will often be jointly responsible for maintaining and protecting the product cloud and its connections to the product. However, the organizational model for managing security is still being written.

Making the Transition

How do we get from here to there? The organizational changes we have described are substantial. Today centralized data groups are just beginning to appear, and the integration of IT and R&D is in a very early stage. Dev-ops and customer success management units are rare, but their roles are starting to be recognized and differentiated. Over time these may emerge as formal functional units.

At manufacturers in fields like aircraft, medical devices, and agricultural equipment, smart, connected products will need to coexist with traditional products for a sustained period. This means that the organizational transformation we are describing will be evolutionary, not revolutionary, and old and new structures will often need to operate in parallel.

Given the scope of the changes, and the scarcity of skills and experience in smart, connected products, many companies will need to pursue hybrid or transitional structures. This will allow scarce talent to be leveraged, experience pooled, and duplication avoided.

What could this transitional structure look like? At the business unit level many companies have encouraged organic smart, connected product initiatives. A function like IT might be assigned the lead role for smart, connected product strategy and deployment. Or a special steering committee made up of the functional heads may be asked to champion and oversee this effort. Some firms are acquiring or partnering with focused software companies for smart, connected product initiatives, injecting new talent and perspectives into their organizations. Caterpillar recently made such a move by investing in Uptake, a predictive analytics firm.

At the corporate level in multibusiness companies, overlay structures are being put in place to evangelize the smart, connected products opportunity, identify the best places to start, avoid duplication, build a critical mass of talent and expertise, and oversee technology infrastructure. These units often have CEO or senior management sponsorship. We are seeing three models emerging:

STAND-ALONE BUSINESS UNIT. A separate new unit, with profit-and-loss responsibility, is put in charge of supporting the company's smart, connected products strategy. The unit aggregates the talent and mobilizes the technology and assets needed to bring such new offerings to market, working with all affected business units. The Bosch Group is one company that has formed such a dedicated unit, Bosch Software Innovations. It enables the company's product-based business units and external customers to build services for smart, connected products.

A new stand-alone unit is free from the constraints of legacy business processes and organizational structures. In some companies, as expertise, infrastructure, and experience grow, leadership may start shifting back to the business units over time. In other cases, stand-alone units may deter, rather than enable, initiatives in the individual business units. Also, knowledge acquired by a stand-alone unit may disseminate more slowly across the firm.

CENTER OF EXCELLENCE. In this model, a separate corporate unit houses key expertise on smart, connected products. It does not have profit-and-loss responsibility but is a cost center that business units can tap. GE has such a center of excellence in Silicon Valley.

CROSS-BUSINESS-UNIT STEERING COMMITTEE. This approach involves convening a committee of thought leaders across the various business units, who champion opportunities, share expertise, and facilitate collaboration. Such committees usually lack formal decision-making authority, which can limit their ability to drive change.

The Broader Implications

Smart, connected products are dramatically changing opportunities for value creation in the economy. A revolution is under way in manufacturing. The effects are not confined to manufacturing, however, but are spreading to other industries that use—or could use—smart, connected products, including services. (See the sidebar "How Smart, Connected Products Change Services.") And the impact of smart, connected products is still in the early innings.

Smart, connected products reshape not only competition, as we detailed in our previous article, but the very nature of the manufacturing firm, its work, and how it is organized. They are creating the first true discontinuity in the organization of manufacturing firms in modern business history. Many of the same organizational changes and challenges will spread to other fields as well.