

MODERNIZING MANUFACTURING: HOW TO BEND WITHOUT BREAKING



Crain's Custom Media partnered with the National Center for Manufacturing Sciences (NCMS) of Ann Arbor, a nonprofit national leader in advanced technology for manufacturers, to gather a panel of executives and owners of small to mid-sized manufacturing firms for an open discussion on a wide range of concerns, difficulties, and potential solutions for problems that are being experienced by manufacturers in Michigan. The discussion follows a survey conducted by NCMS, which gathered opinions of small and mid-sized manufacturers.

Small and mid-sized manufacturers often depend on razor-thin margins and face competition from across the street and across the ocean. Daily operations are a challenge, from the dilemma of finding qualified employees to battles over access to software and hardware – most of which is priced by volume licenses for far larger enterprises.

Bill Loomis: One of the “pain points” identified in the survey involved advanced computing issues, such as design capabilities, analysis software, modeling software, simulation and more. Who of this group has confronted the difficulties and benefits of advanced computing in the small firm environment?

Brian Heldt: The complexity of the parts and the complexity of the systems is kind of like comparing Pong to something you'd play on an Xbox today, or a manual typewriter to a modern page layout app.

Greg Raymond: We're working with sheet

metal stampings, and one of our biggest problems is simulating material flow. When you're bending metal, you're going to have stress points, fracture points, ripping areas, and we're trying to identify those areas before we actually build the tool. There are new technologies out there like Autoform and Dynaform that show the stress points, the fracture points of material when you form it. This has been an important technology for us, saving us a lot of time in the tryout – when you're in press, stamping dies.

Todd Kilgus: To add to what Greg was saying, at Centracore, our core competency is design and then machining and assembly, so consequently, we're working with a lot of different raw materials, castings and forgings in a myriad of processes that we are buying on the outside from vendors. Some of those vendors are small shops themselves, and a lot of those folks don't have simulation/modeling capability, so it's kind of a chain effect. I'm not necessarily geared to know exactly how their simulation modeling needs to work for their particular process in their particular foundry or forging operation, so what we've had to do is – we've had to go out and get some of that technology from some outside vendors and put that simulation together for our supplier, as well as for our customer. It was a big win. It was a customer that needed it and needed it quickly, and we were able to put that together through NCMS.

Dawn White: We're an early-stage company, so we do a lot of modeling and simulation. The simulation products out there are priced for the large customers, for the most part. The history of that industry is to sell to very large companies,

big prices, big maintenance fees, lots of support expense and things like that. So pricing models aren't very well-suited to small companies that would really like to take advantage of this stuff.

Todd Kilgus: When you think about it from a supplier's perspective, especially in our supply chain, you know you've got thousands of RFQs coming through to these foundries and forging operations because there's a smaller and smaller pool of those folks. Our customers want to see the simulation modeling developing as the engineering is developing. That ability to step in and also support our tier-two or tier-three suppliers is important and growing.

Doug Wetzel: I think Protomatic is in sync with almost identically that priority. We've got the latest computers: They're high-end workstations. Machine simulation is an issue, it is a large expense, and for the most part, we don't fully leverage it.

Bill Loomis: Another survey “pain point” was in desktop computing. For instance, software suppliers come and go. A problem?

Andy Istvan: In a different aspect of the IT realm, years ago, when we were choosing a software that we would use for our manufacturing on-the-floor control, we started out with about 25 companies and purposely let time kind of be our guideline. Three years later, out of those 25 companies, only three were still in business, so we chose one of the three and have used them ever since. However, that company will be out of business very shortly. We have enough support, but for how long?

The event was hosted at Lawrence Technological University on March 20. Panelists were:

• **Mark Brucki** – Executive Director of Economic Development & Government Relations, Lawrence Technological University.

• **Paul Dehart** – General Manager, Springfield Industries, a chemical formulator/manufacturer for automotive, aerospace and the tracking industry.

• **Matt Heller** – Owner, Detroit Gun Works and Central Screw Products Co. Inc. Central Screw Products makes parts for heavy industry. Detroit Gun Works supplies machined parts to the firearms industry.

• **Andy Istvan** – Owner, K&Y Manufacturing Inc., a turning facility that services the automotive, military and fire suppression markets. It was founded in 1948, and Istvan has been with the company since 1977.

• **Todd Kilgus** – President, Centracore LLC, a manufacturer of machined castings, forging and aluminum extrusions. It is involved with the design and development of many of those components for its customers.

• **Bob Leonard** – Vice President, Metro Stamping. Leonard also works on talent development for manufacturers through regional sources, such as Lawrence Technological University and Henry Ford Community College.

• **Greg Raymond** – Vice President, R&A Tool & Engineering Co., a third-generation sheet metal stamping facility that began in 1946 and serves the automotive markets.

• **Jon Riley** – Vice President of Digital Manufacturing, National Center for Manufacturing Sciences (NCMS), a nonprofit organization whose sole mission is to make U.S. manufacturing firms more competitive. His particular interest is developing a better understanding of the needs of small and mid-sized manufacturers.

• **Michael Teicher** – CEO, Xoran Technologies LLC. Xoran designs medical imaging equipment for the medical device industry.

• **Doug Wetzel** – General Manager and Vice President and **Brian Heldt** – Finance Manager and Protomatic Inc., a CNC contract machine shop doing custom parts for customers, about 80 percent medical and the rest aerospace. Its niche is small to mid-sized volume orders and frequent work with startup companies.

• **Dawn White** – Founder, President and Chief Technology Officer, Accio Energy Inc. Accio Energy is an early-stage company working on a new approach to wind energy technology.

The session was moderated by **Bill Loomis** of Crain's Custom Media.



MATT HELLER: “There’s a significant barrier of entry on some of the software that’s available, and then even if you get it, does it actually meet what you need to do?”

Bill Loomis: How does a small firm deal with the labor and expense of IT?

Andy Istvan: The other issue with the desktop is just because we're a smaller company, we don't have an IT department, we outsource that. And even within that realm, you see a lot of companies shifting. We've seen employees going from one company to another, and that seems to be a real issue. They promise the world, and then when it's time to deliver, you don't have the support that you need.

Matt Heller: There is software available, but the costs can be extraordinary. There's a piece of software that actually simulates your entire machine, so typical CAM software just simulates the process. But to actually take it and then marry that to the physical machine that you have on the floor, someone has to do that integration. And we're 13 people, it's a two-year development project, and it's \$50,000 to get that, which for some shops makes a lot of sense, but for a lot of the people in this less-than-2,000-employee

range, there's a significant barrier of entry on some of the software that's available, and then even if you get it, does it actually meet what you need to do?

Bill Loomis: Another area of problems identified by respondents was in skills and human resources: the inability to get proper people to do what's needed. People that are needed are not affordable, people that are affordable are unavailable. And finally, a lack of training options to upgrade your people.

Doug Wetzel: We've seen demographics of tail-end baby boomers, 45 and older. They're very competent. And then we have, I guess it's Gen Y, I'll call them 30- to 40-year-olds. We were anti-manufacturing for that population segment. They don't exist. And then we have, I guess it's the Millennials that are just coming into the workforce. They're in the 20s I'll say up to 30s at this point in time, and they don't have the competency and skills to do what the tail-end Baby Boomers are able to do.

And a lot of it is they have just had 20 years or 30 years of experience in the marketplace. They know how to separate the thousand solutions that are not necessarily the best and find the optimal one.

And that's not done with software necessarily. We can simulate it, sure, but it takes time to simulate. A typical computation of simulation might be, you know, multiple hours, so how many thousands of those do you want to do for a couple thousand dollar job? It doesn't make sense, so that's our dilemma.

Bob Leonard: I mean, our strategic advantage emanates from having training in these certain areas. Esteem is an issue, and that's clearly huge – that you had this lost generation sort of that said, mama, don't let your babies grow up to work in manufacturing.

Paul Dehart: It's a supply-and-demand issue. That generation that was lost, that's when all the manufacturing was going overseas, so why would you go into a career where it's going down?

Doug Wetzel: I think the cost of entry has changed from an education base. (It takes) literally years to train a qualified person as opposed to maybe in the '70s, one or two years, and now it's taking us eight or 10 to get all of the little tricks and understand how to ring all the bells of the software. It's just – the technology has become so complex.

Michael Teicher: That selection process tends to be really, really narrow, which is why it took us so long – and again, it's that biomedical, slash, manufacturing engineer. In most industries, there is a large cost associated with that long-term training. If you make the wrong decision – for us as a 50-man shop, it has an impact. That's why we were so cautious.

Bill Loomis: Some are addressing this problem, I think.

Mark Brucki: Over the last year or so, we pulled together some industry folks to talk to them about what their talent needs were. One of the things that came out of that was a need for modeling simulation/visualization to have an academic degree program. We went through about a six- to eight-month period and, ultimately came up with a recommendation to create a modeling, simulation and visualization master's degree program that we're pushing through the university to get approved this January and launch hopefully by fall.

Matt Heller: Maybe there's an area where instead of this being addressed at a governmental or institutional level, if those dollars are funneled to somebody that actually needs the person to train them, apprentice them – I would envision it actually occurring at the place where they would end up at employment.

Bob Leonard: There's a huge misalignment between industry and education here and resource alignment. The problem in my view at a fundamental level is that education has drifted, the pendulum has drifted toward theory, it's not about application.

Paul Dehart: I tried to call a community college five miles from me, and I said I'm willing to hire somebody to work on days, they can go to school at night – and you're just calling into a black hole.

Dawn White: There has to be something. Look at the crushing load of student debt these kids graduate with. It's criminal, and it's hard on the parents and, you know, I mean, maybe there's a way to get some listening going on at the opposite end by talking about manufacturing and apprenticeships as a way to get out of the student debt burden.



DOUG WETZEL: “I think the cost of entry has changed from an education base. (It takes) literally years to train a qualified person as opposed to maybe in the '70s, one or two years, and now it's taking us eight or 10 to get all of the little tricks and understand how to ring all the bells of the software.”

ORIGINS OF THE DISCUSSION

The origins of the roundtable event began late in 2013. It was an industry survey of Michigan manufacturers with fewer than 2,000 employees. “That segment really drives the economy, and we wanted to understand their needs and concerns. What technology do they use? What technology interests them? What do they worry about?” asked Danielle Jones, NCMS business development manager. As it happens, that segment is also more than happy to share: Response rates were almost four times higher than the average for a digital survey. NCMS followed up by telephone with selected manufacturers, forming one of the most detailed portraits yet of a crucial but largely unknown sector. “The response was amazing,” says Jones. “And we quickly realized, ‘hey, we have to keep these guys involved.’ That was the genesis of the roundtable at LTU.” Future steering discussions and a national survey are planned in 2014.

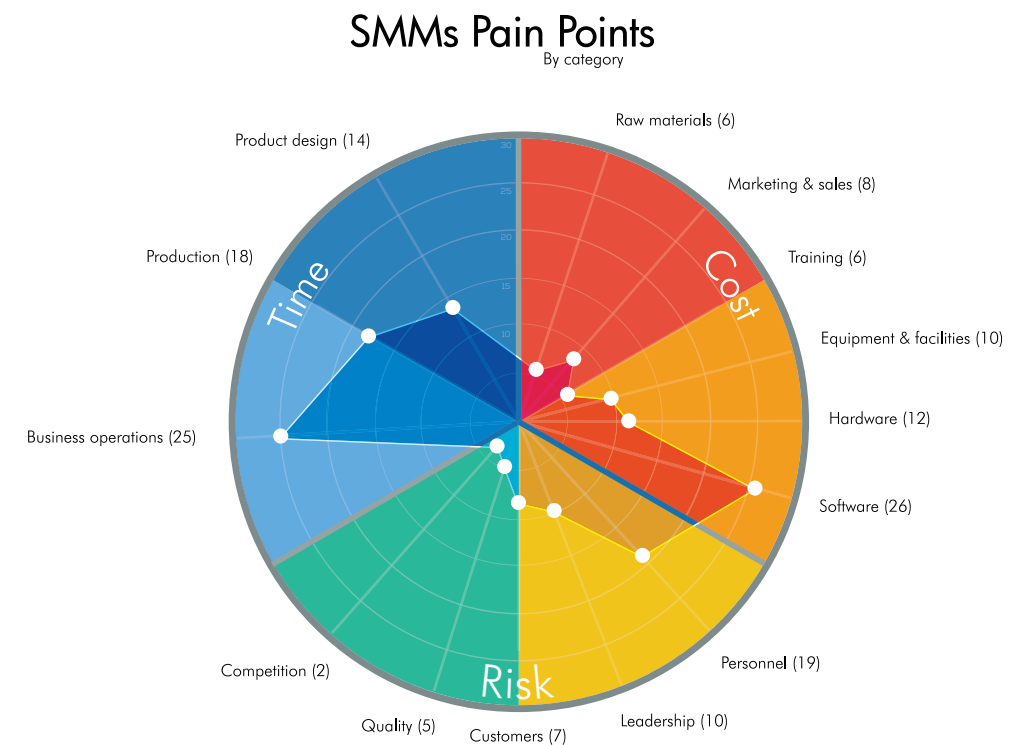
Bill Loomis: Why do small and mid-sized manufacturers matter in Michigan, and what initiated this event today?

Jon Riley: The term “small and mid-sized” creates this sense of being less important, but the truth is, that segment is by far the most crucial element of the manufacturing economy. Nobody exists without those small and mid-sized firms – any big global manufacturer you can think of depends on the tiers below them. In Michigan you're looking at nearly 8,000 manufacturers with fewer than 2,000 employees. And like everywhere else, they're the backbone. They drive Michigan's economy, and they drive the world's economy. We know this. Part of the reason we are here today is what we learned from a survey we did in late 2013, in partnership with the Michigan Manufacturing Technology Center (MMTC). We wanted to understand this segment better, and we wanted to give it more of a voice. Manufacturers below that 2,000-employee threshold are so important, and yet often it feels like they're not heard, or maybe not listened to. We wanted to reverse that. What right do we or anyone have to tell them what they need to run their businesses better? The more interviews we did, the more we realized everyone is talking at these manufacturers, nobody's listening to them. That's not right. NCMS is looking for ways to help get real tools into your hands to keep you competitive, period. And one of the key things we wanted to do today is to drill into some of the responses we got through the survey, and some of the conclusions that were made, and validate those, to make sure we are on track.

Response to the survey was unusually high. Respondents were owners and top-level managers who identified current challenges, frustrations and looming issues that need attention. Where business leaders turn for help, tools, information and guidance on these issues. Finally, respondents also offered solutions based on their direct experience and their knowledge of their industries.

Bill Loomis: What issues did small and mid-sized manufacturers identify as their biggest concerns?

Jon Riley: Out of the responses, five general areas of concern emerged. These included business operations, production, product design, personnel and software. They're areas of concern that we began referring to as “pain points.”



What are the concerns that small and mid-sized manufacturers have? This chart shows their concerns, based on the survey conducted by NCMS.



JON RILEY: “We want people to become aware that there’s a resource that’s been set up and find out how the manufacturers could use it, so we can really customize it to the needs of the manufacturers we’re trying to help.”

SOLUTIONS – THE GRID CELL

Bill Loomis: A lot of these manufacturing issues have been considered in a program called the “Grid Initiative” that was started by NCMS. Jon, what is the “Grid” concept?

Jon Riley: The Grid Initiative is the whole effort – it’s a national innovation network. Manufacturers on the Grid are connected to each other and empowered with technology and collaborative tools. The idea is that collaboration makes everything less risky and less costly, even adopting new manufacturing solutions.

Grid Cells are centers. They exist in the real world, but they also exist virtually on the Grid itself. You might drive out to a Grid Cell, or you might access it from a computer. Either way, you’re connected to a point on the Grid, and that in turn connects you to every other point on the Grid. From there, you can access solutions to your specific challenges. You can optimize and forecast and take advantage of all this technology that’s been out of reach of many manufacturers.

Our vision is that the physical Cells are regional locations anyone can go and trust that their IP is secure while they access technology that might not be available on their desktops. We’ve already got one set up at NCMS headquarters in Ann Arbor and one at George Mason University in Virginia, and we see them spreading out across the country, like pins on a map. So, say one of these manufacturers here has some engineering problem. By adding the capabilities of the Grid Cell to their own, they make the problem easier and faster to solve. Just imagine if manufacturers could solve six-week problems in three weeks, or one. Think what it could do for their bottom line. The Cell is staffed by students and experts who ease the growing pains, and you use the Cell when you need it. You don’t worry about anything in between. And if it does get to the point where, yeah, I want to solve this problem on a repeated basis, I need to run Dynaform to do a stamping tool and I’m doing these things, you know, every three weeks, well, maybe it makes sense to bring it in-house, and the Grid can help with that, as well. But until that point, you are paying on a project-by-project basis, which is easy to cost and determine immediate ROI.

We focused on modeling and simulation initially. It doesn’t have to be that. This could be anything. This could be where are the pain points, and how do we at least begin to look at some piece of this continuum work force development and affordable access to technology.

We want to set up a process where it becomes an extension of your organization – when you walk in there, it’s yours, and it’s yours, and it’s yours. I mean, it’s a shared-use facility that gives affordable access to future workforce or at least expertise and the capabilities.

Todd Kilgus: Who would have access to something like this?

Jon Riley: Anyone. Any small or medium-size manufacturer.

Todd Kilgus: In other words, to go in and utilize those students or to go in and utilize particular software.

Jon Riley: Yes, exactly. We want people to become aware that there’s a resource that’s been set up and find out how the manufacturers could use it, so we can really customize it to the needs of the manufacturers we’re trying to help.

MOVING THINGS FORWARD SOLUTIONS FROM THE PANEL

Panelists voiced their opinions on a range of pain points. But they also have ideas on how to find solutions. Some of the high points from that conversation:

Pricing

Dawn White: Something that has been very beneficial to us through NCMS has been involvement in their Digital Manufacturing Strategic Interest Group; a lot of the focus is to connect and meet other people. It was at one of these meetings that the CEO of a software company came up to me and said, you know, you guys should try my product, it would cost you less, we have a better business model. And in fact, even though there is a huge cost associated with dropping one modeling platform and moving to another, internal cost, we finally decided that, yeah, we could actually save like over \$10,000 a year on this. That’s a lot of money for a small company.

Cloud computing

Paul Dehart: When I kind of envision the digital manufacturing segment, it is almost an industry cloud computing that small guys like us could tap into without having to go through that investment.

Finding qualified young employees through MAT2

Bob Leonard: Is everybody familiar with the advanced technician program that Michigan has started, Michigan Advanced Technician Training, MAT2? It’s a pilot program: 12 students at Henry Ford Community College and 15 at Oakland Community College.

I’ve had the privilege of visiting some of those sponsors of MAT2, about 10 of them, and their clear message is we’re having trouble getting talent.

They’re really excited about the MAT2 program. All of those students have very good affect and really good attitude, which is largely what they are looking for. The students are excited to be there. It’s essentially a free ride at a community college with an associate degree.

There’s a huge need to bridge the gap between manufacturers and educators.

Early college programs seeing success

Dawn White: Related to what you were saying, Bob, for these early college programs that are becoming popular – My daughter went to the early college alliance at Eastern, and she’s now

an engineering student at U of M and planning to go to grad school. Kids can come into those programs and instead of doing the same old stuff in high school without decent shop classes and no training focused on vocational, they actually can go and take those classes. It’s free because they get their foundation grant.

They can come out of there with their associate’s degree or at least two years of college, and if they take the right classes, they’re going to know quite a bit about some of your manufacturing processes.

So there’s a lot to be said for these, and I think that they can be super valuable if a lot of the companies sitting here encourage more kids to take advantage of that opportunity.

Integrating education with manufacturing experience

Todd Kilgus: I think Dawn hits on a great point. You know, we look at the success and people automatically coming out of places like GMI, Kettering University, where they have the half year on/half year off, semester on/semester off, and to think about integrating that with a younger group of people where they’re actually starting that in ninth grade or 10th grade, it starts to change that mindset.

In-house design, outsourced machining

Greg Raymond: I know a company that is – on the IT side, there’s some new technology out there that’s essentially going to get rid of the desktops. Each workstation will have a keyboard and a monitor, they’ll plug into the server, just one cord, and you won’t have to deal with all the breakdowns of the desktop computers. That’s happening now, something I think we can all benefit from, especially if you do your own IT like we do, spend a lot of time fixing fans and graphics cards and finding drivers for the printer. That kind of stuff is going to go away, they tell us, in the next couple years, and I’m pretty optimistic about that.

As far as the skills and human resources, something we’ve been doing the last couple years – we’re an engineering company, so we’re doing a lot of the design in-house or most of it in Solid Works, so we’re finding that if we do our designs and I outsource the machining and the details come back in and we assemble them, try them out, I can kind of eliminate some of the finding-the-right-machinist-type issues that we’re having.

So that’s something that’s been working for us. Maybe we’re doing about 30 percent of that now.



DAWN WHITE: “Something that has been very beneficial to us through NCMS has been involvement in their Digital Manufacturing Strategic Interest Group; a lot of the focus is to connect and meet other people.”

Editor’s note: NCMS has a Voice of the Customer report on survey findings, as well as several events targeted toward small and medium-sized manufacturers on the Grid Cell website, doitindigital.com. There are many ways for manufacturers to stay engaged and become involved in Grid Cells, both in Michigan and elsewhere. Please contact Danielle Jones at (734) 709-3093 or daniellej@ncms.org for more information.



WHAT YOU DO MATTERS. WHO YOU KNOW MATTERS MORE.

Here's how to change the world: get some people. Mix it up a little. Reach across industries and disciplines, make new connections. Sit aerospace down next to food packaging. Have academics and end users share a table. Introduce everybody around, give them some sandwiches, lock the door, and don't let them out until they've done something innovative. Together they accomplish things none could accomplish alone. Collaboration kills risk, cuts cost, and supercharges the process. The trick is building and managing collaborations that work. That's what we do. We're professional puzzle-solvers. We know how all the pieces fit together. We're the network. We know a guy who knows a guy. We see the puzzle. We see the picture. It's more than just making sure everybody plays nice (we do that too). We connect people — introduce big companies to little companies; help out with scary stuff like government contracting; protect everybody's intellectual property, and ensure that the collaboration is working. Alone, each of us lives in this world. Together, we can change it.

WE'VE GOT YOU COVERED.



COLLABORATIVE MANAGEMENT

Risk? Cost? Collaboration is their Kryptonite. Managed properly, it enhances innovation, protects IP, and provides new opportunities for networking and growth.



DIGITAL MANUFACTURING

The Industrial Revolution was a blip compared to what's next. The age of Big Data and virtualization has begun. It's up to us to decide where the journey goes.



INDUSTRY INTELLIGENCE

A "big picture" view won't reveal much without the connections that make it work. Connections are kind of our thing, though. We look for the pattern, not the process.



NETWORK & MARKET ADVANCEMENT

In business, you have to know people... or know people who know people. Cross-industry collaborations extend the network beyond what's possible alone.

COLLABORATION THAT WORKS.



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