

一个称为Texas Prototypes的小公司可成为未来工厂的样板：产品在美国由类似Texas Prototypes的公司构思、设计和制造（同时可改变制造过程和程序），然后转到低成本地区大量生产。这种新型设计中心将一揽子提供工程、印刷电路板设计和组装原型。一旦Texas Prototypes公司达到95%-98%初次通过产品的生产率，就可以转交给客户。

For NPI, Texas Prototypes Doesn't Mess Around

Lisa Hamburg Bastin

Product launch to lifecycle management, under one roof.

Young Michael Shores wanted to be a doctor. One poor chemistry test in college, however, changed the arc of his history. Medicine's loss became electronics' gain, as he navigated a new course in what he calls a Global Product Launch Model at the Richardson, TX-based facility he helped found. Launched commercially in 2002, Texas Prototypes has forged a growing new product introduction business that goes far beyond "introduction." The firm also provides GPLM as well as tackling the seamless transfer of product into manufacturing – from quickturn prototyping to pre-production to launch. This new model has paid off considerably for Shores with fiercely loyal customers and revenues doubling in just two years.

Texas Prototypes is not your average NPI facility, even though the company initially began as part of a design center for a tier one EMS provider. Shores credits the experience for his understanding of the business, for it was at that design center that he was part of a group that included engineering, board layout and prototyping. All these job functions under one umbrella made tension inevitable between the designers and manufacturers, especially when faced with a product that would not work.

"I remember the arguments," recalls Shores. "The engineers would say, 'This thing is not built right.' Manufacturing would reply, 'Hold on, buddy, you guys don't know how to design.' Over

a couple years, I gathered my team on the build side and told them, 'Keep your mouths shut. We don't know why it doesn't work.'"

This tension helped Shores gain an understanding of the engineers' goals and how important it is to have initial products built 100% correctly. The ultimate goal for the group was to have the electrical engineers focused on debugging design issues, not debugging manufacturing problems.

"What we learned is that we hope [the problem] is a manufacturing issue," said Shores. "That's the easiest issue to correct. It's a matter of seeing both perspectives to assist designers in debugging the product and more subtly the process that they're working on."

Ultimately, when the center proved a difficult internal model to pull off, Texas Prototypes was launched as a separate facility. When asked why he thought large assemblers might have difficulty managing design centers, Shores attributed it to their main focus: production.

"That's what [tier ones] do for a living," he says. "The prototyping piece is a means to an end. They want the production, but with the front end I do not think they totally understand what's going on. Most of the guys in their NPI facilities seem to come from manufacturing. We were part of engineering."

Also, according to Shores, the GPL model is not a good fit for large EMS companies – or OEMs, for that matter – because they lack the number of projects to warrant the caliber of team Texas Prototypes has in place. The company has about 27 employees, but Shores calls five of his staff members "hybrids" because they are experi-

enced electrical engineers as well as senior manufacturing process engineers. Additionally, the hybrids have practical experience with what volume factories need and can also readily communicate with customers' engineers.

"Where we add the most value is when we get a [customer's] engineers out on our floor," said Shores. "One of our manufacturing guys will make an electrical comment. You can see [the customers'] eyes light up, and they reply, 'How did you know that?' and he says, 'Well, I'm also an electrical engineer.'"

Friendly Competition

A little friendly competition always helps to strengthen a company's focus and customer service. For Texas Prototypes, it is also an opportunity to pitch a potential customer, who may also be the company's largest competitor. "Our biggest competitors are the tier one EMS guys' internal NPI centers," said Shores. "We compete against them on the front end, yet we launch production to them on the back end."

At first, Shores says, tier ones scratched their heads at Texas Prototypes' business model. They feared Shores and company would compete in the manufacturing business as well. Shores is adamant that volume production is not in the company's plans. "Look at our name: Texas Prototypes," he says. "We're not getting into production. That's not what we do."

As an example, Shores points to a large EMS company to which Texas Prototypes pitched GPLM – at first unsuccessfully. "They said, 'That's part of our core competency.' And we said, OK, because we knew some of their customers were having trouble with their core competency. We ended up getting engaged by their customer. Then we were able to come back [to the EMS firm], arm in arm with the customer."

The customer base that Texas Prototypes has had the most luck with is large OEMs with multiple EMS providers. As Shores' engineering group is the bridge between design and manufacturing, so is his facility the bridge between an OEM and its EMS companies. The Texas Prototypes model is one that would be hard

pressed to give up, if one had the resources to afford it. The company support includes engineering, prototyping, DfM analysis, supply chain and supply chain development. And Texas Prototypes can hand the product launch information directly to the EMS provider.

"If we work with the OEM and we develop this, we can physically hand the

baton with the build recipe to the EMS provider," stated Shores. "We can turn over purchase orders, the supply chain; everything can be turned on immediately. We have an accountability checklist that we go over. We physically help the OEMs manage the transfer into the receiving facility, no matter whose facility it is or where it is located."



This model has helped the company score at least 50 customers. Texas Prototypes has the infrastructure to handle a large number of customers, as design cycles get pushed out or pulled in. "We continue to add to our customer list because it's a crazy up-and-down world in the front end. Last month, we purchased 40 stencils – the stencil guys love us."

Process Control

Texas Prototypes' varied customer base keeps the company technologically advanced as well. In its 14,059 sq. ft. facility, it has built boards with as many as 12,000 components and up to 60 BGAs. Customers have also recently requested quite a bit of lead-free profiling work.

The key to a factory's success, Shores states, is effective control of its processes and thus yields. "The data that we provide is exactly the build recipe that we hand off to the receiving EMS facility. That is critical for the EMS to know what worked well and what required process changes from spin to spin of each prototype build. Yields are made in how you cut your stencils, choose your solder paste, reflow profile and so on. The U.S. has relied too much on automated in-process testing to catch manufacturing problems and in many cases we lose sight of the purpose of the tools, when we should be evaluating and adjusting the process parameters. If you have a problem, you want to fix it, not just catch it."

By the time a customer receives the build data for a project, that product has been tweaked until it is produced at Texas Prototypes in the 95 to 98% first pass



Subtle debugging: Shores

yield rate. Shores' philosophy is that, if his factory can build a product at such a rate in the prototype phase, then his customer should have no problem achieving even higher yields.

So, for Texas Prototypes, where the rubber meets the road is painstakingly developing the build recipe for a product and then handing it off to the customer. "All they have to do is dial it in to their line equipment," affirms Shores. "They have to tweak it; they may have to spend an hour or two. But we've already potentially spent upwards of 30 hours on that project."

To ensure a seamless transition, Texas Prototypes will manage the transfer to the manufacturing facility of choice. The

company will either have its customers come to its facility to see the process in action, or, if the project is complex enough, Texas Prototypes employees will travel to that customer's facility until all is well with their pre-production build.

Texas Prototypes plans to jump into photonics manufacturing, working with a company that reportedly has solved fiber alignment issues via a MEMS device. Says Shores, "This will revolutionize the photonics industry by raising manufacturing yields dramatically and potentially cutting cost by 50 to 80% for photonics components."

Another hot area for the company is lead-free profiling. With the impending RoHS and WEEE deadlines, Shores sees developing and transferring lead-free process capability as an opportunity. "You're going to have a lot of factories that are not going to have a lot of time to focus on that, and that's going to be a large opportunity for us."

Ultimately, Shores sees Texas Prototypes as a template for the factory of the future for the U.S. IP will be developed in the U.S., where manufacturing processes and procedures will be tweaked, then transferred into low-cost regions for volume production. Still, he hints that a facility in Asia and one in Europe would be a natural progression.

Last year Texas Prototypes transferred over \$100 million worth of production to China alone for its customers. The company's revenues have doubled from \$900,000 in 2002 to \$1.8 million in 2003 and are forecast to hit \$3.2 million this year. Shores is a little overwhelmed with the success and response Texas Prototypes has received so far. "I saw the potential for our success, but I am surprised at the number of large OEMs that have sought us out." ■

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Upwards of 30 hours is spent on a product before it is handed off.