



The Digital Manufacturer

Resolving the Service Dilemma

James Macaulay

Kathy O'Connell

Chet Namboodri

Kevin Delaney

November 2015

© 2015 Cisco and/or its affiliates. All rights reserved.



Key Insights

In a climate of digital disruption and global market pressures, many manufacturers want to **differentiate with new service-oriented revenue models**, especially those that rely on connected machines and machine-as-a-service. In a Cisco survey of more than 600 senior executives in 13 countries—from both **industrial machine builders and end-user manufacturers**—86 percent said the transition from product-centric to service-oriented revenue models is a core part of their growth strategies.

However, **the transition to service revenue models is not taking place fast enough**. Executives know they need to do it, but they are failing. According to our survey, there is a **disconnect between the size of the opportunity and how much is being captured**—only 29 percent of respondents indicated services would grow faster than products in their firm.

Complexity and a lack of digital capabilities are holding firms back. The top inhibitor to transitioning to a service model is the difficulty of managing a “two-front war”—products and services simultaneously. However, their ability to capture significant value and leapfrog competitors hinges on accelerating to a service model.

To resolve this service dilemma, the services and digital journeys must converge. To unlock the full potential of the service model, while still improving products, industrial machine manufacturers and end-user manufacturers need to **digitally transform their businesses**.

Digital transformation must start with top-down leadership, and requires changes spanning people, process, and technology. With the foundational business process and technology capabilities in place, manufacturers will have greater business **agility** to leapfrog competitors; derive insights that will create organizational **efficiencies** and reduce silos; and build a new customer, partner, and organizational **experience** for the digital age.

Recent economic analysis by Cisco reveals **the payoff** for a \$20 billion manufacturing firm that digitizes **is a profit upside of 12.8 percent over the next three years**, and 19 percent over 10 years.



The Digital Manufacturer

Resolving the Service Dilemma

Introduction

A Climate of Disruption

In many industries today, simply creating a good product is no longer enough. An increasingly critical question for both producers and users is, what happens *after* the product is sold?

As a result, more and more companies are being challenged to move from once-successful product-centric strategies to approaches that are more service-oriented.¹ When successful, the results include significant, new revenue streams; increased customer engagement and delight (not just satisfaction); greater efficiency and cost savings; and value-added offerings. Companies that successfully leverage services are using them to drive disruptive new business models that, in effect, enable them to charge for business outcomes—for performance rather than physical assets.²

Cisco's survey found that 79 percent of senior manufacturing leaders—both industrial machine builders and end-user manufacturers—believe that digital disruption will drive a moderate to major impact at their companies in the next three years. [🐦] That, combined with pressure on manufacturers arising from reduced pools of technical expertise, increased global competition, and market volatility, places any competitive edge at a premium.³ As a result, nearly all manufacturing sectors—including aerospace, automotive, consumer packaged goods, high tech, and industrial machinery—continue to feel an acute need for more expansive service offerings and technology innovations.⁴

Despite an impetus to act that has been brewing for decades, however, only a select few manufacturers have successfully transitioned to service models.⁵ This gap between the desire to create value-added services attached to product offerings and their limited success has persisted for decades.⁶ This *service dilemma* continues today with growing consequences for manufacturers. The strategic challenges of expanding services profitably threaten their previous investments, along with their future competitiveness.⁷ Meantime, there is a rising threat from competitors that innovate faster than they do.

In a report by the Global Center for Digital Business Transformation, an IMD and Cisco initiative (“[Digital Vortex: How Digital Disruption Is Redefining Industries](#)”), nearly four of the top 10 incumbents in each industry were considered vulnerable to digital disruption in the next three years. However, 35 percent of manufacturing respondents did not feel that digital disruption was a board-level concern.⁸ Given the threat of disruption, this lack of concern is clearly a mistake.

About This Study

To better understand the service dilemma and the role of digitization within the manufacturing industry, Cisco initiated a comprehensive research study. We surveyed more than 600 senior manufacturing decision-makers in 13 countries,* from a range of manufacturing-related segments, along with conducting qualitative interviews with key industry thought leaders, in-depth secondary research, and economic analysis. To explore the business and organizational implications of connected machines in particular, we surveyed both industrial machine manufacturers and “end-user” manufacturers.

* Australia, Brazil, Canada, China, France, Germany, India, Italy, Japan, Mexico, South Korea, United Kingdom, United States

The Digital Manufacturer

Resolving the Service Dilemma

If manufacturers need to become digital, they must become software and service businesses as well—that is, if they want to ensure they are not among the ranks of the disrupted. The choice for *all* industrial machine builder and end-user manufacturing leaders should be clear: disrupt themselves or wait to be potentially displaced by more agile competitors and new business models.

Digitization Lays the Foundation for Service-Oriented Revenue Models

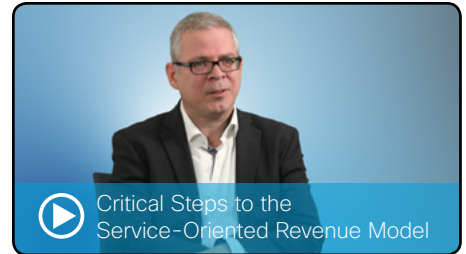
There are multiple perspectives concerning the root causes of the service dilemma facing manufacturers—yet there exist few actionable roadmaps for resolving it.⁹ The clear dependency on digitally connecting products and machines in manufacturers’ service-oriented strategies—along with the increased complexity that they bring—compels the need to consider this transition in a new context: *digital business transformation*.¹⁰

Cisco defines digital business transformation as organizational change through the use of new business models and digital technologies to improve performance.¹¹ It fuels greater and more contextualized insights, and increased speed and agility. These will enable manufacturers to incorporate greater innovation and a shift in perspective regarding the diversity of their service and product offerings, as they increase uptime, reduce time to market, and delight customers with a deeper understanding of their needs.

While manufacturers have made inroads on digital transformation, it is increasingly clear that the digital opportunity is accelerating dramatically faster than their capacity to change.¹² Leaders will need to drive change from the top down; indeed, organizational change is as important as technology change. Capacity to change, therefore, emerges as the key to capitalizing on service-oriented revenues and boosting competitiveness. [Twitter]

As **Figure 1** shows, manufacturing leaders, from both machine builders and end users, made clear they hope to use digital technologies in unleashing the service model.

However, until leaders can operationalize digital business transformation within their firms,

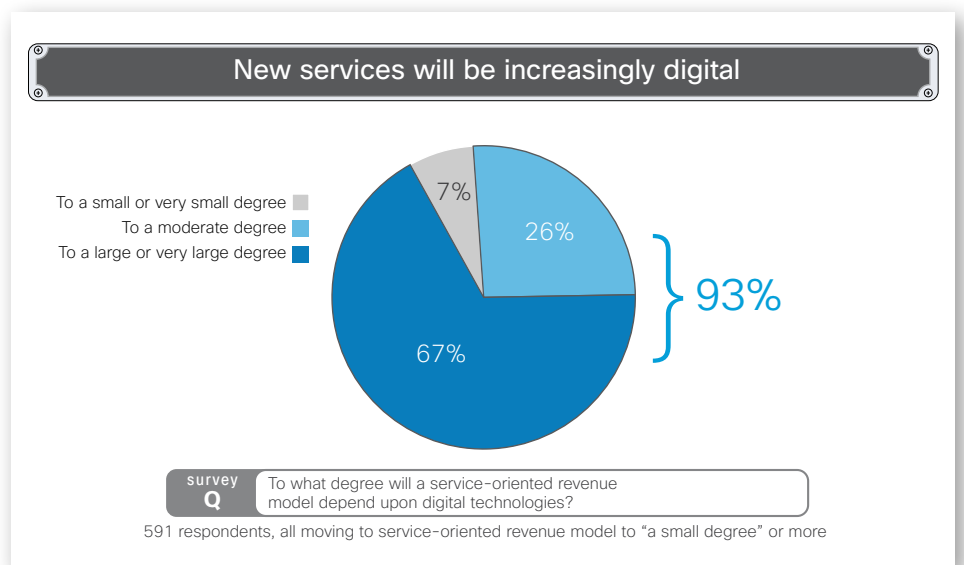


For more insights, please visit <http://cs.co/mfgslama>

Service Dilemma
defined

1. Manufacturers are challenged to improve profitability
2. They invest in new services
3. New services increase complexity
4. Increased complexity creates profitability challenges

Figure 1



Source: Cisco, 2015

The Digital Manufacturer

Resolving the Service Dilemma

the results from service-led innovations, including those that depend upon connected products and connected machines, will continue to disappoint.

In this paper, we will examine the transition to services through the lens of digital business transformation, in the process forging a prescriptive roadmap for business-model and technology innovation for manufacturers.

A ‘Two-Front War’: Selling Products and Services Simultaneously

While manufacturers recognize the need to expand from a product-oriented worldview, venturing into the unfamiliar territories of services creates concerns around complexity, costs, and maintaining quality.

Overall, the transition from products to services is driving what could be called a “two-front war” in manufacturing—in effect, trying to maintain a maturing legacy business while moving into new territory. [Twitter] **Figure 2** speaks to some of the top challenges of managing products and services simultaneously.

At the core of these challenges is the fact that manufacturers are not themselves “technology companies”; yet services (and digital disruption) increasingly demand they must be. As General Electric CEO Jeffrey Immelt has stated, “All companies need to become Internet and software companies. The industrial world is changing dramatically, and those companies that make the best use of data will be the most successful.”¹³ Companies that access, process, and share data across an expanding ecosystem the best will thrive.¹⁴

Gartner, meanwhile, estimates that by 2020, 75 percent of businesses will be digital, or have digital business transformations underway. However, only 30 percent of those efforts will be successful, owing in part to organizational challenges, including a lack of specialized talent and technical expertise.¹⁵

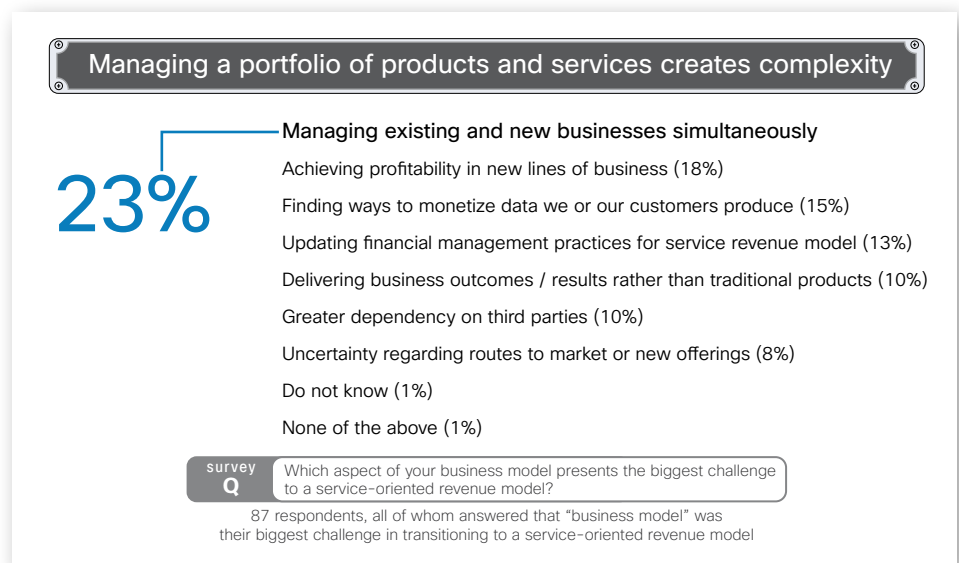
These challenges are clear to our survey respondents. In their eyes, the No. 1 downside of

“It’s a combination of cultural change and preparing the organization for adoption of these new opportunities. On the top management level you have to look at what are the opportunities on a portfolio level, which of these opportunities do I want to focus on? How do I prioritize? How do I fund these ideas?”

Dirk Slama

Director, Business Development,
Bosch Software Innovations

Figure 2



Source: Cisco, 2015

The Digital Manufacturer

Resolving the Service Dilemma

service-oriented revenue models is “complexity in product / service lifecycle management” (34 percent), followed by “greater dependence on third parties” (30 percent). The latter is particularly noteworthy because it highlights the degree to which service models are “ecosystem plays.”

Caution in the face of growing complexity—hence, business risks—has long slowed the transition to services in manufacturing.¹⁶ The most successful manufacturers orchestrate a synergistic ecosystem of partners that can fill capability gaps, create new experiences and insights, and add value to end customers in new ways. However, this is far outside the comfort zone of many manufacturers, who have long relied on their own in-house expertise.

While “strategic fit” and overall market potential are seen as the most important factors in evaluating the transition to services (50 percent and 48 percent of total respondents, respectively, where respondents could choose more than one factor), they were followed closely by considerations about a manufacturer’s capacity to capitalize on the opportunity: workforce readiness (46 percent) and business process readiness (44 percent). As manufacturers contemplate their future strategies, organizational factors and market factors are clearly important considerations.

IT-related challenges centered on a greater need for digital capabilities, such as managing increasing volumes and diversity of data, and leveraging analytics to create new business insights. However, getting data insights to the people (and machines) who need them most can be challenging. As manufacturers must blend IT with operational technology (OT), fragmentation and organizational silos are a growing concern. In one of our interviews, Joe Kann, vice president of global business development at Rockwell Automation, stressed: “IT decision-makers and OT decision-makers frankly don’t have comfortable ways to talk to each other because they have different priorities.” A seamless blend between the two will be essential to future competitiveness.¹⁷

On the next page we illustrate some of the value drivers and business outcomes that arise from digitization.

[Continues on page 8.]



For more insights, please visit
<http://cs.co/mfgkann>

“IT decision-makers and OT decision-makers frankly don’t have comfortable ways to talk to each other because they have different priorities.”

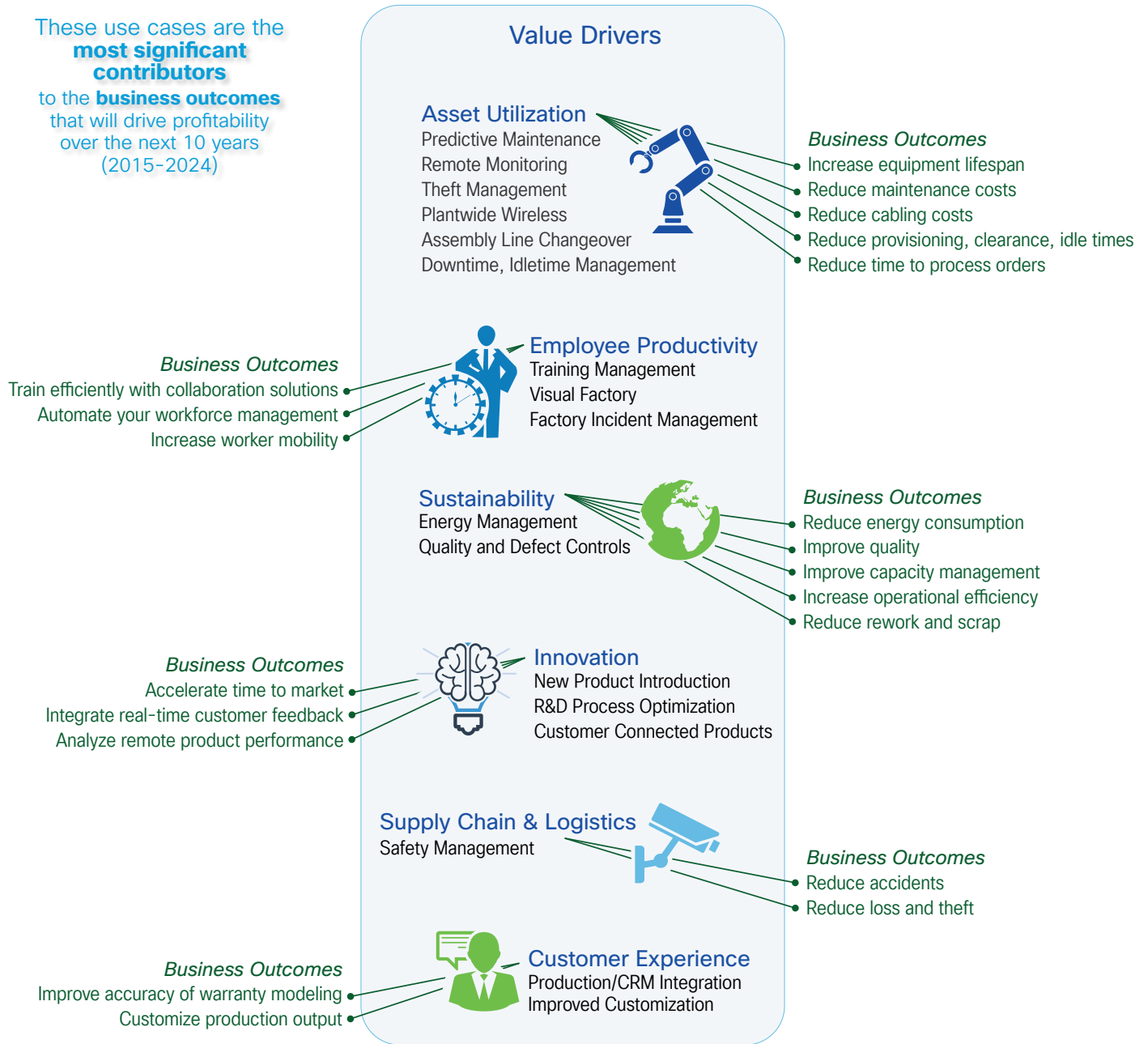
Joe Kann
VP, Global Business Development,
Rockwell Automation

The Digital Manufacturer

Resolving the Service Dilemma

Digitization Enables Significant Business Outcomes

These use cases are the **most significant contributors** to the **business outcomes** that will drive profitability over the next 10 years (2015-2024)



Source: Cisco, 2015

The Digital Manufacturer

Resolving the Service Dilemma

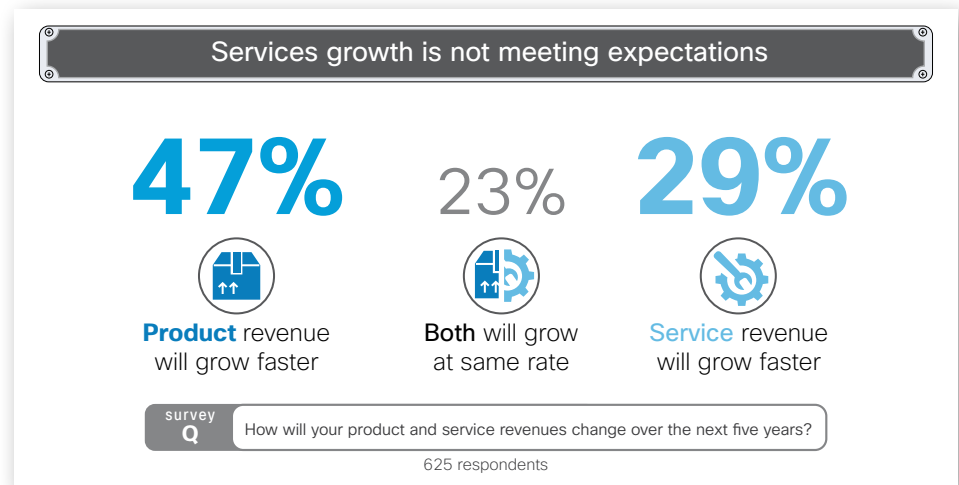
Complexity Continues To Slow Progress

In *The Handbook of Service Innovation* (Springer Publishing, 2015), the authors identify a disconnect between the desire to “servitize” and the current reality. In addition to technology transformation, they stress that manufacturers have underestimated the challenges in driving changes to “strategy, structure, relationships, relationship management, as well as culture.”¹⁸ IDC cites similar organizational challenges for why it projects that only 40 percent of the top 100 discrete manufacturing companies will be providing service platforms by 2018.¹⁹

Since services is starting at a lower revenue base, the opportunity for growth is actually larger than for products. According to our survey, however, there is a gap between the size of the opportunity and how much is being captured—only

29 percent of respondents indicated services will grow faster than products in their firm [🐦] (see [Figure 3](#)). Industrial machine builders and end-user manufacturers agree strongly on their intention to move into services. However, when manufacturers believe that services will not grow faster than products in the short term, it indicates that the complexity of transitioning to a new business model and making the requisite strategic investments is daunting. (For more, see “Regional Insight.”)

Figure 3



Source: Cisco, 2015

Regional Insight

Twice as many firms in Asia Pacific than Europe are transitioning to a service-oriented revenue model for growth. More than half of manufacturers interviewed in Asia Pacific agree to a large or very large degree that their companies plan to grow by transitioning to services (62 percent), compared to 48 percent in the Americas and only 32 percent in Europe.

Accordingly, more Asia-Pacific respondents **expect revenue composition to shift toward services** over the next five years. Fully 40 percent of respondents in Asia Pacific believe services will grow faster than products, higher than their counterparts in the Americas (28 percent) and Europe* (20 percent). Again, Asia Pacific is moving toward services faster than other geographies. Interestingly, developing / developed country economics do not explain the difference: while 33 percent of firms in emerging countries believe services will grow faster, so do 27 percent of those in developed countries surveyed.

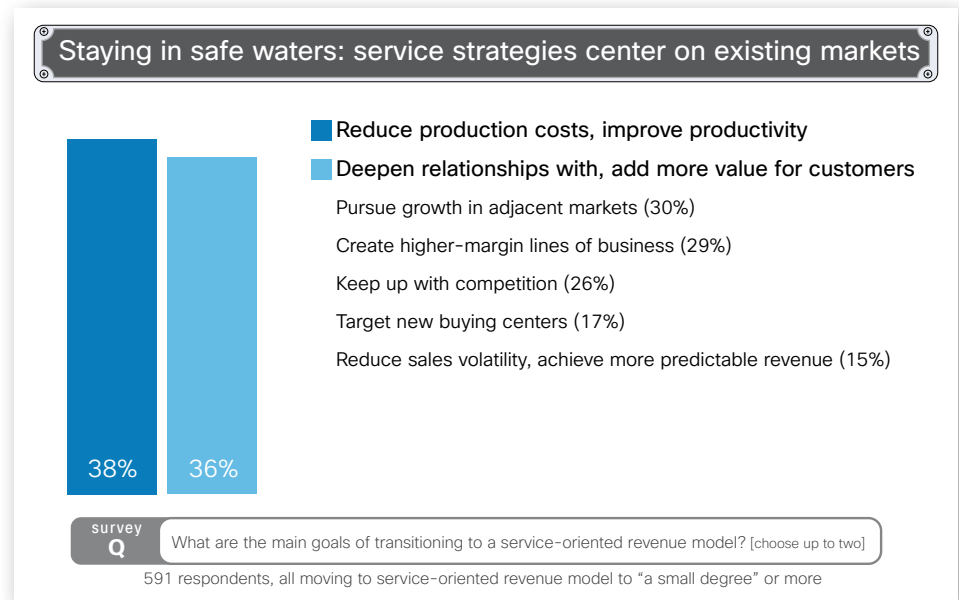
*For this survey, Asia Pacific is defined as India, China, Japan, and South Korea; Europe is Italy, France, Germany, and United Kingdom; and Americas is United States, Brazil, Canada, and Mexico.

The Digital Manufacturer

Resolving the Service Dilemma

Moreover, as **Figure 4** reveals, many manufacturers consider services to be an augmentation of their predominantly product-centric business, rather than a market adjacency unto itself. Conventional wisdom holds that growth is an overriding rationale to the service-oriented revenue model.²⁰ However, the top two goals of industrial manufacturers in pursuing services did not prioritize new growth opportunities, but rather enhancing the current business: improving productivity (38 percent) and deepening relationships with existing customers (36 percent).

Figure 4



Source: Cisco, 2015

The Digital Age Demands Transformation in Technology and Business Models

The promise of services clearly exhibits a powerful pull on manufacturers that want to remain competitive in the digital age. Just as connected products—everything from cars and shoes to home thermostats and refrigerators—are transforming the consumer market²¹ and unleashing new service-oriented business models, connected industrial machines (e.g., plant-floor production equipment) present great opportunities for business-to-business service models.

Rather than simply selling an industrial machine for a one-time fee, for example, industrial machine builders will offer a product that—once connected within the field/plant or, ultimately, across an ecosystem—can be offered as a service in a recurring revenue model. By virtue of being connected, the machine's performance and utilization data will enable new value-added offerings related to predictive maintenance, quality control, plant-floor efficiency, and customer engagement. For example, IBM and National Instruments have collaborated on a cloud-based predictive maintenance solution designed to detect potential problems before they result in downtime; it can be retrofitted to work with older equipment.²²

“Now that digitization, connectivity, and analytics have come together, there will be an explosion in transformational new services offerings....Manufacturers can and should take the technical and organizational steps to aggressively move from a product-focused sales transaction model to a service-focused ongoing relationship model.”

Greg Gorbach


Vice President, Information-Driven Manufacturing, Operations Management, Industrial IoT, ARC Advisory Group

The Digital Manufacturer

Resolving the Service Dilemma

The overall goal is business outcomes; strategy, processes, technology, and organizational changes must all be aligned to address them. As J.B. Wood, author of *B4B: How Technology and Big Data Are Reinventing the Customer-Supplier Relationship*, told Cisco in the context of the IT services segment:

“There’s going to be a big reinvention, in my view, of who does what in the value chain between the potential capabilities of a piece of technology and the business outcomes that the customers want to get. And there are a lot of players in that value chain: there’s the OEM who builds the technology; there might be a channel partner or a service provider; there’s certainly the CIO and the IT department; and there’s the business users themselves. And all of them work together to try to translate a potential technical advantage into a real business outcome.”²³

To move closer toward the alignment of which Wood speaks—and to resolve the service dilemma facing manufacturers—leaders must drive an organization-wide rethink in strategy. In its 2013 report on manufacturing transformation, Oxford Economics reported that more than half of its 300 survey respondents had hit a wall in wringing savings from their manufacturing operations via traditional methods. Among other strategies, many were looking to extend basic maintenance and repair services across the product lifespan, seeking a key competitive differentiator and driver of new revenue.²⁴

Rolls-Royce Holdings, a pioneer in this area, provides an illustrative example of the service-oriented revenue model in action. The company, the second-largest manufacturer of aircraft engines, has leveraged its expertise in maintaining and repairing jet engines, while leaving the airlines to their own specialty: flying. In an outcome-based model, Rolls-Royce is paid for continuous uptime, rather than waiting to fix engines once they falter.²⁵ A key component of this business model is that Rolls-Royce draws more added revenue when the airlines themselves succeed—not when their planes are grounded. As one analyst remarked about Rolls-Royce’s TotalCare service, “They aren’t selling engines, they are selling hot air out the back of an engine.”²⁶

Other such outcomes could include machine uptime on factory floors, energy savings in commercial buildings, or crop yields on farmland. All will demand greater cooperation and connectivity across expanded ecosystems, as data is captured, processed, and shared in new ways.²⁷ Such outcome-based strategies can also deepen the customer relationship, given the level of insight into the end users’ real-time challenges.²⁸

Asset Utilization (example use case)



FANUC

FANUC makes industrial robots for manufacturing companies. In the past, it shipped robots out but had no feedback about robot usage unless there was a problem and downtime. By building a highly secure hybrid cloud to extend its existing data center to customers’ premises, FANUC can now extract data from its robots and connect them with people, processes, and things. FANUC can analyze the data to gain visibility into robot performance, thereby predicting an issue, rather than reacting to a problem. Moreover, such data insights contribute to reduced cycle times, enhanced product quality, and improved efficiency of processes.

[\[learn more\]](#)

“One challenge is on the technology side, making sure that the right infrastructure is provided. The second challenge I would see is again, more on the organizational level, to make sure that you somehow help your organization move towards these new business models.”

Dirk Slama

Director, Business Development,
Bosch Software Innovations

The Digital Manufacturer

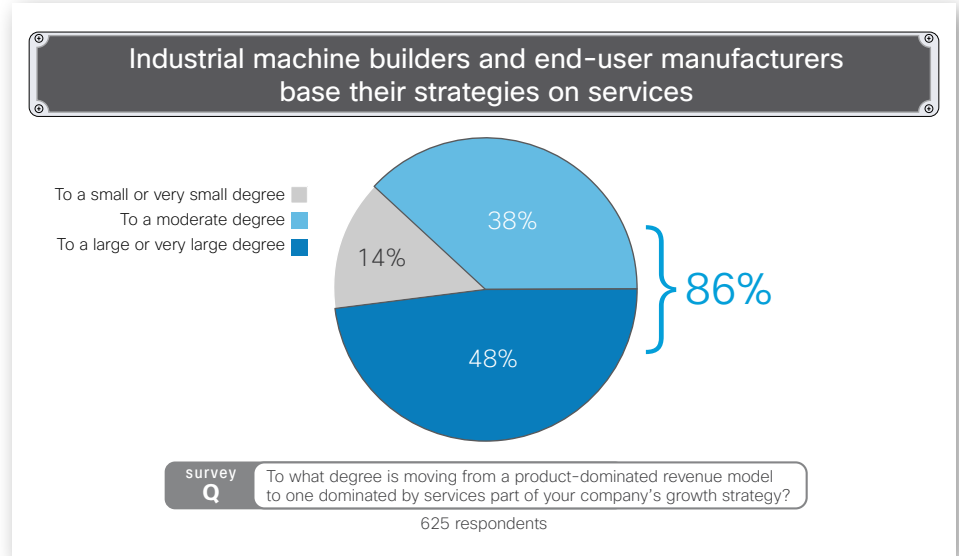
Resolving the Service Dilemma

Our survey confirmed that the transition to a service-oriented revenue model is top-of-mind for industrial machine builder and end-user manufacturing executives. As **Figure 5** illustrates, 86 percent said the transition from products to a service-oriented revenue model is already part of their growth strategies; 48 percent indicated it was part of their strategies “to a large or very large degree.”

Digital Capabilities Are Core to Success

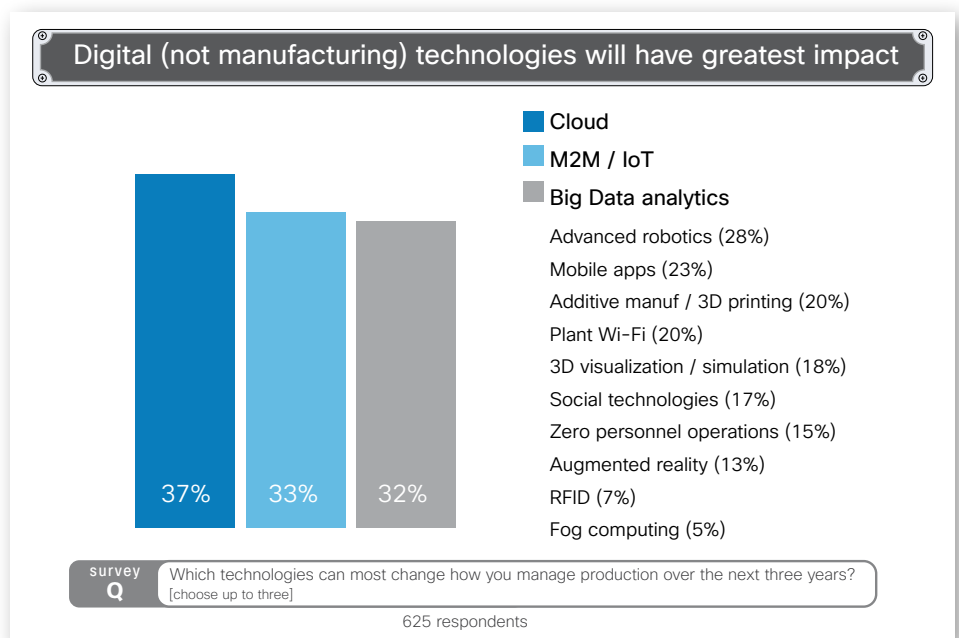
When we asked manufacturers about which technologies will have the greatest impact on production over the next three years, they cited digital technologies such as cloud (37 percent), Internet of Things-related machine-to-machine (M2M) communications (33 percent), and analytics (32 percent) (see **Figure 6**). This is notable in part because of what respondents did not emphasize: “manufacturing” technologies such as robotics, 3D printing, and so forth. It underscores the pivotal role of digitization in manufacturing’s evolution, especially as connecting across an entire ecosystem becomes critical.

Figure 5



Source: Cisco, 2015

Figure 6



Source: Cisco, 2015

The Digital Manufacturer

Resolving the Service Dilemma

Connected Machines: Data-Driven, Networked, and Ever Smarter

To further explore what is possible for manufacturers, we examined the impact of one particularly mature use case: connected machines on the plant floor.

Connected machines can come in several different forms—monitoring devices in-house, monitoring devices by a third-party, or a new conception: “machine-as-a-service” (MaaS), in which the end-user manufacturer (that is, the customer) pays for a business outcome (e.g., better uptime, improved production efficiency) as an operating expense, rather than buying a physical machine as a capital investment (per our previous example of Rolls-Royce).

Connected machines on the plant floor are especially relevant here because they provide us with a “dual window”: first, they illustrate how a manufacturing segment (i.e., machine builders) can convert its core offering to services; second, they underscore the fact that end-user manufacturers must transform on a fundamental level to capitalize on their benefits.

The digital capabilities our respondents considered most important to transformation (cloud, M2M/IoT, and data analytics) also will enable connected machines to reach their greatest potential. When asked which technologies are most critical in getting value (and creating value for customers) from connected machines, number one was analytics (31 percent). This was significantly higher than the next most important technology, connected machine sensors. The importance placed on analytics, even over the foundational sensor technology itself, underscores just how vital analytics is to services going forward.

Indeed, the reams of data generated by those machines will be useless unless they are transformed into insight. That is, real-time insight that can be accessed when and where it is needed, securely, beyond the plant floor and throughout the ecosystem. Without digitization, insight cannot be leveraged to create the new applications that will drive quality, energy efficiency, customer engagement, predictive maintenance, and other outcomes critical to future competitiveness (see [Figure 7](#)).



For more insights, please visit <http://cs.co/mfglittlefield>

“For end users there are a number of benefits when they get to procure products as a service rather than as an asset. The number one is the switch in business model, so being able to move from CapEx to OpEx frees up a lot of capital for other uses. It’s a more efficient use of capital and can improve cash flow.”

Matt Littlefield
President and Principal Analyst,
LNS Research

Figure 7



Source: Cisco, 2015

The Digital Manufacturer

Resolving the Service Dilemma

In our survey, we found that the “connected production machines” use case is a highly mature opportunity for machine builders, with 33 percent already receiving telemetry from customers’ plant environments, and another 56 percent planning to do so. Only 6 percent of machine builders have no such plans. Of those already receiving telemetry from their customers’ plant-floor machines, 54 percent strongly agree with the statement “Our company gets a lot of value from the data we receive from the machines we sell to customers” (another 36 percent somewhat agree).

The machine-as-a-service model for connected plant-floor equipment was also seen in a highly positive light for machine builders, with 48 percent considering themselves “very interested” in such an arrangement, and another 36 percent “fairly interested,” with 4 percent indicating they are already experimenting with this new consumption approach. (For more, see “Regional Insight.”)

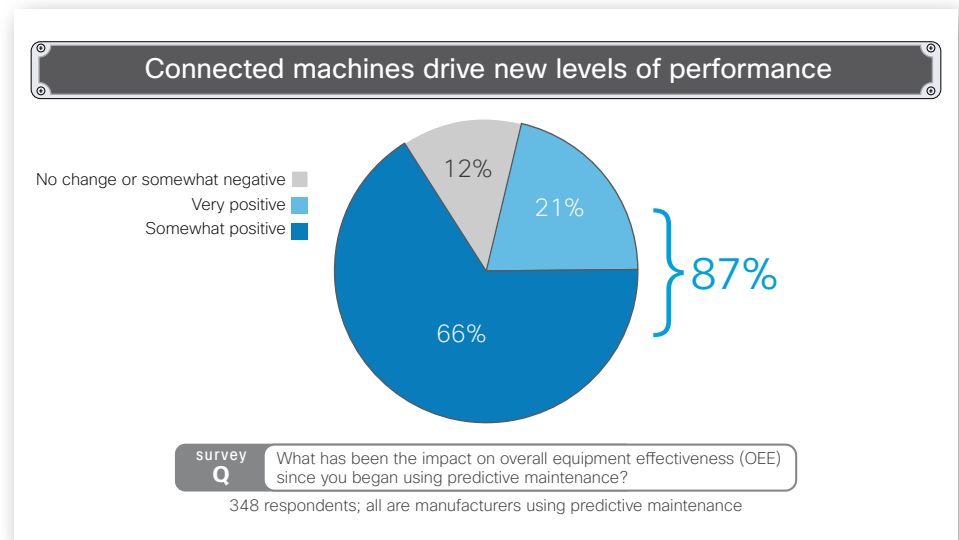
Predictive maintenance is a critical application enabled by connected machines and data analytics. It enables workforces to maintain the machines that need their attention most, anticipating breakdowns *before* they cause downtime.²⁹ In an industry in which overall equipment effectiveness (OEE) metrics typically hover around 60 percent, such improvements promise true competitive differentiation.³⁰ This may explain why predictive analytics scored highest in a Cambridge University study of technology trends leading toward servitization.³¹ Meanwhile, Flex, the Singapore-based technology manufacturer, has leveraged predictive maintenance to help drive a 35 percent reduction in quality defects.³²

Among end-user manufacturers that have access to predictive maintenance via connected machines, the responses in regard to its impact on overall equipment effectiveness were overwhelmingly favorable, highlighting the key importance of digital technologies in maintaining uptime (see [Figure 8](#)).

Regional Insight

The machine-as-a-service model (MaaS) for connected plant-floor equipment was seen in a highly positive light by end-user manufacturers in Asia Pacific. Interest there was higher (89 percent “fairly” or “very” interested) than in the Americas (85 percent) and Europe (76 percent). The primary benefits of MaaS for Asian manufacturers were quality improvement (41 percent) and operational efficiencies (40 percent).

Figure 8



Source: Cisco, 2015

The Digital Manufacturer

Resolving the Service Dilemma

The Payoff

The financial opportunity that awaits innovative manufacturers is substantial, especially considering that many have not yet captured their share through digitization. Cisco's 2015 Digital Value at Stake economic analysis projects the payoff for a \$20 billion manufacturing firm that digitizes is a profit upside of 12.8 percent over the next three years, and 19 percent over 10 years. Cisco defines Digital Value at Stake as the potential bottom-line value that can be created, or that will migrate among companies and industries, based on the ability to harness digital capabilities over the next decade. For the manufacturing industry, these predictions are partly rooted in part on the digitally enabled value drivers shown on page 7.

This value will be driven by such factors as connected machine and product innovations, IT/OT convergence, reduced machine and plant downtime, improved production agility, and enhanced overall supply chain visibility.

We project \$383 billion of the total industry opportunity over the next 10 years will come from connected products, connected machines, and new service models. However, economic analysis also reveals a significant disconnect in manufacturers' ability to adopt and apply the new technologies, and to realize that value, with manufacturers leaving 76 percent of the total annual opportunity on the table. [!\[\]\(0f848bbd71cef6b345273b16f905912a_img.jpg\)](#)

Asset Utilization (example use case)



Sub-Zero

Sub-Zero, a U.S.-based maker of premium cooking products, securely connected remote engineers, development teams, and experts to finalize designs, correct production-line issues, and train technicians. By using video and voice capabilities to connect the plant floor, the office, suppliers, and partners, Sub-Zero estimates internal cost savings of \$2500 per production line each hour, with a direct 5-10 percent reduction in downtime related to design and manufacturing issues.

[\[learn more\]](#)

A New Model for IT and Security

The transition to services is, above all, a *digital* journey. [!\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#) To be truly effective in enabling new service-oriented business models, digital business transformation must span the core elements of the organization: process, technology, and organization.

Organizations must first start with a foundation of agile and secure technology architectures. Unfortunately, too many IT departments are hamstrung by complexity. They spend a paralyzing amount of time, energy, and money simply "keeping the lights on"—maintaining existing systems rather than driving innovation. As Cisco revealed in its 2014 [research on IT](#), this situation demands a new model of enabling digital architectures.

Such automated, agile IT simplifies operations at a time when complexity is mounting. For manufacturers, this can support connected machines and machine-as-a-service while freeing the IT organization from manual configuration, changes, and maintenance.

Moreover, security evolves to a platform-driven approach in which visibility is improved across the entire network—not just on a piecemeal, device-by-device basis—to enable protection before, during, and after attacks. As large volumes of data move beyond the plant floor and across an expanding ecosystem, platform-based security will become ever more critical. Regardless of whether manufacturers are expanding analytics capabilities or protecting a complex network from cyberattacks, agile, automated, and *secure* IT architectures will be an essential component of success.

The Digital Manufacturer

Resolving the Service Dilemma

Key Capabilities of the Digital Manufacturer

To unlock the full potential of the digital opportunity, manufacturers will need to go further in converging services with digitization. This will require holistic organizational and technological change, what we call digital business transformation. It is up to manufacturing leaders to drive the convergence between the already existing services organization and digitization. In short, where the services journey and the digital journey meet, value is found. [Twitter]

To fully digitize the organization and capture the full potential of service value requires building three foundational capabilities: hyperawareness, informed decision-making, and fast execution.

Hyperawareness is an organizational capability to recognize real-time insights and future trends. A critical component of hyperawareness is the ability to see first-hand how products and services are being used in practice. To attain hyperawareness, digital tools—including social networks, connected devices, and analytics—must act in concert to constantly monitor and share critical information, which in the case of manufacturing could be directly from the factory floor.

Those connected industrial machines will be collecting critical and relevant data. Too often, however, organizations fail to act on data insights. *Informed decision-making* is the capability to actively analyze information that arrives through hyperawareness and ensure that it reaches those who need it most. Informed decision-making requires a technology foundation that includes knowledge-management systems to organize insights, collaboration systems to facilitate remote conversations, dashboards to display relevant information, and analytics systems to provide evidence-based insights.

Those informed decisions must be turned into action (predictive maintenance when a plant-floor machine shows early signs of fatigue, for example). Having an organizational culture that encourages experimentation and tolerates failure is central to *fast execution*, but bureaucracy and organizational silos can undermine it. Digital capabilities encourage action at all levels of the company hierarchy.³³

Where Do I Start?

The business challenges confronting manufacturers in the transition to a service-oriented business model are diverse, but consistent themes emerged

“What’s maybe not always talked about so openly, it also means that in the beginning you might actually take a hit in revenues because you basically go from up-front product sales to a subscription base. You lower revenues. Then, of course, you gradually build up these revenues again, but that’s a fairly critical transformation for an organization on the revenue management side of things.”

Dirk Slama

Director, Business Development,
Bosch Software Innovations

Sustainability
(example use case)



Benteler

Based in Germany, Benteler supplies safety, environmental, and efficiency solutions to vehicle manufacturers worldwide. In Benteler’s automated, self-running manufacturing plants, every tool and part is connected to the network, and every step in the production process can be analyzed and controlled from the cloud. Factories can easily move production lines and products from one line to another. The modular solution will result in more agile and efficient factory floors while controlling costs.

[\[learn more\]](#)

The Digital Manufacturer

Resolving the Service Dilemma

in our research, including concerns about their business models, organizational structure, workforce, business processes, IT capabilities, offerings, and customer experience.

The scope of the challenges also speaks to the degree of change required for manufacturers to move forward. Moreover, the challenges are interrelated. For example, a shift in pricing models—from a transactional product sale to outcome-based business models—will be critical. [Twitter] However, business-model change depends upon organizational change, which demands that the workforce evolves in training, culture, and collaboration, all of which must be underpinned by a new model for IT, and so forth.

In short, these varied challenges cannot be tackled with piecemeal solutions. They will demand organizational transformation on a large scale, the re-engineering of business processes, along with a new foundation of holistic, end-to-end digital capabilities. By turning physical assets such as industrial machines into secure digital assets, manufacturers will rise to a new paradigm in which simplification enables new strategic outcomes; automation creates more flexible assets; analytics drives opportunities for machine learning and adaptability; and insight enables rapid and continuous innovation.

Transformation can be disruptive, and according to the Global Center for Digital Business Transformation, only 25 percent of cross-industry respondents described their approach to digital disruption as proactive—willing to disrupt themselves in order to compete.³⁴ The digital age is littered with the remains of companies that never expected to be disrupted, but were—often by players they did not even view as competitors, until it was too late.³⁵

Jeffrey Immelt of GE has summed up the opportunity for manufacturers—and how it could be missed: “If you think about today, 15 percent or 20 percent of the S&P 500 valuation is consumer Internet stocks that didn’t exist 15 or 20 years ago. When you look at retailers, banks, consumer-product companies, they got none of that. If you look out 10 or 15 years and say that same value is going to be created in the industrial Internet, do you as an industrial company want to sit there and say, ‘I don’t want any of that. I’m going to let a newco or some other company get all that?’”³⁶

For many manufacturing leaders, budgets are flat and additional technology investments can appear daunting. Digital transformation, however, requires a “save to invest” strategy. [Twitter] Increases in plant uptime, business agility, and customer engagement will offset initial costs. For example, Cisco research on enabling digital architectures found that such investments would drive



For more insights, please visit <http://cs.co/mfgbolton>

“When you look at digitalization, if we can fully leverage the benefits of digitalization and IoT, all the way from core manufacturing out to that end-user experience, the opportunities are exponential because we can better use all of those services, all of that data.”

Tony Bolton
CIO, Global Telecommunications,
General Motors

Asset Utilization (example use case)



Mazak

Japan-based Mazak, a global leader in the design and manufacture of machine tools, is using analytics and connected machines to improve overall equipment utilization. Mazak and customers are fully aware of program stops, feed holds, spindle overrides, tool changes, and other reasons a machine is idle. By analyzing this data, manufacturing personnel can identify and easily fix downtime-related inefficiencies to improve overall equipment utilization.

The Digital Manufacturer

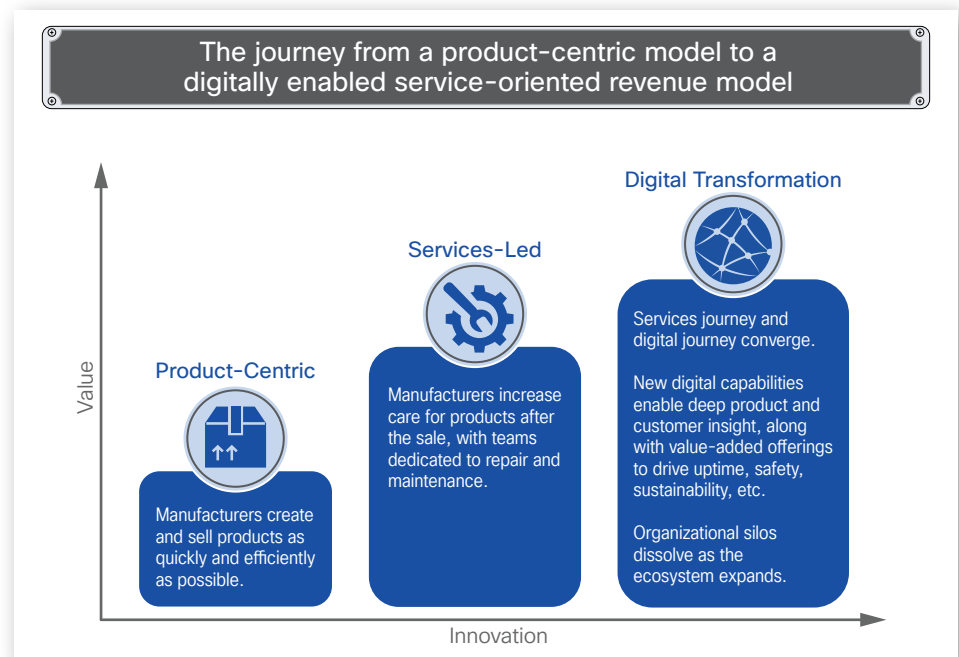
Resolving the Service Dilemma

20 percent savings on IT costs, which could be deployed elsewhere in the business.³⁷ As we have seen in this study, a \$20 billion digital manufacturer can drive a 19 percent profit gain projected over 10 years. [🐦] The real cost lies in not digitizing.

When considering the journey from a product-centric model to a digitally enabled service-oriented revenue model (see Figure 9), the questions executives need to ask themselves are: Do I have the courage to change my business model? Now that I know the potential value I could achieve for my shareholders and provide to my customers, do I want to sit back because I believe it's too difficult or risky to achieve? Do I want to see my competitor next door or in another region capture value that I missed?

For those who are ready to act, we have outlined three areas in which they should start to reimagine their organizations and overcome the service dilemma:

Figure 9



Source: Cisco, 2015

Build a Hyperaware Organization: To implement competitive new business models, manufacturers will need agile IT architectures, hyperaware analytics, and overall business agility. That is, if they are to respond to customers and end users in real time, while ensuring quality and uptime with unprecedented standards of excellence. Security must be built-in at every step, across the entire network, not simply added on an app-by-app basis.

Make Informed Decisions: Manufacturers need to treat analytics as a core capability. All of that data generated by new connections will need to be transformed into *insight*.³⁸ Manufacturers need to move from making machines to generating value by gaining insights from data. This transition is in itself a complex area to navigate and has multiple organizational implications, including talent management. For example, the application of Big Data in manufacturing will reduce the number of workers specializing in quality control, while increasing demand for industrial data scientists.

The Digital Manufacturer

Resolving the Service Dilemma

In the digital age, no one goes it alone. Data insights will need to be shared *securely* across an expanding ecosystem of partners, customers, and third-party vendors. Manufacturers need to move from segmenting markets by industry sector to looking at markets in terms of the customer circumstances and “jobs-to-be-done.” They then need to figure out the best ecosystem approach, including when to build, buy, or partner. Manufacturers will need a new model to orchestrate that dynamic ecosystem and derive insights from data mined from far-flung sources. This will require foundational business and IT capabilities. In short, if manufacturers don’t first transform, they will fall far short in their efforts to become innovative, agile ecosystem players.

Execute Fast: The process of changing business models is a highly complex endeavor that cannot be achieved by facing these challenges on a piecemeal basis. Industrial machine builder and end-user manufacturer leaders will need to shift perspective from building organizations known only for reliability to organizations that are known for speed and agility, and underpinned by data analytics.³⁹ Each firm will need the business process and technology foundation to drive business agility; this will in turn enable innovation and business-model change while breaking down silos between IT/OT and engineering/services. Organization-wide digital business transformation—powered by the right technology foundation—will enable the speed and business agility that allow firms to meet these challenges and outpace their competition.

Once these capabilities are in place, manufacturers will think differently about their customer offerings and move toward a large portfolio of solutions rather than continue to make traditional investments. They must challenge the assumptions that have underpinned prior success, and stress-test the ways in which they deliver value to customers. In this environment, players that drive digital business transformation the deepest will be the ones that innovate new solutions faster than their rivals, both new and old. By digitizing their business, manufacturers will eliminate barriers that now exist among industry segments while creating the new value chains and business opportunities that traditional organizations cannot offer.

A Digital Revolution in Manufacturing

Without looking at the transition to service-oriented business models through the lens of digital business transformation, firms will continue to falter. While technology change is critical, it must be undertaken in concert with re-



For more insights, please visit <http://cs.co/mfgschneider>

“We can give feedback to customers proactively: how to save energy in terms of the operations of their machines, how to make the machine last longer, how to reduce cycle time, so it gives us a whole new set of business opportunities that we can offer to customers to really improve their performance and our ability to support them as a customer.”

Rick Schneider
CEO, FANUC Robotics, Americas

The Digital Manufacturer

Resolving the Service Dilemma

engineering business processes. This will demand consistent policy and company culture, driven by top-down leadership from the C-suite and the board of directors.⁴⁰

Organizations that have been taking a wait-and-see approach, or an evolutionary rather than revolutionary approach, will lag. Those that transform digitally and organizationally will experience a new era of innovation and competition, with concrete gains in quality, uptime, safety, energy savings, and customer engagement, to name a few benefits—along with the aforementioned 19 percent profit gain projected over 10 years.

With foundational business process and technology capabilities in place, manufacturers will have greater business agility to leapfrog competitors; derive insights that will create organizational efficiencies and reduce silos; and build a new customer, partner, and organizational experience for the digital age.

The service-oriented revenue model has captured the interest of manufacturers for years. It is time, in turn, for industrial machine builders and end-user manufacturers to begin capturing *value*, instead of interest. [🐦] By driving organization-wide digital business transformation, the winners will leave the service dilemma—and their competitors—behind.

1. "Services, Not Manufacturing, Will Revive the U.S. Economy," *Forbes*, April 2012
2. "Bringing Production and Services Together," *Sunday Times Magazine*, January 2014
3. "Out of Inventory: Skills Shortage Threatened Growth for U.S. Manufacturers," Accenture, The Manufacturing Institute, 2014
4. "The Internet of Things: Mapping the Value Beyond the Hype," McKinsey Global Institute, June 2015
5. "The Ubiquity Shift: Smart Systems Disruption," Harbor Research, 2013
6. "Overcoming the Service Paradox in Manufacturing," *European Management Journal*, December 2004
7. *The Handbook of Service Innovation*, p. 410, Agarwal, R., Selen, W., Roos, G., Green, R. (Eds.), Springer Publishing, 2015
8. "Digital Vortex: How Digital Disruption Is Remaking Industries," Global Center for Digital Business Transformation, June 2015
9. "Manufacturing Transformation: Achieving Competitive Advantage in a Changing Global Marketplace," Oxford Economics, June 2013
10. "Digital Business Transformation: Disrupt To Win," Cisco, June 2015
11. "Digital Business Transformation: A Conceptual Framework," Global Center for Digital Business Transformation, June 2015
12. "The Third Industrial Revolution," *The Economist*, April 2012
13. "GE CEO Says Software, Analytics Are Path To Zero Unplanned Downtime," *GE Automation News*, October 2014
14. "Seven Ways CEOs Can Apply Digital Business for Competitive Advantage," Gartner, June 2015
15. "Gartner: Top 10 Strategic Predictions for 2015 & Beyond," Gartner, October 2014
16. "Factors Influencing Service Complexity: The Perspective of Servitized Manufacturers," University of Cambridge, Cambridge Services Alliance, October 2012
17. In Cisco's 2015 study of the oil and gas industry, alignment between IT and OT was also seen as a key concern. Fifty-nine percent of survey respondents did not believe that their firms' IT and OT strategies were closely aligned.
18. *The Handbook of Service Innovation*, p. 410, Agarwal, R., Selen, W., Roos, G., Green, R. (Eds.), Springer Publishing, 2015

Sustainability (example use case)



Harley-Davidson

Harley-Davidson, the only major U.S.-based motorcycle manufacturer, rethought its core processes and implemented an agile network that supported wireless and connected factory solutions for mobile access to data and communications within the plant. Troubleshooting problems now takes seconds instead of hours or days. The company improved built-to-order cycle times by 25 percent and reduced product-introduction cycles by months.

[[learn more](#)]

Learn more about your opportunity with digital transformation

Let us assess your organization's connections between people, process, data, and things. We will identify your Digital Value at Stake and include a detailed view of your results that show which digital capabilities drive the most value for your business.

Start by taking the [assessment](#) today.

The Digital Manufacturer

Resolving the Service Dilemma

19. "The Rise of Product-as-a-Service in Manufacturing and Some of the Technology Impacts," IDC Community, December 2014
20. "Sustainability and Growth: the Impact of Servitization," The Manufacturer, Vol. 16, Issue 10, December/January 2013
21. "How Smart Connected Products Are Transforming Competition," Harvard Business Review, November 2014
22. "Predictive Maintenance: Teaching Old Machines New Tricks," RTInsights, August 2015
23. "Fast IT: Accelerating Innovation in the Internet of Everything Age," Cisco, 2014
24. "Manufacturing Transformation: Achieving Competitive Advantage in a Changing Global Marketplace," Oxford Economics, 2013
25. "The Rolls Royce of Effective Performance-Based Collaboration," Maintenance Technology, June 2012
26. "Rolls-Royce: Britain's Lonely High Flyer," The Economist, January 2009
27. "Industrial Internet Report," World Economic Forum
28. "Business Growth and Servitization," The Manufacturer, May 2015
29. "GE Says Internet Connected Machines Are no Threat to Human Workers," VentureBeat, October 2013
30. "Overall Equipment Effectiveness," Maintenance Assistance, 2015
31. "The Future of Servitization: Technologies that Will Make a Difference," University of Cambridge, June 2015
32. Cisco, 2015
33. "The Future of Servitization: Technologies that Will Make a Difference," University of Cambridge, June 2015
34. "Digital Vortex: How Digital Disruption Is Remaking Industries," Global Center for Digital Business Transformation, June 2015
35. Ibid.
36. "GE's Jeff Immelt on Digitizing in the Industrial Space," McKinsey & Company October 2015
37. "Fast IT: Accelerating Innovation in the Internet of Everything Age," Cisco, 2014
38. "Ten Ways Big Data is Revolutionizing Manufacturing" Forbes, November 2014
39. "A New Go-To-Market Model for the Industrial Internet," Industry Week, October 2015
40. "Take Digital to the Core: Harness Three Forces To Win in Digital Business," Gartner, September 2015

Acknowledgements

The authors gratefully acknowledge the important contributions of the following people to the development of this paper: Caroline Ahlquist, Kevin Bandy, Joel Barbier, Lauren Buckalew, Scott Fields, Cheri Goodman, Inbar Lasser-Raab, Bob Moriarty, Bill Radtke, Mike Riegel, Bryan Tanzen, and Virgil Vidal.



Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.



Cisco and the Cisco Logo are trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and other countries. A listing of Cisco's trademarks can be found at www.cisco.com/go/trademarks. Third party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1005R)