4 Tactics for CSCOs to Shift Manufacturing From a Cost of Doing Business to a Competitive Weapon

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This research provides CSCOs with four tactics to craft an agile manufacturing capability. This will support their goals to move manufacturing from a cost center and efficiency enabler to a business partner, and revenue and growth generator.

Key Challenges

- Smart factories offer the potential to enable new levels of agility — but also if not orchestrated and synchronized with other supply chain functions, are merely isolated technology projects that compromise perfect order performance.
- Conventional lean and continuous improvement-based production systems are limited and lack scale. This constrains the larger designs for agile manufacturing.
- A broadening set of technology options are igniting a new wave of factory digitalization initiatives, atop an already-lengthy backlog of technology project and system upgrades in manufacturing operations.
- Decisions for agile manufacturing strategies require a broad and integrated set of stakeholders. Today's decisions are made on a narrow, functional basis and do not include all the capabilities needed to deliver success.

Recommendations

Chief supply chain officers (CSCOs) responsible for strategy, leadership and governance that are seeking to turn manufacturing into a competitive advantage and align production with their evolving supply chain strategies must:

- Achieve the next level of performance for the customer by synchronizing smart factory's role as part of an agile supply system and avoid the peril of isolated production capabilities.
- Reinvest in and modernize the production system by expanding upon current lean and continuous improvement foundations with new digital capabilities and talent.

- Develop a digital strategy for manufacturing operations built on contextualized data and agile IT systems.
- Reshape the team that makes the final manufacturing strategy decisions by including a wider set of stakeholders across supply chain and other business functions.

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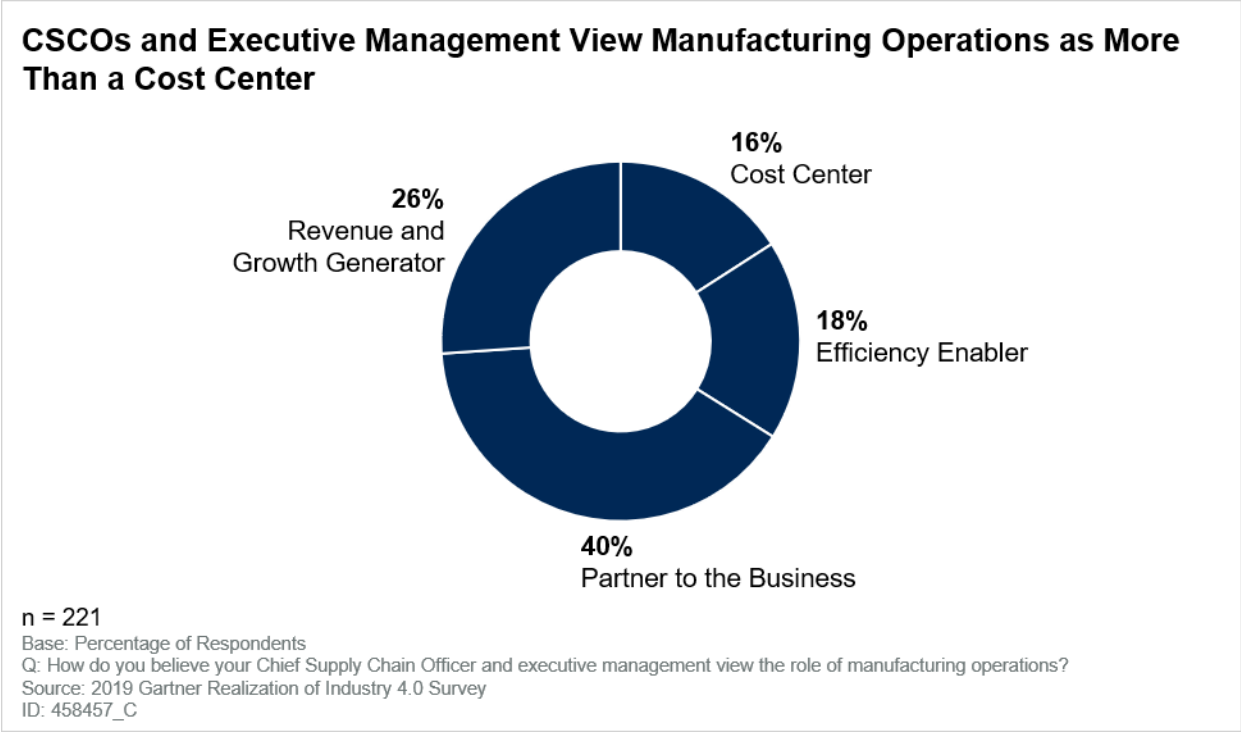
Introduction

> "Manufacturing can and should become a competitive advantage."
>
> Paul Hudson, CEO Sanofi. (See Note 1.)

Volatile markets are fueling supply chain agility initiatives and dramatic shifts in business models have heightened customer expectations, shortening lead times across the entire supply chain. Responding to unplanned market events with speed and flexibility raises the profile of manufacturing operations. CSCOs and executive leadership recognize this, and Figure 1 from

Gartner's 2019 Realization of Industry 4.0 Study illustrates the new expectations for manufacturing operations' role as part of the end-to-end supply chain.

Figure 1. CSCOs and Executive Management View Manufacturing Operations as More Than a Cost Center



Meeting these expectations is no easy task. Designing support for end-to-end agility objectives in manufacturing operations has raised concerns. Nearly four out of five (78%) of the respondents surveyed for this research cite that the pressures to rapidly scale up and down production capacity are a serious challenge. Similarly, 79% cited that the time to respond to unforeseen events is a serious challenge for their organizations. At a more tactical level, there are disconnects between executive strategy and day-to-day execution: Performance measures prioritize asset utilization and efficiency metrics (i.e., overall equipment effectiveness [OEE]), and reporting structures and decisions on manufacturing strategy are misaligned. A substantial backlog of technology projects needs to be managed.

This research provides CSCOs with four specific tactics to help craft an agile manufacturing capability to not just successfully meet new and existing market requirements, but also to succeed with the far-reaching impacts of Industrie 4.0, digital supply chains and smart manufacturing.

Analysis

Synchronize Smart Factories With End-to-End Supply Chain Activities

The smart factory is a concept that describes the application of different combinations of modern technologies to create a hyperflexible, self-adapting manufacturing capability (see Note 2). Smart factories are designed to not only improve existing production capabilities, but also construct new manufacturing processes that support the varying demand for a wider range of products and services. To achieve their potential, smart factories cannot operate in silos. As Figure 2 illustrates, smart factories must not only be flexible enough to maintain the ability to respond to demand, but be orchestrated and synchronized with other supply chain functions (planning, procurement and logistics) and disciplines (product life cycle management, network design and cost optimization).

Figure 2. Synchronize Smart Factories With Designs for End-to-End Agility

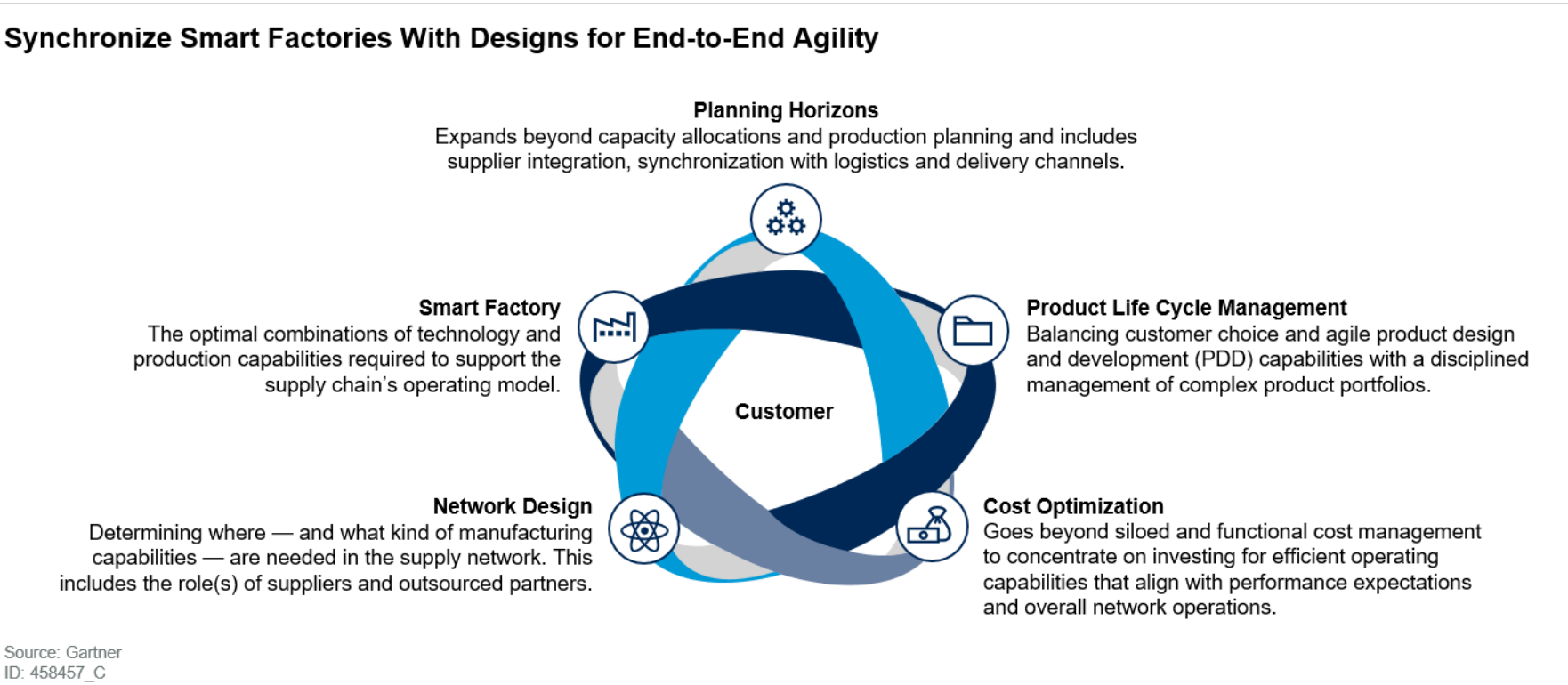


Figure 2 emphasizes knowing and understanding the interdependencies between specific demand channels, individual products and delivery models. Then using them to determine where and how smart factories will be best utilized to stabilize and synchronize production schedules and optimize throughput across the network.

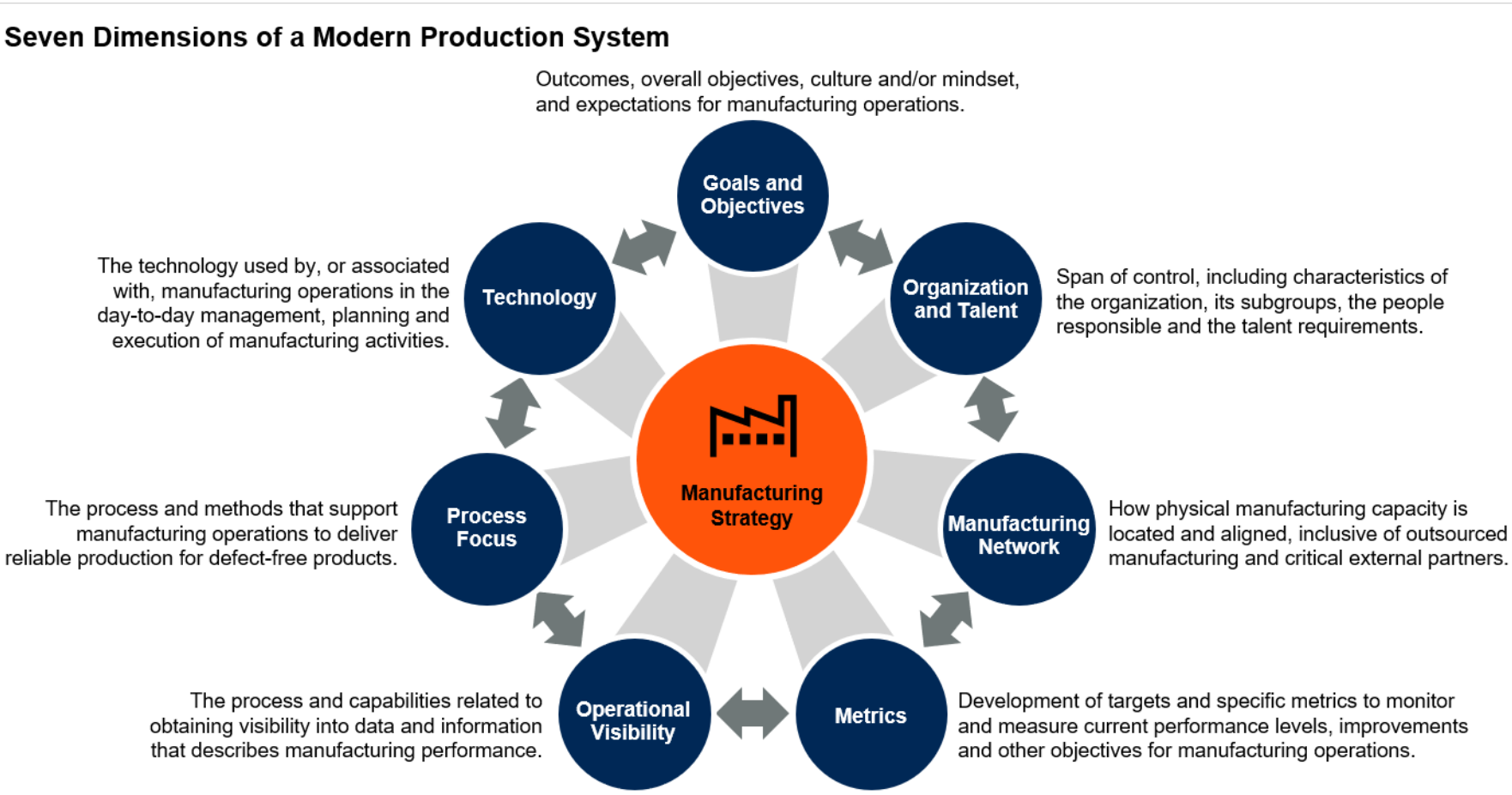
To meet the agility opportunities (and challenges) that mass customization brings, Gartner is seeing activity across different industries. Smart factories are being created by consumer goods and electronics manufacturers. Those industries are either upgrading existing capacity or investing in new production lines altogether — all of which are designed to handle the widening sources of demand and variances in product configurations. Gartner also sees beauty care producers advancing in this direction through in-store laboratories and fit-for-use production capabilities that are coupled with shorter delivery times. However, a leading-edge example of synchronization comes from the home appliances sector.

Changing consumer preferences and demand for mass customization catalyzed an appliance manufacturer's transformation of its business and manufacturing model. As part of a new B2C built on connected products, consumers can configure their products online. The products are then produced in fit-for-purpose smart factories that leverage modular work cells, 5G technology, and sophisticated visualization and analytics to manage production rates and quality. The smart factories are coordinated by the supply chain organization and synchronized across its existing feeder plants, supply base, logistics network (for direct shipments from factories) and its R&D organization. This synchronization has resulted in a 15-day decrease in lead times, lower inventory carrying costs, and a 20% increase in direct shipments. Additionally, the company uses its own Internet of Things (IoT) platform to monitor its connected products. Understanding product usage (i.e., air conditioner energy consumption) patterns has reduced R&D cycles for new versions and/or iterations by one-third.

Reinvest in and Broaden the Scope of the Production System

Production systems are a mature concept and have delivered proven, significant value (see Note 3). One manufacturer's Lean Six Sigma system delivered just over $1 billion in cost savings in 2018 alone. However, traditional production systems, built on lean and continuous improvement, are not equipped to meet the new requirements for agility and speed. By expanding the breadth of the production system to support the convergence of lean and digital, the constraints to agility can be removed. Figure 3 shows the seven dimensions of a modern production system which is designed through the lens of the supply chain organization.

Figure 3. Seven Dimensions of a Modern Production System

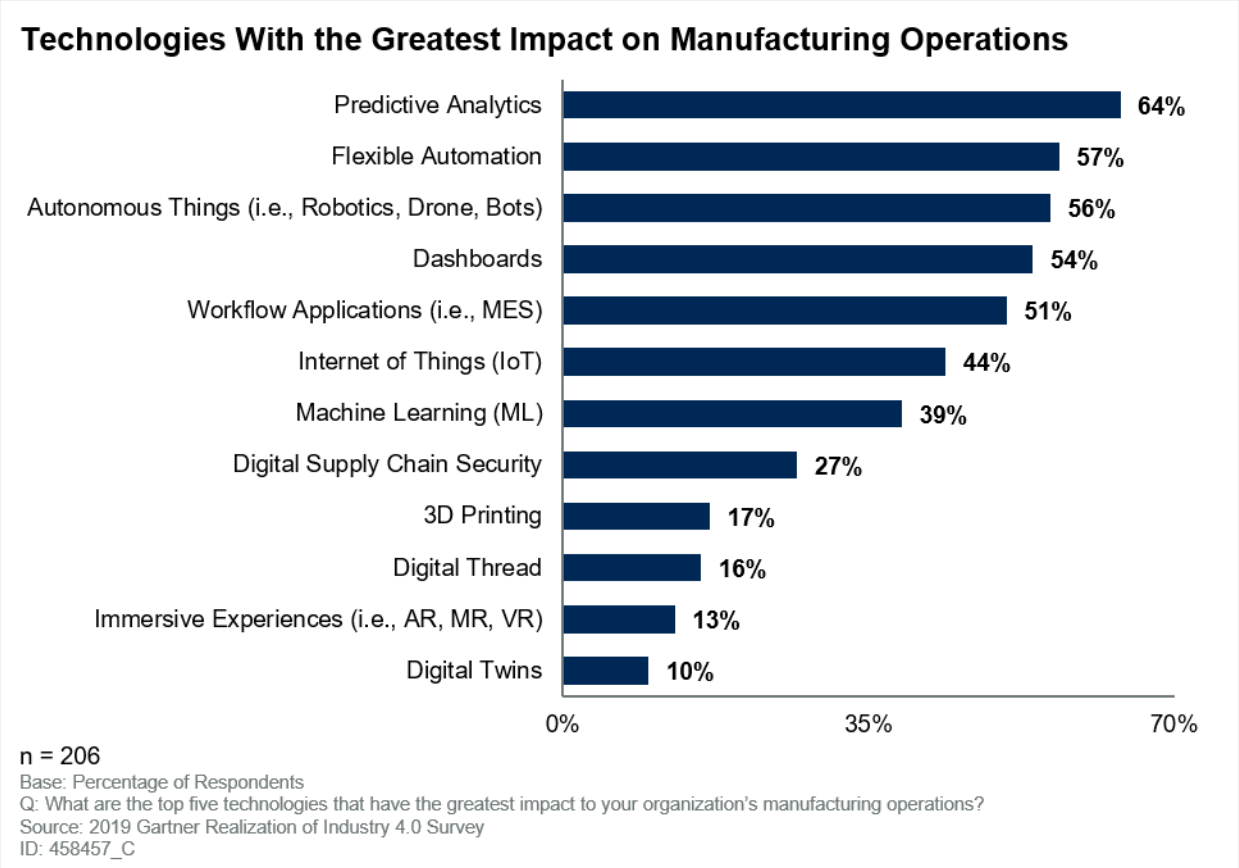


These seven dimensions expand on the established footprint of existing production systems to include organization and talent, technology, the manufacturing network itself — accounting for the different kinds of capacity an enterprise could operate — and operational visibility. The new dimensions are balanced with the existing lean and continuous-improvement-based methodologies, processes and metrics foundations that most organizations have built their existing production systems upon. The next generation of production systems is a substantial opportunity for CSCOs and their teams. Being mindful of the impacts on both the physical and virtual worlds and a "digital-first" mindset should be avoided when developing long-term plans. The predigital foundations require attention — especially standard work, which 21% of survey participants are currently redeploying. This is important, as stability and consistency are essential and should come first. Second should be the application of digital as a tool to transform those processes with a clear understanding of what benefits can be realized and when. This means concurrently developing new people competencies and continuous improvement programs to reduce complexity and ensure consistency at scale.

Develop a Digital Strategy for Manufacturing Operations Built on Contextualized Data and Agile IT Systems

Not all technology investments and pilots are focused on new capacity. In fact, 60% of survey participants are intent on attacking the pressing need to upgrade and modernize existing factories. However, factories are not short on technology. Much of what is deployed today, are complex webs of manual, digital and physical systems of different vintages and sophistications which often differ by site. The data shown in Figure 4 displays the technologies that survey respondents perceive as having the greatest impacts on their manufacturing operations.

Figure 4. Technologies With the Greatest Impact on Manufacturing Operations



It's no surprise that visibility, analytics and control-based technologies are atop the list. These technologies are often at the heart of the substantial backlog of projects that need to be addressed. Also, these technologies are foundational to the success of more advanced digital capabilities in the future. As an example, augmenting these foundational investments with IoT improves the accessibility and accuracy of production data. Factory modernization initiatives require governance CSCOs to closely engage with corporate IT, engineering and factory leadership stakeholders to:

- Develop the prerequisite performance standards within the production system for technology adoption by site. This helps temper the "art of possible" by creating a roadmap that combines upgrading transactional systems for core processes (which consume significant portions of budget and/or capital expenditure) and then the future requirements — to subsequently adopt more complex or advanced technologies.
- Enable repeatable and effective methods to engage operators and factory associates, ensuring adaptation to new tools and ways of working with the least disruption and resistance. This also includes identifying the competencies and training programs required based off of different technologies (see "Industrial Supply Chainnovator 2019: Schneider Electric Wins for Developing Digital Competencies").

- Classify what factory data is needed and when — and for what decisions at a supply chain level. This will help with determining acceptable latency levels between factory and cloud. Be prepared here to spend time architecting the solution to abstract, transform and add context to factory data in order to make it useful (see "Evolve Your Manufacturing Intelligence Strategy to Keep Pace With New Analytics Requirements"). This is foundational for more sophisticated analytics and a proliferated use of sophisticated algorithms and artificial intelligence.
- Identify (through a bimodal approach) which technologies will support the business and technology models needed for competitive differentiation and agility (see Note 4). This will bring new ways of working to light, along with deployment methods for cost-efficient scalability. It will also, given the speed and pace of technology change, help organizations place the right technology bets.

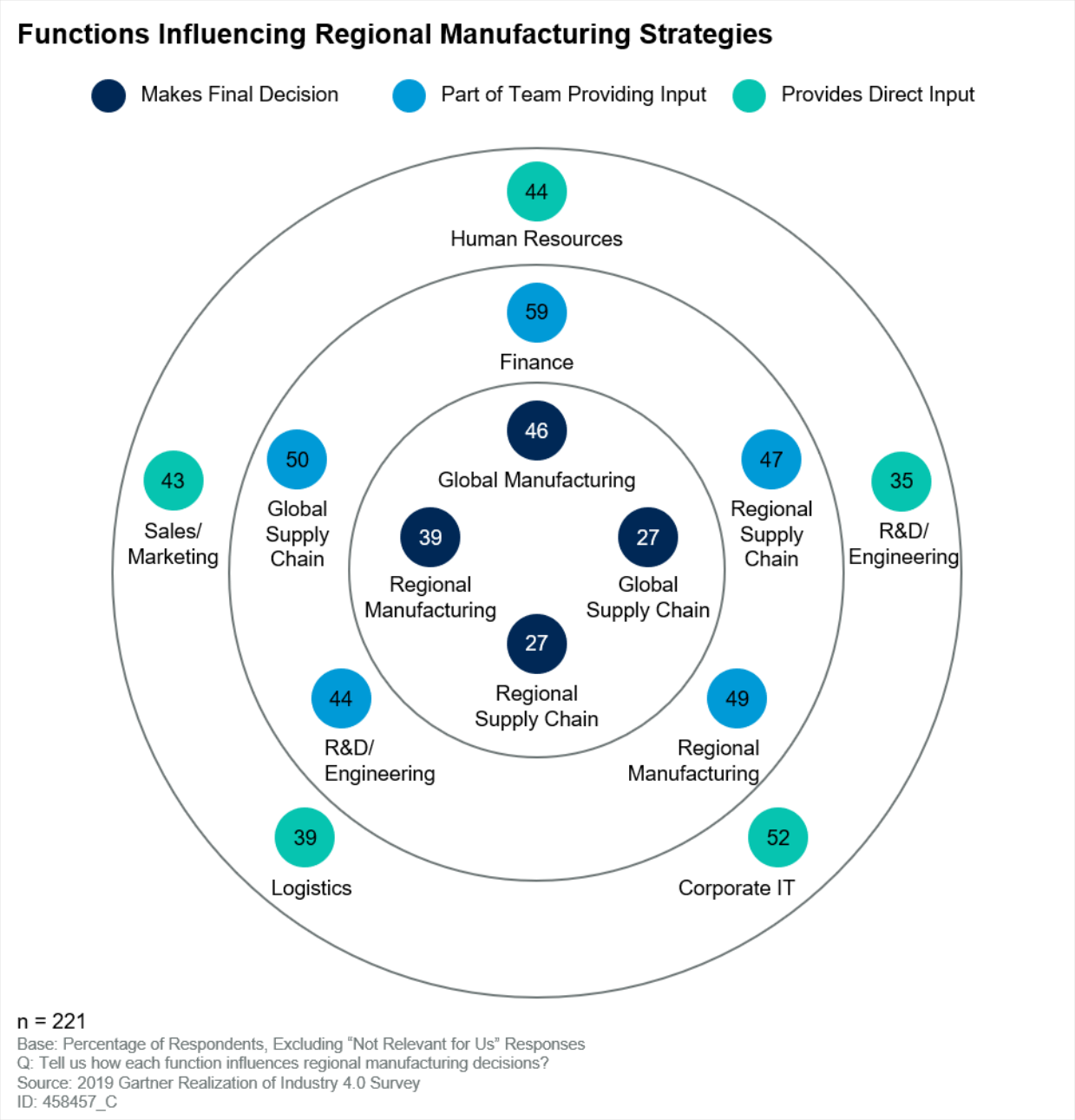
Across all technology projects the major consideration must be speed. Multiyear projects are risky. Careful consideration of agile and platform-based technologies to complement the massive amounts of incumbent, transactional systems is necessary. IoT platforms from Amazon Web Services (AWS), Microsoft Azure IoT, and PTC, for example, provide the tools to develop fit-for-purpose analytics. Siemens Mendix offering and Tulip provide options for low-code application development.

Once use cases are proven and their value is known, they do not consume significant budget to deploy. Instead these "services" are designed to scale rapidly with minimal capital expenditure, making the business and investment easier to justify. An automotive supplier is at the vanguard of this approach and has developed a "catalog" of solutions and services for its global factory network to consume on an as-needed basis. The solutions and services span robotics, manufacturing execution systems (MES), and artificial intelligence (AI) for throughput analysis and visual inspections.

Reshape the Team Making Final Manufacturing Strategy Decisions by Including a Wider Set of Stakeholders Across the Supply Chain and Other Business Functions

Organizational designs might have a hard or dotted-line relationship between the manufacturing function and the supply chain. The supply chain organization might also have a role in setting performance standards too. Appearances can be misleading and create false assumptions. Beyond the organization chart, we find that manufacturing often exists as a support function and acts as an independent organization with objectives set by finance and operations as well. Interviews with CSCOs and their counterparts responsible for executing the manufacturing strategy, point to this being a relationship to tighten. The intensified focus on customer experience, and supply chains offering differentiated services that are built with shorter lead times and smaller, individualized order quantities as part of a digital business strategy mean that the role of manufacturing operations cannot be "assumed." Another assumption is that the end-to-end supply chain goals and objectives are cascaded down to individual factories with frequency and acute clarity. Many manufacturing maturity assessments show that this isn't the case (see "Toolkit: Self-Assess Your Manufacturing Operations Maturity"). Figure 5 shows how different functions impact final decisions for regional manufacturing strategy and that supply chain organizations, whether regional or global, do not have the most robust influence.

Figure 5. Functions Influencing Regional Manufacturing Strategies



The biggest area of opportunity for CSCOs is to incorporate the functions from the outer circle into the team making the decisions. Building these bridges is important. Take into consideration that the organizations are developing direct-to-customer scenarios. The supply chain organization might be engaging sales and logistics in dialogue on inventory and lead times to craft agility and deliver profitable service. Yet, it's unrealistic to expect increased margin contribution and improved competitiveness without manufacturing's involvement in these dialogues so the right trade-offs, that

balance cost and agility, are made based off a clear understanding of all the supply chain capabilities needed (see “A Comprehensive Guide to Direct-to-Consumer Capabilities”).

Equally important is the need to strengthen the relationships with corporate IT and HR. It’s important to engage IT to improve visibility and modernize facilities to be adaptive. HR can help cultivate new digital skills and capabilities in a structured and scalable fashion. This includes training and skills development programs based off of role or technology application.

Widening the set of stakeholders to influence manufacturing strategy decisions, to include those in the outermost ring of Figure 5, can start assuring (with balanced trade-offs in mind) the unlocking and diffusing of greater value out of manufacturing operations in a structured fashion. One manufacturer’s production systems’ template includes its MES. The template has contributed substantial site-level savings (in some instances, over $2 million in savings). Concurrently debottlenecking and digitizing its sites has exposed an estimated 40% to 50% of end-to-end value potential. This has created pull for other functions to rally around the factory, ultimately demanding their participation and alignment, and has improved manufacturing’s impact on top-level growth and performance for the customer.

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

“Supply Chain Brief: Modernize Production Systems to Unlock Manufacturing Operations and Support Agility Imperatives”

“The Agile Supply Chain Imperative: Defining How Companies Can Sense and Respond to Change”

“Video: J&J Manufacturing for the Future — Enhancing Customer Value Through Innovation and Digitalization”

“How Schneider Electric Is Making Its Factories Smarter”

“Understanding the 5 Stages of Gartner’s Maturity Model for Manufacturing Operations”

“Supply Chain’s Path to Agile PLM Starts With Stage Gate”

“A Supply Chain Vision for Driving Cost Optimization Across the Enterprise”

Evidence

In April 2019, SCM World, A Gartner Community, sent out invitations to complete an online survey called Realization of Industry 4.0 to its community members, Gartner clients and to a wider group of practitioners in supply chain and other functions globally. The survey was closed in July 2019, and 221 completed responses were received during the survey period.

The data-driven findings are supported by a series of primary interviews with supply chain leaders responsible for the digital transformation of their organizations’ manufacturing strategy. Other

qualitative data sources come from practitioner presentations from Gartner and industry events, vendor references, Gartner Supply Chain Top 25 briefings, and multiple client inquiries spanning smart factories, smart manufacturing, manufacturing maturity, factory digitization and factory-of-the-future strategies.

Note 1 Sanofi

"Sanofi Opens New Framingham Site Amid $1.6-Bn Bet on Bio-Manufacturing," Boston Business Journal. Subscription required.

Note 2 Smart Factory

"Top 10 Strategic Technology Trends for Manufacturing Industries: Smart Factory"

Note 3 Production Systems

Production systems are a harmonized set of common, core practices and management philosophies that synchronize activities and behaviors across people, processes and technologies. This provides a structure for reliable and profitable product supply in manufacturing operations.

Note 4 Bimodal

Bimodal is the practice of managing two separate but coherent styles of work — both of which are essential to the running of an enterprise. Mode 1 is predictable, improving and renovating in more well-understood areas. Mode 2 is exploratory, experimenting to solve new problems.

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