IndustryWeek®
Advancing the Business of Manufacturing
SPRING 2023: The Innovation Issue

2023 TECH SURVEY

p 8

ALSO INSIDE

Get more from your money.

Credit cards make purchasing convenient and simple. The right card also gives your business purchasing power to drive growth.

Our experts can help make sure you have the right U.S. Bank credit card to meet your business's spending needs.

Start earning more without doing more.

Scan the QR code or visit **usbank.com/bankerconnect** to request your complimentary analysis and consultation.

INSIDE

IndustryWeek.com

www.industryweek.com/facebook www.industryweek.com/twitter www.industryweek.com/linkedin

Cracking the mRNA Manufacturing Code with Pfizer's Supply Chain Chief

Scaling up production of the COVID vaccine from zero to 3 billion doses was Mike McDermott's personal "moonshot."

www.industryweek.com/21259181

Synergies for the Win: Mativ CEO on the Power of a Manufacturing Merger

Julie Schertell brought together two specialty paper makers, Neenah and SMW, last year. Has she found $65 million in savings yet?

www.industryweek.com/21260755

The Latest EV Battery Announcements and Investments

IndustryWeek editors continue to update this slideshow, detailing the major electric vehicle battery investments made by suppliers and automakers since 2021. The most recent addition to the list (as of press time) was Amprius Technologies' March announcement of a massive plant in Colorado to provide batteries for military EVs.

www.industryweek.com/21260159

Dole's North American Operations Shut Down by Ransomware Attack

Ransomware seems popular among manufacturers.

www.industryweek.com/21260685

FTC Proposes Banning Noncompete Clauses. What Does It Mean for Manufacturers?

A former antitrust prosecutor and manufacturing consultant weigh in on the proposed rule.

www.industryweek.com/21260502

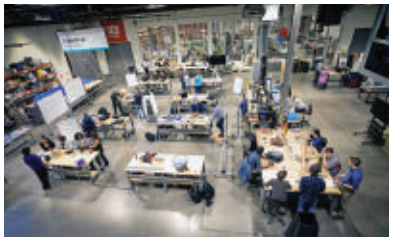
INSIDE

IndustryWeek

SPRING 2023 | THE INNOVATION ISSUE | VOLUME 272 | ISSUE 1

COVER STORY

GE APPLIANCES



PLANT CONSTRUCTION

TRANSCRIPTS

AUTISM

ADDITIONAL READS

Bidding Farewell to Print

By Robert Schoenberger

We talk a lot about digital transformation at *IndustryWeek*, pointing out the opportunities and challenges facing manufacturers as they adopt modern tools to approach centuries-old processes. Truly transforming operations is often difficult and painful, yet it remains necessary to stay relevant.

Like the industries that we cover, *IndustryWeek* has undergone a massive digital transformation. Once strictly a print magazine, we were early adopters of the Internet, putting our news and features on a website in the mid-'90s, branching out into webinars a few years later and reaching thousands of new readers through email newsletters.

Printing a magazine has become a smaller and smaller portion of our output every year. Once a weekly publication, we only mailed out four issues last year. The overwhelming majority of our audience now reaches us digitally.

Those trends, coupled with rising prices for paper and postage, forced us to make a decision. This will be the last print edition of *IndustryWeek*.

To be clear, *IndustryWeek* remains. We will continue writing and publishing great stories. This change will lower some costs for us, but we have expanded our editorial team this year and will continue to bring useful, in-depth information to the manufacturing world.

While ending print is a major change, most of our audience and our advertisers made that transition long ago. The overwhelming majority of you read our material on our website or in daily and weekly newsletters. Major advertisers have told us that they have corporate policies against advertising in print, yet they support our digital efforts.

For those of us who love the visual flair of magazine pages or the tactile feel of paper in our hands, the news is bittersweet. It's also the end of a legacy. *IndustryWeek* and its predecessor brands have been in print since 1882 as *Iron Review* (1882 to 1888), *Iron Trade Review* (1888 to 1930), *Steel* (1930 to 1970) and *IndustryWeek* (since 1970).

My promise to our audience is to make this the beginning of a great new era, not the end of one.

A year from now, I want to be able to stand in front of people and explain that ending the time-consuming, expensive print magazine freed up resources to dig deeper with our reporting and do great new things.

We've already begun several initiatives. Every other week, our live Production Pulse interview program will livestream on IndustryWeek.com and our social media channels, giving audience members a chance to hear from newsmakers. We also have plans to offer career advice to people beginning their journeys in the manufacturing world, as well as news-driven webinars and interactive features that will give our audience more of a voice in what we do.

Our editorial production schedule now calls for us to produce in-depth feature articles constantly throughout the year, rather than concentrating them into print issues. If we successfully stick to our plans, we will have produced significantly more material by the end of 2023 than we did in 2022.

We will continue to hold the annual *IndustryWeek* Best Plants Awards, recognizing manufacturing excellence. Other long-standing programs, most notably the *IndustryWeek* U.S. 500 list of the largest publicly traded manufacturing companies in the country, will get more resources. Expect big changes to this year's list (more news on that coming soon).

So, I bid a fond farewell to the paper version of *IndustryWeek*. And, I'm looking forward to seeing what this amazing staff of editors can accomplish in the days and years ahead. ◀

***IndustryWeek's* Robert Schoenberger** can be reached at *rschoenberger@endeavorb2b.com.*

IndustryWeek
2 Summit Park Drive, Suite 300
Independence, OH 44131
(234) 466-0200
www.industryweek.com

EDITORIAL

Robert Schoenberger | Editor-in-Chief
Jill Jusko | Executive Editor; Senior Editor, Operations
Dave Blanchard | Senior Editor, Supply Chain
Laura Putre | Senior Editor, Leadership; Community Editor
Geert De Lombaerde | Senior Editor
Dennis Scimeca | Editor, Technology
Ryan Secard | Associate Editor, Workforce
Anna Smith | Associate Editor, News
Stephen Gold | Contributing Editor
Timothy Driver | Art Director

BUSINESS OPERATIONS

Frank Chloupek | Group Director, User Marketing and Product Analytics
Robin Darus | Sales Support Coordinator
Brenda Wiley | Production Manager
Melissa Meng | Ad Services Manager
John DiPaola | VP, Group Publisher

DOMESTIC SALES

Dave Altany | Sales Director
Northeast • Southeast • Northwest • International
216-931-9245

Jim Leahey | Regional Sales Manager
West Coast | Upper Midwest
312-914-0536

David A. Madonia | Regional Sales Manager
Northeast | Southeast | Midwest
201-452-6211

Leah Hammond | Strategic Account Executive
216-501-1824

INTERNATIONAL

CHINA: Adonis Mack
adonism@actintl.com.hk

JAPAN: Shigenori Negatomo
shigenori.nagatomo@pacific-business.com

ENDEAVOR BUSINESS MEDIA

Chris Ferrell • CEO
June Griffin • President
Mark Zadell • CFO
Patrick Rains • COO
Reggie Lawrence • CRO
Tracy Kane • Chief Administrative and Legal Officer
Jacquie Niemiec • EVP, Marketing Solutions & Data
Mike Christian • EVP, Industrial Group

INDUSTRYWEEK (Print ISSN: 0039-0895, Digital ISSN: 1930-8957) is published quarterly by Endeavor Business Media, LLC, 1233 Janesville Ave., Fort Atkinson WI, 53538. Postage paid at Fort Atkinson, WI and additional mailing offices. SUBSCRIPTIONS are free to qualified subscribers as defined by Publisher. Rates for non-qualified subscriptions are: U.S. one year-$70, Canada one year-$91 per year, all others one year-$111. Back Issues: (subject to availability) Single copy: U.S.-$15; Canada-$20; Other International-$25. Subscription inquiries: ***industryweek@omeda.com***. CHANGE OF ADDRESS request should be sent to IndustryWeek, PO Box 3257, Northbrook, IL 60065-3257. Please provide old and new mailing addresses and allow 4-6 weeks for processing. CUSTOMER SERVICE CENTER: Phone: 877-382-9187 Fax: 847-291-4816 E-mail: ***industryweek@omeda.com***. Postal/Email List Rentals: Mary Ralicki 212-204-4284 ***mralicki@endeavorb2b.com***. Reprints and Permissions: Materials produced by IW may not be reproduced in any form for any purpose other than personal use without permission. Custom Reprints: ***reprint@endeavorb2b.com***. Printed in U.S.A.

A Service Economy Is No Substitute for Manufacturing Innovation

By Stephen Gold

Since the 1980s, when Japan Inc. started challenging America's hegemony in making stuff, economists have questioned the need for us to make anything at all anymore. Case in point: Jagdish Bhagwati of Columbia University, who denigrated those pressing for a stronger American factory sector as suffering from a "manufacturing fetish."

The rationale is always the same: Western nations have "matured" into service economies and can purchase goods from overseas.

If I have a manufacturing fetish, so be it. There's a fundamental reason why a nation's manufacturing base remains an important societal goal: Innovation is the key to productivity; productivity is the key to higher living standards—and nothing drives innovation or productivity more than domestic manufacturing. Nothing.

Image courtesy of Karaevgen | Dreamstime.com

I raise this issue because this is the 20th anniversary of a seminal paper on this precise point, and over those two decades a growing number of economists have echoed the sentiment. More politicians pay lip service to manufacturing as well, tying it to the creation of middle-class jobs. But this doesn't capture the much broader economic value of having a vibrant industrial base.

In 2003, I oversaw a study by noted economist Joel Popkin titled "Securing America's Future: The Case for a Strong Manufacturing Base." This research went a long way to connect the dots between manufacturing R&D, innovation and increased living standards. And those links are just as valid today.

Higher living standards start with an idea, which spurs manufacturers to invest in R&D, which leads to a variety of innovations. These innovations incentivize manufacturers to invest in human and physical capital, which also create "spillovers" that benefit other parts of society—from competitors to suppliers to other sectors. All of this leads to productivity gains, and in turn to higher-paying jobs, higher-quality products, new products and processes and more competitive pricing. Ultimately, citizens experience higher living standards.

It's a simple formula, but many politicians and economists miss the forest for the trees. They count manufacturing's number of jobs and its portion of GDP, and they conclude that manufacturing is important—but they don't acknowledge the broader impact it has on living standards.

As stated above, it all starts with manufacturing R&D. While the latest data shows that China is closing the gap in terms of R&D investments, the United States remains the biggest player here: the U.S. annually spends roughly $680 billion on R&D, compared to $550 billion by China. After China, the U.S. spends more in R&D than the next seven countries—Japan, Germany, South Korea, France, India, the U.K. and Russia—combined.

This is important for all manufacturers because the spillover effects of innovation are linked directly to R&D. Product and process innovation generated through R&D spending in manufacturing affords advantages not just to its network of suppliers, designers and engineers—the benefits spill over across society. And companies are more likely to profit from spillovers when R&D takes place in *geographic proximity*—that is, in a localized region, especially for benefits from more generalized R&D. Hence the need to keep a dynamic domestic manufacturing base.

This is further demonstrated in the book *Producing Prosperity,* by Gary Pisano and Willy Shih, published 10 years ago. The Harvard Business School economists argued that policymakers need to focus on helping American manufacturers innovate. Their perspective—that manufacturing innovation is most likely to occur within America's "industrial commons"—was not new, but lent further proof that manufacturing is much more vibrant in communities of manufacturers, suppliers, research labs and skilled talent in geographic proximity that support each other and lay the foundation for such innovation. Such clusters can provide a region—and a nation—a competitive advantage.

The point here is that experts generally agree that innovation is the foundation of economic growth that leads to higher living standards. And manufacturing, the sector in which people simply make things, is home to more innovation and outside-the-box thinking than any other sector. In the mid-21st century, that includes the technology sector.

Unfortunately, over the past two decades these industrial commons have started disappearing from our shores. From machine tooling to LED lighting to rechargeable batteries to semiconductor production, much of this nation's technological knowledge and infrastructure has left for Asia. As we saw during the supply chain disruptions of the pandemic, that can have serious consequences for businesses and consumers. It's time to adopt public policies that will keep manufacturing here. ◀

Stephen Gold is president and CEO, Manufacturers Alliance, *www.manufacturersalliance.org.*

Passing the Leadership Torch Was Always Part of the Plan

By Ashleigh Walters

Jack Welch once said, "Change before you have to." A lot of business owners or leaders do not put a plan in place to transition the business before it is necessary.

Why is that? Maybe because it is very emotional for everyone involved. No one likes change because it causes stress. There is a fear of the unknown. But change is necessary for growth.

For nine years, I have had the opportunity to lead Onex, an industrial furnace manufacturer in Erie, Pennsylvania. I remember vividly how stressed and worried I was in the days after I accepted my father-in-law's offer to become the company's general manager. A friend soon calmed me down, saying, "You can only eat an elephant one bite at a time."

As time went on, I settled into a rhythm. Being a problem solver naturally, I found the resources I needed in order to successfully lead the business through a transformation.

Image courtesy of Dreamstime.

My original goal of turning the family business around, creating financial wealth for our employees and ensuring our clients are well served has been accomplished—but only through the help of many people along the journey.

When my husband Drew and I purchased the business from his father in 2018, we were very thoughtful in how we would transition the business knowing that most family businesses do not make it to the third generation. Now, it is time for me to pass the torch to the next leaders at the company.

In the new year, my role will change from leader to advocate. As chairwoman of the Onex board, my job is to ensure the company strategy is sound and people have the resources and support they need to be successful.

Could I stay and lead for another nine years? Sure. But I did what I do best—fix things. It's time to transition so new leadership can grow the business in ways I could have never dreamed of.

Here is some advice for business owners who prefer changing before they have to:

Plan Early

Well in advance, like years, plan for the transition that will one day occur with your business. Ask yourself: What do you want your legacy to be? Think about what is important to you. Do you want the business to remain in the community for years to come? Or is it important to join forces with another company in an industry consolidation?

Train the Next Generation

No matter what your choice may be for exiting the business, you must train the next generation of leaders. Start early in the transition process, familiarizing young leaders with the business strategy, mission and core values. Include them in the tough decisions, talking through all possible scenarios with them and explaining why you made the decision you did. Always be coaching and mentoring, helping people grow and accomplish their goals.

Transition over Time

Have a transition period so everyone has time to pass along information and duties in an orderly manner. We used 90 days to hand off tasks and pass along relationships. Now, we will transition to six months of weekly phone calls to go over operational issues, paired with monthly financial meetings. Eventually, we will move to quarterly board meetings and informal check-ins as needed.

The most popular question I get these days is, "What will you do next?" My answer is, "I honestly don't know." (Though I do plan to continue writing this column.) But I can assure you that I will be involved in helping others reach their goals. I am saying "yes" to opportunities that are true to my core values. I am not saying "goodbye."

While this transition is emotionally charged, it is the beginning of an exciting new chapter for me. So, stay tuned!

Are you ready to embrace the change that is inevitable in life? ◀

Ashleigh Walters was CEO of Onex Inc. through 2022 and is the author of *Leading with Grit and Grace*.

Automation without boundaries

PETER ZORINO
Chief Technology Officer,
Emerson

Emerson.com

It's been some three decades now since the Purdue model first formalized the seven-layer pyramid for "computer-integrated manufacturing" that those of us in the industrial automation space have all come to know (if not love). And while the model's intent was primarily functional, form often follows function and the intervening decades have left us with complex strata and siloes of isolated data that is difficult to integrate and contextualize.

Emerson, a longtime leader in the industrial automation space, has a new vision of a flatter, software-based architecture for automation that democratizes data and enables optimization without all the former hurdles. To learn more, we tracked down Emerson technology leader Peter Zornio at the company's recent Emerson Exchange user conference in Grapevine, Texas, near Dallas. Then chief technology officer for Automation Solutions, Zornio has since been promoted to CTO for the entire Emerson organization.

Q: While many compelling innovations were on display at Exchange, I was particularly intrigued by the future vision of "Boundless Automation" that was presented. Can you take us through the essential aspects of this new architecture and how it's different from the automation systems we've seen up to now?

A: Boundless Automation is our term for the future of operations technology (OT) architecture. That includes everything from intelligent field devices to automation to operational management software—the complete envelope of things that make production operations happen today. We got there pretty simply by looking at the limitations of today's architectures against the technology advances of the IT world in cloud and on what we now call the edge.

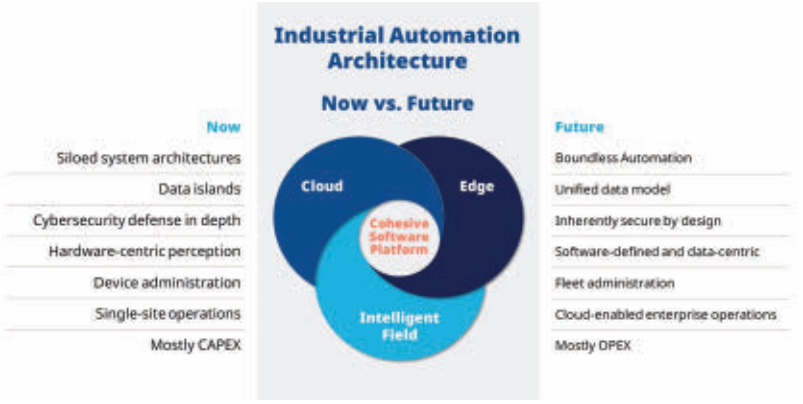
The fact that we have very layered, striated architectures with software sometimes tied to very specific hardware, makes it difficult to move data up and down the layers seamlessly. We've built the layers largely as a security construct, or, as you already mentioned, as form follows function. With digital transformation, people went beyond automation into areas like reliability, sustainability and quality, which meant yet more vertical silos of data with their attendant applications.

We've decided that this kind of silos or layers doesn't make sense going forward. Instead, think of three integrated computing domains—the intelligent field devices, the edge technologies, and the cloud—combined as peers (rather than layers) with a cohesive software environment that ties the applications in those three environments together. That's really the core concept of Boundless Automation.

Q: You've used the phrase "integrated by design" to describe how the various components and systems that participate in these future systems interact with one another. Is this more than the common communication standards and basic information models that we already use?

A: Each one of these three domains will support software applications that, in order to fulfill their value potential, need to be integrated together much more closely than the lowest common denominator functionality that most standards deliver. Now, standards are absolutely good and essential for some core infrastructure, but they can also limit innovation. So, you need to very selectively decide where you're going to have standards, and it's not always a purely technical problem. A very complex standard might deliver a very high level of functionality, but then you're faced with commercial and testing issues around a multi-vendor environment. Who's going to be in charge of making these more complex pieces of software work together?

What we've seen in the software market over the past 20 or 30 years proves that people want and will pay for a unified software ecosystem that provides greater ease of use and provides for usability of the data, what we call data democratization, inside that software ecosystem. Examples close to home include Microsoft's move to integrated soft-



At November's Emerson Exchange conference, the company shared its vision of a new, software-defined automation architecture designed to catalyze the future of modern manufacturing.

ware suites, ecosystems of mobile phones and resident apps, and the original distributed control system (DCS). The DCS has always been an integrated, cohesive suite of automation software that's been designed from the start to work together. The concept has obvious benefits that we've seen people willing to pay for.

Q: Providing more effective and efficient data management and contextualization has been a key push by Emerson for several years now, and the recent controlling interest acquisition of AspenTech and the inmation technology that it acquired promise to advance those capabilities even further. Can you talk to the importance of effective data management in the Boundless Automation systems of the future, and how the inmation and AspenTech technologies help to advance it?
A: If we've learned anything from customers running digital transformation programs, it's that this concept of data democratization or usable data is what's key. Everybody quickly figured out they could use standards, that they could move data back and forth or put it all together in a data lake in the cloud. What was missing was the context provided by a consistent data model around all that data, to make it usable in actual applications.

And that's where inmation comes in: it layers a cohesive, S95-based data model over the disparate data models of various applications. But the Boundless Automation vision goes further, in that applications in this integrated software portfolio will leverage a shared data model right from the start. And of course, now, with the combined portfolios of Emerson and Aspen, we have the broadest suite of OT software in industry. It's a great opportunity to bring them together in the sort of unified software environment that will deliver unparalleled ease of use and data democratization for our customers.

Q: The process automation crowd has long been a pretty conservative bunch—and for good reason—when it comes to adopting new technologies. But the pandemic seems to have only accelerated widespread acceptance of the cloud as an important extension of on-prem automation systems.

What advantages does cloud connectivity offer users of Emerson systems, and how does it increase the value you can deliver on their behalf?
A: First off, I'd note that IT has really run to the cloud and embraced it. And frankly, many applications in the OT world are not time critical and could move to the cloud today to take advantage of those same benefits: outsourced infrastructure, no software maintenance, universal access, elastic scalability and pay-as-you-use consumption-based models. The cloud doesn't solve the data integration issues already mentioned but having all the various systems housed together in the cloud is a better starting point.
Q: Just after Exchange, Emerson announced that it had divested a majority stake in the commercial and residential side of its business in a deal that valued the business at $14 billion. Lal Karsanbhai noted that this was "a next step in Emerson's ambitions to become a global automation player." That's a pretty nice nest egg when it comes to investing to increase the footprint and capabilities of what I think of as an already significant force. What can you tell us about what developments we might we expect in the coming months?
A: I think Lal describing it as "a next step" was a little bit of an understatement. Certainly, the deal succeeded in creating the world's largest pure-play automation company. And frankly, we're big in all areas whether it's sensing, final control, and actual control across process, hybrid and discrete manufacturing.

And with Aspen, we've set up one of the largest portfolios of OT software. So, you can expect that, yes, we'll take that nest egg and be targeting expansion in all those areas.

INDUSTRYWEEK 2023 TECH SURVEY

AR/VR MATURES, IIoT UNHAPPINESS RISES

Justifying technology spending is getting easier, but getting IT and OT departments aligned remains challenging.

By Dennis Scimeca

Finding the right technology to improve processes, increase productivity and boost profits becomes less onerous every year as manufacturing tech proves itself. Scaling those innovations and learnings while maintaining organization-wide enthusiasm for the technology, however, isn't getting any easier.

Still, organizational growing pains are nothing new for manufacturers. The challenges highlighted by some of our key takeaways from this year's *IndustyWeek* Technology Survey are far from insurmountable. This is all good news.

- Augmented reality and virtual reality (AR/VR) technology has matured in manufacturing. Scaling, not experiments and pilots, becomes the chief concern for manufacturers.
- Dissatisfaction with IIoT systems crept up last year, raising questions about how manufacturers ought to set expectations and whether we ought to reconsider this one-acronym-fits-all definition of the technology.
- Following the trend indicated by last year's survey, manufacturers continue to find it easier to justify CapEx for technology initiatives.
- Getting OT and IT departments aligned takes on greater importance, as OT professionals increasingly participate as technology leaders.

Engage the Virtual, Enhance the Real

When asked what they saw as the benefits of wearable technologies like AR/VR headsets and smart glasses, 35% of survey respondents answered, "improved safety," up from 20% in 2022. The percentage of respondents who use AR/VR for increases in production/efficiency or actionable data remained about the same as last year.

BMW workers in Germany wear augmented reality (AR) goggles that guide users with instructions and information during the engine-build process. *Photo Courtesy of BMW.*

Editor's Note:
SUCCESS LEADS TO UNHAPPINESS

No, that subject line isn't a dissertation on Russian literature, it's a recognition that the better tech gets, counterintuitively, the more flaws people see.

Apple's first computer didn't even have a case around it. It was just a series of circuit boards, and early adopters built wooden cabinets to hold them. And they liked it that way! It was primitive, but it was a personal computer in an era of room-sized mainframes.

The company didn't take off until the launch of the Apple II, a machine with a plastic case, accessories, better software and massive improvements to usability.

That's where a lot of manufacturing technology sits right now. Eager early adopters (the kinds of people who enjoyed getting splinters when assembling home computers) have shown that IIoT and AR/VR systems can bring a lot of value. Now, it's time to move past the enthusiasts who have been very forgiving of shortcomings and flaws.

— Robert Schoenberger

We saw another appreciable change, but this time a decrease, for "Don't know enough to say," down to 38% this year from 46% in 2022.

More respondents are increasingly familiar with AR/VR: Does this reflect trends?

When the pandemic hit in 2020, many manufacturers adopted AR/VR for remote assistance. Unable to send employees across countries or continents, companies instead could have an operator wear AR glasses equipped with a camera at the plant with an engineer viewing the camera feed. That method became a powerful tool for remote diagnostics and maintenance.

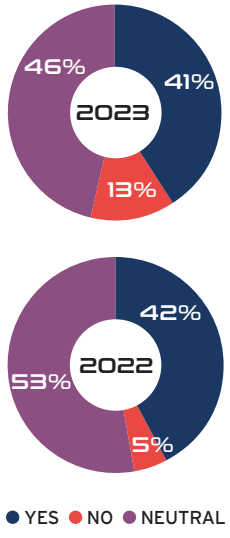
"That use case certainly continues, and it's getting richer as connections to work-order management systems, documentation repositories or IoT platforms become more common and more robust," says Paul Miller, principal analyst at Forrester.

Once manufacturers grew comfortable with the technology, they realized the benefits of AR/VR went well beyond remote assistance. Offsite training allows new hires to learn skills outside dangerous factory environments. Veteran employees can slip on a pair of AR glasses and record operations, effectively holding in-person demonstrations for trainees.

Eric Abbruzzese, AR/VR analyst from ABI Research, says that conversations about AR/VR no longer revolve around pilot use cases and experimentation. During a panel he moderated at the Augmented Enterprise Summit in October 2022, companies like Airbus, Dow and Bristol Meyers Squibb spoke about scaling up the technology.

"BMW, Audi, Porsche, Ford, Volkswagen Group, Stellantis, they're all playing around with AR/VR and are scaling," Abbruzzese says.

If your IIoT plan has passed the pilot phase, is the reality meeting your expectations?



Stellantis views remote assistance as a way to serve sustainability goals, by limiting travel. Ford and Toyota are trying VR for remote collaboration, the latter even establishing offices in Japan and California for cross-Pacific design collaboration in VR.

"You don't build out dedicated VR offices for collaboration if you're not at least a little bit confident in it scaling up. And we're starting to see that in a number of different markets," says Abbruzzese.

How to Know What You're Getting Into

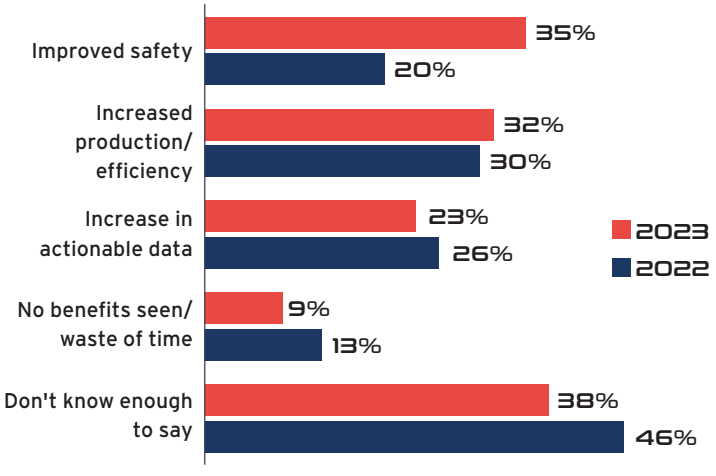
In 2023, 13% of respondents reported that the reality of IIoT plans do not meet expectations, up from 5% in 2022. Unmet expectations may have to do with the term "IIoT" itself. What does a manufacturing company think it's getting when it install an IIoT system?

"It's like talking about 'digital twin.' Digital twin is not a single-point solution. Digital twin is a composition of capabilities, rather than a singular solution. 'IIoT system,' to me, is analogous to that," says Ryan Martin, research director at ABI Research.

IIoT in manufacturing began with remote monitoring of assets and descriptive analytics and is evolving into remote control of assets and predictive and prescriptive analytics. If companies set their IIoT expectations on the coolest demo they saw at a trade show yet end up adopting a bare-bones IIoT tool without a lot of bells and whistles, dissatisfied reactions would make sense.

Maturing is also an issue. Scaling IIoT beyond successful pilot cases brings a series of pitfalls to dodge. Failure to do so would also affect satisfaction with IIoT.

Which of the following do you see as benefits of wearable technologies (AR/MR/VR headsets, smart glasses, etc.)?



"Many of the early pilots and proofs of concept were managed from innovation or R&D teams, where relatively small IoT deployments were conducted by people who were invested in exploring the technology: They liked and were interested in IoT and what it let them do, and they would forgive a lot," says Forrester's Miller.

"Most early adopters of industrial IoT are now in the scaling phase, moving it out of their innovation and R&D teams and expecting the mainstream workforce to engage and use these technologies," he continues. "Quite reasonably, these mainstream workers don't care about IoT… or any of these other emerging technologies: They care about doing their job and will be quick to complain if a poorly or incompletely implemented technology gets in the way of that."

Mark Cotteleer, managing director, supply chain and network operations at Deloitte, understands decreased satisfaction with IIoT in the context of increased adoption. IIoT needs to align across entire organizations to meet its potential. The technology needs time to mature after scaling. Predictive and autonomous use cases may take years to prove out.

"Lots of work has been done on the 'productivity paradox,' in which firms that adopt new information and advanced technologies initially see a dip in performance as the organization works to digest both technology and process. Generally, when organizations stick with it, it will get better," says Cotteleer.

Still Opening the CapEx Purse Strings

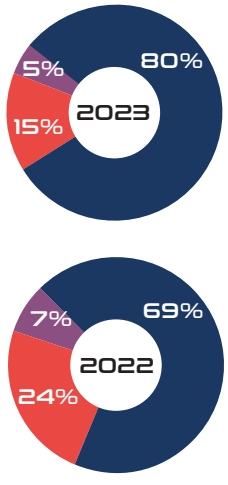
"We've seen the definite continuation of a recent trend… [a] focus on pragmatic and tactical solutions to specific short-term problems like supply chain disruption, energy use/cost, etc.," says Miller. "If there's a clear technical solution to one of these current pain points, there's definitely a willingness to unlock budget to get it implemented."

Martin adds, "When the spend is justified—meaning that this is going to drive immediate results, we'll be able to measure its benefit, success or failure, with a defined and visible time horizon—those are the projects that are getting funded."

Bridging the IT/OT Divide

The number of respondents reporting difficulties moving from pilot projects to proven use cases increased from 7% in 2022 to 12% in 2023. "IT and OT being on the same page" saw a similar but slightly larger jump, from 5% last year to 12% this year.

Chief technology officers, especially if they occupy IT-centric positions, may no longer make primary decisions on which technologies need



adoption on the factory floor. Operations managers, plant technologists and production technology specialists may become driving forces in what technologies their operators need on the line.

The divide between IT and OT comes up often in cybersecurity discussions. IT-driven security revolves much more around software than hardware. Problems with programmable logic controllers (PLCs), industrial control systems (ICS) and supervisory control and data acquisition (SCADA) devices aren't always solvable with a patch, and temporarily shutting down plants to upgrade software probably isn't going to fly for most manufacturers.

Therefore, some cybersecurity experts suggest that manufacturers need separate IT and OT cybersecurity teams. OT professionals find themselves getting new seats at the table, and according to the results of the 2023 Technology Survey, this goes well beyond cybersecurity.

We asked participants whether manufacturing professionals who deal with OT participate in strategic planning like specifying purchasing and planning out OT expansions. In 2022, 69% of respondents answered "yes." In 2023, that percentage increased to 80%.

When we asked whether manufacturing professionals that deal with OT participate in personnel structuring like new hires and reorgs, where 62% answered "yes" in 2022, this increased to 72% in 2023. It seems like bridging the divide between IT and OT has become an even more important consideration for manufacturers, perhaps approaching absolute necessity in some cases.

It's reasonable to connect these two leadership challenges. If IT and OT can't get on the same page, scaling up from successful pilot programs certainly would pose a real problem.

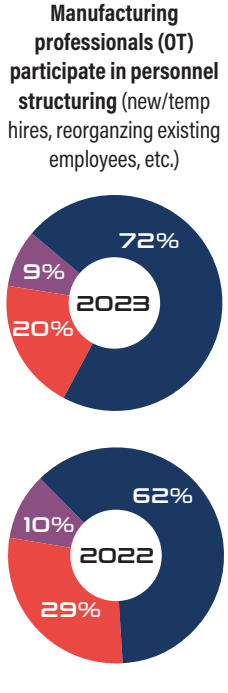
Transforming without New Technology

When asked about their leading technology priorities for the upcoming year, "adding new technologies" went down by 7.6 percentage points and "leading digital transformation" went up by 6.1 points. This may indicate reaping the results of prior technology implementations, scaling those processes and seeing benefits without adding anything else to the equation, for now.

"From the trends we've seen this year, this 'contradiction' could be a strategic shift away from shiny object technology investments to organizational focus on people, process or programs to drive transformation," Brian Zakrajsek, senior manager for smart manufacturing at Deloitte, says.

"[Digital transformation] means fundamentally changing the way that you do business. So, what I'm seeing now, especially given the current macroeconomic environment, there's more adversity to operational risk," Martin concludes. "What that means is perhaps doing things differently, but really prioritizing the end result. Technology is maybe an enabler of that, but it's not the focus.'" ◀

Technology Editor Dennis Scimeca can be reached at *dscimeca@endeavorb2b.com.*



Making Swords and Smokers with GE APPLIANCES

Betting on creative freedom and microfactories to drive innovation in small appliances manufacturing.

By Dennis Scimeca

Sometimes the best way to promote innovation at your company is to shelter innovators *from* the company.

Anyone can walk into a GE Appliances FirstBuild facility and play with everything from CNC machines and lathes to soldering stations, 3D printers and lasers, by making a reservation and paying for their materials.

Sometimes innovators come up with small appliances like the Opal nugget ice maker, developed in 2015, or the Mella indoor mushroom fruiting chamber that FirstBuild launched in 2021. FirstBuild also developed the concept for a multimedia range hood called the Kitchen Hub, manufactured by GE Appliances.

Sometimes people use a forge to create swords (true story).

GE Appliances CEO Kevin Nolan says innovation is the key. His innovation-first mindset means that while GE Appliances founded FirstBuild, the company does not own the ideas birthed there. The people who develop innovative technology at FirstBuild could theoretically take their technology elsewhere and design products for GE Appliance's competitors.

From a corporate point of view, potentially giving away profitable technology might sound more absurd than the prospect of people making swords right next to people designing small household appliances.

But Nolan doesn't think innovation is about locking down intellectual property. It's about speed of iteration and time to market. After 34 years in the small appliance industry and decades spent trying to innovate the old-fashioned way, Nolan decided to change the game.

Rethinking Corporate Innovation

General Electric, the former parent company of GE Appliances, has longstanding ties to the state of Connecticut. The company moved its headquarters from New York City to Fairfield in 1974 and decades earlier ran a plant in Bridgeport, Connecticut, that produced small appliances like clothing irons, toasters, coffee makers and mixers.

Nolan also has long-standing ties to Connecticut. He graduated with an engineering degree from the University of Connecticut in 1989 and soon after took a job at GE, setting up new lighting, industrial and appliance products and assembly lines, outsourcing with OEMs and bringing the products in.

GE Appliances' FirstBuild innovation hub on the University of Louisville's campus is about 9 miles from the manufacturer's massive headquarters and manufacturing operations in Louisville, Kentucky.

> What most people are doing is illogical, spending millions of dollars for something that never sees the light of day and never gets into the market. That's insanity."
>
> **KEVIN NOLAN,**
> *CEO, GE Appliances*

In 2006, Nolan ascended to vice president of technology at GE Appliances. Innovation moved quickly in the fast-paced appliance business but also no differently than for GE's jet engine, train or light bulb divisions.

"We had your typical what I call 'funnel process' for innovation where you take a bunch of ideas and you keep down-selecting them. You work them, and then when they're ready, we bring them out to market. It's a very traditional way to drive innovation," Nolan says.

In 2008, GE announced plans to sell its appliances division, hoping to earn up to $8 billion on the sale. The financial crisis that year put an end to the plans, but from that point forward GE Appliances felt more like a standalone company, says Nolan.

Around this time, GE Appliances looked into reshoring, owing to the time delays and expense of offshore manufacturing. This inspired the company to think about modernizing its plants and rethinking its innovation practices.

"With outsourcing manufacturing, you do start losing your ability to innovate because manufacturing and innovation, they need to be tied together. They need to run in synchrony with each other," says Nolan.

Traditionally, he says, companies consider innovation budgets as a percentage of revenue. In tough times, innovation budgets often disappear first. Just when they need to innovate, they cut innovation off at the knees. Nolan knew GE Appliances had to break that paradigm to achieve success.

In 2013, GE launched a program called FastWorks, based on Eric Ries's "lean startup" methodology. GE engineers prototyped products, shared them with customers to gather feedback and then iterated the prototype based on that feedback.

FirstBuild drew on some of those concepts but cut closer to the heart of the problem. If innovation and manufacturing must run in sync, why not link open co-creation with on-site microfactories to bring the new ideas into reality? So, in mid-2014, GE Appliances founded FirstBuild in Louisville.

FirstBuild had barely gotten off the ground when a major change happened: In 2016, GE sold GE Appliances to Chinese manufacturer and current owner Haier. By that time, GE Appliances produced only major appliances, having backed out of the small appliance space as early as 1984.

In 2020, GE Appliances (Haier kept the division brand name) officially made its return to small appliance manufacturing by launching a broad line of products including coffee makers, toaster ovens and food processors.

But the company had technically returned to the small appliance space years earlier, via the FirstBuild project. FirstBuild's microfactory originally produced the Opal nugget ice maker, but when it couldn't keep up with orders, GE Appliances took over manufacturing and added it to the company's product catalog.

Crowdsourcing and Crowdfunding Small Appliance Technology

FirstBuild in Louisville encourages artists and makers, anyone with interest, to come in and use the center's equipment. Pitches for new products are posted on the FirstBuild website, YouTube and other social media channels for the community to discuss.

Crowdfunding provides the seed money for the projects that the community agrees to manufacture, as it did with the Opal before GE Appliances took over that project. Customer interest, not corporate market surveys, drives FirstBuild's agenda.

"We don't look at the financial payback on anything we work on [at FirstBuild]. We just look at the passion behind the project," Nolan says.

Take, for example, the Arden indoor smoker. It turns out a lot of people love smoking their food but either don't have the space for an outdoor smoker or aren't allowed to have one. What about smoking food indoors (without filling an apartment with hickory smoke, hopefully)? Consumers told FirstBuild it was a great idea and then backed the project on Indiegogo.

Nolan acknowledges that the crowdfunding model confuses a lot of people. After all, GE Appliances certainly has capital to throw at the project and could wind up manufacturing the Arden one day if demand takes off like it did with the Opal.

"You can do all the market surveys you want, but they really don't mean anything. It's different when you give me your credit card. The only thing we believe at FirstBuild is if you really like it, you're willing to pay for it. And that's why we got into crowdfunding, as a good way to really get good customer validation," Nolan says.

Defending Innovation from the Suits

Nolan says he provides the program "air cover." From whom?

"From us."

It's part of the reason the original FirstBuild made its home at the University of Louisville, instead of the massive nearby Appliance Park campus, and why the second FirstBuild facility opens its doors in mid-2023 within the larger Co-Create Stamford facility.

FirstBuild's facilities have meeting spaces, design areas, 3D printers, a machine shop and manufacturing space for small runs of finished products.

When executives see FirstBuild, Nolan says, they worry about someone using GE Appliance's maker space to develop technology the company has no inherent claim to. Why, say these executives, should their company establish a development space that creates technology its competitors may get their hands on?

That's not what concerns Nolan. He worries about getting to market fast.

"If you look at the IP process, how long does it take, from the time you have an idea to have a patent? Three years, maybe? So how long does a product really stay relevant in the market? The IP process has not kept up with the speed of market change, especially in areas like appliances," says Nolan.

Speed of knowledge acquisition is the "real IP" developed at FirstBuild. As an open community, FirstBuild can enhance its projects and turn around new devices in its microfactory much faster than in any corporate environment. Nolan hopes to bring 12 products to market a year, one of which becomes a success and outgrows FirstBuild, like the Opal ice maker. The plan requires fast innovation and iteration, and that requires freedom from corporate hoops and approvals.

Funding the Experiment

All of this freedom carries financial ramifications. Even though it's a non-profit, FirstBuild must run like a business and break even. Makers pay a slight markup on raw materials like wood and metal to generate funds for equipment maintenance, so FirstBuild has a financial motivation to attract as many people to the space as possible.

Nolan doesn't expect a challenge in attracting makers to FirstBuild Stamford. With two massive Ford plants, GE Appliances, a Siemens plant and dozens of automotive suppliers, Louisville has a large enough manufacturing footprint to make equipment access relatively easy for a maker that wants to build something, but FirstBuild still attracts plenty of talent. It isn't just about access to equipment. It's about having fun with other makers.

Stamford, on the other hand, doesn't offer nearly the same manufacturing footprint. Nolan thinks the draw of free access to advanced equipment should bring in a very enthusiastic maker community. They might come up with the next great appliance. They might just make swords [**Editor's note:** *Nolan was clear that, ren faire enthusiasts at FirstBuild aside, GE Appliances does not plan on going into the sword-making business].* Whatever the result, Nolan stands convinced that FirstBuild demonstrates the correct direction in which innovation has to move.

"I think if corporate leaders really looked at their innovation track record, and analyzed it and were humble, they'd realize it's not working that well and they need to do something different," Nolan says. "What most people are doing is illogical, spending millions of dollars for something that never sees the light of day and never gets into the market. That's insanity. What FirstBuild is doing is very logical." ◀

Technology Editor Dennis Scimeca can be reached at *dscimeca@endeavorb2b.com.*

ORIGINAL FIRSTBUILD FACILITY:

Louisville, Kentucky

Located at the University of Louisville's Belknap campus. Founded mid-2014. Minted success with the Opal nugget ice maker design.

NEW FIRSTBUILD FACILITY:

Stamford, Connecticut

A smaller facility located within the larger Co-Create Stamford facility, built in partnership with the University of Connecticut and Connecticut State Colleges & Universities.

Opening its doors in mid-2023. Will leverage Co-Create's microfactory that manufacturers the Monogram Smart Flush Hearth oven.

Growing on a GREENFIELD

Three manufacturers share innovation ideas and lessons learned as they expand their U.S. presence.

By Jill Jusko

GAF Energy will build solar shingles for residential roofing at its Texas factory, scheduled to begin operations later this year.
Photo courtesy of GAF Energy

For manufacturers looking to expand, is there anything better than a greenfield manufacturing site? No pesky existing building envelope to cramp your design dreams, no monuments of production equipment forcing a less than perfect factory layout. Instead, a blank canvas upon which to create, a clean sheet of paper, a fresh opportunity to get things just right.

Of course, that's never really the case.

Constraints exist even with a greenfield site build—money supply is not endless; federal, state and local regulators carve out a variety of limitations; and manufacturers' own production processes add restrictions. Moreover, nothing is ever perfect.

Still, building a new manufacturing plant gives companies and their people a chance to dream big and get that much closer to their ideal site. With that in mind, *IndustryWeek* set out to discover what's on the wish lists of manufacturers raising new plants across the United States and how their journeys are going. What follows are the stories of three such manufacturers.

LEAN, GREEN SOLAR IN TEXAS

Company: GAF Energy
Location: Georgetown, Texas
Product: Solar power generating roof shingles
Size: 450,000 square feet

GAF Energy is at an exciting stage in its development. The San Jose, California-based solar roofing company launched in 2019, and last year it introduced Timberline Solar, a solar roofing system that integrates solar technology into traditional residential roofing processes. It features the first solar shingle that can be nailed onto a roof, according to the company. As part of well-established Standard Industries Inc., GAF Energy may be young, but it has lots of roofing expertise close at hand.

To date, GAF Energy has been producing its Timberline Solar product in San Jose where it has a combined headquarters, research and development and a pilot manufacturing site. "Pilot" may be a bit of a misnomer in that GAF Energy is manufacturing product for sale at the 112,000-square-foot site, but it is a pilot in that the company has been using the facility to develop and refine its manufacturing processes for what is a brand-new product.

"We were kind of simultaneously developing the product in the R&D labs, doing the material science on the materials … and while we were doing that, the manufacturing team was working on process development," explains Ralph Robinett, GAF Energy senior vice president. "We were also designing the automation, leveraging some standard equipment as much as we could and then putting our unique processes on top of it."

What the company can't do in San Jose is scale production both to accommodate growing demand and reap the efficiencies and productivity that accompany economies of scale.

Soon, those challenges won't be an issue. In August 2022, the manufacturer broke ground on a 450,000-square-foot manufacturing plant in Georgetown, Texas, located about 30 miles north of Austin. The new facility, which is expected to begin operations toward the end of this year, will increase capacity by 500%, according to GAF Energy.

"When that building is done and we're ramped, we're confident that it will be the largest solar roofing manufacturing facility in the world," says Robinett.

The new site's design emphasizes flow. The pilot factory in San Jose (not a greenfield build) is essentially a square and, therefore, not ideal to accommodate a Timberline Solar production footprint that includes a "fairly long" production line, Robinett explains.

In Georgetown, "We're able to take a building that is much longer and generate proper U cells. And everything in San Jose was a 'one of' and (in Georgetown) we've been able to add redundancy. So instead of one line with a single point of failure, we now have multiple lines. It's going to drive so much better OEE, so much better efficiency, by being able to move product between the lines, but we've been able to orient them in a very logical fashion," he explains.

Lean thinking overlays GAF Energy's manufacturing plans. It's peppered in Robinett's language, whether he is talking about the rapid cycles of learning in lean product development, or the single-piece-flow, minimizing travel or visual management aspects of lean manufacturing.

"First and foremost, of course, is the respect for the people, respect for the process," he adds.

And speaking of visual management, Georgetown's shop-floor design provides ample evidence of its use. Everyone who supports manufacturing at the new GAF Energy factory—production supervisor, maintenance technician, process engineer—will work from the equivalent of a fishbowl on the shop floor. The glass-walled room provides line of sight to the people and processes, and its location should speed response when difficulties arise on the production floor.

"We have a very open concept," Robinett says.

The Georgetown production-floor layout is the result of many voices and more than a dozen drafts. Employing a brainstorming exercise called 7 Ways, GAF Energy captured ideas from employees rep-

> **"When that building is done and we're ramped, we're confident that it will be the largest solar roofing manufacturing facility in the world."**
>
> **RALPH ROBINETT,** *GAF Energy*

In early March windows were going up at GAF Energy's new Texas factory, with interior work slated to begin soon. *Photo courtesy of GAF Energy*

GAF Energy Senior Vice President Ralph Robinett.

resenting maintenance, process engineering, shop-floor operations and other leaders. They were tasked with sketching out their ideas for the ideal layout, given the cost and capacity goals for the site. The San Jose plant started assembling Timberline Solar only last year, so even as employees there continue to develop best practices in production, they are sharing those learnings in the new site design.

Ultimately, the focus is the user experience, Robinett says.

"It wasn't just, 'Okay, we have a team that builds factories so we know better,'" he says. "It's 'We learn everything (we) can from the people who actually have to operate, who have been learning and struggling with … either the mistakes we made or things we didn't know or the changes that we made over the years.'"

The overall employee experience also includes the environment outside the plant. The city of Georgetown appealed to the solar manufacturer in part because the city-owned electrical utility supports renewable energies. For employees, the site is expansive. The company preserved groves of oaks trees and installed walking trails around a small lake on the approximately 50 acres of land on which the factory sits.

The location provides a short commute for many potential workers and for those coming from Austin, a reverse commute. The new site, Robinett says, "has easy access off the highway but also a very private feel to the campus. That's something that was really attractive."

"It's so important to attract and retain talent, and it's not just about the job, it's the environment that you work in," he says.

Agilent Technologies expects customer shipments from its new facility in Frederick, Colorado, to begin in 2026.

Rendering courtesy of Agilent Technologies.

CLEAN ENERGY TECHNOLOGY IN WISCONSIN

Company: Excellerate (a division of Faith Technologies Inc.)
Location: Little Chute, Wisconsin
Product: Off-site-built electrical components
Size: 385,000 square feet

Now for a glimpse into two greenfield sites going up in Wisconsin and Colorado. Even as GAF Energy expands into Texas, Excellerate is adding to its footprint with a 385,000-square-foot manufacturing plant on the rise in Little Chute, Wisconsin. The company, a division of Faith Technologies Inc., broke ground on the new facility in November 2022.

Excellerate occupies an interesting space in manufacturing. It produces and tests manufactured electrical components and assemblies that might otherwise largely be put together in the field. As Pat McGettigan, executive vice president, describes it, Excellerate is "industrializing construction work by taking labor offsite and building components in our controlled manufacturing facilities." He cites increased productivity as a primary benefit.

Excellerate designed the new site to accommodate demand growth of its current products and to do so more efficiently. The company, however, also is anticipating significant demand growth for renewable energy products, including microgrids, and is growing its capacity to build those products for EnTech Solutions, a sister division focused on energy.

It should come as no surprise, therefore, that smart manufacturing—or perhaps smart energy—is a significant focus of Excellerate's new plant. McGettigan outlines three examples of how it's being incorporated:

Smart breakers: "We monitor the power, we can track the power and we can set it up to be optimized to make sure we're being as efficient as possible with energy usage," the executive vice president explains.

Net zero: Excellerate is equipping the Little Chute facility to achieve net-zero status, although not immediately. "Our goal is to offset and ultimately to completely be able to come off the grid and run that whole facility with renewable en-

ergy. Part of that may be wind, part of that may be solar or that may be from an alternative renewable energy source," McGettigan says. "The electrical equipment we're going to have inside that facility has to be able to adapt to that, so we did have to do a lot of thinking … on the front end to make sure we could do that."

Smart data: Where to innovate and where to automate requires having a good grasp of metrics. Getting a better handle of that data at the new site is part of the plan, McGettigan says. "How are we producing the products? How efficient is our manufacturing? We want to be able to capture as much data as possible with everything that we're doing in that facility to drive innovation, also to drive productivity."

Excellerate is taking a page from its own "industrializing construction" philosophy to accelerate the timeline at its Little Chute site. For example, two electrical rooms for the new plant will be built offsite and brought in, and to the degree possible, the electrical work will be completed offsite as subassemblies and then delivered to the site.

Similar to GAF Energy's new manufacturing site, Excellerate's new plant is scheduled for completion in the fall of 2023.

THERAPEUTICS IN COLORADO

Company: Agilent Technologies Inc.
Location: Frederick, Colorado
Product: Therapeutic oligonucleotides (oligos)
Size: 198,000 square feet

Our third example comes from Frederick, Colorado, where in February, Agilent Technologies Inc. broke ground on a $725 million, 198,000-square-foot expansion at the life sciences company's campus in Frederick, Colorado. The expansion will double Agilent's capacity to produce therapeutic nucleic acids, also called therapeutic oligonucleotides or oligos, used for drugs targeting cancer, cardiovascular disease and other ailments. Agilent says customer shipments from the expansion should begin in 2026.

Frederick has been a hotbed of activity for Agilent in recent years. In 2016 the company announced a 135,000-square-foot production facility in Frederick that opened in 2019. Just a year later the manufacturer announced a 25,000-square-foot expansion to house an additional production line. That additional production line is expected to go live this year.

Agilent's latest expansion will add another two production lines as the projected market for oligos continues to grow. The new build will share some utilities with an existing plant and a warehouse will connect the two, but in all other ways it is a greenfield site.

"We started with a blank sheet of paper and voice of the customer, [also] taking what we had built in 2016 on that same site and trying to improve and make it the best we possibly could," says Mary Beth Gibson, vice president of facilities and engineering for Agilent's Nucleic Acid Solutions Division of the Diagnostics and Genomics Group.

Of course, Agilent Technologies operates in a highly regulated industry, so that blank sheet of paper likely isn't quite so blank. Gibson says restrictions aren't a bad thing. Building a new facility involves a lot of people and many different entities, "so the constraints almost help us corral the ideas."

The vice president says it's also important that Agilent be "forward looking," to make its best efforts to predict how those regulations will evolve over time so that what is built remains compliant through the lifecycle of products being manufactured.

"It does give me a little bit of juice to be able to build something I think will stand the test of time," she says.

Like GAF Energy and Excellerate, flexibility and flow are important considerations in Agilent's new build, says Gibson. And lessons learned from the existing facility and production lines will be incorporated into this latest venture, as will feedback from employees.

Gibson offered a bit of advice for anyone contemplating a new build or substantial addition, and it boils down to:

- Think before you leap. Take the time, she says, to consider what you want, with the end in mind.
- Perform voice of the customer surveys. Find out what your clients want and what your operators want.
- Don't rush into detailed designs without performing feasibility and conceptual work up front.
- Don't let time constraints squeeze these important considerations out of the process.

She suggests it's okay to ask your peers to review your plans as well. "You can always learn from others within the industry, and [we] leaned very heavily on our architectural engineering firm to give us ideas as well. While you think you may know what you want, they can always come up with some better way to do it." ◀

Executive Editor Jill Jusko can be reached at *jjusko@endeavorb2b.com.*

> **We started with a blank sheet of paper and voice of the customer, [also] taking what we had built in 2016 on that same site and trying to improve and make it the best we possibly could."**
>
> **MARY BETH GIBSON,**
> *Agilent Technologies*

TALES FROM THE TRANSCRIPT: ENDURING INFLATION, SMOOTHER SUPPLY CHAINS

By Geert De Lombaerde

Market and economy watchers surprised by the recent data showing that inflation is persisting really shouldn't have been: Many leaders of *IndustryWeek* U.S. 500 companies told us as much in the first few weeks of 2023—and they often added that they are raising prices further, perhaps helping extend those inflationary pressures into the second half of the year.

From Carrier Global Corp. Chairman and CEO David Gitlin: "We've realized that inflation is not over. And we've had to announce further price increases in January that perhaps even a couple of months ago we might not have anticipated."

Added Andre Schulten, CFO of Procter & Gamble Co., who neatly summarized what many of his peers also discussed: "Our suppliers are still in the process of passing through their own inflation. So while their input costs [are] certainly easing, they also haven't fully caught up to the cost structure hits that they have experienced over the past few quarters."

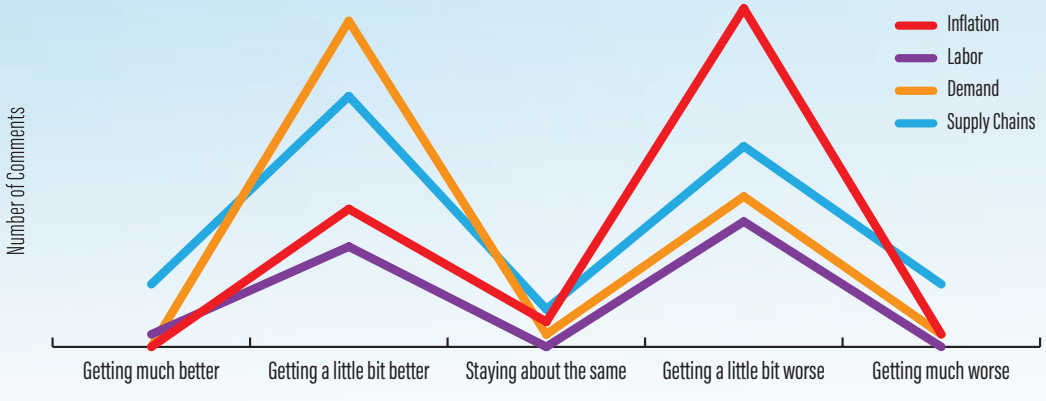
And so, three years after COVID-19 began disrupting businesses in earnest, higher prices continue to flow into and through this economy. That's the most definitive takeaway from our latest quarterly dive into the conference call transcripts of the five largest companies in 10 sectors of the *IndustryWeek* U.S. 500 list of publicly traded companies.

As we did in November, we scoured executives' comments for forward-looking statements about price increases, the labor market, the state of supply chains and overall demand and rated them on a five-notch spectrum from fully positive to fully negative.

Here's how the fourth-quarter commentary—which was given to analysts and investors from late December until the last week of February—translated into broad sentiment barometers ranked from most negative to most upbeat. We've also added representative quotes for context.

Inflation: -0.22 (versus -0.42 in Q3)

As the overall score shows, the inflation picture is getting better at the margins but is still far from good. A large number of public-company leaders said last fall that they didn't see inflation ebbing quickly, particularly because they still face several input



METHODOLOGY

Analyzing 149 executive statements in four economic categories, we scored each comment as either:

- Fully positive: **1**
- Slightly positive: **0.5**
- Neutral: **0**
- Slightly negative: **-0.5**
- Fully negative: **-1**

We then averaged the scores to assign a general corporate sentiment to each portion of the economy.

cost pressures. If anything, that theme crystallized during Q4 discussions, as evidenced by the previous comment from Carrier's Gitlin as well as Kathy Warden of Northrop Grumman Corp.

"The industry broadly is pushing back on accepting long-term fixed-price contracts right now," Warden, Northrop's chair, president and CEO, told analysts. "They're asking for reopeners for inflation. We expect that to continue. And as our suppliers ask us for that, we, of course, are passing that on."

A number of executives also noted that price increases will be key to maintaining or even growing margins in a macro environment marked by weakening demand in several sectors.

"Our expectation is we're going to maintain the majority of our price," said CFO Al Mistysyn of Sherwin-Williams Co. "We think we've gotten past the margin contraction portion of the cycle."

Labor: 0.00 (versus -0.14)

Wage hikes have been contributing to inflation, and several CEOs and CFOs, including those at automotive suppliers Dana Inc. and Lear Corp., told analysts early this year they will again play a role in 2023. Still, our composite score being a zero speaks to the idea that the labor market is finding some sort of equilibrium.

Two things stuck out to us from Q4 commentary on labor: There was notably less of that commentary (19 mentions from our 50 companies versus 29 in the fall), which is another way of saying worker availability is gradually getting better, and executive teams across manufacturing are leaning ever more on automation.

"We're accelerating our investments in our manufacturing capability, buying new machine tools, getting more automation and more robotics because we recognize we're going to be in this labor constraint for some time to come," Jeffrey Leonard, president and CEO of Alamo Group Inc., said on his team's call. "In fact, none of us can really yet see an answer to that, to be candid."

Demand: 0.04 (versus 0.29)

Also near equilibrium were comments about the big picture. Understandably, manufacturers more directly exposed to the housing market and consumer spending don't have the same bounce in their steps as their peers at defense contractors or industrial equipment makers. The idea of a rolling recession affecting only some parts of the economy at one time bubbles up from our data here.

There is more overall caution, however: Last quarter, we logged 37 positive comments about the demand outlook, but that number slid to 25 this go around. Negative comments rose to 21 from 15.

Perhaps most illustrative of the state of much of the U.S. economy in March was P&G Chairman, President and CEO Jon Moeller's take on how many customers are easing off the gas pedal.

"We've been through a period where inventories have been a little bit higher than normal in some of our retail channels," Moeller said. "Supply assurance is increasing, demand volatility is decreasing. So those inventories are understandably being brought down."

Supply Chains: 0.15 (versus -0.17)

Ending on a more positive note, manufacturers' commentary on the state of materials coming to them was markedly more upbeat than in the fall. The number of executives sharing negative sentiments fell from 22 to 13, while those such as Moeller noting improvements climbed to 26 from 15.

There are still pockets of trouble, some executives said, but they're becoming both easier to identify early on and to help address.

The predictability of material leaving factories "is more reliable and aligned with historical performance," Matt Puckett, CFO at VF Corp., said. "This is an important data point that will better position us to more fully service the business in fall of 2023 and beyond."

Still, certitude is in short supply elsewhere, and it's worth bringing the topic back to the headline issue of price pressures, courtesy of Summit Materials Inc. CFO Brian Harris.

"Overall, the supply chain issues have not gone away," Harris told analysts. "We still see those as providing a source of inflation and uncertainty as we go through the balance of the year."

With every one of our four indicators closer to equilibrium in early 2023 than they were late last fall, uncertainty looks to be the watchword for another year. ◀

Senior Editor-at-Large Geert De Lombaerde can be reached at *gdelombaerde@endeavorb2b.com*.

DRIVING INNOVATION THROUGH AUTISM AWARENESS IN RECRUITING

Neuro-inclusive hiring can expand talent pools and bring skilled individuals into the workforce.

By Anna Smith

Hiring practices that accommodate people on the autism spectrum aren't about meeting diversity goals or calling companies inclusive. They're making sure you don't miss the opportunity to hire someone like Peter Mann.

A serial entrepreneur, former Dell senior manager and owner of a company that's pushing design and manufacturing innovations in electric motors, Mann says human resources departments often eliminate candidates like him because they don't know how to deal with people who can't socialize easily or need accommodations to get through the interview process.

"[Autism has] been an asset, since all I think about is work," Mann says of how being neurodivergent has impacted his career. "So, I just put in more hours than [the] typical person. I just can't shut my brain off."

Despite autistic people being able to leverage their abilities at their place of employment, it can be extremely difficult for them to break into the workforce. According to Integrate Autism Employment Advisors, 85% of autistic college graduates are under-employed or unemployed, a rate higher than other disabilities.

Advocating for Employment

When it comes to recruiting neurodivergent talent, misconceptions and misunderstandings play a large part in the disability unemployment gap. Mann explains his experience looking into the topic.

"What's interesting is the vast majority of autistic folks will not even disclose they're autistic because generally, you're met with negative consequences. It's like your interview's canceled, or you get one question in and they're like, 'You're not the right person for us,'" Mann says.

To reach out to autistic people who are struggling to get through the interview process or having trouble moving up in a company, Mann posts on LinkedIn, a platform he uses to advocate for autism awareness.

1948964 © Agsandrew | Dreamstime.com
220229402 © Designer491 | Dreamstime.com

MANN'S DIAGNOSIS

Peter Mann's late diagnosis came about because his wife was watching the "CBS Mornings" show.

"She came and got me and she's like, 'You need to watch this,'" he says. It was a woman describing her own autistic traits.

"As she spoke about this, it's like, that is me to a 'T.' It explains so much. And I was like, 'Holy cow, that is crazy'. And then I went online and started researching it."

He went on to take several online autistic assessments, scoring high on all of them, and was later officially diagnosed.

"I've talked with dozens of people on Zoom or video calls and chatted with probably hundreds of others on social media," Mann says. "And so, it's really been rewarding for me. But at the same time, it's very heartbreaking to hear the stories of the reality of what the experience is because there really is no equity or inclusion."

What he learned from speaking to these individuals is that autistic people are filtered out almost immediately.

"You're judged from these nonverbal cues before you even get started," he says. "And so, the traditional interview process is really set up for those that are extroverted and really good socializers. It's not set up for someone that's better equipped to, perhaps, show you how they can do something, rather than, you know, telling you through words or through a social interaction."

He says that for many individuals, the interview portion of recruiting workplace talent plays to autistic people's weaknesses.

Struggles that appear during the interview process, such as trouble maintaining eye contact and restlessness, are traditionally undesirable for the employer, often viewing these actions as unprofessional.

"I don't think autistic people ever intend to be rude. It's largely a misunderstanding of communication," Mann says. "Autistic people are not even in a place where they can disclose [that] they're autistic. And then if you're comfortable enough to disclose that you're autistic, then in certain cases, you really want some accommodations."

Mann describes a scenario where he was coaching someone through the hiring process where the potential employee wanted to ask for accommodations.

"He asked the HR guys, 'Can I have the interview questions ahead of time?' And the guy's like, 'No, that wouldn't be fair to the other applicants.' Fairness is equality, but equity is about giving the person what they need to be successful in that situation. So, there they were answering an equity issue with an equality answer," Mann says.

Mann believes that this example and others like it are because of training issues. "I'm sure the HR person's a good person, but … maybe nobody's ever asked for an accommodation before."

He adds, "You're obviously not being inclusive or providing equity for people, you'll never get to belonging, which is the ultimate goal, where you can be free to be yourself."

All of these issues show that the traditional recruitment process is not geared toward finding success for every individual, including neurodivergent people. "Just because things have always been done one way in the past doesn't mean that that's the way it should be done going forward.

"When you're hiring for a job, it should be like, 'Is this the best person for this job?' And you know, and if somebody has [a] disability—say like autism [which] is both a minority at maybe 1% to 2% of the population, and it's a disability—are you making accommodations for the person to be their best self? Because that's really what equity is," Mann says.

Understanding Autism

"Autism is really just a difference in the way of thinking, perceiving and socializing. That's it … Co-occurring conditions, you may or may not have, which could be cognition, speech, ADHD, a number of other things," Mann says. "They say, if you've met one autistic person, you've met one autistic person. We're all different."

Mann describes autism as similar to biodiversity. "A left-handed person isn't a defective right-handed person, they're just a left-handed person. Our brains aren't defective; [they're] just wired differently."

He highlights that work styles and interests also come in a wide variety in the autistic community. "For some of us, we have this hyperfocus ability; there are some people that are super creative. Not everybody's an Einstein, but it's a spectrum."

Dan Harris, founder and CEO of the nonprofit Neurodiversity in Business (NiB), describes some ways in which autistic people and their characteristics can sometimes be perceived.

"We are trying to change society's understanding and highlight that neurodiversity is a competitive advantage," he says. "But we don't buy into the whole superpower myth. So, I think it's quite damaging for a large portion of our population that we only project the image of an amazing scientist or mathematician who can go in and do great data and analytics, etc. The reality is that we're all individuals, and we all have our strengths and weakness."

NiB launched in the United Kingdom's House of Parliament in March 2022. At that point, it had 100 founding members and has now grown to over 500 organizations. Featuring no subscription fees for members, NiB's membership includes Mann's business Oransi along with the likes of Amazon, Google, McDonald's and many other businesses from small to global.

When discussing misconceptions about hiring autistic individuals, first look at misconceptions about autistic people, Harris says. They are not all young, white, middle-class males, for example. Autism is spread across race, ethnicity, gender and sexuality.

"We're trying to move away from the very medical model of the '70s, '80s and '90s into the social model, where actually you're looking at the autistic brain as being unique and specific," he says. "But actually, within that spectrum, we need to recognize that autism itself is pretty broad."

Harris adds that the medical model has historically sought a way to prevent or cure autism. "We don't want a cure; we don't think we need a cure."

The key to adding neurodiversity to an organization, he adds, is to treat people as individuals and understand how they need to interact with colleagues and the larger group.

"Sometimes unspoken communication, body language, etc., sometimes can be difficult for autistic people to read. But it doesn't necessarily mean that autistic people are antisocial. … Just because autistic people take longer to kind of interpret or process information due to the differences in the way their brains operate, doesn't mean they don't understand," he adds.

What Can Businesses Do?

Ian Bazzoli is chief operating officer at Integrate Autism Employment Advisors, an organization that works with corporations to recruit, retain and attract autistic individuals. He says companies can make simple accommodations when hiring.

"I often watched hiring managers hire with a biased lens, often overlooking candidates that perhaps could do well in a job. But perhaps that candidate didn't make great eye contact or have a good handshake. And those are things that, you know, many autistic individuals struggle with," Bazzoli says.

As an employer-facing organization, Integrate focuses on how to hire and retain more inclusively. That process "starts with an assessment of their HR practices, everything from how their job descriptions are written and what responsibilities are on those job descriptions to how does has the interview process work on onboarding performance management," Bazzoli says.

"When a resume comes across a recruiter's desk or a hiring manager's desk, they're looking at it in a very short amount of time, 10 seconds or less," Bazzoli says. "If it doesn't have sort of a very clear linear sort of growth to it, or if there's a period of unemployment or the person maybe has job hopped from job to job, they may just pass on the person just because of that. ... One of the things that we remind

FOUNDING ORANSI

After seeing his asthmatic son struggle to breathe as an infant, Peter wanted to focus on indoor air quality. So, in 2009, he began Oransi, an indoor air purification manufacturing company with a clean energy mission. Oransi has recently purchased a manufacturing facility in Virginia and is working on reshoring its manufacturing process from China to the U.S.

companies is that many autistic individuals have had challenges at different stops in their careers."

Companies often pick employees through resume or interviewing factors that don't measure how well candidates can complete the job, Bazzoli says, presenting a problem for autistic people who may struggle in those soft-skill areas.

"Really focus on the critical components of a job. If you're looking for a candidate, does the candidate have those competencies or those aspects that can make them successful in the job? Because so often, hiring decisions are made around aspects that are outside of that."

A prevalent issue surrounding hiring neurodivergent people is that the company does not want to risk the unknown, he says.

Integrate's initial assessment lets them instruct employers on how to tweak processes that are uncomfortable for prospective autistic employees. They then offer training and education for HR, hiring managers and the company on basic autism awareness.

"It's important to understand other people's way of thinking, because it helps us become better communicators, it helps us become better colleagues, it helps us become better people," Bazzoli adds.

Specific management strategies produce the best outcomes for new employees and their employers.

"The final piece is post-placement support," Bazzoli says. "Once an individual is placed into a company, we're doing usually weekly, or biweekly calls with the hiring manager, as well as HR, to make sure things are going smoothly. If there are issues popping up, helping them work through those issues—Awareness isn't enough. It has to be followed up by organizations taking action, making a commitment to hiring neurodivergent individuals and creating a hiring process that's inclusive."

> **It's allowing people to wear headphones if they need that. It's having proper lighting. … In general, things that the typical person may find a little bit annoying, for us can be debilitating."**
>
> **PETER MANN,** *founder of Oransi*

Continuous Responsibility

Accommodations don't stop after the initial hiring process; they must flow over to the job itself, requiring flexibility, autism hiring advocates say.

Sensory sensitivity, for example, is something that affects many autistic people, and leaders should do what they can to accommodate this and other specific concerns.

"Any of the senses can make you hyper- or hypo-sensitive. For me, [it's] noise, and noise is a common one. So, part of accommodations is being in an environment that allows you to be your best self." Mann says. "For many autistic people, the disability that is autism is not so much that you're autistic, it's that you're in an environment that just spins you up or triggers you.

"For me, I go into shutdown, it's like you've plugged all your appliances in, and you blew the circuit breaker. That's what my brain does."

He adds that to accommodate people's challenges, "It's allowing people to wear headphones if they need that. It's having proper lighting. … In general, things that the typical person may find a little bit annoying, for us can be debilitating."

COVID-19 taught many businesses that organizations can run with fully remote or hybrid schedules–the sorts of accommodations that neurodivergent people have been requesting for decades.

Triggers vary by person, as do accommodations. Common examples of making a friendly environment include:

- Let people take breaks if needed
- Set clear expectations
- Create a clear schedule so as to not drive anxiety

"If you accommodate an autistic person in the workplace, it makes it better for everyone. They're not expensive things," Mann says. "It's really just a choice. And it's a choice that people are mostly not even aware of."

Benefits of a Neuro-inclusive Workforce

Because of their unique skills creating a competitive advantage, there are countless benefits to hiring neurodivergent talent.

There is no thinking outside the box, because there is no box, Mann explains. "A lot of the best innovators and inventors are autistic, because there's a different way of thinking. … You're getting different types of people and perspectives."

He adds that, "If you want to grow and evolve as a company, you really need to have people that reflect society."

Education, awareness and taking risks are the road to closing the disability unemployment gap. In the interest of autistic individuals and businesses alike, taking real and tangible steps toward inclusion will break down barriers for a more successful and diversified workplace.

"I think people inherently are good and want to do the right thing. You just, you don't know what you don't know," Mann concludes. "At the end of the day, we live in a very competitive world and innovation is, 'Can you find a better way to do things?' And part of finding a better way to do things is having people who are different and think differently." ◀

News Editor Anna Smith can be reached at *asmith@endeavorb2b.com.*

A Quality Look at QEE

Vita-Mix employs a novel quality metric to measure finished goods and product quality.

By Jill Jusko

You're keeping an eye on first pass yield, regularly reviewing your warranty costs and doing your best to drive down in-plant defects. Quality is a prime concern among most manufacturers, and the just-cited indicators are among those typically tracked by quality departments.

But what about quality employee effectiveness? Is that a measure on your radar?

Probably not, but maybe it should be. QEE is a quality measure created internally by Vita-Mix Corp., the Cleveland-area manufacturer best known for its high-performance blenders.

Vita-Mix's reputation for quality is well-established. Do a Google search on "best blenders," and Vitamix kitchen appliances reliably grab a top spot among the results. Just last year, Wirecutter, the product review site owned by the *New York Times*, wrote, "In our tests, from 2012 to now, Vitamix blenders have always performed the best overall." And *Food & Wine* magazine more recently stated, "Vitamix has become the go-to for chefs and in-the-know home cooks who want the best blender on the market."

Given Vita-mix's quality bona fides, a review of QEE seems in order.

Quality employee effectiveness measures finished goods and production quality. "We developed this metric to capture all of our 'pain points,' so to speak, so we can accurately record our quality and production challenges and work on them for improvement," quality manager Rajesh Saigal says.

It's not a new metric for the company, but it has evolved over time. The current version has been employed for about the last six-and-a-half years.

How QEE Works

Like overall equipment effectiveness, or OEE—a manufacturing metric that has been gaining popularity—QEE is calculated by multiplying three individual metrics: *finished goods audits*, *process audits* and *first pass yield.*

- **Finished goods audits (FGA)** are random audits conducted by quality team members at the end of the production line against a checklist of criteria, "basically mimicking the customer experience," Saigal says.
- **Process audits (PA)** are performed twice a day. Also conducted by the quality team, these audits are random, unannounced and they review the processes on the production floor. The teams check a host of different items, such as torque settings, calibration on critical equipment and electrical settings, among others.
- **First pass yield (FPY)** looks at the number of products repaired or reworked on the line. Three repaired or reworked items out of 100 scores a first pass yield of 97%, for example.

The final measure is calculated: QEE = FGA x PA x FPY.

As with any metric, missing the QEE goal is a cause for concern. Saigal uses the wealth of data captured by the metric to identify top issues impacting finished goods and production quality. With its long history of lean and continuous improvement, Vita-Mix possesses a strong process to implement corrective actions.

The manufacturer recently reviewed its QEE metric with the question: Is it still working for us? The answer is yes, according to Saigal. "Unless somebody comes up with something nice and revolutionary, we are capturing everything we need to with this metric," he says. ◀

Executive Editor Jill Jusko can be reached at *jjusko@endeavorb2b.com.*

A CEO Follows the Product, Turning up a Slew of Hidden Profit

By Steven L. Blue

Everyone learns about the marketing mix in business school. The proverbial four Ps. Product, price, place and promotion. Seems fundamental, but few CEOs examine their marketing mix with a critical eye toward how it should be changed. Especially those who have used the same marketing mix for decades.

I once took over a company that had terrific profitability. For years, it used the same marketing mix—and given the company's profitability, it was successful. No reason to look further. Profit was good, so the marketing mix must be fine, right? Not so fast. Good profit doesn't necessarily mean that at all.

So I dug in to find out whether changing the marketing mix would reveal hidden profits. My analysis was exhausting and comprehensive. It took the better part of a year to complete. I followed *every single product* from the time it left my factory until the time it reached the end-user. It started as an academic exercise just to understand how the money flowed. But the deeper I dug, the more the exercise revealed hidden profits. Huge hidden profits.

Image courtesy of © Les Cunliffe | Dreamstime.com

In my case, from the time a product left the factory until it reached the ultimate end-user, it changed hands as many as *six times*. And every time the product changed hands, it was resold at a higher price than it did when it left my factory. Imagine the profit all the intermediaries were making. Profit that I felt I should have since I was the original manufacturer.

You do the math. Take my profit and multiply it by six times. That is a huge hidden profit that was not being captured.

Price and Promotion

Up to this point, I had critically examined two of the four Ps: Product and Place. Now came the hard part. Price and Promotion. Just because intermediaries were capturing a large portion of my profits didn't mean I could wave a magic wand and capture those profits. My pricing to the end-user had to be carefully determined so it was attractive to them.

I knew the end-user would be concerned about switching costs. And since the end-user didn't really know about my company, promotion became an important, and expensive, undertaking. That was years in the making.

So how did it turn out? I began selling directly to the end-user, raised my prices and therefore profit by a whopping 60%. At the same time, the end-user paid 40% less than prices from the intermediaries. That is what I call a win-win.

Here Are 5 Things You Can Do to Reveal Your Hidden Profits:

- Just because your marketing mix is performing well doesn't mean it couldn't perform better. Do a deep dive on it every few years to see whether you can uncover hidden profits. Chances are you can.
- Follow your products everywhere they go in the world. Dig in and find out who touches it, where they touch it and how much they charge. This will take a lot of work but will be well worth it.
- Agents, particularly international agents, are notorious for price gouging. And they don't like you to know how much they are charging. Don't rely on them for pricing information. Get out there and talk to your customers personally.
- You can spend an infinite amount on promotion. Don't. You may need to exhibit at trade shows while you are introducing the company to end-users. Bear in mind that the last middleman before the end-user has credibility, and you don't, so you will have to establish that. That will take feet on the ground and face time with end-users.
- Finally, don't depend on your sales and marketing teams to do the mix analysis. They will probably tell you everything is fine the way it is. Bring in some outside help to do this. ◀

Steven L. Blue is president & CEO of Miller Ingenuity. He has published five books that teach senior leaders and CEOs how to increase profit, take market share and destroy competition and serves as CEO-in-Residence at Winona State University.

Over Half of US Manufacturing Employees Plan to Leave Their Jobs in 2023: Survey

By Ryan Secard

As manufacturers continue to hunt for talent, benefits are emerging as key to attracting employees.

A new survey of frontline factory workers by Austin, Texas-based business software company Epicor reveals that high turnover is likely to remain a major feature of the manufacturing sector through 2023, and that many workers tend to see free time and advanced facilities as top priorities—aside from wages.

Evgeniia Kuzmich/Dreamstime

In the online survey of more than 600 manufacturing employees, 56% said they plan to leave their current jobs sometime in 2023, sustaining the high turnover seen by manufacturing in the past few years.

In another indicator that manufacturing workers aren't shy about changing companies, only 8% of respondents said turnover has lessened at their workplace, while 45% and 47%, respectively, said turnover was higher than ever or about the same as last year.

The Critical Factor: Work-Life Balance

One of the top issues for surveyed employees, including those who did not indicate they planned on leaving their jobs, was available free time. Nearly a quarter (24%) of all respondents said they would seek more paid time off (PTO) in a new employer, and 23% said they would want more flexible hours.

Providing those work-life balance benefits pays off, according to Epicor, in terms of workforce morale. "Over and over again, respondents said they desire flexible work schedules," the report said. "It's what contributes to lifting their morale, it's what they say can create a more engaging work environment, and it's what they'll look for in a new employer if (or when) they leave their current job."

A slim majority of surveyed employees, 52%, reported that morale at their workplace was high. Twenty-five percent of those respondents indicated that a "flexible work schedule" was their top reason for high morale, and another 22% said their No. 1 morale-booster was "more paid time off."

Workers at the 7% of companies with the worst morale, meanwhile, mostly blamed leadership: 24% of those respondents said their companies' leaders have poor management skills, and a further 15% blamed their companies for failing to address issues in the workplace.

High-Tech, Sustainable Workplaces Are Desirable

Outside of being able to spend time away from work, surveyed employees also preferred that their workplaces be cutting edge, with 60% of respondents saying they would willingly take a pay cut to work in a factory with more advanced technology. Another 61% said they would take a pay cut to work in a more sustainable plant.

A similar portion of respondents, 59%, said their company is making sustainability a priority, but reported attitudes on technology adoption were more even.

Respondents were split nearly down the middle between:

- Describing their workplace as "very modern" vs. only "somewhat modern"
- Their company investing in technology "more than ever" vs. "about the same as we have before"
- Their company "eager to embrace" vs. "hesitant to embrace" new technology

Upskilling On-Site

On-the-job training remains crucial for manufacturers, and survey results reflect that. A full 80% of workers responding to the survey indicated that upskilling is "a priority" for workers like them at their workplace. On-site and on-the-job training remain the most popular and reliable option, but just under half of respondents (49%) said that their employer provides access to an online training platform or website. ◀

Talent and Workforce Editor Ryan Secard can be reached at *rsecard@endeavorb2b.com.*

Shifting Supply Chain Winds Favor Regionalism, Restructuring

By Ambrose Conroy

Editor's note: This is a shortened version of Conroy's February column. For more global challenges and opportunities, go to *www.industryweek.com/21260473*.

The world economy is undergoing significant changes as we shift from a global approach to one focused on regional and national production. Demographic, geographic and political factors are reshaping our world and driving the change.

The new paradigm will not be defined by the globalization that dominated the last half-century. While this transition presents challenges, it also opens up exciting new opportunities for those who are willing to adapt.

Let's take a look at some of these challenges and opportunities.

The American China Crisis and Taiwan

The post-COVID world has escalated tensions between the United States and China, with allies involved on both sides. Companies will continue to need to navigate supply chain disruptions, China risk and concerns about capital outlays in a rising-interest-rate environment.

China has reopened and will continue to deal with the impacts of COVID for many years. Official Chinese policy is that Taiwan is part of China, and therefore any action by China to bring Taiwan closer is an internal matter that other nations should refrain from attempting to influence.

While the rhetoric for breaking ties with China is strong, there are complicating factors. The U.S. trade deficit with China is again growing. Consumers want the low-cost products they can get through the Chinese manufacturing value chain. Meanwhile, higher interest rates and fear of a recession are driving caution among manufacturers around investment in regional production capacity outside of China.

Many companies are hoping the conflict cools, but hope is never a good strategy.

Looking deep into supply chains to understand what components originate in China is now more critical than ever. Executives and boards that ignore the post-China value chain plan are putting their companies' futures at risk with a clear, quantifiable and mitigatable situation.

Image courtesty of Mr.siwabud Veerapaisarn | Dreamstime.com

Regional Industrial Labor and Skill Shortage

Companies are looking to low-cost manufacturing zones in North America and Europe in an effort to move higher-value production to the region. Much of the shift to date has been items where a logistics penalty supported a more rapid move. Challenges exist for smaller commodity components with low margins, which are currently manufactured in China. These parts, mostly taken for granted, will be those that likely stress supply chains in the near future.

Purchasing and supply-chain teams need to unite in their efforts to regionalize a value chain. Lobbying for government support to bring low-margin and -cost components will be necessary. Without subsidies, regionalization may not happen for these components, connectors, small handwork parts, etc. That would constitute a national security risk for the United States and European Union.

The West will pay the price if war breaks out with broader Europe. Eastern Europe, which has historically been the focus of low-cost labor for Germany and the wider European manufacturing base, is now seen as higher-risk as the conflict in Ukraine continues to escalate.

Mexico continues to shine as the heart of the North American low-cost manufacturing engine. While the labor market remains tight in Mexico, universities continue to produce a record number of engineering graduates. This white-collar workforce has given the country a robust position as the center for regionalization in North America. ◀

Ambrose Conroy is founder and CEO of **Seraph** a global enterprise consulting firm that partners with business leaders to handle their most complex supply chain, operations and manufacturing challenges, delivering long-term operational and leadership improvements.

Medical Device Manufacturer Ditches ERP System for Statistical Process Control Software

By Dennis Scimeca

Most devices manufactured by Medbio LLC fall under the surgical aids and implantable categories. Quality control means life or death for the company and/or the patients using their devices.

Medbio had for years depended on an ERP module for quality control at its plant in Grand Rapids, Michigan. The module wasn't designed to upload information directly from advanced equipment like coordinate measuring machines (CMMs), 3D scanners or electronic calipers.

In a slow, laborious process, inspectors collected parts from presses on the floor, read specifications, measured parts and entered data manually into the ERP module to determine whether the parts met specs or not.

By the time inspectors generated their quality analyses, hours might have passed since the end of relevant production runs. If the part didn't meet specifications, the run produced scrap.

For correlation studies and problem solving, Medbio pulled inspection data from the ERP module and loaded it into separate analytical software. The company could analyze processes, but real-time analytics were impossible with the clunky ERP module.

Fed up with its inadequacies, Medbio decided to dump the module in favor of specialized statistical process control (SPC) software from Predisys.

Pilot Program Quick Success

Software installation began in December 2021. In June 2022, Medbio launched a pilot use case in one of its highest-volume production facilities on the Grand Rapids campus.

The facility features streamlined production and some of the company's most advanced equipment, but the data collection problem remained. Rather than depending on measurements taken by hand to generate quality data, advanced equipment such as 2D scanners and CMMs generated CSV files. Inspectors then manually entered this data into the ERP module. So, even with the data generated automatically rather than taken by hand, inspection times still measured in hours.

With the new SPC software, CSV data pipes directly into the system, reducing inspection times to less than a minute. Sean Callaghan, president of the Grand Rapids campus, predicts that once the software deploys at scale at the Grand Rapids facility, the company will save 6,000 hours annually of manual data entry by inspectors.

Image courtesy of Medbio LLC.

Inspection times sped up so quickly that some inspectors from the pilot facility began assisting inspectors in another facility on campus to help ease the inspection workload.

During the pilot, one engineer used real-time data to monitor quality and determine potential issues with tools on the line. If the data indicated a problem, the engineer could determine whether to repair tools on the line or pull them for maintenance, avoiding tooling-related shutdowns and/or preventing entirely bad production runs.

Realizing the Potential of SPC

News about the new SPC system in the pilot facility quickly spread to other inspectors on campus, who clamored for access. The campus-wide transition to the new software was completed in February 2023.

With easier access to data, Medbio has broken engineers into teams for scrap-reduction projects. Long-term, the company wants to provide the same real-time information directly to operators on the floor and marry process data with inspection data for better real-time analytics. The goal: A timeline illustrating what any machine did, coupled with inspection results for related parts, during a specific window of time. ◀

Technology Editor Dennis Scimeca can be reached at *dscimeca@endeavorb2b.com.*

Building at the Speed of Now

Manufacturers want their factories up and operating faster than ever. That's a challenge.

By Jill Jusko

I went searching for an answer today: On average, how long does it take to build a manufacturing plant from scratch?

I know the question is slightly ridiculous. The number of variables involved is massive. Still, I thought there might be some research organization that had taken a stab at answering the question—and maybe there is. I couldn't find a solid response, though.

An easier question is: How fast does a manufacturer want its new manufacturing plant up and running? The answer is "immediately"—faster if possible.

"There are three new trends in the market, and it's speed to market, speed to market, speed to market," says Matt Mulick of Gresham Smith, a national architecture and engineering firm. Mulick is industrial architectural department manager at the company, which has worked with many industrial entities. Gresham Smith's manufacturing clients include several battery plants, headquarters locations and facility expansions. I spoke with Mulick while doing research for a recent article, Growing on a Greenfield (page 16).

Credit: Photo 1993135 © Sculpies | Dreamstime.com

"Everything that we're doing revolves around getting to market and producing faster than we've ever done before," Mulick says. He describes speaking to a potential client the day before our telephone conversation, and the question was a straightforward "What can you do to make this extremely aggressive timeline a reality?"

"If you look at the battery plants, if you look at any of the other plants, that is the No. 1 thing. The EV market is like the space race of the '60s. I mean, you can't make enough of them, and you can't build them fast enough," he says.

My conversations with several manufacturers reflect the need for speed. Indeed, Wisconsin-based Excellerate's business model is built on that very premise. The manufacturer describes itself as having "industrialized" construction work by taking that which would have been constructed onsite into a factory, where it can be put together more quickly in controlled conditions. Like modular homes, big pieces are built in a plant and then shipped to the building site.

Excellerate is employing the same philosophy for some components of a new plant it is constructing.

Mulick says that for many manufacturers, their desire for speed in raising a new factory is entwined with an urgent wish for maximum flexibility. The logic behind the twin desires is solid, although the challenge sounds great. Even as construction gets underway, manufacturers likely have been refining production processes or discovering better technologies and now want those improvements incorporated into a structure that is well beyond the discussion stage.

Ralph Robinett, senior vice president at GAF Energy, nods in agreement when I raise the dual desires with him. His company is building a manufacturing plant in Georgetown, Texas.

"We're designing the building as we're designing the line as we're designing the process. Everyone's got to work in parallel and then you just have to have that tight alignment and the ability to make adjustments," he says.

I'm someone to whom the word "speed" has never been attached, despite the deadline-driven nature of journalism. And speed in concert with flexibility is almost beyond my ken. For Robinett, however, "I find it fun because it means that everyone else moves at the speed you were hoping for."

I'm ready for some lightning moves by manufacturing in 2023. ◀

Executive Editor Jill Jusko can be reached at *jjusko@endeavorb2b.com.*

EHS Today

Helping You Reduce Accidents & Incidents, Training Costs, and Workers' Comp Premiums

EHS Today & Endeavor Business Media have partnered with SafetyNow to deliver engaging & compliant online safety training on an award-winning LMS. Access a library of thousands of hazard and industry specific training, videos and microtraining, expert compiled programs, or build custom training with a user-friendly and intuitive course builder.

Get Your 2023 Safety Training Program Today

Download a free industry-specific, compliant, no obligation safety training program that is broken down by role & department, and that you can implement today.

& Save 30%

on any future safety training from EHS Today, Endeavor Business Media & SafetyNow

SafetyNow

https://www.SafetyNow.com | 1.800.667.9300 | info@SafetyNow.com


TIME™ MEANS
MORE ME TIME
With the broadest mix of
industrial products and technical
expertise at your fingertips, the
only downtime you'll need to
worry about is yours.
motion.com