THE MIDDLE MARKET MANUFACTURER'S ROADMAP TO INDUSTRY 4.0

BDO

CONTENTS

The Middle Market Manufacturer's Roadmap to Industry 4.0

What does Industry 4.0 mean for you? There is a lot of buzz about what the "next industrial revolution" looks like and the potential it holds, but the journey looks different for every organization, and so may the end destination.

It's very easy to look at General Electric's transformation to "digital industrial" and say, *just do what GE is doing.* For the world's largest manufacturers with billions in revenue, adopting GE's digital transformation playbook may not be so farfetched. But for middle market firms—the heart and soul of the American manufacturing industry—revolutionary digitization can feel aspirational, not inspirational. Cutting-edge technologies like artificial intelligence, robotic process automation or in-line 3D printing might seem like distant dreams for manufacturers that are still focused on migrating to the cloud or just dipping their toes into shop floor automation.

However, stagnation is a death knell in today's manufacturing environment. Technology, competition and shifting consumer expectations have changed the game, and middle market manufacturers can't afford to sit back and watch how it's going to play out. Manufacturers in China and India are investing in automation and innovation to better compete on a global scale and cater to growing customer demand for speed, convenience and customization. And Germany—where the term "Industrie 4.0" originated—has arguably leapfrogged the U.S. in manufacturing innovation. It shows: About a fourth of Germany's GDP growth comes from its manufacturing sector, and they've lost only a small fraction of manufacturing jobs compared to peer industrialized nations.

It's not time to bemoan the end of the U.S.' manufacturing reign yet, though. The race to innovate is far from over—and reclaiming the crown may ultimately come down to the industry's middle market.

Industry 4.0 and the Middle Market Maturity Continuum

Middle market manufacturers are arguably in the best position to take advantage of the changes that Industry 4.0 is introducing. More money than the average startup means more funding and resources for innovation (and more room for smart risk-taking); less bureaucracy and red tape than the big boys means more flexibility, collaboration and faster decision-making.

Just look to Germany's midsized manufacturers for proof: According to **this** *Harvard Business Review* article, German middle market organizations issue five times as many patents per employee as large corporations. Clearly, the middle market can't afford to think of Industry 4.0 as an idea just for the big guys.

But the U.S. manufacturing middle market is far from one big homogeneous group; it represents a wide spectrum of manufacturing capabilities deployed in different ways with different priorities and varying levels of technology and supply chain complexity. Nor do these manufacturers engage on an even playing field: New middle market entrants—untethered by traditional rules—are starting out with the tools and technologies fundamental to competing in an Industry 4.0 world. Their more established competitors may now need to scramble, retrofitting just to play catchup.

The keys to success are: 1) establishing a clear, shared vision of the future 4.0 value chain environment of your industry and your company in that industry; and 2) developing a tailored, prioritized action plan designed to create momentum and forward progress. A plan that establishes the right starting point *based on a realistic assessment of where you are right now* will be critical. For example, the Industry 4.0 readiness of a 10-year-old, $100 million electronic equipment manufacturer may look completely different from that of a 50-year-old, $500 million family-owned steel manufacturer. The steel manufacturer may still have legacy IT infrastructure that isn't compatible with modern software applications and development processes. The electronic equipment manufacturer, on the other hand, may have built its workflows in the cloud from the very beginning.

While every organization has a different implementation trajectory, real and meaningful progress is possible for them all. For some manufacturers, the Industry 4.0 journey might be evolutionary instead of revolutionary—and that's okay. Small, incremental innovations add up over time, and as long as these "incrovations" are aligned with the overarching Industry 4.0 vision, what is evolutionary today may be revolutionary when you look back five years from now.
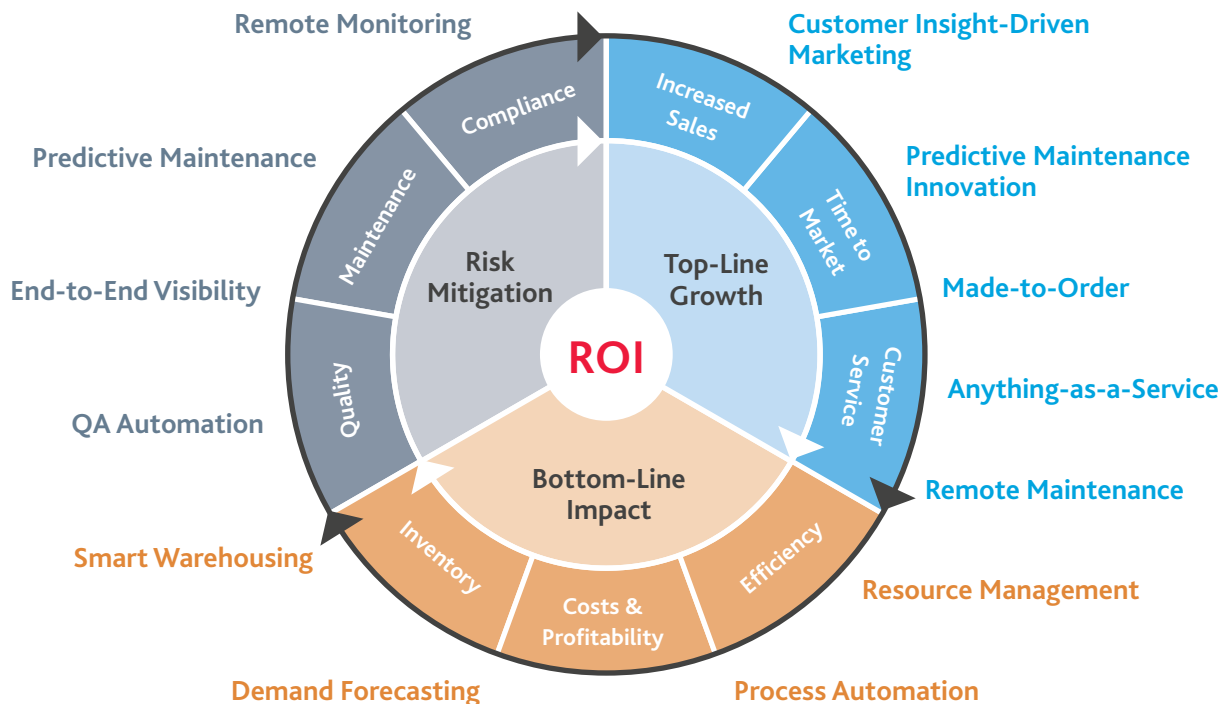
Forget the Jargon: Industry 4.0 = Value Creation

You don't need to be a tech whiz to turn the Industry 4.0 phenomenon to your advantage. The opportunity boils down to three areas of potential value creation: bottom-line impact, top-line growth and risk mitigation.
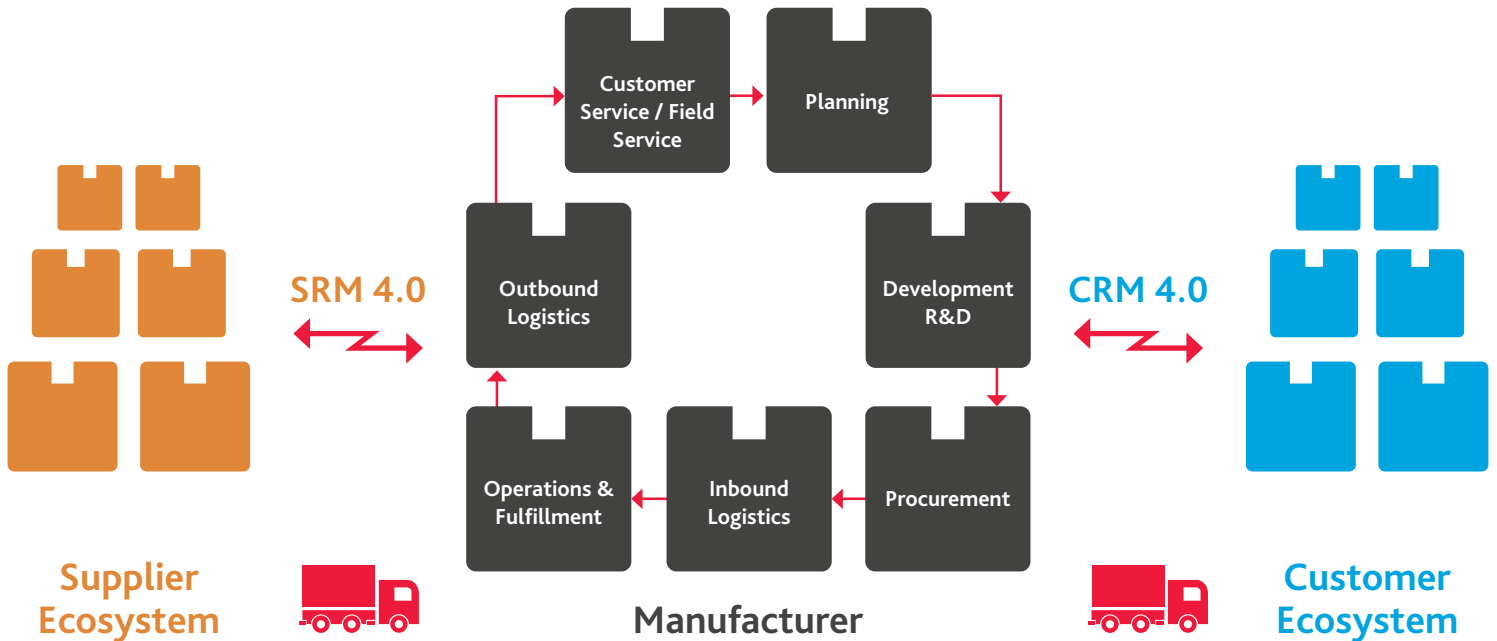
While value is created in different ways depending on where you are on the maturity continuum, incremental value is available to every manufacturer—but it must be rooted in incremental improvements to your current capabilities. It can start with a single improvement initiative in a single functional area. Even small, functional change has ripple effects throughout the entire enterprise. These single, incremental improvements should ultimately be performed against the backdrop of your overarching Industry 4.0 vision, strategy and roadmap to drive tangible ROI enterprise-wide.

The key is to flip your thinking. Instead of focusing on specific technology features or tools, let your goals for value creation lead the way. The real goal for your business isn't, for example, to have predictive maintenance capabilities; it's for that predictive maintenance investment to reduce your mean time between failures, optimize return on invested capital and ultimately preserve or enhance asset value. Start with your high-level objective—whether it's higher levels of performance agility, better inventory turnover or a reduction in production errors— and work backwards from there, asking the question, "How will information transparency, availability and automation unlock business value to this capability?"

INDUSTRY 4.0 VALUE CREATION

Remote Monitoring

Predictive Maintenance

End-to-End Visibility

QA Automation

Smart Warehousing

Demand Forecasting

Customer Insight-Driven Marketing

Predictive Maintenance Innovation

Made-to-Order

Anything-as-a-Service

Remote Maintenance

Resource Management

Process Automation

Compliance · Maintenance · Quality · Inventory · Costs & Profitability · Efficiency · Customer Service · Time to Market · Increased Sales

Risk Mitigation · Top-Line Growth · Bottom-Line Impact · ROI

VALUE CHAIN INTEGRATION

Keep in mind that value creation opportunities will also evolve as you progress in Industry 4.0 maturity. Digitization can fundamentally change the nature of your relationships with suppliers and customers, fostering collaboration and breaking down traditional barriers. The linear supply chain will morph into an **integrated value chain** of mutually beneficial relationships where suppliers and customers collaborate to achieve efficiencies and lower costs by exchanging information and securely integrating systems and processes.

The integrated value chain is predicated on a new level of transparency and information sharing, including constant, bidirectional communication and inter-company visibility into everything from inventory condition, supply status and shipping delays to future-focused factors predicting shifts in demand. This flow of information and aggregated business intelligence across the supply network is often referred to as the **digital thread**, the lifeblood of Industry 4.0.

The real value of the digital thread comes from enabling faster speed to market and speed to decision, empowered by access to more relevant and timely information, enabling better business intelligence and greater intimacy with supplier performance and customer behavior. This sets you up for synergistic *co-creation* of value, where savings and opportunities are generated and shared between business partner organizations, resulting in "win/win/win" relationships.

Getting Started: Assess Your Industry 4.0 Maturity

Before fretting about whether you need to invest in AI or predictive analytics, elevate the discussion: Assess where your business is on the continuum of Industry 4.0 implementation readiness.

Do you have the foundational elements in place to start monetizing your data or driving dynamic forecasting? If not, that doesn't mean it's time to throw in the towel. It's imperative to understand that *every* company can make advancements, but you can't run before you walk.

Change doesn't occur in a vacuum, nor does it happen overnight. For the middle market, the road to Industry 4.0 is less one of digital transformation than it is of intentional digital maturity linked to business value, where disruptive technology is one small part of broader systemic change.

Acknowledging that every manufacturer, especially in the middle market, is at a different point in embracing data and technology, BDO has developed an Industry 4.0 Maturity Model across six dimensions: security, technology, data, process, organization, and governance. These six dimensions are interconnected—and will become even more intertwined as your organization becomes increasingly digital—and support our view of an integrated, cross-functional approach to Industry 4.0 implementation. Clearly, each dimension unlocks several sub-dimensions, but the central point remains: This is much more than simply a technology opportunity.

INDUSTRY 4.0 MIDDLE MARKET MATURITY MODEL

LEVEL 5 **Adaptable Ecosystem**	▶ Data monetization ▶ Inter-company planning & collaboration ▶ End-to-end process management ▶ Prescriptive analytics/robotics	**Consider new revenue streams and increase collaboration and value co-creation with customers, suppliers and vendors**
LEVEL 4 **Integrated Value Chain**	▶ Integrated performance management ▶ Formation of digital thread ▶ Process automation ▶ Predictive analytics	**Focus on third-party systems integration and end-to-end visibility, with heavy consideration given to controls and cybersecurity for information sharing**
LEVEL 3 **Integrated Enterprise**	▶ Collaborative planning ▶ Standardized ERP suite ▶ Consolidated business intelligence/data warehouse ▶ Vendor information sharing	**Integrate data with operations to automate processes, optimize performance and improve decision-making agility**
LEVEL 2 **Breaking Down Silos**	▶ Collaboration by exception ▶ Connected data & devices ▶ Share data upstream or downstream ▶ Pockets of process-level analytics	**Connect disparate data sources and operational systems to enable cross-functional collaboration and visibility**
LEVEL 1 **Stovepipe**	▶ Organizational and operational silos ▶ Islands of technology and data ▶ Manual and non-standard processes	**Explore IoT opportunities and focus on data governance and information sharing across the critical, high value processes**

Define Your Vision

Once you know where you are today, you can define where you want to be tomorrow, next year and five years down the line.

Change is unpredictable and rarely linear. While setting a strategic vision can point you in the right direction, any milestones you set that are contingent on the success of prior achievements may need to shift or change entirely based on empirical feedback. As the external digital environment evolves, so, too, may your desired outcomes. Continuous Industry 4.0 strategy refinement is prudent and even necessary.

Instead of focusing on specific features or tools, define your vision and set KPIs based on value to the business. The end-goal of Industry 4.0 isn't flash. Regardless of your current maturity level, it's all about creating value from your data. Prioritize Industry 4.0

investments based on where you see the biggest gaps and greatest opportunities.

A significant catalyst to Industry 4.0 adoption is the consumer-technology-driven evolution of customer behaviors and expectations. The best enterprise technology innovations are those that are developed to solve existing customer challenges or provide your business with a competitive advantage to better serve them. Technology that is "bleeding edge" but doesn't deliver value to the customer—or its benefits come at the cost of something else the customer values—won't truly move the needle. Rather than retrofitting technology to the customer, the customer can help your leaders set value priorities.

Set Up Your Pilot

Iterative, incremental innovation in small pilots enables faster decision-making and implementation.

Once upon a time, Facebook's official motto was "move fast and break things." That motto may have worked in the early years of Facebook's growth trajectory and was even included in their IPO paperwork. By 2014, however, that philosophy of throwing spaghetti at the wall to see what sticks no longer worked for a company with $2.5 billion in revenue. In April of that year, Facebook officially adopted a new motto: "Move fast with stable infra[structure]."

Facebook's shift in philosophy reflects the middle market's innovation dilemma: Fail to act quickly, and you fall behind; act too fast, and you risk messing up. Failure is a necessary part of the innovation process. But to make failure profitable, you not only need to fail fast, you need to fail *smart*. For most middle market manufacturers, that means dreaming big, but starting small and scaling up what works fast.

That's where the three I's of innovation come in. Iterative, incremental innovation ("incrovation") in small pilots enables faster decision-making and implementation, as well as the ability to adapt or change course at any point. Think of each pilot as an experimental sandbox, where the goal is to learn quickly and apply those learnings to the next experiment and/or scale the solution.

Your Industry 4.0 plan needs to have built-in flexibility to respond and adapt to real feedback and results. Once you have discovered something that works well, you must be prepared to absorb, integrate and expand on these successes without the traditional organizational friction—bureaucracy, politics and change aversion—that's common in established businesses.

THE THREE i'S OF INDUSTRY 4.0 INNOVATION

iNCREMENTAL
Renovation, not reinvention

iTERATIVE
Experiment, fail fast, respond and adapt

iNTEGRATED
Cross-functional collaboration

How do you pay for it?

Embracing Industry 4.0 means investing time, energy and capital to implement advanced technologies and practices. Cost can be one of the biggest roadblocks to progress, particularly in the middle market. Pilot programs—even if you anticipate significant ROI in the long-term—may require reallocating budget or raising additional capital. For some manufacturers, it's a make-or-buy-decision between building new capabilities or buying through strategic acquisitions.

Tax reform has added another layer of complexity to these financing and budgeting considerations, as manufacturers scramble to parse through the 1,000+ pages of provisions and explanatory statements in the new bill. Its impact goes far beyond the finance and accounting departments. Companies on the verge of major strategic business decisions, including those concerning Industry 4.0, all need to seriously consider the implications of tax reform. [See BDO's analysis of how the new tax law will impact manufacturers **here**.]

While many of the changes introduced will benefit middle market manufacturers—particularly the corporate tax rate cut—others create new challenges for funding innovation. For example, the new legislation introduces limitations on interest expensing as well as new restrictions on the carryback and use of Net Operating Losses, both of which could present a significant cash flow obstacle and hamstring emerging companies (in addition to the "start-up" and enacted research expenditure capitalization provisions). The tax bill also eliminates the section 199 domestic production activities deduction ("DPAD"), historically a key tax break for U.S. manufacturers, but its loss is offset by the corporate rate reduction.

Amidst the frenzy of tax reform, one no-brainer for manufacturers exploring Industry 4.0 financing options is maximizing federal and state tax incentives. Manufacturers that take advantage of available credits and deductions have more cash, increased earnings per share, lower effective tax rates, and the opportunity to increase their Industry 4.0 investments.

R&D TAX CREDITS

Last year, more than 6,000 manufacturers claimed an estimated $10 billion in R&D tax credits at an average benefit of $1.67 million per company. The number of eligible manufacturers is much higher, meaning many have yet to capitalize on this opportunity, potentially leaving money on the table.

Some good news for manufacturers is that the federal R&D tax credit remains intact—and its net value was effectively increased by 22 percent, from 65 to 79 percent of incremental qualified spending because of the corporate rate's reduction to 21 percent and the required Sec. 280C(c)(3) election or add back of the section 174 Research & Experimental Expenditures tax deduction. The elimination of the corporate Alternative Minimum Tax also means that more manufacturers can benefit from the R&D tax credit.

The objective of R&D credits is to encourage exactly the type of efforts that are at the core of Industry 4.0. Qualifying activities don't need to be flashy or revolutionary, or even succeed. If companies are trying to make products, processes or software better, faster, cheaper or greener, they probably qualify—and many may not even know it. For the transition to Industry 4.0, manufacturers often qualify if they are attempting to design, develop or incorporate sensors, transmitters, smart devices or other types of machine intelligence into their products or plants.

FOREIGN-DERIVED INTANGIBLE INCOME (FDII)

In addition to preserving the R&D credit, the new tax law introduces a deduction on FDII. The FDII deduction functions similarly to a patent box in European tax systems and is intended to incentivize innovation by offering preferential treatment for income from the export of U.S.-held intangibles, including intellectual property revenues. It will initially be taxed at an effective rate of 13.125 percent and increase to 16.406 percent after 2025.

Manufacturers should identify ways to isolate and track this income, as well as the other components necessary to compute the FDII benefit. However, there is concern that, like other U.S. export incentives that preceded it, the provision may eventually be challenged in world trade courts.

Note that recent tax reform efforts may put these incentives on the chopping block.

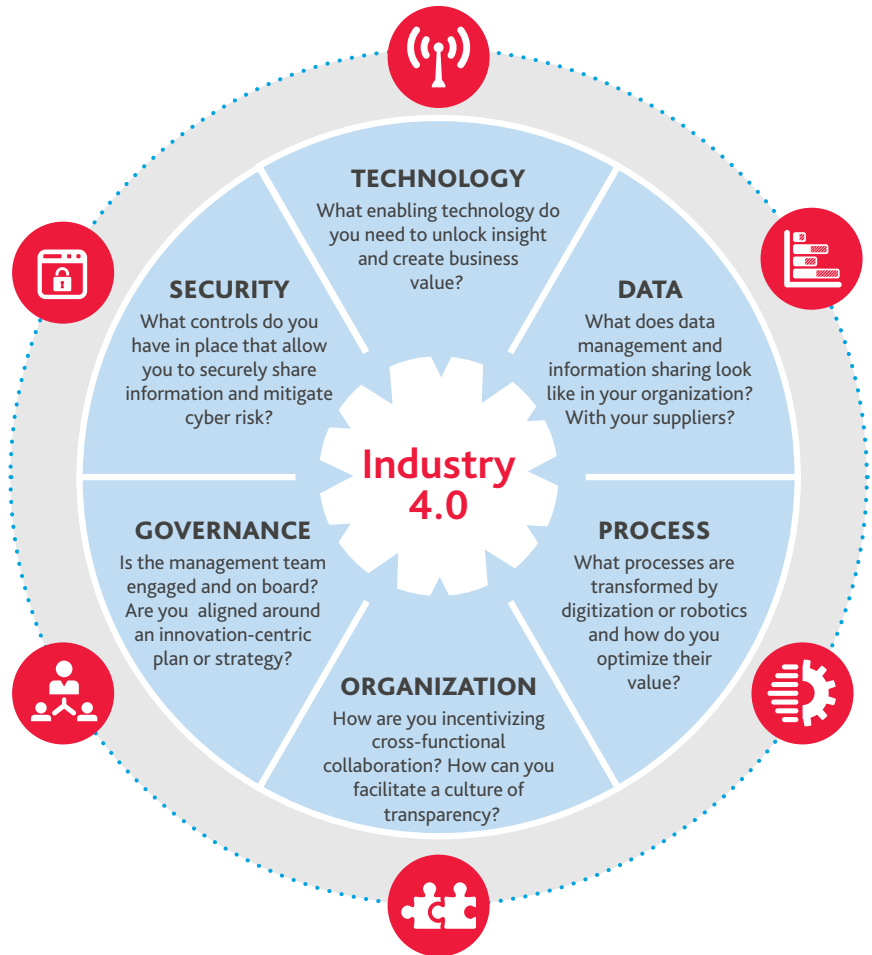# Map Internal and External Cross-Functional Processes

When dealing with complex, multi-stakeholder systems, change doesn't occur in isolation.

Every action triggers a reaction, meaning functional change in one area will have effects elsewhere in the network—some of which may not be expected or good. By the same token, the interoperability (or lack thereof) of external systems or inputs may impact the efficacy of the proposed functional change. As a result, an end-to-end process view of any solution will help you both mitigate the risk of unintended consequences and capitalize on the full process value of that solution.

For any Industry 4.0 initiative to succeed, organizations need to understand how systems information, processes and external entities interact and interface, where there are interdependencies, and how these elements cross borders and organizational boundaries. While each pilot iteration can be worked on modularly—broken down into independent tasks to allow for concurrent progress on interdependent areas—testing must always consider cross-functional interactions and feedback.

Going back to our Industry 4.0 Maturity Model, think about all six dimensions as interrelated, interdependent components of the planning process. Any change in technology will have corresponding implications for required data inputs, connected processes and security

SIX DIMENSIONS OF INDUSTRY 4.0 MATURITY

TECHNOLOGY
What enabling technology do you need to unlock insight and create business value?

SECURITY
What controls do you have in place that allow you to securely share information and mitigate cyber risk?

DATA
What does data management and information sharing look like in your organization? With your suppliers?

Industry 4.0

GOVERNANCE
Is the management team engaged and on board? Are you aligned around an innovation-centric plan or strategy?

PROCESS
What processes are transformed by digitization or robotics and how do you optimize their value?

ORGANIZATION
How are you incentivizing cross-functional collaboration? How can you facilitate a culture of transparency?

protocols, thus potentially introducing new vulnerabilities. The ability to enact the desired change is also contingent on how it is rolled out. Your Industry 4.0 roadmap should account for these relationships *both within your organization and across the boundaries with external entities,* and test each initiative against them, adapting as needed along the way.

Engage External Stakeholders

Your organization's Industry 4.0 initiative will likely create ripple effects across the value chain and require external process and technology changes.

For example, if your focus is on traceability for supply chain resilience, do you include mandates on RFID tagging in your vendor contracts? If you want to improve demand forecasting through predictive analytics, do you have access to the data you need from your top 100 customers—and are their platforms compatible with your systems? Can your information systems communicate with your suppliers'? Equally important, can your customers' information systems communicate effectively with you?

Even if total value chain integration is a faraway goal, you still will need to think about external interoperability and processes for collaboration. Sharing sensitive data to an external network is easier said than done. Doing so requires a fundamental shift in relationships between suppliers and customers, and raises new questions about data privacy and information security.

When planning your Industry 4.0 evolution, view your key suppliers as an extension of your own organization. You may even want to consider inviting these external parties into planning conversations. Collaborative planning with key customers and suppliers early on in your Industry 4.0 journey will help accelerate solution implementation and lay the groundwork for secure co-creation of value.

Prepare Your People

Too often, organizations embark on a digital initiative but forget about the human element.

Even as processes become automated and artificial intelligence takes over data-driven decision-making, change still needs to start with people. Technology for the sake of technology is a wasted investment; you need your employees to understand why they need to leave the status quo behind, believe in the strategic vision and feel engaged in the process. Most importantly, they need to understand what's expected of them and have the resources, training and development to get to the new destination.

Another piece of the people puzzle is collaboration between functional areas that have historically operated in silos. Building cyber-physical systems that integrate software and information with physical processes requires the alignment of information technology with operations technology (OT). If the IT and OT departments aren't in constant communication and committed to learning together, either can become a bottleneck in the roll-out of new capabilities.

In some ways, Industry 4.0 is less about revolutionary technology than it is about a philosophy of continuous improvement, and that mindset is integral to success, bearing in mind that the journey is more like a marathon than a 100-meter dash. The hardest piece of this transition may be fostering a corporate culture that embraces constant experimentation and learning—one in which short-term mistakes and failures are expected and accepted in the pursuit of long-term innovation and value creation.

THE **7C**'S OF CHAMPIONING CHANGE

1 CONVINCE
- ▶ Make the case for change
- ▶ Scope the change initiative
- ▶ Win management support

2 COMMIT
- ▶ Set your strategic vision and desired outcomes
- ▶ Identify internal change champions
- ▶ Establish ownership

3 CODIFY
- ▶ Conduct a baseline assessment and identify barriers
- ▶ Define operational, process, people and behavioral changes
- ▶ Create an implementation plan

4 CONVERT
- ▶ Lay out the strategic vision
- ▶ Communicate individual expectations
- ▶ Empower middle managers

5 CATALYZE
- ▶ Equip employees with training and tools
- ▶ Systematize reinforcement
- ▶ Recognize and reward the wins

6 CULTIVATE
- ▶ Clarify new roles and responsibilities
- ▶ Develop and train for new skillsets
- ▶ Invite employee feedback

7 CHART
- ▶ Monitor and report on progress
- ▶ Measure business and cultural impact
- ▶ Create a cross-functional feedback loop

Racing Forward Without Tripping

Industry 4.0 is the inescapable future of manufacturing—and the middle market is not exempt.

No manufacturer, regardless of size or ingenuity, is immune to technology disruption. The question companies need to ask themselves isn't whether they can afford to invest in the future of manufacturing; it's whether they can afford not to. And if middle market manufacturers play their cards right, they can come out on top of the industrial revolution by capitalizing on the benefits of their relative size and market position.

While inaction isn't an option, risk must be weighed against opportunity. Technology can transform a business, but it can just as easily destroy it. There are essential building blocks for each maturity stage of Industry 4.0 that must be firmly embedded into the business before advancing to the next level. Experimentation is a necessary part of progress, but if you're focused on speed over smarts and skip the basics, those shortcuts may come back to haunt you.

The middle market race to get ahead should be measured, tied to incremental milestones and checkpoints, with a careful eye toward risk management and scalability. Start with an honest assessment of your organization's current Industry 4.0 readiness and set flash aside in favor of ROI and continuous improvement.

Industry 4.0 Middle Market Planning Checklist

ASSESS YOUR INDUSTRY 4.0 MATURITY

- [ ] Where is my organization on the continuum of Industry 4.0 maturity?
- [ ] Where are there gaps in my organization's evolution to the next level?
- [ ] What are my customers' and/or employees' biggest needs?

DEFINE YOUR VISION

- [ ] What do I want my organization to look like five years from now?
- [ ] Based on where my organization is today, where do I see the biggest opportunity to create value?
- [ ] How can I enable a competitive advantage for my customers?

FIGURE OUT FINANCING

- [ ] How much do I want to spend?
- [ ] How will I fund this initiative?
- [ ] What additional resources or investments does this initiative require?

SET UP YOUR PILOT

- [ ] What pilots offer the most reward with the least risk?
- [ ] What are the anticipated benefits?
- [ ] What KPIs will I use to quantify success?
- [ ] How do I track and report on progress and at what cadence?

MAP CROSS-FUNCTIONAL PROCESSES

- [ ] What are the adjacent functional areas potentially impacted by this initiative?
- [ ] What are the process flows that may need to be changed or updated?
- [ ] How might this initiative impact my suppliers or customers?

ENGAGE EXTERNAL STAKEHOLDERS

- [ ] What's the best way to engage my external stakeholders and value chain partners?
- [ ] Do I have access to the third-party information I need?
- [ ] Where do I need to shore up new third-party security vulnerabilities?

PREPARE YOUR PEOPLE

- [ ] How can I rally the entire organization behind this initiative?
- [ ] How do I communicate change to the organization?
- [ ] What training do my employees need?

Accelerating Industry 4.0 Adoption: Q&A with QiO Technologies

To dig deeper into best practices and hear first-hand how manufacturers are integrating Industry 4.0 on shop floors and in executive suites, **BDO's Manufacturing & Distribution Practice Leader and Industry 4.0 Co-Leader Rick Schreiber** sat down with BDO client **Baz Khuti, Co-Founder and CEO of QiO Technologies**, a global software company based in the UK that focuses on applications for accelerating Industry 4.0.

Rick Schreiber: How did your career bring you to launch a venture for industrial companies?

Baz Khuti: I've been in the industry for 30 years, starting on the shop floor, then moving into software development. I've worked with many well-established companies, including GE, Emerson Electric and Invensys. These stalwart companies are unique because they have a long heritage and pride themselves on the quality of their services to customers from long-term engagements. The more complex the product, the more important the relationship between the manufacturer and the customer becomes. Some products have very long lifecycles and can be operational for more than 20 years, and I saw first-hand the challenges that are associated with this longevity.

Industry 4.0 has the potential to fundamentally alter the dynamics between manufacturers and customers in a way that benefits both. As the industry overall shifts towards mass product customization, the relationship will evolve and deepen with new and different challenges emerging. Manufacturers will need to provide unique services, training and maintenance for their products—transitioning from a seller of products to servitization or a product-as-a-service business model. Further, the use of low-cost smart sensors means factories and products will generate significantly more data requiring new software platforms and applications to enable a dynamic supply chain and real-time customer service. For example, insight on how products are performing, predicting maintenance and production—there really is no limit.

These changes necessitate a greater need for secure and scalable data solutions, such as cloud-neutral services and cloud-native software platforms. I saw a market need in helping manufacturing and industrial companies accelerate their adoption of these new technologies, create new business models, and regain control of their data and customers.

RS: In your view, what are the primary drivers of Industry 4.0, and how should CEOs respond to this evolution—or revolution, as many are calling it?

BK: A few competitive forces are fueling the interest in Industry 4.0. First, factories in Asia and other emerging markets have learned how to make products cheaper, faster and of comparable quality to traditional manufacturing economies. Second, integrating software into products has become such a driver of growth that *not* using software could threaten the stability of long-term business contracts, which again, can stretch years or decades and represent considerable value. Third, the average age of manufacturing workers is increasing, and the labor pool needs a different skillset to operate the advanced technology and software required to enable smarter, faster production. In many tech-savvy workers' eyes, manufacturing isn't as attractive an industry as others they may be qualified to enter, so hiring talent, retraining and retaining existing employees can be incredibly challenging.

The first step to survival is vertical integration and fostering a tone at the top that encourages collaboration and trust between functions that historically operated in silos. CEOs must put a strategic framework in place to drive Industry 4.0 solutions across functions that can provide a *customer lens into the factory*, where transparency unlocks trapped productivity, or they will risk being left behind by competitors. One strategic play to consider is acquiring capabilities and software that are

wrapped around products so the customer gains more value from associated services and the manufacturer creates differentiation. Growing software capability in-house and upskilling engineers to become "digital" can help manufacturers drive operational efficiencies and improve safety, which are the primary goals of digitization.

RS: What about mid-sized businesses whose resource constraints may not allow them to scale their Industry 4.0 integration as quickly?

BK: We are working with some businesses that are at the early stages of their path to Industry 4.0 adoption. The key to balancing and prioritizing investment is to start with the low-hanging fruit. Engage in a dialogue and pick an area of focus where you want to see added value in the customer relationship. Think about those elusive questions that have been difficult to answer in terms of business outcomes and pick high-value use cases where investment in digitization will drive a measurable outcome. For the mid-market, a limited proof-of-concept period of four to six weeks can be used as an intermediate step before scaling the solution.

"Think big, start small and scale fast" is the mantra we communicate to our customers.

What does this look like in practice? Consider a legacy steel manufacturer with decades of customer data, quality data, inventory data and purchasing records. Such a firm could create significant value by using cloud-native advanced analytical tools to mine their existing data for trends and insights to improve plant safety, customer relationships or manage inventory and production more efficiently. Once the concept has been validated, the next step could be investment in additional factory and machinery sensors to expand their data collection and drive further value.

For example: We worked with a manufacturer whose machinery continuously collected real-time data, but only stored the data for three weeks before overwriting it. They had already made the investment in the equipment and asked themselves, "What if we could extract the data, analyze it and use it to inform our production cycles?" We enabled them to capture this data and improve productivity.

Another approach we have taken at QiO is to create self-service applications for small to mid-market enterprises. For example, if you want prescriptive maintenance, it can be difficult with a small team, limited tools and disparate data sources. However, using a self-service cloud-based tool, growth-minded companies can improve business outcomes rapidly. A similar approach can then be applied to prescriptive production and prescriptive energy templates.

RS: How should manufacturers address the cybersecurity concerns associated with cloud-based solutions?

BK: Cybersecurity is the number one reason companies are cautious about adopting cloud-based solutions and there is still a significant amount of education to be done in this area. The initial questions to ask are: "How strong is your cybersecurity today? What challenges exist in your cybersecurity architecture? Are you patching correctly?" Only after a company has identified and strengthened its current (internal) cybersecurity should it consider scaling to the cloud. Investing in the cloud before identifying and closing known internal security gaps will only create more issues.

Once you have strengthened your internal security, then extend these security practices into your cloud services. Just as you would keep the door to your data center locked, it is important to monitor and appropriately secure cloud operations. Anti-virus, patching and other security operations, including external penetration tests, must be mirrored and re-created for the cloud. You need to ensure that you know who is accessing your data at any given point in time. Other requirements include the need to monitor access in real time and ensure you know where your data is. Furthermore, should there be a security breach, what risk mitigation plans do you have in place?

RS: Is there a manufacturer you have worked with who has risen to the challenge of digitization particularly well?

BK: A client of ours based in the Middle East opted to completely digitize the business end-to-end. They did that because they wanted to scale up and grow their market share in the face of a major market opportunity. It was a "do-or-be-outdone" inflection point for them. Scaling up required significant process change internally, such as automating many manual processes, and change management became necessary.
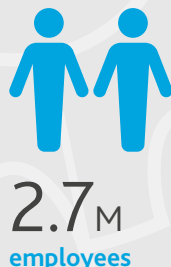
In the case of this client, large projects were being managed manually and their traditional enterprise resource planning (ERP) products were not flexible. Leveraging the data trapped in their ERP system, we enabled them to create and act on real-time production optimization scenarios that improved plant safety, product quality and customer service that translated to significant savings. The key to their success: an Industry 4.0 partner whose applications are built from the ground up to empower rapid and radical improvement, a carefully curated roadmap and a suite of digital solutions that will enable them to achieve, and continue to achieve, safety and operational efficiency improvements.

INDUSTRY 4.0: The Global Race to Innovate

The first industrial revolution began in Great Britain in the mid-1700s. Nearly 300 years later, we stand on the cusp of the next industrial revolution. The global race to innovate is on.
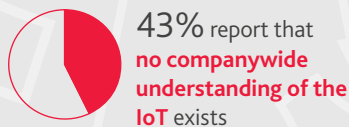
U.S.: 2nd **largest industrial nation**

U.K.: 9th **largest industrial nation**

The State of Manufacturing in a Glance

11.7%
of **U.S. GDP**

12.7M
employees

$2,090.7B
in **exports**

10%
of U.K. GDP

2.7M
employees

£240B
in **exports**

Manufacturers' Readiness for Industry 4.0

Industry 4.0 Awareness & Investment

43% report that **no companywide understanding of the IoT** exists

2 in 3 manufacturers are **aware of Industry 4.0**

Median annual investment in factory connectivity of 3-5% of total sales

Average annual investment of **£106,000** in factory connectivity

84% plan to **increase their investment** in factory connectivity in the next two years

33% plan to **increase their investment** in factory connectivity in the next year

Perception of Industry 4.0 Benefits

62% say **increased speed of operations**

61% say **improved product quality**

55% say **decreased costs**

80% say increased **output levels**

68% say improved **quality**

64% say improved **accuracy**

Barriers to Industry 4.0 Adoption

43% say making a **business case**

39% say adapting **legacy technologies**

35% say incorporating **embedded intelligence**

64% say **initial development costs** are too high

52% say lack of **expertise**

36% say **cyber** concerns

Industrial Skill Shifts

98% anticipate **labor costs, retention and outsourcing** challenges in 2017

76% say the **government should increase support** with education on Industry 4.0 processes and technologies

R&D Opportunities

Perform over **75%** of **business R&D**

Perform **68%** of **business R&D**

17% plan to claim **R&D tax credits**

5% plan to claim **R&D tax credits**

Cyber Vulnerabilities

01 10 0101000 **96%** say potential **security breaches** in their most recent annual financial filings

01 10 0101000 **79%** say the **use of Industry 4.0 will increase the risk of cybersecurity breaches**

ABOUT BDO'S MANUFACTURING & DISTRIBUTION PRACTICE

BDO has been a valued business advisor to manufacturing and distribution companies for more than 100 years. We work with a variety companies from all industrial sectors, ranging from global distributors to startup and niche manufacturing corporations, on a myriad of accounting, consulting, tax and other financial issues.

ABOUT BDO

BDO is the brand name for BDO USA, LLP, a U.S. professional services firm providing assurance, tax, and advisory services to a wide range of publicly traded and privately held companies. For more than 100 years, BDO has provided quality service through the active involvement of experienced and committed professionals. The firm serves clients through more than 60 offices and over 550 independent alliance firm locations nationwide. As an independent Member Firm of BDO International Limited, BDO serves multi-national clients through a global network of 73,800 people working out of 1,500 offices across 162 countries.

BDO USA, LLP, a Delaware limited liability partnership, is the U.S. member of BDO International Limited, a UK company limited by guarantee, and forms part of the international BDO network of independent member firms. BDO is the brand name for the BDO network and for each of the BDO Member Firms.

For more information please visit: **www.bdo.com**.

People who know Industry 4.0, know BDO.

For more information on BDO USA's service offerings to this industry, please contact one of the following practice leaders:

RICK SCHREIBER
Industry 4.0 Co-Leader, National Manufacturing & Distribution Practice Leader, Memphis
901-680-7607 / rschreiber@bdo.com

ESKANDER YAVAR
Industry 4.0 Co-Leader, Management Advisory Services National Leader, Houston
713-407-3293 / eyavar@bdo.com

CHRIS ALGER
Business Performance Improvement Managing Director, Pittsburgh
412-281-4323 / calger@bdo.com

CONTACT US:

FIRST NAME

LAST NAME

EMAIL

PHONE

SUBJECT

MESSAGE

SUBMIT