



## WHITE PAPER

# Speeding the Future Transformation Journey in Manufacturing: A Guide to Transforming Your IT Operations

Sponsored by: NTT DATA Services, formerly Dell Services

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## IN THIS WHITE PAPER

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In this white paper, IDC Manufacturing Insights identifies what business and information technology (IT) leaders should know to face the challenges of the manufacturing industry today and in the future. We present priorities for the manufacturing industry as it prepares for digital business transformation. We also identify a future-ready IT infrastructure that can adapt to business needs and that incorporates technologies such as cloud, mobile, analytics, the Internet of Things (IoT), and next-generation security. Manufacturers require a modernized approach to IT that not only enhances core infrastructure such as the datacenter, servers, storage, and networking but also facilitates higher-performance levels, increased quality, and self-service delivery.

The document discusses how manufacturers depend on IT to provide them with greater efficiency, visibility, speed, and resiliency in their operations, as they collaborate in their value chains, and in how they satisfy customer requirements with improved processes and even connected products and services. IT modernization is the first step to allow manufacturers to realize value from all of their IT assets and provide a backbone for their future business requirements and transformation.

## IDC MANUFACTURING INSIGHTS OPINION

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As an industry, manufacturing is "hot." Regions are creating manufacturing initiatives, and countries are creating policies to lure manufacturing back and prepare the next generation of talent. Maker fairs show entrepreneurs and small-scale artisans how they too can design and manufacture their own products, and what global manufacturers sell goes well beyond the 100-year-old recipe and the mechanical drawings. And new technologies are changing the economies of scale so that large- and small-scale value chains can be successful.

But in this market, it's not enough for manufacturers to pursue the same strategies they have followed in years past – improving productivity or adding capacity and changing suppliers or paring down the number of suppliers to minimize risk. Manufacturers can't "quick fix" customer service problems by changing transportation modes from ocean to air, and there is no magic bullet product that is going to win over the entire market.

According to IDC's 2015 *Vertical IT and Communications Survey* (conducted by IDC's Global Technology and Industry Research Organization), the top 2 business priorities are productivity (selected by 39.3% of respondents) and optimizing business processes throughout manufacturers' operations (selected by 34.7% of respondents). However, business complexity caused by global

operations, global value chains, and global markets is creating challenges for manufacturers' products and processes. Key business themes include customer engagement and customer service, supply chain modernization to support evolving market requirements and manufacturers' "need for speed," and the fundamental nature of innovation in processes, products, and services.

IT is increasingly an integral part of manufacturing's success. Worldwide manufacturers will spend an estimated \$315 billion on external IT expenditures in 2016, according to *Pivot Table: Worldwide Manufacturing IT Spending Guide, Version 1, 2014-2019* (IDC Manufacturing Insights #US40587715, November 2015) (see Table 1).

**TABLE 1**

**Worldwide Manufacturing Spending on IT Services, Software, and Hardware, 2015-2019 (\$M)**

2015	2016	2017	2018	2019
302,171.74	314,918.09	327,920.86	342,031.67	354,249.18

Source: *Pivot Table: Worldwide Manufacturing IT Spending Guide, Version 1, 2014-2019* (IDC Manufacturing Insights #US40587715, November 2015)

And most importantly, the rapid adoption of new technologies and innovation accelerators is preparing manufacturers for the future as well as changing products, processes, and business models. This is a digital business transformation. Key findings about how manufacturers can prepare for the future and speed their journey include:

- **IT modernization:** The journey requires manufacturers to modernize their IT portfolios and capabilities and enable the business with better IT service delivery. An increasing percentage of investments are going toward technologies such as big data and analytics (BDA), cloud, mobile, and collaboration tools as well as innovation accelerators such as 3D printing, robotics, the Internet of Things, cognitive computing, augmented and virtual reality, and next-generation security. Furthermore, many should make sure their core IT infrastructure and IT service delivery are up to the task, including the datacenter, servers, storage, networking, and end-user support.
- **Value realization:** Just having the technology isn't enough. Companies must work to translate their IT resources and investments into IT efficiency, IT agility, and business value. In the future, manufacturers will employ digital technologies and a modernized IT portfolio to drive changes in business models and value chains and remain competitive in the market.
- **Speed of the business:** IT must work at or ahead of business speed, despite the constraints that IT organizations face, primarily because of the increasing connection between IT and business processes, cost competitiveness, and the products and services manufacturers provide to their customers.
- **Knowledge and skills:** The IT organization must attract and retain the most relevant skills, but an assessment of the skills that are required should be conducted across the entire IT ecosystem, in other words, including partners that can provide the necessary IT skills, knowledge, and other assets to support the business' overall priorities.

## Methodology

This white paper draws from our ongoing research, as well as conversations with leading CIOs, IT and business leaders in the industry, and NTT DATA Services executives and manufacturing customers. It also highlights data from IDC's 2015 *Vertical IT and Communications Survey* (conducted by IDC's Global Technology and Industry Research Organization) of 602 manufacturers.

## SITUATION OVERVIEW

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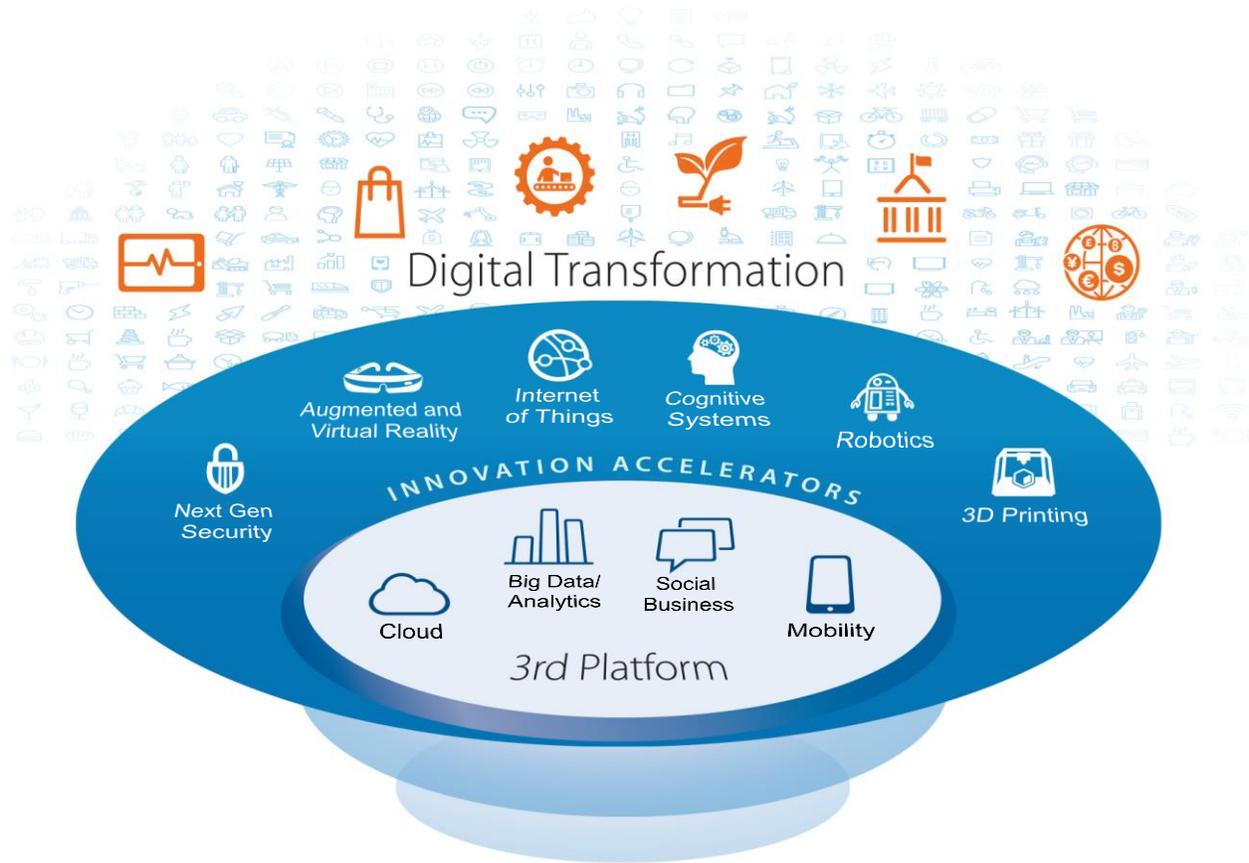
We know that manufacturers still prioritize productivity and optimizing business processes throughout their operations. In fact, productivity has been a top 3 priority for manufacturers for more than five years in IDC's *Vertical IT and Communications Survey*, which speaks to manufacturers' ongoing focus on efficiency and effectiveness. But business challenges require manufacturers to do much more to better serve their customers, manage costs, and compete in a global market. Manufacturers increasingly rely on IT to provide them with greater efficiency, speed, visibility, and resiliency in their operations as they collaborate in their value chains and in how they satisfy customer requirements with improved processes and even connected products and services.

In just a few short decades, information technology has moved from the back office to the front office and finally embedded itself into nearly every aspect of manufacturing, fueled by 3rd Platform technologies – mobile, social business, cloud, and big data and analytics. We're entering an era where the technologies and processes that businesses deploy are so tightly linked to their customers and markets that the boundary between the internal operations of the enterprise and its external ecosystem (e.g., customers, markets, competitors, partners, regulators) is rapidly disappearing. One of NTT DATA Services' customers spoke to us about how its IT services and capabilities need to satisfy not only its own internal stakeholders but also its external stakeholders, including customers, whether that's sharing information about customer orders or in software capabilities that are embedded in products. The expanding use of IT in products and in value chain relationships also creates additional security and data privacy risks.

Business leaders are challenged to move their enterprises to the next level, that of digital business transformation (see Figure 1), employing digital technologies coupled with organizational, operational, and business model innovation to create new ways of operating and growing businesses. That includes technologies such as big data and analytics, cloud, mobile, and collaboration tools as well as innovation accelerators – 3D printing, robotics, the Internet of Things, cognitive computing, augmented and virtual reality, and next-generation security. For manufacturers, digital transformation is changing the way manufacturers design, make, and deliver products and services, as well as how they define those products and services.

FIGURE 1

## The Move to Digital Transformation



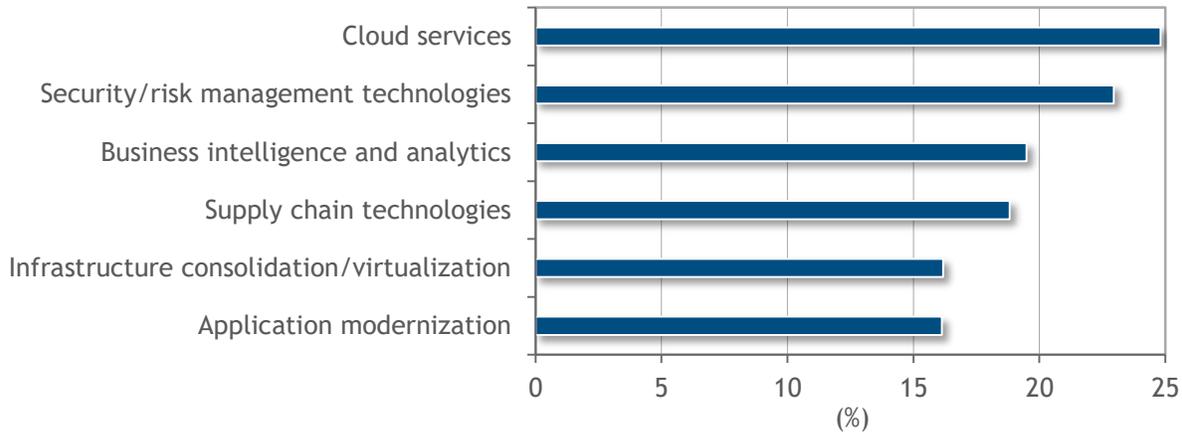
Source: IDC Manufacturing Insights, 2016

We're already seeing evidence that manufacturers are making progress on this journey of digital transformation. Worldwide manufacturers will spend an estimated \$315 billion on external IT expenditures in 2016, with a CAGR of 4.1% from 2014 to 2019, according to *Pivot Table: Worldwide Manufacturing IT Spending Guide, Version 1, 2014-2019* (IDC Manufacturing Insights #US40587715, November 2015). An increasing amount of that spend is being allocated to new 3rd Platform technologies – over 50% by 2017 – and cloud, security, and analytics are among the top investment priorities for manufacturers (see Figure 2).

## FIGURE 2

### Top IT Initiatives in Manufacturing

Q. Which of the following will be the top IT initiatives at your organization?



n = 602 United States-based manufacturing respondents; top 6 responses out of 19 possible responses

Source: IDC's *Vertical IT and Communications Survey*, 2015

Despite how critical we know IT is to digital transformation and the future of the manufacturing industry, the reality today is that the IT organization is constrained by a number of factors, including:

- **Limited size and growth of IT budgets:** The average size of manufacturing IT budgets is approximately 3% of revenue (much less than most industries), and growth in overall IT spending in manufacturing is only 4.1%. Manufacturers have a limited amount of funds to apply to ongoing needs as well as new and innovative investments.
- **Finding time for innovation:** Much like IT budgets, IT resources are often restricted. IT employees spend more time than they'd like on ongoing maintenance or break/fix rather than IT innovation.
- **Updating IT knowledge and skill sets:** Using and embedding new technology into the organization requires new skill sets, and while some members of the IT organization may look forward to developing those skills, not all of them will have the time or the ability. Similarly, expanding the IT organization's knowledge of business requirements also requires ongoing attention.
- **Keeping up with the business pace:** Speed is a factor, given IT's essential role in business operations. Linking IT to business' time objectives frequently stresses the IT organization. Yet missed deadlines are a common occurrence in many IT projects, often because of the complexity of those projects. Furthermore, mergers and acquisitions highlight the fact that even the best-run IT organizations have to be able to adapt to business change.

As important as new IT initiatives are, IT organizations can't necessarily support those initiatives the way they should or would like to with the status quo.

## FUTURE OUTLOOK

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Manufacturers will need to rethink their approach to IT, considering the factors we've outlined – IT budgets, balancing innovation and maintenance, IT skills, and the speed at which they can deliver. Manufacturers will look for opportunities to increase their IT efficiency, IT agility, and business innovation. Some of their changes will relate to a shift in how they spend – funding some projects and resources through operational expenditures and subscription services rather than capital expenditures.

We also expect manufacturers to evaluate how they can work with external partners to deliver some of that efficiency and provide the necessary skills and services as well as speed projects along. For some, the ideal partnership with a service provider could mean freeing up their internal resources to work on the most business-critical projects while outsourcing core end-user services. More than one of NTT DATA Services' customers emphasized the need for a global partner that can support its IT requirements regardless of the customer's location.

We've also seen manufacturers that successfully work with partners to increase innovation, including digital transformation. In fact, all of the NTT DATA Services customers we spoke with highlighted their ability to focus more on the needs of the business and engage with their business counterparts. Not surprisingly, the emphasis on IT-business collaboration requires the internal IT organization to adapt. One NTT DATA Services customer referred to how his team must have "more breadth," referring to the skills required to translate business needs to underlying technology demands and also manage IT partners that help support the business.

In *IDC FutureScape: Worldwide Manufacturing 2016 Predictions* (IDC #259783, November 2015), we identified some of the most important initiatives that manufacturers will undertake that require IT modernization, value realization, and digital business transformation over the next several years. Our predictions include:

- Achieving the market share consequences of customer-centricity investments
- Pushing for global standards for global manufacturers
- Measuring the impact of new technology investments for value realization
- Transforming operating models with digitally connected processes
- Modernizing logistics networks with innovative postponement strategies
- Improving resiliency and visibility to eliminate the need for short-term forecasting
- Leveraging the product innovation platform to drive enterprise quality
- Simulating products, services, and processes with a digital twin
- Exploiting technologies in the modern plant for innovation on the shop floor
- Transforming IT talent to support digitally executed manufacturing

In the next few sections, we provide more detail on the technologies and strategies manufacturers will take to move forward and to be future ready, from IT readiness to increasing IT's business value to digital business transformation, enabling new business models and capabilities.

## IT Readiness for the Future: Strengthening the Foundation and Making New Investments

Manufacturers will require a level of IT readiness for the future that is much more efficient and agile than their current level of IT readiness. To prepare, manufacturers will undergo an application and infrastructure modernization, but with minimal disruption as they transition off legacy assets. Next-generation IT services will be available as easily consumable, consistent, and standardized services that can be delivered quickly and efficiently when and where the business needs them at an acceptable price point. The entire infrastructure will be virtualized and abstracted, governed by policies and rules, and IT customers will expect self-service and automation at the levels of service and security they need. The business value of the investment in IT infrastructure shouldn't be underestimated; according to *IDC FutureScape: Worldwide Enterprise Infrastructure 2016 Predictions* (IDC #259813, November 2015), 70% of spend on infrastructure will be related to digital transformation and will support 3rd Platform workloads by 2018.

Much of this work will be invisible to the users outside IT, but underneath, IT will be taking advantage of a software-defined infrastructure and a delivery approach that most likely combines on-premise and cloud, with a central point of management and oversight. It's critical that the IT foundation be future ready, giving the organization access to new technologies in the datacenter and satisfying business requirements for performance, speed, and availability. Although work may start in the datacenter, it must extend out to all users, ensuring that employees, suppliers, and even customers may have affordable and secure access to the information and systems they need to do business easily and quickly.

Investments that manufacturers will need to escalate include the four pillar technologies in the 3rd Platform, as well as many of the innovation accelerators, with mobile representing one of the most mature investment areas today (see Figure 3). In the move to digital transformation, many new technologies will be woven into how manufacturers operate in the future. Some specific examples of how technologies can and will provide value to manufacturers are as follows:

- **Mobile:** Manufacturers will use mobile applications and devices across the organization. Adoption will continue in areas with early wins – namely, sales and field service – but we expect mobile to help manufacturers increase their productivity with objectives including time savings, increasing visibility, and facilitating workflows and management approvals. Mobile will be essential to how manufacturers stay on top of quality issues, serve customers, and manage the plant and supply chain.
- **Cloud:** As the underlying enabler to so many of manufacturers' technology investments and expectations, cloud is well on its way to being pervasive in the manufacturing industry. According to IDC's 2015 *Vertical IT and Communications Survey*, 95% of manufacturers are planning to use cloud for their new application and infrastructure projects in 2016. That's because cloud is the means of getting essential business process tools and information assets to IT customers wherever they are. We've projected that by 2017, manufacturers will actively channel 25% of their IT budgets through industry clouds that enable seamless and flexible collaboration models. This will greatly reduce collaboration waste in manufacturers' organizations and in their value chains.

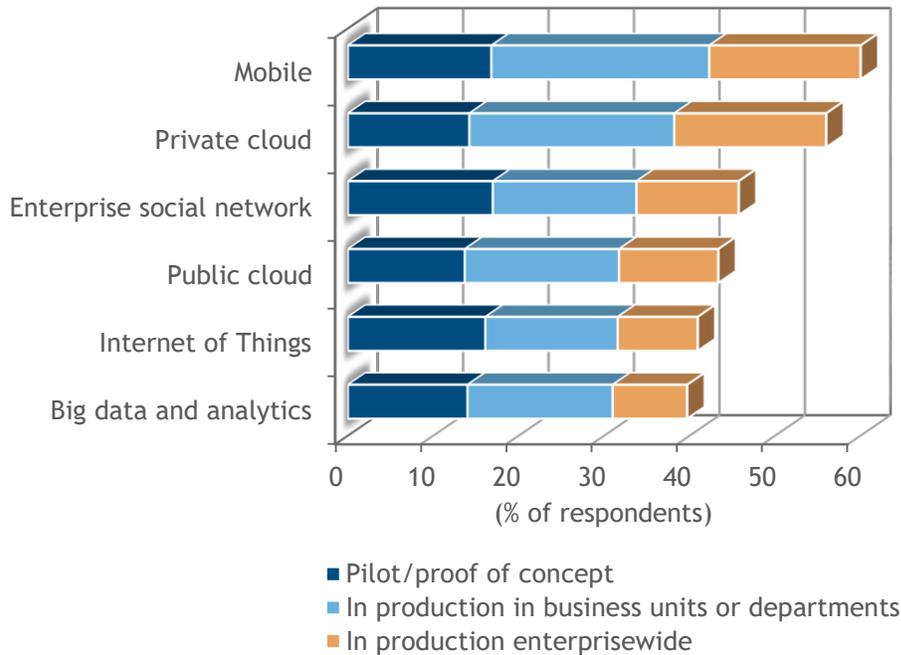
- **Collaboration and enterprise social network:** In large manufacturing organizations as well as geographically dispersed manufacturers of any size, collaboration tools will represent the glue that keeps the company working as one. Manufacturers will also need to excel at using collaboration tools to make sure that the knowledge of the (increasingly few) experienced workers is readily available to a broader population. For some types of manufacturers, social media will be an important way of engaging with and learning from their customers.
- **Internet of Things:** Referring to the use of software, sensors, and IP connectivity enabling "things" to be smart and connected, IoT will be expected in smart manufacturing, connected supply chains, and connected products. The benefits will be many, with efficiency gains through sensors on the production line to manage throughput and increase predictive maintenance and inventory optimization to service revenue opportunities delivered through connected products. We've also estimated that 70% of large discrete manufacturers are now offering connected products to enable a better user experience, improved performance, and efficient service. Of course, IoT should also be used to enhance IT asset management.
- **Big data and analytics:** The scale and complexity of manufacturing operations will only increase with time, meaning manufacturers must have better information to make business decisions and drive automation in all aspects of the business. Pervasive distribution of business intelligence and analytics for big data and small data will be commonplace in the future. We'll see more manufacturers look for ways to make processes, decisions, and tasks more automated, using predictive and prescriptive analytics. Furthermore, with the information and data explosion that comes from digital transformation (e.g., through connected products, online commerce, and complex, global operations), manufacturers will need analytics to find the information that matters most.

IT partners can help manufacturers speed their adoption and incorporate these new technologies into their business operations, for example, with mobile device management as well as mobile application development. Although we haven't listed security separately, more than one of NTT DATA Services' customers also highlighted security as one of the most important challenges they need partners to address. New technologies will require an improved foundation; for example, in *IDC FutureScape: Worldwide Enterprise Infrastructure 2016 Predictions* (IDC #259813, November 2015), we note that approximately 15% of all server, storage, and network spend will be related to IoT workloads by 2018.

**FIGURE 3**

**Adoption of New Technology in Manufacturing**

Q. *At what stage is your organization today in the deployment of each of the following initiatives?*



n = 602 United States-based manufacturing respondents

Source: IDC's *Vertical IT and Communications Survey, 2015*

Planning for the future should also consider how an IT-ready architecture will remain compliant and secure yet enable scalability, extensibility, and easier integration. Some of that work is not just about technology; it's also about IT management and governance. Manufacturers should also be able to see how these technologies need to combine for business use cases, such as delivering analytics via the cloud with next-generation security.

The benefits of IT readiness are significant; fundamentally, IT readiness will translate into improved service to end users and more efficient IT operations, with benefits that also include:

- Easier delivery of IT services at a lower TCO
- More predictable and manageable support and maintenance costs
- Enhanced security of intellectual property and information assets
- Better system performance, reliability, and availability
- Improved end-user satisfaction and increased service levels

## Business Value Realization and Future Business Transformation

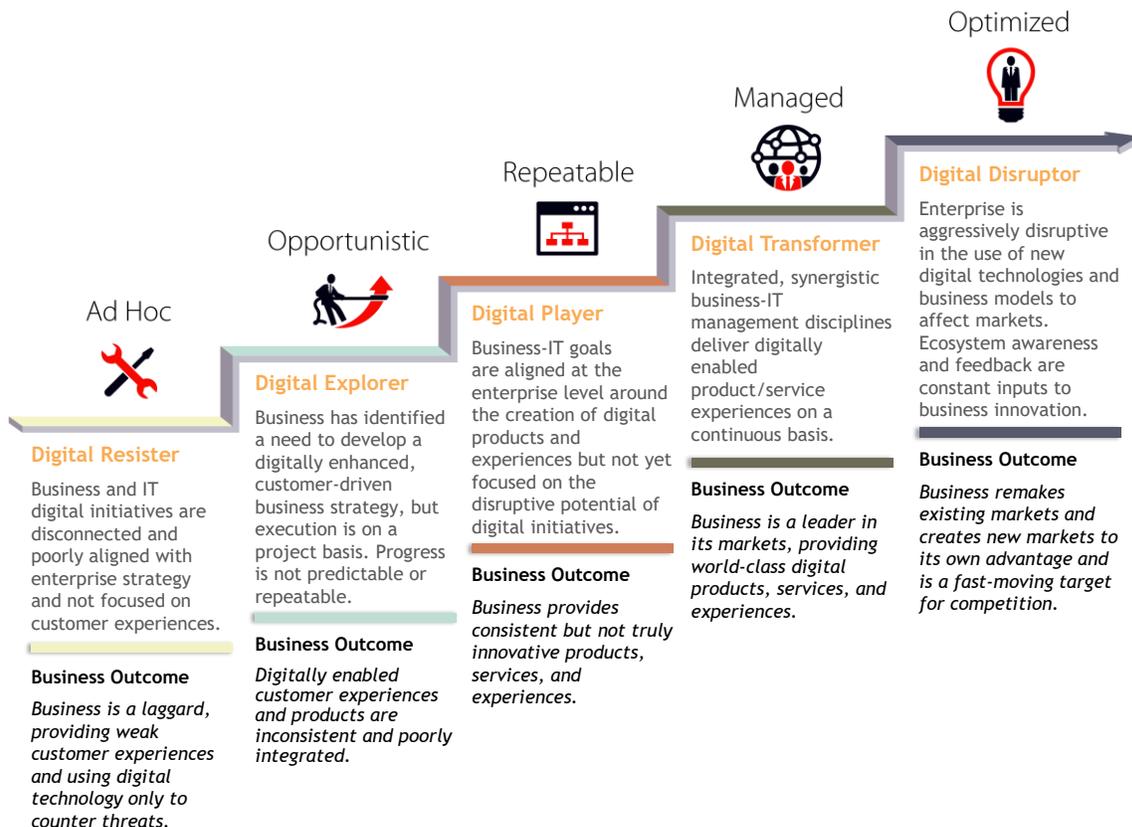
As shown previously, manufacturers are beginning to make essential investments, but they will still need to invest in realizing the value of those investments (refer back to Figures 2 and 3). In *IDC FutureScape: Worldwide Manufacturing 2016 Predictions* (IDC #259783, November 2015), we predicted that by the end of 2016, 65% of manufacturers will have metrics in place to evaluate and drive pervasive changes in the workplace with their new technology investments.

For example, one of our colleagues suggests that 2016 may be the year that security (and other tech) gets an overall equipment effectiveness (OEE) metric, essentially a productivity measure for the plant. Manufacturers could use the same for all technology – a metric that is more sophisticated than just uptime. The benefit of IT needs to be all about the business and how the business defines value.

In addition, digital transformation is not to be confused with digital technologies; however, it does use 3rd Platform technologies such as cloud, mobility, big data, and social as well as innovation accelerators including IoT, robotics, and 3D printing. First and foremost, leadership in companies that undergo digital transformation will recognize the integral role technology must take in their transformation. Some of the outcomes of digital transformation are the ability to treat information as an asset, new and more efficient work processes, customer-centricity improvements, and new business models. Figure 4 depicts the digital transformation journey.

**FIGURE 4**

### The Digital Transformation Journey



Source: *IDC MaturityScape: Digital Transformation* (IDC #254721, March 2015)

We believe that manufacturers need to invest now in digital transformation to enable three scenarios that are critical to their business:

- **Information as an asset:** IDC estimates the digital universe is growing at 40% per year and will reach 44 zettabytes, or 44 trillion gigabytes, by 2020. The challenge for manufacturers is to exploit information to gain visibility into the performance of products and processes as well as drive continuous improvement and new products and services. Ensuring that data is gathered and analyzed in a cost-effective manner and protecting this information as it's collected, stored, and analyzed are critical tasks.
- **Smart manufacturing:** Smart manufacturing initiatives on the factory floor go by many names, including future factory and Industry 4.0, but they all share the objective of significantly improving throughput, quality, and asset utilization across the factory network. Manufacturers will have the information and technology necessary to make their operations more efficient and also facilitate a transition from capacity-focused production to capability-focused production that is more demand focused.
- **Connected products:** With connected products, manufacturers can improve product uptime, increase lifetime customer value, and influence future product design. Manufacturers will track the performance and quality in the customer's environment and deliver new products and services. For example, manufacturers could maintain a piece of industrial equipment for their customer to maximize uptime, but there's also the possibility of reprogramming connected products' software to enable new functions and capabilities.

All three of these scenarios are intertwined. For example, one NTT DATA Services customer spoke at length about his company's need to change data and information into business value as quickly and cost efficiently as possible. He specifically talked about the need to collect data today in preparation for the day when he knows he will need to look back at historical performance in order to guide business decisions. We've talked to many manufacturers that have identified the same kind of requirements, regardless of whether they are using sensors and IoT to analyze information about the plant, supply chain, or connected products. The impact is extensive within IT – from the actual data collection itself to storage, compute, and analytics. And IT partners can help manufacturers accelerate their ability to support these requirements.

## ESSENTIAL GUIDANCE

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To speed manufacturers on their future transformation journey, we recommend that manufacturers take the following approaches to ensure they are maximizing the value they derive from both current and future technology investments.

### Modernization

- Review your current IT capabilities, including your IT organization's skill sets and your IT foundation – datacenter, servers, storage, help desk, and other end-user services.
- Develop immediate and long-term plans for application and infrastructure modernization. You'll need a solid foundation for IT agility.
- Invest in 3rd Platform technologies and innovation accelerators. Enable continuous innovation and create a process for evaluating and incorporating new technologies, giving the highest priority to those that can deliver business value.
- Look to partners that can complement your resources or create greater IT efficiencies.

## Value Realization

- Ensure that IT and line of business are collaborating as true partners in the selection and implementation of new technology. This may seem like an obvious step, but a surprising number of manufacturers do this poorly.
- Know your business priorities and consider options that deliver business value quickly for some early wins. Also consider stakeholders internally and externally (e.g., along the entire value chain from supplier to customer/consumer).
- Work with partners to accelerate your IT capabilities and serve the line of business. Although we expect manufacturers to embed and apply more technology to how they operate, they must also recognize that they need external resources and expertise to move quickly and effectively.

## Future Business Transformation

- Consider how your investments can lead to business transformation, not just incremental improvements. Some of the most transformative use cases will require excellence in applying many technologies.
- Look at all of the IT resources at your disposal – within your own organization and with your trusted IT partners. Very few organizations succeed by "doing it all" on their own.
- Find a partner that understands your industry and your business and speeds your journey. It will make sure you have the resources you need, applied to what matters most to how you do business, how you serve your customers, and how you compete.

## About IDC

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