Successful Manufacturing Digitalization Requires Application Modernization and Integration

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Manufacturing CIOs face issues when supporting digitalization initiatives based on siloed application landscapes and broken processes. Application modernization and integration are indispensable, but need a fundamentally new approach.

Overview

Impacts

- Manufacturing companies risk falling behind the competition and going out of business when their legacy applications do not support digital business models and integration.
- Digital business models expose the holes and gaps between business domains and underlying applications.
- Digital transformation requires collaboration with business partners throughout the entire product life cycle. No manufacturing company can become digital without an ecosystem.

Recommendations

As manufacturing CIOs tasked to support digital business transformation initiatives, you need to:

- Start modernizing your business applications portfolio by applying modern architecture principles such as the composable enterprise.
- Build an integration strategy and enhance your integration capabilities by acquiring necessary skills, defining responsibilities and improving the organization.
- Strengthen your cross-company integration capabilities by building secure access points into applications and processes for better collaboration with other members of your ecosystem.
- Become a trusted partner inside your ecosystem by sharing data and business outcomes in an open, but secure way.
Analysis

Digital business is all about speed. It moves quicker than traditional business. Market dynamics, customer expectations and competitor behavior are changing and altering the business context in which enterprises operate like never before (see Adopt an Iterative Approach to Define Strategy at the Speed of Digital Business). At the same time, readily available data and collaboration inside and across the borders of the enterprise are essential to achieve this speed.

As manufacturing companies are building their “digital thread” — which “connects multiple data and information sources across design, manufacturing and supply chain systems and processes” — they need to start by modernizing and integrating their business applications (see Manufacturing Process Management Is Essential to Digital Thread).

Gartner’s 2020 CIO Agenda: Global Perspectives in Heavy Manufacturing revealed that heavy manufacturers, as some of the earliest users of IT to develop and deliver their products, face formidable challenges modernizing deeply ingrained IT. Figure 1 shows that CIOs in these industries rate themselves as considerably weaker when it comes to “removing technical debt” by “actively following a robust legacy modernization roadmap.” When it comes to using modern technologies such as APIs to integrate inside the enterprise as well as to the outside, the gap between them and fit enterprises is even bigger. The report states: “The heavy manufacturer group has significant technical challenges here. For many companies, the applications are decades old and heavily customized, making modernization hard. Obsolescence of the legacy technology is a big risk.”
The necessity of digital business transformation only increases the pressure to address and solve the issues caused by legacy technology by modernizing business applications and provisioning integration technologies (see Figure 2). The ultimate goal of modernization needs to be the transformation into a “composable enterprise.”

“A composable enterprise is an organization that delivers business outcomes and adapts to the pace of business change. It does this through the assembly and combination of packaged business capabilities (PBCs). PBCs are application building blocks that have been purchased or developed.”

– Future of Applications: Delivering the Composable Enterprise
## Impacts and Top Recommendations for CIOs and IT Leaders in Manufacturing Companies

### Impacts

- Manufacturing companies risk falling behind the competition and going out of business when their legacy applications do not support digital business models and integration.

- Digital business models expose the holes and gaps between business domains and underlying applications.

- Digital transformation requires collaboration with business partners throughout the entire product life cycle. No manufacturing company can become digital without an ecosystem.

### Top Recommendations

- Start modernizing your business applications portfolio.

- Apply modern architecture principles like the composable enterprise.

- Build an integration strategy and enhance your integration capabilities (skills, responsibility, organization).

- Strengthen your cross-company integration capabilities. Build secure access points for collaboration with other members of your ecosystem.

- Become a trusted partner inside your ecosystem by securely sharing data and business outcomes.

Source: Gartner 732395_C

## Impacts and Recommendations

### Manufacturing Companies Are at Risk When Their Applications Do Not Support Digital Business Models

Manufacturing companies, especially in asset-intensive industries such as heavy and complex manufacturing, are behind fit industries in applying modern applications and architecture principles modernization, as shown in Figure 1. And for good reason: Their products and fabrication environments have to be very durable. “Products” such as airplanes, ships, public transportation or energy infrastructure, but also fabrication environments such as large factories, oil platforms or refineries, have to function with utmost reliability not for years, but for decades. The financial investments do not allow for permanent change or frequent replacements.

However, even these industries are under growing pressure to change their business models and products. Adding services to products, getting closer to customers and making products (and their production) more intelligent are important examples. Technologies such as the Internet of Things (IoT) and artificial intelligence (AI) can be used to deliver important innovation (for more details on deconstructing and recombining manufacturing business models, see [How Things and Algorithms Change Manufacturers’ Business Models](#)).
Business applications that were developed and implemented many years ago and have not been kept up to date cannot support new business models or use new technologies well enough. Although some gaps can be closed by smaller alterations or additions, at some point, a more fundamental modernization will have to take place. Companies have started to use Gartner’s pace-layering model to classify business capabilities into those that:

- Are fundamental (systems of record)
- Add incremental competitive advantage (systems of differentiation, often as cloud-based add-ons)
- Are entirely new (systems of innovation, often developed in-house)

These building blocks then form a postmodern landscape of loosely coupled applications (see Use a Pace Layer Lens to Evaluate Build-Buy-Subscribe Application Delivery Options).

When companies introduce new business models, they normally need to also modernize their systems of record. Extending systems of differentiation or introducing systems of innovation no longer delivers what is needed, and more radical steps have to be taken, regardless of the disruption this will create in the short term. Gartner’s TIME method will help to determine the recommended action to take on each application (see Use TIME to Engage the Business for Application and Product Portfolio Triage).

The next level of application modernization is represented by the “composable enterprise” paradigm. Fusion teams allow IT technicians and business partners to closely collaborate on assembling packaged business capabilities to support the faster pace of business change needed for digital business models. Manufacturing companies are well-prepared to use fusion teams (see Fusion Teams: Cross-Functional Collaboration for the Digital Era). In addition to application modernization, various forms of integration are needed. Gartner’s 2020 Strategic Roadmap for the Future of Applications describes the steps to take to implement the composable enterprise. Gartner’s Future of Applications: Delivering the Composable Enterprise illustrates the longer-term vision and maps the journey to get there.

Recommendations:

- Assess your current portfolio for risk and prioritize the modernizations accordingly.
- Start or continue modernizing your business applications portfolio by applying modern architecture principles such as the composable enterprise.
- When selecting applications to deploy, pay special attention to their ability to integrate with other applications or technology.
- Start or continue using fusion teams to overcome organizational and technical silos.
- Redesign end-to-end processes that overcome the boundaries between organizational silos and allow business users to collaborate across departments.
Digital Business Models Expose the Holes Between Business Domains and Underlying Applications

In parallel with modernizing legacy applications, manufacturing companies need to address their integration gaps. Unconnected applications and processes that are not end to end inhibit the quality and availability of data that are at the core of any digital business model. When business models demand higher speed and use data as an essential element, breaks and gaps in business processes become not only visible, but become an inhibitor. It’s impossible to build digital twins or leverage IoT sensors with disconnected applications and processes. It is equally impossible to have fully automated flows from engineering bills of materials (EBOMs) via manufacturing BOMs to service BOMs without human intervention or double data entries.

Integration topics need to be addressed on various layers: human collaboration across departments and teams (e.g., between engineering and manufacturing), process and data integration between applications and devices, and technical integration (e.g., between IT and OT assets, see 2020 Strategic Roadmap for IT/OT Alignment).

This diversity demands new approaches to integration. Gartner’s hybrid integration platform (HIP) capability framework provides a general reference to ensure support for a variety of integration use cases. An essential precondition is that the underlying applications need to offer modern integration technologies, such as APIs and event streams. The support for such technologies needs to be an essential criterion when selecting business applications (see 3 Steps to Designing a Future-Proof Business Application Integration Strategy).

Fusion teams made up of IT and business experts can no longer wait for integrations to be built by traditional code development. A democratized technology platform should be developed and deployed to best support the operation of fusion teams by combining low-code composition/development tools with the traditional code-centric integration/development technology. The teams need to acquire the necessary technical and business skills to define, build and maintain the necessary integration flows by becoming citizen integrators.

A recent Gartner study revealed that 69% of participating manufacturing companies are making moderate investments to support their integration needs, but only 23% report big investments. In the peer group of all participating companies, 53% report moderate and 18% report high investments. These investments might be enough “to keep the lights on.” However, given the complexity of applications landscapes in manufacturing companies, combined with today’s speed of product innovation and of business models, moderate investments will not be enough to gain a competitive advantage. Manufacturing companies, therefore, need to double down on their integration investments.

Recommendations:

- Build an integration strategy in tight connection with the modernization of your application landscape. Integrations need to support end-to-end processes that involve multiple applications and domains.
Digital Transformation Requires Collaboration With Third-Parties Throughout the Product Life Cycle

“In the digital business era, it becomes imperative for organizations to understand and model how business ecosystems will create new business capabilities, products/services and business models” (see 8 Ways Ecosystems Supercharge Digital Business Models). While this has been true for a number of years, most manufacturing companies continue to primarily drive internally focused integration initiatives. 3 The accompanying presentation for 2020 CIO Agenda: Global Perspectives in Heavy Manufacturing states: “Planned future investments [by heavy manufacturers] focus on internal process optimization and efficient asset utilization that enhance design through manufacturing workflow.”

Manufacturing companies have to overcome this internal focus in order to leverage the power of ecosystems and to become successful with their digital business transformation. They need to widen their approach to integration and include business partners. Like with integrations in general, this has to happen on multiple levels:

- **Business strategy:** Business models need to be created that allow for joint value creation and proper compensation among the members of the ecosystem. Example: An equipment manufacturer has local partners whose remote workers are guided through augmented reality (AR) technology to perform certain service and repair activities.

- **Business processes:** Data and process control needs to flow between the members of the ecosystem in an efficient and secure way. Example: All parties involved must define and agree upon business capabilities, such as requisition and commissioning of local experts, assigning the appropriate subject matter expert, guiding the remote worker to fulfill the service work and invoicing for the service. All parties need to follow the same processes for an efficient and high-quality fulfillment.

- **Applications and other technology:** Business models and processes will not work without the underlying applications that support the cross-company processes being fully integrated. Disjunct systems, double data entry or older forms of data transfer are no longer sufficient. Example: The remote workers need technical documentation, ideally in the form of a digital twin, to be used alongside the AR-based guidance to know the technical details and specifications they need. However, this technical documentation should not necessarily remain with the remote worker, to prevent theft of intellectual property (IP), fraud or using outdated technical information in any next activity.
To enable such joint business models, manufacturing companies need to widen the integration initiatives described in the previous section and must open their applications and data sources to their “external” ecosystem partners. Balancing the need for openness versus protection of IP, they need to define handover points and interfaces that will allow the applications used by the various parties to “speak to each other.” Common data models and document formats, processes configured across multiple applications, and efficient and secure collaboration need to be put in place.

Despite that necessity, a recent Gartner study showed that only 8% of respondents focus more on external integration than on internal integration regarding their IoT initiatives. Manufacturing companies score better at 14%, but the vast majority still have to make the shift from internal to external.  

But it’s not enough to have technically opening applications and create touchpoints and interfaces. It is equally important to create trust and confidence between the members of an ecosystem. Sharing business outcomes and mitigating risk jointly is essential. But the integration and security architecture of an application landscape that crosses company borders needs to support and build that trust. CIOs need to take responsibility, not only for the security and quality of their own data and processes, but also for that of their ecosystem partners. Over time, they need to regularly assess the environment to assure all parties are abiding to their commitments.

Recommendations:

- Strengthen your cross-company integration capabilities by using APIs to build secure access points into your applications and processes for better collaboration with other members of your ecosystem.

- Improve joint business outcomes and become a trusted partner inside your ecosystem by sharing data and business capabilities in a safe environment.

Evidence

Evidence is based on the 2020 Gartner Internet of Things Implementation Trends Study to help companies to better understand use, impact and ROI of multiple IT innovations on the future of applications. The primary research was conducted online from June through July 2020 among 402 respondents from Asia/Pacific, EMEA and North America. Companies were screened for having an annual revenue of less than $100 million. They were also required to have completed deployment or plan to complete deployment of at least one use case or project of IoT by year-end 2021. Respondents were required to be at manager or above and should have a primary involvement and responsibility for making decisions in IoT implementation. The study was developed collaboratively by Gartner analysts and the Primary Research Team.

1 Manufacturing companies show a higher level of collaboration between IT and line of business than average.
According to the 2020 Gartner Internet of Things Implementation Trends Study, 61% of surveyed companies reached a level of moderate collaboration between central IT and line of business organizations, mainly focusing on collaborative requirement gathering. Only 32% have reached comprehensive collaboration (e.g., IT product management mindset, use of personas or customer journeys). This shows room for improvement. Manufacturing companies are more advanced, with approximately 44% having comprehensive collaboration. They need to use this advantage to build fusion teams that can address the overdue modernization of their legacy business applications (see Figure 1).

Manufacturing companies invest more in integration than average.

Among all participating companies, 53% are making moderate investments to expand and support their integration needs, while 18% are making big investments. In manufacturing companies, these investments are higher, with almost 69% reporting moderate and 23% high investments. Moderate investments include adding new integration training or approaches to fulfillment. High investments include acquiring new integration tools or hiring additional integration specialists. While the survey focuses on IoT initiatives, the results are transferable to other modernization initiatives as well, especially in manufacturing industries.

The majority of companies focus integration investments on internal initiatives.

Regarding integrations, the majority (61%) of organizations are exclusively or primarily investing in internal initiatives, and only 8% invest primarily or equally in external integrations. In manufacturing companies, it’s 57% internal and 14% external (the balance of 29% reports equal investment). While manufacturing companies invest more in external integrations than the average, presumably in the context of their supply chain, the external investment needs to be higher than it is today. This is necessary in order to harvest the potential of ecosystems and their more intense collaboration in joint value generation.

Recommended by the Author

2020 CIO Agenda: Global Perspectives in Heavy Manufacturing
2020 Strategic Roadmap for the Future of Applications
Future of Applications: Delivering the Composable Enterprise
The Applications of the Future Will Be Founded on Democratized, Self-Service Integration
Choose the Best Integration Tool for Your Needs Based on the Three Basic Patterns of Integration
2020 Strategic Roadmap for IT/OT Alignment
The CIO’s Role in Supporting Industrial Assets
As IT and OT Converge, IT and Engineers Should Learn From Each Other
Survey Analysis: Focus on Practical Outcomes for IoT Projects