

Industry Report

By Bob Stasonis



System integration for fun and profit

When do you need a systems integrator and how do you select one?

Back in the early days of ATE, and I'm dating myself here, a test company defined the architecture and configured functional test systems to the customer's test specifications. Companies like Computer Automation, GenRad, Schlumberger, and Wayne Kerr were just about your only options.

Enter the 1990s and the advent of modular instrumentation, such as instruments on a card, VXI, PXI, and software packages aimed at test including ATE Easy, LabWindows, LabVIEW, and so on. All of these innovations made it easier for the end customers to assemble their own in-process, end-of-line, or depot repair functional test systems. Because of this, the companies I mentioned above are no more. They either abandoned this market or went out of business.

Just as in nature, the test industry evolved to fill changing needs and environments. As companies stopped buying the *Big Iron* of the ATE companies, they found that they could not always do it themselves. Expertise, time-to-market, and staffing are all reasons why system integrators saw major growth in the test markets in the 1990s.

For this column, I enlisted the help of several systems integrators from around the U.S. They vary in terms of relative size, expertise, and geography. Their answers should help you decide when to use a system integrator. In addition, these answers should help define the involvement of your engineers and technicians. While it would be nice to be able to throw a specification at a systems integrator and have a ready-to-use test system arrive on your door a few weeks later, the reality is that you need to be prepared for a number of responsibilities, both technical and financial. Please keep in mind that many of the statements in the article relate to test systems, which is my area of expertise. In most cases, you can substitute *vision*, *automation*, or the like in place of *test*.

What is a systems integrator?

Systems integrators, as a class of company, have been around for a long time. One could argue that Noah, in building the ark, had to design the craft, get the material, and load the cargo! Because of the relatively long history of system integration as an industry, the definition of this type of company can vary, depending on the target market. For purposes of this article, a systems integrator means someone who is integrally involved in a project. The value of a systems integrator comes in many forms and can include:

- Test strategy assessment and recommendation
- Integration of multiple manufacturer's products
- Test code development
- Onsite contractor supervision
- Design services
- Field service
- Training
- Owner support after project completion

Obviously, the size and scope of a test system will determine just how many of these services you may need as well as the type of company you should choose.

Why do I need a systems integrator?

Admittedly, *need* may be too strong a word. After all, with today's modular software and hardware solutions, especially PXI, it's relatively easy to create a test system, right? True, but is it realistic?

The fact of the matter is that many companies are short staffed at present. The last economic downturn caused, in many cases, a severe reduction in headcount. Stan Craft, president of Microcraft, a systems integrator in North Carolina, elaborates, "Many of our customers are manufacturers who do not maintain a staff of test engineers. They seek out integrators so they can continue their focus on producing their products while letting test professionals satisfy their test requirements. Others may have test engineers on staff, but their time is spent keeping production going. These companies look outside because these engineers do not have the time to keep up with the latest technologies and develop systems. System integrators are typically on the cutting edge of technology and can bring this experience into the organization. Other companies have test engineering departments, and they simply have too much to do. These companies typically look towards an integrator to augment those resources that are strapped."

Another aspect I have personally been aware of is the lack of a clear test strategy. Many companies design a product and simply do not understand how to best create a test strategy that balances the issues of fault capture, production beat rate, and cost of test as a percentage of the overall product cost. In past roles in my career, customers have handed me an engineering specification and asked for a test specification (what should be tested and how), a test system, and overall strategy! In this case, the systems integrator needs to have a clear grasp on budgets and practicality. It is important to note that many of these systems integrators have staff members that are from the companies

named earlier in the article. So they have been through the balancing act that your company might need to succeed.

How do I find and select a systems integrator?

Easier said than done, I'm afraid. The term systems integrator yields over 850,000 hits on Google! So you need to refine your search a bit. My research shows that most entities supporting systems integrators are trying to sell their own products. The systems integrators are part of their sales chain. But there are several choices. In one market niche, I did find an independent organization – The Control and Information System Integrators Association, or CSIA. A screenshot of their homepage is shown in Figure 1. According to Robert Reinhart, the chairman of CSIA, the “CSIA is an alliance of control and information systems integrators that have met defined standards and provide a means to make it easier for companies to find them. Now in our second decade as an organization, the CSIA features a searchable database of systems integrators worldwide.” The CSIA also produced a series of books on selecting and auditing a systems integrator.

The CSIA believes that there are more than 4,000 *systems integrators* worldwide. With such a large number of choices out there, the CSIA has been putting manageable procedures in place that all members must pass, which ensures that the systems integrators can deliver to their customers. Regular membership is available for systems integrators that meet a set of criteria. Within three years they are encouraged to move up to registered member. The criterion for being a registered member is very rigorous. Reinhart explains, “Our six point audit process looks for the best business practices in terms of general management, human resources, project management, quality management, financial management, and business development. If a systems integrator has a CSIA registered member diploma on their wall, you can be sure that they are a professional organization.”

Also, at least in the U.S., on-line phone directories can help. Verizon Superpages (www.superpages.com) uses the term system and integration engineers. You can search by state or city and define how far from that city to show results. In many cases, your best bet will be to use a vendor and search their network of systems integrators. For PXI systems, the largest list on the Internet is the National Instruments Alliance Program (www.ni.com/alliance). There is a directory of more than 600 systems integrators and consultants that you can search by company, product, and service.

Other websites I have found include:

- www.pxisa.org/products.htm – The PXI Systems Alliance features a “Systems, Services, Integration, and Consulting” section.
- www.parker.com/pin/ – Parker Integrators Network – Parker is a manufacturer of motion control systems.
- www.microlink.co.uk/global.html – Microlink is a data acquisition vendor.

Of course, I could refer to hundreds of other sites. The key here is to look at vendors that are in the area of measurement and control you are working in and check out their listings. Of

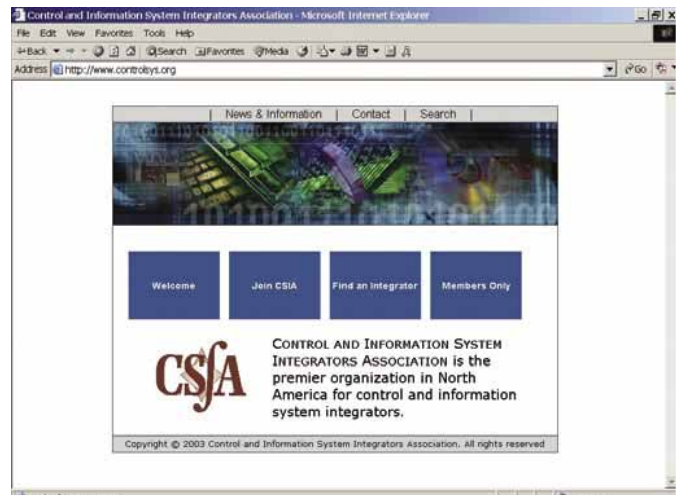


Figure 1

course, there is always the old fashioned way...call the company and ask!

Once you have a list of names, you need to drill down into their capabilities. Questions to ask include:

- Location – If there will be extensive consulting during the project development, is the systems integrator convenient to your engineers? Or will web and phone conferencing suffice?
- Skill sets – Do they understand your market niche? Do they speak your language (buzzwords, acronyms, philosophies, etc.)?
- Past experience – Do they have a proven success in areas that would work for your company?
- Project management – Can the systems integrator show that they are organized enough to get the job done right, on time, and documented so that the project is well understood and can be replicated in the future?
- Business practices – Is the company well managed on a financial level? Are they going to be around for the long haul?
- Technology expertise – Does the systems integrator understand the instrumentation requirements as well as the best system architecture/software environment or even a specific vendor's products? This is a broad question. Some of the key areas to consider include motion control, machine vision, boundary scan, VXI, PXI, PLCs, LabVIEW, LabWindows/CVI, C/C++, Visual Basic, Ladder Logic, etc.

It is also critical to ascertain whether your company and the systems integrator communicate well. Peter Blume, president of Bloomy Controls (whose mobile DAQ system is shown in Figure 2), talked about a systems integrator's expertise when left to their own devices, “If you want the systems integrator to make many decisions for you and specify your complete test system, then it's essential that they understand your products, business, and industry. Your system may benefit from their experience in terms of cost and functionality. However, this exposes you to several risks. The test system may not come out as desired, if you're not fully involved in the specification and design phases.”

Nobody's perfect...what might go wrong?

Just as outsourcing any project or process has its share of problems, so does keeping it in house. The seeming lack of control and the assumptions that everybody knows what is going on are danger signs that must be addressed. If this is your first time using a systems integrator, Rule #1 is: "Don't assume." Ask for clarification if you don't see what you expect. Here are some guidelines for both sides to help minimize the impact of Murphy's Law.

- Clear documentation – Adequate schematics, theory of operation, CAD files, and, most importantly, a test specification. What does the customer want the test system to look for (parameters and accuracies), how much time does the system have to finish the tests, how big should it be, what factory processes does the test system have to communicate with, time scales, and how much should it cost?
- Statement of work – What will the systems integrator deliver? What will the system look like (configuration, footprint, etc.), milestones during the development, requirements from the customer (reference boards, specialized instrumentation, etc.).
- Clear points of contact – Both sides should define early on who should be contacted for technical, financial, or support issues.

That last bullet is especially important from a design standpoint. Paul R. Salopek, president & CEO of Advint, explains, "Design engineering should participate in the outsourcing such that the full requirements are clearly defined to the systems integrator. It is beneficial for design engineering to provide insight into product details as they relate to test. It is also important to emphasize that design engineering can also utilize a systems integrator to assist in product design and validation by collecting and providing salient data concerning product performance. Another area where engineering and systems integrators can benefit is during design. If a product is designed for test, the resultant tests can be more valuable in many ways. Test cost, coverage, and certainty can all be enhanced by keeping test in mind during product design." Some systems integrators have designed platforms to fit many customers' needs. Figure 3 shows the PUMA from Advint. The PUMA is designed for remote test applications and can be carried to wherever the test is required.

Of course, after all is said and done, there are still surprises. As Peter Blume of Bloomy Controls explains, "The greatest problem is project scope or feature creep, where the end result is larger, more complex, or just different than originally anticipated. It's nearly impossible for a customer or integrator to create a specification with the level of detail and foresight required to totally avoid project scope or feature creep. It's perfectly natural for some of the requirements to continue evolving as the system is developed, and the customer may receive additional benefits not previously considered. Sometimes the changed requirements are easy to implement and are not charged, and sometimes they are more challenging and/or require additional hardware and software. The problem is that when the latter situation happens, some customers are unwilling or unable to pay for any associated extra costs. Customers should budget more than the quoted price in case their requirements expand."



Figure 2



Figure 3

Microcraft tries to lock specifications down early on. Stan Craft explain that, "All the issues need to come out in detailed specifications that the customer is required to sign. We typically try to get two signatures. Signing the document does several things for us. First, it elevates the seriousness of this phase. Second, it allows us to leave them alone. They can go back to doing their regular job, and we can go off and develop the system. Third, it draws a line in the sand that cannot be moved without an engineering change order. Most importantly, we have a record of the change and its impact on the project."

Ultimately, the systems integrator needs to press the end customer for as much detail as possible. Jim Campbell, president of Viewpoint Systems (and treasurer of the CSIA), add, “Studies have shown that for every hour you don’t spend collecting the necessary specifications and project requirements, you will spend a factor of ten to one hundred times more in recovery! So doing your homework upfront is crucial!”

Support here, there, and everywhere

Given that the world is now considered one big supply chain (parts from China assembled in places like Mexico and South America, and shipped everywhere), support of a manufacturing process becomes more critical than ever. In other words, if you build it here, will it work reliably there?

When planning a project with a systems integrator, it is important to keep support in mind. As most system integrators do not have worldwide support systems in place, most of them will send someone overseas when necessary, but that takes time. This should be one of the areas of discussion. Questions include:

- Adequate documentation for the remote installation – Can your technicians overseas perform calibration and troubleshooting with minimal support from the systems integrator?
- Diagnostics – What software/fixturing will be provided to verify and diagnose systems problems? What level of diagnostics will be provided?
- Spares – Are the parts readily available near the final location of the test system? Should spare parts be shipped with the system to minimize downtime?
- Training – Can the systems integrator provide adequate training for your engineers to understand the system and any test programs provided? Do they provide program development training as an option if you want your staff to develop future test programs?

Jim Campbell of Viewpoint Systems believes in WIT, Whatever It Takes, to support the customer. “If necessary, we can put people on site in a matter of days. Of course, in many cases today isn’t fast enough. If the customer needs maximum up time, we have developed relationships with local companies to provide support, and we’ll put the necessary spares in place. But our first priority is to provide a system that has minimal downtime and documented preventative maintenance procedures to further minimize the possibility of failure.” Figure 4 shows a custom fuel cell test system created by Viewpoint Systems in order to stay true to this vision. It is designed using a PXI chassis, rack mount instrumentation, and custom user interface.

Justifying the added expense

In many cases, there is a perceived notion that you can always do it cheaper yourself. After all, you’ve got all of those engineers in your department. Surely you can control your expenses better than a third party, right?



Figure 4

That can be the case but typically only when you have a dedicated staff strictly for test engineering, and you have a sufficient volume of projects to justify them. According to National Instruments research for the 2004 Automated Test Summit, the average test engineer completes at least seven projects a year. Twenty-five percent of these test engineers juggle ten projects or more. As the average development cycle can be over eight months, many of these test development projects must be completed in parallel. So while you may have the expertise, you may not always have the capacity.

Paul Salopek of Advint has his own definition for success, “A key to being a successful systems integrator is making the person responsible for test in your customer’s organization as successful as possible. If you can help them provide a higher quality product, on time and within cost, you have validated their decision to utilize your services.”

Jim Campbell sums it up as, “A good systems integrator will sell the value of their project management skills. The ability to develop a strong statement of work, meet schedules and budgets, plus offer documentation and support can be priceless in the long run.” So, if you’re a systems integrator and you’re reading this, here is what your customers are looking for!

Don’t be confused

In these pages, I’ve presented a lot of questions that have many answers. You need to determine what is an acceptable answer for many of these questions before you meet with systems integrators and especially before you sign that purchase order. Forewarned is forearmed, they say. Hopefully, your experience will be more successful if you follow these guidelines. **PXI**

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KNOWING PXI...

A guide to educational resources

By Bob Stasonis

Mark Twain once said, "I have never let my schooling interfere with my education." However, as there is no *PXI school*, where do you get educated? My point here is that many people in the industry do not really understand PXI's advantages and disadvantages, technical features, and technology applications. So how does one develop a better understanding? I decided to see what resources are out there.

The most obvious place to start is this magazine. The contributions of many PXISA members and PXI users give you a good flavor of PXI's capabilities. Beyond this publication, the next place to look is the Internet. Google came up with over 191,000 references to the acronym "PXI." To make your job easier, let me share a few places on the Web where there is general reference material for PXI. As some of these sites are commercial entities, they will, of course, try and sell you their PXI wares. But they have good reference material as well.

- www.pxisa.org – The official website of the Alliance, pxisa.org allows viewers to download the specifications, look up applications, and find links to all of the members.
- www.pxionline.com – The website for this magazine lets you research past issues of the magazine and download digital copies of the latest edition of the magazine.
- www.ni.com – As the founder of the PXI architecture, this company sponsors a website with plentiful information on the architecture and successful applications.
- www.pickeringtest.com/pximate – Pickering Interfaces offers a hard copy manual called the "PXImate." The book discusses the basics of PXI as

well as in-depth discussions on various instrument types. It also has contributions from other alliance members, including Acqiris and Virginia Panel. You can order a free copy from this website.

Seminars

There have been several PXI companies who have presented PXI tutorials at various locations around the world. For example, in North America, National Instruments joined with several companies and presented the Automated Test Summit (www.ni.com/testsummit). Geotest regularly hosts their PXI Workshops (www.geotestinc.com and click on "Workshops"). Also, the DATA show, sponsored by Bode Enterprises (www.thedatashow.com), has a presentation on the PXI Architecture that has been developed by many members of the Alliance.

Taking charge

You can also help drive more PXI educational experiences in your area. There are many technical organizations that can set up regional lectures and workshops. One example is the IEEE's Instrument & Measurement Society. Local chapters of the society are always looking for input from their members on what topics to present. If you are part of IEEE, ask them to get PXI in front of their members.

Of course, I could not cover every possible resource here. Please e-mail me with any resources I missed and I'll try and cover them in a future issue. The more you know about PXI, the more successful your usage will be.

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P X I S I D E B A R