Internet of Things: A Data-Driven Future for Manufacturing

Invest and Adopt Now to Reap Real-Time Insights

Despite the rapid growth of sensors and the buzz around the Internet of Things (IoT), adoption has lagged behind the hype.

Based on a recent IDG Research survey of 100 IT executives in the manufacturing industry, this white paper explores the various challenges standing in the way of adoption, the security implications of an IoT strategy for businesses, and what manufacturing organizations should do to optimize their IoT implementation while mitigating risk.

The Internet of Things (IoT) has generated substantial buzz, driven by three main trends: the explosion of sensors in everyday items, the arrival of inexpensive storage options, and better chipsets for connectivity.

Today, sensors that record, transmit, and share information are interwoven into the fabric of everyday items, from the watches and clothes we wear to the thermostats that regulate our home temperatures. These once stand-alone products are becoming interconnected within a network of devices that generate huge volumes of data. And that data creates opportunities for better preventative maintenance, improved decision-making, and cost avoidance.

The consumer market was quick to adopt the IoT. Large manufacturers have used statistical process control and data analysis to optimize production for years. But companies and IT organizations with a business-to-business focus have been slow to invest.

According to a recent study by NTT DATA and IDG Research Services on emerging technologies, only 29% of enterprise respondents in manufacturing are investing heavily in IoT, while a quarter say they're doing little in this area.

And when asked at what stage of investment in the IoT they expect to be in 24 months, respondents predicted little progress beyond researching and piloting solutions toward the goal of generating a network of connected devices integrated with enterprise applications.

The availability of new, integrated sensory data, combined with advancements in connectivity, security, interoperability, and analytics, creates immense potential for organizations.

"Particularly in manufacturing, those companies that collect, merge, and analyze the various data sets recorded on the factory floor—from unit production and equipment operation data to process and human operator data—will stand out from their competition through better, informed decision making," says Prasoon Saxena, Senior Vice President and General Manager, Global Manufacturing Services at NTT DATA.

The data-centric approach of the IoT improves equipment uptime, increases throughput and yields, reduces component failures, and curbs unnecessary costs. Those capitalizing on this opportunity today can create new business models to spur growth and competitiveness.

While the business benefits of the IoT are attainable, various hurdles continue to slow adoption of IoT strategies and solutions. For enterprises to invest in the IoT, they will need to overcome organizational resistance, security concerns, the added demand that the IoT places on infrastructure, and the inherent ambiguity that surrounds new technologies.
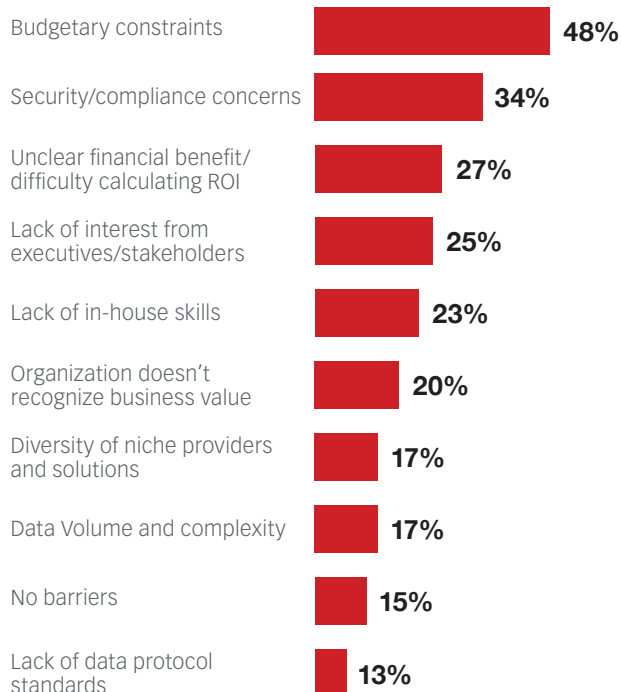
Challenges Impeding Adoption

Even though manufacturers have been collecting and storing data to help optimize their systems for years, the term "IoT" is relatively new. The recent proliferation and convergence of network-connected devices is the tipping point that enables businesses to discover a new realm of insights.

NTT DaTa

CIO Strategic Marketing Services

Barriers to Investment in IOT

Barrier	Percentage
Budgetary constraints	48%
Security/compliance concerns	34%
Unclear financial benefit/ difficulty calculating ROI	27%
Lack of interest from executives/stakeholders	25%
Lack of in-house skills	23%
Organization doesn't recognize business value	20%
Diversity of niche providers and solutions	17%
Data Volume and complexity	17%
No barriers	15%
Lack of data protocol standards	13%

SOURCE: IDG Research Services, September 2015

"For a while, companies have been doing certain things to connect machine-to-machine without necessarily referring to it as the IoT," says Jay Monahan, Global SAP shop floor lead for NTT Data. "The demarcation is in the IoT's ability to integrate data that previously resided in silos and transform the way we process that information in order to inform decision making."

Since the IoT is a relatively new term, its definition lacks consistency across industries. As with many emerging technologies, this ambiguity muddies the value proposition and obscures a clear path to profitability. Return on investment matters, and with budgetary constraints inhibiting technology investment, an inability to demonstrate immediate value has kept proponents from making a strong business case for the IoT. In fact, 48% and 27% of respondents list budgetary constraints and unclear financial benefit as barriers to IoT investment, respectively.

Security, cited by 34% of IDG respondents, poses another challenge. The scale of the IoT creates an unprecedented attack surface for hackers. Just as mobility and the consumerization of IT extended the fire-wall beyond the periphery of the data center, so too does the proliferation of sensors on factory equipment expose the organization to risk that must be mitigated.

Moreover, in order for companies to analyze information on process variability holistically rather than in isolation, they must integrate the data generated by these sensors. This includes data pertaining to material, process recipes and methods, and equipment differences. Thus, in addition to shoring up the network and extended attack surface, IT must also manage the various platforms and protocols of the sensors cataloguing data.

Concern over the demand the IoT would place on existing infrastructure has further slowed adoption. Today, imagination is the only limit to what can be monitored and measured. However, the more data that IT collects, the more it must store, process, and analyze.

In contrast to virtualization and cloud—two technologies with more predictable ROI—concerns over insufficient resources and the need to purchase expensive hardware has had an impact on IoT investment.

Finally, organizations have struggled to develop a clear roadmap for the IoT. Industry use cases or best practices are still few and far between. Accordingly, many organizations are unsure of where to begin, or even whether their infrastructure and business processes are equipped to handle an IoT implementation.

"With all of the information we're able to track today, organizations often have the tendency to want to start too big and end up getting lost in a snowstorm of data points," explains Monahan. "You cannot launch an IoT initiative with the attitude that you have to collect everything. Rather, start small with a pilot program focused on a known bottleneck and define key, manageable KPIs [key performance indicators]."

Despite these concerns, the analytics that can be applied to factory floor sensory data can yield real operational efficiencies, cost savings, and additional business value. These benefits, among others, should drive investment in the IoT beyond what the survey respondents' expect.
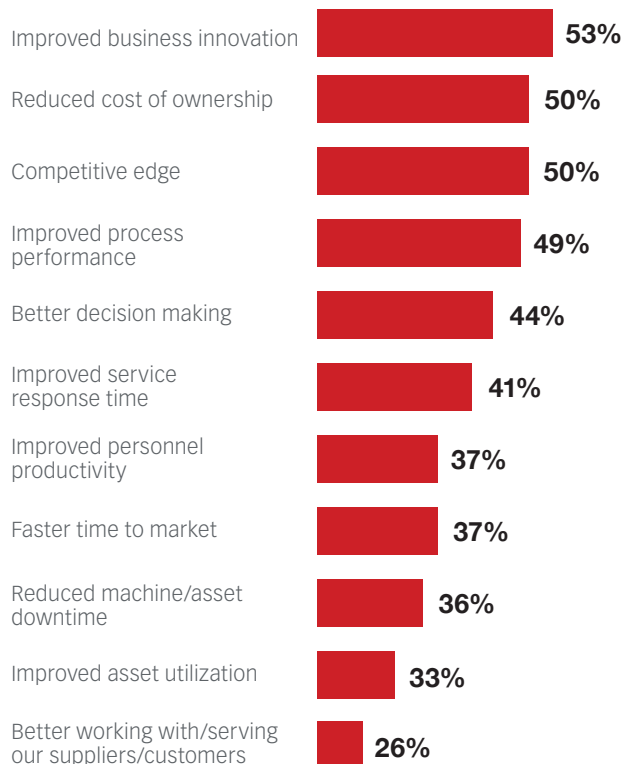
Factors Driving Adoption

Equipment across the factory floor can generate thousands of data types and petabytes of data in only a few days. That data can be stored and made available for analysis and insight discovery.

The real value is not the data itself, but the ability to

Benefits of IOT

Benefit	%
Improved business innovation	53%
Reduced cost of ownership	50%
Competitive edge	50%
Improved process performance	49%
Better decision making	44%
Improved service response time	41%
Improved personnel productivity	37%
Faster time to market	37%
Reduced machine/asset downtime	36%
Improved asset utilization	33%
Better working with/serving our suppliers/customers	26%

SOURCE: IDG Research Services, September 2015

improve the decision making by providing end users the power to view multiple business scenarios instantaneously and react in real time.

"The tools available today are capable of ad hoc recording, enabling end users to move though processes faster. Inquiries that traditionally take hours, days, or even weeks can be performed on-demand," says Monahan.

In manufacturing, process variability stems from numerous factors that can often be monitored via sensors. That data is strongly correlated to yield, quality, and output. When integrated, that sensor data provides insights that show when processes are getting out of whack. Through data analytics and visualization tools, IT can interpret those results and make informed decisions about emerging quality issues and preventative maintenance. This limits hardware failure and downtime, which ultimately reduces cost and improves productivity.

The IoT is also capable of detecting defective Test Interface Units (TIUs) that wrongly categorize good units as bad, creating additional savings. Prior to the IoT, if a faulty TIU categorized a unit as bad, it would be scrapped and replaced with a spare part during regular preventative maintenance, even if it was operating properly.

In a recent pilot conducted in one of its manufacturing facilities, Intel found that data analytics, applied to factory equipment and sensors, were able to predict up to 90% of potential TIU failures before being triggered by the existing factory's online process control system, helping to save inventory that would have been categorized as faulty and reducing yield losses by up to 25%.

In addition to improved component uptime, increased yield and throughput, predictive maintenance, and reduced component failure, data analytics and IoT enable organizations to gain insights into factory floor processes that improve their decision making and position in the market.

Take Husky Injection Molding Systems Ltd., for example. Husky makes equipment used to manufacture plastic products, including bottles and parts for the medical industry. Working with Intel and automation technology company Beckhoff, Husky deployed ruggedized industrial PCs to create an IoT networked platform that controls all the injection molding processes.

A key ingredient is the Intel IoT Gateway kit for quickly commercializing IoT products and services. It blends communications, security, and management functions. This lets faster, flexible PCs replace legacy "process logic controllers" that traditionally run factory floors using highly specialized hardware.

The result? A Husky system strategically optimized to anticipate and respond to market demands, while lowering total production costs and ensuring best-in-class quality.

In fact, the top benefit linked to the IoT is improved business innovation, cited by 53% of respondent organizations in IDG's study, followed by reduced cost of ownership, cited by 50%.

Given myriad types of parametric, product, and equipment data available, these benefits are the tip of the iceberg. With additional data mining and analysis, new business value and efficiency gains emerge, fueling a competitive advantage.

However, to realize the efficiencies and innovations that can be garnered through instrumenting the physical world, successful companies indicate that careful planning and a clearly defined roadmap is critical.

5 Steps to Optimize Benefits and Mitigate Risks Associated with IoT

❶ *Start small, prepare to scale*

With data growing exponentially, it is tempting to want to analyze it all. Don't. Everything is more manageable when you begin small, pilot a concise program with well-defined KPIs, establish a new flow of data, develop policy, and expand it once it's refined. That said, prepare a solution that can scale. Once you have had a taste of success, you will want to increase both the amount of data and the number of data streams analyzed, and you will want to be provisioned to do so.

❷ *Prioritize security*

Arguably the single most important aspect to any organization is its security and data protection. Unsurprisingly, elevated security annually ranks as the top technology initiative. IDG Research finds that 78% of respondents list it as critical or very important, head and shoulders above any other initiative. Prior to embarking on an IoT deployment, be sure to modernize your applications to ensure security requirements are met and proper protocols are installed and aligned.

❸ *Assess and fortify infrastructure*

Collecting a wealth of new data and analyzing that data increases the demand placed on the data center. As infrastructure reaches its capacity, its performance diminishes. While virtualization technologies have made available previously unusable capacity, you should ensure that your systems are not close to operating at maximum capacity, and that you have the existing network to handle the additional throughput. If not, then consider bolstering your data center or leveraging cloud solutions. Use the results from the pilot program to project growth, and use those insights to plan for IoT implementations.

❹ *Build data analytics capabilities*

Data itself is not valuable; the value comes from the insights you can glean from the data. This is the reason why data analytics ranks second among IT's top priorities, according to IDG Research. The power of data analytics stems from the ability to integrate and correlate the vast amount of structured, semistructured, and unstructured data, and extract meaningful insights from it.

❺ *Empower your workforce*

"Like with mobility and the consumerization of IT, businesses' initial adoption of IoT will come from the user, not from IT," says Bassam Amrou, innovation executive, Global Manufacturing Services at NTT DATA. Given the rapid adoption of the IoT within the consumer space, this prediction appears sound. If the IoT is another example of consumerization, expect Internet-connected devices to find their way into the workforce—whether they are sanctioned or not. Rather than be reactionary, it's better to get ahead of the curve and plan for IoT adoption.

Conclusion

Although current IoT adoption has largely lagged behind hype in the B2B space, pioneering manufacturers are taking the necessary steps to capitalize on its potential by investing in enabling technologies and mitigating their risk factors. Although the market for the IoT is still in its infancy, many first movers have already begun extending successful pilot programs more broadly to augment productivity and efficiency gains. The cost savings and added throughput recognized by these organizations have in turn improved gross margins and bottom-line results, which have in turn created new opportunities for reinvestment. In order for manufacturing companies to remain competitive, they need to continue to differentiate themselves through the efficiency optimization afforded by the IoT. ∎

For More Information

NTT DATA partners with manufacturers to deliver innovative approaches to IT, OT and business enterprise challenges. Whether your industry is automotive, chemicals, discrete, high tech or aerospace, our experts provide:

• Insights that improve and create efficiencies your supply chain and across all phases of the manufacturing lifecycle

• Solutions to adopt new digital technologies in sensors, cloud, analytics, and automation

• Outcomes based on client priorities and delivered from our comprehensive portfolio of consulting, applications, infrastructure & managed services

Visit us at NTTDATAservices.com/manufacturing