Engineering in the Intelligent Enterprise
Designing for Customer Demand and Product Individualization

Anne Sailer
SAP Digital Supply Chain Engineering
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“We help our business areas make IT projects faster, smarter, and more precise. That’s how we thrive instead of just survive. We need a unified method and culture of project and portfolio management to win. The right IT system is a huge success factor.”

—Martin Baldinger, IT Product Manager PPM, Festo AG & Co. KG
Executive Summary

Now more than ever, customers are connected, informed, and always on. They demand high-quality, individualized products and delivery within shorter time frames. To meet these market requirements, companies need to synchronize their demand chain with their supply chain.

Ultimately, companies that design delightful product experiences deliver exceptional customer experiences. The traditional boundaries between R&D, manufacturing, logistics, and operations are dissolving within the enterprise and across the supply chain.

With Industry 4.0, many organizations are on a journey to digitally transform their research and design processes. They are breaking down silos, increasing visibility, and driving customer centricity. Furthermore, they are reaching higher levels of efficiency, optimization, and productivity.

To realize the full potential of business cases and become a successful part of the Industry 4.0 movement, businesses need a connected ecosystem – both inside and outside the enterprise – amplified by three fundamental components:

- **Velocity**: The true success of a digital product lifecycle is best achieved by structuring an integrated digital platform that blends intelligent technologies and product data across the entire manufacturing lifecycle. Automation, knowledge, experience, and integrated processes drive better and faster decision-making, further accelerating time to market.

- **Profitability**: The key to profitability is connecting customers and products in real time. A closed-loop environment provides feedback from a deployed product to the R&D organization. It validates assumptions that are made during early product development and helps optimize product offerings over time based upon specific use, cost, and reliability.

- **Quality and compliance**: Product lifecycle management (PLM) is no longer an isolated part of the design process. Native integration across all relevant processes in manufacturing, quality management, compliance, purchasing, and sales and distribution enables efficient reuse of information and support of downstream processes.

SAP is uniquely positioned to provide this level of differentiated innovation. We provide product development solutions that are the “product system of record,” not just the “single source of the truth.”

25% faster time to market for new products where projects are managed via a documented process with all the steps, from concept to product launch.

SAP Performance Benchmarking n = 43

11% more new product launches where compliance and sustainability checks are embedded in the development lifecycle.

SAP Performance Benchmarking n = 49
Design to Operate for Engineering

SAP® Digital Supply Chain solutions are empowering companies to deliver on their Intelligent Enterprise aspirations. Spanning design, manufacturing, logistics, and asset management, these solutions play a critical role in helping to ensure positive customer experiences. But to get to this point of their transformation journey, leading organizations are integrating processes across traditionally siloed business areas that include R&D, manufacturing, supply chain planning, logistics, and aftersales service and maintenance.

By connecting every aspect of the supply chain digitally, your business can optimize operations and streamline integrated processes with focused initiatives such as:

1. **Design with the customer in mind**
   In the design phase, you can achieve the level of connectedness necessary to monitor trends and innovate in the direction customers want. Increasingly, organizations want to design smarter, Industry 4.0-enabled products and assets that have embedded sensors to capture real-time data once they are running in a live environment. It’s also important to think in terms of compliant PLM, which requires the integration of product development into the supply chain from the beginning.

2. **Plan with visibility across silos**
   To become more responsive and shorten planning cycles, your organization should connect across departmental silos. This unified view of real-time supply and demand helps balance inventory and service levels. For planners, this means synchronizing processes and tools to break down data silos quickly, while running simulations for better decision-making, faster planning cycles, and real-time response to change.

3. **Manufacture with flexibility, speed, and efficiency**
   Sophisticated digital supply chain capabilities and improved connectedness between design and manufacturing can help your organization increase shop-floor visibility, identify process bottlenecks, and manage operations with greater agility. This approach facilitates smart factory capabilities that transform rigid production lines into flexible manufacturing cells – making the shift from mass production to mass individualization possible.
4. Deliver on time
The delivery phase is a critical aspect of the supply chain that can make or break the customer experience. Leveraging Industry 4.0 capabilities can streamline logistics and help ensure better delivery experiences. Connected vehicles, for example, are optimizing delivery routes based on real-time weather and traffic conditions, as well as supporting real-time tracking and monitoring conditions such as the temperature in freezer compartments. Next-generation warehouse technology, meanwhile, is leveraging robotics and augmented reality to assist staff, increase productivity, and deliver goods to customers faster.

5. Operate with new business models
Many organizations are transforming the operating phase with IoT-connected assets that plug directly into the digital supply chain. This tactic helps drive new business models, where the manufacturer owns the asset and charges the customer for usage, uptime, or another metric. In this case, the manufacturer is responsible for facilitating the most cost-efficient maintenance program, which is now possible with advanced analytics that monitor asset health, predict imminent failures, and respond proactively.

A digital supply chain that is integrated from design to operations acts more like a network. Visibility, communication, planning, analysis, and execution are all orchestrated across critical operational phases based on real-time inputs and requirements. Work and data flows span functional silos to provide greater flexibility and consistency, leading to benefits such as reduced financial and operational risk and higher rates of customer satisfaction.
Engineering in the Intelligent Enterprise

Engineering companies face many challenges today. The market is becoming increasingly volatile. Globalization means borders disappear and new competitors appear. Customer expectations are changing, while demand for individualized products continues to grow.

Engineering is not just a closed space. Silos of information, sequential operations, and unsynchronized material flow negatively affect business performance.

Intelligent engineering in the intelligent enterprise requires your business to design with the customer in mind. With our portfolio of PLM solutions, you can make the world of engineers better by fostering innovation and providing a set of flexible, automated, intelligent services. Doing so allows your engineering operation to run at its best every day and accelerate processes that move ideas into products more rapidly.

Ultimately, our solutions empower your business to design, innovate, and deliver compliant and profitable products to market faster than your competitors. You can accomplish it all with lower production costs; higher quality standards; and better adherence to customer, regulatory, and sustainability requirements.

“Our strategy for digitalization is to incrementally adopt new applications and technology from SAP to boost efficiency and profitability.”

—Arnab Mukherjee, Manager, Enterprise Applications – Enterprise-Wide Engineering, Varian Medical Systems Inc.
Enablement Technologies for Intelligent Engineering

Infusing machine learning, blockchain, and Industrial Internet of Things (IIoT) technologies into business applications is taking computing and processing power to an entirely new level. More importantly, it precipitates the rise of Industry 4.0.

Groundbreaking digital capabilities enabled by these advancements include:

- Leveraging innovations based on intelligent technologies such as analytics, artificial intelligence, Big Data, blockchain, IoT, machine learning, sentiment analysis, and 3D printing
- Generating previously unimaginable levels of supply chain Big Data with the IoT and unstructured data such as sentiment analysis
- Driving smart assets and products with machine learning and AI, while augmenting the user experience and the potential of predictive analytics
- Strengthening data security and trust with blockchain, which improves transparency, auditability, and regulatory compliance
- Enabling rapid prototyping of designs through additive manufacturing processes supported by 3D printing
- Redesigning after-sales services and spare parts management to increase flexibility and responsiveness, lower inventory costs, and offer on-demand 3D printing services
Engineering in the Experience Economy

In the experience economy, there is an unprecedented volume of products and points of sale. Only by understanding your customers, market, and products and knowing which areas of the process to optimize help you remain competitive.

Solutions from SAP and Qualtrics cover both the operational data (O-data) and experience data (X-data) you need. SAP solutions support product design and engineering processes and provide operational data. Meanwhile, Qualtrics® solutions deliver insights into product performance and customer requirements and satisfaction.

Collaboration becomes more efficient due to greater traceability for requirements and product data and consistent delivery of product data throughout the value chain. For example, an integrated 3D viewer makes product design more detailed in downstream processes, while AI helps anticipate what customers want in the moment.

But the intelligent engineering process does not end stop there. Intelligent product optimization is the next logical step. This approach provides customer insights, supplier information, and quality data by using this information to transform X-data into business value.

With experience management solutions, engineering companies can meet and exceed customer expectations. They analyze this X-data with O-data to uncover new ways to improve the whole design phase with one goal in mind: design innovative products that meet changing market requirements while compressing time to market.
Designing to fulfill customer demand and individual product requests is more important than ever. We are living in a fast-moving world, where everything from market trends and customer desires to competitors and employees change day by day.

Meanwhile, increasing calls for better sustainability practices are putting tremendous pressure on engineering organizations. But how can a company manage the balancing act between highly variable demand for individualized products and a sustainable, green footprint?

**Welcome to Industry 4.0**

Industry 4.0 technologies, including PLM, are significantly disrupting all segments of the manufacturing industry. This new reality requires organizations, processes, and people to leverage new ways of doing business. New, compliant products must be brought to market faster. Quality and efficiency must increase. But what matters most is meeting and exceeding customer demand anytime and anywhere.

But this is only one aspect of development success. Companies that thrive are going beyond delivering new, compliant, and better-quality products. They are also minimizing the waste of raw materials. Products that are developed to fulfill customer needs are deemed more useful and less risky in terms of production missteps. Ecological, sustainable design is an additional add-on benefit for most customers – and PLM solution can help you deliver on that promise.

**The road to success**

To master this balancing act, companies need to break down their organizational and information silos. Driving real-time insights, connected processes, and continuous collaboration with Industry 4.0 advanced technologies – such as machine learning and IoT – automate processes wherever possible and facilitate precise coordination across logistics channels.

While achieving intelligent engineering may seem daunting to some, there is a blueprint that can be followed.

- Integrate processes – from the design phase to manufacturing and onward to logistics and service – to enable the process efficiency needed to meet demanding customer expectations
- Support intelligent engineering functions with better supply chain visibility and business information to plan more effectively and make better business decisions
- Listen intently to your customers and workforce to help ensure you are meeting market expectations and taking every opportunity to improve your manufacturing and engineering operations

**LEARN MORE**

For more information about digital R&D and engineering solutions from SAP, contact your SAP representative or [visit us online](#).