

An IDC Whitepaper

Digital Twins: Potential Of Constant Optimization In The Consumer Product Industry

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Executive Summary

The consumer industry is undergoing a series of dramatic changes, triggered by consumer demand for personalized experiences and products, continuously increasing time-to-market requirements (from months to days), growing complexity of product design, demand for “size-of-one” lots in manufacturing processes, and emergence of technologies such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain.

Embracing digital platforms — and becoming data-driven — is essential for CP companies to enable new customer experience-led business models. The streamed gathering and analysis of customer, product, and process data — unified to facilitate platform-based collaboration across the ecosystem of partners and suppliers — enables CP companies to continuously innovate their offering at speed and scale.

CP companies can plan, manage, and execute this complex set of activities by leveraging digitalization platforms that provide the environment for digital twins of products, assets, and ecosystems. Digital twins are receiving a lot of interest from the CP industry because they promise to improve innovation and design, visually enhance collaboration, and enable ongoing operation of connected products and assets — all in a fast-paced, digitally transforming, competitive environment for manufacturers.

Digital twins, or virtual representations, can be used to manage multiple aspects of a CP business, including product and package design, ongoing optimization of connected products, and manufacturing process modeling, operation, and optimization.

The benefits of digitalization platforms for product life-cycle management resonate with the **four core areas of the consumer industry** extended value chain:

- At the ideation stage, digital twins enable highly efficient design and development processes.
- Digital twins are essential to update and execute at speed and scale manufacturing and production processes driven by customer experience requirements.
- Digital twins play a concrete role in supply chains, as these can be virtually designed to model risk and optimal execution and to determine the capability required to meet predicted demand.
- They are also an essential support for commercialization and customer engagement, as they provide data foundations to execute product personalization at scale, to enable direct-to-consumer commerce services, and to capture customer experiences

Becoming digital platform—and data-driven is essential for consumer product companies to enable new customer experience-led business models.

Key Technology Trends Related to Digitalization Platforms

For many years, CP companies have focused their businesses on fulfilling orders from their main customers, the retailers. Fundamentally, CPs' guiding principle was calibrating production processes to demand cadence, in a context where the experience was in the hands of the retailers.

However, this was true only for the years during which the retail industry was leveraging asymmetric customer experience strategies, focused on maximizing revenues from rigid customer journeys and standardized offerings that relied on static customer segmentations.

Today, the customer is in the value chain driver seat, and retailers are gearing their customer experience strategies toward real-time contextual personalization, relying on capturing dynamic customer journeys and segment-of-one customer profiling. Such a dramatic change is leading retailers to make considerable investments to digitally transform their companies.

For retailers, the key objective is to become platform- and data-driven organizations, integrated into the extended value chain for optimized operations execution and collaboration-based innovation. In this context, consumer product companies often struggle to really understand consumer needs and wants or even things consumers don't yet know they want.

It's part of the reason that 80% of new products fail. CP companies need to move from being demand- and fulfillment-driven — with a productivity focus approach — to delivering customer experiences that rely on streamed data gathering from the extended value chain and on mass customization-oriented processes. As a result, the manufacturing industry — and the CP subindustry with it — is changing faster than ever before. Digital technologies like cloud, mobile, Big Data and analytics, and IoT have been drivers in the industry for years, and companies of every size must embrace them.

Manufacturers also have high expectations for the business value of technologies such as edge computing, cognitive computing/artificial intelligence (AI), collaborative robots (cobots), autonomous vehicles, 3D printing, augmented reality/virtual reality (AR/VR), and even blockchain.

Within manufacturing industry, ecosystem strategies is a key pillar to improve resiliency in organizations. This is because closer integration and collaboration in ecosystems — including customers, suppliers, and partners — helps to rapidly tackle challenges related to changing market conditions as shown on figure 1.

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IDC's Digital Resiliency Framework comprises three phases of response to business disruptions:

- **Respond and restore.** This phase is not the time for deep analysis, planning, or investment; the onus is on fast action.
- **Expand and optimize.** Digital investments are considered again but are still modest.
- **Accelerate and innovate.** Investments in digital transformation are substantial again, not only to ensure survival but also to thrive

Figure 1 - IDC's Digital Resiliency Framework

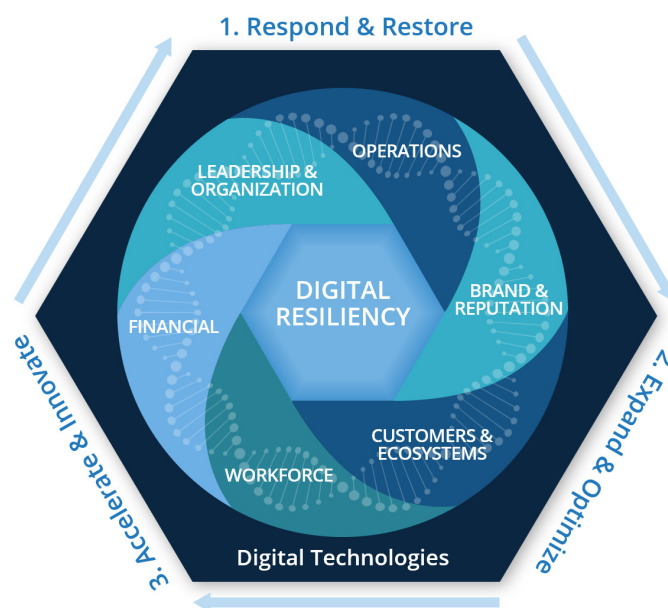


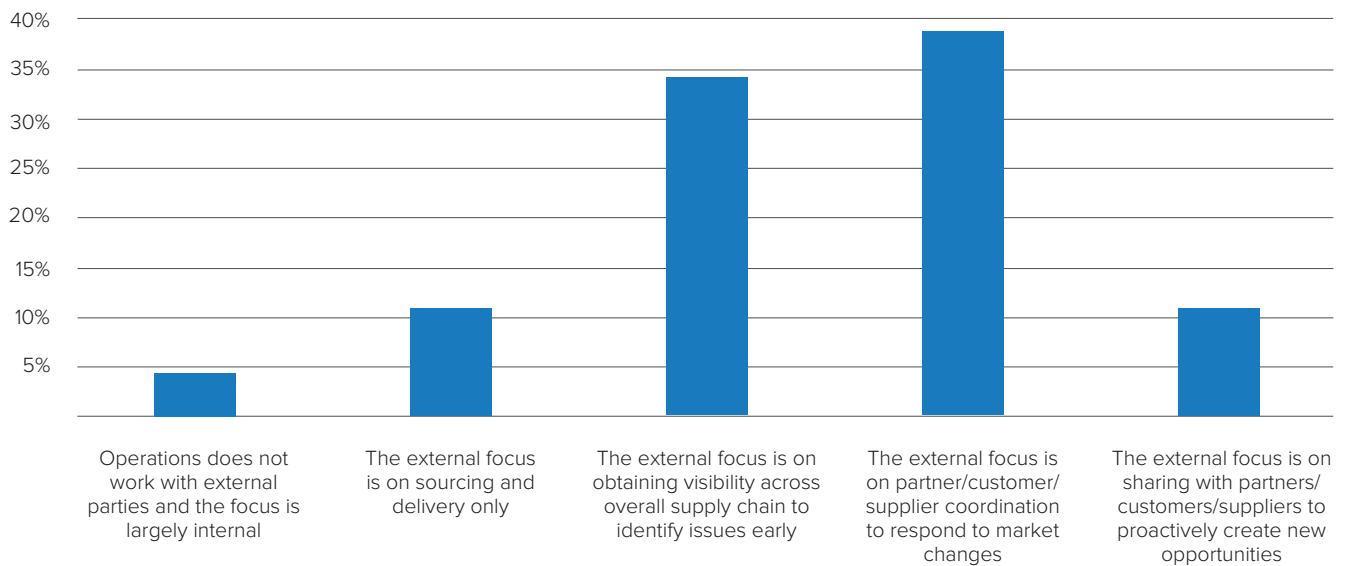
Figure 2 shows that only 11% of manufacturing organizations worldwide focus their ecosystem operations on sharing with customers, suppliers, and partners to proactively create new opportunities.

For 39% of manufacturers, the focus of ecosystem operations is on customer, supplier, and partner coordination to respond to market changes.

For 35% of manufacturers worldwide, operations work with suppliers to obtain visibility across their supply chains to identify issues early. For the remaining 15%, operations focus on internal, with external sourcing and delivery.

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Figure 2 - Companies working with their ecosystems of customers, partners and suppliers



Source: IDC's Future Enterprise Resiliency & Spending Survey, February 2021 (n = 127 worldwide manufacturing organizations)

IDC expects that **By 2023, 30% of manufacturers will share applications with industry ecosystem partners to improve visibility and operational efficiency and ensure safety, security, and quality.** As manufacturers diversify their production facilities to address disruptions in supply chain and geopolitical challenges, manufacturers will seize the opportunity to use local knowledge for both global and local innovation.

Moving to distributed innovation models and leveraging domestic public and private organizations will provide access to greater numbers of innovation partners and the ability to support localized targeted product innovation.

By 2025, global manufacturers that have embraced a distributed innovation model and put in place local innovation systems will See a 30% Greater Innovation Rate and an Increase in Sales of 5%



Digital Twins Are the Communication Vehicle Across Digital Platforms

Digital twins enable data rendering of virtual and real products, and a more agile and ecosystem-oriented execution of complex production processes. As stated, CP organizations are investing in digital twins in the short term. In the longer term, **IDC predicts that, by 2024, 50% of manufacturers will network related product and asset digital twins into digital twin ecosystems, for a systems-level view of their business and a 5% reduction in the cost of quality.** CP companies' investments in digitalization platforms that enable them to manage digital twins are happening in parallel to retailers' investments in what IDC defines as the retail commerce platform — a cloud- and microservices-based system that includes the core retail capabilities enabling customer experience differentiation and seamless omni-channel commerce, along with the required operational efficiencies for profitability and business model agility.

A retail commerce platform — with open APIs and a microservices architecture — is the primary opportunity that CP organizations have to integrate their systems into retailers' systems. In this context, the streamed sharing of product data coming from digital twins — combined with data coming from the distribution side — is crucial for both CP companies and retailers to collaborate on the joint delivery of value for their common client, the consumer. Given CP organizations' specific nature and objectives, one of the key characteristics of digital twins is that they can be used for a broad range of purposes, at various degrees of complexity. CP companies can leverage such tools, starting from low complexity digital visualization tasks, for ideation and innovation, collaboration with customers and suppliers, and visualization of processes.

Then, at intermediate complexity levels, digital twins can be used for digital development tasks (for internal design and development, service, and maintenance at a workgroup level) or as enablers of the “digital twin enterprise” (for enterprisewide, internally focused visibility and collaboration). At the highest complexity levels, there are two extended value-chain-oriented uses. One is geared around the digital twin ecosystem, for real-time product and asset operation and improvement, extended to customers, partners, and suppliers. The other is focused on digital twin orchestration, for real-time visualization, visibility, and decision support across a complementary network of digital twins for products, assets, facilities, and plants.

The Benefits of Digitalization Platforms

Digital twins offer CPs the opportunity to leverage a visual vehicle that transfers information and knowledge across digital platforms. The range of information that digital twins can cover includes new product ideas, manufacturing or service work instructions, sections of a design, or the full fidelity product or asset model. CP companies are actively investing their resources into adopting digital twins, as the value of having a full fidelity twin and networks of related twins becomes clear. The key overall value of digital twins is that they can be the repositories of multiple data models along the single digital thread that relate to the product or asset: production, supply chain, service delivery, or customer.

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Digital twins offer a number of benefits, as they:

- Improve **speed and agility** from product design to packaging and production. To safeguard efficiency, legacy product life-cycle management processes often rely on rigid and siloed sequences of interactions among the different stakeholders, systems, and data involved in the production stages. This means that any change in the production plan can trigger complex and time-consuming adjustment processes. Digitalization platforms, however, are architected to plan and execute production processes by streaming the collaboration across CPs' internal and extended value chains. Data generated during the product design phase is built into the digital twin and can be accessed and leveraged by any department involved in upstream and downstream processes — and, at the same time, shared with retailers. CP companies using a digitalization platform therefore benefit from faster processes and time to market on one hand, and on the other hand from greater agility when it comes to actioning the feedback received from the extended value chain through streamed data collection and analysis.
- Support **direct-to-consumer (D2C) business models** and changing consumption trends. A CP's digital strategy that attributes high priority to consumer-driven value generation inherently accounts for the increasing weight of consumer digital commerce activities on total revenues. In the past, D2C business models have often been perceived as complex frameworks to build and maintain. Furthermore, this perception is combined with prejudices on the risk of potential conflicts with the distribution industry. Now, D2C business models are essential assets for the growth of CP organizations. The models enable companies to differentiate their offerings according to the individual downstream stages of the value chain and to substantially increase control of customer experience. In this context, digital twins provide CP organizations with the backbone to adapt their products and offerings according to the analysis conducted on direct interactions with consumers.

- **Enable personalization and mass customization.** Tightly related to D2C business models, CP companies need to design and realize size-of-one lots to serve the “segments of one.” IDC predicts that, driven by demand for product personalization, 50% of manufacturers will have integrated simulation and configuration tools with customer profile data by 2024, achieving up to 2% gains in revenue. Digitalization platforms are the assets that translate individual customer requirements into product specifications.
- Deliver **innovation at speed and scale.** Overall, digitalization platforms offer increased opportunities for CP companies to efficiently and effectively execute innovation strategies that go beyond pure technology and product innovation. Platforms that enable them to manage and streamline the different and complex phases of products realization, leverage collaboration across the extended value chain, and capitalize on customer experience are essential to pilot innovative business models. Once successful pilots are identified, digitalization platforms enable CP companies to scale innovation throughout complex geographical, organizational, and technology structures. This in turn guarantees distributed visibility and access to digital twins and, at the same time, central control of business model execution



Siemens' Digitalization Platform Offering

Siemens AG is a global technology firm that has been active for more than 170 years. The company has a global presence, focusing on power generation and distribution, intelligent infrastructure for buildings and distributed energy systems, and automation and digitalization in the process and manufacturing industries. In fiscal 2018, which ended on September 30, 2018, Siemens generated revenue of

€83 billion and net income of €6.1 billion. At the end of September 2018, the company had around 379,000 employees worldwide.

Within the manufacturing industry, Siemens Digital Industries Software dedicates considerable efforts to build a digitalization platform offering focused on the specific needs of consumer product companies and providing an integrated environment for digital twins. The vendor's value proposition relies on a clear understanding of the key macro-trends that are impacting the consumer industry, such as globalization, greater regulatory demands, and consumer behavior driven by increasing expectations for experience personalization. The vendor's value proposition for the CP industry is geared around providing a set of technologies to digitally integrate product life-cycle management processes in the extended value chain, offering a backbone for the single digital thread.

To help CP companies to do this, Siemens offers Xcelerator, a comprehensive, integrated portfolio of software, services and an application development platform. It is designed to help companies of all sizes become digital enterprises with solutions that can be personalized and adapted to fit customer and industry-specific needs.

Xcelerator combines the full portfolio of Siemens software for design, engineering and manufacturing with a low-code application development platform, which includes cloud and app services for digital engineering and the Internet of Things (IoT). Low-code application development offers customers the ability to build multi-experience apps and share data on any device, from any location, on any cloud and any platform to quickly realize the benefits of digital transformation.

Siemens Xcelerator is also available in the cloud, Xcelerator as a Service to help customers of all sizes take the next leap forward in their productivity and gain additional competitive advantage. This can significantly lower the barrier of entry for small companies and reduces IT costs for companies of all sizes. The main benefits of Xcelerator as a Service are flexibility, scalability and accessibility, while providing a comprehensive digital twin, personalized

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The Challenges Linked to Digitalization Platforms

Digitalization platforms offer the unprecedented opportunity to integrate, manage, and execute complex processes across consumer product companies' extended value chains. However, the organizations that adopt digital twins often face a number of internal and external challenges.

- **Integration of internal legacy systems.** Over the past few decades, CP companies have been building their IT assets around disparate delivery models (on-premise, private cloud, public cloud), often without centralized integration layers and hybrid IT infrastructure management systems. In addition, old isolated processes may still be Excel based, rather than built in a proper platform framework. Digitalization platforms are mostly cloud based, and despite their inherent flexibility, CP companies might find it difficult to integrate old systems and workflows into the new assets. In some cases, adopting a digitalization platform could mean substituting obsolete and irreconcilable IT solutions.
- **Overcoming internal data silos.** The presence of legacy IT systems — characterized by suboptimal integration capabilities — also means that, over time, CP companies have been accumulating isolated data generated in the different departments involved in the product life cycle. Digital twins really work only if CP companies provide the platform with data coming from the entire value chain. Therefore it is possible to reach an optimal capitalization of the digitalization platform only by investing resources in the parallel aggregation and consolidation of data in common repositories.
- **Redesigning organizational schemes.** Reattributing the collection and provision of data to centralized data repositories also entails revising standardized and consolidated organizational roles and functions across the CP company. The key challenge here can be employees' reluctance to cede data ownership and process control to new data-focused roles.
- **Digital skills development.** Directly related to the organizational schemes challenge, CP companies that invest in a digitalization platform will face the short-term need to realign their human resources' digital skills to the new implemented IT capabilities. At the same time, to further develop the organization's overall digital skills level, CP companies might need to hire business-oriented digital-twin experts. This creates a challenge for HR, LOB, and IT departments that look for appropriate people to hire, given local scarcity of talents and competition from other manufacturing subindustries.
- **Partners' readiness and openness to data integration and sharing.** In the same way that internal data integration is a mandatory requirement for digitalization platforms to work properly, the willingness and capabilities of the ecosystem of partners and suppliers to collaborate to dynamically update the digital twins is essential to get maximum value from such platforms. In some cases, however, a CP's partners or suppliers across the extended value chain might be at a lower level of digital transformation maturity, and this can create challenges when it comes to sharing data.
- **Players at different stages of digital transformation maturity** might have highly restrictive data-sharing policies (that could be related to local legislation such as GDPR), and from the outset this would block integration opportunities for digitalization platforms.
- **Budget constraints.** The investment in a digitalization platform requires the financial commitment of many different internal stakeholders, within both lines of business and IT. Due to department-specific short-term priorities, digital-twin promoters could face some resistance when it comes to allocating budget for long-term projects that require considerable resource investment across the internal value chain.

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