



DIGITAL INDUSTRIES SOFTWARE

Accelerate digital transformation in electronics

Optimizing product development faster at lower cost with enhanced collaboration,
processes and innovation

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Requiring more than just agility

In today's fast-evolving market, electronics power everything from consumer devices to industrial products. The demand for smart products – smartphones, appliances, medical devices and more – continues to surge, creating immense opportunities alongside significant business challenges.

Digital transformation is a term heard often in the high tech electronics industry. But what does it really mean for you and your company?

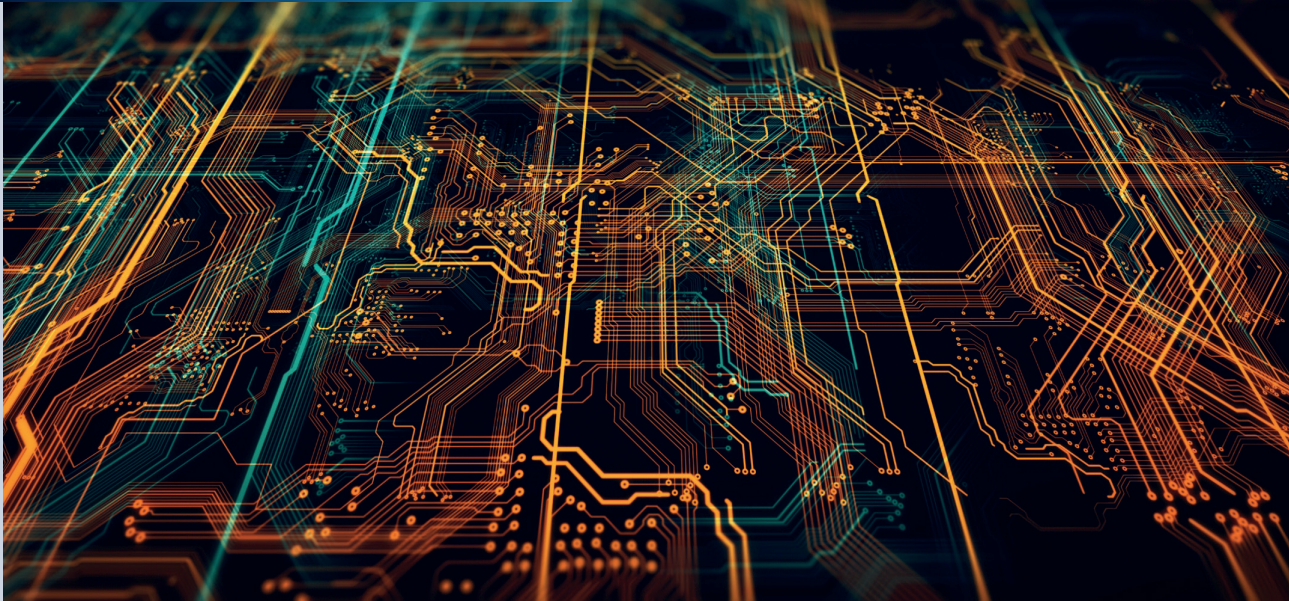
To achieve transformation, processes must go beyond agility alone. In this e-book, we discuss the tangible advantages and opportunities digital transformation can deliver.

Key takeaways

- Learn the five essential steps to drive digital transformation and reshape your business
- Break down silos to foster collaboration and enhance communication
- Streamline operations with digital tools to reduce complexity
- Transform processes for impactful, long-lasting improvements across your business

Contents

- Industry overview: current challenges
- Digital transformation solutions
- Five steps to digital transformation
- Enhancing collaboration by breaking down silos
- Simplifying systems and processes
- Don't just replace – dramatically improve
- Summary – key benefits



Current state of the electronics industry and its challenges

As the expansion of the digital world accelerates, businesses must digitally transform to keep pace:

- Products are more complex, they're smarter, often smaller, connected and they develop intelligence
- The rate of innovation is outpacing traditional siloed design and engineering product development teams where disparate tools and manual processes dominate
- To keep pace, design teams must start integrated and stay integrated, increasing efficiency to accelerate next-generation product development

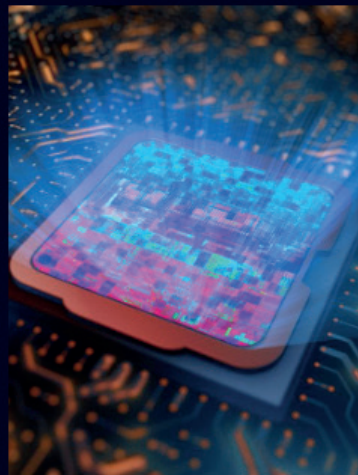
- Most importantly, electronics companies need to have strong strategies in place to implement digital transformation and accelerate product development

Enabling companies to streamline development processes while fostering innovation

Operating efficiently in this data-driven era



Keeping pace in the digital world



Accelerating product development

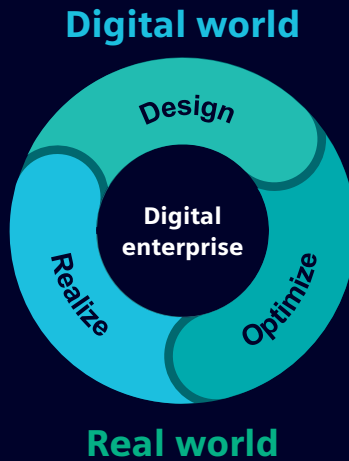


Increasing focus on quality and sustainability

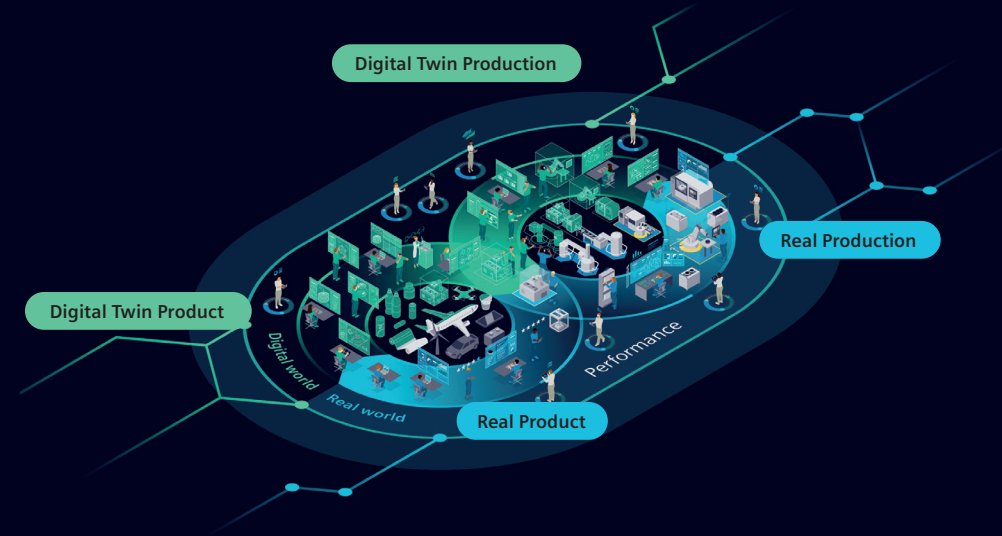


Start by leveraging a digital twin approach that combines the real and digital worlds, enabling continuous optimization across the enterprise.

The Digital Enterprise combines the real and the digital worlds with a comprehensive digital twin approach.



This enables continuous optimization of design, simulation, engineering, commissioning, automation, service, and recycling.



Closed-loop connections between the digital and real worlds enable insights and informed decisions.

Continuous optimization really begins with a comprehensive digital twin to merge the real and digital worlds.¹ This approach lets you harness data to make faster, more confident decisions for your company and customers. A comprehensive digital twin is used to create closed-loop connections for actionable insights, improving planning, optimizing production and advancing your journey to becoming a digital enterprise.²

Why transform into a digital enterprise? A digital enterprise empowers teams to design, launch and produce products with greater efficiency while continuously adapting to market changes, evolving regulations, sustainability goals, new technologies and consumer demands.

The digital enterprise is essential for gaining a competitive advantage, and adopting the digital twin is a key step in the transition. A digital twin not only provides a model of real production and products, but it creates a bidirectional link between a digital model and its physical counterpart, allowing updates to flow between them. This connection enables teams to optimize design, predict maintenance needs, monitor performance and improve decision-making. By providing a dynamic, data-driven virtual model, the digital twin transforms how we design, develop and maintain complex products across their lifecycle.

Let's explore the role of the digital twin in the five steps of digital transformation.

Five steps for digital transformation

Electronics companies have been pursuing digital transformation over the last couple of decades, but progress has often been slower and less comprehensive than needed.

Our five-step framework helps companies evaluate their digital maturity and accelerate toward a fully optimized, closed-loop enterprise. These steps guide the transition from a document-based system to a fully digitalized engineering process. The 5 steps are:

- Configuration
- Connection
- Automation
- Generative design
- Closed-loop optimization

Five steps on the journey of Digital Transformation maturity



A roadmap to help companies build more optimized products faster for far less cost

Five steps for digital transformation (continued)

Step 1 – Configuration

The first step, configuration, transitions the process from document-based to model-based workflows. This enables the managing, creating and changing of documents and the archiving of product information. The goal is to securely store data for easy access and reuse it throughout the product lifecycle, which is known as product data management (PDM). This begins with configuring enterprise reference architecture to ensure secure, traceable and well-organized data from requirements to the industrial edge.

To configure your engineering processes, start by creating a physics-informed digital twin along with a standardized bill-of-materials (BOM), work breakdown structure (WBS) or product breakdown structure (PBS) that all stakeholders adhere to. A digital twin is a virtual model of a physical product or process that is used to predict performance and optimize operations. It can represent either the product (product digital twin) or the manufacturing process (production digital twin), simulating real-world conditions to validate performance before investing in production or optimizing manufacturing operations.

Step 1 - Configuration



A roadmap to help companies build more optimized products faster for far less cost

Step 2 – Connection

Connection bridges multidomain product data across the entire lifecycle, ensuring traceability from requirements to design, manufacturing and disposal. It involves creating common data models for seamless flow across engineering tools and databases, establishing a single source of truth. End-to-end connectivity – from requirements to design, testing and feedback from the industrial edge – enables enterprise interoperability, fostering collaboration and driving innovation.

To connect your design and engineering processes, it is essential to have end-to-end digitalization with agile application programming interfaces (APIs) for building the digital backbone that supports the industrial metaverse. Although many companies consider this stage the end of their transformation, stopping here limits return-on-investment (ROI). To fully realize digital transformation, companies must go further.

Step 2 - Connection



A roadmap to help companies build more optimized products faster for far less cost

Step 3 – Automation

Automation is central to digital transformation, freeing humans from repetitive tasks and enabling focus on more impactful work. It's divided into two phases: automating mundane tasks and automating complex tasks once thought only humans could handle. Using artificial

intelligence (AI) and machine learning (ML), the goal is not to replace engineers, but to enhance their work environment, allowing them to focus on the most critical aspects of the engineering process.

Next, invest in AI/ML to build confidence in its reliability for tasks like part design, risk-based inspections, work-force management and other routine activities.

Step 3 - Automation



A roadmap to help companies build more optimized products faster for far less cost

Five steps for digital transformation (continued)

Step 4 – Generative design

Generative design is a multidomain process that leverages AI/ML to automatically create one-to-many design alternatives. The process begins with engineers creating a series of prompts describing desired parameters and ending with auto-generated detailed design artifacts. Additionally, once a design can be auto generated, then many design alternatives can also be auto generated.

You can unleash the power of generative design for assets, work packages and operations for continuous improvement and optimization studies that support better decision-making across the asset and system lifecycle.

As a next step, invest in physics-based analytics that allow for “tuning” of assets in the virtual world of the digital twin with numerous iterations leading to optimal physical world performance.

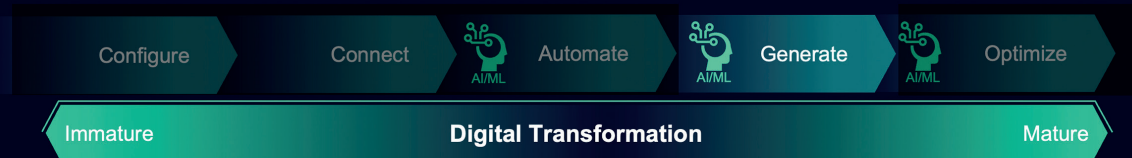
Step 5 – Closed-loop optimization

Closed-loop optimization is used to evaluate design alternatives against key performance indicators (KPIs), adjusting goals and relaunching the generative design process for continuous improvement. This iterative process tests virtual prototypes (digital twin) to optimize the product affordably, avoiding costly trial-and-error in production. The best iterations are presented to engineers for final validation, reducing mistakes and the need for physical prototypes.

Model-based optimization is used to analyze the full data stack with live, federated feeds, generating hundreds of iterations in a trained AI environment for a competitive edge. Closed-loop optimization links AI/ML to markets,

supply chains, equipment performance and maintenance, while low-code applications enhance shop floor operations.

Step 4 - Generative Design



A roadmap to help companies build more optimized products faster for far less cost

Step 5 - Closed Loop Optimization



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Enhancing collaboration by breaking down silos

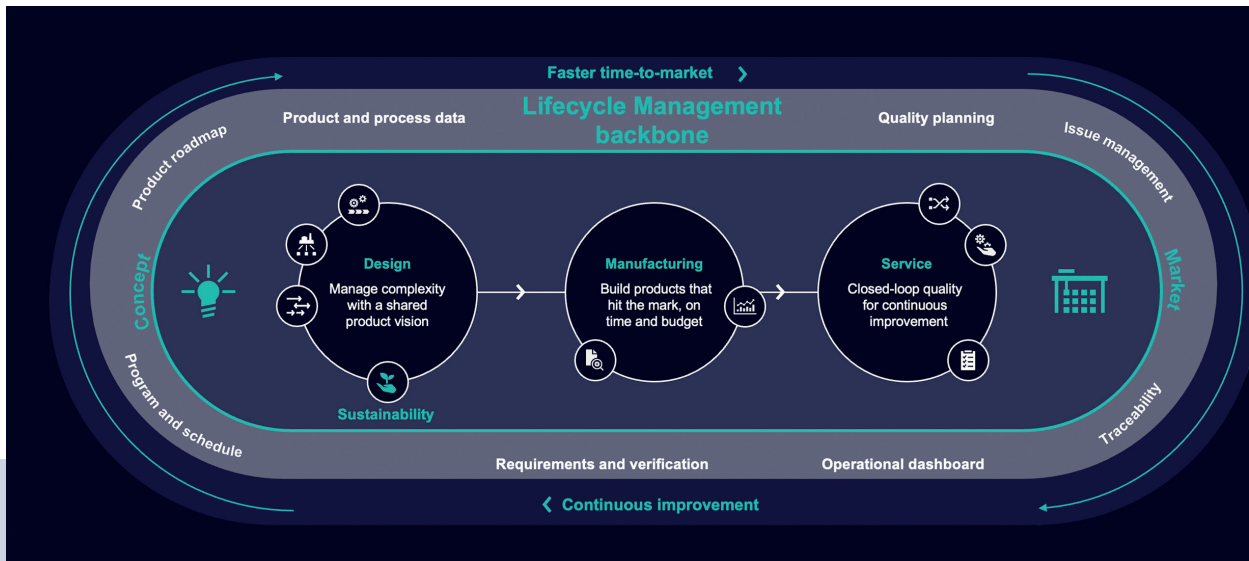
The value of digital transformation is not simply in replacing systems or processes, but in dramatically improving them. With electronics products evolving rapidly, embracing digitalization at every step – design, manufacturing and service – presents opportunities for growth. As complexity increases, focusing on your organization's process for turning ideas into better products becomes essential.

Orchestrate a seamless, customer-centric journey from concept to market

For modern electronics, what does a seamless journey look like? It means aligning your strategic goals with the power of automated workflows and optimized resources:

- For design it means managing complexity with a shared product vision
- For manufacturing it means building products that hit the mark on time and on budget
- For service it means achieving closed-loop quality for continuous improvement

When you harness the power of digital transformation to integrate all these components, you're not just managing, you're orchestrating a seamless, customer-centric journey from concept to market.



Simplifying systems and processes

Having explored how digital transformation breaks down silos and enhances collaboration, let's now focus on reducing system and process complexity to dramatically improve them.

Digital transformation creates an interconnected environment that empowers your business to make unified, data-driven decisions throughout the product development lifecycle, from planning and design to realizing the product and optimizing performance for continuous improvement. Two key opportunities to leverage digital transformation for reducing complexity are quality planning and traceability.

Quality planning

Prioritizing product quality early in the design process is key to meeting form, function and quality specifications. Electronics companies should use quality planning and risk mitigation to address design complexity. The value of quality planning should extend beyond production support to all core business processes.

Traditional challenges include:

- Breaking down silos between engineering, manufacturing and quality management
- Ensuring traceability across departments with a unified repository
- Providing a common environment for change and configuration management

Quality planning success hinges on identifying risks early in the product lifecycle

- Plan quality upfront, developing milestones alongside design
- Reduce risk and costs with guided failure mode and effects analysis (FMEA)
- Use control and inspection planning to monitor quality and manage risks
- Set quality milestones before production begins

To ensure successful product launches, plan each phase, address risks and mitigate potential failures early using advanced tools to prevent costly defects throughout the product lifecycle.

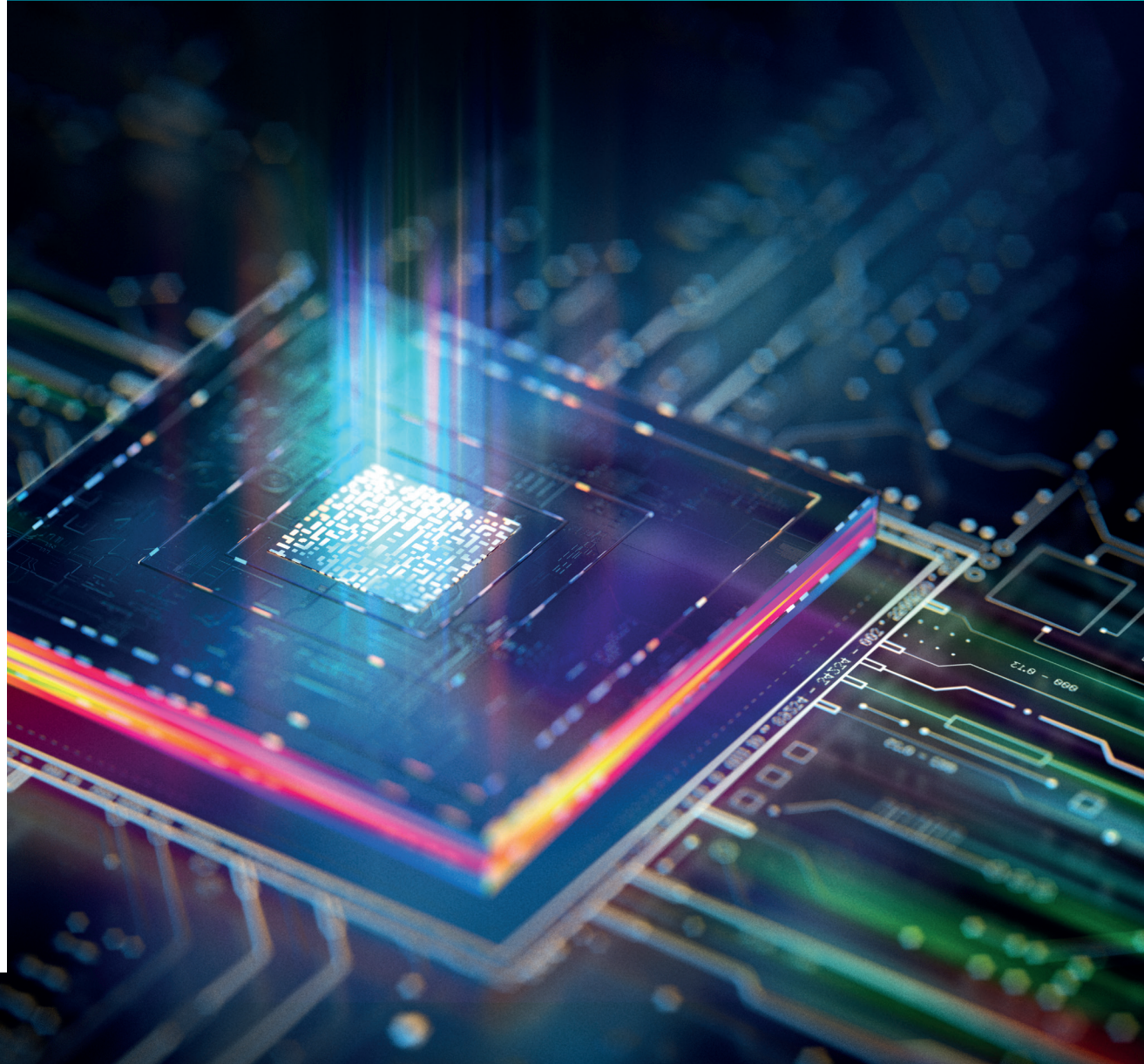
Traceability supports timely product delivery

Traceability is critical to ensuring timely product delivery, yet many teams struggle to leverage it effectively due to disconnected legacy systems, inability to share change history and limited risk management capabilities. End-to-end traceability enables teams to confidently address issues by verifying design requirements and identifying root causes. This confidence comes from being able to trace a customer's idea through to manufacturing, ensuring the right elements are connected and minimizing irrelevant work.

Traceability advantages

- Provides data-driven product management
- Enables closed-loop decision-making within system or product architecture
- Accelerates execution by resolving issues based on design relationships
- Facilitates efficient risk analysis by assessing the impact of changes before implementation

As product complexity grows, decision points increase. Every change must be made with data, considering the overall product architecture. Traceability ensures the team – design to manufacturing – confidently implements updates and resolves issues without over- or under-engineering. By integrating traceability into lifecycle management, it automatically links changes to relevant content, helping assess risks and ensuring that manufacturing processes are complete, and problems are quickly addressed.



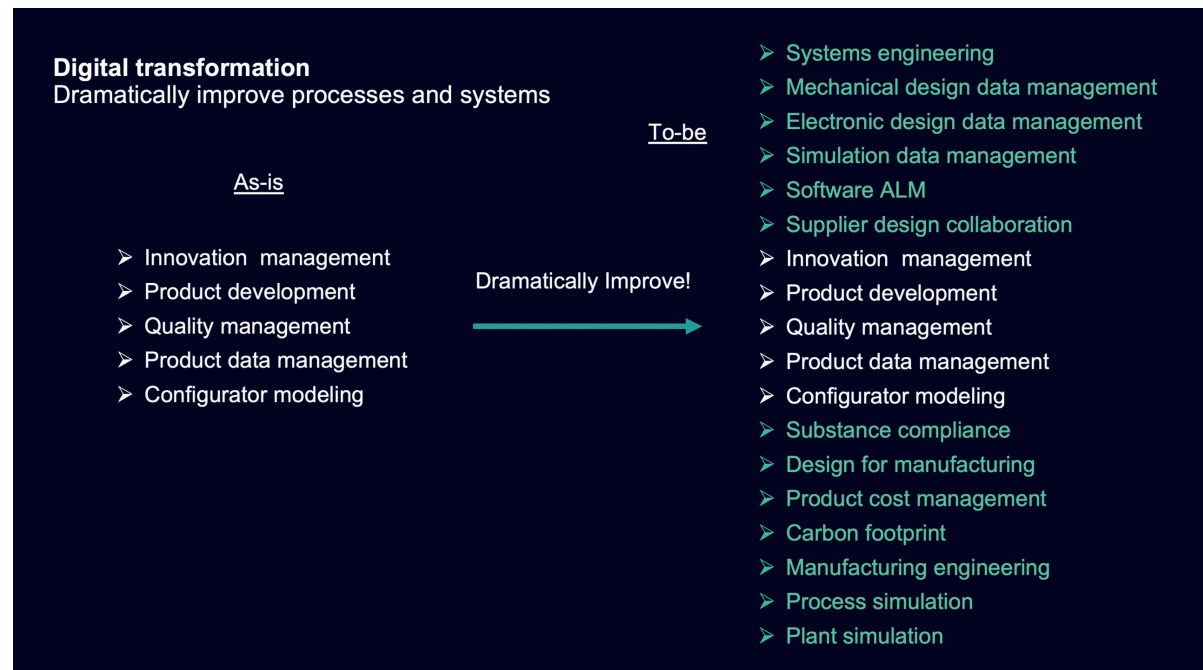
Don't just replace – dramatically improve

Data management advantages

Effective product and process data management is key to creating a comprehensive digital twin. The system must provide a single source of truth, eliminating the need to search across multiple sources for more efficient collaboration and product development. It should integrate design processes, such as electronic computer-aided design (ECAD) and mechanical (MCAD) codesign, across your global organization. The system must be user-friendly, allowing engineers to benefit without product lifecycle management (PLM) expertise, and efficiently manage a consistent, product-level bill-of-materials (BOM) with mechanical, electronic and software data.

Digital transformation is an opportunity to not only replace existing systems but to dramatically improve them. It allows for a more holistic approach, implementing complete solutions for both processes and systems. Instead of simply replicating current functionality, use this opportunity to enhance and optimize both processes and systems.

Digital transformation enables you to eliminate siloed systems, such as separate CAD data management and BOM management, while integrating capabilities for greater efficiency. Digital transformation is a journey, not a destination, and when approached step-by-step, it fosters continuous improvement.



Key benefits

Digital transformation enables electronics companies to develop optimized products faster and at a significantly lower cost. In this e-book, we've highlighted three key outcomes from leveraging digital transformation in new product development:

1. Enhanced collaboration and speed: By breaking down silos, teams can collaborate more effectively, speeding up decision-making and product development.
2. Simplified processes and systems: Reducing complexity streamlines operations, making it easier to manage and scale product development without unnecessary hurdles.
3. Continuous improvement and innovation: Moving beyond simple system replacement, companies can dramatically improve processes, driving greater efficiency and fostering innovation throughout the product lifecycle.

When these elements are integrated, companies experience greater efficiency, faster time-to-market and a stronger competitive edge in an ever-evolving industry.

Forty-six percent of companies hinder operations by using multiple BOM systems.

"In a recent survey by CIMdata ("The Importance of an Enterprise Bill of Material," CIMdata PLM Foresight Research, November 22, 2022), 46 percent of respondents report using multiple BOM systems, hindering business operations and complicating variant management."

Accenture White paper: "Navigating the Enterprise BOM Complexity: A framework-driven approach for a future-ready organization," 2024, Page 9.

Digital transformation is more than just replacing manual processes with digital ones. The value lies in cultural change and the adoption of reimagined processes that fully leverage well-defined digital strategies.

We invite you to connect with us to explore how we can support your company's transformation. For more information, please reach out. at go.sw.siemens.com/_Wwd4D1J

References

1. The Siemens Glossary: <https://www.plm.automation.siemens.com/global/en/our-story/glossary/digital-twin/24465>
2. Siemens blog: "Deloitte, Siemens and the Model-Based Enterprise: The Future of the Digital Twin," Issue 04/2023, <https://blogs.sw.siemens.com/thought-leadership/2023/04/05/deloitte-siemens-and-the-model-based-enterprise-the-future-of-the-digital-twin/>

Siemens Digital Industries Software helps organizations of all sizes digitally transform using software, hardware and services from the Siemens Xcelerator business platform. Siemens' software and the comprehensive digital twin enable companies to optimize their design, engineering and manufacturing processes to turn today's ideas into the sustainable products of the future. From chips to entire systems, from product to process, across all industries, [Siemens Digital Industries Software](#) – Accelerating transformation.

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