

Practical Guidance for Manufacturers Starting Their IoT Journey

By Rick Davidson



If you are a manufacturer, you are likely investigating use cases where the Internet of Things (IoT) can enhance your products' capabilities, provide more insights on how your products are used by your customers and, of course, increase product sales. As IoT-enabled products become more and more mainstream, your customers will come to expect smart and connected products that improve their lives (e.g., personal health and safety, productivity, leisure, etc.). And, your competitors will be working hard to be first-to-market with game-changing products for your industry sector.

The Internet of Things is the transformation of everyday products in three ways:

1. **Smart:** Products are intelligent and algorithmic via embedded controllers, and capable of data storage. These capabilities are particularly important for products operating within a remote setting, where an "always on" network connection may not be possible.
2. **Aware:** Products can sense temperature, vibration, and a host of other attributes, via micro-electrical/mechanical sensors, that can only be measured at the product's location.

3. Connected: Products are able to communicate with each other machine to machine (M2M), or with the enterprise via telecommunication networks ranging from mesh to global.

As a result, IoT-enabled products will sense and collect information about their environment, status or condition, location and many other parameters. They will also provide insight into your customer's behaviors as they use your products. Only companies that are selling these smart and connected products will be able to participate in a market that is not only defined by product features and functions, but also by the data these products generate.

The Big Data Challenge and Opportunity

As you might imagine, a large number of these smart, connected, aware devices will produce volumes and volumes of data when operating in the customer environment. A hundred thousand IoT-enabled washing machines transmitting usage information each day or thousands of power drills transmitting torque, shock-force, temperature and location data every hour will produce a tsunami of data. However daunting the task of analyzing this data appears, there is tremendous value in capturing product insights and customer usage patterns. Taking all of this data and transforming it into actionable information can create a competitive advantage for product manufacturers.

There are many methods for achieving competitive advantage through the collection, analysis and gleaning of insights from all of this data. If your product data achieves Big Data scale (measured in terabytes or 10¹² bytes of data), you may need new skills and tools to manage it. The "big" in Big Data is not just "a lot." Traditional business intelligence tools used for analyzing both structured and unstructured data may be inadequate. Where relational databases, using structured schema to define data relationships works well for a few terabytes of data, new data analysis techniques will be required to capture insights from extremely large volumes of data, measured in petabytes and even exabytes. Analyzing all of this data will require the use of Machine Learning and massively scalable computing platforms that can process and make sense of large volumes of data in real-time. IBM's Watson, with its Alchemy API, and Apache's Hadoop are just two examples, but many similar platforms are sure to follow. These platforms will condense the large volumes of data into meaningful insights from which action can be taken.

Another opportunity, as well as a challenge, to achieve competitive advantage using IoT and Big Data is through data integration with transactional systems. Enabling data connectivity to your enterprise's CRM, ERP or PLM systems provides the intelligence needed to improve the design of products, improve the customer experience or improve operational efficiency. In the cases above, knowledge is a critical organizational asset that must be preserved in order to be leveraged. This asset, when effectively captured, can then be used to train the next generation of employees.

Your Next Step: Developing the IoT Use Case

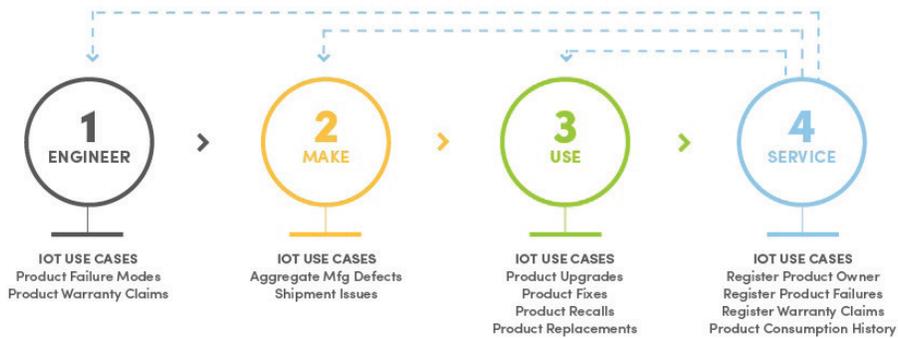
Development of IoT use cases that deliver real business value should be the first step in the journey to IoT-enabled products. Sure, there are lots of interesting concepts that could be pursued, but which ones will deliver meaningful customer value and increased sales? Cimphoni has a methodology for identifying and implementing such opportunities, which requires innovative thinking and technical analysis. To "prime the pump" for your use case development, here are a few examples of real

Internet of Things use cases that deliver customer value today.

Predicting Product Failure – By capturing and assessing real-time product parameters such as vibration or shock, temperature, duty cycles and others, we can compare this to historical information and match current environmental patterns to previously observed product failure modes. This approach has been used by Rockwell Automation and others involved in the oil industry to monitor sensor data from drilling platforms, combine it with historical records, provide alerts to a technician’s mobile application and then dispatch the technician to correct the anomaly.

Demand Insight – For companies that use demand signals to predict replenishment needs, IoT and Big Data offer the ability to insert data into current forecasting methodologies that involve a degree of guesswork today. As an example, many residences and businesses use natural gas to heat their homes and businesses. Customers, particularly those in rural areas with onsite CNG storage tanks, need to have their CNG tanks periodically refilled to ensure an uninterrupted supply of natural gas. By combing typical consumer usage patterns using flow rate data captured by IoT devices and combining this information with regional weather forecasts, it is now possible to keep CNG tanks from running out of gas, optimize delivery routes, fine-tune the supply side and keep regional CNG inventory levels lean.

IoT “Feedback Loop”



Feedback Loops – A key and unique benefit of IoT involves frequent feedback loops that can be used to inform improvements to product quality and business processes. Before IoT-enabled products were developed that could produce this type of rapid feedback, we relied on customer focus groups, surveys and product returns. For IoT enabled products, these feedback loops can be nearly instantaneous. This feedback falls into three primary categories:

- 1. Manufacturing feedback involves IoT devices providing real-time information to the manufacturing process while the product is being built. This capability can be used to provide key metrics on lean manufacturing processes, monitoring work-in-process (WIP) and adherence to tolerances for closely calibrated components, and providing immediate notification if manufacturing robotics are failing to configure products to specification.**

2. **Customer usage feedback can be provided by IoT devices in the field. By receiving information related to duty cycle, feature usage and environment, manufacturers can apply this intelligence to the product design and engineering processes, addressing common failure modes or enhancing product performance .**
3. **Service feedback can be provided by IoT devices to give manufacturers a more direct view of the product owner to enable warranty registration and collection of demographic and geographic information. It also facilitates other service processes such as recall and replacement needs, upgrade opportunities and product failures. By enhancing serviceability of products, the customer enjoys a greatly enhanced experience from both the product and the brand.**

Transactional Integration and Personalized Customer Engagement – In some industries, product loyalty has a direct relationship to product usage. This affinity gives companies a direct incentive to monitor usage of products or services to detect attrition during the customer lifecycle. Devices can talk to each other (machine to machine or M2M) and make determinations about the environment they're operating within and their proximity to similar devices. As an example, for customers that own a cordless drill from a major tool manufacturer, it would be an advantage to know if other products from the same manufacturer are being used in near proximity and their frequency of use (e.g., duty cycle). By gathering this data, the tool manufacturer can determine the nature of the work being performed (distinguish between a building contractor and a homeowner) and assess the opportunity to up-sell or cross-sell additional products or services. If the product user registers the tool using a mobile application, then the manufacturer can promote the purchase of additional products with instant discounts delivered via the same mobile application.

- **By integrating the IoT product data into a marketing automation (MA) system, it can identify the customer as belonging to a specific segment that qualifies for add-on products. This MA system can then create user specific ads, emails or text messages offering the customer a discount for purchasing a circular saw or sawzall. Dynamic customer segmentation is an excellent use case for IoT.**
- **The circular saw and drill are observed to be used in rapid succession to each other, suggesting that the customer rapidly swaps the interchangeable battery between the devices. A new sales lead can then be created for the marketing automation platform to offer the tool owner a discount on an additional battery.**
- **By incorporating the ability to predict product failure, as mentioned previously, and integrating product failure modalities into a CRM system, a service representative can proactively call the customer to schedule warranty service to repair a faulty component on a tool before the customer experiences unplanned product failure.**

It's Time to Make Your Products Smart, Aware and Connected

Manufacturers now have an opportunity to engage more directly with the end consumer than at any time in history. IoT-enabled products support this level of engagement by providing companies product usage information. These insights can only be realized if manufacturers develop the ability,

either internally or with partners, to analyze and glean insights from this information. Additional value can be realized by integrating product information captured from IoT devices into enterprise transactional systems (e.g., Customer Relationship Management, Marketing Automation, Product Lifecycle Management, Customer Service) to increase sales, reduce product failure modes or improve customer service.

Although defining the IoT use cases that are relevant to your products can be a challenge, it is the first step in developing smart and connected products. Harvesting and acting on the data generated from IoT-enabled products will also require some learning and creativity. However, the greatest challenge for companies, we believe, will be to create smart and connected businesses equal to the capabilities of their products. “Smart,” in the sense that they will use IoT data to improve the value their products delivery to their customers. And, “connected” in that they will use this information to develop strong and mutually beneficial relationships with their customers. Time to get started.

About Cimphoni

Cimphoni is built on the premise that technology, when properly applied and led, can deliver innovative solutions that transform businesses, enrich the products we use daily and improve the quality of our lives. The Cimphoni team is comprised of technology and business leaders, physicians and medical researchers with a thirst for innovation and a passion for solving problems. Cimphoni Consulting is focused on business transformation using information technology to enable new product and service offerings and improve business performance.

Cimphoni Solutions develops Internet of Things strategy, devices and data analytics, as well as custom enterprise software. Cimphoni Life Sciences creates new medical devices and solutions that address acute and chronic illnesses and improve the health of individuals.

Founded in 2012, Cimphoni is headquartered in suburban Milwaukee and has an office in Phoenix to serve customers throughout the United States. More information can be found at www.cimphoni.com.

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