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Tech-enabled disruption of products and services: The new battleground for industrial companies

Venkat Atluri, Jeremy Eaton, Mithun Kamat, Satya Rao, and Saloni Sahni

Industrial companies are finding that technology is an important link in the value chain for innovation and product development. The transformation is challenging, but there are ways to getting it started.

With economic profit flatlining, industrial companies are turning to revenue growth to drive value. Using technology to innovate and develop new products and services is fast becoming the new battleground. Companies are not only enhancing their offerings through software and data but making the transition from selling hardware-based products to creating tech-enabled businesses.

The effect on the industrial sector will be profound. In the auto sector, for example, estimates suggest global revenues will almost double from $3.5 trillion in 2016 to $6.6 trillion by 2030. As much as 84 percent of this growth is expected to derive from disruptive new offerings such as shared mobility, connectivity, and electrification. To get a share of this growth, companies have no option but to pursue tech-enabled innovation for themselves.

What's more, innovation in products will go hand in hand with innovation in business and revenue models, just as aerospace-engine original equipment manufacturers (OEMs) have long since made the transition from selling engines to selling power by the hour. Similarly, agricultural-equipment providers are selling farmers not only tractors and harvesters but productivity solutions enabled by connectivity and remote monitoring.

This article examines how much value could be created by tech-enabled product innovation in the industrial sector, identifies the key digital levers and enablers companies need to have in place, and suggests how they can go about capturing a fair share of the value at stake.

Sources of value

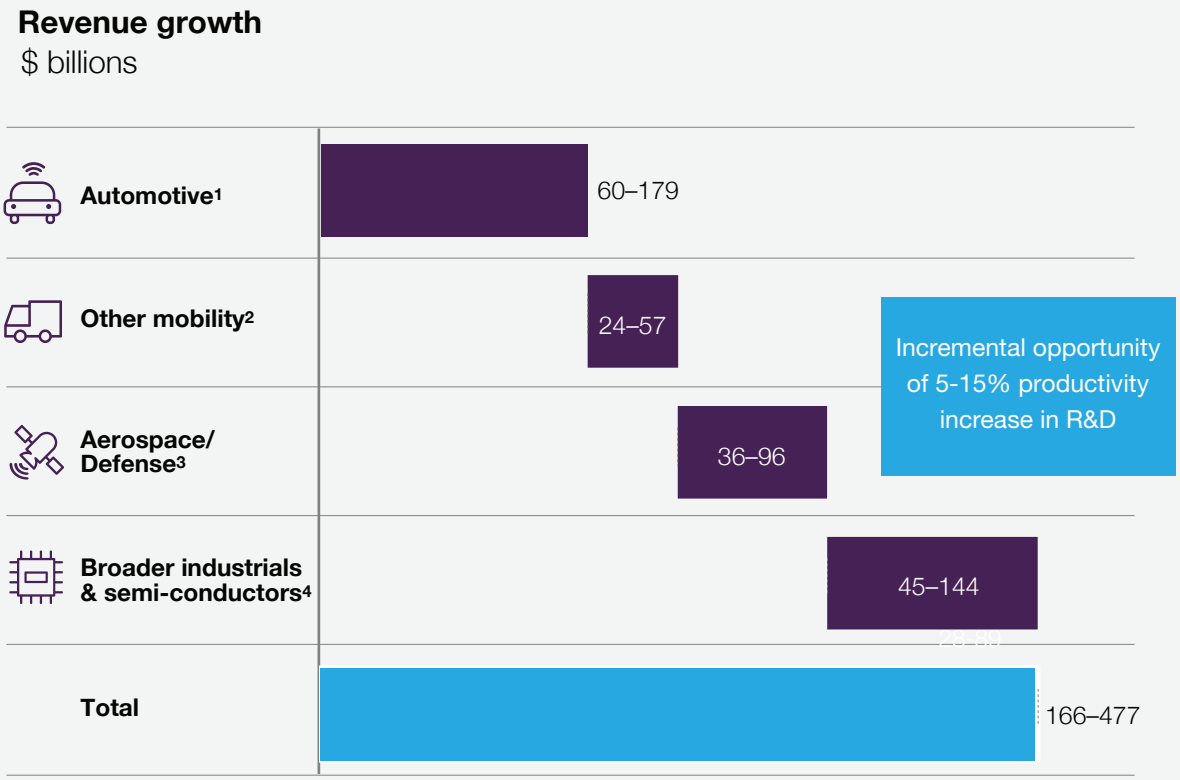
McKinsey's analysis indicates that using technology to improve innovation and product development could deliver $166 billion to $477 billion in new revenue and $8 billion to $25 billion from margin expansion through greater efficiency in R&D. Exhibit 1 illustrates how this opportunity breaks down across the subsectors in the industrial sector.

Exhibit 2 provides an overview of the key levers and enablers needed to capture value from the three main sources we identified, namely:

Extract value from connected products and services

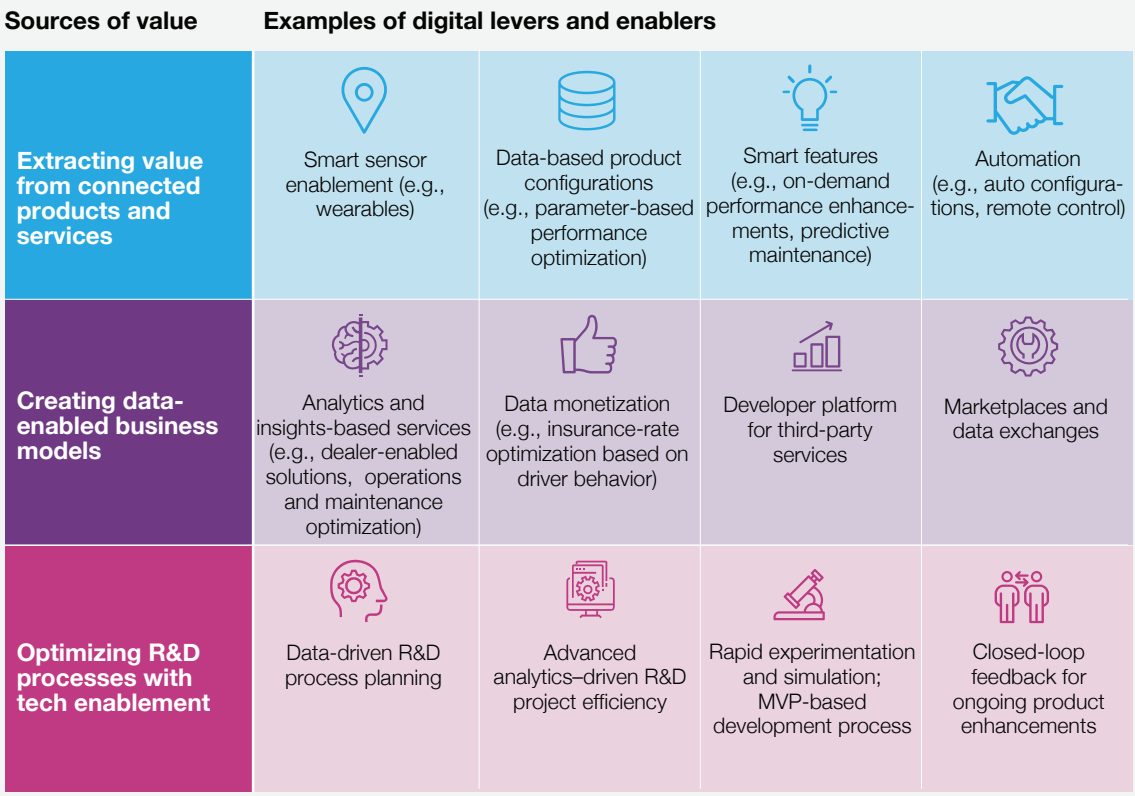
Our analysis indicates that connected products could deliver $34 billion to $95 billion in incremental

EXHIBIT 1 The value from tech enablement in innovating and developing products varies by industry segment



1 Whole value chain including tier 1 suppliers, automotive OEMs, and dealers
2 Commercial vehicles and off-highway equipment (e.g., for construction and agricultural use) including tier 1 suppliers, equipment manufacturers, and dealers and distributors
3 Includes tier 1 suppliers and equipment manufacturers
4 Includes industrials, food processing and handling, motion and controls, industrial automation, and electrical, power, and test equipment across the value chain: component suppliers, equipment manufacturers, distributors, VARs, engineering and services providers, and product companies

EXHIBIT 2 Value drivers and enablers in product development and innovation

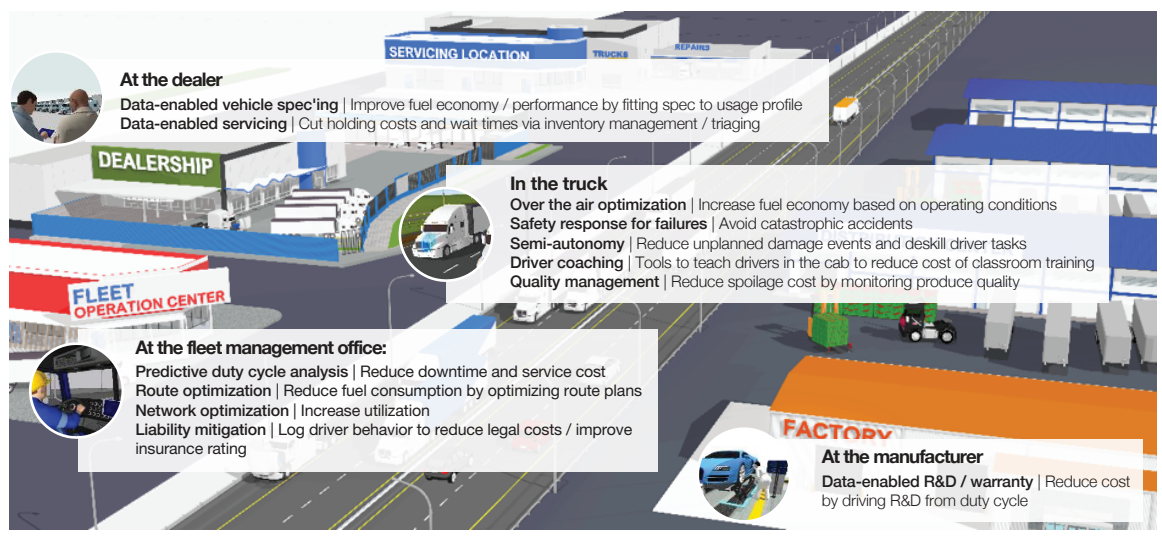


industry revenue growth. As the costs of sensors, connectivity, and computing continue to fall, leading companies are harnessing technology to reinvent their products and services and launch innovative new offerings in a bid to leapfrog competitors and gain market share.

In line-haul trucking, for instance, technology will make it possible to reimagine operations across the entire value chain, as illustrated in Exhibit 3. A commercial fleet could save on fuel costs and improve vehicle performance by calibrating vehicles over the air to match operating conditions. A dealership could spec vehicles more intelligently by using data on individual customers' usage patterns, and cut wait times at service facilities by managing inventory and triaging service jobs in real time. At distribution centers, semi-autonomous tractors could save time spent moving trailers around the yard and reduce the incidence of damage. Finally, manufacturers of line-haul trucks could collect data on duty cycles to inform R&D and cut warranty costs.

Bringing connected products to life in this way requires industrial companies to address a number of practical challenges. Chief among them is building an IoT platform—a complex undertaking, especially for a sector that has traditionally treated engineering and IT as separate disciplines. Another challenge is deciding on the most suitable architecture from a

EXHIBIT 3 Examples of connected products in commercial vehicles



wide array of providers and options, such as building on a generic IoT platform or procuring a turnkey solution from a specialty IoT partner.

Successful companies take two key steps to facilitate product connection:

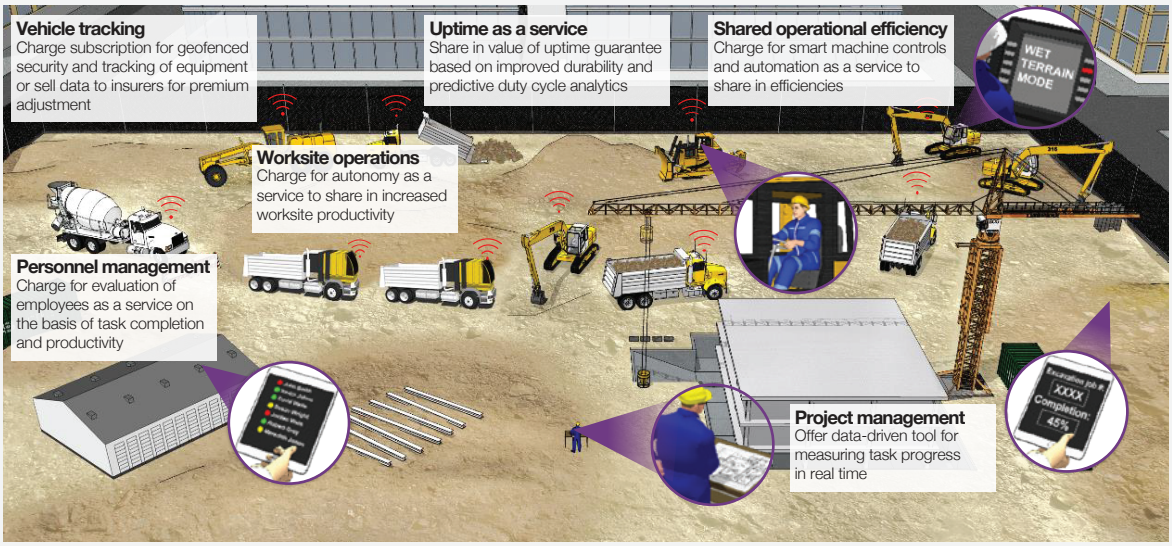
Ensure that use cases drive platform requirements both while developing minimum viable products (MVPs) and over the long term. For example, use cases that require the real-time processing of large data sets, such as autonomous driving, demand significant edge computing capacity in the vehicle as well as in the cloud, while use cases based on aggregating data from a multitude of devices, such as consumption trends from connected appliances, can be handled exclusively in the cloud, at much lower cost.

Take an end-to-end approach to architecture. A siloed approach, in which device, cloud, and app data are all handled independently, is likely to cause duplication, with each layer over-developing its own features rather than delivering functionality across the whole customer experience. By contrast, focusing on adding incremental end-to-end capability forces companies to address dependencies between data models, communication protocols, and so on, at an early stage in development programs, thereby greatly reducing risk.

Creating data-enabled business models

New business models offer the largest opportunity in tech-enabled product development, with an estimated $132 billion to $382 billion in incremental industry revenue growth. Some of these business models are likely to disaggregate value chains in much the same way that Uber is disrupting investment allocations for automotive companies, and increasingly aerospace companies as well. Manufacturers of mining equipment, for example, could explore a range of opportunities to create new revenue streams, such as charging insurers for vehicle usage data that helps them set premiums or offering mining companies uptime as a service (Exhibit 4).

EXHIBIT 4 Examples of data-enabled business models in mining equipment



Unplanned downtime accounts for more than 10 percent of working time and causes considerable operational disruption. Our analysis indicates that a mere 1 percent improvement in the availability of earth-moving equipment could create more than $200 million in value in the US alone. An OEM could reap enormous benefits by offering uptime as a service, issuing a reliability guarantee for its equipment, and claiming a share of the value thus created for its customers.

Launching data-enabled businesses can be even more challenging for an industrial company than creating connected products, especially in two key aspects:

Getting from data to insight to value. Many industrial companies assume that the raw data generated by their IoT offerings is monetizable in its own right, but this is seldom the case. Companies usually need to combine multiple data streams—often including third-party data sets—before they can achieve a level of insight that yields commercial value. Another common misconception is that IoT offerings generate so much data that companies should be able to discover a silver bullet somewhere in it. Misled by this belief, one multinational industrial company tied up dozens of highly qualified data scientists for a decade on data projects that failed to find a viable route to market or indeed demonstrate any real commercial potential. Successful companies make sure that data-enabled offerings are owned by the business from the outset, and they take care to answer the question, "Who values this offering, and can I sell it to them?"

Getting to market. Pushing data-enabled offerings through existing channels and sales teams is likely to produce mixed outcomes at best. Reps may lack the expertise and customer connections to sell the new offerings effectively and may turn to other products to make up their quota, leaving the innovations branded as failures. One building-management company developed a data-driven product to reduce

clients' operational and energy expenses, opting to launch the new offering through its existing branches to get to market quickly. However, one of the product's core benefits lay in reducing the time building owners spent on service issues in the local branches, while the company rewarded its branch managers based on the number of service hours they sold. Given the clear conflict of interest, branch managers mostly ignored the new offering.

Leading industrial companies aren't afraid to cannibalize their core if it brings them greater overall benefits, and they plan their organization, hiring, and incentives to support their new offering and maximize its chances of success.

Optimizing R&D processes with tech enablement

With an estimated $8 billion to $25 billion in incremental industry margin expansion, this is the smallest value-creation opportunity of the three. But it is still important, given that traditional approaches to R&D efficiency—peer benchmarks, lean engineering, trial and error—are producing diminishing returns and ceasing to confer competitive advantage. The fundamentals of tech-enabled R&D efficiency are a shift to agile iterative product-development cycles and the rapid deployment of digital- and analytics-based productivity techniques. Consider a typical company where engineers use ten or more systems in a typical day's work, ranging from timesheets, emails, and project plans to bills of materials and suppliers' systems. By integrating data from all these disparate systems into a common structure, the company can use machine-learning algorithms to track metrics dynamically and extract powerful insights that provide a fact-based, granular guide to sources of value.

One aerospace and defense company applied advanced analytics to identify productivity drivers and metrics in its software engineering. It began by creating a data lake that combined data from a dozen or so sources, including the enterprise value-management system, software code tracking, timesheets, and Microsoft Exchange. Then it ran multivariate algorithms to identify factors that correlated to productivity metrics. It found, for instance, that replacing late-stage software testing with early-stage testing using automated scripting would improve productivity by 5 percent.

Finally, the company created a business case and action plan to address target initiatives. This entire process was completed in just 16 weeks, thanks to a sprint-based approach that combined traditional engineering practices with advanced analytics. The company found opportunities to reduce software defects by 35 to 50 percent and increase engineering capacity by 20 percent.

How to capture the value

For all their promise, few industrial Internet of Things (IoT) products have reached full maturity and scale as yet. In our experience, one of the main barriers to adoption is a lack of understanding of how to capture the value of technology. Developing new offerings is only half the battle; companies must also invest in an effective go-to-market approach. This involves two elements:

Knowing where the value is created.

Those industrial companies that have succeeded in scaling connected products or data-enabled services understand where the value is created (by direct customers, end users, or ecosystem partners, for instance) and how it is created (through lower transaction costs, improved safety, fewer defects, or some other benefit). This knowledge is fundamental to developing appropriate business, pricing, and revenue models, quantifying value creation, and understanding how much value accrues to each party. For many connected products or data-enabled

services, the end user is the primary beneficiary of the value created. Component and subsystem suppliers will need to find a path to monetization that reaches the end user, perhaps via an ecosystem approach or partnership with OEMs.

In upstream oil and gas, for example, the value created by reducing downtime at a fracking site or oil rig is captured by drilling contractors but delivered by a combination of players. Data ownership is fragmented: the drilling contractors control the data from the large equipment they manage; manufacturers of, say, frac blenders own the algorithms and data that generate insights into the equipment and how it works; and component manufacturers, in turn, own performance data on individual products such as pumps. In this environment, creating value will entail forming partnerships with multiple manufacturers and designing a model that enables value to be fairly shared among the partners.

Establishing the right monetization model.

Industrial companies can monetize their products directly or indirectly. Direct options include bundling products, launching add-on services, and delivering an offering as a service. Indirect routes include capturing new market share, developing preferred-supplier status with OEMs, and so on. To maximize value capture, companies need to select a monetization model that is appropriate to their position in the value chain and the criticality of the value at stake.

Take the example of an agricultural-equipment manufacturer selling productivity services to farmers. In general, measuring the improvement in crop yield or quality that can be generated by data-enabled farming equipment is difficult, as it depends on multiple variables over the course of the year. However, on occasions when farmers need to harvest a crop within a short timeframe—as with sugar cane, for example—they want their equipment running at maximum productivity, opening up opportunities to create value by optimizing uptime or output. Meanwhile, a component manufacturer in this value chain may find that its best monetization strategy is to develop a preferred position with the OEM.

How to get started

Most industrial companies are still at an early stage in transforming their innovation and product development through technology. Some hesitate to take the first steps, others are stuck in pilot mode, and still others struggle to build a viable business case in the face of traditional development cycles and limited monetization opportunities. But delay could cost companies dearly: late adopters risk not only leaving value on the table but also losing market share to nimbler competitors. A McKinsey Global Institute survey found that being a first mover conferred an advantage of about 7 percent in earnings before interest and taxes—more than double the roughly 3 percent achieved by average responders.

So where do you start? We suggest five steps:

- *First, listen to your customers.* They know what they want when they see it, even though they may not be able to articulate it in advance. Invest heavily in customer insights to identify pain points in the user experience, and pressure-test your new offerings with customers to ascertain what they are willing to pay for.

- *Second, place big bets.* It's fine to fail fast, but avoid spreading your investment across too many ideas. Successful organizations prioritize a few big bets that get the lion's share of management attention. Having identified your big bets, consider novel ways to organize around them. Some tech-enabled industrial companies use a VC-like governance structure

with a digital unit reporting directly to a "digital board" comprising the CEO, CTO, and CFO. Such a structure ensures that funding is based on reaching milestones, that issues are resolved quickly, and that the core business stays focused on the core.

- *Third, adopt agile product development.* Set up small, autonomous, cross-functional teams that can get close to customers, fail fast, and pivot to the next opportunity. Traditional product development cycles are a recipe for failure, as they can't keep up with advances in technology and data.
- *Fourth, build out your ecosystem.* Commercial as well as technological partnerships are essential to moving fast and scaling effectively. Building and maintaining a robust ecosystem of partners demands dedicated resources.
- *Fifth, establish the right go-to-market capabilities.* Selling tech-enabled products is nothing like selling traditional hardware. It requires knowledge of consultative selling, software bundling, and unfamiliar sales cycles and solution architectures. Expecting your traditional sales channels to convert customers quickly or bolting a digital sales group onto a traditional organization could spell disaster. Instead, develop a clear customer interaction model and overhaul your sales structure, processes, enablement strategies, and incentives.

Tech-enabled innovation and product development has the potential to deliver enormous and much-needed revenue growth in the industrial sector. Companies that take a rigorous approach to finding, quantifying, and capturing value—and then move quickly—can expect to see the greatest impact.

Venkat Atluri is a senior partner in McKinsey's Chicago office; **Jeremy Eaton** is the IoT Venture Leader in the Minneapolis office; **Mithun Kamat** is an associate partner in the Stamford office; and **Satya Rao** is a partner in the Chicago office, where **Saloni Sahni** is a consultant.