The Future of Applications in the Industrial Equipment Industry
Software as a Source of Competitive Advantage

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EXECUTIVE SUMMARY

Technology, especially information technology, is transforming the entire industrial equipment industry and leading to unconventional growth.

Especially important to the success of an industrial equipment company is digitizing the engineering, manufacturing and supply network. Most supply chains today are no longer fit to compete in a digital world. Linear and static, they hamper growth opportunities and lead to cost issues that threaten competitiveness. A supply network managed as a digital ecosystem equips the organization for growth, enabling quick movement into new geographies, support for new value delivery approaches and creation of innovative products and services. This digital ecosystem—as well as other factors such as industry consolidation and marketplace alliances—puts pressure on the IT environment of industrial equipment companies, particularly in the area of applications.

Several challenges are particularly noteworthy:

• Manufacturers must break down traditional business silos, both internal and external, by allowing data from embedded and connected devices to flow along all processes across the value chain. Combining and orchestrating business partners then becomes essential.
• Companies need to use information to enable new capabilities and business models—where capital-intensive products are sold as a service.
• Intelligence and connectivity should be implanted into the traditional “metal sheet product” to enable interaction with a broader environment.
• Automation techniques and network visibility should be used to increase speed and flexibility of manufacturing facilities and the digital supply chain.
• As data and information capture becomes more prevalent and as assets come online, companies need to use advanced analytics to perform simulations, predict maintenance and manufacturing issues, and make more informed business decisions.
• Manufacturers need to rethink how they make use of the data collected in a connected world to create advanced products and services. Data from inside the equipment and through telemetry will be made available in PLM systems to optimize products.
Revitalizing IT with new application strategies

Meeting these challenges is difficult in part because of aging IT systems. Many companies are trying to compete with applications that were designed for another era. Monolithic applications are often built from the ground up—slow to implement and slow to change. IT organizations typically spend more than 60 percent of their budgets just maintaining existing systems, leaving precious little time for innovation.

The pace of change and rising complexity are also daunting to many IT organizations, which have to track more technologies and types of solutions than ever before.

Some estimates predict that more than 50 billion “things” will be connected to the Internet by 2020,¹ and the number of partners and providers a company must interact with continues to expand.

To stay more nimble in this complex environment, manufacturers need to fundamentally rethink how applications should be built and deployed, as well as how to integrate existing systems and processes.

Three strategies are especially important:

**LIQUID**
Developing applications that are more modular or component-based and API driven, enabling quick composition of functional applications.

**INTELLIGENT**
Embedding software intelligence in applications to manage growing volume, velocity and complexity, and to maximize the business value of internal and external data—including that from the physical world.

**CONNECTED**
Creating applications capable of connecting with other applications both inside and outside the enterprise boundary of the manufacturer.
LIQUID APPLICATIONS
A fundamentally new way to build software

To compete with agility and speed, companies can no longer afford complex, lengthy and expensive coding of applications, or massive, multi-year system implementations. What’s needed is a new way to build software—one that is faster, flexible and more liquid. No longer can applications be “built” as one distinct activity and “maintained” as another. Liquid applications will be assembled leveraging modular architectures and next-generation integration techniques. These elements, combined with engineering innovations such as Agile and DevOps, mean that software can be continuously delivered and evolve as business needs change.

The core processes of traditional industrial equipment companies are still very “solid” in nature. Becoming more liquid is increasingly relevant in areas such as:

- External enterprise integration—e.g., integrating to the end-customer’s IT systems
- Localization of core processes due to issues such as compliance and logistics
- Digital services that add to the product value proposition such as connected vehicle services and remote equipment operation services

Liquid applications require enterprises to create application architectures that are modular, featuring reusable components sourced internally or externally. One of the key components is emerging software platforms, including platforms as a service, which provide well-defined technical architectures along with standards, governance and reusable code. Platforms facilitate more rapid creation and assembly of liquid business solutions, as applications are increasingly assembled from prebuilt components.

For example, Accenture Connected Platform as a Service is the basis for the Uconnect™ connected vehicle services launched by Fiat and its subsidiary Chrysler. It consists of a range of connected, Internet-based services that have been designed to help drivers remain focused on the road. The diagnostics data that the system generates provides Fiat with insights to enhance services in other areas including customer relationship management (CRM), marketing, quality, customer services, after sales, and research and development.

GE’s Predix is another cloud-based platform that helps companies develop applications on a cloud infrastructure to connect industrial machines with people through data and analytics for better business outcomes. The platform provides consistent, secure, and scalable support for new applications. Predix can securely connect with multiple machines, old and new, from different vendors on very large industrial scales using a heterogeneous mix of data and communications protocols to aggregate data from these devices.

Predix and Uconnect are evidence of another important characteristic of liquid applications: a cloud-first mindset. Such a mindset requires that applications be engineered to operate and scale in the cloud, even if the initial deployment is on-premise. Policy-based architectures will allow organizations to dynamically decide what parts of applications run in the cloud, and how. Companies should establish a common component repository for their business, including cloud components and SaaS-based functionality. Along with that, they will need to adopt a culture of leveraging what exists rather than creating something new.

Accenture’s “@SPEED” auto supplier solution is an example of a cloud-first, API-based offering, used by many large Tier 1 and Tier 2 auto suppliers. It is a cloud-based enterprise solution using SeeBurger as the API interface between the OEM and Tier 2 suppliers. Because it is a cloud-based SaaS solution, scalable services can be provided to small, medium and large auto suppliers to address their major production and logistics challenges.

Several factors are key to succeeding in this API, cloud-based platform environment:

- Well-defined process building blocks that are translated into service APIs
- Creating digital business components based on “API economics” rather than traditional processes such as manufacturing, design and inventory management
- Enabling Service Oriented Architecture layers on legacy ERP platforms

Liquid applications require more liquid development

Liquid applications are not possible without making a fundamental shift in software development to Agile methodology. The traditional V-cycle approach to application development is anything but “liquid.” It requires heavy processes and contractualization between teams, as well as a great deal of documentation. Value is not delivered until the end of a project. When new requirements are inevitably introduced later in the project, they are difficult and expensive to respond to. By the end, there is significant uncertainty about whether all developed features are delivering the expected value.
By contrast, Agile is a collaborative and flexible approach that delivers essential business value and quality capabilities, quickly and frequently, speeding time to market. With Agile, teams continuously inspect and adapt practices to satisfy customers. This is accomplished by building in a more liquid manner, with a “Plan, Do, Inspect, Adapt” feedback loop for each iteration of development and solution delivery.

- **Plan** involves a two-level process that evaluates customers’ priorities at every iteration start and then breaks down those priorities into executable tasks for the iteration (also called a “sprint”).

- **Do** includes not only design and coding to execute the tasks, but also developing tests with code and then the building and execution of those tests on the daily work products.

- **Inspect** utilizes a continuous integration environment and testing processes to perform daily inspection of the quality of the solution.

- **Adapt** includes demonstration of the iteration work products to customers and stakeholders as well as a team retrospective on the execution of the iteration, making sure the end product will deliver the expected value. This feeds back into the next planning cycle to reflect new customer priorities as well as adjustment of the final product.

For example, leveraging an innovative co-management model and Agile methodology, Michelin and Accenture are jointly developing and supporting master applications in three core business areas: business intelligence, research and development, and manufacturing, while also maintaining hundreds of legacy applications. By using Agile at scale, Michelin is creating efficient, responsive, flexible, and cost-effective information management systems that will facilitate faster, better decision-making and ultimately enable better performance.

To compete with agility and speed, companies can no longer afford complex, lengthy and expensive coding of applications, or massive, multi-year system implementations. What’s needed is a new way to build software—one that is faster, flexible and more liquid.
To manage business complexity and the growing volume and velocity of data, companies need to embed software intelligence everywhere. Software intelligence is made possible by increased processing power, advances in data science, and innovations in natural language processing, machine learning, and cognitive computing. Thanks to these advancements, software can be taught to automate decision making through rule-based algorithms, self-heal, and evolve and innovate on its own through advanced learning techniques.

Intelligent automation will become a key feature of the manufacturing environment. The power of intelligent automation lies in its ability to fundamentally change traditional ways of operating, for businesses and individuals. These machines offer strengths and capabilities (scale, speed, and the ability to cut through complexity) that are different from—but crucially complementary to—human skills. And their increasing sophistication is invigorating the workplace, changing the rules of what's possible so that people and their new digital co-workers can together do things differently. And do different things.

As an example, consider Siemens' so-called "lights out" manufacturing plant. Siemens has automated some of its production lines to the point where they can run unsupervised for several weeks. For Siemens it's a step toward a larger goal of creating the fully self-organizing factory. Here, machines will largely organize themselves, supply chains will automatically link themselves together, and orders will be directly converted into manufacturing information that is incorporated into the production process. This will make the industrialized manufacture of highly customizable products a reality. Before you assume that people are cut out of this loop, you should recognize that even Siemens' lights out manufacturing plant requires 1,150 employees to support it. They just have different roles than before, as many are now focused on programming, monitoring, and machine maintenance. On the other hand, industrial companies will likely start to increase their investments in collaborative robots (or cobots) which can perform tasks from injection molding and gluing to welding and assembling whilst under human supervision. This signifies a shift from a human-centric to a human-machine centric workforce transforming the production and service processes in the factory.

Intelligence is also becoming increasingly pervasive throughout the industrial equipment environment as companies adopt a strategy for the Industrial Internet of Things (IIoT), enabling capabilities such as predictive asset management. Early adopters are already realizing quick wins in terms of higher productivity, lower operating costs and more effective asset utilization.

Diversified industrial group ThyssenKrupp AG, for example, uses networked equipment sensors to identify and predict maintenance issues, which reduces unscheduled downtime and helps prevent unnecessary repair trips. By integrating predictive maintenance data with ERP systems to optimize workflow scheduling, manufacturers can help ensure that the impact of equipment unavailability is minimized by dynamically adjusting production runs.

As products become more intelligent, so too will factory floors. Automation will accelerate, dramatically changing the face of the manufacturing workforce, along with the skill sets required to succeed in a significantly more automated economy. Consider, for example, how mining company Rio Tinto is optimizing the use of critical expertise by using control towers to deal with exception management and execution deviations in its production processes. Skilled equipment operators sitting in the mining maven's remote command center in Perth, Australia, can work alongside data analysts and engineers to orchestrate the actions of drills, excavators, earthmovers and dump trucks across multiple mining sites.

Another example of intelligent automation at work is Accenture's Warranty Management solution. Automated, rule-based warranty claims management, parts returns and supplier recovery systems help increase the efficiency of claims processing, improve supplier recovery effectiveness and extend the business process from the repair network to the manufacturers and their suppliers. Features include warranty strategy, an executive dashboard, KPI's, alerts and notifications. The solution can also help an OEM predict the impact of warranty claims on any region or geography based on real-time data analysis.

Such a solution helps overcome a traditional challenge for industrial equipment companies: the lack of a harmonized data model across the core process chains.
Woodside Energy also incorporates intelligence into its environment in innovative ways. Machines and equipment on its oil rigs are connected to each other. If a particular piece of equipment begins to have a problem or break down, the deviation is analyzed to see if the same equipment on other rigs has similar deviations. Actions can then be triggered to remedy the problem. By making equipment intelligent enough to self-manage and collaborate with the rest of the manufacturing system, manufacturers can drive overall reliability, predictability and optimization.

Intelligence also needs to inform how applications are built. Companies can use software intelligence across application development, testing, deployment and maintenance to manage increasing volume, velocity and complexity. Look for automation opportunities across the application lifecycle. Routine tasks and decisions can be reduced or eliminated using accumulated knowledge and experience to improve productivity through effort reduction and leaner processes.

To manage growing volume, velocity and complexity, and to maximize the business value of internal and external data, companies need to embed software intelligence everywhere.
Connectivity in the age of the software-driven business is about more than application integration. It’s about creating new competitive frontiers using software. To grow revenue and defend their market position, businesses must open new dimensions of application connectivity—with business partner and customer ecosystems, as well as with the rapidly growing Industrial Internet of Things—that are essential to delivering new products services. An increasing number of companies are investing in robust partner APIs to enable modern integration. But much more progress in this area is needed. Many companies are looking for ecosystem-driven revenues and customer engagement—for example, elevator purchasing decisions done by building architects, integrated solutions for mining companies, and “Truck as a Service” solutions by truck manufacturers. Connected applications play an important role here.

On the factory floor, connectivity can be achieved by retrofitting existing equipment with sensors to increase visibility into its condition and identify threshold violations so maintenance can be scheduled proactively. Vibration measurement and analysis, infrared thermography, oil analysis, ultrasonic and motor current analysis can all be applied to rotating equipment and other moveable machine parts. The baselines created by condition monitoring, combined with analytical techniques, can help manufacturers correlate current and historical data to predict potential equipment failure, and begin a mitigation process. In Europe, for example, a large utility company is using sensors and analytics to anticipate pipeline leakage in real time. Maintenance work can be scheduled at the appropriate time, not only significantly reducing unscheduled down time, but also the costs associated with ordering replacement parts urgently and bringing in unscheduled maintenance workers at short notice.

Another innovative connectivity example comes from the maritime industry with a “Connected Ship” solution from Accenture. The challenge that needed to be addressed, something similar across multiple industries, was access to only partial data, siloed by providers. In maritime, this situation can impede the development of new shore services. The Connected Ship leverages Accenture’s Connected Platform as a Service (CPaaS) to enable the delivery of whole data—integrated and standardized—from vessel to shore, in the context of a broader, connected ecosystem. This enables more effective service development innovation.

Connected applications are also essential to the digital supply network of industrial equipment companies. RFID tags have been used to help connect partners and move goods from a logistics and supply chain management perspective across organizational boundaries. But they can also be used on the factory floor to track work-in-progress materials, route those materials efficiently, enable parts requirements, handle JIT replenishments, and manage the availability and utilization of assets. When coupled with other data regarding materials as they flow through the factory and eventually to target customers, RFID tags and other tracking mechanisms can provide plant operators with insights that enable them to process raw materials efficiently, right through to the finished product.

Integrating the data obtained by real-time visibility into the availability of materials across the entire supply chain with information systems will enable manufacturers to schedule the appropriate production run with the right set of configurations and workforce. Further changes to materials availability can be quickly reflected to minimize unnecessary interruptions and delays.
How can companies create and manage new dimensions of application connectivity both internally and externally? Enterprises need multiphase strategies to build and nurture an ecosystem. They must start—and learn—with the internal developers and business functions, and then create a broader ecosystem that includes external entities such as business partners and customers. Revisiting the business strategy before implementing the ecosystem strategy to determine which of the existing assets can be used to create a new, disruptive business and what new assets can be readily built is also imperative. Companies need to define the technical and architectural capabilities needed to implement and manage their successful new ecosystem.

Connectivity in the age of the software-driven business is about more than application integration. It’s about creating new competitive frontiers using software. To grow revenue and defend their market position, businesses must open new dimensions of application connectivity.
The industrial equipment industry holds untapped potential for growth around the globe. That growth is being fueled by a number of marketplace forces:

- Innovation is accelerating as companies work to differentiate themselves from competitors.
- Players are increasingly focused on developing new services that attract and retain customers.
- Companies are attempting to more tightly connect and collaborate with partners across the value chain.
- Automation, analytics and intelligence are redefining corporate strategies in the era of the Industrial Internet of Things.

Meeting these challenges and driving growth requires a new generation of applications—liquid, intelligent and connected. The business of applications is changing how industrial equipment companies operate and grow. No longer a supporting capability, applications are a driver of strategy and competitive differentiation. They can enable entirely new services for new markets.

The future of applications is an exciting one for companies that are willing to develop a new operating model for software development and then fundamentally change the way they build and maintain software.

NOTES


6 “Smart Production—Finding a way forward: How manufacturers can make the most of the Industrial Internet of Things,” Accenture 2016.
About Accenture

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions—underpinned by the world's largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With approximately 373,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives. Visit us at www.accenture.com.

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