



Manufacturing Transformation

Achieving competitive advantage
in a changing global marketplace

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Introduction

Manufacturers around the globe are undergoing a profound transformation. External market shifts and technological changes are reshaping the competitive landscape for manufacturing firms, ushering in a new era of growth, change, and economic opportunity.

Competitiveness hinges on transformation to respond to market shifts and technology trends—the goal is to make better things while also making things better.

We surveyed over 300 global executives to analyze the ramifications of these changes for manufacturers. The survey and a series of related interviews with market leaders show that competitiveness hinges on transformation to respond to market shifts and technology trends. The goal is not only to “make better things”—creating products and services that meet customer needs and are truly innovative and distinct—but also to “make things better,” facilitating the engineering, service planning and execution, management and production processes through which innovation can evolve from conception to retirement, and creating a closed feedback loop to ensure continual improvement and alignment across the business.

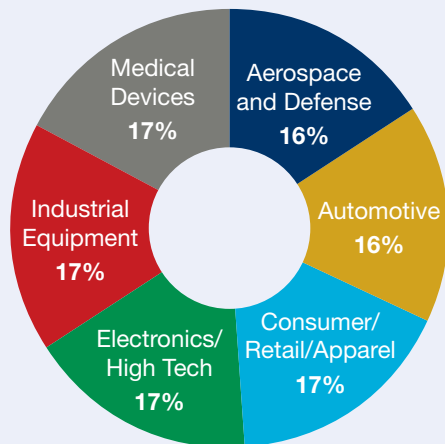
Who took the survey?

We conducted a survey of over 300 manufacturing executives during the first quarter of 2013. Six primary market sectors were represented: Aerospace and Defense, Automotive, Consumer/Retail/Apparel, Electronics/High Tech, Industrial Equipment, and Medical Devices. The top four national markets were the USA, China, Japan, and Germany. Over 40% of survey respondents were C-level executives, with the rest being direct reports to C-level executives.

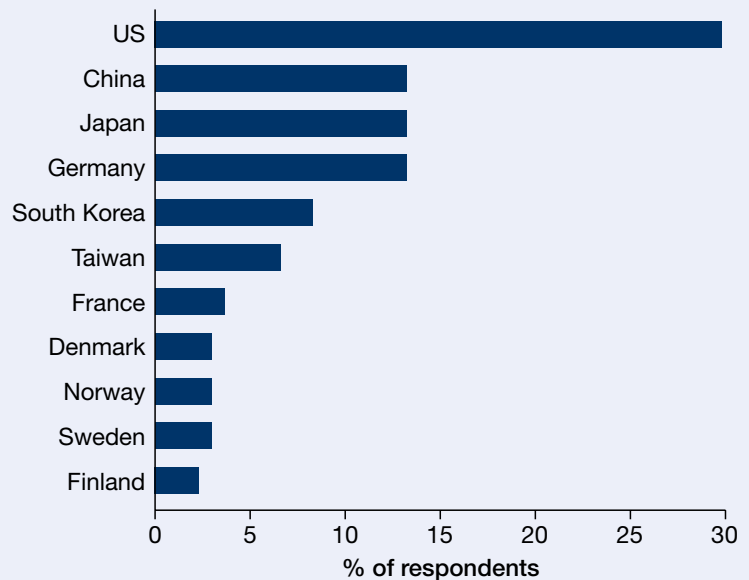
The top five job functions were supply chain/manufacturing, product/engineering, IT, strategy/corporate development, and service. Annual revenue for surveyed organizations, which were split into almost four equal parts, ranged on the low end at \$250 million to over \$5 billion. In addition to the survey, we interviewed manufacturing executives from Boston Scientific, Deere Inc., Emerson, Herman Miller, Ingersoll Rand, and Santa Cruz Bicycles to provide additional context.

Fig. 1: Survey respondents by industry and country

Companies by industry segment



Country in which company is headquartered



This dual emphasis on making better things while making things better is driven by several broad market shifts. According to the survey, the top trends that are jolting business as usual in the global manufacturing industry include:

- **Economic realignment** due to recessionary forces in the developed world, and the rise of fast-growth emerging economies.
- **Technology change** driven by Big Data, the Internet of Things, mobile and social computing, and the cloud.
- **Talent challenges** as the developed world sees a skills gap and the emerging world lacks sufficient management depth.
- **Supplier and partner complexity** caused by distributed sourcing, engineering, and production, as companies must manage more partners across more dimensions of quality, compliance, and risk.
- **Greater global competition** as firms must defend their domestic markets from new overseas rivals while simultaneously tapping new markets for long-term growth.
- **Increased regulation** arising from environmental concerns and standards-based factors like ISO compliance that apply across an increasingly interconnected world.
- **Changing customer behavior**, including fragmenting customer demand.

Fig. 2: External market shifts are remaking the landscape for manufacturers



The effects of these shifts vary in intensity according to company size, industry, and region, and are viewed differently across executive functions. For example, economic realignment is a greater concern for companies in the industrial equipment sector (74% of respondents) than other firms. Technology change ranks highest in faster-growth markets in Asia (75%), where firms are less invested in legacy systems and so can move quickly to adopt the latest equipment. At the same time, 69% of manufacturing C-level executives view talent shortages and labor costs as a critical worry. All of these changes are happening against the backdrop of increasing regulatory constraints, which C-level executives cite as another important area of focus (52%).

One important strategy involves interweaving new services with product offerings to provide additional value.

Given the forces at work, manufacturing firms are taking a variety of approaches to transform their businesses and find new ways to differentiate themselves. One important strategy involves interweaving new services with product offerings to provide additional value—not only at the time of sale, but throughout the product’s useful life. Other strategies focus on globalized product development and tying planning and engineering functions much closer together in order to offer virtually any number of options to products built around the same core platforms.

This report analyzes how manufacturers are transforming their businesses to succeed in the new global landscape. The report found that successful transformation initiatives were grounded by three broad themes:

- **Rethinking strategy and planning** to eclipse pure operational excellence as the source of competitive differentiation;
- **The service imperative** that extends beyond repair and maintenance to become a key differentiator and profit driver in its own right; and
- **Innovation everywhere**, expanding beyond traditional product R&D to encompass all parts of the enterprise ecosystem.

These three approaches provide a scaffold for evolving transformation into tangible business results. As demonstrated later in this report, manufacturers that place a higher priority on these elements can realize significant revenue growth and cost reduction.

Definitions used in the study

Strategy and planning refers to decisions regarding how a company engineers, sources, manufactures, and services its products, and coordinates these processes.

Service refers to how a company plans to service its products, delivers its services, and coordinates these processes.

Manufacturing operations refers to the execution of manufacturing processes, including purchasing, logistics, production, scheduling, and control.

Waves of change

Over two-thirds (68%) of manufacturing firms are expected to undergo a significant business process transformation over the next three years.

As market and technological forces upend many time-honored assumptions about manufacturing, strategic transformation has become a necessity. Over two-thirds (68%) of manufacturing firms are expected to undergo a significant business process transformation over the next three years. Geographically, more firms in Europe (74%) are expected to overhaul their basic operating models than those in North America (64%) and Asia (67%).

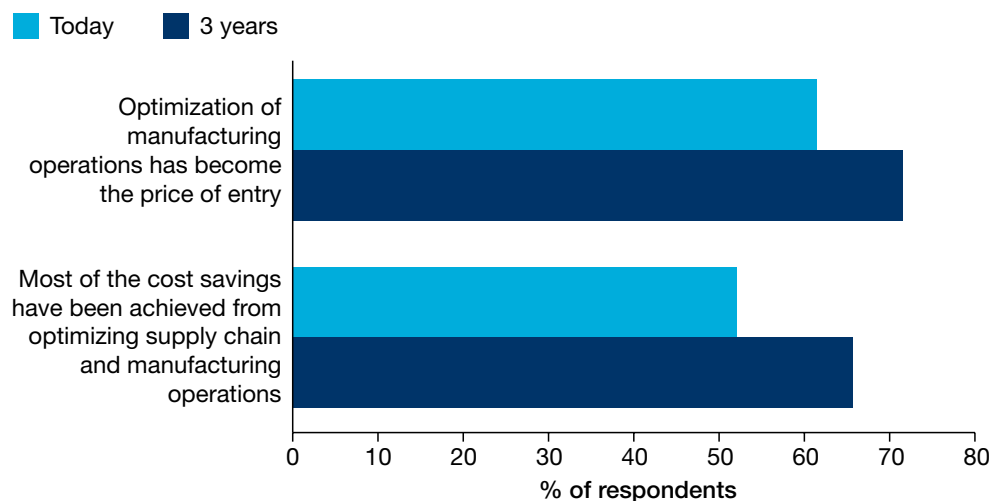
Given the shifting landscape, fresh thinking is needed to effect transformative change. Key areas of manufacturing transformation include rethinking strategy and planning, the service imperative, and innovation everywhere. How manufacturers prioritize these themes can have a substantial effect on revenue and costs.

Rethinking strategy and planning

Strategy and planning for products (43% of respondents), service (37%), and manufacturing (31%) rate as top factors driving business success, according to our survey. Strategy and planning eclipse operational execution as a competitive driver for all industry sectors.

One reason for increased emphasis on strategy and planning is that traditional means of improving bottom-line performance are running out of steam. Over half (52%) of survey respondents report that they have wrung out almost all savings in their manufacturing operations. While this figure indicates there is still work to be done, 65% of surveyed executives believe that optimizing operations has become the industry's price of entry rather than a source of long-term differentiation. That number rises to 71% in three years.

Fig. 3: Optimization of manufacturing operations becomes routine

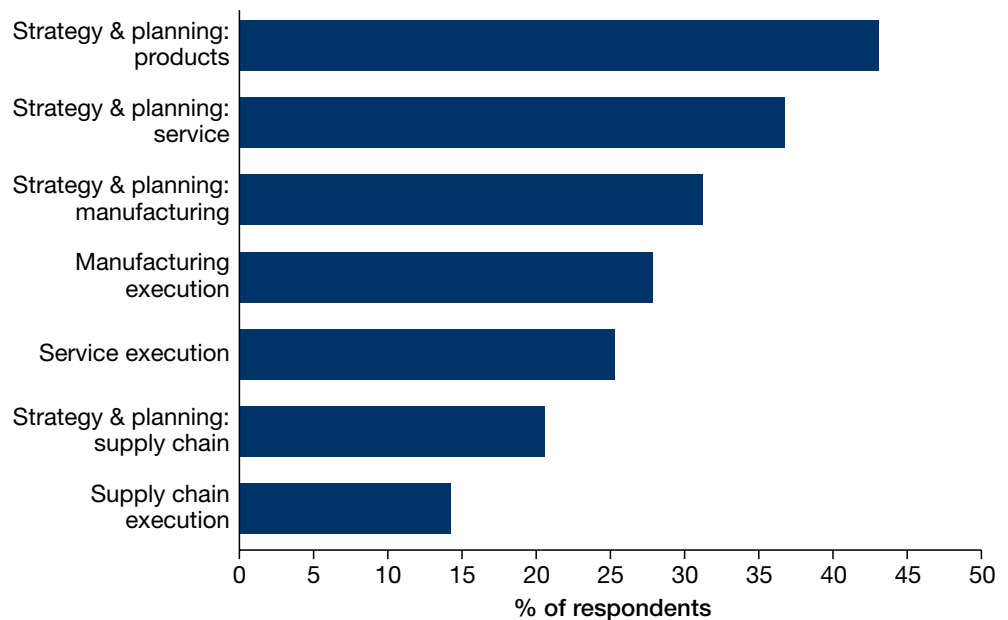


Another reason for heightened attention to strategy and planning is customer fragmentation, a major concern for manufacturers. The customer fragmentation trend is most pronounced in Asia (57%), where customer needs and budgets are widely divergent, and is top-of-mind for C-level executives (57%).

Responding to greater fragmentation, more than two-thirds of survey respondents will apply Voice of the Customer initiatives, led by aerospace (72%), high tech (75%), and very large firms (79%), to better understand their customers. Over half of surveyed executives plan to develop networked or “smart” products to create a feedback loop that incorporates customer data, with high tech (71%) and very large firms (60%) leading the way. Some 43% of manufacturers plan to relocate more production to be near customers, particularly the medical devices (54%) and automotive (50%) areas.

But manufacturers aren’t just playing defense in response to the relative decline of operations as a differentiator and greater customer fragmentation. Among the proactive steps being taken is heightened coordination of strategy and planning between engineering and service functions, which will rise from 54% today to 73% in three years according to the survey. Better coordination between engineering and service divisions dovetails with greater intent by executives to use feedback from service execution (52% today) to drive decisions and enable improvements to product development and quality (65% in three years).

Fig. 4: Most important to improving competitive positioning



To become market leaders, firms are improving their capabilities to coordinate strategy and planning on multiple levels. For example, in three years the use of global product development—leveraging geographically-distributed product design teams—will almost double. Likewise, systems engineering to optimize complex manufacturing processes will grow by 59% over three years. The practice of balancing resources and schedules with global portfolio management is expected to rise by 50%. Finally, a shift toward global product platforms, in which a customizable product family sits on top of a general platform, will rise by 49%.

An example of globalized product development at work is Santa Cruz Bicycles, which competes in a heavily fragmented market. The company imports both standardized components from Asia and custom parts machined to its own specifications. Many of its competitors opt for assembly in Asia and then import the finished bikes; Santa Cruz instead sources components from overseas and assembles close to its market, creating flexible inventory and providing customers the ability to customize their orders.

Surprisingly, the real key for making this strategy and coordination system work lies in human factors more than anything else, according to Joe Graney, Engineering Director at Santa Cruz. “We’ve got a crack design team and a good supply chain with our frame vendors,” he says. “We also have a Taiwan-based engineering and logistics crew who are Santa Cruz employees. We’re not managing from afar but actually have got our crew on the ground there, which really helps with communication and expedites things.”

According to Mr. Graney, the remit for the engineering and logistics team is to liaise with the Taiwan component vendors. Aside from being Taiwanese nationals, which eliminates the language barrier, the Santa Cruz employees also handle quality assurance in Taiwan rather than California. “They really understand what the design people are after,” says Mr. Graney. “They go and advocate for that at the vendor site rather than having a lot of back and forth.”

Even as manufacturers like Santa Cruz Bicycles rightly place strategy and planning near the top of their transformation initiatives, other challenges continue to present themselves. Issues involving workforce skills for delivering service-based value, for example, demand attention. Workers prepared to handle the new era of service offerings may be especially difficult to find. Leading-edge firms must address these human factors while maintaining their focus on the big strategic imperatives.

Deere: Finding the core and non-core

Manufacturing firms must blend three types of knowledge to remake their strategies: Domain knowledge of the product and how it interacts with other products and systems; operations knowledge for making things better, faster, and cheaper than the competition; and customer knowledge of what the end-user demands or is about to demand. These areas are reduced in the strategy and planning process to a simple yet profound question: What constitutes the core value driver and what does not?

In the case of global agricultural-equipment manufacturer Deere Inc., a key driver for the tractor-manufacturing strategy hinged on drive trains, says Pat Pinkston, Vice President for Global Platform Services for the firm’s Agriculture and Turf Division. Drive-train manufacturing capabilities drive the design, which ultimately affects power density, turning radii, and similar performance parameters valued by customers. The size and configuration of the drive train determines where an operator sits on the machine. Different sized tractor models are the first layer of complexity for producing drive trains. Additionally, there are customers who want different types of transmissions (power shift, infinitely variable, collar shift, or low cost) as part of the overall drive-train package. A further challenge was Deere’s competitive decision to shrink the lead-time for building a drive train from 40-50 days to one week.

These layers of complexity quickly made it apparent that the machining of drive-train castings and gears had to be a core internal competence for the company. That one strategic decision rippled across the length and breadth of Deere’s revamped Waterloo, Iowa manufacturing facility. “The whole Waterloo redevelopment activity was based around the fact that, number one, from a performance standpoint, drive train is critical; from a delivery standpoint, drive train is critical; from a quality standpoint, it’s critical,” says Mr. Pinkston. “We’ve got to continually understand what’s core, what’s non-core, and as the technologies, business, and customer requirements shift, be able to reassess and figure out how to integrate all that in a way that allows us to differentiate.”

The service imperative

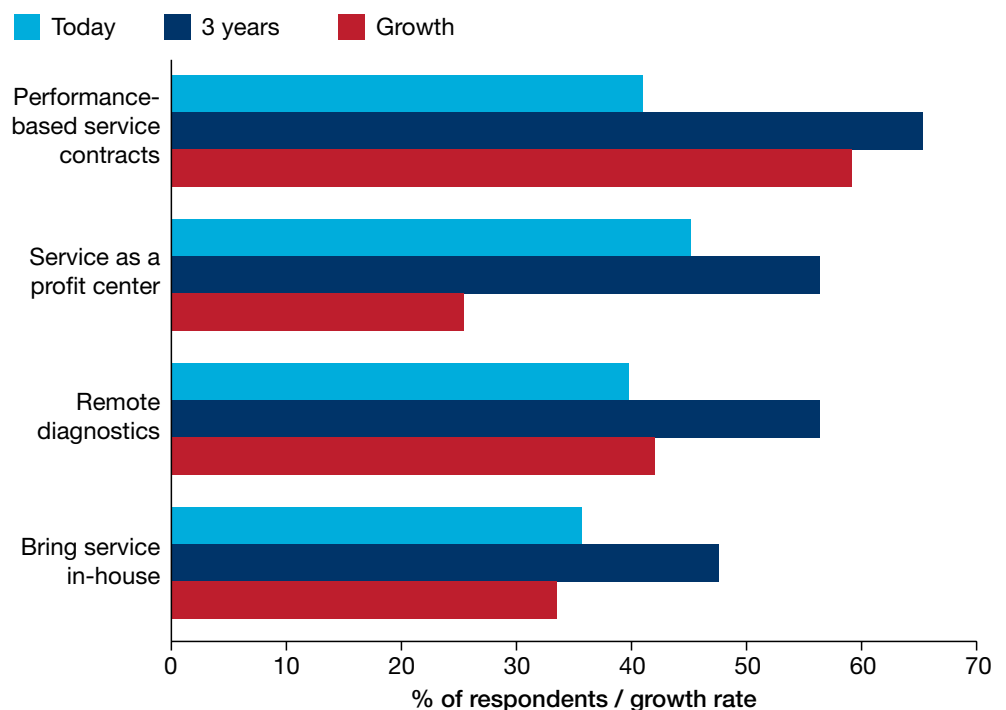
Historically, the service dimension of manufacturing focused on repairing and maintaining products. As a separate business, service was almost an afterthought compared with the all-important product sale. Today, however, more manufacturers are viewing service not simply as a way to enhance the value of their present products, but as a distinct value proposition and revenue generator in itself.

For example, Rolls Royce no longer just sells airplane engines to its customers. It has a service-based offering called TotalCare that sells only the hours that each engine is in service. From scheduled maintenance to overall management, Rolls Royce guarantees an engine’s performance by taking responsibility for its operations. TotalCare transfers the risks and costs associated with an engine being offline to the vendor, thereby making reliability and uptime major incentives for both the customer and Rolls Royce.

Rolls Royce is part of a growing wave of manufacturers that view “product as a service” as a core part of their overall value proposition. Over 70% of manufacturing firms will use service to differentiate their products by 2015, with over half (56%) planning to establish service as a profit center. Equally telling is that 77% of manufacturing C-level executives say that enhancing service is a key factor for competitiveness. Geographically, more European manufacturers (82%) plan to focus on service than US (67%) or Asia (66%), according to the survey.

Firms plan to use a portfolio of strategies to improve their service propositions. The aerospace/defense industry (74%) and medical device manufacturers (70%) plan to lead with performance-based contracts. Similar to the Rolls Royce TotalCare solution, these contracts are about a customer paying a vendor based on performance against a set of defined metrics.

Fig. 5: Top service strategies



Regardless of industry, the service-based value proposition is fueled by data. Some of the most important data involves the ways customers use a product—information that exists outside of the factory walls. Not surprisingly, a significant trend that started in the '80s and '90s but has accelerated dramatically in the past decade has been the evolution of “smart” products—software-intensive, networked products that have sensors and connections back to the original manufacturer. Such products are key to creating product-as-a-service offerings. For example, because smart products are connected, they can report service needs before failure.

Greater emphasis on smart products is indicative that a solutions- and systems-level focus is gaining traction among manufacturers, according to Paul Camuti, Senior Vice President and Chief Technology Officer at Ingersoll Rand. “What we’re trying to do as a company is to systematically apply information and communication capabilities across the whole product portfolio in order to move from being a supplier of hardware to a supplier of lifecycle customer experience,” he says.

Mr. Camuti’s observation that product lifecycles and customer experience are gaining over hardware production for driving transformation reflects an evolving mentality among manufacturers that innovation is now everyone’s business, not just traditional R&D.

Ingersoll Rand: HVAC as a service

Ingersoll Rand manufactures HVAC (heating, ventilation, air conditioning) units under the Trane brand, ranging from residential machines to massive rooftop installations that sit on top of commercial buildings. While the company built its brand and business on the back of product excellence, it is now pivoting into a new business model that offers its customers a comfortable climate as a service proposition.

At Ingersoll Rand’s Ohio-based Trane Intelligence Systems, data from 10,000 pieces of HVAC equipment around the world are managed remotely. Remote diagnostics enable Trane Intelligence Systems to know ahead of time when HVAC filters need to be changed, when oil or bearings are starting to wear, and when Trane should plan for maintenance. Harvesting this data from operations enables more efficient service scheduling for Trane while maintaining uptime across customer premises.

But along the way to better product maintenance, Trane Intelligence Systems realized that the same diagnostic data could be used to adjust the internal temperature of buildings in order to extract better energy use from the equipment. Given that air conditioning can amount to 40% of a commercial customer’s total energy bill, this is not an inconsiderable value proposition.

One of Trane’s major customers is a large chain of movie theaters, which serves over 200 million customers annually at more than 300 locations around the world. According to Ingersoll Rand’s Paul Camuti, the Ohio control facility enables Trane Intelligence Systems to remotely control the HVAC units in theaters according to various parameters, including time-of-day, season, and even the number of people in a theater based on ticket sales. Such connectivity allows Trane to plan for non-disruptive routine maintenance while letting the theater owner save on energy bills by turning HVAC into a service—and a revenue stream.

Manufacturers are viewing service not simply as a way to enhance the value of their present products, but as a distinct value proposition and revenue generator in itself.

Emerson: Building a business from sensor data

After several product generations spent improving the core compressor design of its Copeland Scroll line of refrigeration units, Emerson's Climate Systems unit made a strategic decision to focus on sensor-based diagnostics as a differentiator. According to Charles Peters, Senior Executive Vice President at Emerson, the initial reason for equipping the compressors with sensors was to measure use and changes in electric amperage, which is often an indicator measure for a variety of performance or fault conditions.

As more customers installed the sensor-equipped Emerson compressors, the company noted it was harvesting a rich set of usage data. Teams of Emerson staff fanned out to supermarkets and other heavy users to discover the full extent of their industrial cooling challenges based on data collected from compressor units. Customers spoke to Emerson about issues related to the size of maintenance departments to energy bills to tracking refrigerants and ensuring food quality—topics that went above and beyond the technical operation of a compressor unit. This feedback helped the Emerson field staff realize that a larger revenue and customer loyalty opportunity existed by connecting the compressor units to applications that used sensor data.

For example, 37 billion pounds of bananas are shipped globally each year. Bananas are consumed in every country on earth, but are grown in comparatively few, so they often must travel thousands of miles before arriving at a local store. If the temperature drops even a few degrees below the ideal temperature at any time during its journey from the field to the grocery aisle, the banana skin will develop dark spots and will not ripen properly. If the temperature rises a few degrees, premature ripening and shrinkage occurs. Consequently, continual monitoring and adjustment to maintain temperature is a prerequisite every step of the way, a data-intensive task that touches the entire produce transport ecosystem.

The challenge presented Emerson with an opportunity to create an end-to-end solution. "Massive amounts of information flowing between compressors and applications required new layers of middleware to be built," says Mr. Peters. "Sales teams had to be retrained to package discrete parts of the solution to sell to different parts of customer organizations. And so this decision to embed diagnostics into compressors morphed into a much bigger business model as we thought about how to apply this knowledge to a full suite of customer problems."

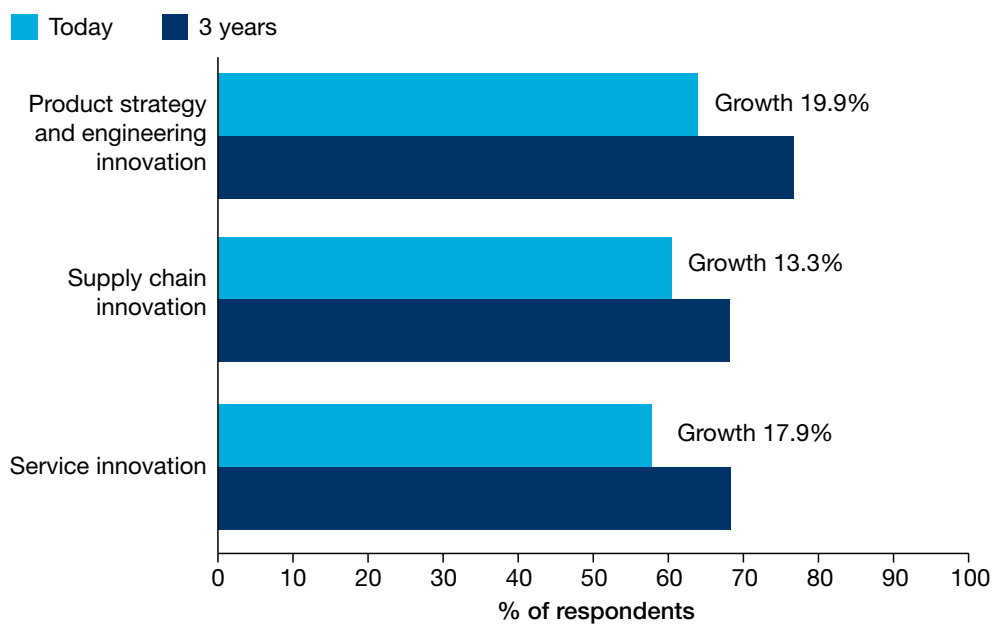
Innovation everywhere

The decision to place an innovation bet is as much a business and strategy issue as it is a design challenge. This is because commercially successful innovations must simultaneously provide value to the customer while enabling the manufacturer to realize an economic return. Innovation requires a strategy and planning ability to harness trends rather than simply react to feedback coming from the market, the partner and supplier ecosystem plus the factory floor.

Manufacturers are approaching innovation with a range of techniques, from adding connectivity to products to scouring emerging markets for items that can be sold in mature economies, and even opening up the innovation process to the public. Across industries, firms are sharpening their focus on innovation for product strategy and engineering (76% of respondents in three years, up 20%), supply chain (68% in three years, up 13%) and service (68% in three years, up 18%).

The emphasis on innovation will grow even more during the next three years with increased efforts in product strategy and engineering leading both service and supply chain initiatives.

Fig. 6: Greater focus on innovation



Reverse innovation is another area that is growing more popular, as firms design products for emerging markets and bring them to developed ones (35% of surveyed manufacturers practice this today, vs. 50% in three years). As one example, furniture-maker Herman Miller developed “desking”—tabletops with small screens that separate workspaces—via its overseas R&D function. The firm is now migrating that popular design to the US.

Herman Miller also is expanding its design and manufacturing presence around the world. This makes the company part of a significant trend, as the number of manufacturers embracing a design, build, and service anywhere philosophy will grow 125% in three years to include 58% of all firms. Aerospace (67%) and emerging markets (72%) are among the early adopters.

Executives expect significant growth of new types of manufacturing technology such as 3D printing, an additive process in which successive layers of material are laid down by a computer according to a stored Computer Aided Design (CAD) model. Additive technologies stand in contrast to traditional machining technologies, which typically rely on cutting or drilling to remove materials to achieve a desired design. Use of 3D printing and similar additive technologies will grow 123% (to 27% of all manufacturers) over the next three years. The automotive sector will be especially aggressive with 3D printing technologies over the next three years, with 40% of survey respondents indicating that additive manufacturing will be a significant revenue and profitability driver, up from 27% today.

Manufacturers in different industries will assess the value of smart products, additive production technologies, and reverse innovation differently, depending on their market goals. But clearly a system in which design and engineering, production, sales and service, and marketing all operate independently of each other is a relic of a bygone era. Regardless of industry sector, the need to align product design, manufacturing processes, and service, with other corporate functions to “make things better”—is more important than ever.

Boston Scientific: Open innovation in medical manufacturing

One of the most important innovations for any manufacturer of size doesn't relate directly to products or services, but on how to capture and organize innovative ideas in the first place. History is replete with stories of innovative companies that stagnated once they grew large. “When you're a big company, a big challenge is to learn how to innovate like a small company”, says Sujal Bhalakia, Vice President of Operations, Strategy and Engineering for Boston Scientific, a major player in the medical manufacturing sector.

Boston Scientific has attacked the size dilemma in part by embracing an “open innovation” model for certain areas. During the first quarter of 2013, the company launched an innovation portal through which inventors inside and outside of Boston Scientific can submit ideas for new products or enhancements to existing products by registering on a website. First-time users submit non-confidential summaries of their inventions or ideas for review by a small Boston Scientific team, which stress-tests concepts against expected outcomes and likelihood for commercialization.

If an idea passes that initial filter, the submitter and Boston Scientific will enter into a more confidential relationship that can potentially lead to commercialization and compensation for the inventor. Aside from the need to expand the footprint of potential collaborators, the portal captures the power of innovation as a creative process that happens everywhere.

“Ten years ago, most manufacturers in the medical field thought in terms of one product for one geography based on one platform,” says Mr. Bhalakia. “But when you look at the entire product lifecycle process for complex medical devices, you can find points of innovation all along the way from your suppliers to your production and planning people, not to mention clinicians using your product. The point is that innovation doesn't just happen. You have to provide structures through which people can contribute.”

Driving business value

Well-executed transformation efforts can produce measurable business results. Based on the survey data, we developed a business-impact model to estimate how changing transformation priorities—rethinking strategy and planning, greater emphasis on services, and optimizing manufacturing operations—might affect revenue and costs. The model assumes a “prioritization curve” that tracks the emphasis placed on each of the three transformation activities, from “no or limited priority” to “moderate priority” to “high to very high priority.”

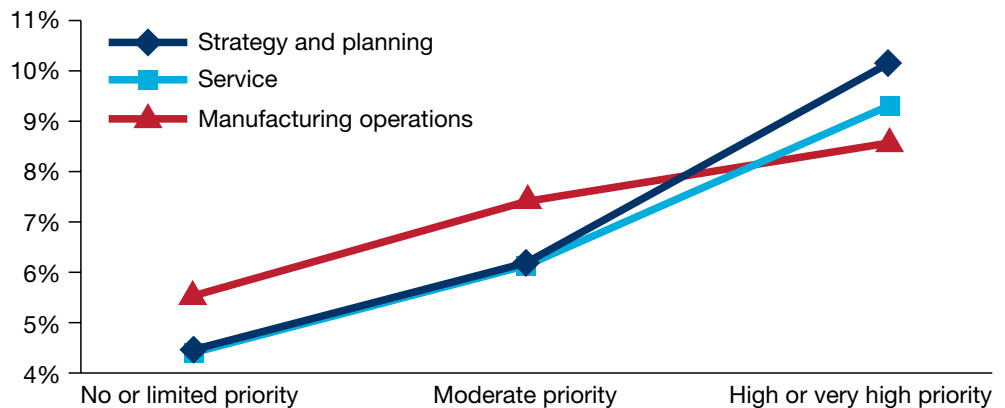
To gauge the performance of individual firms, we asked respondents about their current prioritization of strategy and planning, service, and manufacturing operations. Those responses were compared with general profitability and cost structures for firms, according to their industry sector. This approach approximated the value of different transformation initiatives to estimate the average revenue gains and cost reductions reported by firms, according to their level of prioritization in each strategic area.

For firms that place limited priority on all three areas, manufacturing operations yields the biggest impacts in terms of revenue and costs. As companies move up the prioritization curve, however, our analysis shows that focusing on strategy and planning and service offer greater opportunities for revenue and cost savings than focusing on manufacturing operations.

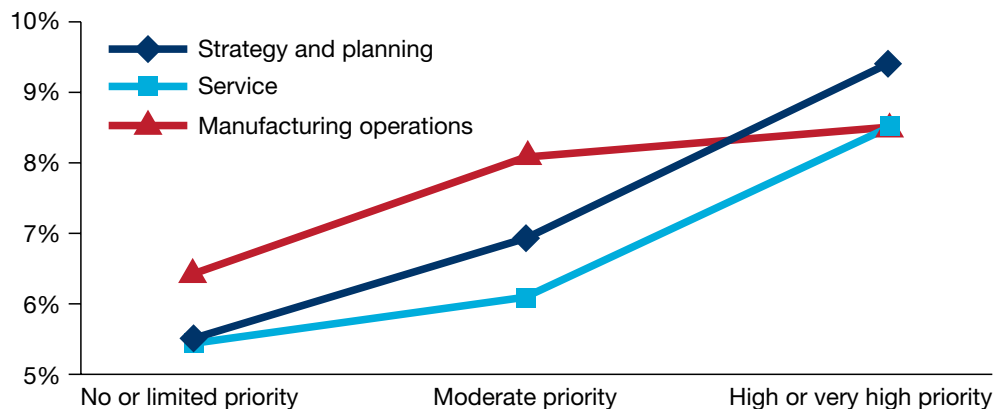
Manufacturers that prioritize strategy and planning and service will enjoy increasing marginal returns.

Fig. 7: Quantifying the average annual impact across the prioritization curve

Average revenue impacts



Average cost impacts



Firms that currently place a limited priority on strategy and planning can improve revenue by an average of 1.8 percentage points (from 4.4% to 6.2%) by moving up the prioritization curve and making strategy and planning a moderate priority, while moving from moderate to high yields an additional 3.9 percentage points (from 6.2% to 10.1%). This compares with a 1.8 percentage-point increase (from 5.6% to 7.4%) by moving from limited to moderate on the manufacturing operations prioritization curve, and an additional 1.2 percentage points (from 7.4% to 8.6%) by moving from moderate to high. The impact for increasing focus on service are 1.8 (from 4.3% to 6.1%) and 3.2 (from 6.1% to 9.3%) percentage points, respectively.

Similar benefits can be gained on the cost side. By moving along the respective prioritization curve from moderate to high, the cost reductions can improve an additional 2.4 (strategy and planning), 2.4 (service) and 0.4 (manufacturing operations) percentage points.

Consider a manufacturing firm with \$5 billion in annual revenue and a 20% profit margin. According to the business-impact model, this hypothetical company could enjoy the following additional revenue and cost effects from increasing its prioritization from moderate to high along the three transformation vectors¹:

Revenue increases

- Strategy and planning: \$195 million
- Service: \$160 million
- Manufacturing operations: \$60 million

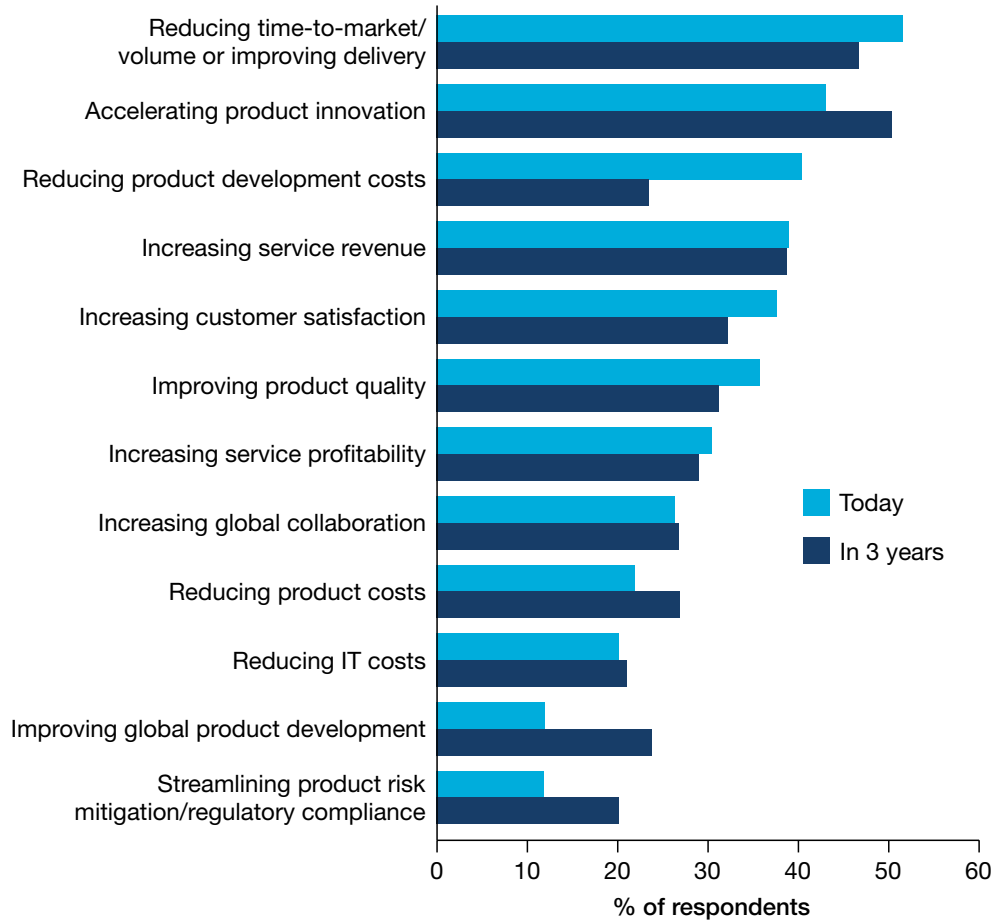
Cost reductions

- Strategy and planning: \$96 million
- Service: \$96 million
- Manufacturing operations: \$16 million

Manufacturers are pursuing a number of approaches to achieve these results, and these approaches will change over time. Today, firms are focused on reducing time to market as the top way to generate value (52%), followed by accelerating product innovation (43%) and reducing product development costs (40%). In three years, accelerating product innovation will move from the second-most important value driver to the most important value driver (50%), followed closely by reducing time to market (47%) and increasing service revenue (39%). Other value drivers will rise and fall in prominence over the next three years. The importance of global product development as a way to generate value will double (from 12% to 24%), while the importance of reducing product development costs decreases from 40% today to 23% in three years.

¹ This example does not give a precise timeline but assumes that the manufacturer has fully migrated from one stage of prioritization to the next highest.

Fig. 8: Methods for driving value



The key focus for manufacturing firms will be to determine where their transformation efforts fit on the prioritization curve and then decide how to drive those efforts forward.

Conclusion: A new manufacturing mindset

A confluence of external market pressures, new technologies, and new competition compels manufacturers to transform their business processes. The survey data and interviews reveals that effective, lasting transformation requires a re-think of strategy and planning, an intense focus on creating service-based value, and an embrace of technology-driven innovation above and beyond traditional R&D.

Given that, how should manufacturers shape their transformation priorities going forward?

Map market trends

The research suggests that manufacturers must start by grasping the market trends expected to have the greatest impact over the next three years and then map those findings to how they currently align strategy and planning. Global economic headwinds over the past decade combined with new technology rank as the top two factors (cited by 66% and 61% of respondents, respectively) that have created a systemic rather than cyclical change in manufacturing competition.

Questions to consider:

- Do we have a clear idea which market trends are likely to have the greatest impact on our firm over the next three years?
- Do we have an economic model that quantifies how our transformation initiatives and priorities impact our revenue and costs?

Assess coordination of strategy and planning activities

A second step is for manufacturers to analyze how they coordinate strategy and planning activities across their organizations. Executives must ask themselves and their teams how their strategy and planning process aligns engineering, service and supply chain/manufacturing functions. Among the likely methods to drive tighter coordination over the next three years are global product quality (60%), global service (57%), and global product compliance (55%) efforts. Each endeavor also depends on a closed loop among functions inside the organization and between the manufacturer and its partner ecosystem.

Questions to consider:

- Do we know how well strategy and planning is coordinated within and across our business functions (e.g., engineering, supply chain) to respond proactively to market trends?
- Do we have in place robust methods for coordinating strategy and planning throughout the organization and partner ecosystem (e.g., global product quality, global product compliance, global product development)?

Measure progress toward a service-centric business model

Service cannot be viewed simply as a way to enhance the value of present products, but as a distinct value proposition and revenue generator in itself. To start, manufacturers must take feedback from service execution to drive decisions and enable improvements across service planning as well as product development and quality. Within three years, 77% of surveyed executives intend to harness service execution feedback to improve their service value propositions, while over half (52%) plan to use the same data to improve product development and quality; 56% plan to establish service as a profit center.

Questions to consider:

- Do we have an effective HR strategy for recruiting, training, and retaining the talent needed for ongoing service transformation?
- Are we maximizing our use of remote diagnostics, and other forms of direct feedback to improve the customer experience with our products and services?

Understand sources of innovation

Manufacturers must approach innovation as an enterprise-wide effort. Leading manufacturers are sourcing innovative solutions from emerging markets and bringing them to developed ones (50% of surveyed manufacturers within three years). Alongside geographic sources for new innovation, firms are expanding the use of smart products (over half of total respondents, 60% of very large firms, and over 70% of high tech firms within three years) to give them greater insight into customer needs and preferences.

Questions to consider:

- Do our innovation efforts extend beyond traditional R&D to encompass all parts of the enterprise ecosystem?
- Do we embrace a design, build, and service anywhere philosophy, and how do we compare to competitor capabilities and customer expectations?

Thus, there will be no shortage of work for manufacturers that keep up with the speed at which market trends evolve and stand ready with a relevant value proposition. Indeed, those who choose the right priorities now are most likely to be the ones that thrive during this important period of industry transformation.

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