

MANUFACTURING MATTERS

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ROBOTICS, AI AND MACHINE LEARNING ON THE RISE IN MANUFACTURING — AND SO ARE CYBER RISKS

Industrial robots are getting smarter, faster, cheaper—and, as a result, more ubiquitous in manufacturing. In what many are hailing as Industry 4.0, or the fourth industrial revolution, manufacturers of all stripes are facing both new opportunities and new challenges thanks to advances in automation, digitization, augmented reality systems and artificial intelligence.

According to data from the International Federation of Robots (IFR), in 2015, global sales of industrial robots hit a record high of some 248,000 units—a jump of 12 percent over 2014. The IFR estimates that by 2018, there will be approximately 2.3 million such machines deployed in factories around the world. Bank of America/Merrill Lynch estimates that by 2020, the market for industrial robots and artificial intelligence-based systems will be a combined \$153 billion.

While the automotive industry still remains the single largest user worldwide, healthcare, food and electronics manufacturers are increasingly relying on robots and automation. Their roles are changing, too. Once relied on almost exclusively for repetitive and potentially dangerous functions like welding and materials handling, “smart machines” and robots are now being used for more sophisticated jobs that require a higher degree of human-like “intelligence,” such as selecting, packaging, inspecting and testing products and assembling extremely small components.

How industrial robots have influenced both productivity and employment worldwide and whether jobs are at risk to the “robot revolution” has long been a subject of debate. A recently published paper from London’s Center for Economic Research, written by George Graetz of Uppsala University and Guy Michaels of the London School of Economics, says that industrial robots have proven to be a “substantial driver” of both economic growth and labor productivity. While the findings are somewhat less conclusive about employment, they seem to indicate that robots increase the need for skilled, more highly paid workers while displacing low- and mid-skilled workers. Certainly, manufacturers will need to hire digital talent to support these emerging technologies and prepare for digital transformation.

Indeed, humans and robots are working together in a more seamless way. Lighter, smaller, more dexterous and sensitive machines can be used more safely with humans while also allowing for greater mobility and flexibility in manufacturing environments. Unlike their stationary ancestors, these newer robots can be moved as needed. True, such “cobots” account for only a small percentage of worldwide sales; not even 5 percent in 2015, according to the Financial Times. These machines, with their relatively small price tags of around \$24,000 (compared to multiples of that for larger machines), could be a great boon to smaller manufacturers. Thanks to advances in augmented and virtual reality, machines can also be controlled, monitored and even repaired remotely.

The increased use of automation and robots—along with artificial intelligence, including machine learning—in manufacturing means having a “smart,” adaptable networked factory that brings together data from supply chain and logistics, design, production and even marketing and sales—and of course from machines and devices themselves, from both inside and outside the factory. The Internet of Things, the cloud and Big Data, with their combined and complementary abilities to collect, store and analyze data, have proved to be a boon for machine learning—and vice versa. The more data collected and analyzed, the “smarter” machines will become. The

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Managing a manufacturing or distribution company is not for the faint of heart. Competitive environments can be brutal, consumer demands are relentless and costs seem to rise on a daily basis. With the influx of global imports, rapidly changing technologies and an ever-changing economic landscape, manufacturers of today are facing some very challenging times.

Success in this sector demands swift management decisions, an accurate prediction of future trends and the ability to reduce costs and enhance operational efficiencies. Companies can no longer “go it alone” when tackling these “make-it or break-it” issues. It is crucial to have the guidance and expertise of a trusted business advisory firm. Barfield, Murphy, Shank & Smith is just that firm.

Our highly skilled professionals have the knowledge and experience to guide your organization through complicated situations and tough business decisions. We focus our efforts on the specific issues that are unique to the success of manufacturing and distribution companies. As your partner, we can help you get to the places that you’ve only dreamed of going before.

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smarter machines become, the more manufacturers can leverage the gains in quality, efficiency and costs.

And the artificial intelligence that powers machine learning helps to ensure that manufacturers can benefit in a variety of ways from the data generated by highly digitized facilities and connected devices, not only identifying process inefficiencies but remediating them. Imagine a piece of machinery that can self-identify when it needs repairs or maintenance before a breakdown occurs. Swiss manufacturer ABB used machine learning techniques to develop a computer-based system that deploys real-time metrics to adjust operations, boosting throughput by as much as 5 percent.

AI and machine learning can unlock a veritable treasure trove of timely customer-related insights, both in the B2B and B2C arenas. These insights, coupled with more adaptable machinery, allow manufacturers to quickly pivot to meet customer needs, better predict supply-and-demand dynamics and optimize the supply chain in real time.

Advances in robotics and automation, coupled with cheaper costs, have come as manufacturers around the world are facing rising labor costs, greater global competition and an increasingly uncertain economic environment. Yet such advances are not without their price. As manufacturers develop smart products and processes, more data and network entry points are created every day.

The U.S. Department of Homeland Security reported in January that investigations of cyber attacks on the manufacturing sector nearly doubled in the year ended Sept. 30, 2015. In fact, manufacturing was the second-most targeted industry for cyber attacks in 2015, according to IBM. While the industry may have flown under the radar as high-profile attacks against the retail, financial services and healthcare industries made headlines, manufacturers' information, intellectual



HOW SHOULD MANUFACTURERS FUND INNOVATION?

An Examination of R&D Tax Credits vs. Government Contracts

Imagine this: Company X is a plastics manufacturer attempting to develop new products that can be used in medicine. The company has grown in recent years, generating approximately \$40 million in revenue last year, and has invested heavily in developing biodegradable plastics that can be used for the treatment of bone and bodily injuries and in various other medical procedures, as well as accelerating its 3D printing capabilities to achieve greater scale.

Company X believes it is on the brink of developing a breakthrough biodegradable formula that could be widely adapted in the medical field and is weighing options to fund its ongoing research and development (R&D) activities. Specifically, Company X's management team is evaluating whether pursuing R&D tax credits or a government contract would be most beneficial to its efforts.

To better understand the pros and cons of each option, Company X should ask itself the following seven key questions to determine which option best suits its operations and strides toward innovation:

I. What are the benefits and uses of R&D tax credits?

Enacted in December 2015, the Protecting Americans from Tax Hikes (PATH) Act permanently extended the federal R&D tax credit, better enabling companies to factor these credits into their long-term tax planning. R&D tax credits can result in cash savings of up to 20 percent of qualified spending—potentially more if the qualified activity occurs in certain states. R&D credits can be used to offset regular income tax liability and, for

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property and products have become prime targets for cyber criminals.

Not surprisingly, cyber risk is moving up on manufacturers' list of priorities, ranking in the top 10 risk factors for the first time in BDO's annual Manufacturing RiskFactor Report. More than 9 in 10 manufacturers (92 percent) cite cybersecurity concerns this year, up 44 percent from 2013. Nearly all (91 percent) also cite operational infrastructure risk, including information systems and implementation of new systems and maintenance.

Is the risk worth the reward? While we're still in the early aughts of Industry 4.0, missing out on the next major wave of industry innovation is potentially deadly. However, before manufacturers can take the leap into automation and AI, they need to build the foundation for business transformation. Cybersecurity and IT risk considerations must be treated as an integral component of innovation—not an afterthought.

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some smaller businesses and startups, the alternative minimum tax (AMT) and a portion of their payroll taxes. If a company isn't paying taxes, the credits can be carried back one year and forward for 20 years. These credits can reduce a company's effective tax rate, increase its cash flow, improve its earnings per share and provide additional funds for investment in new business opportunities or additional employees.

2. What are the benefits of government contracts?

Cost-reimbursable contracts with the government can minimize financial risk by providing reimbursement for actual costs incurred, plus a profit or fee on top of the costs incurred by the organization. The government will also reimburse a proportionate share of indirect costs, including overhead, general factory expenses and administrative costs. Because these costs generally aren't recovered, having the government pay a share of indirect costs can especially benefit manufacturers.

Further advantages for manufacturers that hold government contracts include developing new customer relationships, expanding and diversifying their client portfolio, unlocking new business opportunities and the potential to receive multi-year, high-dollar contract awards from the government, bringing in additional predictable cash flow.

3. Am I eligible for contracts or credits?

All manufacturers are eligible to bid on government contracts, unless they have been previously suspended or debarred by the government.

A manufacturer is likely eligible for R&D tax credits if its activities include attempting to develop or improve the functionality, performance, reliability or quality of its products, processes,

software, inventions, techniques or formulas.

4. Are there any added benefits of pursuing R&D credits or government contracts for a company of our size?

The PATH Act provides additional opportunities for select smaller companies for tax years beginning after 2015. Eligible small businesses, defined as privately held corporations, partnerships or sole proprietorships with less than \$50 million in average gross receipts for the three preceding tax years, can now use the R&D tax credit to offset their AMT.

Additionally, there are certain government funds set aside for small businesses, which are defined by gross receipts or the number of employees, depending on the industry classification of the individual contract. For example, companies performing contracts under NAICS code 325211 (Plastics Material and Resin Manufacturing) with less than 1,250 employees are considered small businesses. If the company meets these criteria, it could bid for certain contracts set aside specifically for smaller businesses.

5. What systems or documentation are required to pursue either opportunity?

No specific supporting documentation is required in order for manufacturers to claim R&D tax credits. While tax examiners may sometimes ask for project accounting records, time-tracking details or other documentation, generally the only requirement is that manufacturers be able to prove expenditures were made and relate to qualified R&D activities. Several court cases have upheld the principle that oral testimony can be relied upon to substantiate a taxpayer's credit.

There are no system requirements for organizations prior to winning

a government contract. However, before submitting the first invoice to the government, manufacturers must implement a cost accounting system to track costs by contract, as well as a procurement system documenting the justification of source selections and monitoring subcontracts. Certain requirements may also be unique to each contract, and companies should fully understand what these are prior to submitting invoices to the government.

6. What happens if our company is approved for credits or wins a contract?

If Company X is approved for R&D tax credits, the biggest benefit is offsetting tax liability. Once the company claims R&D tax credits, it has set the foundation for doing so again in the future because its qualified expenditures and activities have already been identified, and the processes for claiming them already established.

If Company X wins a government contract, it will need to deliver the statement of work in a timely fashion. In addition, because it hasn't held a government contract before, it will need to implement the systems described above and any others defined in the contract. Ideally, all costs would be recovered, including the costs of implementing a compliance framework. Furthermore, the company could enjoy the added benefits of contracting experience and increasing its profile in the government contracting industry.

7. Is it possible for a manufacturer to use both a government contract and R&D tax credits?

It is possible that a manufacturing company could both win a government contract and claim R&D tax credits. If the contract provides

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that the company is both at economic risk for its R&D activities and is allowed to use the results of the research or retain substantial rights to the results, then the company is also entitled to a credit.

On the other hand, if the agreement states that the government will pay the company whether or not the research succeeds, or if it provides the government exclusive rights to use the results of the research, then the research is considered "funded" and does not qualify for the credit.

With a thorough consideration of these questions, Company X should now be well on its way to identifying the cost-offsetting method that best fits its activities. While Company X exists only in the hypothetical sense, any manufacturers that are attempting to develop or improve their products, processes or software should consider exploring whether R&D tax credits or government contracts can help them along the path of innovation and improve the return on their investment.

This article has been adapted from a piece that originally ran in AccountingWEB. You can view the full piece [here](#).



SPOTLIGHT ON: LEAN MANUFACTURING & CONTINUOUS IMPROVEMENT

Q&A with MasterCraft Boats

BDO sat down with their clients Larry Janosek, Vice President of Operations, and Tim Oxley, CFO, of Tennessee-based MasterCraft Boats to discuss how their employee empowerment program and emphasis on continuous improvement helped them cultivate a reputation for industry leadership in operational efficiency and best practices for factory management. The company has achieved three ISO certifications and last year was recognized as a winner of *Industry Week's* Best Plant Award.

You recently won an *IndustryWeek* Best Plant Award, and lean principles are an important part of MasterCraft's philosophy and culture. How has encouraging continuous improvement helped your bottom line?

MasterCraft's process philosophy is deeply rooted in a culture of continuous improvement, where every person in the organization is focused on the elimination of waste with the goal of improving all aspects of the organization. We believe that to achieve sustainable operating results, organizations must foster a culture where every person is engaged every day in making small changes. Our associates are on track to implement over 17,000 continuous improvement ideas this year.

It's important to communicate a shared

vision of what the company's future state looks like and the path the organization will take to get there. This includes making sure employees understand why the strategic goals are important and how tactics and operational details support those goals.

Policy deployment is a method for insuring that the strategic goals of the company drive progress and action at every level within the company. It achieves this by aligning the goals of the company (strategy) with the plans of the middle management (tactics) and the work performed by all employees (operations). People perform best when they have a purpose and when they understand not only what to do, but why certain tactics are important.

***IndustryWeek* reported that MasterCraft has increased on-time delivery to customers to 96 percent since 2012. Have supply chain efficiencies contributed to that success?**

We've shared our lessons learned through our focus on continuous improvement with our supply chain. Our suppliers have been able to reduce waste in their processes, shorten lead times, forecast better and improve first-time quality,

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which has had a positive impact on our organization's ability to deliver. We have provided our suppliers with systemic self-assessment tools that have helped them develop better internal systems.

Lastly, our suppliers recognize how important it is to have strategic tools and guidelines in place to help them ensure that their operations are as efficient as possible. They benefit from reduced variation in their processes and some have recently obtained or are in progress toward obtaining their ISO 9001 certification for quality management.

As manufacturers of a spurge item, how does a limited audience and potentially sensitive demand impact your production strategies?

Our production strategy has and

will continue to be set up for flexible manufacturing. Our production lines are balanced and set up to run any model on any production line, which allows us to react in the event of changes, whether predicted or not. This setup allows our customers to create a highly customized version of our product to meet their needs.

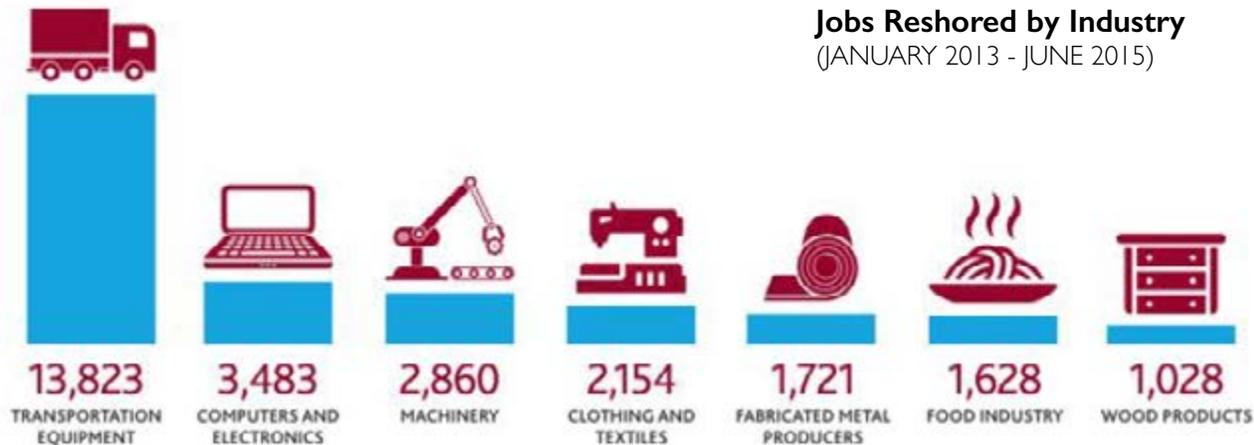
MasterCraft's production is highly labor-intensive and you don't have plans for implementing robotics. Is your production philosophy evolving in other ways as the industry moves toward greater connectivity and high-tech production?

We continue to invest in technology to boost our real-time reporting capabilities, along with our data collection systems and technology related to testing and product development.

How can manufacturers continue to push the envelope in terms of lean manufacturing? What trends do you expect to dominate in the next 12 months or beyond?

In order to push the envelope in terms of lean manufacturing, organizations must continue to provide adequate development opportunities for their employees. Tools and systems do not operate a business—people do. Excellent organizations tend to have cultures that are built around collaboration and empowerment. To achieve ideal lean results, it's important that employees embrace and carry out lean principles.

COULD A LACK OF SKILLED LABOR SLOW THE RESHORING WAVE FOR U.S. MANUFACTURERS?



U.S. manufacturing is on the rebound, having added more than 730,000 jobs since the end of 2010. And industry analysts expect the sector to create at least another 700,000 jobs by the end of the decade, according to the [Manufacturing Institute](#).

Many of these jobs are the result of the return of operations to the U.S. from abroad, also known as reshoring. Companies are exhibiting a strong commitment to reshoring, and a

December 2015 study by [The Boston Consulting Group](#) found that:

- ▶ 54 percent of companies with more than \$1 billion in revenue are considering reshoring
- ▶ The share of executives saying that their companies are actively reshoring production increased by 9 percent since 2014 and by almost 250 percent since 2012

- ▶ Of manufacturers planning to add production capacity over the next five years for goods consumed in the U.S., more plan to add that capacity in the U.S. than in any other country

Perhaps no company has had a bigger impact on the reshoring trend than Walmart. The retailer has committed \$250 billion to U.S.-made goods over the next decade and reshored 4,444 jobs between 2010 and 2014, according to

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the [Reshoring Initiative](#). This has set in motion a chain reaction, as suppliers are reshoring their own operations to serve the retail giant.

U.S. automakers are also making significant investments. Ford, second only to Walmart in reshoring over the past five years, brought 3,250 jobs from Mexico to Michigan and Ohio and moved 1,800 jobs to Tennessee. General Motors also brought 1,800 jobs from Mexico to U.S. plants, according to analysts at the [Reshoring Initiative](#).

Reshoring is strongest in the Southeast and Texas. Companies building new facilities frequently choose right-to-work states with comparatively lower wages and business taxes. Companies that move operations to other regions typically choose existing factories with excess capacity. For example, in 2014, Whirlpool announced it would relocate production of KitchenAid small appliances from China to an existing facility in Greenville, Ohio, adding 400 workers.

WHY BUSINESSES RESHORE JOBS

Costs

Two major costs—labor and energy—are dramatically reduced for many companies when they reshore. The cost of labor in China has increased 320 percent since 2000, according to the [Reshoring Initiative](#). Gas and oil prices, volatile in other countries, have been lower and more stable here in

the United States, and few predict that will change in the near term.

Logistics

Reshoring shortens the supply chain and cuts time to market, helping companies be nimbler.

Brand Building

Businesses boost their brands when they can market their products as “Made in America.” Companies enjoy better quality control and access to skilled labor, which can improve the product, further strengthening their brands.

WHO WILL FILL THE JOBS?

Add existing manufacturing sector growth, plus reshoring, plus the pending retirement of the baby boomers, and U.S. manufacturers say there will be as many as 3.5 million job openings over the next 10 years, according to a 2015 [GE Reports study](#) by General Electric. Meanwhile, according to the [Reshoring Initiative](#), there are still 3-4 million manufacturing jobs abroad, offering a chance for enormous economic growth if reshoring continues. The U.S. might not have enough skilled manufacturing labor—today or in the pipeline—to meet this demand. Several factors contribute to the gap:

Perception

After years of layoffs, plant closings and relocations to emerging markets like China and Mexico, the industry has struggled to attract younger talent. While initiatives like Manufacturing Day are making strides to cultivate a new generation of manufacturers, a 2015 study from the [Manufacturing Institute](#) reports that just 37 percent of

parents would encourage their children to pursue careers in manufacturing.

Demand for technical skill

U.S.-based manufacturing jobs today focus on operating, maintaining and programming high-tech machines. Employers need problem solvers with strong technical skills. Unfortunately, inadequate investment in manufacturing education, vocational schools and community colleges, along with a decline in apprenticeship programs, have contributed to the skills gap.

Wages

Concerns about wages may push otherwise qualified workers away from a manufacturing career. While automakers have reshored jobs, for example, some have moved to areas where wages and benefits are lower. Increases in manufacturing pay are struggling to keep pace with the influx of jobs to fill.

Experts note that these hurdles are not insurmountable, and several strategies are already yielding progress. As the cost of doing business abroad continues to rise, manufacturers are heading home to take advantage of lower costs, more efficient logistics, stronger protections for intellectual property and a boost to their brands. Job opportunities abound for employees with the technical skills and problem-solving ability to operate and maintain high-tech equipment and engineer new products. By collaborating to offer educational programs and apprenticeships, leaders in business and government can grow the skilled workforce to keep pace with the rapid growth projected for the manufacturing sector for years to come.

PERSPECTIVE IN MANUFACTURING

The housing market remains a bright spot in the U.S. economy this year after a similarly robust 2015. Housing construction is booming and U.S. construction spending reached its highest level in March in more than eight years, according to the New York Times.

Both the residential and commercial sides are making gains. Inventory is tight and, with demand exceeding supply, home prices are climbing and new home starts are on the rise. As a result, construction job numbers are up, and builder sentiment is positive, MarketWatch reports. With interest rates still low and fewer rate hikes expected

than previously predicted, mortgage rates remain at historically low levels, adding to the positive construction environment.

This recent uptick in building has boosted sales of construction products, turning manufacturers of these products

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into attractive takeover targets for private equity firms and strategic buyers alike, according to *The Middle Market*. BDO's Q1 Manufacturing & Distribution M&A Outlook and Review notes that while the general economy tends to ebb and flow in four- to seven-year cycles, the building products industry appears to be in year four of a 10-year cycle and deal flow in the sector is active.

Innovative Chemical Products—backed by Audax Private Equity—acquired adhesives maker Fomo Products in April for an undisclosed sum. Fomo manufactures adhesives, sealants and spray foam products, making it a natural fit for ICP, which makes coatings and adhesives for the construction, packaging and printing sectors. Also in April, Nautic Partners-backed IPS—a global manufacturer of adhesives, solvent cements and specialized plumbing products—purchased Integra Adhesives from management in its fifth acquisition since becoming a Nautic VII portfolio company in February 2015. And Z Capital Partners bought Twin-Star International, a designer and manufacturer of electric fireplaces,

heaters and home furnishings.

Strategic investors have also closed a number of deals in the last year: Quanex Building Products paid \$248 million for cabinetmaker Woodcraft Industries in November; while last August, Summit Materials bought gravel-pit operator LeGrand Johnson Construction, which will become part of Summit's Kilgore Companies business in Utah. Door manufacturer Masonite International bought privately held USA Wood Door last October for \$13 million and door-kit maker National Hickman for \$82 million last August.

The Middle Market predicts that building products M&A will remain strong through 2016, as the prospect for a continued housing recovery remains strong. Private equity firms interested in middle market companies may continue to find opportunities in the building products sector and those entering now could be poised to enjoy even greater growth.

Sources: *Forbes*, *Furniture World*, *MarketWatch*, *Mergers & Acquisitions*, *Modern Distribution Management*, *New York Times*, *NREI Online*, *The Wall Street Journal*.

FUTURE PERSPECTIVES: WHAT'S UP NEXT FOR MANUFACTURING INVESTORS

Strong appetite for M&A in the manufacturing sector has persisted following an active year of deals in 2015 – industrial manufacturers announced a record-level transaction volume of \$1.3 trillion in Q4 2015, according to commercial real estate services firm JLL. Several factors indicate that deal activity in the sector will remain steady, including the need for geographic expansion and strong demand in the housing market, reports Mergermarket. However, as we near the upcoming presidential election, investors will likely approach the space more cautiously due to uncertainties around the impact of future regulation on deals. In fact, investors are more optimistic in manufacturing industry deals over the long term than the short term. In Mergers & Acquisitions' Mid-Market Pulse (MMP), survey respondents gave manufacturing deals a 12-month forward-looking sentiment score of 61.4, compared to the three-month sentiment score of 59.7. That said, consolidation in the building materials and construction sectors ramped up in May 2016, notes Modern Distribution Management, highlighting the large role that deals will continue to play in the building products sector for the foreseeable future.

DID YOU KNOW?

According to the [2016 BDO Manufacturing RiskFactor Report](#), the top 100 U.S. manufacturers unanimously cited supply chain concerns as a key business risk for the third year running.

The manufacturing industry has been hit hardest by ransomware, with 54 percent of manufacturers reporting an attack, according to a recent [survey](#) by security company KnowBe4.

According to the latest survey from consulting firm J.D. Power, 21 of 33 automakers in the [survey](#) improved car

quality. Scores improved 6 percent over 2015, marking the biggest jump in seven years.

Forty-seven percent of distributors report increasing their staff in the last 12 months, while 22 percent have reduced their staff in the same time, according to Industrial Distribution's annual [Survey of Distributor Operations](#).

Activity in the manufacturing sector expanded for the fourth month in a row in June, according to the Institute of Supply Management's [Report on Business](#).