RESEARCH SPOTLIGHT

ACCELERATING DIGITAL TRANSFORMATION:

Improvement Initiatives and Role-Based Industry Apps Take the Lead

Industry 4.0, Smart Manufacturing, and Digital Transformation

all referred to by LNS Research as Industrial Transformation, have become the dominant topics of boardroom conversation for large and mid-sized industrial companies alike. The industry is well past the stage of vendor hype and marketing. Many industrial companies have already successfully launched Industrial Internet of Things (IIoT) platform pilots, established strategic initiatives, initiated cross-functional teams, and built business cases. These companies are making plans to roll out people, process, and technology best practices capabilities to quickly capture the ROI defined in the business cases - often with targets in the hundreds of millions of dollars, and with just three to five years to achieve value across a global network of plants.

A holistic framework for Industrial Transformation that links Strategic Objectives all the way through to Solution Selection and implementation is required to achieve success towards these aggressive business targets. As important as the chosen IIoT technology platform is, it is just one of the critical foundational elements for success. The value of connecting multiple data and computing resources comes to bear via the industry-focused software applications that are created on top of the IIoT platform. Also, the ability for these software applications to provide the relevant decision support information to the different users and roles across an organization will determine the speed of acceptance and adoption that will accelerate business success.

Since its inception in 2011, LNS Research has been focused on Operational Excellence as it relates to people, processes, and technology. Our most recent Analytics That Matter survey, in partnership with MESA (Manufacturing Enterprise Solutions Association) International, was launched in February 2018. For the last six years, we have partnered with MESA on the Metrics That Matter survey, which has been one crucial foundational element of LNS Research's primary data-driven research. As the use of plant-centric data has expanded dramatically since the last joint metrics survey in early 2016, we decided to change the focus from overall metrics to the use of analytics in manufacturing operations and beyond.

> **THE IIOT PLATFORM IS JUST ONE** of the critical foundational elements for success. There is tremendous value in connecting multiple data and computing resources via industry-specific software applications created on top of the IIoT platform. The ability for these software applications to provide relevant decision support to different users and roles across the organization will determine the speed of acceptance and adoption to accelerate business success.
>
> **—MATTHEW LITTLEFIELD**
> *Principal Analyst*

Analytics That Matter: Research Demographics

GEOGRAPHY AND COMPANY SIZES

Survey respondents to date have been primarily from North America at 74%, with 12% representation from Europe, 7% from Asia/Pacific and 7% Rest of World. There was also a good representation of small to very large company participants in this survey. Small companies are under $50MM, medium from $50MM - $1BB, and large companies are over $1BB

ROLES

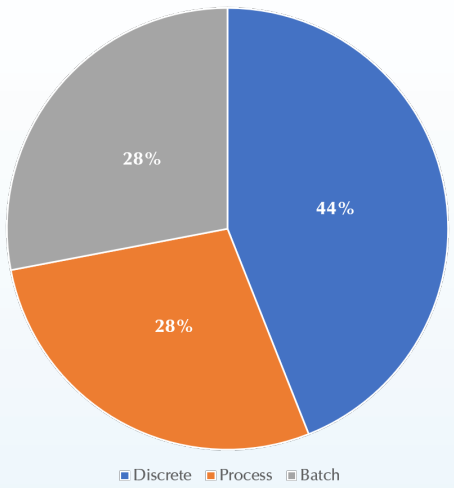
Since it takes a collaborative, organization-wide approach to be successful with Industrial Transformation and associated IIoT initiatives, it was good to see a healthy cross-section of roles represented in the survey – from top management to manufacturing supervisors and staff. The top two roles were directors at 23%, followed by managers at 22%.

FUNCTIONAL AREAS

Operations (26%), engineering (20%), and IT organizations (20%) had the most significant representations in the survey pool. There is a lot of industry discussion about how IIoT is creating the need for operational technology (OT) and IT organizations to come together, which is reflected in the data.

INDUSTRIES

Industrial Equipment providers have a keen interest in IIoT / analytics. The survey has good overall industry representation from discrete, process, and hybrid/batch industries.

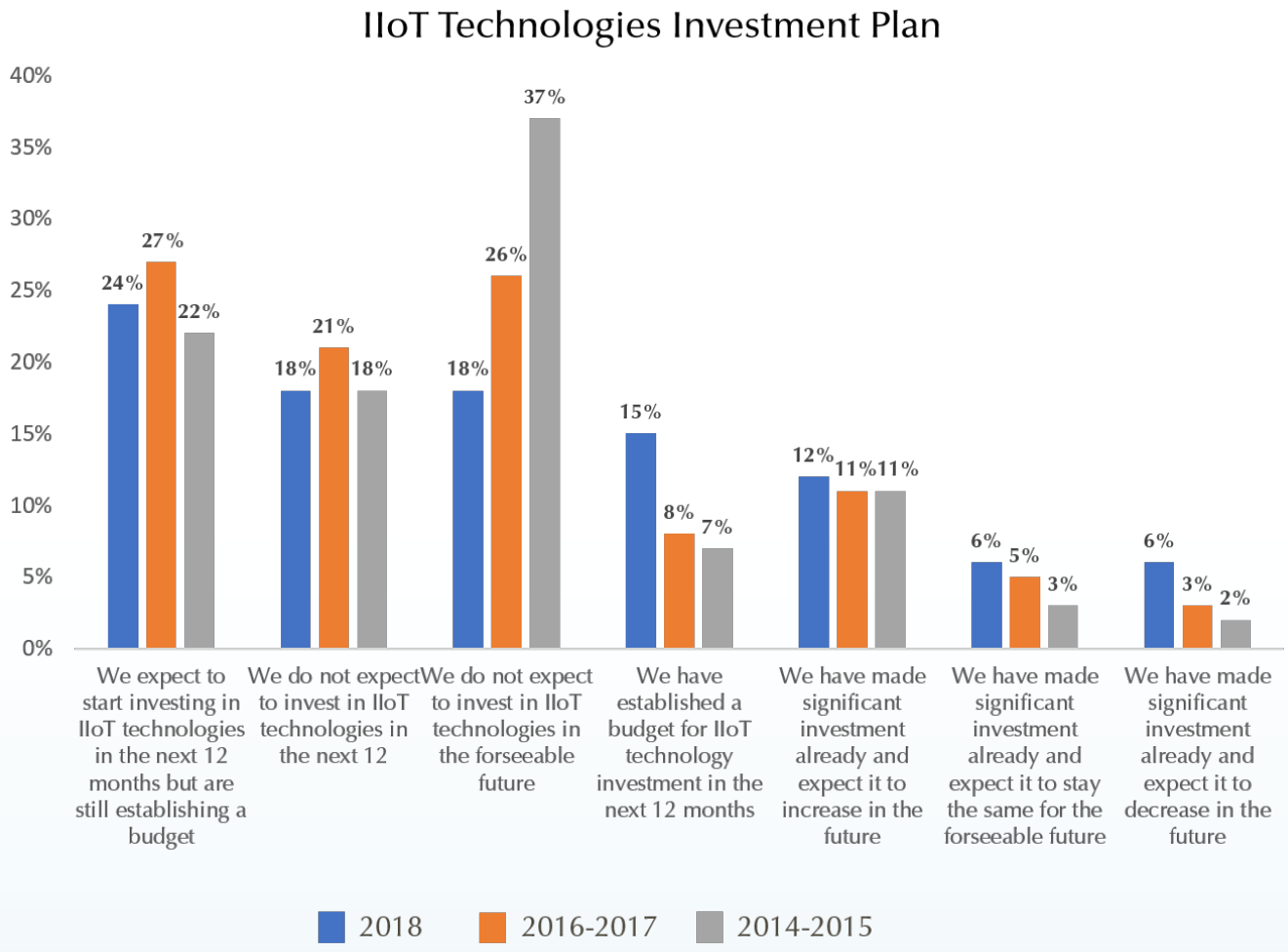


THE INVESTMENT ATTITUDES towards IIoT technologies have evolved from 2014-2018, with only 18% not expecting to invest in IIoT technologies in the foreseeable future - down from 37% in 2014.

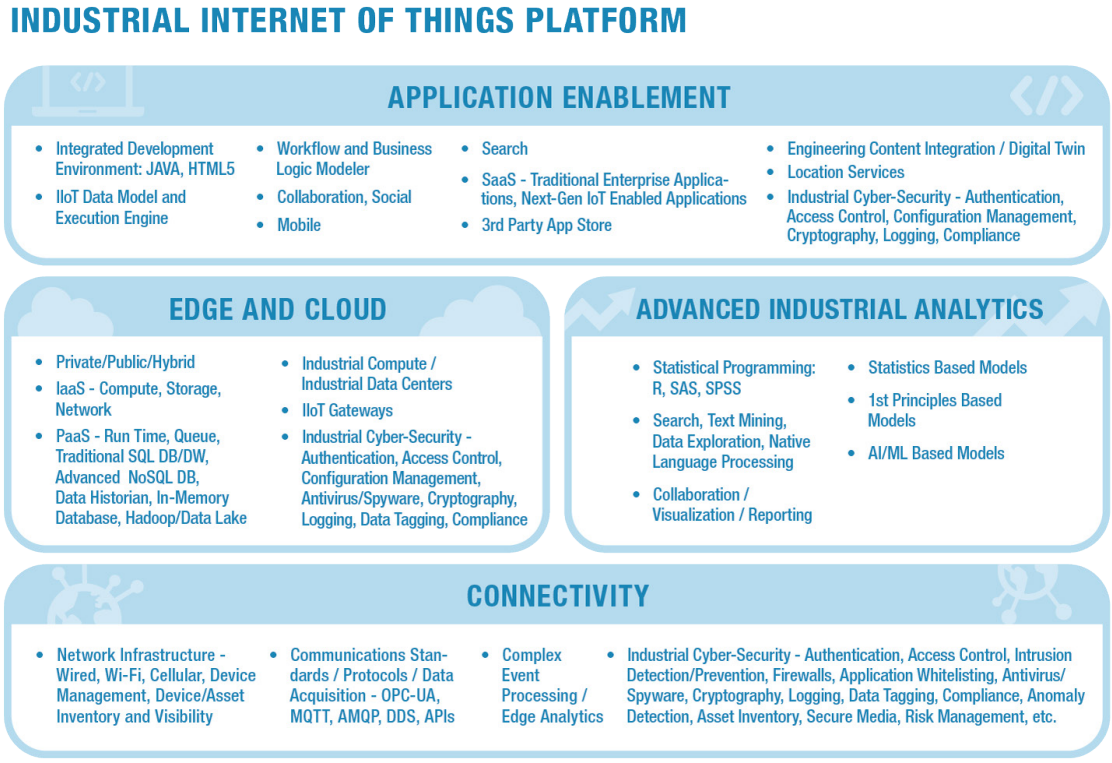
—MATTHEW LITTLEFIELD
Principal Analyst

The Emergence of IIoT platforms

LNS Research has continued to track IIoT platform adoption and investment since our initial 2014 introduction of the concept and survey. Since that time, many vendors have launched IIoT platform software and related applications offerings. Some have been successful in driving volume, creating effective partner ecosystems, and delivering valuable solutions, others less so. However, no one will argue that the space, in general, is moving past marketing hype, and customers are moving to the deployment of real industry solutions that solve existing issues and create new business opportunities. The investment attitudes have evolved from 2014-2018, with only 18% not expecting to invest in IIoT technologies in the foreseeable future - down from 37% in 2014.



A robust IIoT platform provider today needs to check many boxes, essentially delivering a robust solution set and ecosystem across four key areas – Connectivity, Edge and Cloud, Advanced Industrial Analytics, and Application Enablement.



What's Required to Get More 'Out-of-the-Box' IIoT Solutions?

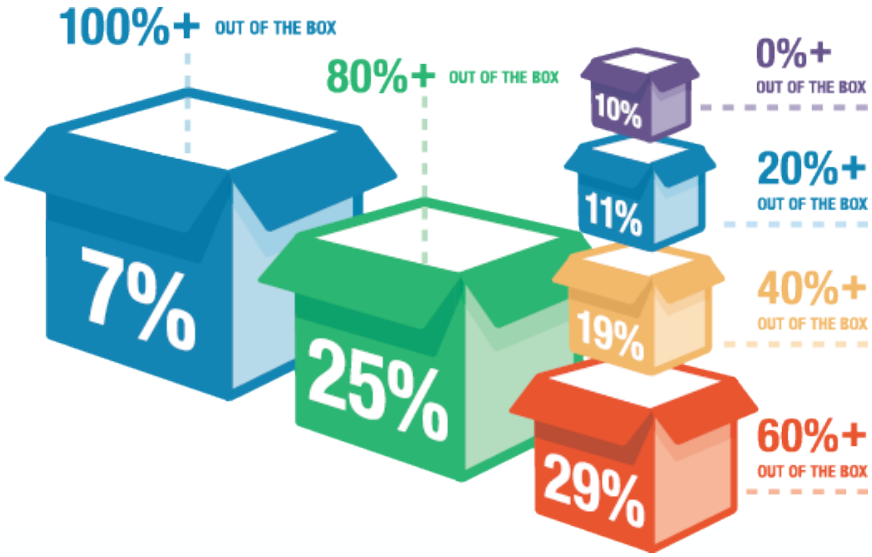
Upon looking at LNS's historical Manufacturing Operations Management (MOM) research, we can see that software in the manufacturing space has typically required a fair bit of effort to create effective solutions. Only 7% of manufacturing software solutions have provided 100% functionality 'out-of-the-box.' We can also see that most of software in this space has traditionally been in the 60-80% range of 'out-of-the-box.'

To eliminate confusion, and hopefully give the industry a standard way to talk about these issues, LNS Research uses the following definitions for each of these terms:

- **OUT-OF-THE-BOX:** Functionality that comes shipped directly from the software vendor or can be configured easily (where easily means configured by a business, not an IT professional) with

built-in workflow tools, templates, and best practices provided directly by the vendor.

- **CONFIGURABLE**: Functionality that can be created using built-in workflow tools shipped by the vendor. To be considered configurable, functionality should be forward-compatible with future releases.
- **CUSTOMIZABLE**: Functionality that is configured using built-in workflow tools shipped by the vendor but may not be forward compatible with future releases. Also, other functionality not sent directly from the vendor that cannot be created using built-in workflow tools. All customization has no guarantee of compatibility with future releases and contains the risk of being costly to maintain over time.



In our discussions with hundreds of manufacturing end-user companies, they are striving to get to the 80%+ 'out-of-the-box' threshold for platform capabilities and pre-built applications, with the remainder of functionality being delivered through configurations and outright elimination of customization going forward.

IIoT platforms promise a new approach to industrial software, that makes it much faster and easier to build, deploy, and manage applications, and can avoid highly customized and multiple monolithic systems on the plant floor that can't easily communicate. However, to make this a reality in a more 'Out-of- the-Box' fashion, the IIoT platform as an enabler is not enough. The marketplace is asking for industry- based applications that include the associated, relevant analytics to be pre-

> **IIOT PLATFORMS PROMISE** a new approach to industrial software, that makes it much faster and easier to build, deploy, and manage applications, and can avoid highly customized and multiple monolithic systems.
>
> **—MATTHEW LITTLEFIELD**
> *Principal Analyst*

built and delivered by industrial software providers or their solutions partners. Complete application solutions, or pre-built accelerators that approach the 80% functionality mark, must be rapidly provided by systems integrators and end-user organizations. Otherwise, the effort required to create and maintain new IIoT-based solutions will not have moved forward beyond what end users have traditionally experienced in the past.

Role-Based Analytics and Metrics/KPIs

IIoT platforms, as well as standalone analytics software, can provide a wide range of simple to complex data calculations and information representations. However, for the resulting analysis to be useful, the needs of specific end-users and roles should be carefully considered. Because requirements around time domains and types of information presentations vary significantly by individual roles across a manufacturing enterprise, it is essential to consider this when creating and selecting industry applications and solutions. Whereas a plant worker will typically require the fastest detailed data/measurement responses, an executive may operate on summarized measures by an hourly, daily or weekly time domain – and on an exception basis. In all cases, actionable information about current operational status and performance metrics/KPIs needs to be provided in their specific time-appropriate manner.

For manufacturers to realize faster time to business value, industry software applications need to invest in connectivity capabilities that can automate data collection, perform real-time analytics calculations and contextualization of data into actionable information, along with providing role-based displays that alert users and supports rapid decision making. In the future, we see the need for even more comprehensive IIoT-based industry applications that utilize workflow and production execution functionality to enforce best-practice procedures.

The good news is that today's software technology enables the creation of application solutions that provide the right information to reach the right roles and people in a timely fashion, ensuring right actions can be taken for corrective actions and positively impacting operations performance within a given window of opportunity. That said, when looking at the results of over 570 LNS Research manufacturing survey respondents since 2014, only 20% of these companies have currently implemented the combination of processes and software that provides role-based metrics/KPIs to their staffs. Another 26% plan to have put these into place

over the next year. The connectivity capability is an integral part of today's manufacturing journey and needs to be supported by vendors who can provide role-based, industry apps.

Benefits from The Combination of IIoT Platform and Digital Tools for Continuous Improvement

With the newest survey data, we have examined how using a best practice combination of IIoT platform and digital technologies to enable continuous improvement (CI) has impacted the fortunes of companies. Our new research shows companies deploying this combination are outperforming those that haven't in many critical areas – net profit margin, manufacturing cycle time, changeover times, production throughput and first pass yield.

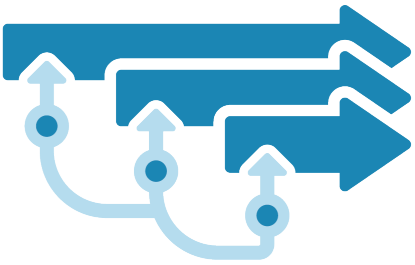
The first most exciting results were that adopting an IIoT platform alone didn't have much impact on how companies approach manufacturing. Companies weren't that much more likely to use Cloud or Edge analytics and weren't that much more likely to use prescriptive analytics.

The two places where IIoT platform adoption did make a difference was in the use of predictive analytics and the performance of some higher-level value chain metrics like capacity utilization and successful new product introductions (NPI).

These results indicate that to-date while many companies have adopted an IIoT platform, they haven't been successful in driving adoption down into the plant floor environment to make use of all existing and new potential data sources. There are several reasons why this has likely not yet happened inside of many companies. There is a need for pre-done industry applications that provide role-based analytics and information presentations 'out-of-the-box,' and these are just now emerging in the marketplace. Also, it's likely that some companies haven't done the hard work of changing existing automation architectures to support the extensive use of these new platforms at this level.

Our research also suggests that the real performance benefits come when companies do more than adopt an IIoT platform and take actions like implementing a strategic initiative focused on Industrial Transformation or adopt next-gen digital tools to enable continuous improvement.

Specific highlights include a dramatic increase in the use of Cloud and Edge-based analytics, as well as a significant increase in the use of

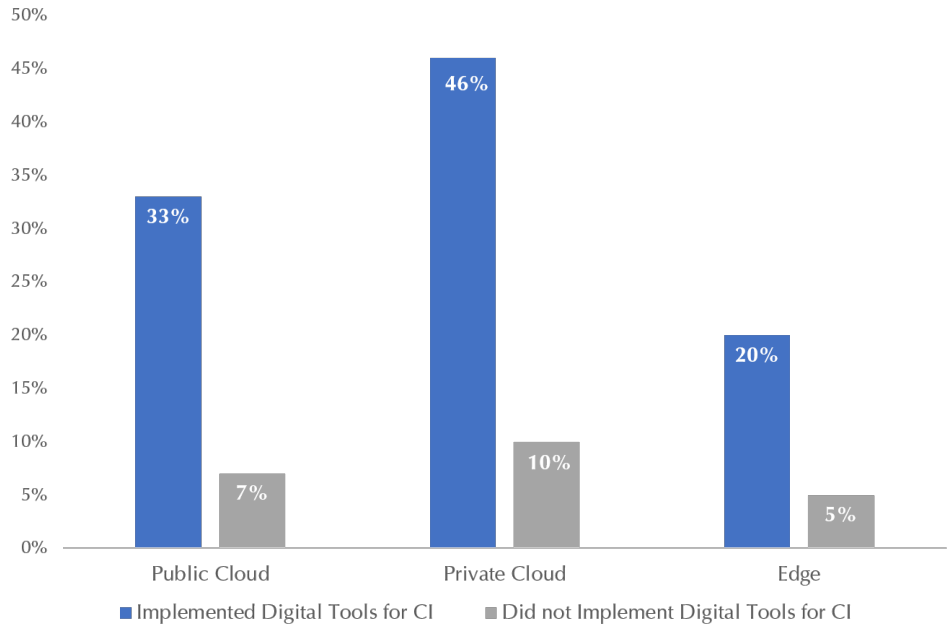


DIGITAL TRANSFORMATION FRAMEWORK by LNS Research describes a systematic approach to simultaneous and interconnected digital initiatives, in order to manage transformation across all levels and functions of the organization.

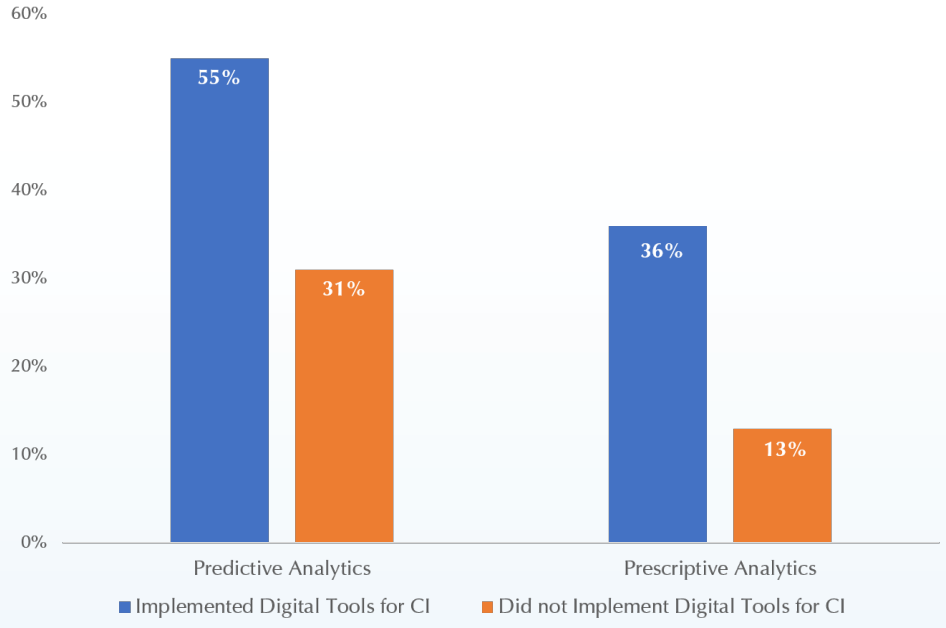
Click to learn more about the **Digital Transformation Framework**

prescriptive and predictive analytics. Cloud, Edge, prescriptive and predictive analytics capabilities are all part of what should be delivered with today's comprehensive IIoT platforms.

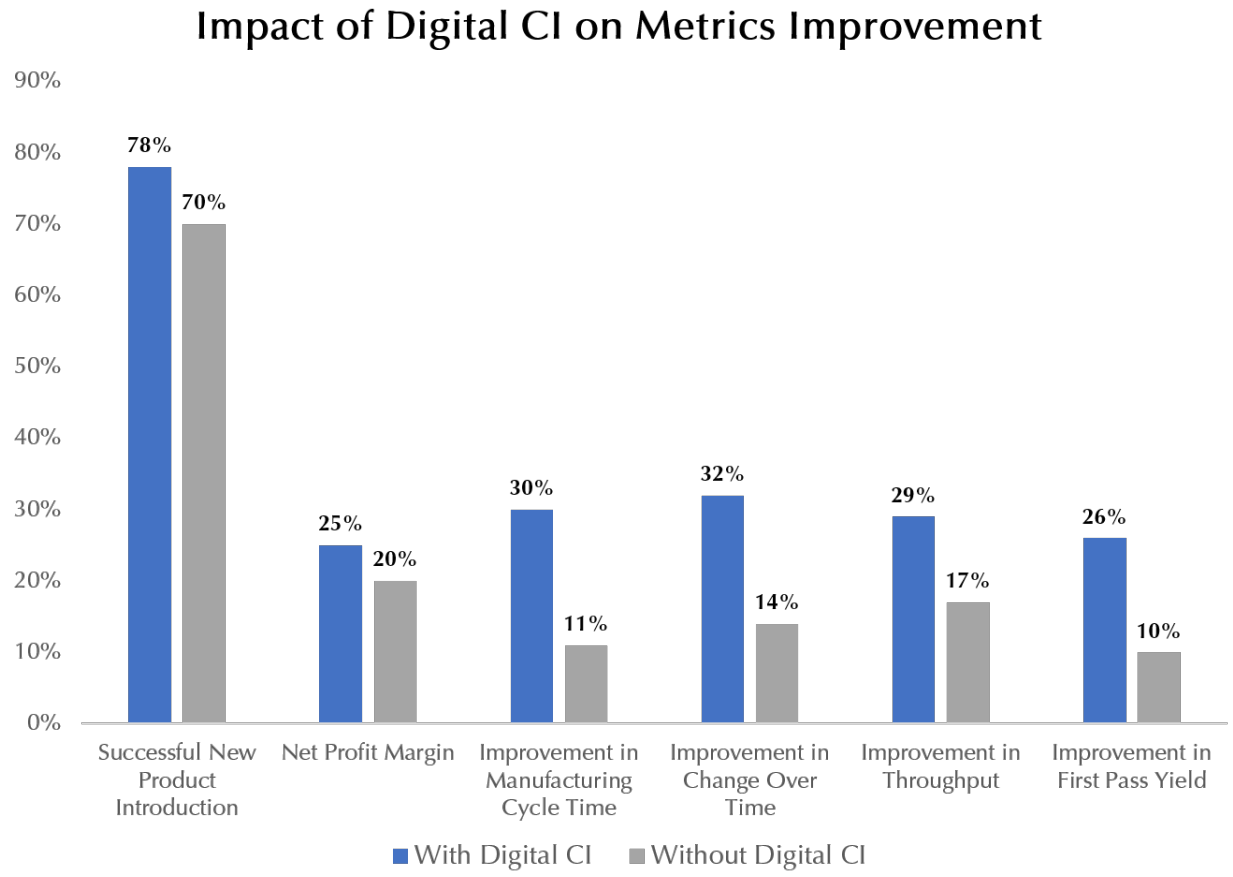
Impact of Digital CI on Cloud and Edge



Impact of Digital CI on Analytics Sophistication



Our survey indicates that Business and manufacturing performance improvement metrics show dramatic improvements for companies utilizing the combination of IIoT platforms, analytics and digital tools for CI.



LNS Research believes these increases in performance improvement are because when companies launch new strategic initiatives and compliment Operational Excellence with digital tools, they leverage and extend their existing culture and change management capabilities embedded within the organization, rather than just deploying new technology disconnected from these aspects of the business.

Recommendations to Capture Similar Benefits

There are some architecture and platform recommendations your organization should consider to ensure rapid rollouts and value capture with Digital Transformation initiatives and the IIoT.

- **IIOT IS A TECHNOLOGY ENABLER** and needs to put into the context of broader strategic initiatives. Review the LNS Research Digital Transformation framework.
- **IIOT PLATFORMS PROVIDE A CRITICAL UNIFYING** and application environment. They are one component of a manufacturing enterprise's overall Operational Architecture.
- **IIOT PLATFORMS PROVIDE A COMMON DATA MODEL** for bringing together different data types:

  Structured (enterprise resource planning (ERP), product lifecycle management (PLM), manufacturing execution system (MES), supply chain management (SCM), client relationship management (CRM), and more.)

  Semi-structured (data historian, streaming sensor, and more.)

  Un-structured (web, GIS, image, video, pdf, and more.)
- **IIOT PLATFORMS TYPICALLY SUPPORT USER-DEFINED COMBINATIONS** of Edge, on-premise, private and public cloud computing and data architectures.
- **IIOT PLATFORMS TYPICALLY INCLUDE DIFFERENT TYPES OF ANALYTICS**: Statistics, First Principles, artificial intelligence (AI), machine learning (ML) – combinations of these can be used to create prescriptive and predictive results.
- **THE KEY VALUE OF IIOT PLATFORMS** will be derived from end-user value which is realized through the applications that are built upon the platform. Users should look at their application needs as compared to the 'out-of-the-box' apps that are available from IIoT platform providers and their industry ecosystem.
- **LOOK FOR INDUSTRY-SPECIFIC IIOT APPS** that include "80% complete" accelerators or pre-done, role-based analytics and decision support, while also incorporating the following attributes:

- **EMBEDDED MANUFACTURING OPERATIONS COLLABORATION**: Since enterprise collaboration tools typically don't provide the required industrial operations context and have not been broadly adopted, especially on the plant floor. New IIoT apps need to include enterprise-grade collaboration tools that are specifically tailored to the industrial context and are embedded as an integral part of the apps.
- **EMBEDDED ADVANCED INDUSTRIAL ANALYTICS**: There are robust existing analytics within the industrial space: existing trend analysis, dashboards, simulations, optimization models, and more. New IIoT apps should utilize these current capabilities and layer new AI/ML and predictive analytics on top of this existing intellectual property.
- **NEW IIOT APPS SHOULD RUN ON TOP OF AN IIOT PLATFORM** that is flexible and lightweight in architecture: The only thing constant in the industrial sector is change itself. M&A, new products, new production lines, and new assets are always coming on and offline. Adapting to these changes must be simple and cost-effective for OT based end-users, not requiring IT resources to manage.
- **INDUSTRY SPECIFIC**: The market has accepted over the past several years that the IIoT is a distinct subset of the broader IoT and will need its own specific set of solutions. What has not yet been addressed is that the Industrial sector itself is incredibly broad. Likely, there will not be one platform that spans all industries. Furthermore, even within specific industries, generic applications are often not good enough. For example, even though there may be 80% similarity between the needs of different types of complex discrete or batch manufacturers, adoption and success depend on that 20% difference.

  Next-gen applications need to be specific to the level of aircraft assembly or dairy processing, not merely discrete manufacturing or batch management. This level of industry app specialization is only possible with a robust platform, ecosystem, and an industry-specific vendor strategy.
- **NEW IIOT APPS SHOULD PROVIDE A MODERN USER INTERFACE** (UI) for the next-gen workers, supporting augmented reality (AR), virtual reality (VR) and Digital Twin concepts.

Presented by:

Author:

Matthew Littlefield ,
Principal Analyst
matthew.littlefield@lns-global.com

License to distribute this research report has been granted to:

ptc
www.ptc.com

LNS Research provides advisory and benchmarking services to help Line-of-Business and IT executives make critical decisions. Our research focuses on the Industrial Internet of Things (IIoT), Digital Transformation; and providing insights into the metrics, leadership, business processes, and technology capabilities needed for achieving Operational Excellence. Learn more at www.lnsresearch.com.