

From Product-Centric to Solution-Centric: Solving the Lifecycle Puzzle in Manufacturing

The manufacturing industry is undergoing a profound transformation, driven by advancements in digitalisation, the Internet of Things (IoT) and artificial intelligence (AI). Companies that traditionally have focused solely on producing physical products are evolving into comprehensive solution providers. This shift significantly alters how manufacturers operate, interact with their customers, and create value, demanding a reorientation from mere products to delivering personalised customer experiences and services.

However, as this transformation unfolds, several complex challenges must be addressed at the intersection of hardware, software, and services. The industry's ability to navigate these challenges will determine whether it can fully capitalise on the opportunities of a solution-centric model.

Drivers of Transformation

Today's customers increasingly expect not just products, but personalised experience, continuous support, and added-value services. Concurrently, digitalisation and IoT technologies have dramatically expanded opportunities to harness data for innovative, data-driven solutions. AI and machine learning advancements empower manufacturers with predictive maintenance and optimisation capabilities, enhancing efficiency and cost savings. The trend toward the service economy further reinforces this transition by combining products with complementary services, creating new avenues for growth and more stable revenue streams.

The Hidden Integration Challenge

A core challenge for manufacturers lies in the fragmented management of physical and digital assets. Mechanical and electrical components are typically managed in traditional Product Lifecycle Management (PLM) or Product Data Management (PDM) systems, while software components are stored and developed separately, often in platforms such as GitHub. These systems rarely integrate well, resulting in a disjointed view of the overall solution.

This disconnect becomes especially problematic when managing the installed device base. Often, there is little to

no reliable information about the software versions installed in the field. This lack of visibility undermines predictive maintenance, version compatibility, security management, and lifecycle planning. On the other hand, continuously evolving cyber-attack vectors force continuous software updates for software stacks. The new software versions may not be as backwards compatible with earlier hardware. Together, these two create a likely challenge: existing installed devices will soon fall out of software support. Solving this issue is essential for a coherent solution-centric approach.

Implications for IT System Landscape

To support this transformation, manufacturers must evolve their IT infrastructures. Traditional enterprise resource planning (ERP) systems must develop into flexible, digital core platforms that enable collaboration, data sharing, and integration with IoT and AI technologies. Cloud computing provides the scalability and agility needed for a solution-centric business model.

API-based integration becomes essential to ensure seamless data flow between PLM/PDM systems and software development environments. Digital twin technologies allow for simulation, prediction, and optimisation across both hardware and software dimensions. Meanwhile, robust cyber security measures must protect increasingly connected ecosystems.

Lifecycle Thinking Must Evolve

The traditional view of a product lifecycle is insufficient in the era of software-driven solutions. Hardware may remain in the field long after its associated software lifecycle ends. Without updates, devices risk becoming outdated, vulnerable to cyber threats, and unable to support new capabilities.

This presents both a threat and an opportunity. On one side, manufacturers risk dissatisfied customers and security liabilities; on the other, they gain opportunities for upselling retrofits, hardware upgrades or entirely new devices. To thrive, companies must embed lifecycle intelligence, continuous integration/continuous delivery (CI/CD), and real-time monitoring to ensure long-term customer value.

Could Updates Become Mandatory?

A critical question emerges: could the market evolve such that software updates on installed industrial devices become mandatory? This is already the norm in consumer electronics, where laptops and smartphones receive enforced updates for security and functionality. In the same spirit, the EU Cyber Resilience Act addresses the entire product lifecycle, from design to end-of-life, and aims to minimise vulnerabilities, foster transparency, and ensure secure updates. The IEC 62443 standard for cyber-physical devices requires that embedded software be kept up to date.

For manufacturing, this could be transformative. If devices could be updated automatically or otherwise regularly, even post-sale, manufacturers could ensure long-term security, compliance, and feature parity. However, this requires technical, legal, and contractual changes, as well as a mindset shift towards long-term solution ownership.



From Product-Centric to Solution-Centric

AI, IoT, and digitalization are transforming the industry, turning product manufacturers into holistic solution providers.

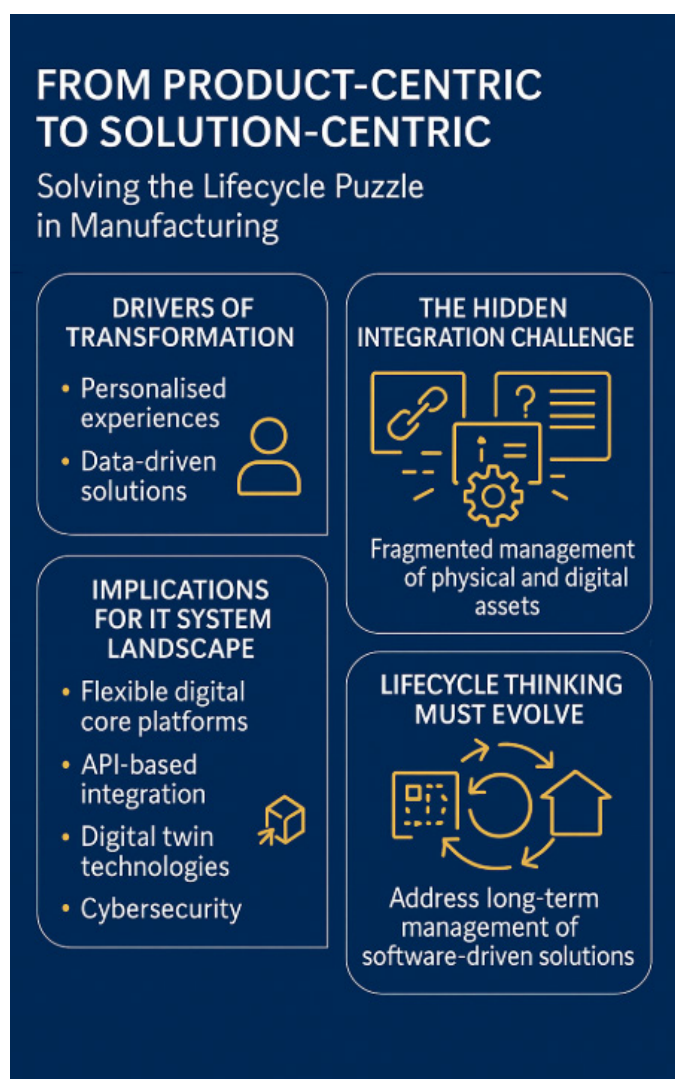
Value is created at the intersection of hardware, software, and services.

Managing Product Lifecycles Differently

Manufacturers must adopt integrated solution lifecycles encompassing hardware, software, and services. This requires:

- Service-oriented architectures for modularity and flexibility
- Versioning and configuration management to ensure compatibility
- Good grip (and communication) of compatible hardware and software versions
- Solution-specific data management for diverse data sources
- Lifecycle analytics to optimise performance and profitability
- Continuous integration/testing to keep deployed solutions current and secure

These changes require not only technical investments but also changes in governance, roles, and responsibilities.



Navigating the Transformation

To succeed in this environment, manufacturers should:

- **Define a Lifecycle-Centric Vision:** Align leadership on integrated solution lifecycle management.
- **Integrate Hardware and Software Systems:** Break silos between mechanical/electrical PLM and software development platforms.
- **Enable Updateability:** Build platforms capable of automated, secure updates across the installed base.
- **Enhance Customer Experience:** Empower sales and service teams to deliver high-touch, personalised support.
- **Strengthen Cyber Security:** Protect systems with strategies tailored to connected solutions.
- **Modernise IT Infrastructure:** Adopt cloud, API-based integration, and digital twin technologies.
- **Implement Governance and Change Management:** Ensure structured, cross-functional oversight of the transformation.

Conclusion

The shift from a product-centric to a solution-centric manufacturing model is both promising and demanding. Success requires solving foundational challenges in lifecycle continuity, system integration, and upgradability. By addressing these issues now, manufacturers can secure their competitive position and unlock new forms of customer value, business growth, and innovation.

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