# Quantifying the return on investment (ROI)

The business case for internet of things initiatives


## Executive summary

### ROI redefined

If someone asked you to create an ROI model for an investment in Internet of Things (IoT) connectivity, where would you start?

Organizations today are under tremendous pressure from management and customers to deliver a higher quality of products and services at lower costs, and to do so using existing resources. Any expenditure companies do make to help them achieve this goal is expected to deliver a measurable, hard-dollar ROI—and to deliver it quickly. For product manufacturers in particular, ROI has traditionally translated to "reduce costs." However, cost is just one piece of the ROI equation.

Today's market leaders understand that ROI is multidimensional and that, in many cases, the cost-savings component can be secondary to other returns such as improving customer satisfaction, brand differentiation, and the collection of accurate data, all of which can also drive increased revenues.

As companies do everything they can to retain and expand relationships with existing customers—their most valuable assets—new business models and value-added services are coming to the forefront, and with them comes significant new opportunities for the enterprise. The IoT is creating new opportunities for companies to enhance their services, gain business insights, improve business processes, and differentiate their offerings. In fact, connecting machines is bringing companies closer to their customers while delivering real ROI and payback.

In this white paper, ThingWorx™, a PTC® company, presents examples of IoT value propositions and defines an ROI model for building a business case and tracking results related to IoT initiatives. This paper uses real-world customer results and a set of key metrics to help executives and managers understand the return they should expect when investing in IoT.

## IoT introduction: Unlocking the value of smart, connected product data

With all of the industry buzz and vendor movement around IoT and the Industrial Internet, it's time for business leaders to understand how smart, connected products and assets can improve efficiency, provide a competitive advantage, drive revenue, and potentially transform their businesses. If you know what your products are doing and how your customers are using them, you can then unleash the resulting data into your enterprise and unlock the value of that data.

The value propositions are straightforward and fall into several buckets of capabilities that differentiate your products, including remote monitoring, remote service, usage analysis, ERP/CRM integration, and value-added services.

Smart, connected products enable remote monitoring and remote service that drive both a reduction in the costs of services and an improvement in the level of service. Analysis of connected product data can improve business decisions, product design, and manufacturing processes. Core business processes like billing,

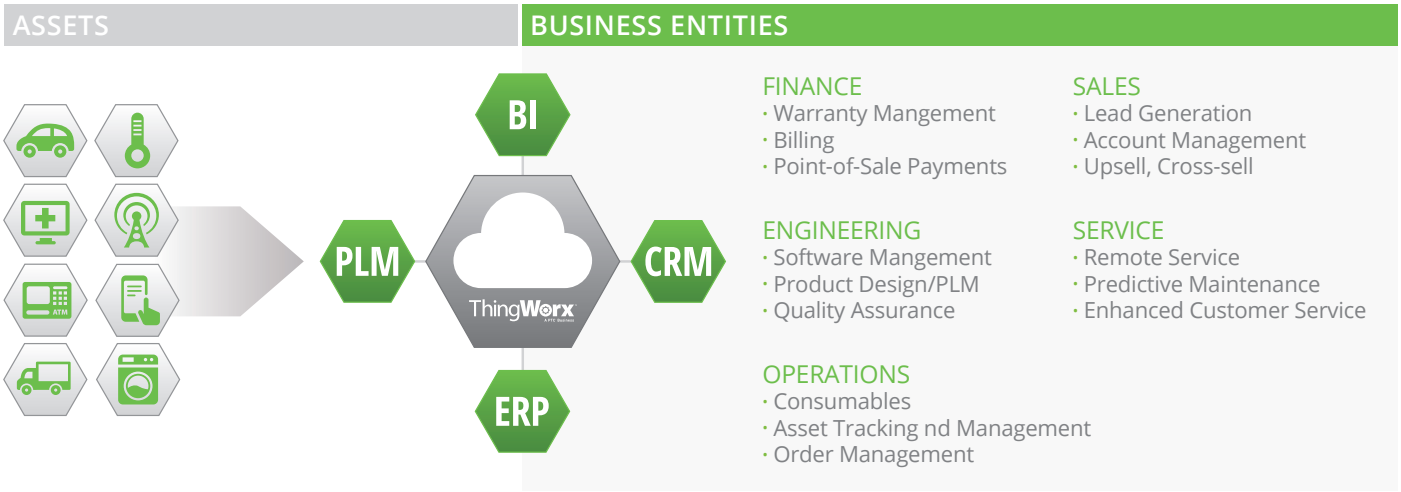


Figure 1: Enhancing a Process with Smart, Connected Product Data

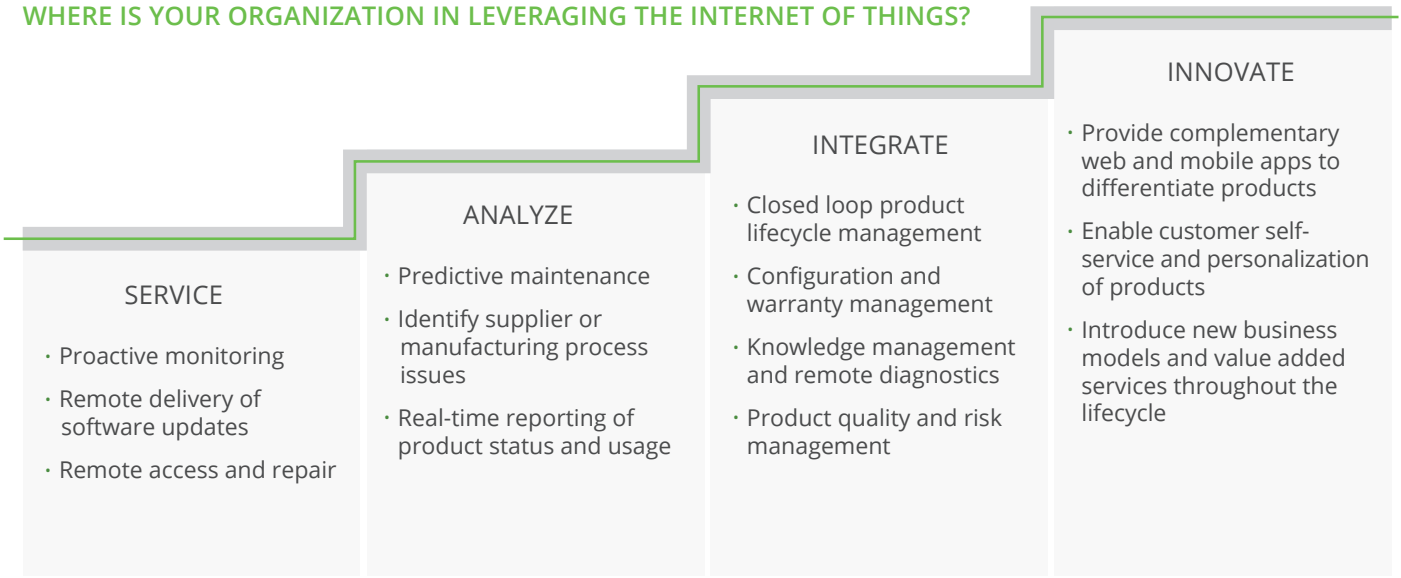


Figure 2: Connected Product Maturity Model

field service, product registration, compliance, consumable management, recalls, and warranty management can all be improved with connected product data. And finally, the selling and marketing of connected products, which include new applications for end users, can deliver a competitive advantage and drive revenue growth.

The future with IoT embraces the reality that no product or asset will be an island. All products, devices, facilities, systems, equipment, delivered goods, processes, workflows, and people will coexist in a connected world, interacting and being interdependent. IoT systems will act like social networks, socializing connected product data to foster unparalleled knowledge and collaboration.

ThingWorx has interviewed customers, analyzed results, and found top- and bottom-line impacts that executives need to understand. The following sections share these finding and discuss what they mean for the enterprise. You will find an overview of the business metrics for IoT and the description of a framework to quantify the return on investment.

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### Customer success story

#### Varian medical systems, inc.

Varian Medical Systems is engaged in the design, manufacture, sale, and service of equipment and software products for treating cancer with radiotherapy, stereotactic radiosurgery, and brachytherapy.

It also designs, manufactures, sells, and services x-ray tubes for original equipment manufacturers, as well as replacement x-ray tubes and flat-panel digital image detectors for filmless x-ray imaging in medical, dental, veterinary, scientific, and industrial applications. It designs, manufactures, sells, and services linear accelerators, digital image detectors, image processing software, and image detection products for security and inspection purposes.

#### Metrics

- Reduced MTTR by 50%
- Average of 700 calls resolved remotely per month
- Saved 4 hours of travel time for each call
- Reduced service costs by $2,000 for each problem resolved remotely

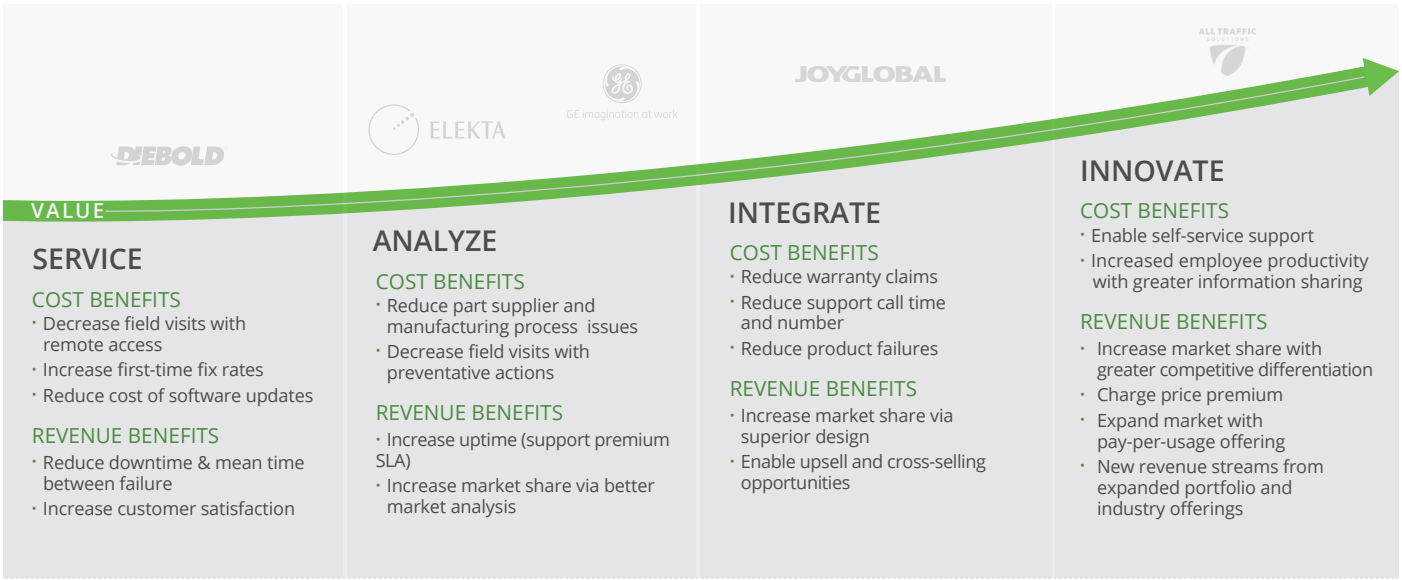


Figure 3: ROI at Each Level of the Value Curve

## The metrics of smart, connected products

### What is a metric?

A metric is a measure of quality—a success story that describes a quantifiable benefit. It can represent reduced time to market, improved productivity, increased market share, lowered or avoided costs, or higher profitability overall—any result that is valuable to you and your company and that can be translated into a monetary gain or savings. Metrics are an extremely effective way to quantify and compare a project's contribution and to highlight how that work has positively influenced the company's bottom line.

### What are you measuring?

Your goals, and the goals of your company, dictate where the best metrics can be found. What is most important to you and your company? Some connected product-related goals that can be converted into metrics include:

| Reducing | Increasing |
|---|---|
| Time to market | Market share |
| Service costs (number and length of visits) | Revenue |
| Customer downtime/ SLA penalties | Profitability/margins |
| Mean time between failure (MTBF) | Average selling price |
| IT infrastructure costs | First time fix rate (FTFR) |
| Mean time to repair (MTTR) | Customer satisfaction/ loyalty |
| Time to innovation | Share of wallet |
| Product recalls and returns | System uptimes |
| Call volume in service center | Product registrations |
| Warranty claims | Competitive advantage; win ratio |

Customer success story

Leica microsystems

Leica Microsystems is a leading global designer and producer of innovative, high-tech precision optical systems for the analysis of microstructures as well as a broad product portfolio for histopathology. It is one of the market leaders in the business areas of microscopy, confocal laser-scanning microscopy with corresponding imaging systems, specimen preparation, and medical equipment.

Metrics

- Reduced unscheduled downtime by 40%
- Cut field service visits by 33%
- Improved service productivity by 5%
- Fixed 30% of detected problems remotely
- Improved time-to-repair fulfillment from 75% to 87%
- Saved more than $500,000 (U.S.) annually by avoiding 400 on-site visits

### Which internal organizations can provide data to develop your metrics?

- Service and support
- Engineering
- Operations
- Finance
- Sales and marketing

### When do you collect data?

It is important to remember that collecting metrics is an ongoing process. Metrics for individual projects can be combined to quantify bottom-line goals such as profitability, market share, and time to market. Each time a workweek is finished or a project is completed, you gather metrics. Metrics are not static, so you need to be aware of these dynamic changes and their impact. Begin collecting metrics before you begin a project. Work with a representative cross-functional team to document your existing processes and workflows. Be as

detailed as possible, listing each step in each process, the associated deliverables, and relevant quantitative data.

**For example:**

**Process:** Software update

**Step:** Remote product at customer-site installation

**Data to collect:** Time to fix; cost to complete update; customer satisfaction

When evaluating a new process using IoT, compare your results with the results you gathered on a similar process when using your previous methods.

## The value of improved service

Every product requires some level of service and support. To provide world-class service, organizations are increasingly adopting service solutions that identify, diagnose, and resolve issues remotely. A connected product strategy helps to deliver proactive services that improve uptime and decrease the number of field visits or the length of support calls. At the same time, it increases the first-time fix rate (FTFR) and slashes service costs, paving the way for value-added services to be developed based on the data that is being returned from the devices. These are the key value propositions:

- **Diagnose problems remotely:** An expert on a service call can use a remote access and service application to directly access the diagnostic parameters and log files, as well as live and historic operational information about the troubled device. Even if the user has reset the device, the expert can mine captured data about what the machine was doing at the time of failure or compare snapshots of the device state at selected times, and then use this data to diagnose problems without user intervention.
- **Reduce on-site travel with remote repair:** Experts can remotely repair, adjust, or administer devices without traveling to the site. If they determine the cause of problem was user error, they can monitor how the operator is using the device and offer training or advice on how to use it better or differently. When they find a problem they can fix remotely, the experts can adjust system parameters, manage files, download software fixes on demand, or proactively update software across a whole range of devices. The proactive fault notification, remote problem diagnosis, and remote repair features translate into quantifiable dollar savings.
- **Utilize service resources more effectively:** Because monitoring, diagnosis, and repair can be done from anywhere in the world, companies can intelligently utilize service experts located worldwide and put the best people on the right job, while reducing time and travel expenses. Experts can troubleshoot and resolve problems from their desktops using a standard Web browser and collaborate with each other and with on-site support personnel or device operators.
- **Reduce software installation, distribution, and upgrade costs:** With remote software-management capabilities, individual devices or whole device populations can be updated using a secure mechanism without costly software duplication and shipping. The solution can maintain indepth

### Customer success story

**Diebold®**

Diebold, Incorporated, is engaged in providing integrated self-service delivery and security systems and services primarily to the financial, commercial, government, and retail markets. The company operates two lines of business—self-service solutions and security solutions—and the company's sales personnel, manufacturers' representatives, and global distributors sell systems and equipment directly to the customers.

**Metrics**

- Approximately 17% of all issues are resolved remotely
- Overall downtime for the product line reduced by 15%
- Turnaround time for problem resolution reduced from an average of one to three hours to fewer than 30 minutes when remote corrective action is successfulavoiding 400 on-site visits

information on each device configuration, so specific software releases can be correctly mapped to a given device installation while avoiding customer errors. This reduces distribution costs and helps reduce costly call-center calls from customers who are struggling with upgrade procedures or using obsolete software.

### Table 2: Key benefits and metrics of remote service

| Benefit | Key Metric |
|---|---|
| Reduced call volume through proactive notification | Number of calls |
| Shortened call-handling time | Length of calls |
| Fewer emergency repair visits | Number of field repair visits |
| Improved troubleshooting | Number of second or return visits |
| Less travel for on-site support | Number of maintenance visits |
| Fast delivery electronically of software upgrades | Number of field upgrades/patches |

## How do you translate the data you have collected into value?

Once you have obtained the raw information, you will need to perform some calculations to quantify your achievements. For the purpose of our example, we have chosen to adopt the following standard assumptions:

- Fifty workweeks per year
- Four weeks per month
- Five days per week
- Forty hours per week
- Eight hours per day

**Employee burden rate:** This is computed by adding insurance and other benefits to the hourly wages of an employee. This rate will enable you to translate time savings into labor cost savings.

**Average weekly sales of products/services in units:** This is computed for your company's fiscal year.

**Profit margin of the products/services:** This is income derived from the units sold less all operating expenses divided by sales.

## Examples:

### Labor cost savings

Company XYZ estimated that each field service technician deployed in the field has a capacity of ten on-site customer visits per week. The expected results for implementing remote service would be a reduction in total on-site visits by 30 percent. The burden rate for a field service technician is $100 per hour.

- Step 1: Determine the number of visits per week, assuming that an average field-service visit at a customer location is four hours long
  - Example: 40 hours per week/4 hours per visit = 10 ten calls on average per field service technician per week
- Step 2: Determine the man-hours saved by using IoT to remotely diagnose and repair 30 percent fewer issues without an on-site visit
  - Example: 10 calls x 30% x 4 hours = 12 man-hours saved per week
- Step 3: Develop a quantifiable metric; subtract the amount of time required per workweek times the burden rate for a field service technician to determine labor cost savings
  - Example: 12 hours per week x $100 per hour = $1,200 in savings per workweek
- Step 4: Determine the impact across the entire field service organization
  - Example: Assuming 100 technicians x 50 workweeks x $1,200 per workweek = $6,000,000

### Increased product revenue

Based on value-added services that can be enabled by ThingWorx, company XYZ estimates that a connected product line could generate an additional revenue stream. Assuming customers will subscribe to these services within the first year of product ownership, here is a sample calculation of increased revenue:

- Step 1: Determine the value of connected product services for each product unit assuming the average selling price of a connected application is $50 per year per user, and the average number of users per connected product is 20
  - Example: $50 x 20 users per product = $1,000 per product
- Step 2: Estimate the total product revenue increase. Assuming a 25 percent attach rate on a total product unit volume of 100,000, the increase in product revenue for the new connected application would be 100,000 units x 25% x $1,000 = $25,000,000.

## The value of analytics and better decisions

To get greater value from the data beyond improved service, you need to analyze the data and utilize the tools and applications that provide insights into the devices providing the connected product data. The value of analyzing this data comes from three areas:

- Identification of quality issues: By looking at the trends across multiple systems, you can reduce costs by identifying any quality issues or design flaws in parts supplied by third parties or within your own manufacturing processes, allowing you to understand what is causing downtime for customers. Understanding the relationships between problems and specific batches or production runs can identify a bad batch early and streamline the recall process. It is also possible the problems are more serious and still in the current manufacturing process. In this case, the data may trigger the need to change the current manufacturing process.
- Predictive maintenance (schedule maintenance only when required): By analyzing historical data you can begin to more accurately predict the maintenance cycle of your devices and machines and their discreet components. Analysis of connected product data, including sensor data, will uncover patterns in connected product data readings that are early indicators of failures. Rather than performing preventive maintenance on a calendar basis when it may not be needed, companies can track exactly how much a device has been used and if it's truly time for service—thereby eliminating unnecessary preventive maintenance calls and premature repairs or component replacement. Service reps can also perform preventive maintenance during scheduled calls, reducing unplanned and planned downtime and customer interruption. This predictive maintenance knowledge can then feed increased revenues by providing increased uptime with premium SLA pricing.
- Improved product design: The understanding gained from real end-user behavior and usage patterns also allows product managers and engineers to design better products and prioritize new features, as well as drive an increased market share by offering a superior product design. Product management can utilize this usage data to define next-generation product requirements and ensure that companies design a product that takes into consideration real-world customer feedback.

**Table 3:** Key benefits and metrics of connected product data analytics

| Benefit | Key Metric |
|---|---|
| Predictive instead of scheduled maintenance | Number of maintenance visits |
| Ability to identify design flaws | Number of recalls |
| Ability to identify part supplier issues | Number of recalls; mean time between failure (MTBF) |
| Ability to identify manufacturing process issues | Number of recalls; cost of warranty services |
| Ability to charge more for higher SLAs | Average selling price |
| Superior product design based on improved understanding of usage behavior | Win ratio; market share; customer satisfaction |

## The value of smart, connected product data integration and business process efficiency

Organizations that were early in bringing their products online are now realizing that the real "gold" in IoT is taking that data and integrating it with enterprise systems such as CRM, ERP, PLM, or data warehouses—optimizing critical business processes, reducing service call times and warranty claims, and enabling an efficient product recall process.

IoT data from connected assets, in collaboration with other enterprise systems, can provide not previously possible visibility and automation across organizations. For example, product data flowing through a CRM system can also be sent to billing or into a supply chain management system—helping to eliminate error-prone manual steps and providing new sales opportunities for things such as consumable replenishment or warranty renewals. Additionally, integration with quality assurance or product lifecycle management (PLM) can help enhance product features based on real-world data that shows usage patterns or equipment issues—helping to improve customer satisfaction and streamlining beta programs.

By monitoring consumable levels in machines, operations can resupply in advance to avoid downtime. Service, sales, and marketing can observe consumption over time and deliver the right service at the right time to avoid costly delays to a client. Measuring critical data points in a device allows for notification to the service team if there is a risk of failure, and, simultaneously, the finance department can be informed when warranty guidelines are not being upheld.

One example of connected product data integration is the implementation of a usage-based insurance strategy, which is revolutionizing the auto insurance industry. Operations and finance teams can track speeds, idling times, parking locations, distances traveled, hard stops, and more, leading to decreased premiums for consumers and providing a point of differentiation for those companies providing the service.

### Customer success story

#### Agilent technologies®

Agilent Technologies is the world's premier measurement company, offering the broadest range of innovative measurement solutions in the industry. The company's three business units—chemical analysis, life sciences, and electronic measurement—provide customers with products and services that make a real difference in the lives of people everywhere. It manufactures a range of scientific instruments, including oscilloscopes, chromatography, spectrometers, signal sources, signal and network analyzers, atomic force microscopes, and nuclear magnetic resonance spectrometers.

#### Metrics

- Reduced onsite repairs with no parts by 20%
- Ramped up deployments from 2007 to 2009 by 450%
- Determined 40% of "Push for Help" requests could potentially be resolved remotely
- Tied their initiative to SLAs
- Used customer feedback to measure and improve the initiative

In a survey of customers, 67 percent reported having already integrated, or were in the midst of integrating, connected product data with an enterprise system. Why? What value is connected product data to ERP and CRM? What are the benefits of making connected product data available to these systems? The answer is simple: many business processes can be improved by using connected product data. The table below shows examples of nine business processes that are improved with connected product data.

**Table 4:** Key benefits and metrics of smart, connected product data integration into business systems

| Business Process | Benefit | Key Metric |
|---|---|---|
| Customer Service | More effective troubleshooting and customer case handling (CRM efficiency) | Length of support calls |
| Field Service | Proactive creation of field-service requests with accurate data and health status | Time to resolution |
| Warranty Management | Reduction in warranty claims and warranty services costs | Number of warranty services; warranty costs |
| Recall Management | More efficient recalls with more accurate data of which machines need to be recalled | Support cases for recalled products |
| Usage-based Billing | Market expansion using pay-per-use billing (pay as you go) | Number of new customers; market share |
| Consumables Management | Increase in sales of consumables | Consumables revenue |
| Compliance | More efficient auditing of interactions with equipment/machines | Cost of compliance |
| Configuration Management | More accurate data about the installed equipment and configurations | Cost of configuration management |
| Enterprise Asset Management | More accurate data about current location and status of a corporate asset | Cost of asset management |

## The value of differentiated products that change the customer experience

The ultimate goal for product manufacturers is to have a highly differentiated product offering, transforming your business and increasing customer loyalty through innovation. By providing more value to customers who purchase your machines/equipment, you can increase sales and loyalty and reduce churn.

Unlike the value discussed so far which has focused on your organizations, the value we are discussing here is to the end user. This value, when understood by the customer, will encourage them to purchase connected services and drive the adoption of your connected product programs.

There are many types of custom applications that can enhance the utility of a product. For example, organizations can present data from the connected product to users and end customers via portals that they can view while using equipment in real time. This enables application leaders and developers to receive real-time technical and industry information and develop a culture of innovation that motivates and rewards end-user feedback. Mobile applications for smartphones and tablets are emerging as a way to put applications that interact with products in the hands of field personnel and end users who need remote access from anywhere.

Several manufacturers provide their clients with Web applications that allow the users to remotely control and monitor the consumables on a machine in order to replenish them in a timely manner. Others supply applications that audit all machine activity and make it easy to generate compliance reports.

Some assets, such as surgical pumps, are designed to be mobile and may be transported with a patient on a gurney or bed and transported out of the assigned operating room, or possibly even out of the hospital. The manufacturers of these machines may provide an application that allows the hospital staff to track the pump and to know where it is at any point in time, which enables them to better utilize the asset pool.

A final example of giving customers a seamless experience when managing their assets is the provision of a Web portal to complement equipment that provides a mashup of connected product data and other customer account information, including service history. Moreover, all of this connectivity enables automated product registrations, which in turn enables cross-selling, upselling, and greater sales of consumables.

These value-added applications deliver product differentiation that can not only increase your market share, but also provide new business services that can increase the average selling price.

### Customer success story

#### General electric® power and water

GE Power and Water is the world's premier alternative fuel generator provider, offering the broadest range of power generation products. The company connects its generators to ThingWorx to monitor the health and status of the machines and to provide remote service. The company also stores historical data to understand patterns that emerge in the sensor data that are early indicators of future failures, enabling them to implement predictive maintenance and reduce the number of scheduled service visits.

#### Metrics

- Reduced onsite repairs by 50%
- Saved $800K in customer service costs
- Increased uptime to save customers $1.2 million
- Tied contracts to SLAs to offer premium services
- Leveraged predictive maintenance to replace bearings

**UBIQUITOUS DEVICE CONNECTIVITY LAYER**
- Scalable
- Secure
- Embeddable
- Easily deployable
- Any network topology and communication scenario

**MODEL-BASED DEVELOPMENT**
- "Codeless" development
- High levels of efficiency and reuse
- Increase development velocity by 5X – 10X

**EVENT DRIVEN EXECUTION & 3D STORAGE ENGINE**
- Supports scale requirements for massive numbers of devices
- Optimized & unified storage for time-series, structured, and social data
- 10X Faster than traditional RDB
- Two-way interfacing with big data analytics

**FLEXIBLE DEPLOYMENT OPTIONS**
- Cloud
- On-Premise
- Embedded
- Hybrid

**CODELESS MASHUP BUILDER**
- "Drag & Drop" Interface
- Rapid Creation of IoT Applications
- Extensive Collaboration Components
- Data Visualization Charts, grids and forms

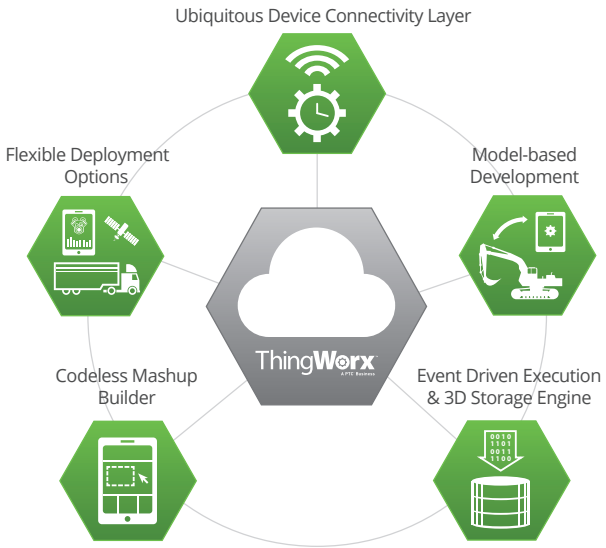


Figure 4: Reduce Upfront Costs, Drive Down Operational Costs, and Minimize Risk

## Why it is time to connect your products now

The bottom line is that connected products offer companies the ability to provide better service at a lower cost, minimize response time, and maximize the use and reach of their resources. At the same time, they are looking to improve revenue, margins, market share, and most important, customer satisfaction. Connected products can be the key to providing world-class service, gaining business insights, improving business processes, and differentiating your offerings.

Leading companies consider IoT and use of the Internet for remote monitoring important or essential to business operations and as key enablers to increasing customer satisfaction. Furthermore, they demonstrate a strong understanding of what IoT is, have succinct expectations for the delivery of business benefits and ROI, and are well on their way to adoption.

Every company, depending on its applications and types of devices, will have different pain points and business needs for implementing IoT and different expectations for where and how they expect a return on their investment. The reality is that high, measurable cost savings, topline growth, and increased customer satisfaction—which ultimately translate into increased market share—are being realized today by companies across industries that are using IoT, with payback being measured in just months.

Contact PTC at PTC.com/go/scp to learn more.



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