



Platform-Based IoT Services Transformation

A roadmap to rapid digital innovation for established industrial companies



Idea in brief

IoT-based services are transforming the industrial sector. Although many firms are struggling with this challenge, research has shown that platform adoption can accelerate innovation and enable traditional enterprises to manage this kind of highly disruptive change.

GE has packaged its broad experience in a true platform, built for deriving specific industrial insights across diverse industrial sectors.

More than a set of technology building blocks that save time in building new solutions, the platform incorporates decades of capability building, deep investments in assets and infrastructure optimization, and a vibrant ecosystem of partners to enable IoT-based services transformation.

Adopting a cloud-based platform-as-a-service like Predix does not work in isolation. Providing transformed services will require new capabilities, organization structure, and business models tightly coupled with your traditional product and customer knowledge. This paper sheds light on these challenges and provides a roadmap for tackling IoT-based services transformation.



IoT transformation at Pitney Bowes

Pitney Bowes' equipment and operations have touched more first-class mail than anyone but the U.S. Post Office for almost a hundred years. But like many other established organizations, its traditional business is being challenged by new competitors and business models brought about by the new ubiquity of digital technology (see Iansiti and Lakhani, Harvard Business Review [2014]). In response, over the last few years, Pitney Bowes started on a journey of IoT-based services transformation, changing both capability base and business model toward a new vision of how sensors, data, and analytics can power new, transformational services for its industrial-scale mail equipment customers.

Pitney Bowes started on a journey of IoT-based services transformation.

The world's largest banks, telecom providers, and service bureaus operate mailing "factories" that produce millions of statements, communications, and marketing letters every month, using Pitney Bowes equipment. Its vision for services transformation was grounded in an understanding of these customers' need for greater service availability and revenue growth. Pitney Bowes began by aligning its leadership on a three-step plan to drive IoT transformation:

1) move from traditional break-fix service contracts to predictive maintenance, 2) optimize its customers' operation of the machines, and 3) accommodate top-priority jobs and meet critical service level agreements (SLAs) with adaptive and dynamic real-time capacity scheduling.

Coming from a software background, Pitney Bowes' Chief Innovation Officer, Roger Pilc, recognized the need for a fundamentally different approach to digital innovation to meet the needs of this new business approach. Rather than developing each capability and technology from scratch, Pitney Bowes leveraged GE's Predix* data, analytics, and services platform built exclusively for industry. Predix packages GE's massive internal investments in its own industrial IoT and services transformation into a modular software architecture that is easily accessible by GE's customers. The know-how accumulated through dozens of large-scale implementations has been assimilated in the package. Building on this foundation and leveraging GE's strategic advice on how to get started, Pitney Bowes could focus on its deep understanding of its customers while employing a fast and agile approach, enabling the team to achieve early wins and build momentum for the IoT initiative.

Already, Pitney Bowes has developed new ways to drive its own IoT-based services transformation. With its Clarity solutions suite powered by Predix, the company is using shared data on asset, application, and operator performance to drive new services in predictive and preventative maintenance scheduling. It is analyzing data on throughput and other productivity metrics to drive greater customer efficiencies. In addition, the company is developing an innovative approach to balancing capacity across its customer base with a real-time,

self-learning scheduler that gets smarter over time to help customers achieve peak performance by unlocking additional production capacity. Of course, there is still much to be done. But in just a few months, Pitney Bowes collaborated with GE to create a solid foundation for rapid digital innovation to operationalize its IoT vision.

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The Pitney Bowes experience summarizes many useful lessons for organizations planning to use IoT in their businesses to drive services transformation. Most of all, it highlights a fundamental insight that emerges from many observations of established firms dealing with rapidly changing, disruptive technologies: that platforms like Amazon AWS, Salesforce's Force.com, and GE's Predix are an essential foundation for transformation. These platforms not only encompass a set of technology building blocks that save time in building new solutions, but effectively package decades of capability building, deep investments in assets and infrastructure, and a vibrant ecosystem of partners to enable the rapid adoption of a new technological generation.

We will now unpack these ideas, describe best-practice approaches from an array of successful initiatives, and offer a roadmap for platform-based IoT transformation.



Achieving IoT-based services transformation

The rapid adoption of the Internet of Things, with its explosion of sensors, ultra-low cost connectivity, and powerful analytics, is transforming services and business models in the industrial sector. Increasingly, manufacturers are seeking to create software-based value-added services that produce business outcomes for customers and add incremental revenue to the enterprise. Indeed, customers are coming to expect not only best-in-class physical products from manufacturers, but also new services driving new levels of productivity, uptime, and business impact. Sitting on the sidelines for this transformation is problematic, as a number of new and old companies—from IBM, Google, and ThingWorx to Siemens and Caterpillar—are positioning themselves to extract value from traditional industrial sectors. Delivering the data-based services that provide the lifeblood of the IoT provides new opportunities for competitors to entrench themselves with your customers and capture an increasing share of the value.

Implementing IoT transformation is not a simple task. Keystone Strategy recently conducted in-depth research with 75 discrete and process manufacturing companies who attempted IoT transformation. This market survey tells a humbling story. As IoT projects are technologically very complex, when companies attempted the transformation by themselves—working to cobble together multiple software, hardware, communications, and cloud computing technologies to collect, process, and report on sensor data—results were quite poor. Most projects took over three years to complete. And in spite of considerable efforts, just 5% of IoT adopters achieved significant business outcomes. Most projects instead merely established a basic level of “ping-response” with their connected devices and barely started reporting on backward-looking questions (i.e., “what happened?”). Many were struggling with how to store and process this new influx of data. Others described a one-step-forward, two-steps-back evolution where they began to collect data only to realize that they were not capturing anything truly valuable to the business.

Pitfalls of IoT implementation

Keystone Strategy’s study of 75 industrial IoT initiatives shows dramatic differences in IoT adoption performance and approach, with just 5% achieving significant business outcomes:

PRACTICE	AVERAGE	BEST
Time-to-value	3 years	3–6 months
Development	Waterfall	Agile
Equipment	Monitoring	Predictive
Perspective	Rearview	Forward-looking
Results	Reporting	Outcomes

Without relying on true platforms, most initiatives so far have only at best produced incremental improvements rather than truly transformative experiences.



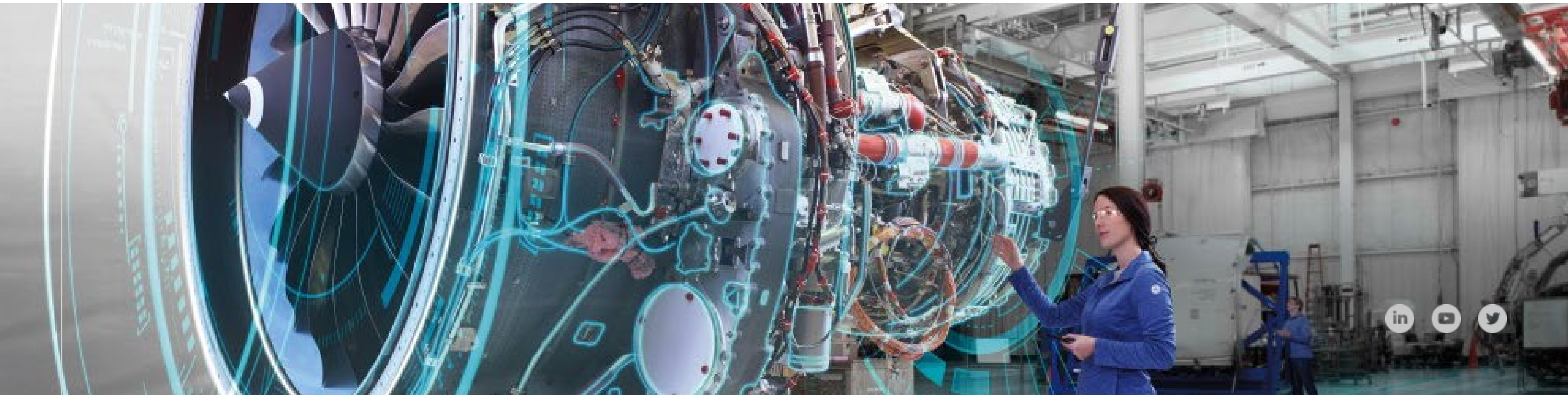
Even the best and most established companies often underestimate the challenges in making an important transition in technology and business model. IoT-based services transformation will change almost every aspect of a firm's operating and business models. It will require new capabilities in software development and analytics. It will motivate the adoption of new partners. It will drive new sales models and opportunities. It will change pricing schemes and approaches. Ultimately, most transitions fail because they underestimate the complexity, pervasiveness, and organizational impact of the challenge.

Clearly a "go-alone" approach to IoT transformation is not an easy way to go. However, research has shown that platform adoption can drive massive new efficiencies for traditional firms managing complex business and technology transitions. Years of innovation research have demonstrated the value of software platforms for accelerating innovation and managing disruptive change. For example, thousands of companies have improved their sales and marketing practices through the use of Salesforce.com without

building their own customer relationship management system from scratch. Similarly, organizations seeking to launch a high-scale customer-facing website or mobile app have turned to Amazon Web Services. In doing so, they have benefited from dozens of years of Amazon's experience operating its online retail site. Companies seeking to add these capabilities can leverage the AWS platform and its multiple billions of dollars in technology and content development without having to develop the underlying infrastructure themselves. AWS customers can instead focus on the innovation that matters most to their customers. It is thus imperative that firms understand the potential of IoT platforms in enabling this transformation process.

Ultimately, most transitions fail because they underestimate the complexity, pervasiveness, and organizational impact of the challenge.

Packaging its own capabilities and experience in industrial IoT-based services transformation, GE has assembled a powerful platform aimed at guiding its customers through this complex technology and business transition. In contrast with other technologies that enable solutions for hosting and manipulating data, GE's Predix cloud-based platform as-a-service (PaaS) provides the full industrial stack needed for deriving specific industrial insights, and packages long-standing investments in capability building, infrastructure, and partner development. GE has already connected an expansive ecosystem of industrial devices to the platform, allowing individual organizations to benefit from the combined scale of a much larger base. Predix is built to rapidly derive industrial insights across the entire industrial IoT stack, from sensors to networks to customer analytics applications, all the way to driving actions and real business impact.



Predix can enable an established firm, running a highly complex business, to carve out a manageable and measurable program for IoT transformation. This enables a firm to simplify its approach, leverage the experience and scale of GE and its ecosystem of partners, and focus on driving innovation in their traditional, trusted customer relationships. For example, Predix enables an expansive ecosystem of industrial devices, driving cloud updates to devices and apps running locally, “on the edge,” significantly reducing the complexity of integration. It incorporates the tools to build a digital replica, a “digital twin,” of your assets on

top of the data platform and the suite of apps and developer tools that support operational and business insight. It has been architected to facilitate tailored solutions from a broad network of systems integrators and software partners. From the user interface to mobile enablement and focus on security optimized for industrial devices, to the “how-to” knowledge, the solution and the digital stack are designed to accelerate time to value capture for new transformative services in industrial settings. The following case study on GE’s transportation business highlights the level and nature of the capabilities it developed and packaged into its solution.

How to get started

Adopting a platform does not work in isolation; an IoT-based services transformation will change almost every aspect of a firm’s operating and business models. The top question we get when discussing these transformations is how to get started. We have distilled the best practices observed in our research.

1. **Create your services transformation roadmap:** Develop a vision for new services that drive true business outcomes for your customers and customers’ customers.
2. **Build internal alignment, organize, and assemble the right capabilities:** Use your vision to create and sustain support for separate resources, carved out from the traditional business and organized in a cross-functional team.

A minimum viable team typically consists of product engineering to bring an existing products perspective, sales or product management to provide a good proxy for the voice of the customer, and data scientists with the analytical capabilities to structure the analysis in a way that drives the right answers.

3. **Engage your customers in rapid, low-cost, iterative experiments:** Share your roadmap and engage with your customers in joint data-driven experiments to test your hypotheses.

Rapid feedback is essential. Minimize the scope and time it takes to run experiments and start delivering outcomes to your customers.



GE Transportation's platform-based journey

GE Transportation is a \$6 billion global technology leader that has been manufacturing and maintaining locomotives for the railroad industry for over 100 years. For decades, GE collected data from hundreds of sensors on thousands of locomotives, but limited its application until recently to informing basic break-fix models. Its practices changed significantly in recent years. Using Predix as a foundation, GE Transportation is engaging in a dramatic services transformation for its railroad industry customers. GE's transformation journey started from optimizing efficiency for an individual train, to growing revenue for the entire railroad, to now exploring value creation across the entire rail ecosystem, with billions of dollars in value creation potential. As the services transformed, GE's business model also evolved—from a cost-plus sale of equipment, to maintenance contracts, and now toward outcomes-based software and services pricing.

GE's railroad customers expressed clear needs. Fuel makes up 15–20% of a typical railroad's operating cost, one of the biggest line items on its books. Velocity across the network is the biggest lever for revenue growth, with every 1 mph of increased speed resulting in as much as \$200 million of economic gain. Traditionally, a train's engineer balances dozens of complex variables to optimize fuel burn (costs) versus velocity (revenue) by “gut feel” as the train accelerates or decelerates hundreds of times on each journey. By analyzing historical data, GE

realized there was tremendous variability in the performance of different engineers on the same line. GE's product engineers and data scientists developed algorithms that combined information on route configuration (rail curvature, grade, etc.), locomotive history, and current operating conditions (number of cars, load, wind speed, etc.) to optimize train acceleration and braking in real time. Imagine an aircraft autopilot system for trains. The approach worked. This Trip Optimizer™ application can drive over \$1 billion in annualized cost savings and increased revenue potential across GE's installed base of locomotives.

Demand on railroads will grow 25–50% over the next decade.

In the next stage of service transformation, GE collaborated with its customer Norfolk Southern to create Movement Planner to manage the operations of an entire rail line. Demand on railroads will grow 25–50% over the next decade. Combining train location data with customers' routing and destination data, GE was able to optimize the routing and passing patterns across a network of trains, the railroad equivalent of air traffic control for trains, increasing train speed and rail capacity.

GE developed algorithms to optimize train acceleration and braking in real time to enable over \$1 billion in annualized cost savings and increased revenue potential.



Finally, aggregating data across different train lines, GE has begun to experiment with services that transform the full rail ecosystem. To transit North America's hub-and-spoke rail system, a typical train car transits multiple lines, collecting in massive rail yards to be coupled with cars from other lines for the next leg of the journey. With Predix, GE is able to begin integrating data across the Trip Optimizer and Movement Planner solutions and beyond. GE is positioned to again create new value by optimizing this process, orchestrating the arrival and departure of cars across the entire ecosystem.

As GE expanded its locus of value creation from train to line to ecosystem, it worked more and more closely with its customers, sharing knowledge and operating experience. GE first positioned itself to encourage greater sharing of data within each regional railroad's operations, and is now focused on sharing across more solutions and operators, significantly evolving customer business models.

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The transportation example does not stand alone. GE has built capabilities and learned important lessons in services transformation across a variety of verticals, from aviation, power generation (gas, wind and nuclear), transmission, and distribution to oil and gas, mining, industrial lighting, and healthcare systems. In each case, the transformation path shared similarities with the transportation example. And in each case, the knowledge gained was incorporated into Predix. The next IIoT journey example, courtesy of GE Power, illustrates how the Digital Power Plant is yet another way to make platform-based transformation a reality.



GE Power's platform-based journey

GE Power is a multibillion-dollar power generation technology and services company that manufactures generation assets across fuel sources including gas, steam, wind, nuclear, and more. Effectively, Predix enables this established business to jumpstart IoT-based innovation. By building solutions on Predix, it's possible to drive value very quickly by rapidly executing focused digital transformation projects. GE's Digital Power Plant, built on Predix (see below), is an example of this and is helping drive digital transformation across power generation fuel sources including nuclear, wind, hydro, solar, coal, and gas for customers like Exelon.

GE and Exelon are partnering on five rapid, iterative beta programs across a spectrum of digital solutions across the Digital Power Plant solution map to enhance and build deeper insights and analytics, as well as the business decisions that rely on those insights. Each pilot lasts only a matter of months, with a focus on improving analytic, operational, workforce, or asset performance in a specific case. The solutions that result from the pilots offer deeper insights across Exelon's fleet to enhance asset operations, business decision-making, workforce optimization, and fleet-wide capacity management.

The pilots were handled through rapid co-innovation programs led by a cross-functional digital and operations team from GE Power and Exelon. This collaborative effort included discovery sessions held in GE Digital's Foundries. The discovery sessions allowed the team to align on the five co-innovation projects in a short period of time and focus on outcomes including enhanced predictive analytics, prescriptive operation actions and insights, workforce planning and optimization, and improved asset troubleshooting and analysis. Each of these five pilot programs would last a matter of months, with each acting as a proof of concept to rapidly deploy across the extensive portfolio of generating assets that Exelon has in North America. One of the pilots involved Exelon's IT group learning how to develop on the Predix platform and porting over some of their proprietary analytics in the nuclear plant management space. The microservices created could provide a significant new market opportunity for Exelon to resell to other nuclear plant operators globally. This is a game-changing innovation for the power industry. GE Power and Exelon show the possibilities that exist for larger organizations to operate as a startup from the first approach: partnering rapidly on all possible ideas for operational and asset improvement, and later aligning these needs to solutions developed on Predix.

“Exelon is one of the first movers in deploying Industrial Internet solutions. Given their history of innovation and delivering value to their customers, we are incredibly excited about the impact this partnership will deliver in terms of customer value, de-carbonization, and our long-standing collaboration. The world needs affordable, accessible, reliable, secure, and sustainable power, and digitization is the next game changer.”

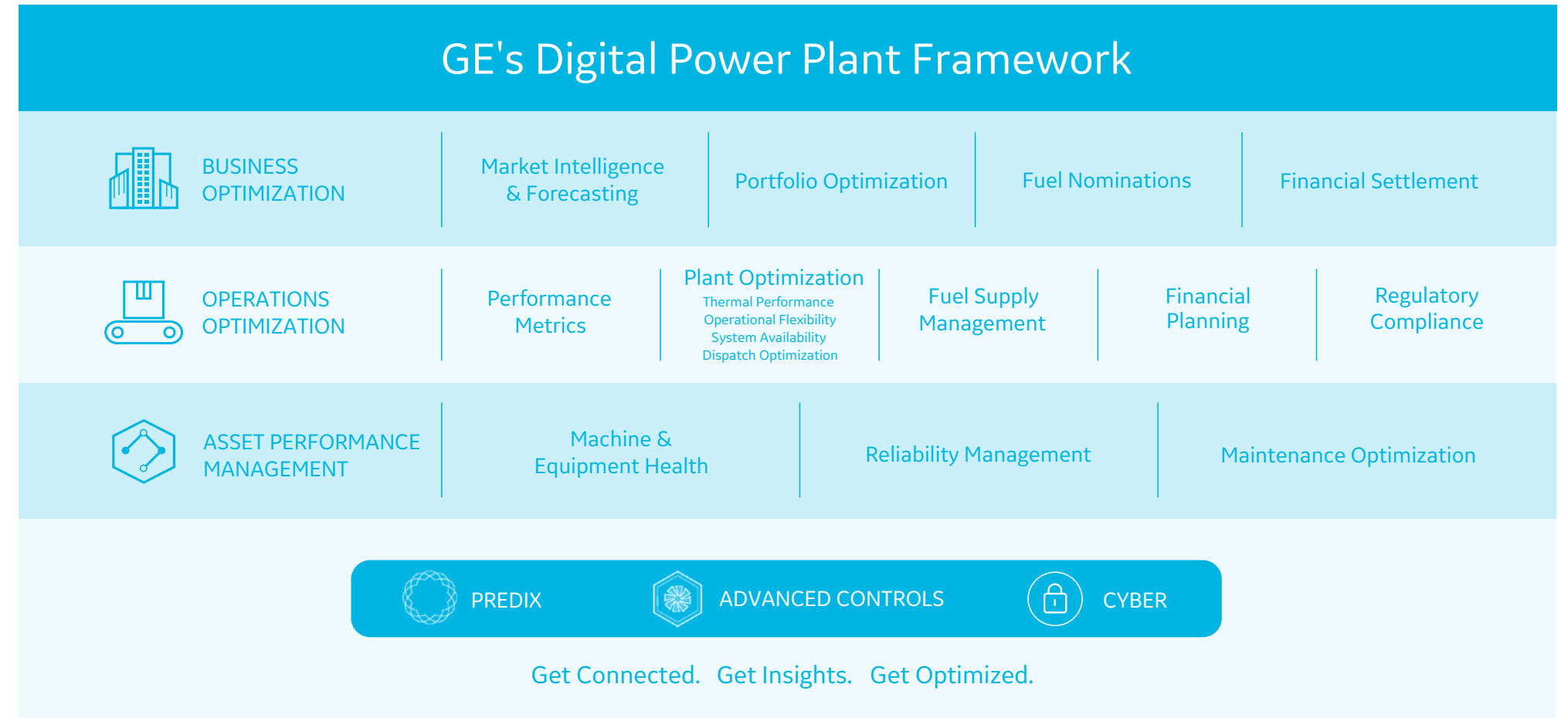
Steve Bolze, President and CEO, GE Power



Digital power plant case example

The power and utility industry is undergoing a radical digital transformation—from generating power, to moving power, to consuming power. Power generation utilities have long established a set of conservative heuristics to manage the complexity of their operations. Hundreds and even thousands of controllable and uncontrollable factors contribute to the business outcomes of each utility. Lacking the data scale and analytic capability to understand the limits of equipment and operational decisions on a real-time basis, they typically set thresholds well below optimal levels to buffer against variability and rare but predictable events. The business operations also face complex trade-offs of current market conditions and long-term profitability driven by the equipment, operating, and management decisions.

The power and utility industry is undergoing a radical digital transformation—from generating power, to moving power, to consuming power.



GE's Digital Power Plant is a robust industrial stack of digital analytics solutions to optimize equipment assets, plant operations, and business operations of power generating utilities. GE Digital's Asset Performance Management solution uses physics-based models and performance analytics to optimize asset health and reduce unplanned outages. With each utility's unique key performance indicators (KPIs) in mind, Operations Optimization uses simulation in a "digital twin" of plant assets to act as a digital problem solver, proactively resolving key operational challenges, such as reducing turbine startup times or optimizing fuel consumption in spinning reserves. Finally, the Business Optimization solution connects the equipment, operators, and dispatchers to the traders and equips them with real-time information about asset health, production capacity, and market prices that allow them to reduce financial risk and make smarter energy trading decisions.

Combining these three industrial-grade apps as part of GE's Digital Power Plant provides a single interface for plants to make coordinated, holistic operational and business decisions with the potential to deliver \$50 million in new economic value per plant. Increased visibility into asset health and operations afforded by these three solutions allows plants to no longer conservatively balance across operations and maintenance, leading to the rapid realization of previously unseen revenue.

GE had 15 customers within 100 days of its launch of Digital Power Plant in October 2015, including customers such as Exelon, PSEG, RasGas, and Salt River Project, to name a few.



Startup mode: platform-based services innovation

Effectively, Predix enables an established firm to jumpstart IoT-based innovation in “startup mode.” Building on GE’s Predix, it’s possible to drive value very quickly by rapidly executing focused experiments. The examples of the partnerships with Pitney Bowes and Exelon established impressive results in delivering new software-enabled services to customers in just two months.

Naturally, adopting a platform like Predix does not work in isolation. We have distilled the best practices observed in our research into three steps for getting started on IoT services or platform transformation.

01 Create your services transformation roadmap

Developing a services transformation roadmap is key to setting a clear vision of the longer-term course and driving strategic alignment for the long haul. A good roadmap should define the best starting points for IoT to begin creating value and the key milestones for the services transformation to progress over time. Additionally, the roadmap should provide a vision for how your company will differentiate itself through services and how it will monetize these offerings at different stages of evolution.

Figure 1 sketches the basic structure of an IoT services transformation roadmap. As you go from left to right, the scope of digital transformation increases, targeting increasingly complex and diverse challenges, and driving increasingly

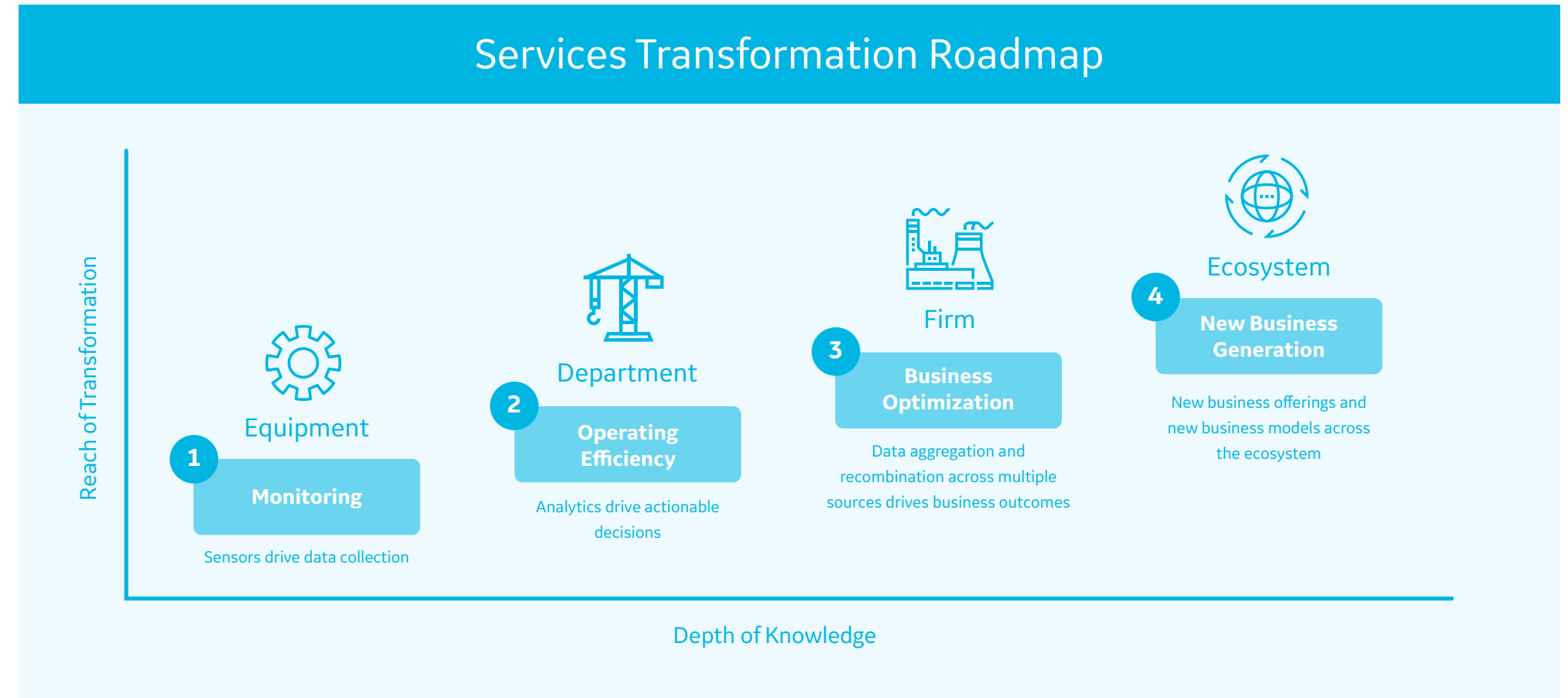


Figure 1

important impact. As a first step, organizations will start by adopting increasingly ubiquitous sensors that begin to collect data to monitor the performance of their equipment. As a next step, organizations will begin to use this data to drive increasingly actionable decisions, perhaps to optimize equipment maintenance schedules, or to reduce equipment operating cost. As a third step, the organization might begin to optimize product or service performance, creating substantial incremental business value. As a fourth step, the data drawn from a much deeper understanding of products and services is used to drive new innovative applications, connecting across different ecosystem stakeholders and generating completely new business opportunities.

This vision of progressive value creation is required to continue capturing value and expanding business models. Customers become accustomed to the value at each stage of the roadmap and less likely to continue paying for it over time unless you continue to innovate. The longer-term vision is important because as you approach the limits of innovation in one stage, you need to have already aggregated the data and built the capabilities to be successful at the next stage, or risk stalling out. The GE Transportation case study is a powerful illustration of the roadmap progression in action. We’ve seen similar transformations in industries from machining to medical devices to the smart grid.

02 Build internal alignment, organize, and assemble the right capabilities

Providing transformed services will require new capabilities in areas like data sciences and software development. A successful approach will require integrating these new capabilities with deep product, operations, and business knowledge. Engineering, service operations, sales, and data scientists should thus work together in an integrated fashion. But while IoT initiatives should integrate across multiple business functions, it is also important to separate teams developing new product and services offerings, and insulate them from the pressures and incentives of their traditional business. In startup mode, IoT begins as a strategic project with a heavyweight technology team. The project can be incubated within business development or the office of the CTO, and subsequently spun out. GE has, for example, established a digital business unit encompassing the company's software offerings. Within each business unit, GE has established chief digital officers who report into the business and into the software organization to drive the evolution of the software business and progress along the roadmap.

Because of the complexity of this transformation, senior-level ownership is a table stake for successful industrial IoT initiatives. More so than other technology disruptions, IoT requires multiple company functions to be operating in concert, and strategic direction must be established by company leadership and echoed throughout the organization. Paul McElhinney, CEO of GE Power Services, was initially a skeptic when GE embarked on its digital transformation journey.

"I thought it was a fad and that I could wait it out." But when the Aviation Services group he led at the time ran into complex operational challenges reducing profitability with a major customer, McElhinney partnered with the incipient Predix team to get to the root of the problem. When he saw the results of the experiments with data- and analytics-driven services, it became clear that IoT would become the "single biggest competitive differentiator" for GE. He drove this message throughout the business unit and aligned the organization around the strategic goal of delivering transformative services.

To align incentives across different value-chain participants, IoT-based implementations frequently adopt outcomes-based business models. In these settings, different participants will baseline current system performance and share gains from improvement. Such outcomes-based business models will drive new needs in sales and marketing. While complicated in scope, a typical service agreement sale generally focuses on a narrow set of criteria. GE's new outcomes-based services require a much broader knowledge of the customer's business and a more consultative approach to selling, often involving cross-functional customer stakeholders. Evaluating data from half of the commercial wind turbines in North America, GE determined that a combination of product configuration and dynamic management algorithms based on environment could help customers deliver 20% more electricity than a traditional wind farm. This capability has transformed the nature of GE's relationship with its customers from transactional equipment and services to a business model based on outcomes.



Customer engagement case study

GE produces aircraft engines for over 200 different airlines, powering over half the world's large commercial planes. These engines need to respond in exactly the same way every time, tens of thousands of times over the course of their lives; GE's success in the market is grounded in its ability to produce every engine to exacting standards and performance. But services transformation in the airline industry is very different. While the equipment is identical, operations and business models vary dramatically by region and carrier. To impact outcomes with new services, GE engages its customers through rapid experimentation to understand their unique operational and business-model needs.

The Qantas Group illustrates this contrast in environment, operating objectives, and business models. One of Australasia's largest airline groupings, Qantas is collaborating with GE on initiatives like flight crew awareness, operational insights, and airspace utilization improvements to support a transformation strategy. In this collaboration, GE is providing data analytics to enable Qantas to identify ways to reduce operating costs, increase aircraft utilization, optimize the design of terminal area navigation, and improve the business of flight.

03 Engage with customers in rapid, low-cost, iterative experiments

Because of the intrinsically networked nature of the problem, IoT-based transformation is most effective when it drives collaboration and experimentation across different stakeholders in the value chain. So share your roadmap and engage with your customers in joint data-driven experiments. Using your roadmap and simulation results, test and refine your hypotheses. Align on pilot opportunities that leverage your data scale to go beyond what either you or your customers can do individually. In the case of Exelon and GE's Digital Power Plant, running quick, iterative pilots with customers to focus on testing specific outcomes and improvements was a successful approach. Focus on new, quick wins that emerge from the collaboration.

However, don't boil the ocean. Minimize the scope and time it takes to run experiments and start delivering outcomes to your customers. Rapid feedback is essential. For example, Pitney Bowes gathers new, practical insights into how its customers' mailing factories operate on a daily basis; industrial tools manufacturers are gathering granular information on the "speeds" and "feeds" individual operators are using on their equipment in near-real time; railroads quickly gather daily operating data on locomotive performance to realize system-wide efficiency gains. Contrast these examples with a healthcare diagnostic equipment manufacturer in the Keystone strategy study, who invested six months in developing a compressive digital enablement concept with a lead customer and then spent nearly two years instrumenting their equipment and developing the full digital stack solution. When they finally implemented the system in a real-world environment, they found they hadn't instrumented the right data to solve the customers' most important challenges. We've heard similar stories over and over from very successful equipment manufacturers, and in almost every case, the right solution approach could have been known much earlier in the process through rapid, low-cost, iterative experiments with customers.

Conclusion

This paper has laid out an agenda for IoT-based services transformation. Over the last few decades, we have learned that when faced with such massive disruptive transitions, established firms have most often lagged behind. The failures are too many for an exhaustive list and include household names and brands from Kodak to Wang, from Digital Equipment Corporation to Compaq, and from Nokia to Blockbuster. At the same time, we have also learned that well-designed platforms can provide a highly effective way for established firms to renew themselves and experiment to drive new business and operating models. Thousands of firms have benefited from deploying Salesforce.com to streamline their business processes or Amazon Web Services to experiment with and deploy cloud businesses.

This paper has focused on the potential for one such platform to drive transformational impact across the industrial sector.

Predix is drawn from GE's billion-dollar investments in its own transformation, and is designed for modular and agile deployment. Rather than taking the entire transformational burden, GE's customers can build on its sophisticated infrastructure, draw from its capabilities and lessons learned, and drive toward a rapid and impactful transformation. GE's IoT transformation platform is thus spawning an ecosystem of IoT initiatives and driving a wave of change in the industrial sector.

A platform alone will not drive the necessary changes for positive outcomes. Providing transformed services will require new capabilities, organization structure, and business models tightly coupled with traditional product and customer knowledge. Successful firms adopt a startup-like culture of experimentation and rapid iteration, and incorporate the guidance of experienced partners. The valuable insights these firms offer, along with the support of GE's Predix platform, provide a roadmap for successful IoT-based services transformation.



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About GE

GE (NYSE: GE) is the world's Digital Industrial Company, transforming industry with software-defined machines and solutions that are connected, responsive and predictive. GE is organized around a global exchange of knowledge, the "GE Store," through which each business shares and accesses the same technology, markets, structure and intellect. Each invention further fuels innovation and application across our industrial sectors. With people, services, technology and scale, GE delivers better outcomes for customers by speaking the language of industry.

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