The future of growth and the manufacturing industry:
Disrupting products, production and supply

SPRING 2017
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Quick read

We surveyed over 375 U.S. manufacturing executives to find out how they are shaping their firms to succeed in the future, looking in detail at how they plan to create, protect and transform value in an era of political uncertainty and technological disruption. Survey respondents were C-suite and senior director level individuals from a range of manufacturing sectors, including food and beverage, industrial machinery, automotive, steel and metals, and chemicals.

The research unearths a group of leading manufacturers that are taking bold decisions and reinventing themselves for the future. They are exploiting innovative technologies, mastering advanced data analytics, and taking a more strategic view of risk. Companies are also evaluating the impact of political and regulatory change in the near-term that may impact long-term focus.

The gap between these leaders and other businesses will grow as technology widens the performance gap and makes it more difficult to catch up. If a company does not want to be stranded on the wrong side of that chasm, it must initiate far-sighted, strategic and profound change.
Introduction

The winning manufacturers of the future will be those that have a leadership team bold enough to question and reimagine their core business model.

Why? Because new technologies and changing customer demands are transforming the manufacturing landscape and how value is created.

- The borders between the manufacturing and technology industries are blurring, connectivity is turning “dumb” products into smart ones, and robotics and digital technologies are disrupting the economics of production. Manufacturers must decide where they want to play in an industry that will look very different in the future.

- Customers are demanding custom products, and they want them quickly, which means that manufacturers must be agile enough to increase customer engagement and compress time to market. That requires making supply chains less complex and more efficient. In a recent survey conducted by Grant Thornton for the National Association of Manufacturers, close to half of the respondents (48%) said that customer demand drives their supply chain strategy. The survey also found that speedy delivery and enhanced customer service are key issues for manufacturers.

In this changing landscape, organizations must prepare for uncertainty. They must understand the impact of technological and political shifts, and identify how to compete in an age of smart manufacturing.
Prepare for uncertainty

These are both unsettling and exciting times for manufacturers. The political landscape is increasingly volatile, new technologies from robotics to artificial intelligence (AI) are reinventing production and products, and cyberthreats are on the rise. The winning companies will take bold steps to arm themselves for the unfamiliar landscape ahead.

Political ups and downs
The Brexit decision and the election of President Trump were given significant impetus by voters in the hollowed-out manufacturing cities of the UK and the Midwestern U.S. These are the people who have seen manufacturing jobs steadily disappear over the past quarter century as deindustrialization took its toll. While some of those jobs have gone to lower-cost manufacturers in China or Mexico, many have been automated out of existence or gone unfilled for lack of trained workers who have the right skills.

In President Trump’s first joint address to Congress in February, he said: “We must restart the engine of the American economy, making it easy to do business in the United States, and much, much harder for companies to leave.” Many manufacturers would probably welcome the first part of that message, with its implicit promise of lower taxes, less regulation and tougher negotiations with trade partners that manipulate their currencies or close their markets to U.S. goods.

But the second part of the message is more troubling. A positive scenario would include improved public-private partnerships and apprenticeship programs to train tomorrow’s manufacturing workers, or fair-trade agreements that create jobs and benefit workers in both developing and developed countries. A less appealing scenario would see legislation introducing steep and protective tariffs, leading to retaliatory trade wars that inhibit global trade and cooperation.

The factory of the future
Today’s sophisticated, connected factory is already unrecognizable from its industrial past. Robotics, automation systems, integrated sensors and other advanced manufacturing technologies have created sophisticated factory environments with highly efficient processes, and leading manufacturers are making bold investment bets to keep up with the rapid pace of this change.

What’s next? One persuasive vision is of a factory staffed by robots and sensors, which creates opportunities for manufacturers to exploit the true potential of AI.

AI means that machines “learn” from the ground up (from real-time data and trial and error) as well as from the top down (through a programmed set of rules). Advanced manufacturing technologies with AI act more like the human brain. They are able to work through situations where bits of information are missing, and can discern patterns in data even when there is ambiguity.

By learning ways to improve efficiency or discovering data from other machines, interconnected machines can change their course without human intervention. For example, they might detect emerging customer buying patterns and redirect factory floor workflows accordingly.
The future of growth and the manufacturing industry

The convergence of manufacturing and smart technologies has paved the way for communities to promote, encourage, and develop innovation for their companies through dedicated innovation centers, such as mHUB in Chicago.

This dedicated manufacturing innovation center supports a co-working community of product designers, developers, entrepreneurs, engineers and manufacturers.

“What we’ve created here is a 63,000-square-foot, state-of-the-art innovation center with 10 different labs and a micro-factory within it,” says Haven Allen, mHUB’s executive director and co-founder. “As well as members making products, we have some corporate tenants. GE has a 2,800-square-foot lab within mHUB, focusing on oil and gas non-destructive testing technologies and doing so under an open-sourcing sort of model. We pull together innovators, entrepreneurs and manufacturers, so we’re not just solving perceived needs, but also real industry needs.”

Lear Corporation – Combining robotic efficiency with human craft

David Kazyak, vice president, Global Seat Engineering, Lear Corporation — the leading global supplier of automotive seating systems and electrical systems — points out that for high-quality products, human craftsmanship is an important element alongside robotic efficiency. “Every year you see more robotic applications, whether you’re just talking simple Automated Guided Vehicles or higher-end robotic assemblies. However, with seats, while we use robotics where we can for efficiency, it’s still a very crafted product. To meet our craftsmanship and appearance requirements, we still need people with passion and experience to produce the highly crafted look.”
The dark side of technology

Intelligence gathering is not solely an exercise in understanding customer buying patterns. On March 7, 2017, WikiLeaks claimed it had documents that proved the CIA used smartphones and other interconnected devices to gather intelligence. Internet-connected thermostats, home monitors and personal assistants potentially serve as points of entry for hackers.

Advanced technologies offer the most promise for manufacturing, but they also represent the greatest threat, both for the protection of their intellectual property and for the reputational risk of their products. Addressing that threat will take consistent global enforcement of cybercrime and coordinated global policy efforts to build better encryption technology. Countries must be good global citizens and act in their mutual best interests as international trading partners. This need, however, is threatened by the populist shift in the global political landscape, with a move toward more nationalist and protectionist policies.

The lack of a coordinated global response will make it more difficult for manufacturers to tackle one of their biggest threats. Sensor technology and supply chain automation tools bring manufacturers into a connected ecosystem. In our research, 69% of manufacturers say that information security and cyberrisk is a “very likely” or “likely” exposure over the next three years.

As Figure 2 shows, this is a top-of-mind risk across the manufacturing spectrum. The ability to guard against cyberattack — and protect intellectual property — will be a key capability of leading U.S. manufacturers in 2020.

Figure 1: Areas where manufacturers with earnings growth of 20% or more in the past year are investing

<table>
<thead>
<tr>
<th>Technology</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet of things</td>
<td>70%</td>
</tr>
<tr>
<td>Robotics</td>
<td>50%</td>
</tr>
<tr>
<td>3-D printing</td>
<td>50%</td>
</tr>
<tr>
<td>AI</td>
<td>43%</td>
</tr>
<tr>
<td>Supply chain</td>
<td>40%</td>
</tr>
<tr>
<td>automation systems</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2: Top sector respondents agree that information security/cyberrisk is very likely or likely over the next three years.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive manufacturing</td>
<td>83%</td>
</tr>
<tr>
<td>Steel and related metals manufacturing</td>
<td>71%</td>
</tr>
<tr>
<td>Industrial machinery, equipment and tools manufacturing</td>
<td>70%</td>
</tr>
<tr>
<td>Food and beverage manufacturing</td>
<td>66%</td>
</tr>
<tr>
<td>Chemicals and related products</td>
<td>56%</td>
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</tbody>
</table>
Forging a future, today

Manufacturers have four critical priorities as they look to respond to these disruptions.

1. Build the digital supply chain
Supply chain complexity and inefficiencies are a major barrier to the growth ambitions of manufacturers. Issues such as under-used assets, high asset transportation and rework costs, and the inability to react quickly to unexpected risks, such as quality problems with a vendor half a world away, are putting the brakes on growth and affecting customer service.

Forward-thinking manufacturers are using technology advances — AI, advanced robotics, 3-D printing, prescriptive analytics — to improve the performance of their supply chains. By using 3-D printing, for example, companies can respond quickly to changing customer demands and shift production from factories offshore to sites closer to the customer base. Robots, meanwhile, can work on production lines alongside human workers.

However, it is the connectivity of an increasingly digital supply chain that will transform performance. The digital supply chain allows manufacturers to capture data from sensors and connected assets, use advanced analytics and AI to extract insight from that data, run prescriptive analysis, and then provide that real-time information to operational leaders who can use it to optimize performance. Potential improvements include better demand forecasting and automated inventory management, improved time to market, and lower-cost sources of raw materials. The supply chain shifts from its traditional linear shape to becoming an intelligent, agile network that responds rapidly to fast-changing customer needs.

Manufacturers need to understand the key technologies by seeking perspectives on how advances in areas such as AI and data analytics can transform the supply chain. They also need to assess what capabilities and competencies they will need within their supply chains to exploit those technologies.

Figure 3: Top barriers between manufacturers and their growth ambitions are the following supply chain issues.

<table>
<thead>
<tr>
<th>Supply chain issues ranked by respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply chain complexity and inefficiencies</td>
<td>44%</td>
</tr>
<tr>
<td>Growing regulatory, tax and political uncertainty, such as the Organization for Economic Cooperation and Development’s [OECD’s] Base Erosion and Profit Shifting (BEPS) tax plans, and Brexit</td>
<td>41%</td>
</tr>
<tr>
<td>Effort required to manage defensive priorities, such as compliance</td>
<td>37%</td>
</tr>
<tr>
<td>Inability to source digital talent and skills</td>
<td>33%</td>
</tr>
<tr>
<td>Concern about ability to manage the tax implications of key growth strategies, such as acquisitions</td>
<td>19%</td>
</tr>
<tr>
<td>Inability to find funding sources and credit</td>
<td>15%</td>
</tr>
</tbody>
</table>
A pragmatist’s guide to supply chain innovation: Professor Morgan Swink

For Professor Morgan Swink — executive director of the Center for Supply Chain Innovation at the Neeley Business School at Texas Christian University in Fort Worth — complex supply chain networks are not the only challenge facing manufacturing’s supply chain leaders. They also face complex choices about how to utilize technology and data analytics to drive innovation. He outlines a number of practical steps that supply chain leaders can take to deliver innovative results and steer their way through complexity.

Think of competitive differentiation and capabilities, not technologies.
“Rather than looking at technologies like drones or robots or machine learning, it’s more about the underlying capabilities that these kinds of technologies provide. What are the underlying capabilities: speed, faster decision-making, consistency, 24-hour availability? Link that up with what differentiates your products in the marketplace — lead time, quality, features — and from there start to talk about technology.”

Pinpoint the uncertainty or variability you’re trying to manage.
“I ask managers about the biggest source of uncertainty or variability in their operations: internal processes, supply, demand? Pick one of those areas and be more specific about the kind of uncertainty that they’re dealing with in those areas. Then talk about how technology can maybe help address that particular problem.”

See data analytics as a learning exercise that can deliver option value.
“Visibility is a long-term journey, but that doesn’t mean you cannot be opportunistic. Take a look at what data you have, and then map that against what you’d like to have. If there’s any overlap, be opportunistic and pursue that one data source opportunity. The ROI on a data source may not be immediate, but by going through that process, you’re likely to learn a lot about your organization’s capabilities and weaknesses. You’ve got to recognize that even if it’s a failure, or it doesn’t yield the kind of benefits you wanted, learning from it has some value, and it might create new options for the next initiative. That’s what I call option value.”

Give someone leadership responsibility for driving innovation.
“Give someone the title and responsibility for driving innovation. A lot of companies will have a Six Sigma, Lean or other overarching process improvement organization. But it’s important to realize that innovation can sometimes go beyond the focus of process improvement programs. It takes visionary leadership to recognize the value of innovation and the need for it, given the complexity and dynamism of our changing supply chain world. This means setting aside resources to staff an innovation office and cast a wide net in search of ideas. For example, giving your employees the chance to interact through conferences, supplier forums, or organizations like the Institute for Supply Management or Council of Supply Chain Management Professionals.”

Identify business model opportunities from advanced supply chain capability.
“There are examples of companies that have become so good at some aspect of supply chain that they are able to sell that capability to other companies. A few years ago, Cummins, which manufactures engines, put a lot of emphasis on developing their spare parts network. They got so good at it that now they sell consulting and logistic services to other similar kinds of industrial equipment companies to manage their spare parts systems. There are lots of examples of that kind of thing.”

Professor Swink is executive director of the Center for Supply Chain Innovation at the Neeley Business School and the James L. and Eunice West Chair in Supply Chain Management at Texas Christian University in Fort Worth.

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2. Anticipate shifting customer needs

In our survey, 62% of manufacturers make “building stronger customer relationships” a high priority for the future. But achieving that ambition is going to get more and more challenging. As new technologies make their impact felt, customer needs and preferences in manufacturing are changing fundamentally — and fast.

Take automotive manufacturing. As the world’s mega-cities become increasingly dense, and regulators and policymakers make private car use increasingly expensive and onerous in urban environments, consumer behaviors are changing radically; car sharing, for instance, is on the rise.

These sorts of shifts mean that manufacturers need to be armed and ready for uncertainty. They will need to make anticipating new market trends into a continuous process of using data analytics to identify where customer needs are changing and assessing different scenarios. In our research, 57% of manufacturers say that advanced data analytics will be key to deepening their understanding of customers.

This profound understanding of customer needs will be critical as the industry increasingly shifts from a pure product focus to embrace data-driven services. In our research, 57% of manufacturers with strong EBITDA growth over the past year say they are seeking to drive growth over the next three years by shifting from a product-related offering to more of a service-related one (see Figure 4). For manufacturers with no profitability growth, the percentage drops to just 31%.

Manufacturers with a deep understanding of their customers’ needs are adding wraparound services to their products, which cements their relationships with existing customers and differentiates them from their competitors. By ensuring that they understand changing customer needs, manufacturers can identify the service opportunities that will meet rising customer expectations and, in some cases, create high-margin revenue streams in their own right.

Figure 4: To drive growth over the next three years, we will shift from a product-related offering to more of a service-related one.

By performance over the past 12 months

- **Over 20% EBITDA growth**
  - 57%
- **10-20% EBITDA growth**
  - 55%
- **1-10% EBITDA growth**
  - 41%
- **0% EBITDA growth**
  - 31%
For Bill Hickey, former CEO of Sealed Air Corporation, data-driven services are critical in a global manufacturing environment where there is always someone who can produce a product for less. “As it becomes harder and harder to differentiate yourselves on a product basis, you need to find other attributes that differentiate you from someone who essentially copied your product and was bringing it to market at a lower price than you,” he says. “Some people change colors, some add features, and others provide additional benefits such as extended warranty, remote monitoring or two-day delivery. Now when you have all this data that you’ve been collecting as part of your manufacturing process, you need to find ways to use this to differentiate your products.”

**Beyond the factory walls: Co-creating with customers**

Today’s demanding consumers do not just expect a product to be cost-effective; they will often expect it to be customized, connected and delivered quickly.

To meet today’s needs and anticipate tomorrow’s, manufacturers will need to look beyond the traditional walls of the organization and connect with customers. Power tool manufacturer DeWalt, for example, has an insights panel where users of the tools can provide feedback on the company’s tools and new ideas.

In our survey, 74% of respondents say that manufacturers will need to co-create and collaborate with customers and others to drive innovation and stronger customer connections. This is a particular priority for U.S. manufacturers with a strong performance track record (see Figure 5).

**Figure 5: Manufacturers will need to co-create and collaborate with customers and others to drive innovation and stronger customer connections.**

By performance over the past 12 months

- **97%**
  - Over 20% EBITDA growth past 12 months

- **85%**
  - 10-20% EBITDA growth past 12 months

- **70%**
  - 1-10% EBITDA growth past 12 months

- **62%**
  - 0% EBITDA growth past 12 months
3. Build transparency to gain clarity and visibility

Manufacturers increasingly operate under a spotlight, especially in consumer products. They must meet escalating demands for transparency from a range of stakeholders — customers, suppliers, taxing authorities and regulators.

- Manufacturers need to go beyond compliance to address stakeholders’ concerns regarding sustainability. How are the products made? Where do the raw materials come from? They want to understand the environmental impact of making a product and the ethics of production, with manufacturers providing reassurance that their ethical claims are justified. On the website of U.S. clothing company Patagonia, for example, consumers can read the Footprint Chronicles and click on different parts of the supply chain to understand where materials are sourced and made.

- Tax complexity has increased for manufacturers and their supply chain partners. R&D and other credits, cost segregation studies, transfer pricing studies, and international tax planning are essential as the value-add shifts from the manufacturing plant to knowledge, design, brand and other less tangible components of value. The OECD’s actions concerning BEPS, which aim to close international tax loopholes and establish where taxes should be paid, add further complexity. In our research, 41% of manufacturers say that growing regulatory, tax and political uncertainty — including BEPS — is a major barrier to their future growth ambitions.

Data analytics will be key to giving stakeholders the nuanced, frequent and detailed information they require. Manufacturers must aggregate data from legacy sources with information from new sources, such as connected devices, and combine internal and external data. Putting themselves in their stakeholders’ shoes, they can build analytical models that give stakeholders the information they need.

Moving past the first step

“Transparency is really just the first step,” said Ward Melhuish, Grant Thornton’s national advisory leader for Consumer and Industrial Products. “The four categories of data analytics on the supply side are diagnostic, descriptive, predictive and prescriptive. I like to break that down to practical steps. On the product side, transparency provides the visibility to the data to analyze and problem solve, streamline the kinks, and ultimately pivot to optimize production. For demand forecasting, better transparency provides the visibility to see patterns in the buying behavior, anticipate changes and create more predictive tools. When manufacturers can link the demand and supply sides, they are well-positioned to work across their entire value chain to address complexity and changes.”

4. Find talent for the smart manufacturing age

President Trump has exhorted companies to “buy American, hire American.” The implied vision could be to create a new generation of manufacturing workers and take the fight to overseas competitors such as China.

The wage differential may be closing as Chinese wages rise, but the skills and capabilities of Chinese workers are increasing and the industry profits from a supportive infrastructure.

People will be critical to establishing a competitive advantage for U.S. manufacturers on the global stage. While technology is important in the age of smart manufacturing, it takes skilled people — from the executive team to the factory floor — to operate, much less drive, innovation in business models, production processes and products.

According to our research, however, manufacturers in the U.S. are struggling to find the talent they need. As Figure 6 shows, over half of industrial machinery and automotive manufacturers point to the growing issue of finding enough workers with fundamental manufacturing trade skills, including enough female trade workers, as a significant barrier to their growth ambitions.
Manufacturers must address this talent gap and look ahead to ensure that they have the skills and competencies required to compete in the future. In our research, 55% of automotive manufacturers put a high priority on aligning management and employee skills with the changing needs of the company. There are a number of critical areas:

- Manufacturers need to retrain their existing workforces to operate effectively in an age when technologies such as robotics and the internet of things are redefining the competencies required from production workers.

- In addition to retraining traditional production workers, manufacturers must recruit staff with new skills, such as data scientists and computer coders. In our research, 73% of manufacturers who achieved EBITDA growth of over 20% in the previous 12 months point to the inability to source digital talent and skills as a barrier to their growth ambitions. To recruit the talent they need, manufacturers must revisit their employee value propositions. Many of the best young tech and science talents will be drawn to innovative technology companies. To attract these top talents, mainstream manufacturers need to communicate a compelling vision of how they plan to drive innovation in smart manufacturing.

- With 57% of manufacturers putting a high priority on developing products or services that allow them to move into new sectors, finding people with experience in target sectors will also be critical.

For mHUB’s Haven Allen, manufacturing’s constantly changing technology landscape means that companies and their people need to embrace career-long learning. “The days of running a drill press for 30 years are gone,” he says. “People are going to have to approach their careers on the basis of continuous learning. Employers are going to need to recognize that and establish how they can incorporate it.”

Figure 6: Top sector respondents indicated they are struggling to find enough workers with fundamental manufacturing trade skills.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Industrial machinery, equipment and tools manufacturing</td>
<td>58%</td>
</tr>
<tr>
<td>Automotive manufacturing</td>
<td>58%</td>
</tr>
<tr>
<td>Food and beverage manufacturing</td>
<td>46%</td>
</tr>
<tr>
<td>Steel and related metals manufacturing</td>
<td>42%</td>
</tr>
<tr>
<td>Chemicals and related products manufacturing</td>
<td>35%</td>
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</tbody>
</table>

“Thirty years ago, many people got their start in manufacturing at a very low skill level and worked their way up,” he adds. “The same sort of progression needs to happen, but it’s a very different starting point nowadays.”

Manufacturers are teaming up with local community colleges to build programs that resemble Germany’s apprentice model. Smart collaboration among government, academia and business can spur investment in perhaps the most valuable resource of all — the U.S. worker.
Conclusion: Customer-driven manufacturing

Manufacturing is changing fast. As smart products become more popular, new competitors from the technology sector are moving into the manufacturing space. To compete, manufacturers need to rethink how they deliver value.

In the world of smart products, customers see value coming from the experience offered by a product and the access it provides to the information they want. It’s no longer simply about the excellence of the product and the profit that can be generated from a product sale. Forward-thinking manufacturers will use advanced analytics to understand how their consumers’ needs are changing, and they’ll build the supply chain, technologies and talent needed to delight the customers of tomorrow.
We want to hear from you
Please take this quick survey and
tell us what you thought of this content.

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About the research

We surveyed 1,092 senior leaders in U.S. companies to understand their key growth, transformation and risk management priorities over the next three years to 2020.

Respondents were drawn from across the C-suite, and included CEOs, CFOs, COOs, CIOs and chief risk or compliance officers.

The research was focused on three core U.S. sectors — IT, manufacturing and banking — and one in 10 respondents were from organizations with annual revenues of more than $1 billion.

The research was conducted by Longitude Research on behalf of Grant Thornton LLP, and the survey was supplemented by in-depth interviews with a range of U.S. business leaders, as well as Grant Thornton subject-matter professionals.

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