



2.0

the next version
of industry

2.0 | the economy



first things first ... free trade changes the rules of industry.

It's here. After nearly a century in development. After redesign and testing — not to mention plenty of tweaking along the way — the next generation of industry has finally arrived and it's available today at a manufacturing plant close to you.

For decades after Henry Ford introduced mass production in 1908, American manufacturing remained more-or-less true to its original version, not straying too far from the iconic assembly lines, organizational charts and philosophies of its early pioneers. It's not that industry never budged from the day of the Tin Lizzie, but earlier changes were more like refinements than revolutions. To borrow a software metaphor, there were plenty of "dot-upgrades" along the way, but nothing radical enough to be called a completely new version.

But what's emerged now is entirely different. Version 2.0 is brand-new product that completely rethinks the way manufacturing operated for nearly a century.

It's hard to pin down precisely how the next version of industry actually emerged. There have been countless changes in the economy. Changes in technology. Changes in organizations and people.

If you have to choose which one came first, it was probably the economy, because while technology transformed primarily with inexpensive computer products over the last two decades, structural change in the economy — deregulation and free trade agreements that helped reshape the industrial marketplace — occurred much earlier.

If you want instant fireworks, try this: Drop into a meeting of manufacturing executives and start tossing around any pointed opinion on NAFTA, the North American Free Trade Agreement. You'll almost certainly spark a heated political debate over what many believe is a fairly-recent march toward free trade.

Actually, it began decades before. Economist Mike Walden, a professor at North Carolina State University, places the date around the end of World War II, when the General Agreement

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on Tariffs and Trade was signed. Known in economic parlance as GATT, the international treaty was designed to promote trade of manufactured and agricultural goods by reducing protective tariffs and providing a forum to resolve trade disputes.

But free trade truly began to soar in 1994, when NAFTA created one of the world's largest free trade zones. Among other things, the still-controversial treaty among Canada, Mexico and the United States removed many investment restrictions and eliminated tariffs — making it easier to send both raw materials and finished products across international borders.

The result of NAFTA, GATT and many other lesser-known free trade agreements is an increasingly global community, where people are more connected — economically, culturally and socially. The economic connections seem to produce the most debate. Without tariffs to boost the price of products crossing borders, manufacturing has become a truly global affair, with labor-intensive products being made in places where people work for less.

Whether that's good or bad overall is hard to say. Ed Swartz, CEO of Static Control Components in Sanford, believes it's clearly hurt American industry, costing millions of jobs over recent years. On the other hand, he says, it's simply the economic law of comparative advantage at work.

"Let's say a shopper is in a store and there are two items that are alike," he explains. "They're made from the same fabric. They're the same color. One of them has an American flag and an AFL-CIO logo on it to appeal to patriotism and that product is \$100. Right next to it is the same identical product. It has a 'Made in China' sticker on it and it's \$40.

"Now which one is the consumer going to buy? That's what's going in the world. If you're looking from the perspective of the consumer, it holds down inflation and saves the consumer money. But if you look it at the point of the view of American industry, it puts them out of business and costs Americans their jobs."

Walden agrees. Free trade has created a challenge for many industries, especially the textile business that once stood with

tobacco and furniture as pillars of the Tar Heel economy. The “big losers” in free trade, Walden says, were textile and apparel workers who lost jobs when work was moved to Mexico or Asia.

On the other hand, some economic benefits are often lost in the discussion. “Up until the mid ‘90s, clothing prices were rising 2 to 3 percent a year,” the economist explains. “But since the mid ‘90s, and that would be the date for NAFTA, clothing prices have been going down 1 percent a year. That saves consumers, including you and me, \$20 billion a year.”

Another seismic economic shift began three decades ago with a national push for deregulation. The most notable change came in telecommunications when an antitrust lawsuit forced industry giant AT&T to spin off local telephone companies in the early ‘80s and the Telecommunications Act of 1996 threw telephone, long-distance and cable companies into a direct, heated competition for the first time.

The demise of the Civil Aeronautics Board, which once regulated commercial aviation, is another example. For most of the last century, federal agencies micromanaged the airline industry, including the cost and availability of air travel. Since deregulation began in 1978, more airlines have formed, new routes have been added and competition has dropped prices to the point where average people can afford to fly.

Both the communications and transportation industries, Walden says, had been highly regulated and dominated by companies that were not terribly effective. Deregulation had a significant impact on business and industry by changing what he calls the economic “rules of the game.”

“The move in the U.S. for deregulation forced firms to be more competitive,” says Walden, “and that forced companies to adopt technology and take advantage of the global economy — motivated by the fact that they had to be lean and mean in fierce competition with other firms.”

So what have these economic shifts meant for the long-awaited next version of industry? That the 2.0 version of industry operates in a hypercompetitive global environment. From the genesis of manufacturing, industrial leaders could generally focus their attention on American trends and tastes, monitor domestic economic indicators and occasionally even rely on friendly Congressmen to isolate their businesses from foreign competition.

No longer. Industry now has a decidedly international accent and global outlook. There’s no doubt the economic environment is strikingly new. But that wasn’t the only driving force behind 2.0, the next version of industry. Economic reality joined forces with emerging technology to shake up the very concept of American manufacturing.

2.0 deregulation and breakups

2.0 the next economy

2.0 | technology



technorevolution! nothing in industry will ever be the same.

Was it the chicken or the egg? Many who follow industrial trends argue about whether technology or economics spurred the more significant changes leading to 2.0, the next version of industry. Whether economics came before industry, or industry came before economics, there's no doubt both were critical driving forces in what has emerged. Over recent years, it's become impossible to talk about manufacturing without focusing on paradigm-shifting changes in automation and information technology.

Robotics. E-mail. Computer-aided design. Video conferencing. Automation. Fax. Every single one of them was unfathomable in our first version of industry — in the days of “Modern Times,” when Charlie Chaplin’s nameless factory worker stood for hours on end, tightening one bolt after another as parts passed by on an industrial assembly line. For that matter, many were still science fiction when today’s mid-career industrial managers walked into a plant for the first time. Technology once thought impossible is just another blasé fact of life in today’s modern times.

Michael Rappa probably understands the revolution as well as anyone. As director of the new Institute for Advanced Analytics at North Carolina State University, he works daily to help graduate students and business leaders understand how technology and data analysis affect industry. Rappa believes technology has rocked industry in two distinct, but related, ways.

Continuous improvement in automation, he says, has revolutionized how products are made — and, for that matter, how well they’re made. By removing people from the

2.0
technology
rocks
industry



production equation, companies have both reduced costs — personnel being a major expense for any business — and minimized human error that can reduce the quality of what’s being produced. Automation also allows work to be done faster, increasing overall productivity.

At the same time, the increased use of computers has generated an explosion of manufacturing information that can be collected, analyzed and used to improve production — often just about as quickly as the data become available. “Everyone, from the factory floor to the executive suite, is living with more data about what’s happening day-to-day on manufacturing lines,” he explains. “And the flow of information connects from various points in the supply chain all the way to the end customer, who can access real-time information about inventory and availability.”

The free flow of production data has spawned an entire industry surrounding quality control. Successful companies use each datum, every statistic, any minute piece of information to monitor their processes, make sure products meet specifications and find ways to make further improvements. Groups like the International Organization for Standardization have created measurement-based standards to certify companies that consistently use recognized quality management systems. And then there are the management systems themselves, approaches like Six Sigma, which provide specific steps to eliminate production defects and improve quality.

Rappa says industry may have been changed more by global markets than technology. But as far as technology is concerned, he believes this free flow of production data — and the quality control programs that have taken advantage of the information — could be the most important change

technology has produced in American industry.

That's because technology has not only changed processes and products, but also the people who make it all work. "Automation shifts the roles played by workers toward higher value-added skills requiring higher levels of education and training," Rappa says. "It may also shift the balance in terms of the number of people required relative to the capital investment.

"Completing high school, attending community college, and in some cases, a four-year college degree, may become an essential part of workforce development and retention. Manual dexterity is being supplanted by a need for mental dexterity: the ability to accurately analyze and assess a situation given the available data and make decisions at every level of the organization, including the factory floor."

Emerging technology, combined with new markets, caused a shakeup throughout industry. Companies quick to accept the new realities — whether they liked what was happening or not — had the best chance to survive.

One of those quick to adapt was Static Control Components, a Sanford-based company that now ships products to more than 165 countries worldwide. CEO Ed Swartz says globalization makes it critical for his company to invest in technology to maintain a competitive advantage. The only way to prosper, he believes, is to automate the business and reduce production costs.

"I saw this coming 15 years ago, and so should have my industrial brethren," he says about the rise in foreign competition. "What we did was we got 10 automation engineers and we built one machine that does the work of 50 people. We automate everything we possibly can and we get labor costs down to a fraction of the total cost.

"That's the answer. You have to take the labor costs out. If you try to go head to head with the same amount of labor, they're going to kill you."

Static Control, which managed to automate without layoffs by expanding its business, wasn't the only company rising to the challenge. Hanesbrands and Frontier Spinning Mills, two companies manufacturing yarn in Sanford, have managed to survive a much-publicized decline in the domestic textile industry thanks to careful automation and quality control.

Two years ago, employees at Hanesbrands, then operating as National Textiles, managed to drop annual costs by 4 percent, thanks to a combination of innovative work and emerging technology. That accomplishment made Sanford the low-cost producer for two years in a row among the

2.0 playing the advantage

company's nine plants clustered in southwest Virginia, northeast Tennessee, northeast Georgia and a good portion of North Carolina.

2.0 the rest of the story

There's more to the story than "sexy" topics like automation and information technology. Economist Mike Walden, a North Carolina State University Professor who publishes a popular newspaper column, points out that industrial technology includes far-more mundane items like modern shipping containers. Dramatic improvements over the last decade, he says, have allowed companies to ship goods safely, with minimal losses — an innovation that shouldn't be dismissed in a global market.

With constant change, one obvious question is: What's next? Walden's quick to point out he's no futurist, but poses the prospect of something called "virtualization" — using computer technology to put a virtual image of a product or person at different geographic locations. That could open up all sorts of options for business and industry — from virtual meetings to entirely new production methods.

"I was shopping this weekend for suits and it was done the traditional way," Walden says, suggesting how virtualization might work in the retail sector. "They took my measurements and were going to send them off to a manufacturer to have the suits made. Down the road, I can imagine that we might sit at home and manufacturers would take a virtual image of me, take measurements from that image and have my suit shipped electronically."

2.0 the next technology

Such dramatic changes are interesting to ponder, but waves of new technology have already washed through the emerging global marketplace, transforming every aspect of industry. Nothing is untouched. New technology and markets in 2.0, the next version of industry, don't simply offer novel ways to manufacture products or new places to sell them. The revolutionary changes have fundamentally altered the way organizations are structured, how people work — and even the workers themselves.



2.0 | organizations



‘first version’ organizations have been discarded with the flat earth theory.

The World is Flat. No, it’s not some ancient theory about the earth’s geography or position in the universe. It’s the title author Thomas Friedman chose for his best-selling book describing an international march toward globalism. The world is flat, he says, because it’s become so interconnected. With fewer barriers interfering with commerce, and technology making it easy to do business instantly with billions of people around the planet, our world is a far different place.

If Friedman’s right — and it’s hard to argue against the case — then it’s not surprising that industry would change so radically. After all, you can’t expect the same-old organization doing the same-old business in the same-old way at the same-old place to function just as well in an environment so radically new.

Life has become so different that even the notion of assembly lines — perhaps the bedrock foundation of industry’s first version — is being turned on its head. Economist Mike Walden, who studies manufacturing at North Carolina State University, cites this example as just one way the global and the digital revolutions have shattered our paradigm.

“What many people say we have is no longer the assembly line, but the ‘disassembly line,’” explains Walden. “Instead of manufacturing a product in one building, on one site, they’re going through various phases of manufacturing, where something is done to the product at site one, and then it’s shipped to site two where something else is done, and then it’s shipped to site three, and so forth.

“That is going to be the rule for some time to come. Information technology takes advantage of not only where

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2.0
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is flat,
too

they can manufacture the product totally. But they're breaking the manufacturing process down into segments to get the most cost-effective way at every stage."

If the world has become flat metaphorically, manufacturers have become flat literally. As intricate robotics and less-flashy automation become the norm, far fewer people are needed to keep production humming.

Machines, not people, now transport raw materials to work cells, move parts in and out of manufacturing processes and even monitor what's taking place along the way. Right off the bat, that means fewer people are needed to produce anything, whether it's bricks for home construction or parts for an automobile driveshaft. And, it also means that many specific jobs that once were common in local manufacturing plants don't even exist any more.

Then there are the ripple effects. With fewer people actually making products, there's no need to keep as many supervisors on the payroll. Add to that the trend toward using self-directed work teams — where employees with different areas of expertise manage their own production — and layers of supervisors and managers have simply disappeared from organizational charts.

In short, organizations have become flat.

Ed Swartz, CEO for Static Control Components, says his business looks tremendously different than it did just a few years ago, not only in how his people are deployed, but even what they've been hired to do. His organizational chart is strewn with automation engineers, hydraulic engineers and other high-level technical specialists he didn't have in 1986 when the company was formed. "We've completely revamped our business over the last 10 years," he says. "It doesn't look anything today like it did before."

So, industry is an entirely different animal than it was 20 years ago?

His reply: "It's a different animal than it was five years ago."

2.0
lean
and
mean

It stands to reason that if globalism and technology have changed the way organizations are structured in 2.0, the next version of industry, they've probably changed the way they function as well. For many companies, that new way of operating is wrapped up in a broad concept called "lean manufacturing." Though it's practiced differently from company to company, being lean essentially boils down to finding some systematic way of doing business that minimizes waste, improves quality and reduces both production time and costs.

The idea has become so pervasive in manufacturing that



creating specific ways to put these principles into practice has become a full-fledged industry of its own. That's led some critics to dismiss lean manufacturing as little more than the latest in a very long history of management fads.

Bob Jones, a Sanford-based consultant and founder of Solomon Engineering and Operating Solutions, disagrees. The only way to remain competitive is to eliminate waste, he says, and lean manufacturing gives companies a powerful method to do it. Not only on the plant floor, but also in less-obvious areas like accounting, purchasing, human resources and engineering.

"The principles are not a program of the month. They are a sound, fundamental, common-sense approach to running a business," he argues. "Toyota has implemented these principles so successfully that they have become the most profitable auto company in the world. While there is no such thing as a success formula, lean manufacturing is the closest thing I have found and utilized over the course of my 28-year manufacturing career."

Jones believes that those who don't embrace the fundamentals of lean manufacturing won't be able to keep pace with the exponential rate of change in industry, and that, he says, is a formula for disaster.

Many agree, including Caterpillar, which has been transforming its entire company based on lean concepts. The world's leading manufacturer of building and mining equipment recently adopted the Caterpillar Production System, a comprehensive approach to business. Plant manager Jim Brophy sums it up as a way to deliver "world-class safety, better quality and higher efficiency." The goal is to give his

company the flexibility it needs to compete successfully at any stage of the business cycle.

The Caterpillar Production System touches the entire organization, using 15 guiding principles to transform the company's operations, culture and management. The management component applies lean principles to help Caterpillar improve continuously. "Management is leaner," Brophy says. "It's more direct, minimizes the waste and improves the information flow from the communications and problem-solving perspectives."

Because there are fewer layers of management, data can flow quickly to everyone in the organization, allowing employees to solve all kinds of problems quickly. As a result, the company can create a safer environment, make higher-quality products and adapt more quickly.

One tangible example is Caterpillar's "hour-by-hour boards," used to share data with everyone in the organization. Boards list specific goals and whether they've been met. If the company falls short, the display notes what the problem is, allowing employees to begin finding a solution right away.

Brophy says this approach is essential to success: "At Cat, regardless of whether we're number one or number five, we can never be complacent when it comes to our competitiveness in any marketplace, with any product, and any manufacturing operation."

2.0 the next organizations

Pressures from a global marketplace and the breathtaking advance in technology have redefined organizations in 2.0, the next version of industry, leaving companies flatter, leaner and more focused on adapting quickly to whatever unexpected new situation arises.

But all of the new management structures and systems are merely theory on paper if the people of industry can't make it happen.



2.0 | people



in the end, the next
version rests on one
essential truth:
it's all about
... the people.

Economics. Technology. It's tempting to write off these pressures redefining industry as impersonal forces, something akin to gravity — an unexplainable and irresistible phenomenon that sweeps people up in its wake.

But economics is nothing more than the result of countless personal decisions. Technology, the output of creative individual minds. At the bottom line, both are about people, and the same is true for 2.0, the next version of industry.

With new global markets and cost pressures in the economy ... and complex technology being added to make products ... and smaller and flatter organizations being designed to get the work done efficiently ... the key to success remains having good people to make it all work. So, what's different? It's who those people are.

In the first version of industry, companies worried most about finding employees who could get to work on time and bring with them a fairly narrow set of skills. It helped, of course, if they had some ability to write and calculate, but the real question was whether people could reliably perform the few tasks they'd be doing for many years to come.

Demands have increased exponentially. With machines controlled by computers and more routine business being conducted every day by e-mail and on the Internet, computer literacy is essential for just about any kind of job at all. And that greater reliance on written communication places a premium on good language skills.

2.0
the
human
equation

Lean manufacturing ups the ante even more. Now that companies are operating with fewer people in an oft-turbulent, always-changing environment, it's not unusual for employees to find themselves shifting quickly from one area to another. Simply to survive, they need to begin with more than one set of traditional job skills and, more importantly, possess the ability to learn others. Quickly.

Edith Edmond has watched these trends emerge. As manager of the Employment Security Commission's office in Sanford, she works both sides of the employment equation, helping companies find quality workers and preparing her neighbors to step into those new positions. Most of the change, she says, has happened over the last two decades.

"About 20 years ago, we were labor intensive, with lots of people doing segments of a total job and working together to make things happen," she explains. "Someone would open a box, another person would insert a product, another person would close the box. Now, equipment is doing most things. We need people who can set up, adjust, monitor and do minor repairs to that piece of equipment."

2.0 constant training

The new demands and higher stakes have made training more critical than ever.

Ray Epley plans to retire this fall as industrial relations officer for Central Carolina Community College, which does a considerable amount of training for manufacturers throughout Lee, Chatham and Harnett counties. Changes during his career, he says, have been staggering. At first, employers didn't need all that much. Maybe an occasional overview course in supervision. Perhaps a refresher in technical writing or making measurements. Nothing too intricate or out of the ordinary.

Now, he scours the region, occasionally reaching as far away as Washington state to find top-quality instructors who can tackle a long and growing list of specialized subjects demanded by local industry. Quality management certifications like ISO 9000 didn't even exist years ago, and now earning that prized accreditation requires an entire menu of training for everyone from machine operators to managers.

Safety is another a hot topic, with training in everything from emergency response to hazardous materials. Thinking back, Epley says he can't recall taking even one safety class the entire time he worked during his first career as a tool and die maker.

Another big difference: Training that used to be something special, a break from the work routine, has become part of the routine for people in 2.0, the next version of industry. "It's



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continuous training, because things change so quickly,” Epley says. “They’re coming out with new equipment and computer programs every few years, new quality processes and new validation systems, so we’re now providing continuous training.

“We used to go in, do some training and we were out of there. We didn’t see them again for five or six years. Now, it’s constant training.”

Flexibility. It’s what you hear most when industry leaders describe what defines people in 2.0, the next version of industry — the ability to do many different jobs and pick up new ones at the drop of a dime.

Edmond emphasizes this when she talks with clients looking for jobs. “Years ago, we started telling people that they will change their occupations at least five times in their careers — not just having five different jobs, but five entirely different occupations. So, if they’re going to have five occupations, they’ll need five different skill sets.

“Most employers have already added educational programs as a benefit for their employees, and we recommend to anyone that if the employer makes these programs available, they should take advantage of them.”

There’s little doubt the much-hyped “next version of industry” has now arrived, and it’s far different than the one we lived with for nearly a century. Free trade, spurred by international treaties, has broadened the playing field and deregulation has changed economic rules of the game. Automation and information technology have fundamentally changed how and where products are made. And those new realities have forced dramatic changes in how companies are structured, the way they function and even what kind of person does the work.

Despite it all, one fact remains unchanged: The success of any enterprise remains in the hands of its people, and as long as they remain creative and looking to the future, manufacturing may reshape, but it will won’t go away. Assuming that’s true, what unimaginable new realities might version 3.0 of industry eventually bring?



2.0

the next version
of industry

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Appearing in photos throughout the edition are: Sheila Vines and other Coty employees (cover), Brenda McGraw of Hanesbrands (p. 4), Mary Jay of GKN Precision Forming (p. 8), teacher Edwin Thomas (left) and student Charles Childress at CCCC (p. 11), Len Boozer of Olivia Machine & Tool (p. 11), Ofelia Estrada of Cargo Control USA (p. 15), employees at Coty (p. 18), Bob Beaudoin at Zurn (p. 21), and Miquel Chavez at Coca-Cola Triangle Vending (p. 23).

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Education.



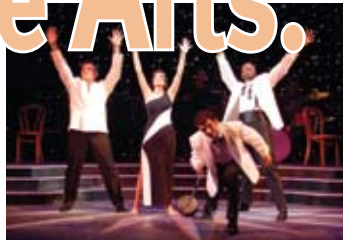
progress and
innovation.

With educational quality on the rise, one of the state's best community colleges and innovative options like Lee Early College, Lee County's poised to seize the future.

The Arts.

creativity and
expression.

The Temple Theatre and Conservatory. Public art. Sanford Pottery Festival. Pottery studios. Artists working in downtown galleries. If creativity's the key to success, we're opening the door.



Business.



world-class
opportunity.

Moen. Tyson. Wyeth. Coty. Caterpillar. 3M. Static Control. Some of the world's best-known companies thrive here. And that means we can, too.

Our strength
is working
together.

LEE COUNTY
NORTH CAROLINA
Southern Base of the Research Triangle Region
Economic Development Corporation

of one hundred
committee
100
LEE COUNTY