon AB, Ericsson of Sweden and Nokia of Finland are also outsourcing to the Americans. Last month, a unit of Mitsubishi Electric Corp. sold production lines in Georgia to Solectron and hired it to make cellular phones, the first time a big Japanese manufacturer hired a U.S. company to do its manufacturing.

American contractors are facilitating the rise of the *virtual company*, doing little besides design and marketing products, and Solectron, with annual revenue approaching \$5 billion, is gaining rapidly on the kingpin of electronics contract manufacturing, SCI Systems, of Huntsville, AL. Solectron exploits ties to its Silicon Valley neighbours. Teams of its engineers sometimes design products for clients that are competitors. The clients don't mind.

"They learn from other customers," says Hans Ahlinder, vice president of production for Ericsson, the Swedish telecommunications giant, which recently sold Solectron a factory in Brazil and hired the company to design new products. "There's technology they can provide better than we can internally, they will always be more efficient."

This contrasts with the stereotype of contract-electronics companies: sweatshops where low-paid workers solder tiny parts together. Sure, Solectron relies on immigrants and first-generation Americans and pays low wages — new assembly workers start at about \$6.50 an hour — but the firm invests heavily in training, offers English classes, and salaries can rise rapidly through bonuses, overtime and promotions. Almost a fourth of its California workers were promoted last year.

As Solectron and other contract manufacturers expand to do everything for everyone, however, they risk losing the very nimbleness behind their success. Solectron has acquired or agreed to acquire six factories in the past year, accelerating its growth and raising questions about its ability to integrate the new capacity. Even some customers say it may become vulnerable to a new generation of Solectrons.

Sometimes, Solectron helps move jobs out of the USA. Hewlett Packard is eliminating 1,000 employees at a printer factory in Vancouver, by outsourcing the work to Solectron, which will build the printers in Brazil and Mexico. But it also rejuvenates US factories languishing as small branches of electronics giants. In 1993, Solectron bought a 73-person HP circuit board plant in Everett, WA; the plant now employs 563, and Solectron expects to double the work force in two years.

### **Solectron in *Business Week***

*21 June 1999*

"In the past few years contract manufacturers have moved from high-tech snoozes into industry stars. As the pace of technology accelerates, companies from Silicon Valley start-ups to computer giants such as IBM are looking to push responsibility for nuts-and-bolts manufacturing onto ... contractors.

"Now contract manufacturers are stealing the thunder from some of their better-known customers. In this year's BUSINESS WEEK Info Tech 100, the former ho-hum contract manufacturers are the best represented category in the top tier.

"Industry leader Solectron ranks number three, Taiwan-based Quanta Computer is 14<sup>th</sup>, Flextronics 17<sup>th</sup>, and Jabil 22<sup>nd</sup>. 'It's been quite extraordinary. Business is amazing,' says Solectron CEO Koichi 'Ko' Nishimura.

"Why is the industry red-hot? After their humble start making plain-vanilla products like printed circuit boards, contract manufacturers are proving that they're some of the most efficient producers of everything from Palm Pilots to supercomputers. Part of the reason is that they spend almost nothing on corporate frills. Solectron's overhead is a rock-bottom 4% of sales, vs 18% at Compaq, and 9% at super efficient Dell Computer.

"... contract manufacturers get more out of their capital investments since they handle such huge volumes. Consider, for example, a \$600,000 laminography tester, which can be used to scan products for poor solder joints that can't be detected in any other way. A typical manufacturer would use the device once a day, but Solectron, because it makes products for so many customers, uses it five times a day.

Now these companies are looking to expand their businesses by taking on more behind-the-scenes work for their clients, including purchasing, logistics, and the more mundane aspects of product design and repair. In effect, they want to become operations-for-hire for tech industry leaders. 'It's no longer about making stuff cheap,' says Nishimura. 'Now we're doing more and more high-value things.' Here's how:

- Companies like Solectron are now major buyers of parts and get volume discounts that can be passed on to big and small customers alike.
- Contract manufacturers also help clients get their products into global markets quicker and cheaper because they have facilities around the world. Solectron has 21 plants, from Brazil to Romania, and even bought laptop-repair specialist Sequel Inc. so that it can fix its customers' products and return them in one day.

- Plunging prices are forcing traditional manufacturers to outsource. Not only is a maker of a \$600 PC hard pressed to amortize the cost of a factory, but it can't compete with a contract manufacturer that can keep its factory lines humming 24 hours a day. And thanks to E-commerce, customers expect suppliers to deliver custom-configured products at the lowest cost in the shortest span of time. This requires build-to-order manufacturing where products are shipped directly from factories to customers. That plays right into the hands of contract manufacturers that have spent the past five years buying plants and honing back-office logistics skills.

For proof, check out how Cisco Systems has used contract manufacturers. By electronically sharing sensitive product and sales data with Jabil, Cisco is able to ship routers and other products anywhere in the world in less than two days, without ever touching the product. One key reason: Jabil's 'dynamic replenishment system.' Developed from years of monitoring the production of hundreds of companies, the system analyzes several types of data — ranging from basic sales forecasts to the likely impact of upcoming product promotions — to estimate how much stock it needs to have on hand at any point.

Top contract manufacturers are looking at a new wave of business that should help them rival their largest customers in size within the next few years.

Solectron expects to boost sales from \$5.3 billion in fiscal 1998 to \$20 billion in fiscal 2001. 'We're going to grow at rates that no one has ever seen for a company of our size,' vows Mark Holman, Solectron vice-president for business development. By 2001, say analysts, contract manufacturers could assemble 30% of electronics gear, up from 15% today. 'By then, technology companies won't have the in-house manufacturing expertise to fall back on,' says analyst James Savage of Thomas Weisel Partners. "So contract manufacturing will continue to outperform the overall high-tech market, with lower risk."

*By Peter Burrows in Milpitas, CA.*

### **Solectron milestones**

**1977** — Roy Kusumoto, a manufacturer of solar energy products, founded Solectron in the midst of the solar energy boom. "Solectron" is a combination of solar and electronics. Work was handled by less than 100 'associates' [employees] in one building in California.

**1978** — Winston Chen joined the company as president. Expanded contract manufacturing projects to a wider variety of electronics firms in California's Silicon Valley

*Solectron was founded in 1977 to make solar-energy products but was deep in debt a year later when Chen, a former IBM manager, took over and focused on serving Silicon Valley's booming electronics companies, according to Scott Thurm in The Wall Street Journal, August 18, 1998. By 1984, Solectron had annual sales of \$50 million, but Chen couldn't persuade the valley's venture capitalists to help him expand. He ultimately raised \$8 million from a New York fund. Four years later, Solectron had to cancel its first attempt to sell stock to the public. But a year later, it succeeded. Since then, its stock has risen more than 60-fold.*

**1981** — Implemented quality standards. Full system build services offered

**1982** — 'Solectron University' established to teach quality techniques to production workers and provide leadership seminars for managers

**1984**

- Began assembling boards using surface mount technology (SMT) leading the industry in offering this increasingly popular assembly process
- Statistical Process Control (SPC) implemented to lower parts per million defect levels

**1985**

- Weekly Customer Satisfaction Index (CSI) surveys initiated
- "Just in Time" manufacturing, turnkey manufacturing and remanufacturing capabilities added
- Philosophy of continuous improvement adopted company wide

**1987**

- Dr Koichi Nishimura joined as chief operating officer
- Implemented quality and productivity improvement process
- Added circuit test capabilities
- Integrated single site system

*Chen hired several former IBM colleagues, including Wilson and the current chief executive, Koichi Nishimura. It took Chen a decade to coax Nishimura to join Solectron as chief operating officer in 1988, and three more years to persuade his hard-working protégée to give up an early-morning paper route that Nishimura took over when his kids went off to college. These days, the 59-year-old Nishimura wouldn't be a reliable carrier. He now spends about three weeks a month on the road, according to Scott Thurm.*

**1989**

- IPO
  - Introduced repair services
  - Began using Malcolm Baldrige National Quality Award as corporate roadmap
- Expanded the Manufacturing Resource Planning System

*In 1990, Solectron University drives management and employee skill development, supporting Solectron's philosophy to hire for traits ¾ train for skills.*

**1991**

- Won the Malcolm Baldrige National Quality Award
- First offshore expansion to Penang, Malaysia
- Implemented 5S Quality Program

**1992**

- Established facilities in Bordeaux, France and Charlotte, NC as the result of an acquisition from IBM
- Solectron listed on NYSE under the symbol SLR
- Opened program office in Japan to better support customers in the Asia/Pacific
- Began drive for ISO certification
- Electronic Data Interchange (EDI) system implemented
- Established corporate supply-base management organization
- Configure-to-order capabilities added
- Established global account management teams

### **1993**

- Expansion to Everett, WA. With acquisition from Hewlett Packard, and Dunfermline, Scotland with acquisition of Philips Circuit Assemblies
- Intersite communication extended for improved global responsiveness
- Began implementation of self-directed work teams
- New campus completed in Milpitas, CA

### **1994**

- Solectron's net sales top \$1 billion
- Implemented Solectron Total Quality Excellence Evaluation Program

### **1995**

- Solectron grew to more than 10,000 associates worldwide
- Established facility in Boeblingen, Germany when Solectron bought Hewlett Packard's PCBA operation
- California facility won first-ever California Governor's Golden State Quality Award
- Acquired Fine Pitch Technology to enhance pre-manufacturing capabilities with quick-turn prototyping
- High-velocity manufacturing added to improve customers' time to-market and time-to-volume
- Established facilities in Austin, TX, when Solectron bought Texas Instruments' Customer Manufacturing Services business
- Established Solectron Technical Center to centralise research and development

### **1996**

- Established facility in Westborough, MS
- Solectron Technology SB won Malaysian Quality Management Excellence Award
- Solectron Technology, Inc won the North Carolina Quality Leadership Award
- Solectron Texas won Texas State Quality Award
- Established new facilities in Johor, Malaysia and Suzhou, China

### **1997**

#### **Twentieth Anniversary Year**

- Established manufacturing facilities in Guadalajara, Mexico and an Asia/Pacific headquarters in Taipei, Taiwan
- Launched World Wide Web site
- Service offering expanded to include total system design, configure-to-order and reliability and failure analysis
- Solectron Technology, SB Was named recipient of the Malaysian Prime Minister's Quality Award
- Acquired Force Computers, Inc, the leading designer and manufacturer of computer platforms for embedded applications, further expanding Solectron's design capabilities
- Global partnership with Ericsson Telecom AB results in the establishment of Solectron's first South American facility in Brazil and a New Product Introduction center in Sweden
- Solectron Germany moves from Boeblingen to a new, larger facility in Herrenberg

## 1998

- The company won its second Malcolm Baldrige National Quality Award for Manufacturing. Solectron is the first company in the 10-year history of the award to win twice. In December, President Bill Clinton presented the award
- Debt rating upgraded by Moody's, Standard & Poor's, and Duff and Phelps
- Solectron opened a new 342,500 square foot facility in Guadalajara, Mexico
- Solectron presented Crystal Award to 2G suppliers for their consistent on-time delivery, quality, long-term support and dedication
- Solectron opened New Product Introduction center in Stockholm and Norrkoping, Sweden
- The company announced plans to expand its Everett, Washington facility to accommodate rapid regional growth
- Acquired the manufacturing assets of NCR's Computer Systems and Retail Solutions groups and assumed operations in Georgia, South Carolina and Ireland. The acquisition further expands Solectron's systems integration business
- Solectron grew to more than 20,000 associates worldwide
- Announced expansion of Sao Jose dos Campos, Brazil facility to 300,000 square feet (27,880 square meters) to better serve its multinational customers
- The company announced plans to open a full-service, high-volume manufacturing facility in Timisoara, Romania
- Acquired IBM's Electronic Card Assembly and Test Operations in Charlotte, NC
- Opens a program office in Israel to capture emerging electronics market
- Signed letter of intent to form a strategic alliance with Ingram Micro to provide build-to-order and configure-to-order assembly services for PCs, servers and other products in the United States, Canada, Europe, Asia and Latin America

### Quality Solutions

*A Solectron success story*

**Customer**  $\frac{3}{4}$  One of the world's leading peripheral companies.

**Situation**  $\frac{3}{4}$  An OEM discovers its new product has a defective part that could result in a potential hazard for the user. Product demand has been generated, orders taken, and retail outlets are expecting delivery.

**Solution**  $\frac{3}{4}$  Within six weeks, Solectron sets up a line, assembles and trains staff, disassembles, upgrades, reassembles, functionally tests, repackages and ships 20,000 units to market.

**Bottom line**  $\frac{3}{4}$  By partnering with Solectron, the OEM delivered a high-quality product in time to meet their product launch date.

**The Story**  $\frac{3}{4}$  A global leader in peripherals had spent more than six months building a new product. Pre-delivery demand for the product had been created, orders taken, and retail outlets lined up to receive shipment. Then, a product defect was discovered, one with a high risk of field failure, and one that could potentially be hazardous to the user. The company did not have the resources to quickly rework the product to meet their delivery schedules.

Company executives decided they had two options:

1. Release the product and face the consequences — market embarrassment, loss of reputation, and product liability and recall costs, or
2. Engage Solectron to re-manufacture the product before delivery to the market.

Solectron was able to quickly assess the situation and develop a comprehensive solution. Within six weeks, Solectron's support services set up a line, assembled and trained staff — who then disassembled, upgraded, reassembled, functionally tested, repackaged and shipped 20,000 units. By partnering with Solectron, the OEM was able to avoid market embarrassment, reputation loss, high field failure, warranty support, repair and product liability or recall costs.

### **Solectron's support services**

Solectron's services don't stop at the end of the assembly line. Customers can confidently look to Solectron for support in end-of-life manufacturing, repair and refurbishment, warehousing, logistics, and worldwide distribution of technology products. By partnering with Solectron, OEMs can take advantage of the company's completely integrated service offering across the entire product life cycle.

A challenge for many OEMs is how to manage and support their existing customers and products when they are launching new products and technology in the marketplace. This is a difficult dilemma for many OEMs since they have limited resources. If an OEM does not provide the highest quality service and support to their existing customers, they can potentially lose their established customer base. And if they are not continuing to develop and launch new technologies and products, they will jeopardize their competitive position in the market.

By partnering with Solectron, the OEM can achieve an optimal balance. Solectron can provide high-quality services to the OEM's existing customer base, allowing the OEM to focus their efforts on their new products. Solectron helps OEMs support their customers by providing after-sales service on an on-going basis. And, as the OEM continues to develop next generation products, Solectron's Support Services manages the necessary end-of-product-life activities for the company's existing product line. Plus, if needed, Solectron will manage an OEM's returned products, whether manufactured at Solectron or not. These services can also extend a product's market life, thereby increasing the OEM's revenue.

Another challenge many OEMs face is managing product upgrades. When a product is successful, an OEM may choose to add new features to enhance its capabilities or do product extensions. When this happens, Solectron is ready to assist. Its Support Services group is expert in all areas of product upgrades, including materials management, process development and distribution management. Solectron will reconfigure existing product inventory to reflect the new revision level, and quickly get the upgraded product back into the marketplace.

Customers can expect Solectron's support services to operate as if it were an extension of their own service department. Customers have free access to the shop floor and to project status reports via Intranet. And to ensure the highest level of service, each Solectron customer is assigned a Customer Focus Team. This dedicated team includes Solectron experts from each strategic area of the manufacturing process - supply management, inventory controls, engineering services, master scheduling, document control, quality assurance, and customer reporting - to provide comprehensive project management and close communication throughout the entire product life cycle.

In addition to support services, Solectron can provide its customers a full range of services across the entire product life cycle from the earliest stages of design to manufacturing to end-of-life.

## The benefits

Product failure or recall can often have a tremendous negative impact on a company's reputation and bottom line. Solectron's Support Services can help prevent this from happening. Solectron is able to move quickly, shift gears, and effectively and efficiently correct the problem before it becomes a market nightmare.

Regardless of the product or size of company, OEMs can benefit from Solectron's uncompromising quality, global presence, and unparalleled supply chain management expertise. And, when customers use Solectron's Support Services in combination with its design, printed circuit board and systems assembly capabilities, they have access to a total product life cycle solution.

No matter what services a customer chooses, Solectron's partnership goal remains the same — to deliver the highest quality product, with the fastest time-to-market at the lowest total cost.

*Source - Solectron*

## Solectron Quality Solutions 2

*A Solectron success story*

**Customer** ¾ A start-up networking company.

**Situation** ¾ A venture-backed, start-up company is designing two-way wireless networking equipment. It is a one-of-a-kind product, utilizing the most advanced technology available. Demand for their product is increasing, quality is a key concern and the OEM needs a strong manufacturing partner. An inferior product or the inability to meet demand would seriously damage the OEM in the marketplace.

**Solution** ¾ Solectron immediately assembles a **Customer Focus Team**, which quickly designs and builds a customized assembly line — with emphasis on built-in product testability. Within two weeks, the units are being assembled, rigorously tested for quality and shipped directly to the OEM's customers. In less than two months, production is ramped up to required volume.

**Bottom Line** ¾ Solectron provides the manufacturing solution that enables a small start-up OEM to effectively compete against much larger multinational corporations.

**The Story** ¾ The start-up company is in an enviable position. They have a great product, demand for the product is increasing and they have little competition. The challenge? The small company doesn't have a manufacturing infrastructure. They need a strong manufacturing partner — one capable of ramping up production quickly, ensuring high product quality levels and doing it as economically as possible. In addition, the OEM requires a global presence and overnight distribution capabilities to compete with large multinational companies.

Solectron provides the customer with a total manufacturing solution, including supply-chain management and product distribution. While design analysis, prototyping and initial build are under way, a customized assembly process is developed to include functional testing. Production ramps up and the number of finished units increases to required levels in under two months. Solectron also handles global distribution — shipping the finished units directly to the OEM's customers. This direct distribution means the OEM does not need to establish costly, large distribution capabilities to handle the increase in product and customers; and product inventory is managed at optimum levels.

## **Product Development, Manufacturing & Distribution**

Solectron is the global leader in electronics outsourcing solutions. Solectron provides OEMs the flexibility and quick response time needed to succeed in today's increasingly competitive electronics marketplace. Solectron's integrated services and expertise span the entire product life cycle — from pre production planning and design to manufacturing, distribution and end-of-life product service and support.

Customers benefit from Solectron's ability to respond quickly to changing needs and its unwavering commitment to the highest quality standards. Today, OEMs are turning to Solectron for help with design and New Product Introduction (NPI) management. They're utilizing the company's expertise in supply-chain management and ability to leverage material supply. They're maximizing the manufacturing and market benefits of Solectron's worldwide system of manufacturing facilities. They're calling on Solectron to deliver products directly to the end-user and to handle all repair and after-sales service.

Today, Solectron is leading the electronics outsourcing industry in redefining the manufacturing process. Solectron not only designs products for quality, manufacturability, testability, serviceability and functionality, but builds entire roadmaps. These roadmaps detail the best component choices, where the product should be built, how best to manage materials, increase inventory velocity and optimize delivery - all before manufacturing has even begun.

One of the biggest advantages of the Solectron solution is flexibility. Solectron is able to respond quickly to changing product demand and schedule fluctuations. By optimizing internal processes, Solectron is able to efficiently and cost-effectively ramp up or ramp down production. The company's flexibility also means it can meet the wide variety of production demands inherent in the electronics manufacturing industry. High-, medium-, low- and extremely low- volume production projects are handled on a daily basis, as are build-to-order and configure-to-order requirements.

With the globalisation of the world economy, Solectron's network of worldwide facilities puts the company where its customers need it - close to their expanding markets for faster product delivery. This global presence also enables Solectron to offer customers a full range of value-added manufacturing services including cost containment, compliance with local content regulations and the elimination of expensive freight costs, tariffs and time-consuming customs clearances.

Solectron's network of fully integrated facilities also allows the company to design and implement a manufacturing mix that utilizes the strengths and specialization found at individual sites. This ability to *pick and choose* means Solectron's customers receive the best possible manufacturing and delivery solution.

**The benefits** <sup>¾</sup> By partnering with Solectron early, start-up companies are well positioned for the future. Solectron's flexibility allows these smaller OEMs to quickly ramp production up or down, depending on demand. Also, by partnering with Solectron, OEMs are able to take advantage of the company's ability to quickly respond to their evolving needs.

Having Solectron handle distribution and control inventory means OEMs do not need to incur the expense of establishing and maintaining a global distribution network.

And, as larger, multinational companies begin to compete directly, start-ups will be able to take advantage of Solectron's global presence and material purchasing power to remain competitively priced and positioned.

To better utilise assets and lower costs, OEMs are becoming less involved in day-to-day manufacturing. As a result, for many companies — large and small — Solectron has become an integral part of their manufacturing process. And while this has allowed OEMs to concentrate their efforts and resources on core competencies such as R&D and marketing, it has also meant Solectron has needed to respond by offering a virtual design and manufacturing solution. And that is what the company has done.

No matter what services customers choose, Solectron's partnership goal remains the same — to deliver the highest quality product, with the fastest time-to-market at the lowest total cost.

*Source - Solectron*

### **Solectron Quality Solutions 3**

*A Solectron success story*

**Customer** ¾ A world leader in PCs.

**Situation** ¾ An OEM underestimates demand for their new product. Revised projections call for a rapid, massive increase in production — from 3,000 to 60,000 finished units a month. The OEM does not have the internal manufacturing capacity to meet this demand. But it must be met if they are to maintain their reputation and marketshare.

**Solution** ¾ Solectron assembles a team to determine the best course of action. The answer? Set up a new factory. Solectron finds space, designs and builds a customized assembly line, hires and trains associates and ramps to volume. Within 12 weeks, 30,000 units a month are rolling off the line; by 20 weeks that number hits the desired 60,000.

**Bottom line** ¾ By partnering with Solectron, the OEM is able to quickly increase production to meet unexpected market demand. The OEM meets their goal without incurring the drastic increase in fixed costs associated with owning and staffing a new manufacturing facility.

**The Story** ¾ A world leader in PC products — and a Solectron partner — faces a problem. Demand for their product is suddenly soaring and they do not have enough on hand to meet the increase. Nor do they have the internal capacity to increase production. At this time, Solectron is acting as an overflow manufacturer for the OEM, producing 3,000 units a month. The OEM asks Solectron to increase manufacturing capacity to 60,000 units a month ¾ and to ramp to this volume quickly.

Assessing the requirements — where? How many shifts? What kinds of teams? How much will it cost? — Solectron determines the best solution is to set up an entirely new factory dedicated to the customer. Solectron leases a facility, orders equipment and hires aggressively. Within four weeks, 250 people are on staff and a half-mile of assembly conveyers is installed and operating. Twelve weeks after accepting the challenge, Solectron is producing 30,000 units/month. Within 20 weeks of starting the project, production volume reaches 60,000 completed PCs a month, well within the customer's timeline.

*Source – Solectron*

## Some 'Solectron' definitions

*Contract manufacturing* — The practice of making products or subcomponents of products to be sold under a different company's name.

*Core competencies* — Those functions or practices deemed by a company as central to its existence. Those activities that the company believes it does best, should focus on, and that are in the company's best interest for long term success and growth.

*Custom packaging* — The ability to add value to basic *box and ship* distribution. For example, adding product literature or promotional items and shipping to the customer in a box printed with the OEM's packaging design.

*CSI* — Customer satisfaction index, a tool Solectron uses to obtain feedback from its customers.

*Design-for-manufacturability* — An approach to product design whose goal is to ensure that the product can be produced in the best possible manner.

*Dock-to-stock* — A supplier quality management practice that allows a component or product to enter into a company without going through an incoming inspection upon arrival at the receiving dock.

*EDI* — Electronic Data Interchange

*EMS* — Electronics Manufacturing Services

*Fortune 500* — A list, compiled by Fortune magazine, of the 500 largest manufacturing and service companies in the United States.

*Fulfilment* — A process that supplies a finished manufactured product directly from a manufacturing facility to a distributor or end user without the finished product going back through the company that has created the product. The fulfilment cycle may include receiving customer orders, configuring products to order, shipping and invoicing products to distribution outlets or end users around the world.

*Just-in-time manufacturing (JIT) (kanban)* — The material handling practice that minimises or eliminates the amount of product brought into inventory by setting up a delivery schedule that brings materials directly from the supplier to the production floor.

*Manufacturability* — The characteristics of a product design that allow it to be produced.

*MRP* — Material requirements planning

*OEM* — Original equipment manufacturer

*Original design manufacturer (ODM)* — A business model/product manufacturing method whereby product is designed and assembly is performed upon receipt of functional requirements for a type of product. In the typical ODM model (in the PC market, for example), the manufacturer designs the complete product. In other cases, the ODM may rely on a combination of original design capabilities for some assemblies/components and off-the-shelf components and assemblies to meet the customer requirements.

*Outsourcing* — Subcontracting manufacturing work to outside companies.

*PCB (printed circuit board)* — A sheet of insulating material carrying circuit elements and terminals so that it can be inserted into an electrical apparatus (such as a computer).

*Program manager* — The overall business manager at Solectron responsible for a particular customer who directs all activities performed at Solectron in support of that customer. This person is the key link between the manufacturing team at Solectron and product management at the customer.

*Program office* — A Solectron location that functions as a liaison for dealing with both suppliers and customers in a region. The Japanese program office in Tokyo, for example, works to establish and maintain relationships with suppliers and serves as a base for business development activities with customers.

*Printed circuit*—A circuit for electronic apparatus made by depositing conductive material in continuous paths from terminal to terminal on an insulating surface.

*PTH*—Pin-through-hole technology, a method of soldering electrical components to a board substrate that involves pin-through-hole connections.

*QIP*—Quality Improvement Process. Supply-base management Solectron's materials management organisation. Includes activities such as purchasing and inventory control.

*SMT*—Surface Mount Technology, a method of soldering electrical components directly to a board substrate that uses less space than pin-through hole method.

*TAB*—Tape Automated Bonding — a method of affixing an integrated circuit chip onto a PC board

*Turnkey*—A type of outsourcing method that turns over to the subcontractor all aspects of manufacturing, including materials acquisition, assembly and testing. Its opposite is consignment, wherein the outsourcing company provides all materials required for the products and the subcontractor provides only assembly equipment and labour.

*Value-added*—The increase in worth of a product or service that comes at each stage of the work process.

*White box*—The increase in worth of a product or service that comes at each stage of the work process.

*Sources: Dataquest, December 1996, Technology Forecasters, Inc., September 1997*