GLOBAL DISRUPTION IN
ASSET PERFORMANCE MANAGEMENT

APM 4.0: Redefining Asset Lifecycle for Industry 4.0

CONNECT:

lnsresearch.com

LNS research

GLOBAL DISRUPTION IN ASSET PERFORMANCE MANAGEMENT

APM 4.0: Redefining Asset Lifecycle for Industry 4.0

TABLE OF CONTENTS

ACRONYM
QUICK REFERENCE
VIEW ON BLOG

lnsresearch.com

Executive Summary: Beginning an Evolution

Executive Summary: An Evolution Has Begun

To date, Asset Performance Management (APM) has been a poorly understood and underutilized opportunity for asset-intensive industries. Too often, reliability and maintenance professionals' ideas for creating value through maintenance have been sidelined by larger objectives. In fact, their ideas don't just easily align to these larger goals; they help operations staff drive toward achieving them.

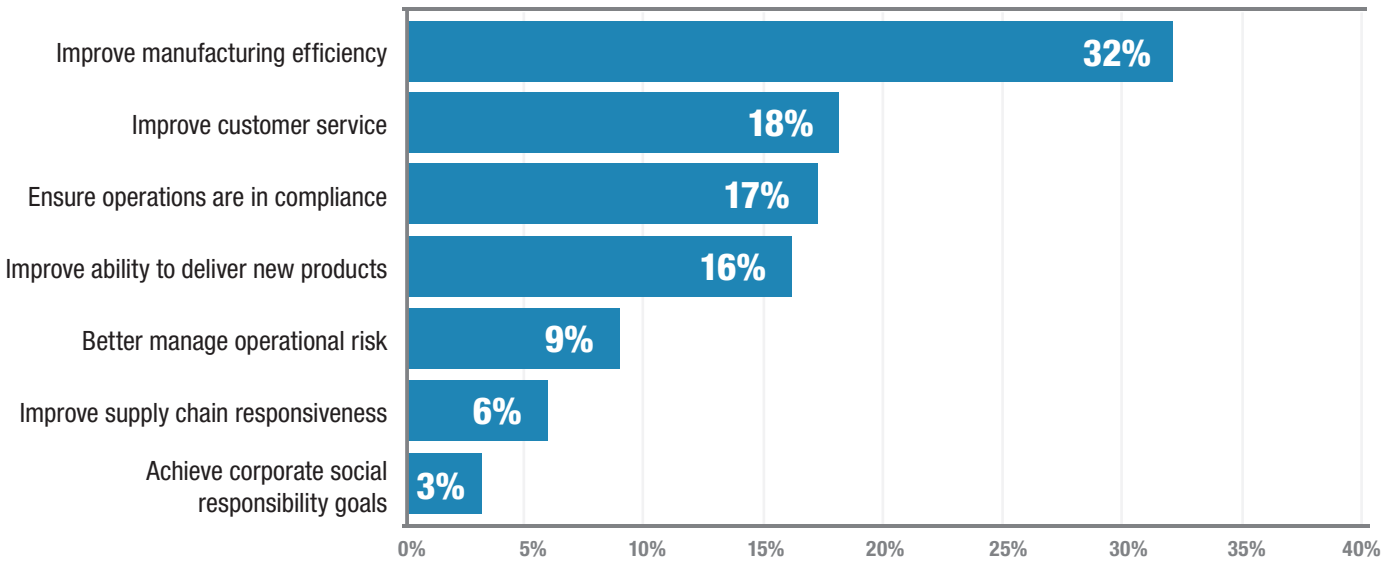
Yet, over the last 20 years, industry has pushed assets, people and related maintenance technology to their limits to meet these objectives. It has shown some success through reduced downtime, improved safety, and workforce efficiency, but it is still not enough.

New opportunities to push APM now emerge through the Digital Transformation Framework, Industrial Internet of Things (IIoT) platforms, and smart connected assets. As this framework and related technologies come together, there is confusion about what is new, what is repackaged as new but is novel, and what is purely marketing hype. To clarify where APM is headed, the market requires a clear understanding and definition: APM 4.0.

Early adopters of this new paradigm have lower operations costs because of improved asset reliability, longer asset life, and better decommissioning and disposal costs. But there is a greater opportunity to affect the asset lifecycle and what it means for operations and maintenance moving forward in this IIoT era.

At the heart of this opportunity is understanding everything this new era touches related to the asset; it all revolves around driving new insights and innovations for Operation Excellence. As organizations talk about Industry 4.0 projects, they must consider how this evolution in industry is creating an enhanced model—APM 4.0. This eBook discusses the evolutionary path of APM and how to reach APM 4.0 by managing the asset lifecycle in the IIoT era.

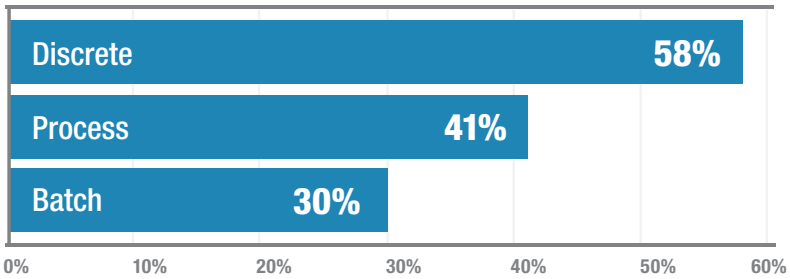
What is the Top Operational Objective of Your Organization?



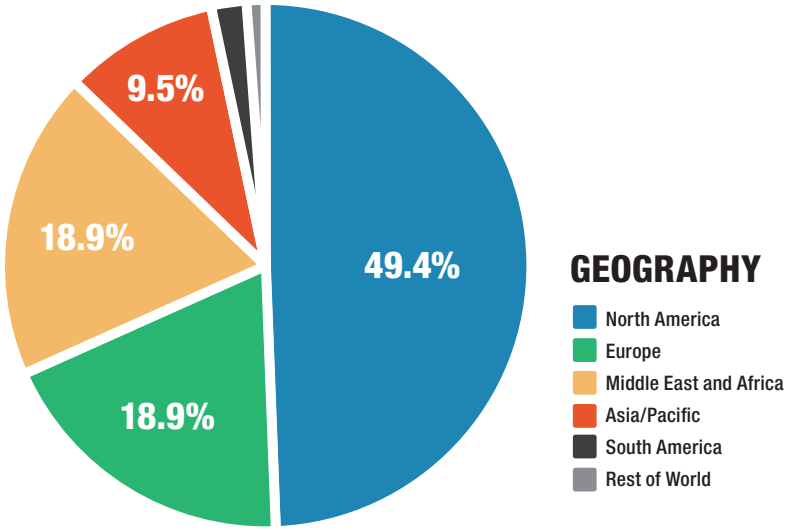
SECTION

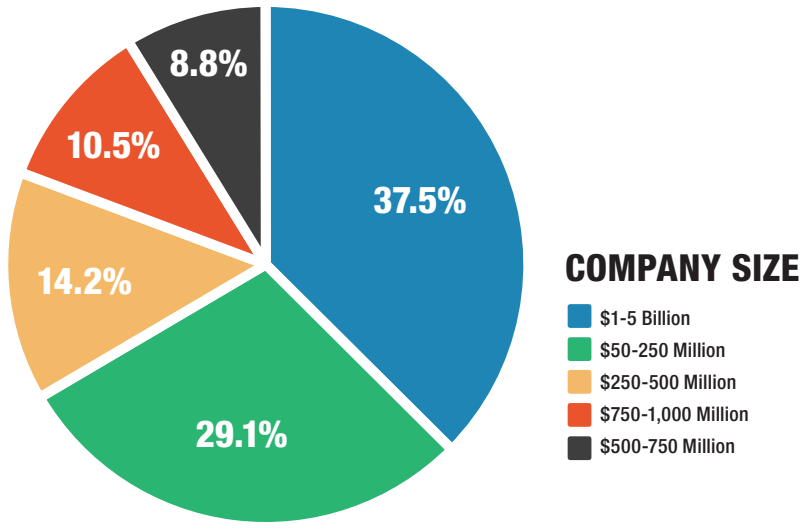
Research Demographics

We consolidated and compiled data from two surveys, IIoT and APM. Together they include over 400 responses from a wide range of industry segments and organizational levels. Combining them allows us to get a full view of the market and trends that are converging as Digital Transformation initiatives take shape in discrete, process and batch industries.



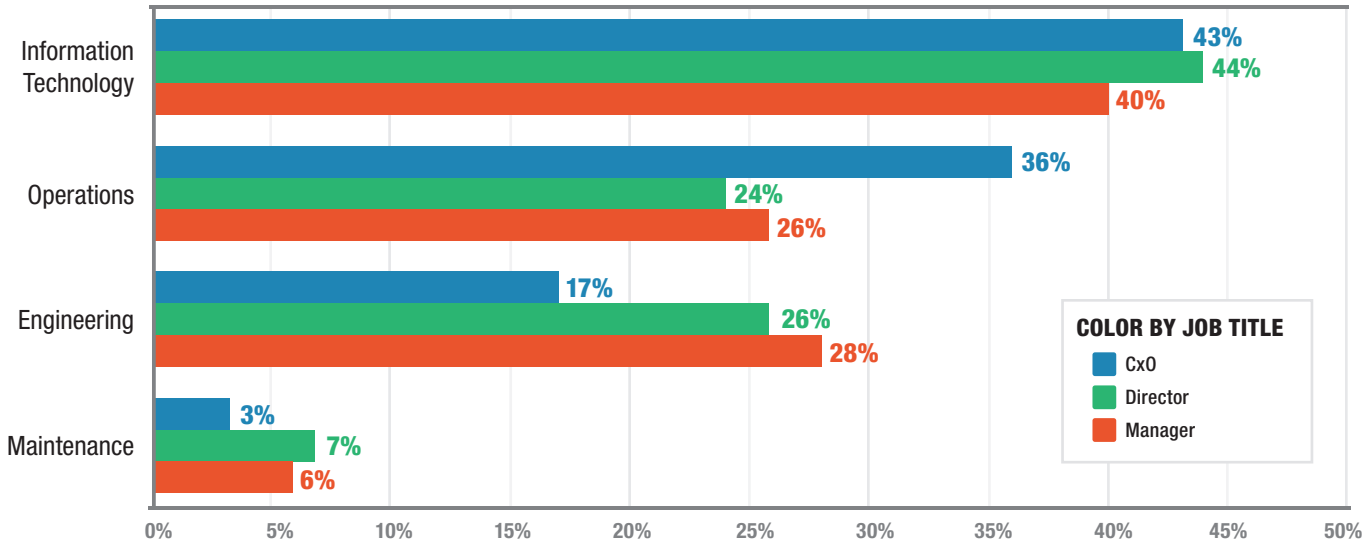
The mix of geography and company size has changed as LNS Research receives more responses from the Middle East due to a surge of interest in best practices for IIoT and APM. As expected, most survey respondents reside in North America, with virtual tie in responses from Europe and the Middle East. The Asia Pacific region rounds out global participation.





Research Demographics *(Cont.)*

Consistent with LNS' focus on the business leader, the surveys show a strong mix of C-level and director level responses from for both APM and IIoT. As companies consider the effects IIoT will have on the Asset Lifecycle, all levels of the organization should be involved. This will ensure successful implementation of people, process, and technology.



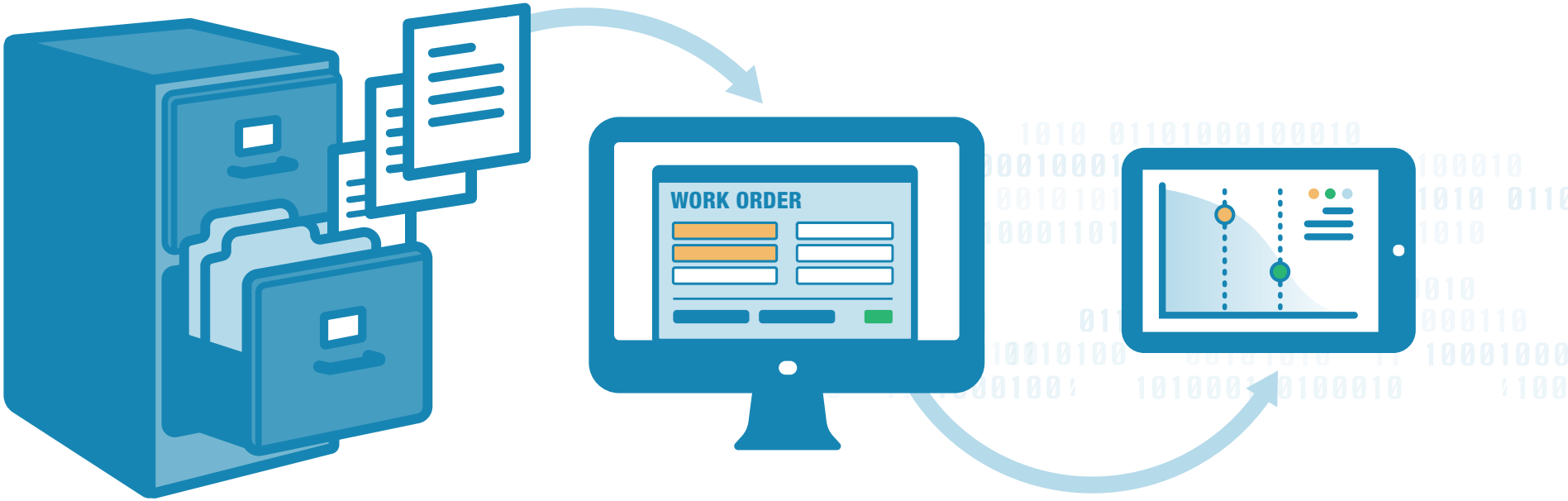
SECTION 2

The Global State of Asset Performance Management

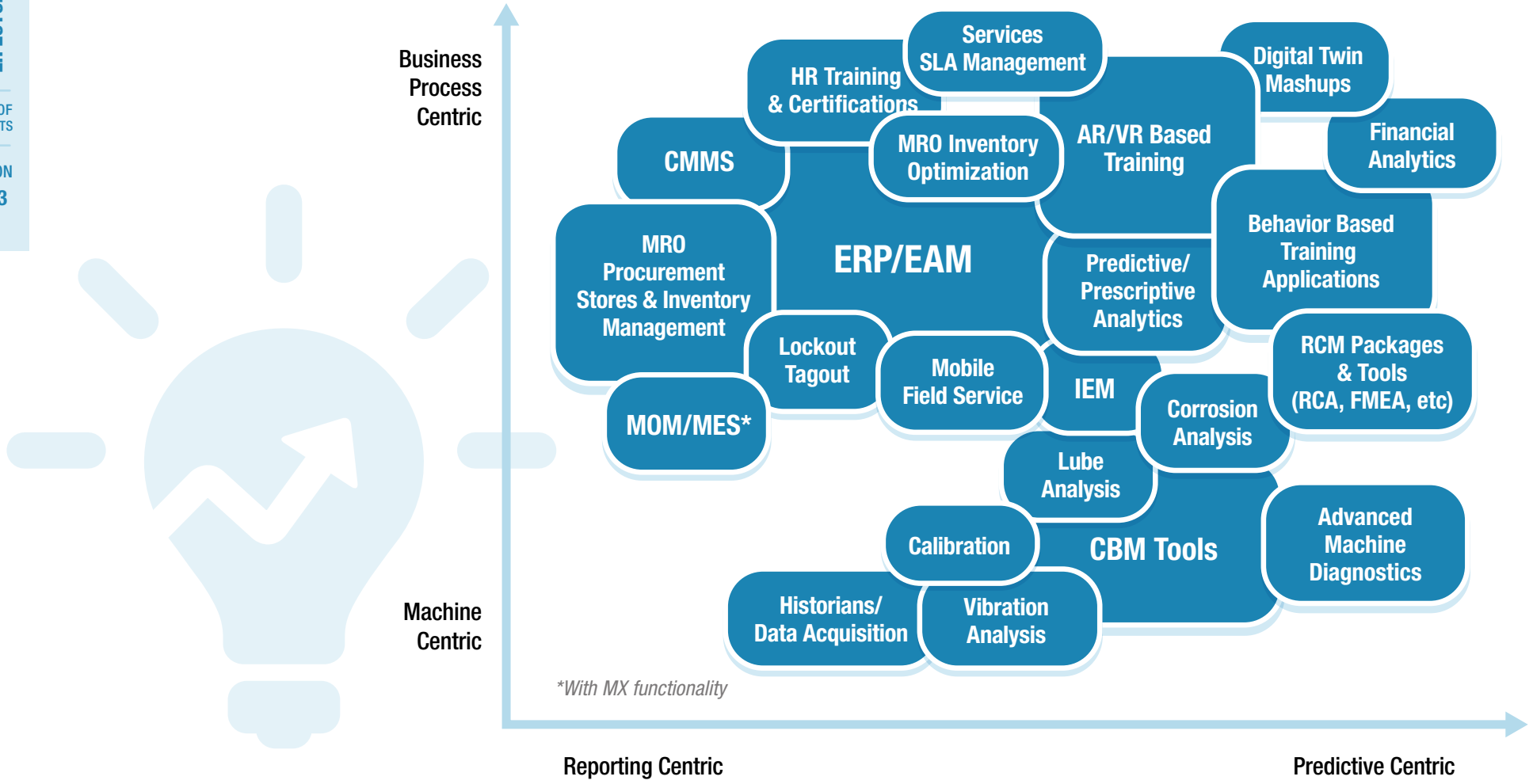
APM Tech Space Takes Shape

When looking at the evolution of APM and where it is today, it's not any different than any other software space. The minute computer processes and related applications replaced paper-based processes everything began to change. In its simplest form, the APM (i.e. maintenance) space has gone through three evolutionary stages:

1.0: Paper-based record keeping and processes
2.0: Computer-based transactions systems (CMMS to EAM; calendar-based maintenance)
3.0: Instrumentation of assets (RCM and analysis; condition and Usage-based maintenance)



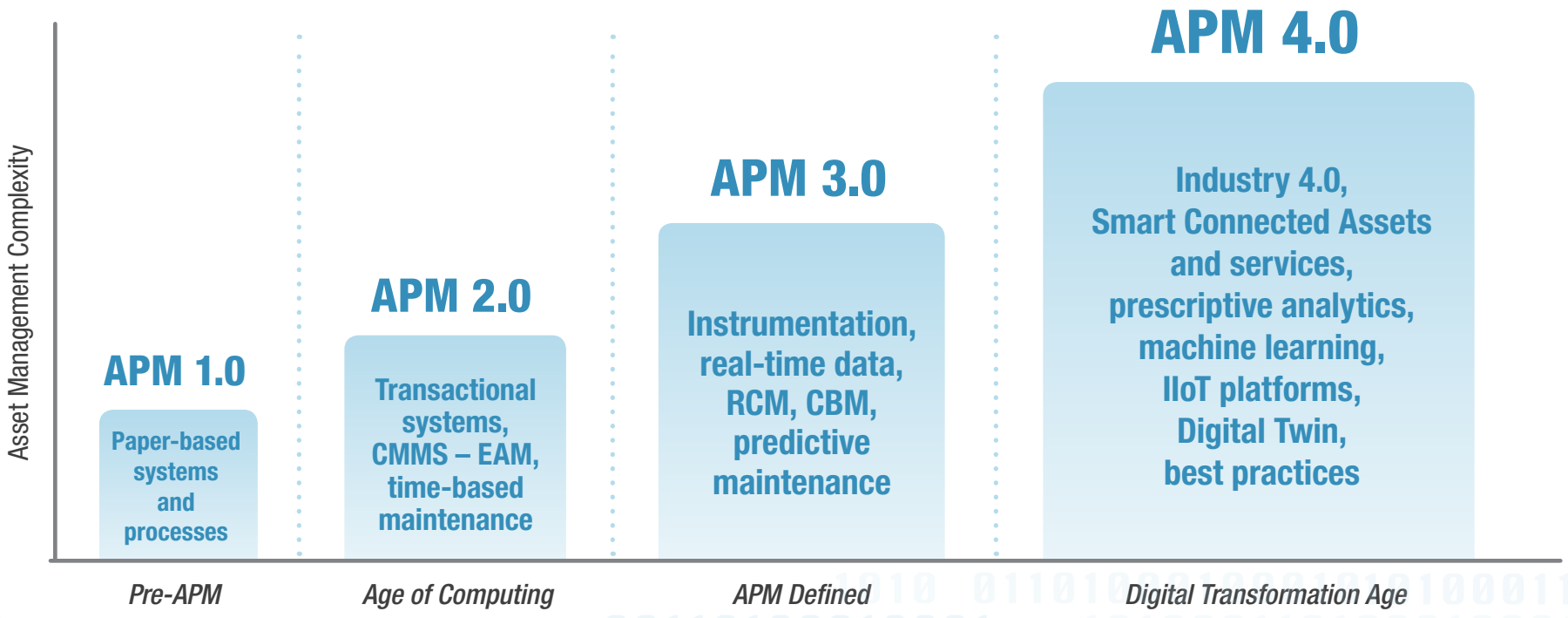
The original definition of Asset Performance Management didn't emerge until the third stage, "instrumentation of assets." The APM Applications Landscape by LNS Research helps organizations understand of all the critical solutions available to manage assets. This is a framework for companies to establish context and understand all the solutions required, whether business-centric or machine-centric and each one's role in the use of data – reporting centric or predictive centric.



Industry 4.0 Demands a New Approach to Asset Performance Management

We're headed into a new age of opportunity and value creation with Digital Transformation. Industrie 4.0, (or as it is called in the US Industry 4.0 or smart manufacturing) has emerged as the catalyst to bring together cyber-physical systems, the Internet of Things and Cloud computing to create the smart factory, facility, or plant. If organizations are going to invest in elements of Industry 4.0—whether a complete transformation or partial investment—APM is a critical component of the strategy. Existing APM thinking and solutions must evolve to support these efforts and a next generation APM will be required. Enter APM 4.0 – an evolutionary step that will bring together many components we see now and that have the potential to make an impact in the future. At its core, APM 4.0 includes:

- Prescriptive analytics and machine learning
- Smart connected assets and services
- IIoT platforms
- Industry best practices
- Digital twin as a mashup

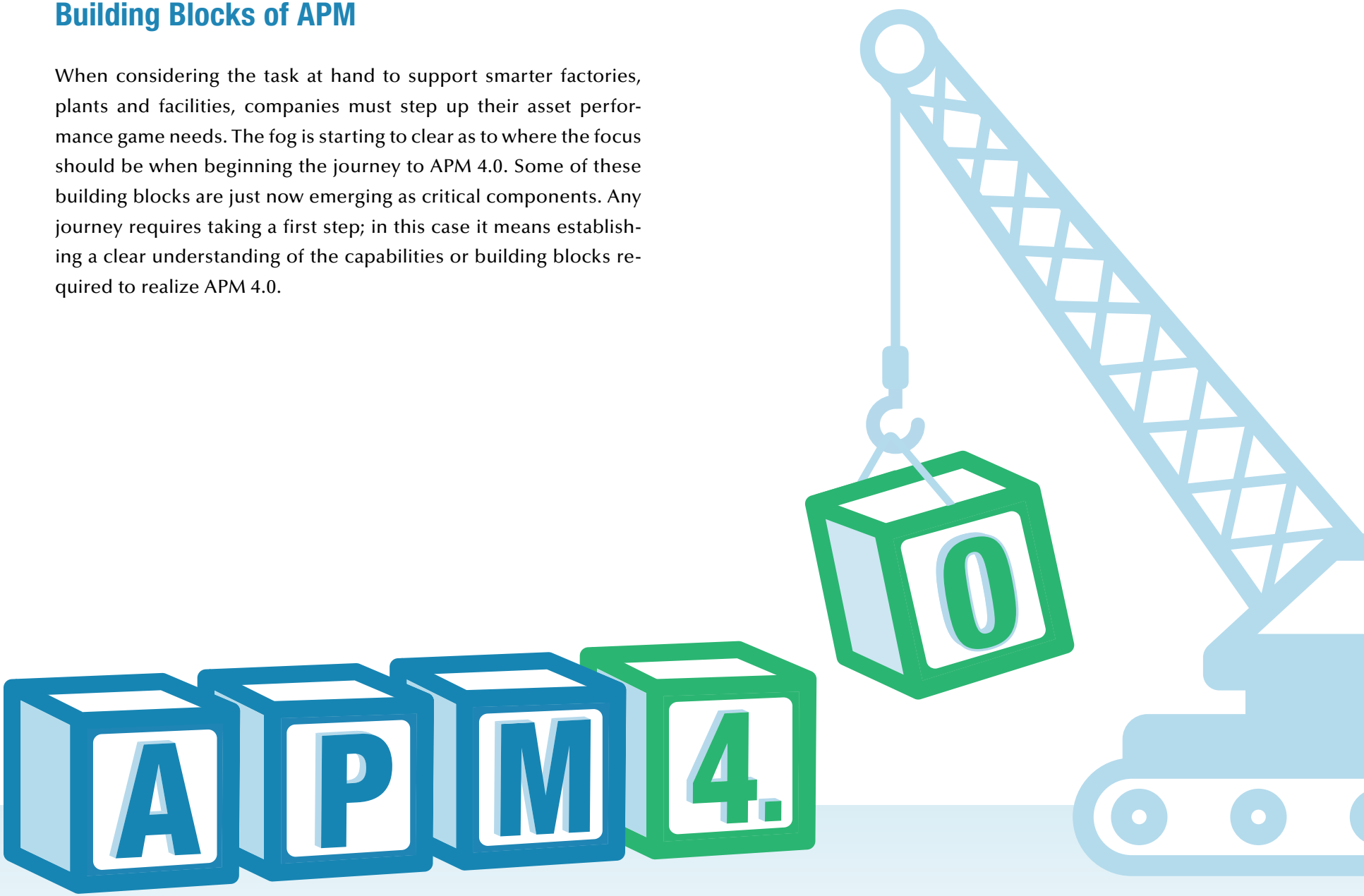


SECTION 3

Building Blocks of APM

Building Blocks of APM

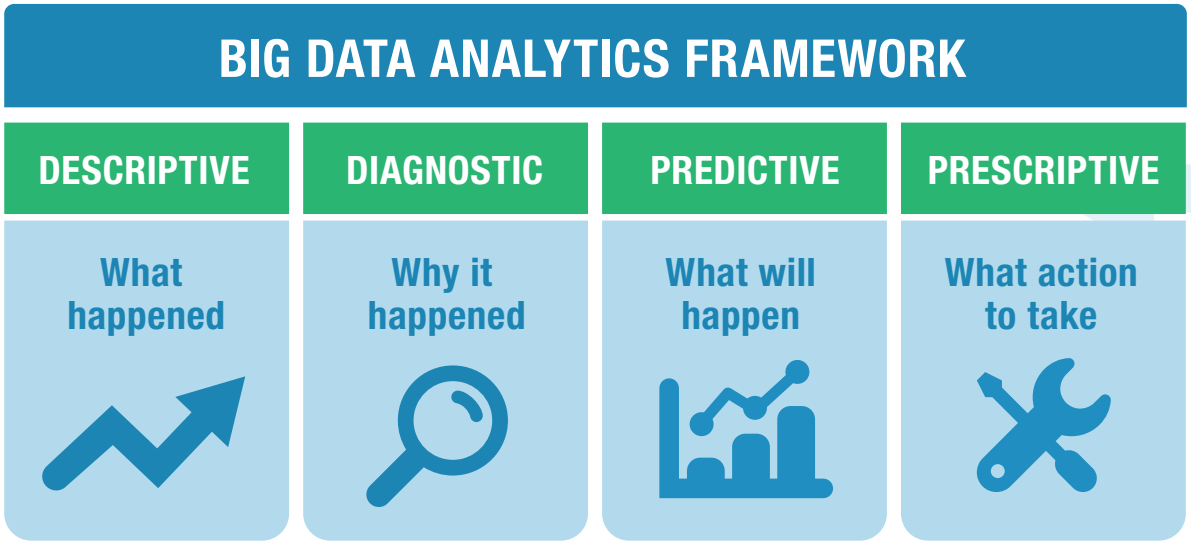
When considering the task at hand to support smarter factories, plants and facilities, companies must step up their asset performance game needs. The fog is starting to clear as to where the focus should be when beginning the journey to APM 4.0. Some of these building blocks are just now emerging as critical components. Any journey requires taking a first step; in this case it means establishing a clear understanding of the capabilities or building blocks required to realize APM 4.0.



Prescriptive Analytics

Maintenance has evolved from reactive to condition-based maintenance (CBM), but this is not enough to match the Digital Transformation paradigm shift maintenance organizations face. The APM 4.0 program needs to include predictive (minimally) and ideally prescriptive analytics to achieve an entirely new level of maintenance value. The greatly reduced cost of sensors and network connectivity makes it attainable.

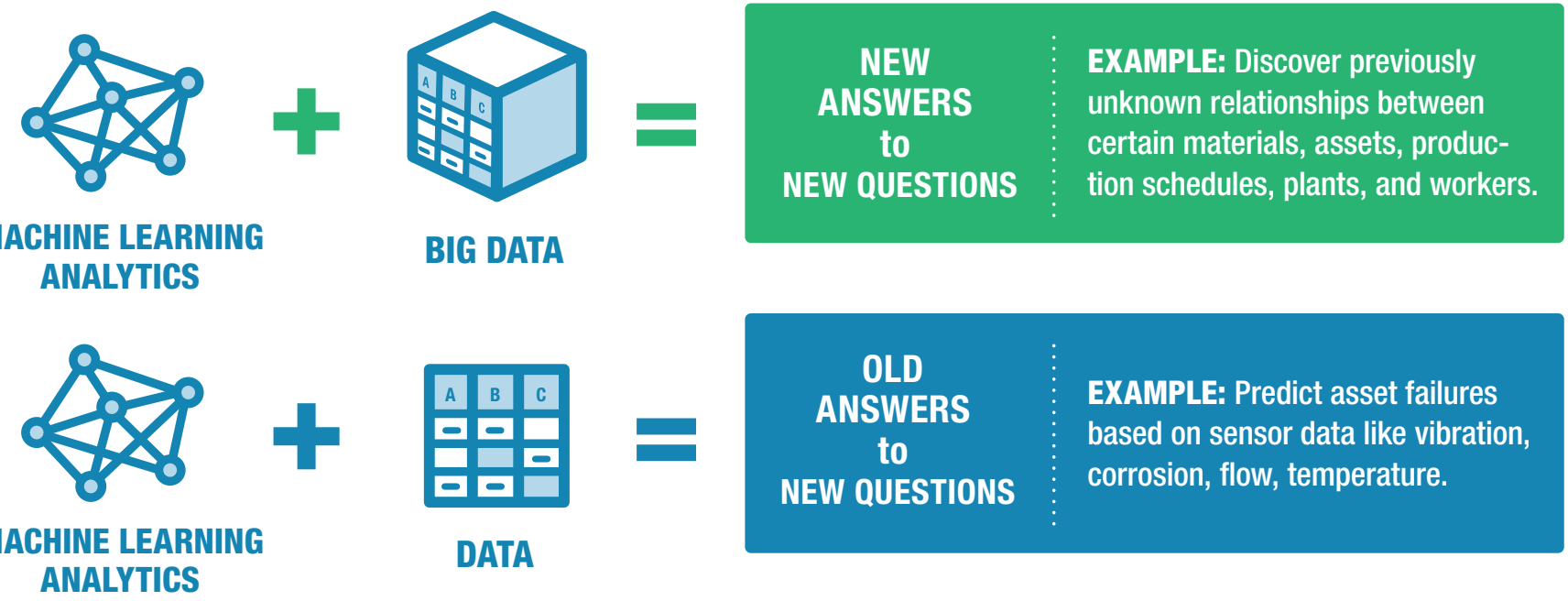
There are two levels of prescriptive analytics organizations should consider with APM 4.0. The first is prescribing maintenance activities to postpone or prevent failure. The second is more sophisticated; it is the ability to prescribe operational changes to alter how the equipment performs. The level means becoming maintenance smart; the second enables operational excellence and alignment to Industry 4.0.



Machine Learning

Machine learning is a type of artificial intelligence that provides the ability to learn and gain insight into operations and maintenance without being specifically taught how to do so. It enables an automated search through data to look for patterns, and is the basis to adjust and improve APM processes and actions.

For APM 4.0, consider two types of machine learning. The first is low hanging fruit: applying it to old data sets and predicting failure. The second is applying machine learning to Big Data to discover answers to questions maintenance organizations didn't know to ask.



Smart Connected Assets

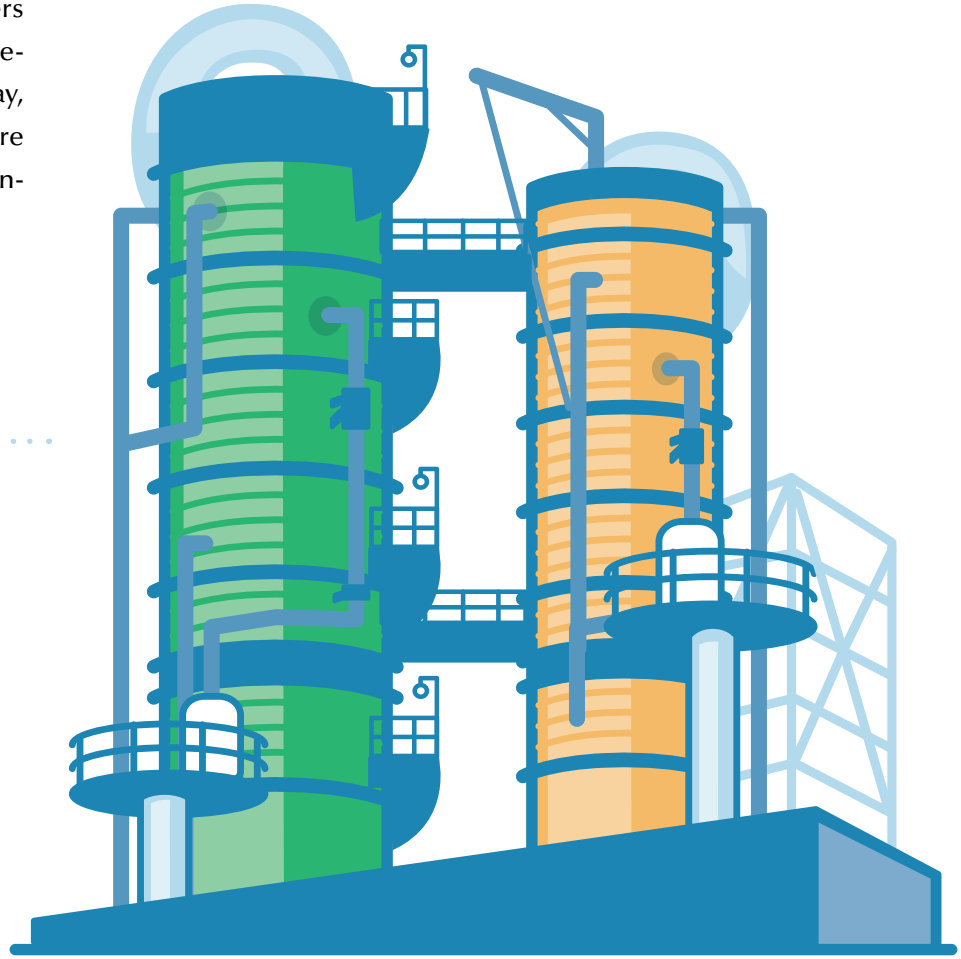
Industry 4.0 includes cyber-physical systems, IIoT Platforms, and Cloud computing; the outcome for maintenance is smart connected assets. From an operations perspective, the information and potential for these assets to enable Digital Transformation initiatives is critical for success.

APM 4.0 takes advantage of the information and insights these assets provide to maintenance organizations. For many years, companies spoke of wanting to expand monitoring of assets. Two barriers stood in the way: sensing technology was quite expensive and delivering the data to people who needed it was quite difficult. Today, assets lay the groundwork by providing a key data source to do more real-time and predictive analysis, and the future promises the potential for autonomous operation.

SMART CONNECTED ASSETS

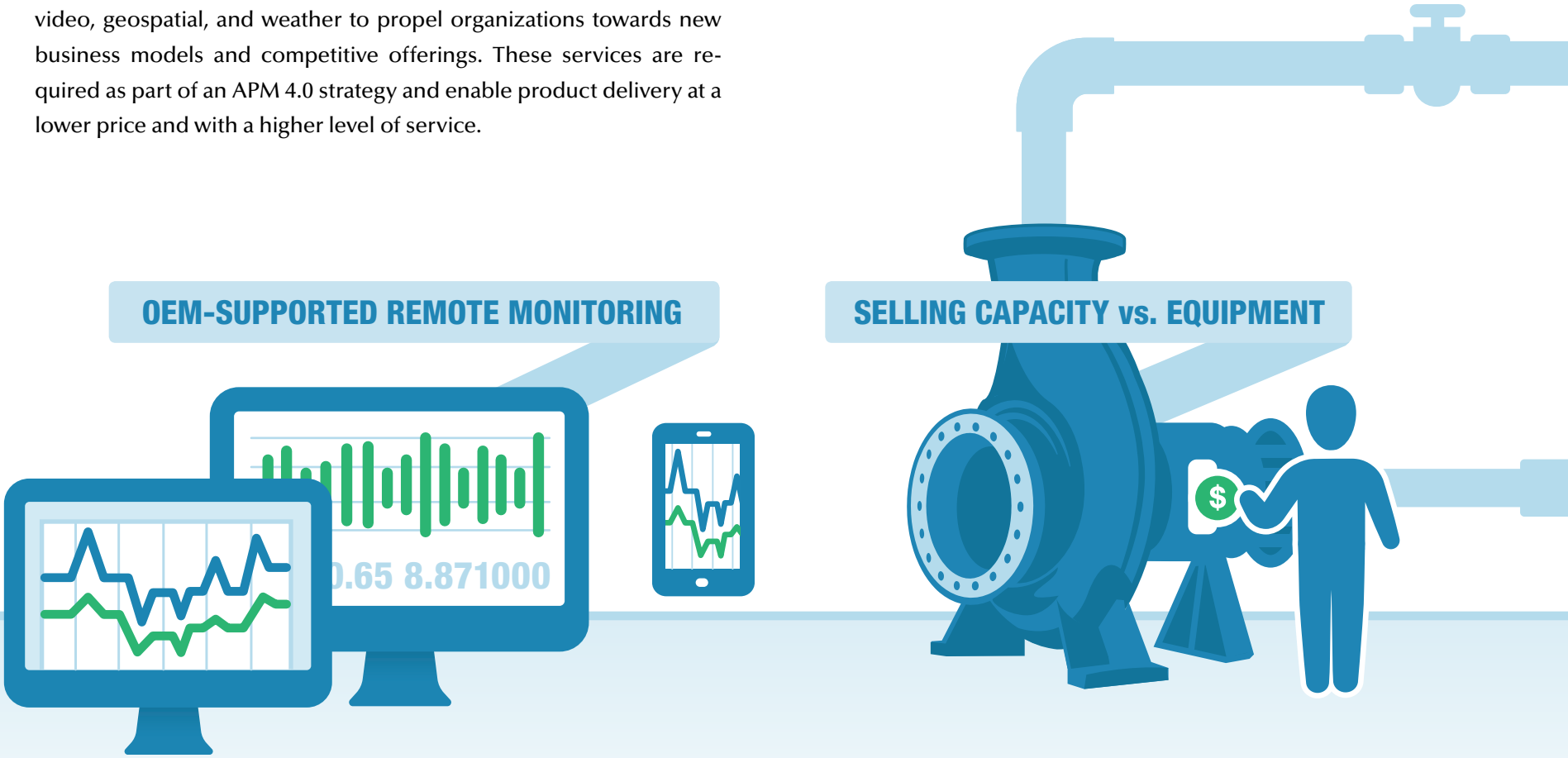
Convergence of sensors, instrumentation, controls, and assets

REAL TIME → PREDICTIVE → AUTONOMOUS



Smart Connected Maintenance Services

Organizations that adopt a smart connects assets strategy are gaining a competitive advantage and can be more profitable in doing so. LNS Research survey data validates this in multiple areas. As asset-intensive industries move toward prescriptive analytics and machine learning, the insights those technologies provide will mean companies deliver better services. These analytics incorporate new sources of data like video, geospatial, and weather to propel organizations towards new business models and competitive offerings. These services are required as part of an APM 4.0 strategy and enable product delivery at a lower price and with a higher level of service.



IIoT Platforms

Much work has been done by LNS to define and describe the promise of IIoT platforms. We are now at the stage that these platforms have solidified enough through partnerships and investments that it makes sense for companies to shift their IIoT posture from concept to action. For APM 4.0 to work properly, IIoT platforms are required. Technology companies build them specifically to handle many connections to assets and communication protocols, and when it makes sense, to send data to the Cloud. This is the backbone and the future of APM 4.0.

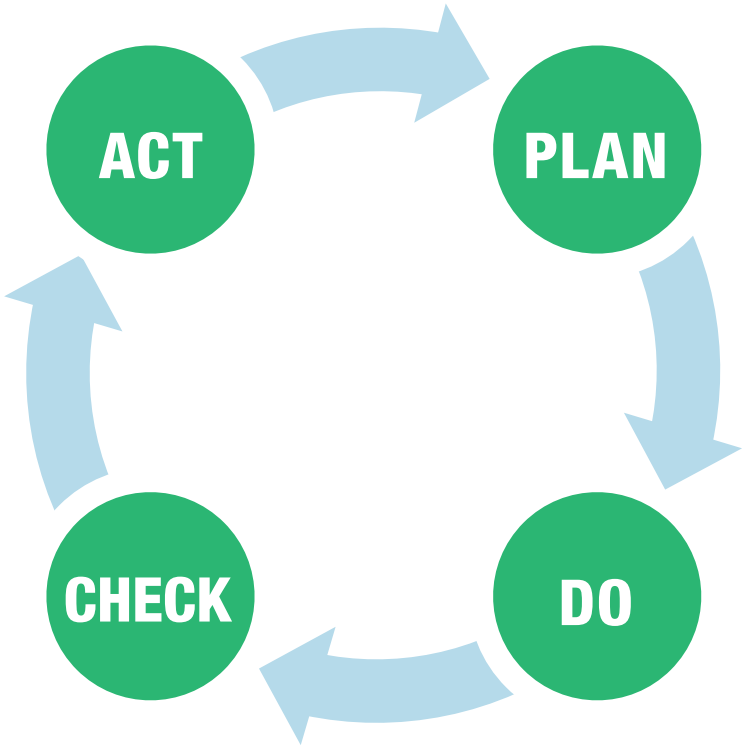
INDUSTRIAL INTERNET OF THINGS PLATFORM by LNS Research describes the connectivity, network styles, analytics, and applications frameworks to support smart connected operations and smart connected assets; within and across a plant, facility or production network in a manufacturing or other industrial operations setting.

Click to learn more about the
Industrial Internet of Things Platform

Maintenance Best Practices

Not just by coincidence, but as technology accelerated so did the learning curve on best practice APM. These best practices allow organizations to optimize maintenance teams and processes for optimal productivity. One of the most notable is PAS 55, the British Standards Institution's (BSI) Publicly Available Specification that evolved into a larger body of work on an international scale, ISO 55000. This standard outlines what high-level steps organizations should pursue, and makes allowances for each organization to configured it to meet its industry and cultural circumstances.

In the age of APM 4.0, maintenance professionals must follow industry best practices. Companies should take the time to work with experts to implement such programs, otherwise any technology will fail to live up to its potential.

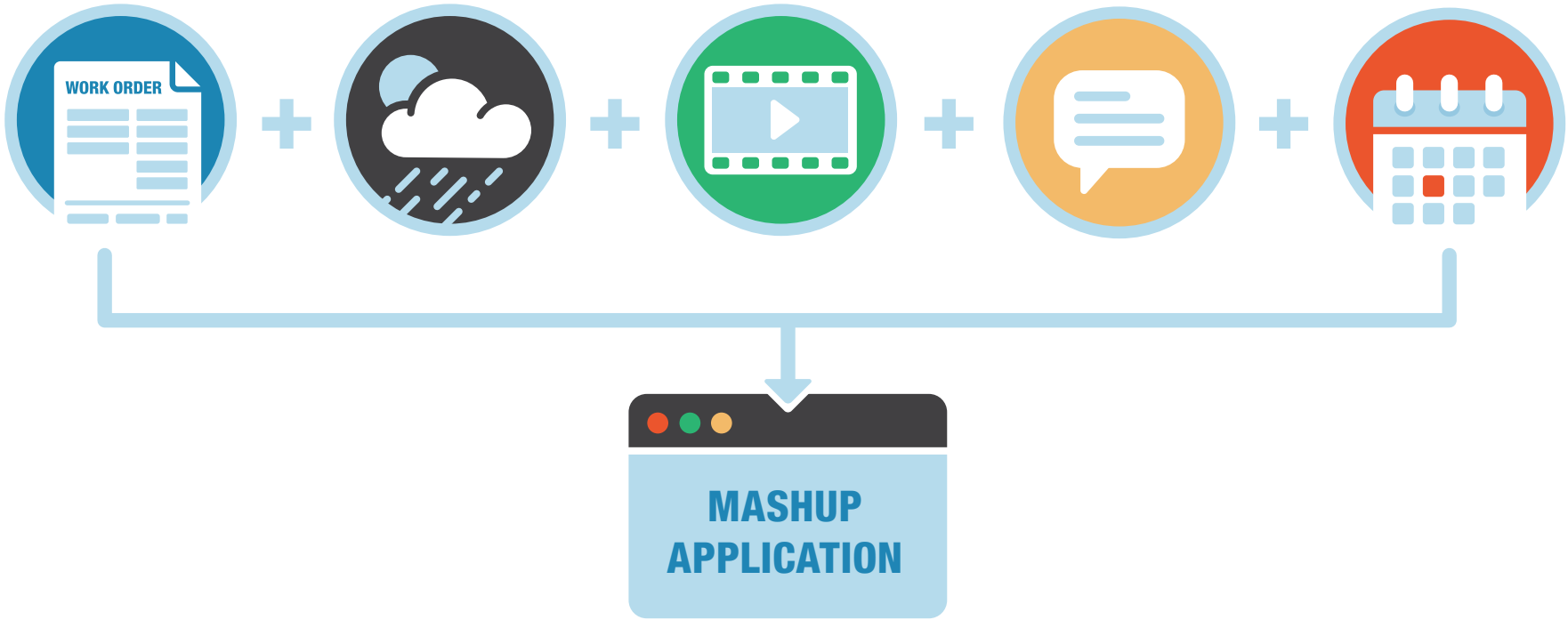


Mashup Applications

APM 4.0 is mashup at its best. It utilizes the sensing, prescriptive analytics and autonomy of smart connected assets and services and it leverages the connectivity, Cloud and predictive capabilities of IIoT platforms. Collectively, it brings to bear all the power of IIoT platforms and smart connected assets to increase insights for maintenance, with industry-specific maintenance best practices delivered through user-friendly, intuitive applications.

It's no surprise then that it requires mashup applications to achieve it. These mashups will use content (video, weather, text, schedules, etc.) from more than one source for a single view and interface to operate efficiently and effectively. APM 4.0 and the mashups for it break down organizational silos and related applications, by bringing together information that companies can now share more easily than before.

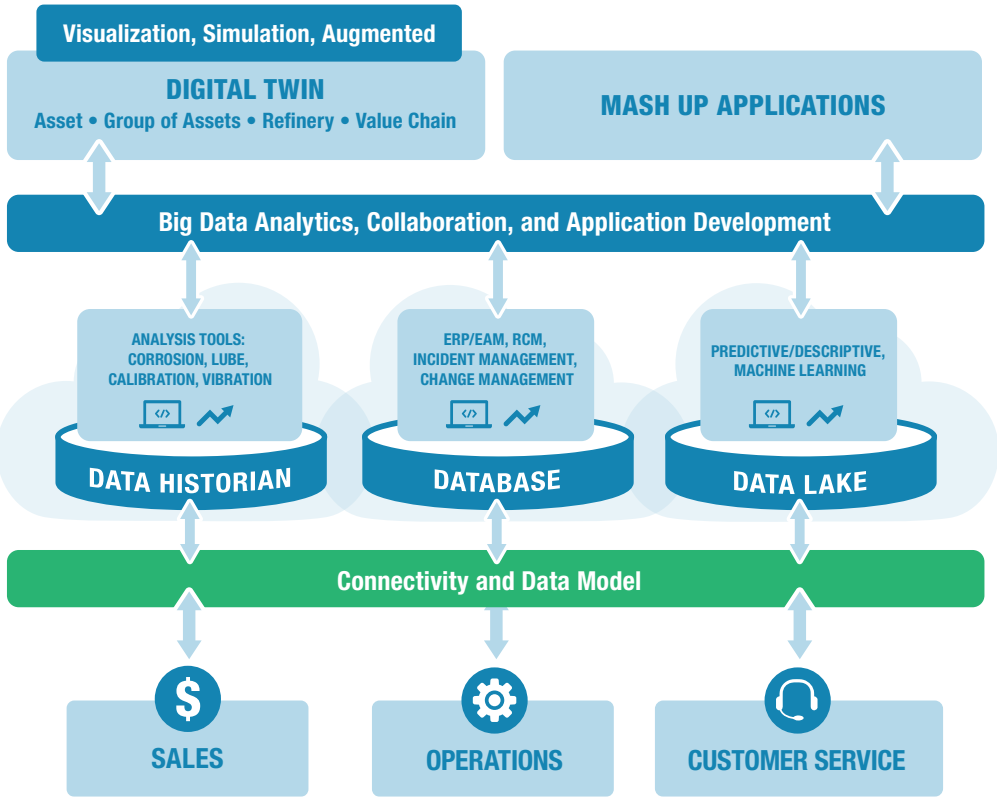
APM 4.0 gains insight from applications and data across the value chain. Now in play is information from sales and marketing, operations, finance, and customers. Organizations can also start to take an industry view, across operating units, to get the whole picture when making decisions.



The Ultimate Mashup: Digital Twin

ONE OF THE FIRST "killer apps" of value to maintenance is the Digital Twin; it's at the top of the food chain for APM 4.0. LNS defines the Digital Twin mashup as an application that can connect the data from assets and the services they provide, to anyone in the workforce, suppliers, manufacturers, sales and marketing, operations and maintenance, together on one platform, one application. The interface is more than just a digital copy of a physical asset; the Digital Twin mash-up offers virtual and augmented reality models that users can edit, manipulate and put into a larger set of context with other assets operating around them.

Consider petrochemical refining: the digital twins of the distillation tower, cracking units, reformer and alkylation units can be combined to simulate, visualize and monitor the performance of the entire system throughout the asset lifecycle. Where the digital copy of the physical asset is concerned, use cases are unlimited in APM 4.0. As an example, a company can use these twins to view and understand the status of an asset, use the sensor data from the asset to update the digital twin in real-time, and support operational decision making.



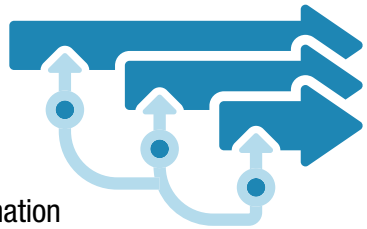
SECTION 4

Gearing Up for Success with APM 4.0

Roadmap to APM 4.0

Asset Performance Management is evolving, and leadership must take steps to manage the asset lifecycle in the IIoT era. A Digital Transformation approach will smooth the transition from traditional use of technology and prepare the company for the shift to the digital age of asset management. LNS recommends a five-step process to ensure you position the organization to succeed for years to come.

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**

STEP 1

Align the Organization with Best Practices

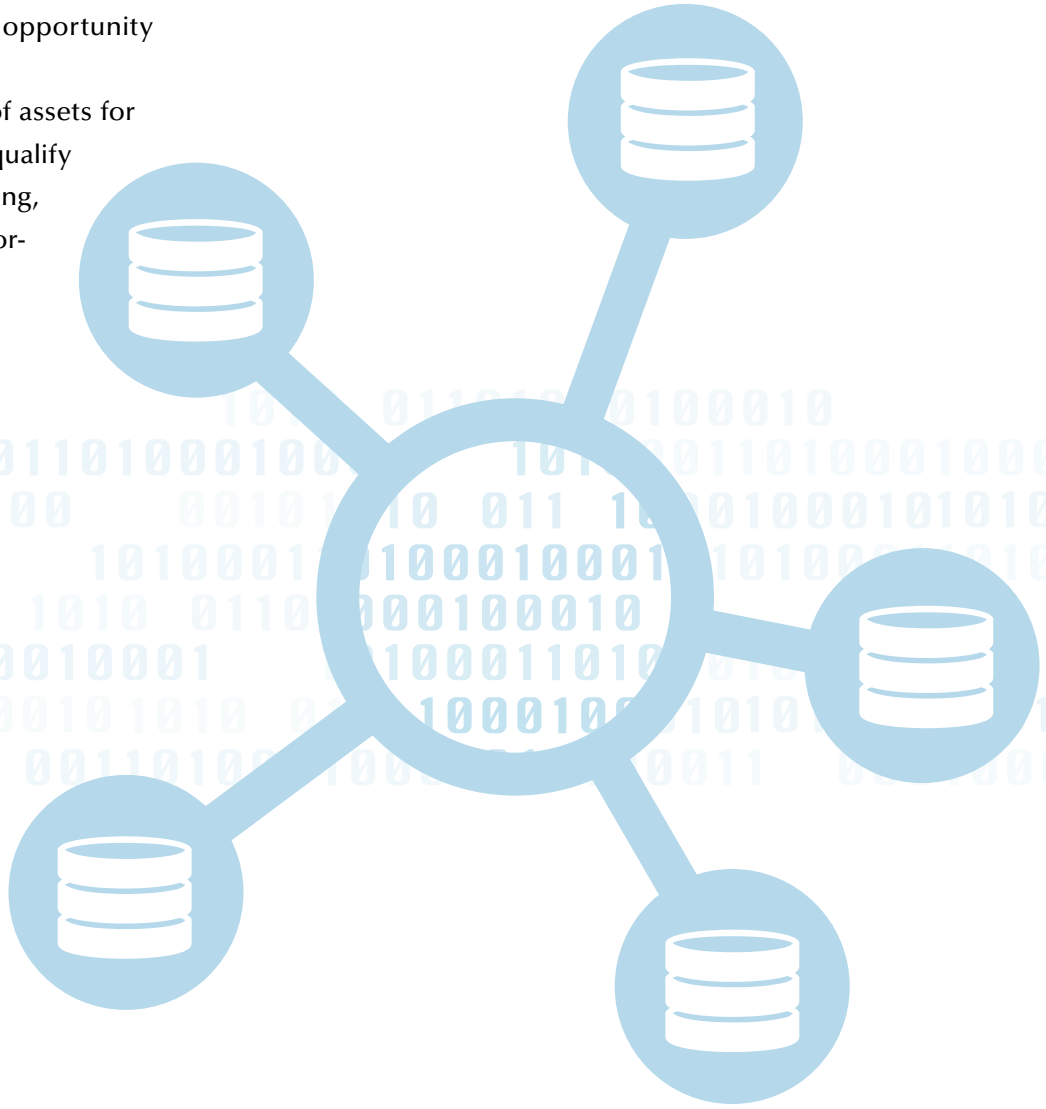
Use the best practice frameworks to align people, process, and technology. This approach ensures the maintenance organization aligns with the rest of the business and has a seat at the table when it comes to creating value. The effort requires maintenance organizations to commit to ISO 55000 and other applicable frameworks. These best practices provide flexibility to configure processes to fit specific organizational requirements and industry needs. It also allows for innovation to make step change improvements, trying and failing, and quickly adapting for continuous improvement. Formalizing the maintenance process will uncover any lacking skill sets, safety and regulatory gaps, and technology solution requirements. A good example of this is the creation of a digital services division to bring maintenance and IT closer to enable APM 4.0.

STEP 2

Understand Big Data and How to Use It in Maintenance and Operations

Data is both friend and enemy; ensure the company has a resource who understands it and how to harness it. APM often deals with data generated in multiple domains, such as historians, image/video, vibrations, etc. When the company combines these data sources and then applies predictive analytics, there is a real opportunity to move to APM 4.0.

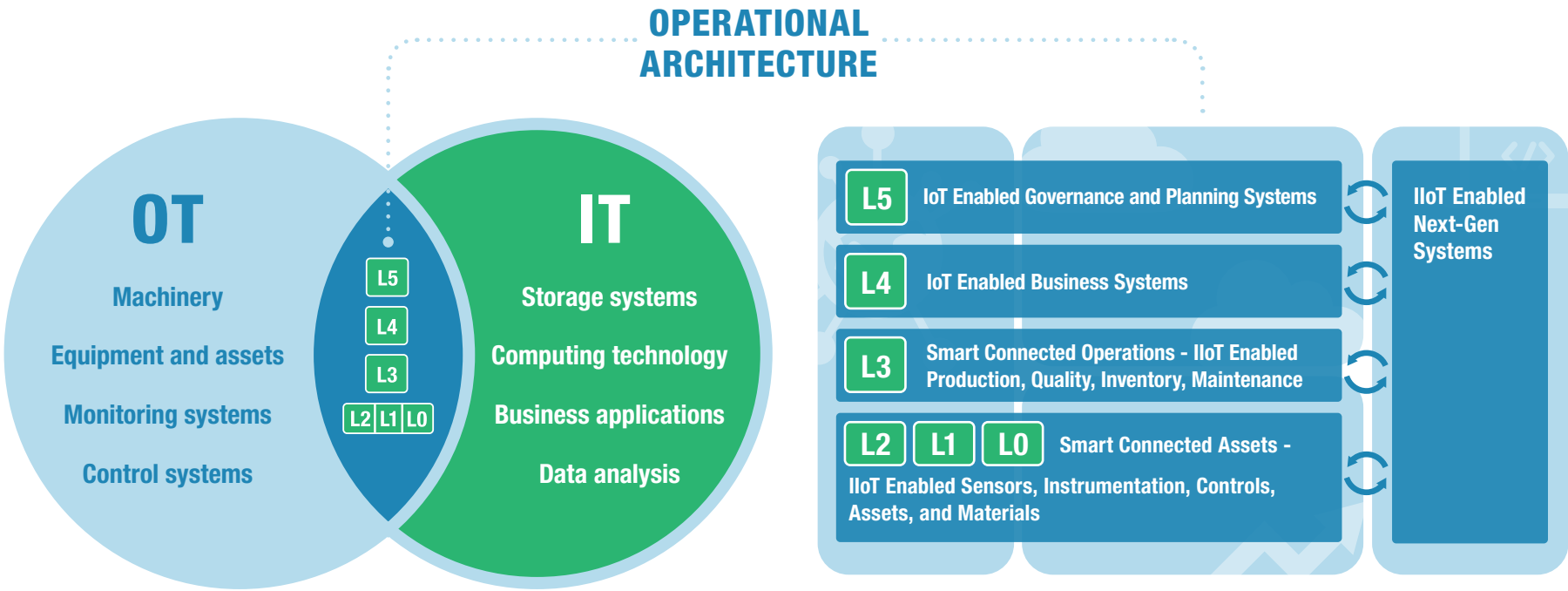
Beware: simply monitoring hundreds or thousands of assets for runtime to schedule preventative maintenance doesn't qualify as APM 4.0. Organizations must move to Big Data thinking, combining readily available data, with unstructured information, like internet searches and weather.



STEP 3

Use Operational Architecture to Execute

We believe strongly that Operational Architecture (OA) is critical to executing a successful APM 4.0 implementation within a manufacturing or asset intensive enterprise. Like any initiative, there are strategic and tactical elements. The OA exercise helps to clarify and separate strategy from tactics so that the company understands where their APM capabilities are today and define where it needs to be to accomplish goals. This is the roadmap of how to get from the as-is to the desired state.

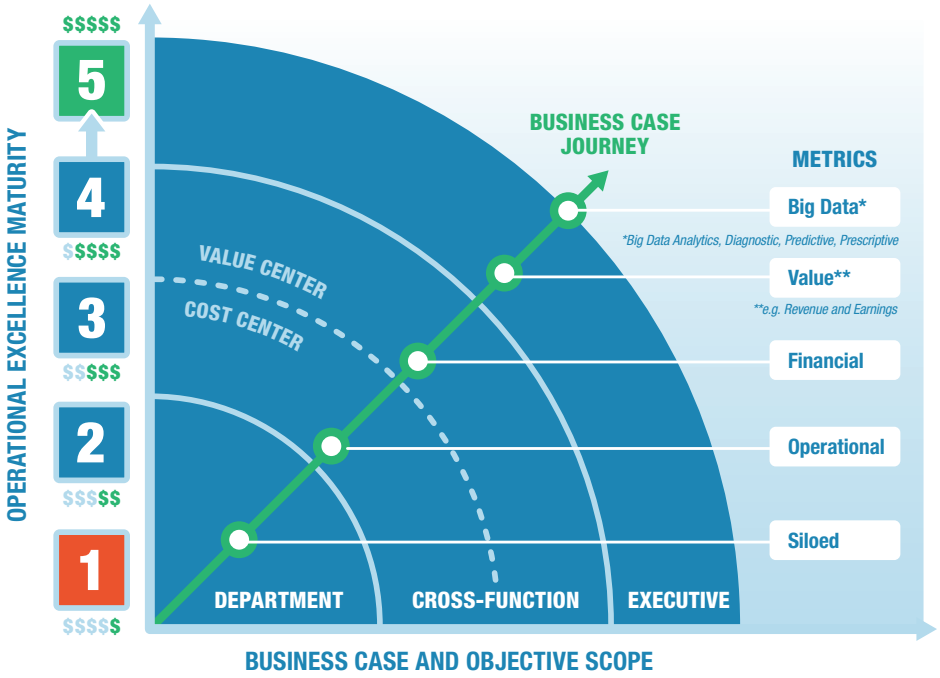


STEP 4

Build the Business Case

The business case charts an organization's journey from today's as-is state to the ultimate end goal. The company should pinpoint current APM maturity to prepare and moving up the business case journey line.

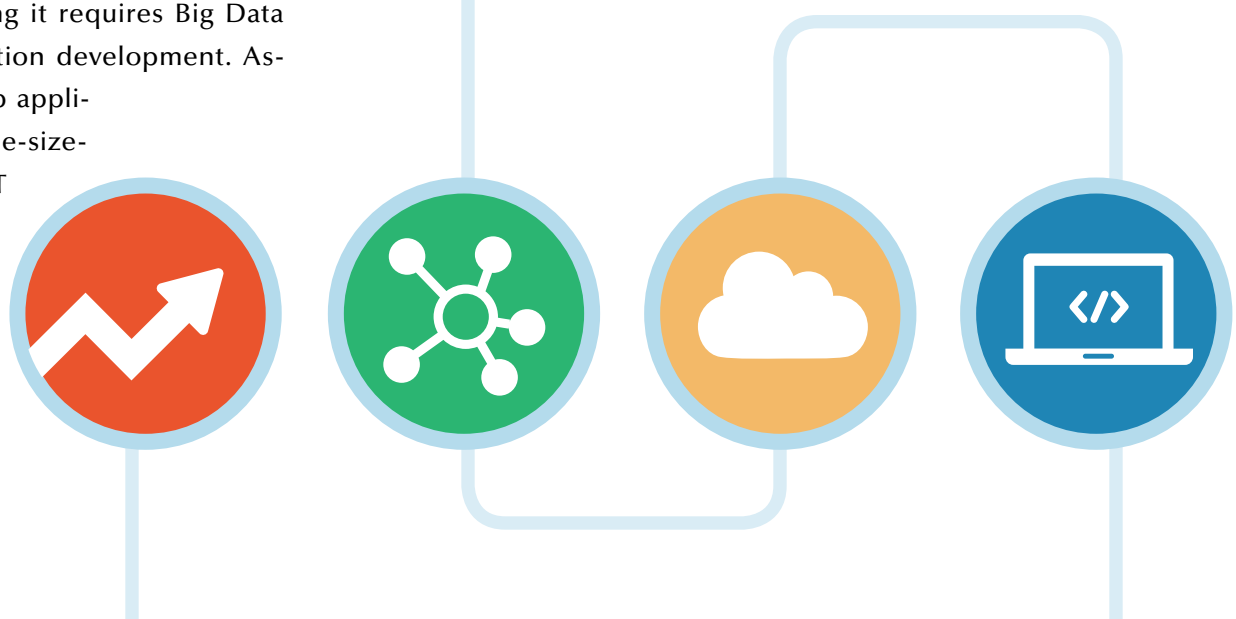
The business case journey provides a distinct dividing line where asset lifecycle and APM 4.0 shifts from being perceived as a cost center to a value center. It also helps to shape the solution footprint required to move forward with a technology selection process.



STEP 5

Build an IIoT Platform to Harness Data and Make Apps

APM 4.0 requires an IIoT Platform. Building it requires Big Data analytics, connectivity, Cloud and application development. Assembling this correctly will enable mashup applications like the Digital Twin. There is no one-size-fits-all approach to building the right IIoT platform. It requires a multi-vendor approach. This is a journey, figure out the requirements and map them to maintenance best practices.



SECTION 5

Recommendations

Recommendations

After years—even decades—of managing assets in a back room, there is now an opportunity to be heard in the boardroom. APM 4.0 is the only way to manage the asset lifecycle in a world moving to Industry 4.0 and smart manufacturing. We are in the early phases of transforming the asset lifecycle in the era of IIoT with APM 4.0. As more and more pilot projects lead to success and expand to larger enterprise projects, organizations will realize that managing assets is not a cost center, but an opportunity for value creation. For those ready to act now here are some key recommendations on how to get started with APM 4.0:

- **Follow the Digital Transformation framework**; it's the only way to align strategic objectives through to solution selection;
- **Architect and embrace an IIoT platform** as your approach to technology investment and deployment;
- **Incorporate smart connected assets** into your approach to Digital Transformation by leveraging the power of distributed intelligence and heightened data availability;
- **Create mashup applications** that culminate in "killer apps" like a digital twin;
- **Align technology decisions** with business objectives using Operational Architecture;
- **Adhere to best practices**; this is an important component that no business can overlook – APM 4.0 will fail to deliver the innovation promise without it; and
- **Do not forget** people, processes, and the connection with operational performance benefits and ROI; as the information begins flowing, new ideas and resources will be required.

Authors:

Jason Kasper, *Research Analyst*
jason.kasper@lnsresearch.com

Dan Miklovic, *Principal Analyst*
dan.miklovic@lnsresearch.com

Connect:

lnsresearch.com

ACRONYM QUICK REFERENCE
VIEW ON BLOG

Presented by:

LNS research

License to distribute this research report has been granted to:

Schneider Electric

HELSINKI
tel. +358 9 540 4940
info@klinkmann.fi

RĪGA
tel. +371 6738 1617
info@wonderware.lv

TALLINN
tel. +372 668 4500
info@wonderware.ee

VILNIUS
tel. +370 5 215 1646
info@wonderware.lt

САНКТ-ПЕТЕРБУРГ
тел. +7 812 327 3752
info@wonderware.ru

МОСКВА
тел. +7 495 641 1616
info@wonderware.ru

ЕКАТЕРИНБУРГ
тел. +7 343 287 1919
info@wonderware.ru

УФА
тел. +7 347 293 7004
info@wonderware.ru

САМАРА
тел. +7 846 273 95 85
info@wonderware.ru

КИЇВ
тел. +38 044 495 33 40
info@wonderware.com.ua

МИНСК
тел. +375 17 2000 876
info@wonderware.by

КАЗАХСТАН
тел. +77779994825
sales@wonderware.kz