

Keysight Technologies

Notebook Manufacturer Finds Margins in the Details

Case Study



Overview

First International Computer, Inc. (FIC) designs and produces notebooks and PC motherboards for NEC, Mitsubishi and other household names. The company works in an industry beset by a global economic downturn, decreasing demand and intense competition. Yet FIC is thriving, with revenues of \$2.2 billion USD in 2000, and over 4,500 employees in eight manufacturing facilities on four continents. Clearly, FIC is doing many things right, especially in its design and manufacturing processes, where quality controls, lead-times and product costs are subject to constant scrutiny. As a result, FIC has been able to increase its margins and market share, running its production lines around the clock, and thriving in a difficult market while many of its competitors are struggling to find customers. It's a success story in manufacturing with origins in design, where design-for-manufacturing (DFM) methods and an automated test environment (ATE) help FIC control costs, improve product quality, and protect its margins.

“In the old days, people automatically assumed that with high quality and performance came high price, but not any more. Today you have to provide high performance, high quality and low cost. If you can't do that, you'll never make it as an ODM. No way.”

– Michelle Hsieh
Vice President, FIC Portable Computer Group

Profit is in the Details

To the Outside World, notebook computers are something of a commodity. They're small, light and reliable. The displays are great, the keyboards are very usable, their power and features often rival or exceed desktop systems, and they're amazingly affordable, especially compared to the notebooks of just a few years ago.

Now consumers want it all, and notebook manufacturers are struggling to balance customer expectations with the realities of electronics manufacturing. FIC has come up with a formula that seems to work. The company provides notebook PC design and production services to some of the world's largest, most recognizable computer brands. FIC is thriving in the demanding Japanese market, and also has significant market share in China, Europe and North America.

FIC succeeds by automating its processes, cutting costs, and successfully identifying and eliminating the margin-stealing gremlins that lurk in every manufacturing line. In many cases, the relationship with Keysight and the use of the Keysight 3070 helps FIC maintain the high degree of process vigilance required for success in manufacturing and design.



Product Design

"Design determines cost," says Michelle Hsieh, Vice President of FIC's Portable Computer Group in Taipei, Taiwan. That simple statement belies a hard-earned insight at FIC. Like other original design manufacturers (ODMs) producing notebooks today, the company wrestles constantly with the challenge of increasing product quality while reducing product costs. The die is cast in the early stages of design. "Lowering costs means using inexpensive materials wherever possible, and making the best use of those materials in the best designs while still maintaining high performance and quality," says Hsieh. "Material costs are 80 percent of the cost of a notebook, and material costs are already determined when you decide on the design." To keep material costs as low as possible, FIC focuses not just on its components and devices, but also on the periphery of its processes. The company looks for ways to tighten the relationship between its purchasing department and key vendors. By working more efficiently with vendors, FIC keeps costs down. FIC also reviews efficiency at its own factories, looking for ways to improve just-in-time manufacturing as a way to control inventory costs.

The design of components, devices and printed circuit boards (PCBs) is another area of intense scrutiny at FIC. Hsieh notes that while 0201 components and other packaging technologies, such as those used in cell phones and PDAs, can reduce PCB size and cost, they can also raise costs in manufacturing since testing points (and coverage) are reduced. Hsieh points out that since PDAs, cell phones and notebooks are rapidly shrinking, FIC is already planning for a time in the near future when "no contact" test will become an important part of their test strategy. Their use of the Keysight 3070 in-circuit test (ICT) system fits into that plan by allowing a transition to multi-faceted test, where ICT, X-ray and AOI are combined as part of a single automated test environment.

Design for Manufacture (DFM)

Product phases at FIC include a working sample, engineer sample, trial run, production pilot run, then master production. DFM techniques are used to find and eliminate problems at every stage. "We might see a problem with layout, which would affect our ATE testing and coverage, and thus our percentage of misjudgments," says Hsieh, noting that FIC collects all DFM and PALdata and shares it with their customers through their web site. "All they need is a password." This degree of open communication is enabled by linking ATE and other equipment throughout the production facility to the network. All

engineers involved in the process, whether in design or production, know exactly what problems have occurred and how they've been solved. Everyone has equal knowledge of the situation, and each discipline brings key insights to the problem-solving process. "Automation becomes critical here," notes Hsieh. "The information relay from one station to another is very important." The Keysight 3070 simplifies automation by linking computer files to barcodes. A quick scan can provide all relevant layers of detail.

Supplier Relationship

Design considerations always come first, but FIC also finds cost savings at the other end of the product cycle. The company has successfully reduced warranty costs even as the industry standard for notebook warranties gets longer. "It used to be one year, then a year and a half, now two years," says Hsieh. "That puts pressure on us and our suppliers, because when the warranty is for 24 months, you better be sure that the products you're selling are extremely durable." Once again, vendor relationships make the difference. FIC sets stringent quality requirements with its suppliers, requiring strict yield rates and audits for all vendor-supplied components and devices that go on their PCBs. Thus end-user quality is partially ensured by FIC's choice of suppliers, a key consideration since warranty costs are a critical control point for product costs.

Lead Time

As the second largest provider of notebooks in Asia, FIC typically deals in large volumes yet manages to begin shipping products just three days after an order is placed. "Lead time control is crucial for us," says Hsieh. Accurate forecasting and tight JIT processes play a big role, as does the choice of an ICT system. "Our previous supplier used wireless, which requires washing PCBs, which in turn takes time," says Hsieh. With the Keysight 3070, FIC can take advantage of short-wire fixturing technology to reduce development and programming time while also reducing fixture cost and increasing fixture reliability—all key considerations.

Lead time from design to manufacturing is another area for cost cutting at FIC. The company allows just three weeks for the test team to develop complete programs after they receive the CAD files. In that time, parameters need to be tuned, debugging needs to be completed, and tests need to be stabilized. Automatic program generation tools on the Keysight 3070 help FIC test engineers meet the three-week window.

System Uptime

The importance of test system stability can't be overstated. It's especially crucial at FIC since the company uses its test systems 24 hours a day, six days a week, in back-to-back 12-hour shifts. Their test equipment must be able to withstand high temperatures and constant use without breaking down. A key metric for FIC is idle time. "Before we used the 3070, idle time was about 20 percent and we needed a break," says Hsieh. "We needed an air conditioner to keep it cool, and the system really couldn't be moved, which compromised our efficiency. But after we got the 3070, we eliminated idle time almost entirely. The only idle time is the time it takes for engineers to tune the equipment."

Service was also a key checkpoint for FIC during review, and although Keysight did not dominate this part of the sales process, the difference became clear after the sale. "Keysight showed great determination by assembling a team right away," remembers Hsieh. "They found many engineers to join the support team, and even invited our engineers to work at Keysight to learn the system." The result is that FIC engineers were able to transition quickly from their previous test systems to the Keysight 3070, and get the baseline training they needed to get up-and-running quickly.

Detail management begins early and runs deep at FIC, driving decisions throughout the entire design and manufacturing cycle. Some of the company's critical success factors are addressed with the Keysight 3070. FIC's relationship with Keysight makes a difference in an environment where every detail affects profitability.

Process Feedback

FIC's old test equipment used to be offline, maintained as a separate loop that was segregated from the production line. That way unplanned downtime, a frequent occurrence, did not affect the flow of production assemblies. With the Keysight 3070, FIC was able to bring ICT online as an integrated part of the production line, allowing test data to be passed down through the line instantly. "Keysight machines are so stable we can afford to have them online," says Hsieh. "The data appears on the monitor, and the yield rates and feedback are immediately collected so changes and adjustments can be made, which helps the data information flow become smoother. That saves a lot of time." It was an unexpected competitive edge, allowing FIC to further adjust its already tight processes and increase yields down the line.

"Keysight provided what we need, including stability, technological breakthroughs and, of course, a competitive price and good payment terms. The team is successfully run."

Michelle Hsieh
Vice President,
FIC Portable Computer Group


Quality Control

Good test upstream means higher yields downstream, but what does that really mean for FIC? "High yield means stable products, and from a service point of view, that saves money," says Hsieh. More importantly, it sets the stage for long-term growth based on solid customer relationships. "With stable products, we gain the trust of clients. The most obvious example is that, in the old days, our clients would audit us with a final Quality Control check. They don't do that any more. Imagine the trust involved when a Japanese firm offers you 'no inspection!'" From the perspective of FIC's customers, quality did not change when FIC switched to the Keysight 3070; the company strives to provide the highest quality products regardless of which test systems are used. The benefit when switching to the Keysight 3070 was evident mostly at FIC, where 3070 tests reduced overhead costs by minimizing WIP and inventory. FIC was able to meet its customers quality expectations effectively and less expensively.

Summary

Like other notebook manufacturers, FIC wrestles constantly with the challenge of increasing product quality while reducing product cost. The Keysight 3070 helps in some key ways:

- Automated DFM capabilities allow instant web-based communication. All engineers involved in the process, whether in design or production, know exactly what problems have occurred and how they've been solved.
- Automated program generation reduces the time it takes to get from final CAD files to a functioning program.
- Stable systems mean little or no idle time. The Keysight 3070 has proven to be so stable that FIC puts the systems inline as part of the assembly process, working around the clock, six days a week.
- Constant process feedback from the inline systems allows FIC to constantly tune its production processes, eliminating process drifts that can reduce quality or increase repair costs.
- With the Keysight 3070 upstream, yields are increased downstream, minimizing WIP and inventory while protecting FIC's reputation for quality.



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