The forces driving manufacturing transformation reveal the future of competitive advantage.
Why? During the past 50 years manufacturers have focused on efficiently making great products to maximize returns at the moment of sale. In recent years however, leverage from such production-centric product strategies has begun to diminish, in part because they have become commonplace. Within three years, 71% of those same executives believe that optimization of manufacturing production processes will have become simply the “price of entry” to compete.

The path to true competitive advantage in the modern manufacturing era requires a rethinking of nearly everything - from how products are designed, built, and serviced, to the underlying business models manufacturers employ. Causing the need for this strategic realignment is a set of market forces, which are now converging to accelerate the manufacturing industry’s trajectory toward the “tipping point” of a fundamental transformation.

Oxford Economics, a global forecasting and quantitative analysis firm, surveyed 300 manufacturing executives worldwide about the impact of industry shifts and organizational priorities on the future of competitive advantage. To meet anticipated future challenges, **68% of those executives said they expect their firms will undergo significant business process transformation in the next three years.**
SEVEN FORCES

We’re at the early stages of this fundamental transformation, marking what could be one of the most significant disruptions to the manufacturing industry since the Industrial Revolution. Understanding the driving forces, their specific impact, and the opportunities they create, reveals the roots of manufacturing transformation and the future of competitive advantage.

PTC has identified seven major forces, some of which are long-standing while others are more recent. Individually, any one of these forces is disruptive. Together they are completely transformational.

Visionary manufacturing firms have already identified the forces that will have the greatest impact on their industries, and they are beginning to transform business processes to leverage one or many of them, and embrace entirely new business models to capitalize on the opportunity.
DIGITIZATION

Definition: Replacing analog product and service information with a fully accurate virtual representation that can be easily leveraged across the value chain (engineering, factory floor, service).

Transformational Impact: While not a new market force, digitization continues to be transformative in the form of competition from desktop publishers, faster commoditization of products, and newer features that not only confirm fit but simulate behavior. Today, the demand for 3D CAD models and digital mockups are exploding. 3D printers now build parts directly from digital models and are moving beyond prototyping into true additive manufacturing. Leveraging these 3D models and simulations during the service lifecycle is also creating breakthroughs in service efficiency, as service technicians can now see the solution they previously had to visualize.

Example: College Park Industries, a leading manufacturer of high-tech prosthetic devices, uses CAD models to simulate fit with each customer and uses 3D simulation to evaluate performance. One product line alone, the Trustep foot, has over 400,000 viable combinations that allow the foot to be custom-built for each person. Using 3D CAD models, College Park simulates and predicts stresses and strains within the 3D models they’ve designed, finding failure modes without building physical prototypes, which cuts many months off the typical design timeline.

As manufacturers digitize product and service information and leverage the internet, they reduce geographic boundaries.
GLOBALIZATION

Definition: The general shrinking of the world driven by technology that eliminates economic and geographical divisions and opens new markets.

Transformational Impact: The shift in global demand for manufactured goods is happening at an accelerating pace. A recent McKinsey study finds that developing economies could account for as much as 70% of global demand for manufactured goods by 2025. Historically, innovation was done by a single brilliant inventor, e.g., Eli Whitney or Thomas Edison. Now, the growing demand of global markets and exponential sophistication of products requires a different approach. To succeed in this new world, global workers must collaborate efficiently and continuously from concept to design, manufacture, and service. Technology is helping to eliminate these conventional boundaries and enabling access to these critical new markets.

Example: Agco, a global manufacturer of agricultural equipment with 3,100 independent dealers in 140 countries, had a goal to improve quality and decrease Time-to-Market. Agco deployed a single source of digital truth for product data to ensure clean handoff from engineering to manufacturing and service across a highly distributed product design team. This business process transformation increased reuse of engineering designs and improved efficiency of change management, enabling Agco to achieve their business goals.

As manufacturers design, build, sell, and service globally, they are confronted with increasing regulation.
REGULATION

Definition: Enforcement of governmental rules, non-governmental organization policies, and industry standards related to environment, health, safety, and trade.

Transformational Impact: Manufacturers face an increasing variety of regulatory requirements from a variety of sources – governments, NGO’s and industry standard bodies enforcing rules and procedures related to the environment, health, safety, and trade. In fact, a Manufacturers Alliance for Productivity and Innovation (MAPI) study found that growth in the cost of major regulation has far exceeded economic growth, especially manufacturing sector growth, and estimates that 2183 unique regulations have been imposed on manufacturers in the past 30 years. Manual processes are not only slow and time consuming, but can leave manufacturers exposed to these new regulatory requirements.

Example: Motorola Mobility is a leading mobile device designer and manufacturer of 50,000 products containing 300,000 supplier parts from over 4,000 suppliers. In the U.S., the SEC will now require public companies to audit their use of “conflict minerals” from the Democratic Republic of the Congo. Motorola Mobility is implementing a due diligence program to identify and trace conflict minerals through their supply chain by upgrading IT solutions for conflict mineral management and reporting. Motorola distinguishes its brand through Corporate Social Responsibility, and through these programs and investments, is doing the right thing not only for society, but for its shareholders as well.
PERSONALIZATION

Definition: Efficiently tailoring products and services to accommodate regional and personal preferences.

Transformational Impact: Efficiently produced standardized products are no longer sufficient to sustain competitive advantage. In fact, 57% of C-Level executives from an Oxford Economics study identified fragmenting customer expectations and demand as a major concern, which requires finding scalable ways to serve these fragmenting customer needs. The goal is diversity with scale, which starts with regional/market variability and matures to personal variability. In addition to expanding efficiently into new markets, some unanticipated benefits are emerging from product variability, such as reverse innovation. A new offering created to meet unique needs of an emerging market can be delivered as a cost-effective new offering worldwide – even in developed markets.

Example: In 2002, GE innovated a portable, easy-to-use, ultra-low-cost ultrasound scanner that was able to address the unique market needs in rural China. Today, the portable ultrasound machine is the growth engine for GE’s ultrasound business in China, but more significantly, worldwide sales from portable ultrasound products skyrocketed between 2002 and 2011 from $5 million to about $280 million – an average annual compounded growth rate of about 50%. These portable ultrasound machines were originally developed for markets in an emerging economy and are now being sold in the United States, where they are pioneering new uses for such machines.

As manufacturers expand personalization and innovation initiatives, they are increasingly leveraging software.
SOFTWARE-INTENSIVE PRODUCTS

Definition: Integrated systems of hardware and software capable of sophisticated human-to-machine interaction, diagnostics, and service data capture, with additional value delivered through enhancements.

Transformational Impact: In a 2011 Wall Street Journal essay, Marc Andreessen proclaimed that “software is eating the world,” and outlined how industry after industry is being disrupted by software. This disruption requires that every company add software development and digital innovation to their list of traditional core competencies. For manufacturers, these software-intensive smart products leverage embedded sensors that allow the products to collect, share and analyze data with the relevant context or state. Software also enables personalization and adapts the product to consumer and situational needs based on sensor data, machine learning, and digital user interface.

Example: Continental, a tier one auto supplier with over 120,000 employees worldwide, now has more software engineers than mechanical in some departments. These software-intensive component systems provided to auto OEMs, like windshield wiper systems or related window control systems, send a signal to the wiper system when it rains and adjusts the speed of the wipers based on the volume of rain. Leveraging these same sensors, OEMs use this information to determine when passenger windows, sun-roof, or convertible top should close to avoid water damage inside the vehicle.

As manufacturers embed software and sensors, they are adding connectivity to those products.
CONNECTIVITY

Definition: Pervasive networks of “things” – often mobile – embedded with sensors and individually addressable to enable sophisticated monitoring, control, and communication.

Transformational Impact: Smart products are becoming increasingly connected – to us, to each other, and to the manufacturer. According to Cisco, the number of internet connected devices reached 8.7 billion in 2012. Connectivity enables manufacturers to monitor, control, and service its products, begin to collect large volumes of usage data to understand how its products are being used, learn how to maintain them; and how best to deliver value over the useful life of the product. These capabilities are accelerating the migration of value that is delivered from the physical aspects of the product to the digital / software aspects and creating new opportunities for differentiation. However, connectivity also increases the infrastructure and capability requirements as well as increases vulnerabilities and cyber security risks.

Example: Schneider Electric manufactures equipment for electrical power distribution, industrial control, and automation. Surprisingly, today about 40% of global electricity use is from buildings, but connecting lighting, HVAC, IT and security into a single system can greatly improve efficiency. Integrated approaches, like those delivered by Schneider Electric, can reduce energy use by 30%, trim capital expenditures, decrease operating expenditures, and improve overall business performance.

As manufacturers deliver ongoing value through smart, connected products, new business models have emerged.
SERVITIZATION

Definition: Fundamental business model shift in which products evolve to integrated “bundles” of services capable of delivering new value continuously throughout the customer experience lifecycle.

Transformational Impact: While the term “servitization” in a manufacturing context is traced back to Vandermerwe and Rada [1988], the convergence of forces has created a new imperative for this business model shift. Products and services will be bundled together to form new systems of value that will be consumed most commonly as an on demand service, transferring ownership and risk from customer to manufacturer. This shift begins with effective management and delivery of aftersales support services, then products bundled with warranty, and finally performance-based service contracts. However, creating and transitioning to the right business model to build a successful product as a service business is far from easy.

Example: Ingersoll Rand is a $14B company delivering products and services that create safe, comfortable, and efficient environments. IR has 30,000 employees, including 2,000 service professionals. Their heating/air conditioning division Trane, one of their business units, is an example of a company leading the way into entirely new business models – selling “building comfort” as a service. Roughly 30% of Trane’s revenues today come from this new business model.
RESPONDING TO THE SEVEN FORCES

The impact and opportunity from each of the forces will vary by individual company circumstance, but there is no doubt about the potential for disruption these forces represent. It is also clear the impact on the future of competitive advantage will be felt everywhere.

Manufacturers will need to transform existing business processes and fundamentally rethink how they design, build, and service their products to expand the ways value is exchanged with customers and across the supply chain and ecosystem. But, for those that get it right, the future represents a huge opportunity to create sustained differentiation through product and service advantage.

Key questions to consider:

- Do we understand which forces are likely to have the greatest impact on our industry and firm over the next three years?
- Do we have alignment between our current business transformation initiatives and priorities and these forces?
- Do we have the right talent and technology platform to respond to these forces and capture the opportunities they create?
- Do we have an engaged network of partners and suppliers that can enable the opportunities these forces create?

To discuss how these may impact your industry, or how PTC can help your company transform, contact PTC.