REGION FOCUS: WORLDWIDE

Establishing a Connected Data and Products Strategy with the Right IoT Platform

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IDC Opinion

Businesses continue to search for cost and productivity efficiencies as well as improved visibility into their business processes and products to give them an edge in an increasingly competitive and evolving economic environment. As technology evolves and innovation increases, businesses are looking for ways to create a feedback loop from their products so they can capture and gain insight from the products they make and deploy.

Digital transformation, which includes adding the capability to leverage data to improve internal processes and customer relationships, is an imperative within the manufacturing industry. IDC found that digital technology played a central role in improving 90.6% of organizations' operations during the past two years (source: IDC's *Worldwide Future of Operations Survey*, July 2022).

The Internet of Things (IoT) is a key lever of digital transformation that manufacturers can use to optimize their businesses from three perspectives. They can use IoT data to refine production processes, enhance supply chains, and improve products, including launching new as-a-service (aaS) business-based digital models that provide a feedback loop from connected products. Other benefits include improving customer satisfaction and retention and reducing service costs due to the ability to remotely support and manage the products after deployment.

Organizations across many vertical markets have mature IoT deployments. Most IoT assets are located on premises, such as connected machinery, and are stationary versus mobile assets.

Connecting products allows makers to understand how products are working in the "real world." This insight provides critical input to future product design decisions. In addition, with visibility into a product's performance after it's deployed, there is opportunity to use the monitoring capabilities to enable predictive maintenance services, which help improve service delivery, reduce cost of service, and improve not only customer experience but also customer satisfaction because product downtime is reduced or mitigated alltogether. Finally, connected products introduce the ability to offer new digital services such as warranty programs or other value-added services. With each of these benefits, makers of connected products can use the feedback loop to improve the product itself, drive better customer satisfaction, and develop new revenue streams.

In This White Paper

This white paper discusses market opportunities and challenges for manufacturers as they look to deploy connected product strategies. The commentary in this paper draws upon custom IoT Research conducted on Lexmark's behalf in May 2021 and IDC's research on *North American Enterprise 5G, IoT, and Private Mobile Networks Survey (August 2022);* and *Top 5 Trends to Watch in the IoT Cellular Connectivity Market (Q1'23, IDC #US49366223)* to provide insight into how manufacturers are deploying connected products.

IDC conducted a quantitative study to get firsthand data around this topic. It provides details on connected product strategies, challenges of deploying IoT projects, the use of analytics in these projects, and the benefits of making IoT investments. (See **Appendix** for more information about the study's methodology.)

Finally, this white paper provides an overview of Lexmark's Optra IoT Platform. The platform offers a robust architecture that allows makers of connected devices to collect, filter, condition, and correlate device and core system data. This data can be as varied as device alerts, sensor detail, utilization rates, and service logs. The platform also allows for the ability to manage device settings and update firmware remotely while operationalizing data insights through Lexmark's in-house consulting service.

Situation Overview

The IoT Market Through the Lens of the Connected Product Maker

The market for new digital products and services, connected devices specifically, could be considered mature, with 60% of manufacturers reporting that they have a connected product in production. However, not all these makers are fully capitalizing on the insight and feedback that these connected products can provide to product design and customer experience and to creating new revenue opportunities.

The effort to stand up the business processes to benefit from the data these connected products capture is not insignificant and shouldn't be underestimated. Investment must be made in the tools to gather, process, and interpret the data so that decision makers can act. On top of that, deciding what tools or platforms to use to help analyze the data is challenging as the vendor landscape continues to evolve with new entrants continuing to disrupt the market with new capabilities and functionalities that makers can leverage for competitive advantage.

Connected products also provide insight into asset life. By monitoring an asset's productivity and performance, an IoT-connected product system can help extend the life of an asset through predictive analytics and maintenance.

However, it should be noted that connected product strategies are deployed in an iterative approach — most often starting with a single product line. After lessons are learned, additional products are added. So even though more than 60.0% of manufacturers are deploying connected products, oftentimes they still only have a single product deployed that can provide data feedback. And capturing the data is perhaps the easiest part of the journey. Turning that data into meaningful, actionable insight is where many IoT projects break down.

Although from an enterprise market perspective, about 60.0% of organizations have deployed IoT projects in at least one department of their companies, while 40.0% are planning to deploy, are conducting trials, or have yet to successfully deploy IoT projects for which a robust platform is required. Finance, healthcare, energy, and government have the highest IoT maturity among verticals (source: IDC's *North American Enterprise 5G, IoT, and Private Mobile Networks Survey*, August 2022). These companies and verticals will require a platform to orchestrate the business benefits they desire.

Measuring Connected Product Success

Connected product manufacturers indicate that their connected product strategies are focused on enhancing customer satisfaction with the product (49.5%), improving revenue performance of the product (47.5%), and increasing cost savings by implementing predictive maintenance capabilities on the connected products (47.3%). **Figure 1** (next page) provides other success metrics that makers view as important to defining success of their connected product strategy.
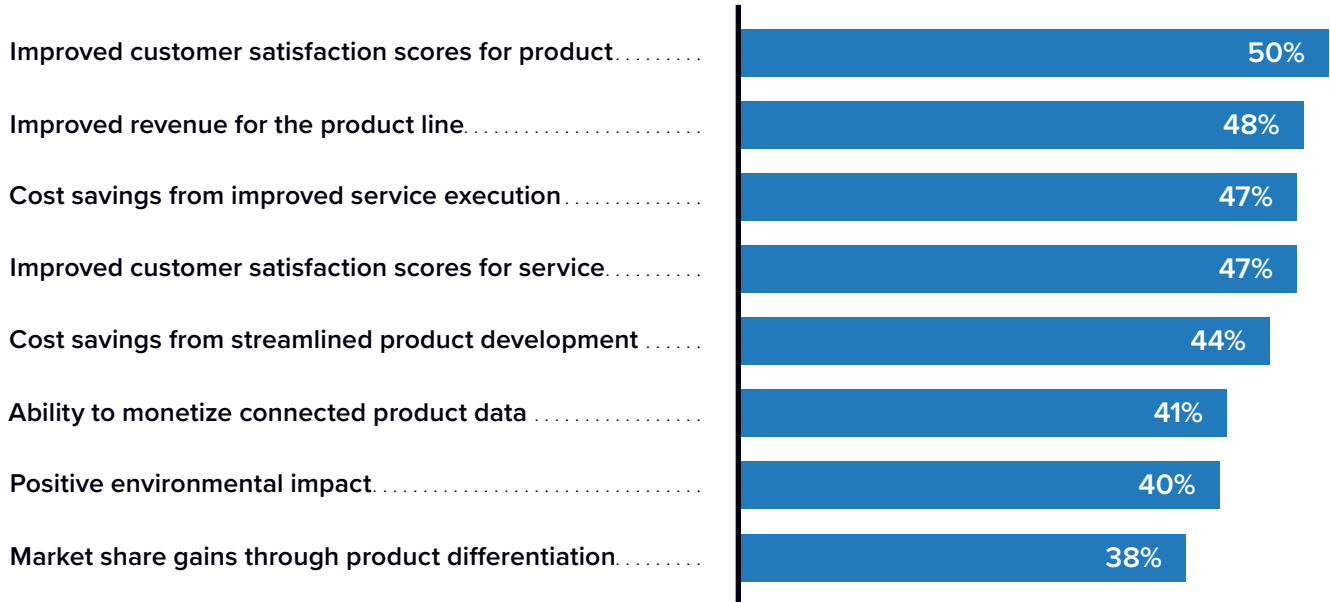
FIGURE 1

Connected Product Success Metrics

What are the metrics you are using to define the success of adding connectivity to products?
(Percentage of respondents)

Improved customer satisfaction scores for product.........	50%
Improved revenue for the product line........................	48%
Cost savings from improved service execution..............	47%
Improved customer satisfaction scores for service..........	47%
Cost savings from streamlined product development	44%
Ability to monetize connected product data	41%
Positive environmental impact...................................	40%
Market share gains through product differentiation.........	38%

n = 907; Source: *IDC and Lexmark's IoT Study,* 2021

Gaining Insight from Connected Products

To bring a connected product to market, manufacturers must embed sensors and connectivity into their device during the manufacturing process. Yet without the ability to capture, process, and interpret the data, the connected product doesn't provide additional value to the maker or its end users. This means that connected product strategies must also include an investment in a software platform (often called an IoT platform) that collects and analyzes data captured by the device.

Because IoT platforms are a central component of a connected product strategy, organizations need to consider this critical software element early in their strategic planning. Product makers can choose to build a software platform on their own or purchase an end-to-end, commercially available IoT platform to support their connected product strategy. Today, according to the study, 39% of manufacturers of connected products have chosen to leverage a commercially available IoT platform. About 30% have chosen to build their own platform, while an additional 24% are using a mix of both commercial and built in-house

IoT platform approaches. For the largest group of organizations that chose commercial IoT platforms, the top two reasons to purchase are the speed of implementation and the opportunity to save time and costs associated with the management and upkeep of the software. For those organizations that chose to develop an in-house IoT platform approach, they felt that they had the skills internally to support the software development and that it would be more cost effective to build than source externally.

Those respondents that deployed commercial platforms are more satisfied with their IoT software approach (79.2%) versus those that built their own (59.7%). For those makers using commercial IoT platforms, IDC research shows that they have an average of three IoT platforms in use. The study indicates that connected product makers are struggling with having to manage these multiple IoT platforms. Almost 50% of these makers have plans to consolidate on one platform soon. This demonstrates that while there has been a good deal of experimentation with commercial IoT platforms, many companies have not yet settled on a single platform to manage their connected product deployment.

Those respondents that deployed commercial platforms are more satisfied with their IoT software approach **(79.2%)** versus those that built their own **(59.7%)**.

Deploying an IoT Platform to Support a Connected Product Strategy

As mentioned previously, the IoT platform is a critical element of a connected product strategy because it provides the tools to capture, process, and analyze data captured from the deployed products.

Many different components go into an IoT platform. IoT platforms must be able to:

▶ Capture data from the device (via SDKs or APIs)

▶ Transform and enrich data in stream or at rest

▶ Analyze data at rest or in stream (historical or real-time analysis):

- Analyzing data includes the tools to perform different types of analysis such as business intelligence, predictive analytics, machine learning, and artificial intelligence

▶ Store large amounts of data

▶ Integrate IoT data with other key systems of record (e.g., ERP systems) or engagement (e.g., customer relationship management [CRM] or field service management [FSM])

In addition, organizations must ensure they have the right architecture in place to maximize the value of the deployment (e.g., which activities should run at the edge and which should run in the cloud or datacenter?).

Taking a DIY approach requires the organization to glue all those components together and maintain each component over time through each product refresh. This introduces a significant amount of effort and can affect time to market. The DIY approach should be closely considered when taking all the previously mentioned elements into account. Conversely, using a commercially available IoT platform can help speed time to market and provide more predictable cost and effort requirements over time.

Challenges in Connected Product Strategies

It is important to understand the reasons that hold organizations back from deploying connected products. According to the study, security concerns (40.0%) are the main challenge for connected product deployments, which is in line with many digital transformation projects. Overall cost of deployment (34.7%) and deployment complexity (28.7%) were also top challenges cited by respondents.
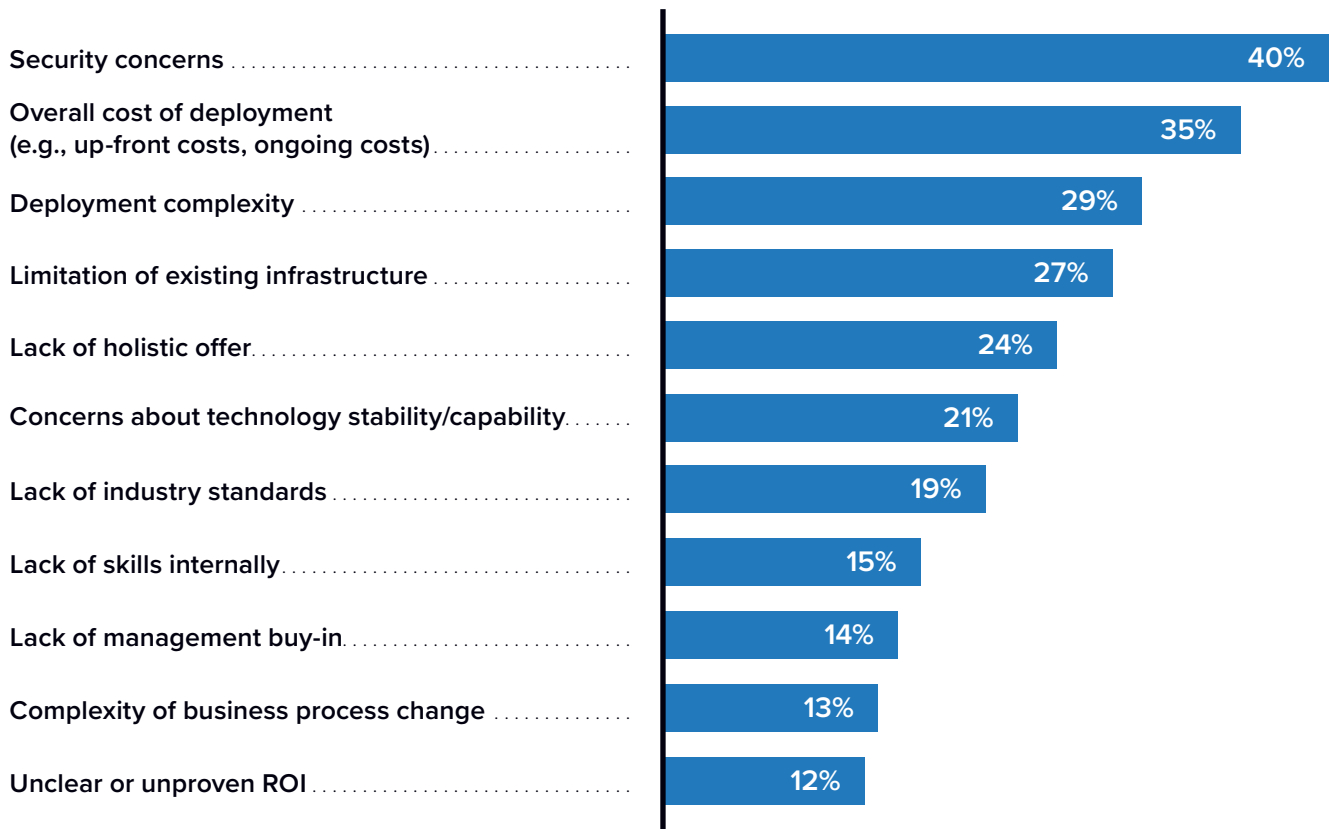
Figure 2 offers an interesting glimpse into the challenges that manufacturers face as they build and offer connected products to customers.

Despite these challenges, enterprises are still deploying connected product strategies via IoT projects. IDC's *Worldwide Future of Operations Survey* reported that 31% of respondents executed IIoT projects with minimal payback that did not meet the expected ROI. Companies should consider the road map when deploying IoT platforms and connected products. Scaling the project is crucial to ensure success and create a trajectory on how to expand and deploy connected devices and other tools.

FIGURE 2

Top Challenges to a Connected Product Strategy

What are the main challenges holding back or slowing progress on IoT projects for connected products within your organization?
(Percentage of respondents)

Challenge	Percentage
Security concerns	40%
Overall cost of deployment (e.g., up-front costs, ongoing costs)	35%
Deployment complexity	29%
Limitation of existing infrastructure	27%
Lack of holistic offer	24%
Concerns about technology stability/capability	21%
Lack of industry standards	19%
Lack of skills internally	15%
Lack of management buy-in	14%
Complexity of business process change	13%
Unclear or unproven ROI	12%

n = 415; Source: IDC's *North American Enterprise 5G, IoT, and Private Mobile Networks Survey,* August 2022

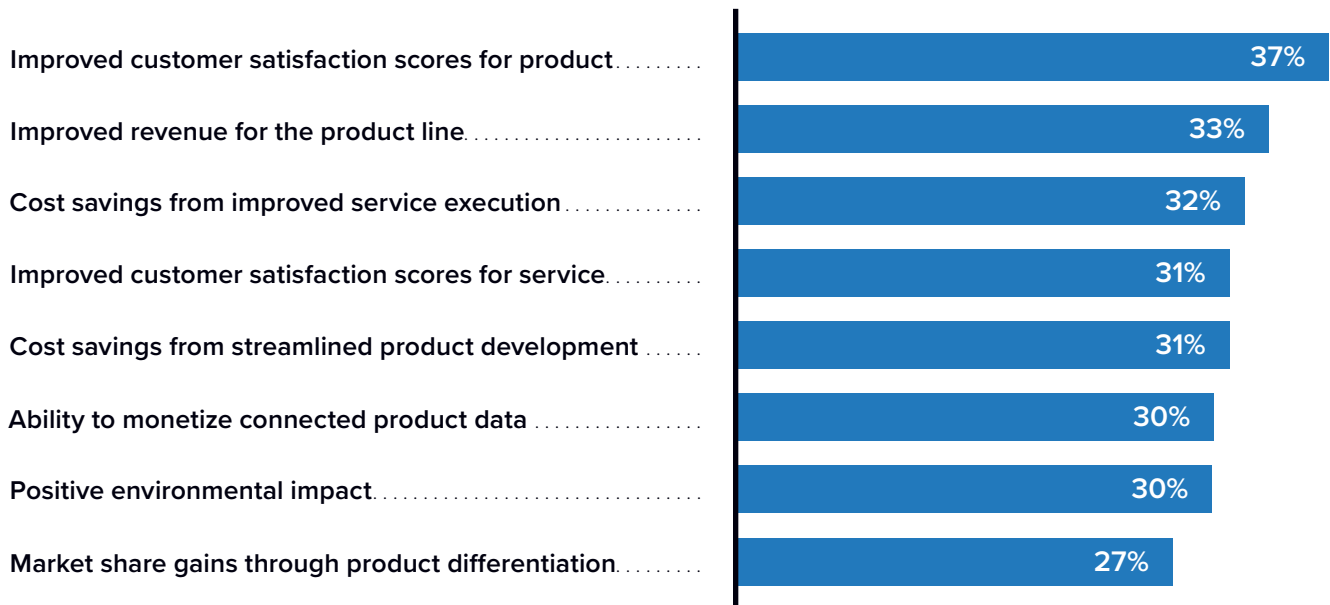## Analytics in Connected Product Strategies Considerations

The point of gathering IoT data is to gain insight that can be used toward achieving a business goal (such as revenue growth or customer satisfaction) or feedback from a connected product. Analytics is an important part of any connected product strategy. However, it's not an easy task to mine the data. **Figure 3** highlights some of the challenges organizations have as they use analytics to gain insight on their IoT projects. The top challenges are preparing the data (e.g., data quality) and a skills deficit in terms of being able to interpret the data.

FIGURE 3

Data Quality Remains the Biggest Roadblock to Gathering Insights

What are the top 3 challenges your organization has encountered with respect to IoT analytics?
(Percentage of respondents)

Improved customer satisfaction scores for product	37%
Improved revenue for the product line	33%
Cost savings from improved service execution	32%
Improved customer satisfaction scores for service	31%
Cost savings from streamlined product development	31%
Ability to monetize connected product data	30%
Positive environmental impact	30%
Market share gains through product differentiation	27%

n = 1,792; Source: IDC's *U.S. IoT Decision Maker Survey,* July 2021

Like other IoT deployment and analytics projects, organizations typically go through a similar maturity curve with their IoT projects. However, IoT deployments are more likely to involve the analysis of real-time data, which is often different from other types of analytics initiatives. Another important element to consider when deploying IoT is to train and upscale talent within the organization to ensure employee retention.

There are five stages an organization might follow for IoT deployment projects:

■ **Stage 1: Planning phase**
This stage understands the details and the level of effort for IoT deployment.

■ **Stage 2: Proof of concept or limited trial**
This stage learns about the capabilities of IoT and obtains confirmation of the desired business benefits.

■ **Stage 3: Deployed/deploying within a single business unit or department**
This stage truly understands the business impact in one department and makes sure that the lessons learned in the "proof of concept" stage are being utilized.

■ **Stage 4: Deployed/deploying in multiple departments**
This stage reflects that the organization has bought into the benefits of IoT deployment and is in full swing of adopting IoT.

■ **Stage 5: Companywide deployment**
Complete adoption of IoT and full business benefits are being utilized. Robust connectivity and platform are essential for this stage.
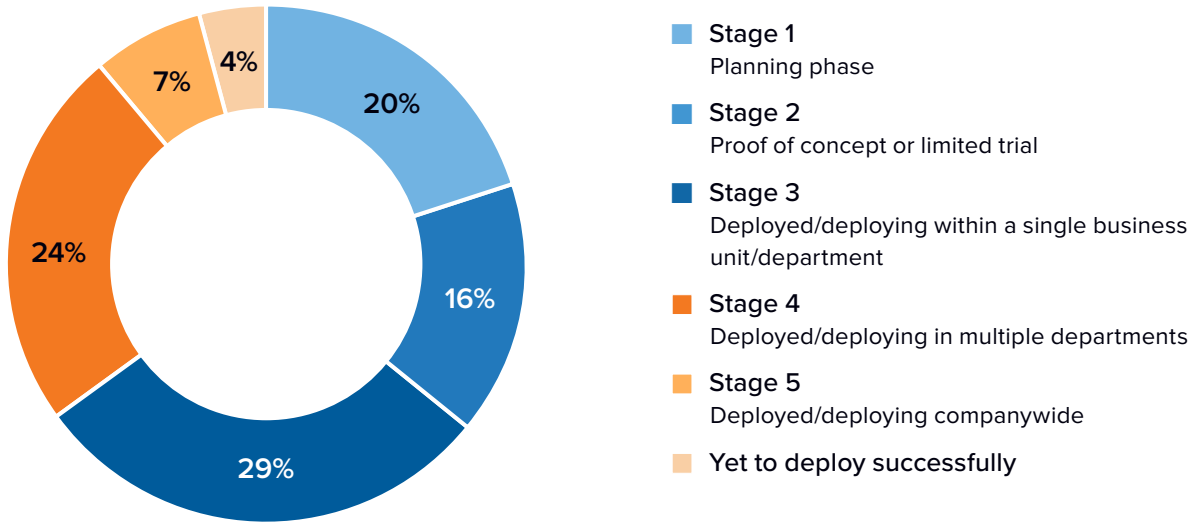
Figure 4 (next page) provides a current view of where organizations are today on the IoT deployment maturity curve.

FIGURE 4

Where Organizations Sit on the IoT Deployment Maturity Curve

Which of the following best describes how mature the majority of your organizations IoT projects are today?
(Percentage of respondents)

- **Stage 1**
  Planning phase
- **Stage 2**
  Proof of concept or limited trial
- **Stage 3**
  Deployed/deploying within a single business unit/department
- **Stage 4**
  Deployed/deploying in multiple departments
- **Stage 5**
  Deployed/deploying companywide
- Yet to deploy successfully

n = 415; Source: IDC's *North American Enterprise 5G, IoT, and Private Mobile Networks Survey,* August 2022

Integrating IoT Data into Business Processes

Organizations often face difficulty when integrating IoT data into business processes. For decision makers to act on insights from IoT data, the data needs to be integrated into the system that supports the business and decision-making process. For instance, if the reading of a device indicates that a part may need to be replaced, the field service technician needs to be alerted to the necessary replacement, which would require an integration with the field service management system, and then with the ERP system to see if that part is available for the replacement. Some of these integrations can be straightforward, but often, back-end systems have been highly customized, making for a lengthier integration process.

Having these new capabilities also requires change within the business. Traditionally, a technician would be deployed for routine maintenance visits.

IDC research shows that today approximately **71.9%** of the enterprises believe that it is critical or very important for IoT devices to capture operational data and provide analytics. **52.0%** of organizations consider non-AI advanced and predictive analytics is important to achieve operational excellence and resilience.

The technician would conduct standard diagnostic tests to determine device health. If an issue was caught, the technician would determine if the part was available. This process could take a few days to weeks. With connected products, predictive maintenance, real-time monitoring, and a continuous feedback loop, traditional maintenance processes are made more efficient and customer friendly and provide cost savings.

IDC research shows that today 19.0% of organizations believe it is critical for IoT devices to capture operational data. Another 52.9% believe that it is very important. Operational data provides the base line for predictive analytics for optimization. Only 6.5% of organizations believe that it is not important (see **Figure 5,** next page). IDC's *Worldwide Future of Operations Survey* shows that 52.0% consider non-AI advanced and predictive analytics as important to achieve operational excellence and resilience.

FIGURE 5

Importance of IIoT Devices Capturing Data

Many manufacturers offer predictive services capabilities on IoT data. How would you rate the importance of IoT devices to capture operational data?

(Percentage of respondents)

Important	53%
Somewhat important	22%
Critical	19%
Not at all important	7%
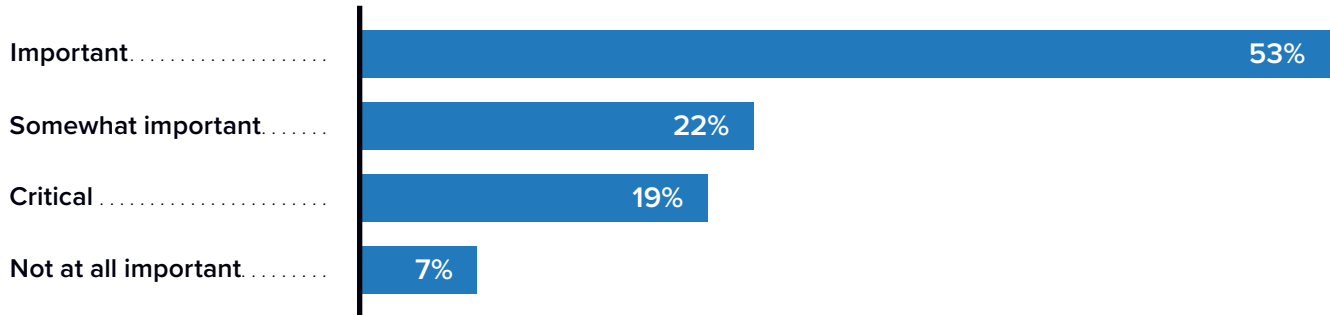
n = 1,372; Source: IDC's *Worldwide Future of Operations Survey,* 2022

Evolving to an As-a-Service Supplier

Moving from being a supplier of products, or "things," to a supplier of services is another major shift for businesses. Manufacturers need to not only reevaluate their core business models but also determine if they have the right people, technology, and processes to support this shift. According to IDC's study, only a small percentage of manufacturers have launched an as-a-service model alongside their connected product initiatives. Yet an additional 22% are considering a move in this direction in the next 24 months (see **Figure 6**, next page). Early success stories will demonstrate the value of this monumental shift. IDC expects to see the trend of "aaS" models to accelerate in the next few years, as they create a significant opportunity for market differentiation.

The benefit of using aaS models is that companies can scale and deploy rapidly. The Industry 4.0 journey has been underway for over a decade in certain industrial sectors. As these tools find their way into new markets, they benefit from past lessons and can be executed more precisely. Many connected products require only minimal and specific data to provide operational insight, and that data can be used to provide predictive analytics and operational efficiency.

FIGURE 6

Plans to Launch an As-a-Service Model

Is the organization launching new as-a-service business models based on IoT data?
(Percentage of respondents)

Not sure	71%
Yes in 24 months or beyond...................	9%
We already launched a new aaS model.......	7%
Yes in the next year	6%
Yes in the next 6 months	4%
Yes in the next 12–18 months	4%
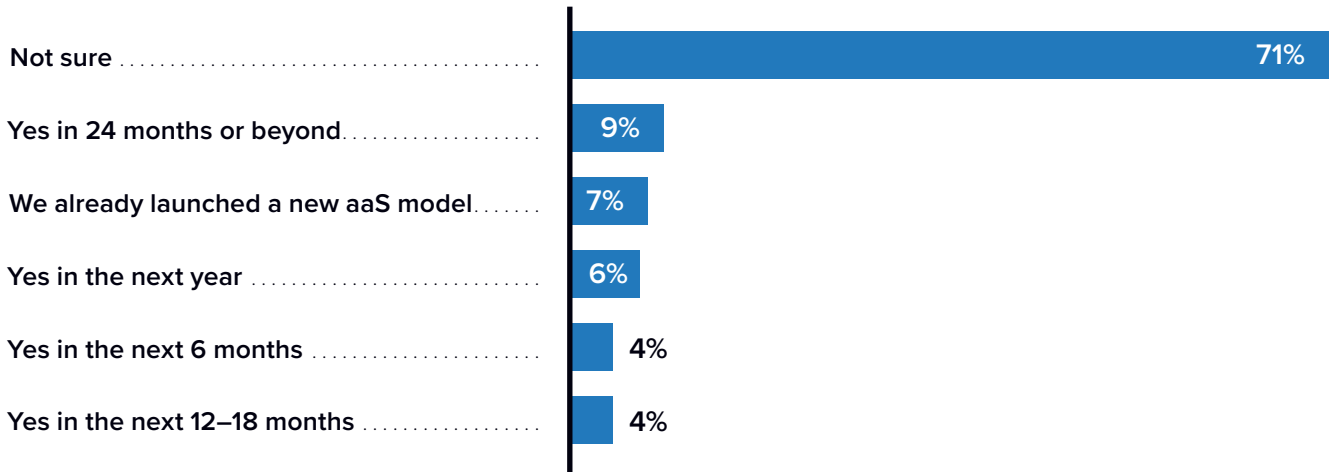
n = 907; Source: *IDC and Lexmark's IoT Study*, 2021.

IDC expects to see the trend of "aaS" models to accelerate in the next few years, as they create a significant opportunity for market differentiation.

Lexmark Optra IoT Platform: Helping Deliver Business Outcomes

Lexmark is a printer manufacturer and early adopter of IoT connectivity and IoT data analytics to drive business outcomes. Lexmark creates IoT- and cloud-enabled imaging technologies that are deployed, connected, and remotely managed in more than 170 countries worldwide.

Lexmark originally developed the Optra IoT Platform to run its managed print services business — using it to remotely handle 70.0% of support issues and to increase its profitability by 25.0% via asset optimization. The company now has 40.0% recurring revenue and a 30.0% improvement in engineering efficiency because of this significant investment and shift in business model.

Although printers and print services remain core to Lexmark's business, its Optra IoT Platform helps other manufacturers of connected devices in their own IoT-driven digital transformations to quickly achieve high-priority business outcomes, including:

▶ **Predictive services** to reduce costs and improve the customer experience

▶ **Asset life-cycle management** to maximize product life span and increase profitability for each device

▶ **Systemic innovation** through free-flowing data and insight between R&D, manufacturing, quality assurance, and demand planning

▶ **As-a-service engagements** to secure recurring revenue and differentiate from competitors

▶ **Partner for success** to have a large ecosystem of partners they can leverage to help their customers develop successful IoT projects (the Lexmark Optra platform continues to evolve and enhance its capabilities through partnerships as and when feasible. For example, in addition to connectivity, a sustainable IoT project needs enhanced data analysis, which the Lexmark Platform provides.)

▶ **Highlighting IoT for sustainability** and helping businesses understand how IoT can save money and drive efficiencies

▶ **Ensuring end-to-end security** by offering additional security services to specifically address the needs of mission-critical customers (IDC found that security was the biggest challenge for North American enterprises with IoT deployments and the leading factor in choosing an IoT vendor [source: IDC's *North American Enterprise 5G, IoT, and Private Mobile Networks Survey*, August 2022].)

The solution attempts to address some of the pain points around platform component integration, analytics, and business processes with three main components:

▶ **Engineered IoT platform** built on software technologies that offers easy deployment and the ability to connect and harmonize data from both connected devices (via edge, agents, and native connectivity) and core business systems

▶ **Prebuilt, ready-to-deploy accelerators** including algorithms, machine learning/ artificial intelligence models, reporting dashboards, and business process templates that fast-track insights, efficiencies, and time to value

▶ **Consulting services** that operationalize insights to enable customers to realize the full value of their investment and to achieve desired business outcomes

The scalable architecture features a zero trust security model and can be hosted or deployed in a customer's cloud instance. It allows for collecting, filtering, conditioning, and correlating data such as device alerts, sensor detail, utilization rates, and service logs, along with the ability to remotely manage device settings and update firmware. A catalog of customizable algorithms advances businesses from descriptive reporting to predictive analytics. Established business process templates help transform, automate, and orchestrate predictive service delivery processes. The visibility to device utilization and integration with back-end ERP and CRM systems enable new business models, including as-a-service engagements.

Lexmark has a better handle on what makers of connected devices need because it has moved through the IoT process itself to differentiate from the competition, shift to an "aaS" model, and drive more value out of its own connected products.

Challenges and Opportunities for Lexmark

While Lexmark is a large supplier of printers, Lexmark is a growing brand in the IoT platform space. It has seen success in new markets outside of the printing industry. It will have to continue to promote its platform and its ability to analyze data from connected products such as hospital equipment and industrial assets. However, Lexmark has a better handle on what makers of connected devices need because it has moved through the IoT process itself to differentiate itself from the competition, shift to an "aaS" model, and drive more value out of its own connected products. By providing operational insight examples and helping companies deploy their IoT projects, Lexmark can stand out among other IoT platform providers.

Conclusion

Businesses of all sizes are undergoing digital transformation, and in many instances, implementing IoT technology and connected products can be critical initiatives in this shift to differentiate against the competition.

However, IoT projects are complex — involving connectivity, a platform to gather and analyze the data, and the integration into existing business processes and systems. Many organizations have had a difficult time finding the right IoT solution that meets their needs due to a variety of challenges. Lexmark's Optra IoT Platform addresses many of the challenges by offering a proven engineered IoT platform that Lexmark uses itself and from which it has realized numerous quantifiable business benefits. Lexmark's Optra IoT Platform addresses the challenges that organizations face in terms of connected device strategies. Based on the company's own experiences managing large fleets of connected devices, Lexmark can help other businesses improve their products and services and launch new digital business models.

Appendix

Methodology

In May 2021, IDC and Lexmark fielded and completed a survey to gain a deeper understanding of IoT platforms and the opportunity for connected product makers in the IoT market. The research also endeavored to understand connected product strategies, maturity, and spending data, along with the reactions to a specific IoT concept. The survey garnered responses from 907 respondents who were qualified as decision makers making investments to support an IoT project.

The respondents resided in North America (the United States and Canada) and Western Europe (Germany, France, and the United Kingdom). Respondents were screened against two sets of criteria: First, they had to have decision making or influence over IoT platform decisions; second, they had to have strong knowledge of the factors going into IoT platform decisions. They all worked for manufacturers of connected devices sold directly to businesses or consumers within the engineering value chain or tech value chain.

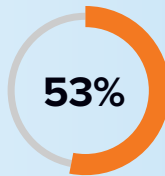## Some characteristics of the respondents are:
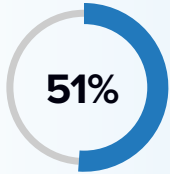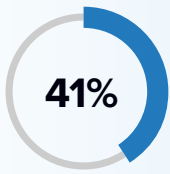
51% of respondents in North America and
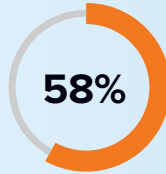
58% of respondents in Western Europe are in IT roles.
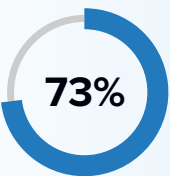
73% of North American respondents said they are at the director level, while

53% of Western European respondents said they are at the director level.

41% of respondents said the primary business activity of their companies was in computer and electronic product manufacturing, followed by

20% in machinery manufacturing.

The study shows that sustainability is the main organizational objective for building and selling connected products.

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Jitesh Bhayani is a research vice president in the Worldwide Network and Telecommunications group, serving as a research and thought leader across a diverse set of telecom services, collaborating across IDC's team of telecom research analysts. He provides strategic direction and advisory services across a variety of disciplines such as wireless, wireline, voice, and managed services. Jitesh is a key collaborator with IDC's Consulting Services Team and serves as a trusted advisor to multiple communications service providers, cloud services providers, and IT solutions vendors.

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