In a competitive and disruptive market, customers will benefit from partnering with engineering services providers to modernize the life cycle of their products and build resiliency into their operations.

Modernizing and Transforming Products and Operations

March 2022

Written by: Mukesh Dialani, Program Director, Digital Engineering and Operational Technology Services

Introduction

The pandemic forced most manufacturers to analyze and understand their inefficient operations. Many were caught off guard by the ensuing disruptions because their existing technology infrastructure did not alert them to slowing demand and impending supply chain breakdowns. As a result, they kept producing goods that were not in demand — or failed to produce those that were. In many cases, sales, profits, and branding were negatively impacted. This situation accelerated investment in relevant digital technologies to transform the way products were built. It also spurred adoption of modern manufacturing operations strategies that ensured tight integration with other stakeholder business units such as supply chain, IT, and customer experience.

Organizations must leverage new digital technologies if they want to transform product manufacturing and infuse resiliency into their operations as they work toward improving unique end-user experiences and mass customization. The days of leveraging cost reduction and other basic marketing strategies to grow revenue and differentiate in the market are over. Irrespective of their size, manufacturing companies can choose from a range of new digital technologies and methodologies that can modernize and transform their operations. This impact is being seen across a range of industries such as automotive, process manufacturing, and aerospace. These technologies and methodologies include Industrial Internet of Things (IIoT), digital thread/twins augmented/virtual reality (AR/VR) robotics, product life-cycle management (PLM) on cloud and edge computing, analytics, DevOps and other new software engineering methodologies; artificial intelligence/machine learning (AI/ML); security, and 5G. For example, digital thread and digital twin investments can help support a model-based engineering environment where one can explore the behavior of virtual prototypes in different operation environments. Investments in cloud PLM accelerate real-time collaboration by all stakeholders, reduce cost of ownership, provide scalability, and enable real-time availability of updated features/functionality.

In IDC's December 2021 *Future Enterprise Resiliency and Spending Survey, Wave 11,* participants were asked about the impact of digital investments on their financial metrics. Approximately 72% of manufacturing industry respondents reported a 1–24% increase in revenue. Another 19% reported a 25 –49% increase in revenue. The responses for cost savings and profits were in similar ranges.

AT A GLANCE

KEY STATS

In IDC's December 2021 Future Enterprise Resiliency and Spending Survey, Wave 11, participants were asked about the impact of digital investments on their financial metrics. Approximately 72% of manufacturing industry respondents reported a 1–24% increase in revenue. Another 19% reported a 25–49% increase in revenue.

Many manufacturers' operations contain disconnected and siloed legacy technology that does not provide the granular data and insight that can help transform their operations. For example, PLC/SCADA sensors collect data that is stored in a siloed manner by various business units and thus not connected to the IT data. Sometimes this situation creates duplication of investments for certain infrastructure. IT and OT (engineering) may duplicate cloud and analytics investments. These departments also struggle with access to budgets for new investments, retaining knowledge as existing talent departs, and hiring/training new staff.

Finally, product teams want to introduce new products or get modernized products to market faster to meet their targets but often do not consider end-customer feedback during the production process. This can lead to products that end customers don't want or are not satisfied with. The woes for manufacturers don't end here. Without these new technology deployments, they have no insight into impending machine shutdowns or supply chain disruptions. Customers also want real-time insight into their entire production infrastructure. They want to be aware of any impending failure so they can plan spare parts inventory and be aware of plant performance across different sites.

Key Considerations

Most manufacturing customers are unaware of how to envision and implement a digital transformation program. They require assistance with envisioning a road map, budget justification strategy, and other considerations. Manufacturing leadership and other executives should keep the following considerations in mind as they embark on any new infrastructure modernization initiative:

» **Product modernization.** New digital technologies can leverage data in real time that captures a customer's experience using a product as well as the product's performance in any environment. This feedback can be used to make either physical changes to design, user interface, or embedded software to accelerate product development and improve overall customer satisfaction and product performance. Digital technologies can also be used to personalize marketing, access the right demographic, improve pricing, and enhance aftermarket services. This has a direct correlation to increasing revenue and improved CSAT.

» **Industry 4.0.** This methodology modernized manufacturing operations by integrating IoT, edge/cloud computing, analytics, and AI/ML on the shop floor and across the entire operations value chain. It also necessitated that IT and OT collaborate to transform their operations and realize the true potential of these investments and initiatives. Collaboration helps build resilient operations that analyze and leverage sensor-generated data to enable informed decision making. In a true transformation scenario, shop floor data is integrated with operational data from ERP, customer feedback/service, supply chain, and other stakeholder data to create a holistic view of the entire operation.

» **PLM, digital thread, and twin.** A digital thread implementation enables digital traceability of every aspect of the product life cycle — from the R&D stage through product design, engineering, production planning, manufacturing, delivery/distribution, and post-sale-related activities such as customer support. It enables all stakeholders to have the same real-time view of the product, process, manufacturing, and supply chain data. It also includes relevant application (CAD and other software) and asset life-cycle management functions. A digital twin represents a digital version of the product or operations and includes product or infrastructure (machine) data such as design, performance data, supply chain data, and related software included in the product or machines. A digital twin simulates any product, infrastructure (e.g., machinery, buildings, bridges), processes, and controls.
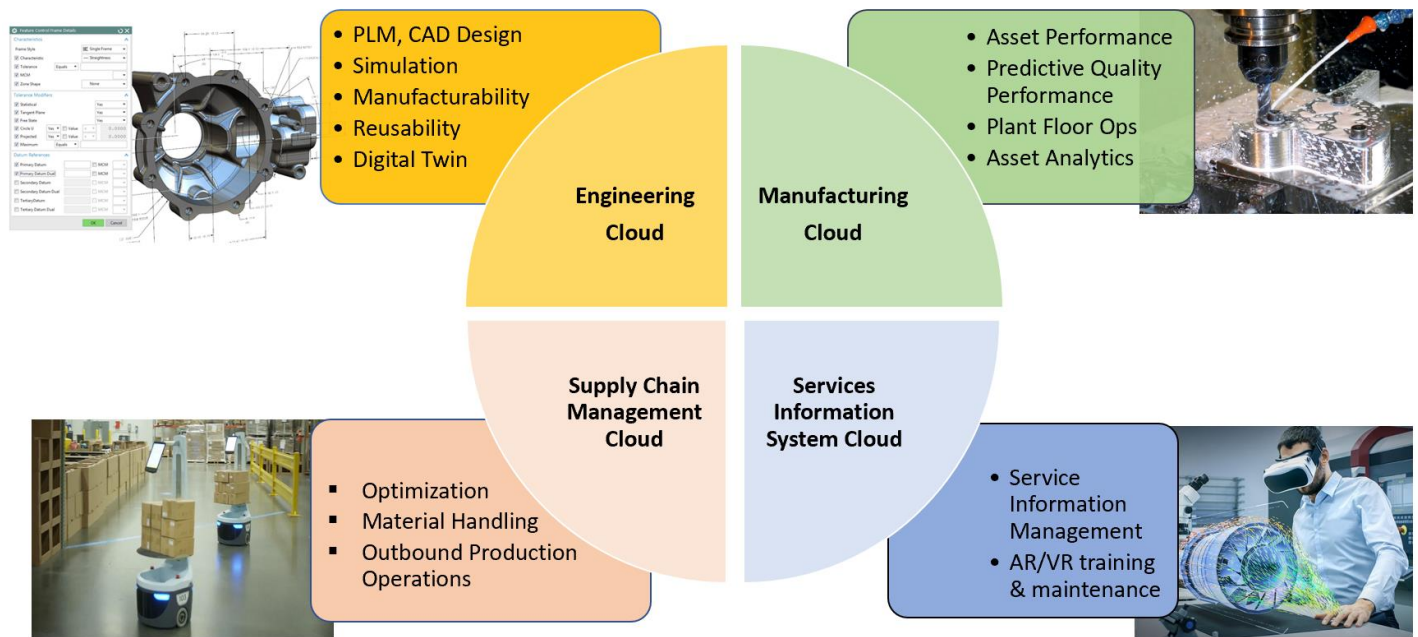
In manufacturing, digital thread implementations ensure that any product design or manufacturing errors are reduced as everyone has the same version and data and it's not in manual form. Such implementations improve quality, reduce wastage, increase collaboration, and improve field technician performance leading to expedited time to market and increased customer satisfaction. PLM data in the cloud also helps with reducing errors and cost and lets decision makers allocate the appropriate infrastructure/machines for manufacturing, modernizing/optimizing a process, and managing a tight schedule while measuring performance based on pre-defined metrics.

» **Worker training and safety.** It is important to ensure that workers are trained well and that checks and balances are in place so shop floor and field technicians can do their jobs safely. Ignoring these issues can have legal consequences as well as lead to delays in production and overall operations performance. Over time, products and related processes have become more complex so training is all the more critical. Augmented reality helps improve the time it takes to onboard or train existing and new employees on the shop floor. It can provide safety instructions in a 3D format that overlays digital and physical information. In addition, collaborative robots, sensors on hats and other wearables, smart PPE, and other protective initiatives improve the comfort and safety of workers and help boost performance.

» **Cloud and analytics.** Cloud is a key part of any Industry 4.0 strategy. It enables the integration of all manufacturing, engineering, supply chain, sales and distribution, customer feedback, service, and other related data. Cloud also enables the efficient analysis of large data sets. According to IDC's *Future Enterprise Resiliency and Spending Survey, Wave 11*, 57% of manufacturing industry respondents said they were investing in cloud infrastructure as part of enterprise intelligence investments.

» **Supply chain resiliency.** As customers saw their supply chains get disrupted during the pandemic, it forced them to examine their existing technology infrastructure. They realized that they did not always have granular end-to-end visibility in real time, which hampered their ability to take predictive and prescriptive decisions. A well-structured supply chain control tower is backed by high-quality data. It also includes the ability to manage inventory and prevent stockouts, as well as a modernized order execution system, track and trace capability, inbound/outbound logistics, and an integrated view of all processes, systems, and applications across all stakeholders.

» **Aftermarket services**. OEMs and product companies must realize the potential of aftermarket services such as parts provisioning, product repair, maintenance, and other services such as remote access monitoring and management of products and infrastructure. Customers can gain competitive advantage and increase their revenue from ongoing services contracts. If their products and operations are sensor enabled and connected to the network, they can collect data from their installed base and provide these services.

» **Partnerships.** As manufacturers embark on envisioning and deploying various transformation initiatives, they need to identify a set of technology and services partners they can collaborate with on their plant modernizing journey. Working with an experienced partner ensures a more coordinated approach and extensive know-how in modernizing product- and operations-related functions and reducing overlaps in investments and effort.

Considering Tech Mahindra

Tech Mahindra is a global IT services and consulting company that is part of the Mahindra Group, which is based in Pune, India. Tech Mahindra has revenue of US$5.4 billion and employs 125,236 people in 90 countries. Tech Mahindra delivers a variety of cloud-based solutions as shown in Figure 1, including engineering and manufacturing cloud, service cloud, and a supply chain management cloud. The company's manufacturing vertical focuses on assisting enterprises in using manufacturing cloud solutions as an integral part of digital transformation, with access to domain experts from more than 50 countries and over 60 OEMs and cloud technology service provider partners.

FIGURE 1: *Tech Mahindra's Cloud-Based Solutions*

- PLM, CAD Design
- Simulation
- Manufacturability
- Reusability
- Digital Twin

Engineering Cloud

Manufacturing Cloud

- Asset Performance
- Predictive Quality Performance
- Plant Floor Ops
- Asset Analytics

Supply Chain Management Cloud

Services Information System Cloud

- Optimization
- Material Handling
- Outbound Production Operations

- Service Information Management
- AR/VR training & maintenance

Source: Tech Mahindra, 2022

Engineering

Tech Mahindra offers a hybrid cloud multi-CAD PLM with an integrated enterprise infrastructure platform for manufacturing companies. The platform consolidates data, runs at low latency, and provides a variety of end-user CAD and PLM software access services focused on delivering secure workload as a service (WaaS). It offers remote working environments for the CAD/PLM user community and supports private, public, and hybrid cloud variations.

WaaS lets the Engineering Cloud enable process automation as more of a touch point solution based on a framework that requires less scripting to spin off and maintain instances. This lowers challenges with continuous integration and complicated release management, improves operational efficiency, decreases time to market, and nurtures an agile culture across the organization. It also reduces tool administration costs by 20%, according to Tech Mahindra.

In the coming years, cloud service providers will offer more secure features to their customers. Tech Mahindra's solution focuses on integrated and unified product views as well as industry cloud and data security compliance, among other things.

Manufacturing

Building or consolidating information as a single source of truth is critical, as is the ability to automate workflows. It not only allows for the development and deployment of key manufacturing analytics use cases but also ensures that the insights are acted on and incorporated into existing workflows or processes. This streamlines the process of implementing analytics, speeds up ROI, and increases productivity by up to 10%, according to Tech Mahindra.

Tech Mahindra's Manufacturing Command Center links factories and enterprise programs like ERP across the business. It provides end-to-end visibility for key KPIs across all geographies, divisions, product groups, and factories. It also develops standardized monitoring mechanisms, ranks/rewards the best-performing entities, and leverages analytics to spot trends and improvement areas. End-to-end monitoring, proactive alarms, and historical performance tracking are available to the factory team. A closed-loop system with an asset and production twin guarantees feedback is acted upon and leverages analytics to predict abnormalities.

The command center solution can help businesses save operational technology (OT) and IoT infrastructure expenses by assisting in migrating industrial data platforms to the cloud and helping to improve IT/OT staff efficiency by switching to managed cloud services. It can also aid in faster implementation of manufacturing use cases to improve operations and the supply chain. Tech Mahindra states that it can yield up to a 62% improvement in IT staff productivity.

Supply Chain Management

Tech Mahindra has developed a cloud-based supply chain solution that provides real-time, end-to-end supply chain visibility solutions to end clients. The solution does this by leveraging the latest cloud-based microservices architecture, AI/ML, and blockchain services to address business issues such as visibility and transparency for n-tier mapping, shipment tacking and traceability, and modern data plundering. The system monitors and detects SKU-level values that are at risk, assesses them, and provides mitigation options, which the company claims can improve response time by 50%.

All of this is accomplished using cloud-hosted machine learning algorithms that discover patterns associated with the most common dangers. The supply chain solution not only collects real-time events related to shipment tracking but also forecasts shipment ETAs that may be affected by natural disasters or human-caused interruptions. The platform's alert notification is integrated to disseminate essential messages to stakeholders.

Service Information System

Tech Mahindra has invested extensively in cloud-based solutions for the manufacturing aftermarket industry to provide service professionals with access to the most up-to-date manuals, 3D designs, media, and vehicle diagnostics. It also allows OEMs to collect and manage feedback, as well as assess CR health conditions.

The service information cloud provides an accurate and speedier means to diagnose fault codes and connect them to documents and media. It also has the ability to accept or report service steps followed, updates, or modification requests from the repair process back to the vehicle OEM engineering team. Engineering, electric modifications, media, assembly sequence, and other information may be disseminated from OEM to dealers, service personnel, and other third parties in a timely and correct manner.

Capabilities such as AR/VR, speech to text, and code scanning with mobile enable service technicians to provide high-quality service faster, which Tech Mahindra claims can maximize end-user growth by 20%. These features will be integrated with CAD and PLM on the cloud, with the option to scan error codes and access information via a mobile app to provide a rapid solution.

Challenges

Any product or operations transformation initiative is not devoid of challenges. Various issues that manufacturers must keep in mind as they embark on such initiatives include:

» **Defining a vision/strategy and next steps.** Engineering or operations may find it difficult to clearly define the business or operations problem and modernization strategy, or leadership may not see these issues as critical. It is crucial to explain the benefits primarily in financial terms and market facts.

» **Obtaining the required budgets.** The organization may not have the total funding needed to undertake transformation. In such situations, manufacturers can plan a phased deployment and invest savings and other benefits into subsequent phases.

» **Getting different business units to collaborate.** Internal culture can sometimes inhibit collaboration. C-suite intervention may be required to get everybody on the same page.

» **Avoiding the proof-of-concept trap.** Manufacturers must identify the correct use case and run pilots before scaling them. This should be a time-bound exercise and not go on forever.

Tech Mahindra should partner with customers to manage the previously mentioned challenges. At the same time, the company should ensure it understands the competition, which could be an external or a low-cost service provider. Other considerations for Tech Mahindra include ensuring that the customer has the budget required for a digital transformation program and that the leadership is committed. Finally, Tech Mahindra should encourage customers to start small and scale quickly to avoid pilot purgatory.

Conclusion

Manufacturers without the necessary skills, infrastructure, competencies, and internal innovation process should look to partners to help them modernize their processes and bake in resilience. A due diligence procedure can help them find service providers that can assist them with transformation while also fitting into their culture. The majority of these partners have knowledge and experience with similar manufacturing initiatives and can help with change management as well as the tools and processes needed to secure internal funding.

About the Analyst

Mukesh Dialani, *Program Director, Digital Engineering and Operational Technology Services*

Mukesh Dialani is a Program Director for IDC's Worldwide Digital Engineering and Operational Technology Services research. He is responsible for executing field research and custom research projects across the entire life cycle of hardware and software products. Based on this background that included working with end customers in the engineering services domain, his core focus also includes operational technology and emerging technology areas related to Industrial IoT, Computer Vision, Robotics, AR/VR, and digital transformation pertaining to engineering services.

MESSAGE FROM THE SPONSOR

Transformation of product architecture and resilience in productions operations are key imperatives for manufacturing organizations. Digital technologies such as IIoT, cloud, data and analytics, AI/ML, and 5G Networks are increasingly being leveraged by Tech Mahindra to transform products and transform manufacturing operations. Our core strength in product development, production, and performance optimization across the value chain has been recognized by both our customers and industry analysts. Tech Mahindra Engineering and Industrial Cloud is a key enabler to enable this transformation.

To learn more about Tech Mahindra visit https://www.techmahindra.com/en-in/manufacturing/

◉ IDC Custom Solutions

The content in this paper was adapted from existing IDC research published on www.idc.com.

ᓍIDC