Modern Approach to New Product Introduction (NPI)

SUSTAINABLE GROWTH VIA PROFITABLE, HIGH-QUALITY NPI

A QUALITY 4.0 SERIES PUBLICATION

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TABLE OF CONTENTS

ACRONYM
QUICK REFERENCE
VIEW ON BLOG

SECTION 1

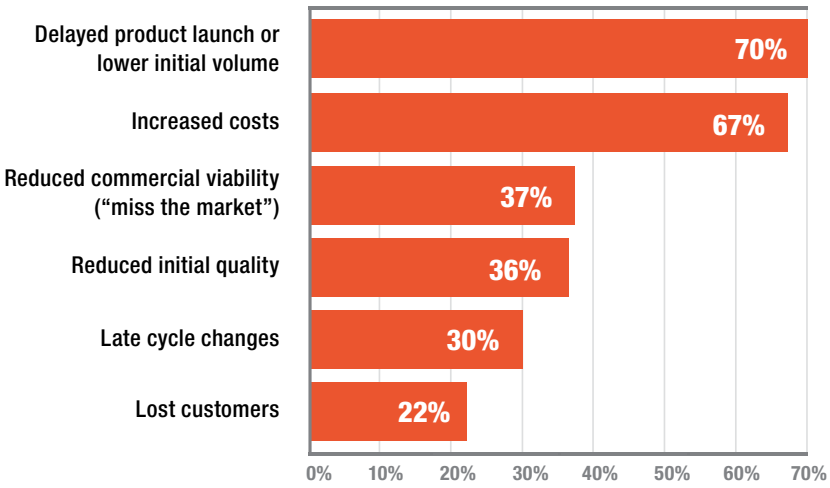
Executive Summary

Executive Summary

Developing profitable, timely, high-quality products is more important today than ever before. Visibility to product performance has never been higher, while competitive pressures continue to squeeze margins and time to market. To compete, manufacturers must deliver better, faster, and cheaper. It's "easy" to do one of these, hard to accomplish two, and a strategic, collaborative, digitalized effort is required to achieve all three consistently.

Manufacturers devote considerable cost and effort to new product introduction (NPI). LNS research reveals that the median manufacturer invests 25% of its personnel in NPI and introduces a new product in 24 months on average. Even with this substantial investment, NPI often fails to deliver expected outcomes. Only 56% of new products meet all NPI success criteria.

Which negative impacts has your company experienced due to challenges in managing requirements?



When we dig deeper, we discover that the market battles obstacles of ambiguity, siloed ideation, partially informed decisions, and misaligned actions. As an example, 55% of manufacturers experience insufficient cross-functional validation of requirements and specifications, which leads to market delays and increased project costs. Since 91% of companies still rely on spreadsheets and electronic documents to track requirements, is this surprising? There's only one way to survive in today's fierce climate: remove the obstacles that prevent collaborative NPI.

LNS projects that the gap between NPI leaders and laggards will continue to widen. Innovation leaders have overcome the traditional obstacles by digitalizing their NPI process. They leverage the advanced technologies of the Industrial Internet of Things (IIoT) to gather new insights from connected operations and connected products. These new insights can greatly reduce the uncertainty surrounding product performance, manufacturing operations, and in-service operating conditions, which has value to many NPI stakeholders. The most successful manufacturers will combine these new, clearer insights with the right culture and competencies to create market disruption.

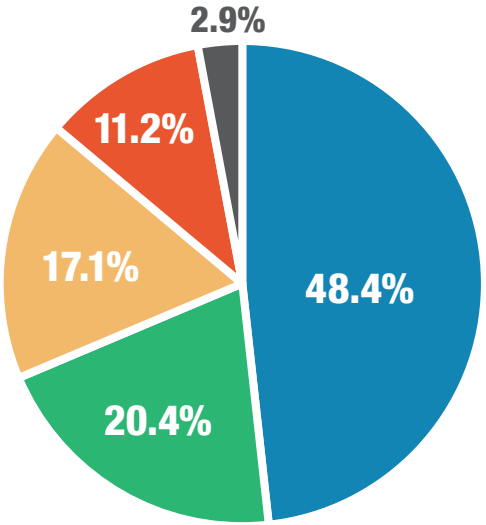
Corporate and functional leadership must reexamine NPI, remove roadblocks to favorable outcomes, and digitalize processes and information to achieve success in today's market conditions.

SECTION 2

Demographics

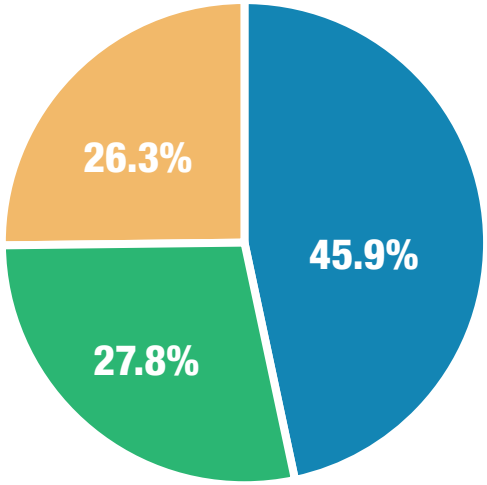
Demographics

Analysts leveraged two surveys for this report. The first is LNS' long-running enterprise quality management system (EQMS) survey, with 1198 respondents. It captures people, process, and technology best practices related to quality, and is a rich source of metrics and KPI data.



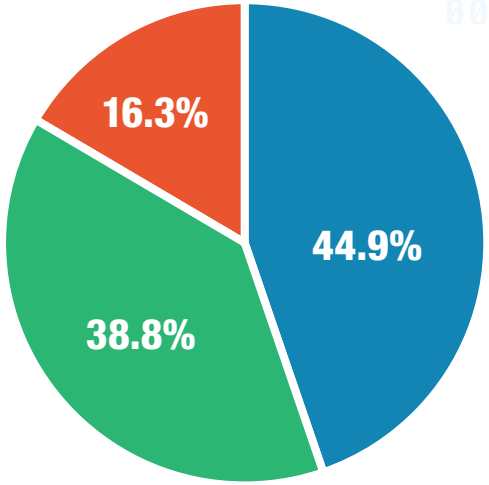
GEOGRAPHY
COLOR BY HQ LOCATION

- North America
- Middle East and Africa
- Europe
- Asia / Pacific
- Rest of World



INDUSTRY
COLOR BY INDUSTRY

- Batch
- Discrete
- Process

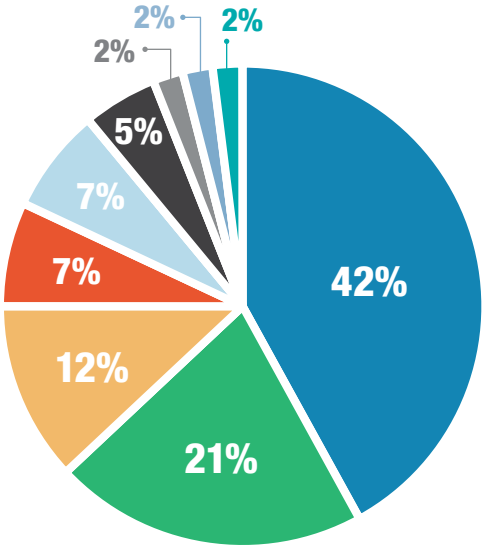


REVENUE
COLOR BY COMPANY REVENUE

- Small: $0 - $250M
- Medium: $250M - $1B
- Large: $1B+

Demographics *(Cont.)*

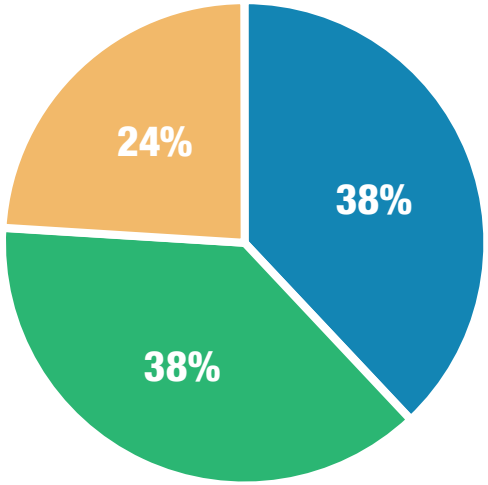
LNS also conducted a survey specifically for this study, which examines NPI and NPI success from a cross-functional perspective. We divided the survey into four sections: overall NPI process objectives and health, multi-stakeholder practice adoption and challenges, KPIs, and quality engagement. Total cleansed response count is 122.



DISCIPLINE

COLOR BY AREA OF RESPONSIBILITY

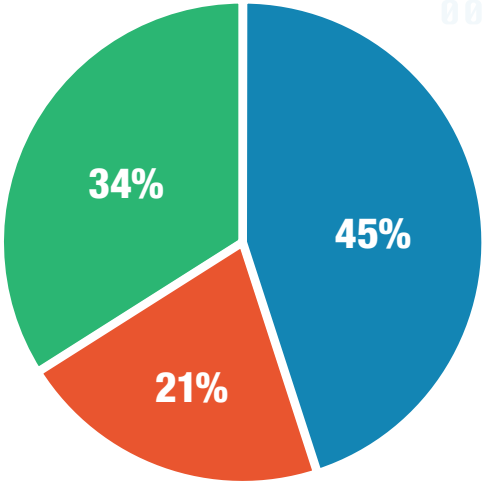
- Quality
- Product development
- Operations
- Information technology
- Business
- Production planning, handoff from development to manufacturing
- Compliance
- Energy
- Environment, health and safety



INDUSTRY

COLOR BY INDUSTRY

- Batch
- Discrete
- Process



REVENUE

COLOR BY COMPANY REVENUE

- Small: $0 - $250M
- Medium: $250M - $1B
- Large: $1B+

SECTION 3

NPI Megatrends

Globalization of Value Chain and Competition

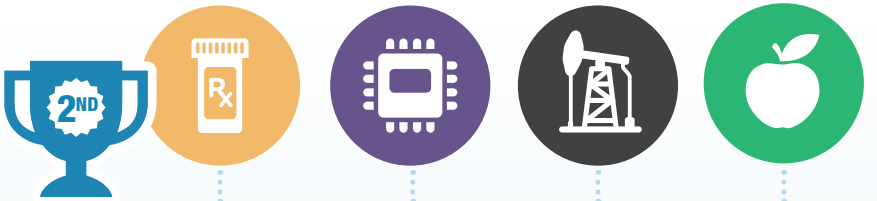
Globalization presents NPI opportunities, threats, and complexities. Global customers provide new revenue potential for manufacturers. However, there are many complexities to overcome to reach new regional markets. Each country may have distinct product regulatory and registration requirements with relevant documentation, validation, and approvals. Additionally, product requirements often vary by region, with specific culture preferences, cost and performance expectations, and infrastructure capabilities. For instance, poor electrical power and water quality impact requirements in certain regions. Furthermore, regional sourcing can affect IP protection and the quality of supplied goods and services. Launching a product in new regions can be lucrative, but success isn't necessarily a quick or easy proposition.

TOP TREND:
Collaborating with Complex Supplier Networks

HIGHEST-RANKED CONCERN IN...

AEROSPACE & DEFENSE
with **68%** of 497 respondents

AUTOMOTIVE
with **46%** of 548 respondents



SECOND-RANKED CONCERN IN...

LIFE SCIENCES
with **52%** of 747 respondents

INDUSTRIAL
with **43%** of 548 respondents

ELECTRONICS
with **47%** of 509 respondents

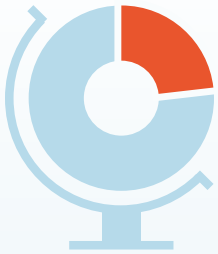
FOOD & BEVERAGE
with **41%** of 518 respondents

Globalization of Value Chain and Competition *(Cont.)*

Global low-cost competitors are a significant NPI consideration with several impacts on the market. They exert downward pricing pressure and trigger new marketing by regional incumbents which includes messaging related to quality, premium performance, innovation, or locally made. Quality and time to market are critical NPI criteria for incumbents facing low-cost threats, and the study reveals that quality is directly connected to time to market and costs.

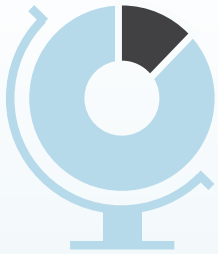
Global success requires expertise and active engagement from business leadership, compliance, quality, supply chain, validation, and product development.

NPI Objectives



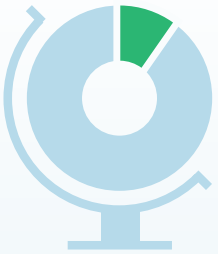
23%

Protect the customer base against global competition



12%

Develop products to sell and manufacture globally



8%

Satisfy regional requirements with new products

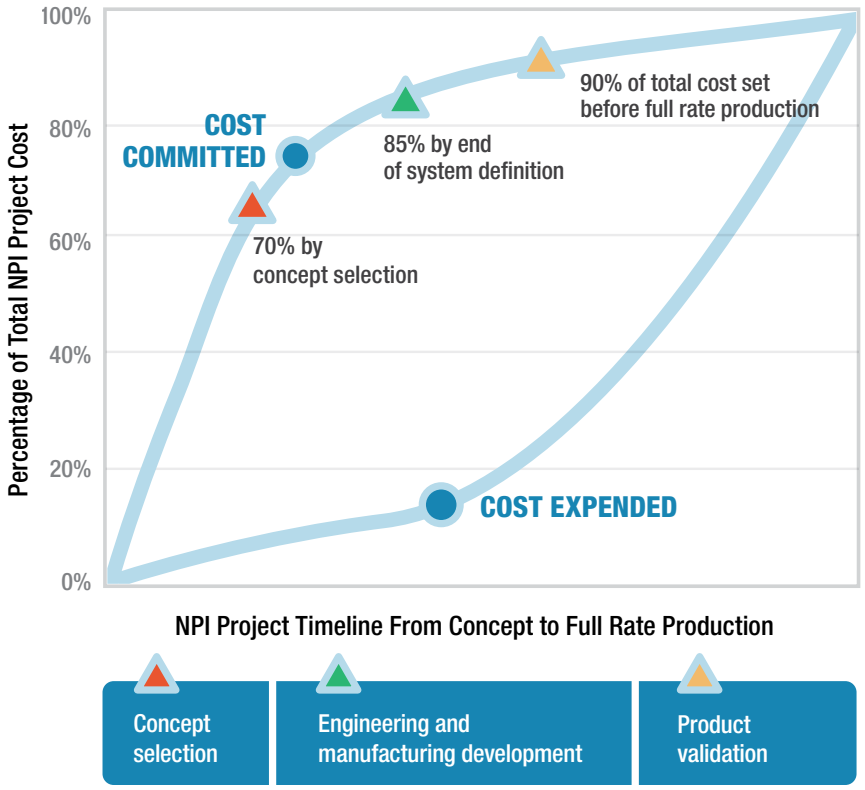
Product and Configuration Complexity

Product management has progressively grown more complex across all industry verticals, due to trends in product personalization, traceability, and increasingly technical products. For instance, the pharmaceutical industry has seen an increased focus on regulated supply chain traceability oversight. The FDA's recent investment in blockchain-based supplier data traceability demonstrates intent of much greater regulatory oversight of the drug supply chain in the future. Pharmaceuticals also have highly configured small batch drugs, creating significant development, operational, and data management challenges.

Discrete manufacturers have experienced significant shifts on several fronts. Traditionally mechanical products have increasingly added electrical and embedded software content. Configuration complexity has grown exponentially for some manufacturers as well. Transportation provides excellent examples. It's common knowledge that modern passenger vehicles may have more than 100 million lines of code, and while a heavy portion of this code exists in infotainment systems; modern software-controlled transmissions and other systems contribute as well. Heavy trucks have also gone digital, but may also have millions of possible configurations, meaning that each vehicle that rolls off the assembly line is different.

Although product and configuration complexity has increased, products must still meet aggressive project schedules, cost targets, and quality expectations.

Costs Determined Long Before Expenditure[1]



[1] *Sherman, Marty, and Bill Kobren. "Product Support Should-Cost Opportunities." DAU News. November 2, 2017. Accessed March 29, 2018. https://www.dau.mil/library/defense-atl/blog/Product-Support-Should-Cost-Opportunities.*

Time to Market Pressures

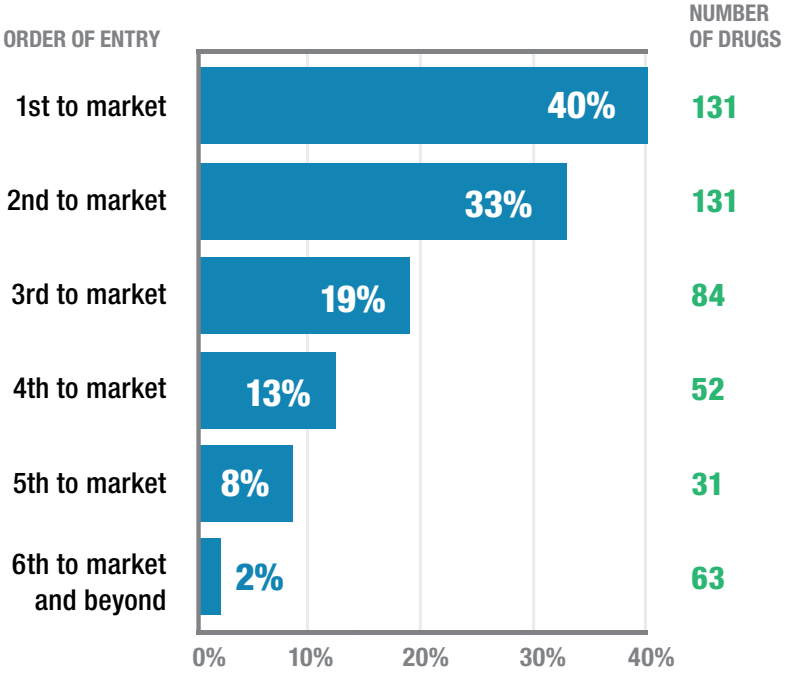
Time to market is critical to corporate success. Quickly evolving markets like technology rely on rapid time to market to adapt to the latest technology, leapfrogging competition. Conversely, science-rich environments like life sciences and aerospace and defense may have much longer time to market, which carries significant risk and can have a dramatic impact on market share and profitability. For instance, one drug manufacturer had projected 7% revenue growth upon the release of its second-generation drug until testing issues delayed approval. Experts now project that the firm will lose 35% of its existing market share to generics, a total swing of $174M.[1]

Technology plays an increasing role in time to market. Innovation leaders now leverage systems engineering, 3D models, simulation, and collaboration technologies to eliminate prototype tooling and production systems. Manufacturers adopting these approaches have reduced time to volume by 30%, providing tremendous competitive advantage and lasting market share.

While simulation is one important element, effective approaches rely on multi-stakeholder engagement with effective change management and collaboration between product, production planning, operations, and quality teams.

First Entrants on Average Achieve Higher Market Share Ten Years After Launch[2]

Average market share (measured by sales), 10 years after first launch in class, %



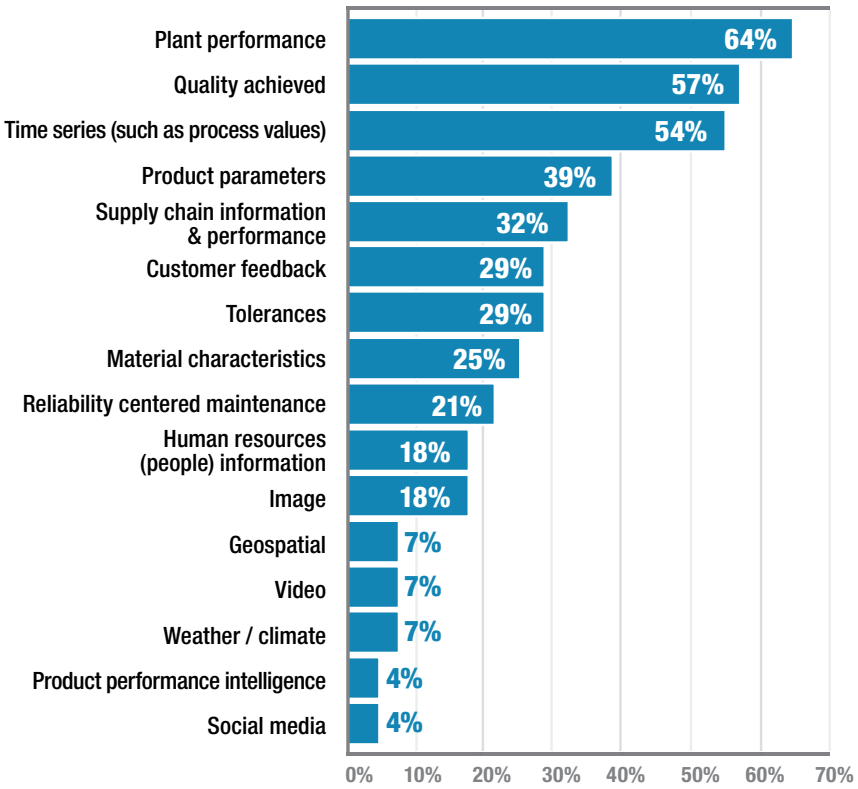
[1] *Gatlin, Allison. "Could An FDA Delay Snag This Biotech's Pre-Term Birth Drug?" Investor's Business Daily, Investor's Business Daily, 26 June 2017, www.investors.com/news/technology/could-an-fda-delay-snag-this-biotechs-pre-term-birth-drug/.*

[2] *Cha, Myoung, and Flora Yu. "Pharma's First-to-Market Advantage." Accessed March 18, 2014. https://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/pharmas-first-to-market-advantage.*

Product Performance: More Visible All the Time

This trend is the most powerful of all. Today's manufacturer delivers more complex products, quicker, and to more global regions. Business to business (B2B) and business to consumer (B2C) customers have unprecedented visibility of product performance and quality. This visibility directly correlates to revenue.

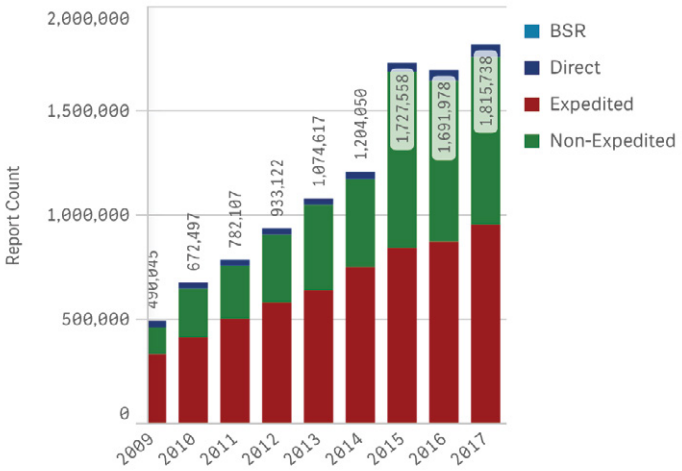
What types of data are used in your enterprise analytics system?



FDA Adverse Events Reporting System (FAERS) Public Dashboard

Total Reports 14,840,598 | Serious Reports (excluding death) 8,434,750 | Death Reports 1,491,711

Reports received by Year and Report Type



Reports received by Year and Report Type

	Total Reports	Expedited	Non-Expedited
Total Reports	**14,840,598**	**7,834,038**	**6,244,018**
2017	**1,815,738**	951,656	803,516
2016	**1,691,978**	869,959	771,026
2015	**1,727,558**	839,197	846,702
2014	**1,204,050**	746,074	423,744
2013	**1,074,617**	634,816	411,411
2012	**933,122**	577,515	326,586

Product Performance: More Visible All the Time *(Cont.)*

Consider this:

- Suppliers, such as those in the automotive supply chain, are monitored by automated and instrumented supplier management systems. These systems separate suppliers based on risk formulas, which include factors like quality and on time delivery. Preferred suppliers get a bigger slice of the pie, while higher risk suppliers require more oversight and receive fewer competitive contracts.
- Consumers use social media and online marketplaces to communicate product and services experiences with unprecedented reach and influence. Anything less than four stars can devastate product sales.
- The FDA recently launched a public dashboard featuring adverse events, making it easy for regulators, the life science value chain, consumers, and litigators to query adverse events.

This level of scrutiny and instantaneous global visibility means that manufacturers can no longer afford to launch products and improve them post-release. Product performance and quality must be excellent at initial release.

SECTION 4

NPI: Are We Ready?

Success and Performance

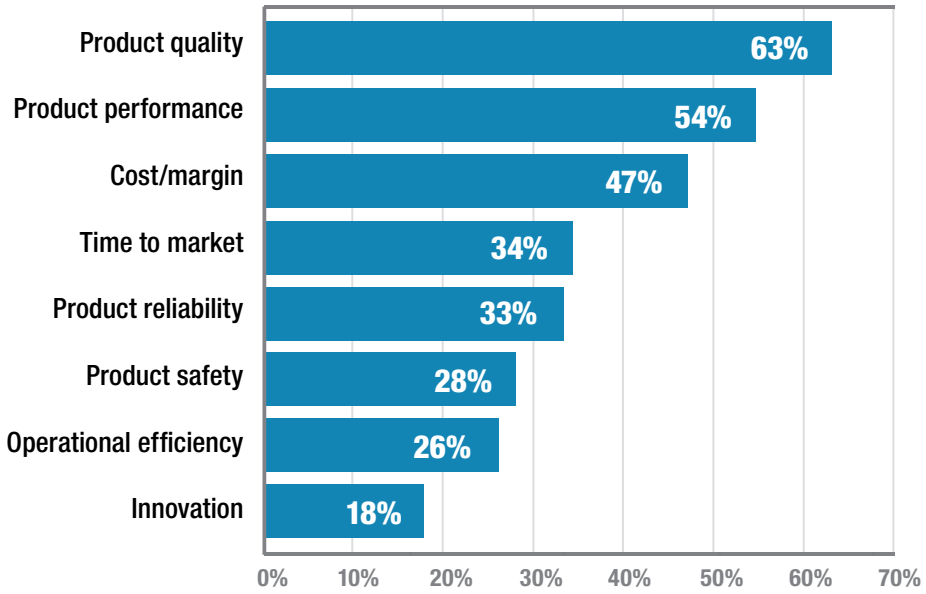
Is the market ready to face these sustained trends? One way to inspect this is to quantify the market's ability to introduce new products successfully. But what is a successful NPI? LNS research data identifies that the four top criteria required for successful NPI are product quality, product performance, cost/margin, and time to market.

While it's no surprise that these criteria were highest ranked, it is also well known that they tend to conflict with each other, particularly in late cycle changes when organizations must decide whether to increase cost, delay release, or launch with known quality defects. LNS data reveals that quality, costs, and time to market were prioritized nearly on parity. However, for many, all four criteria are required to claim NPI success, and any compromise means lower success rates.

Manufacturers invest heavily in NPI, with an average of 25% of the workforce focused on it, and a mean NPI cycle of 24 months. Given the investment, it's difficult to assert that the NPI process delivers against expectations; one area to improve is late cycle compromises.

How does your organization define "successful" NPI?

Select all that MUST be met and do not include secondary criteria.



COIN TOSS #1

HIGHER COST VERSUS QUALITY …

HIGHER COST WINS 52% OF THE TIME

COIN TOSS #2

DELAY LAUNCH VERSUS QUALITY …

DELAY LAUNCH WINS 55% OF THE TIME

COIN TOSS #3

NOT SUCCESSFUL PRODUCT LAUNCH VERSUS SUCCESSFUL PRODUCT LAUNCH …

NOT SUCCESSFUL WINS 44% OF THE TIME

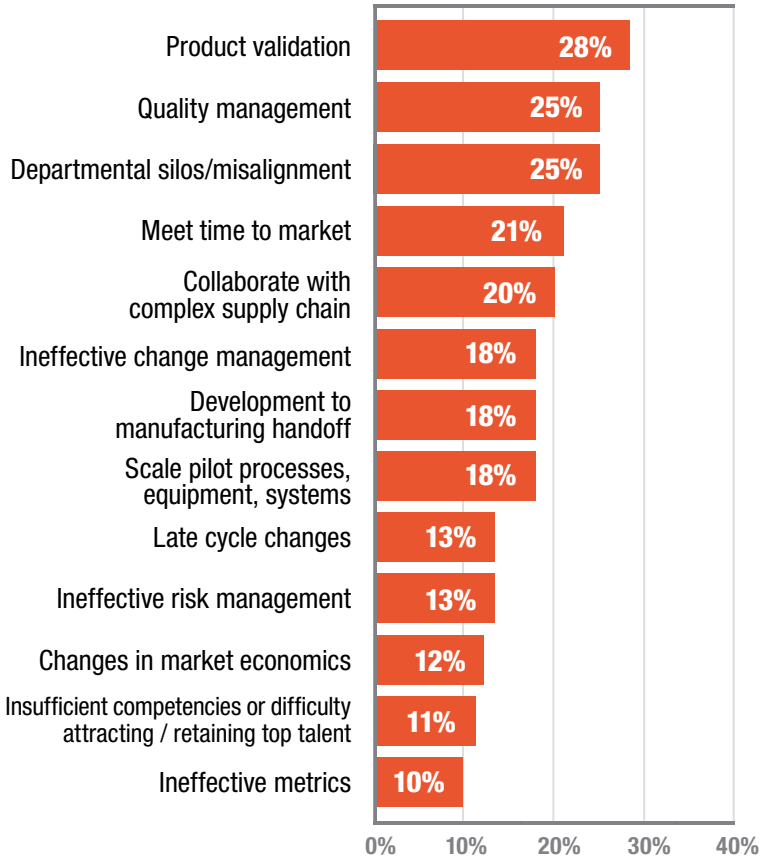
Objectives and Challenges

What will successful NPI deliver? For one, the market expects that NPI will drive business success. Top objectives for NPI include increased market share and revenue, filling specific market niches, and defending the customer base against global competition. NPI also provides the opportunity to build or enhance a brand around quality, innovation, quality of life, and a premium experience. Surprisingly, a relatively small portion of the market says that a top objective is launching smart connected products.

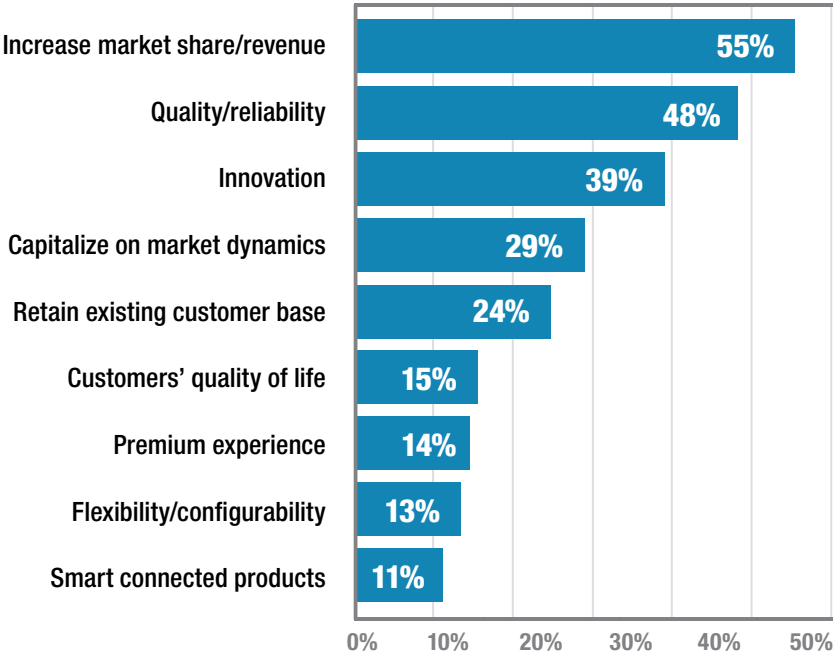
Several challenges prevent companies from achieving objectives. While many obstacles are significant, product validation, quality management issues, and departmental silos and misalignment are the top three challenges. The remaining hurdles, for the most part, fit broadly into the categories of organizational silos, process and collaboration silos, and data silos.

Companies expect NPI to deliver financial success and improved brand, but product validation, quality management, and departmental, process, and data silos are significant barriers to success.

What are your top challenges to achieve NPI objectives? (select up to three)



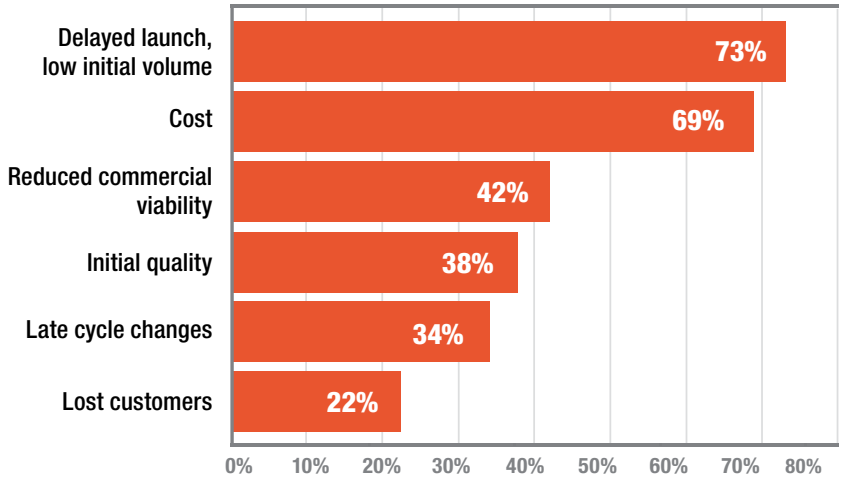
What are the top objectives for NPI? (select up to three)



Obstacles to Collaborative, Cross-Functional NPI

This study also explored requirements management, risk, product verification and validation, suppliers, and production planning. These are common areas that require handoffs among multiple stakeholders. Challenges vary by discipline, but three issues are common areas of concern: lack of consistent or formal processes, disparate systems and data sources, and late engagement in NPI. These challenges have a negative impact on time to market, costs, performance, and quality – all four of the top NPI success criteria. Clearly, the market has weak cross-functional collaboration, which is a critical obstacle to NPI success.

Challenges in Requirements Planning, Negative Impacts



Common Challenges by Discipline

	ENGAGED TOO LATE	DISPARATE SYSTEMS, DATA SOURCES	NO CONSISTENT OR FORMAL PROCESS
Requirements planning	29%	31%	42%
Risk	20%	24%	43%
New product test	n/a	15%	24%
Supplier management	40%	33%	35%
Production planning	30%	36%	n/a

SECTION 5

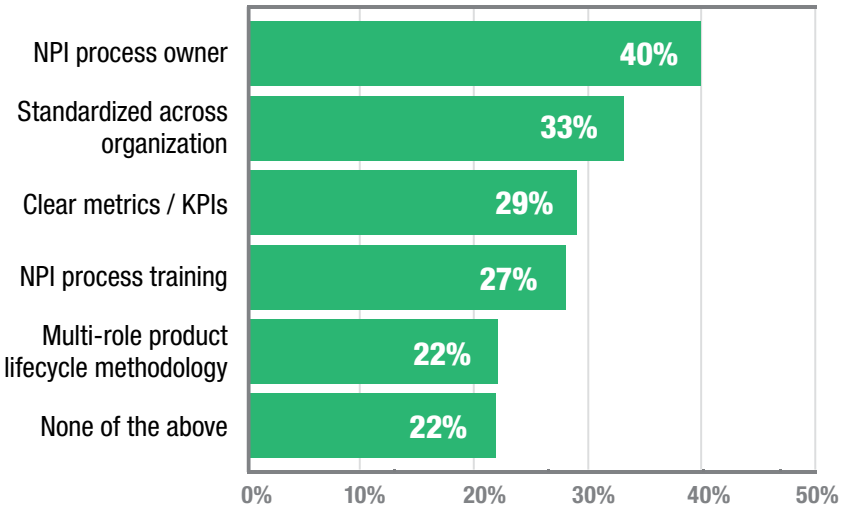
Three Keys to Differentiation with NPI

Key to Differentiation #1 | Strategic

We now understand the strategic relationship between NPI and business targets and that success in NPI must include multiple stakeholders. It's also clear that silos prevent collective participation and decision-making, which is a leading cause of NPI process failure. The first step to break down silos is align objectives among disciplines, departments and peers. Interestingly, product development and operations teams report that their top objective is improve quality, while that very thing is third on the quality team's list; their top two objectives are compliance and cost reduction.

The LNS Digital Transformation framework prescribes aligning objectives as the critical first step. While NPI itself is strategically important, leaders must align Strategic Objectives of the stakeholders engaged in NPI to overcome obstacles and meet defined success criteria.

NPI Practices Adopted Enterprise-Wide



Top 3 Objectives by Discipline

OPERATIONS

- Product quality — 68%
- Production efficiency — 58%
- Manufacturing agility — 34%

PRODUCT DEVELOPMENT / PRODUCT MANAGEMENT

- Product quality, reliability, safety — 47%
- Product performance differentiation — 47%
- Corporate financial targets — 42%

QUALITY / COMPLIANCE

- Customer requirements, industry standards, regulations — 68%
- Total cost of quality — 48%
- Quality metrics (complaints, efficiency) — 26%

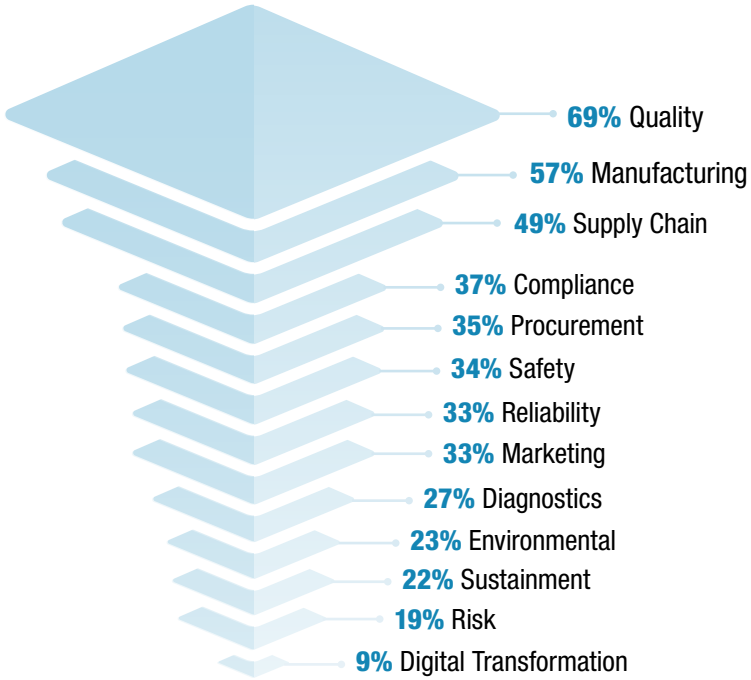
Key to Differentiation #2 | Collaborative

How healthy is your NPI process? Surprisingly, most industrial organizations lack fundamental NPI process practices, resulting in poor repeatability and monitoring. Twenty-seven percent of companies do not have an NPI owner, consistent corporate-wide NPI processes, KPIs to measure process health, formal NPI training, or a defined process to engage multiple stakeholders.

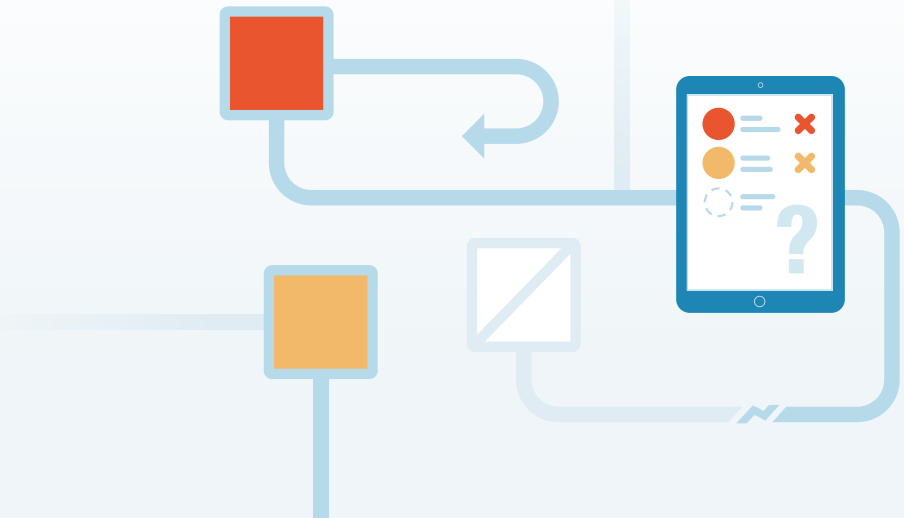
The rest of the market has made some progress embedding certain disciplines with a standardized process and methodology into NPI, particularly quality and manufacturing/assembly. The median respondent embedded four of thirteen disciplines into NPI. While all disciplines are not needed for all organizations, many of the disciplines identified are important regardless of industry. Embedding disciplines compounds value. In fact, quality management data is the most broadly used for lessons learned.

Top management and cross-functional leaders should prioritize efforts to improve NPI process management and engage every relevant discipline in a repeatable and measurable fashion. NPI strategies should include Digital Transformation.

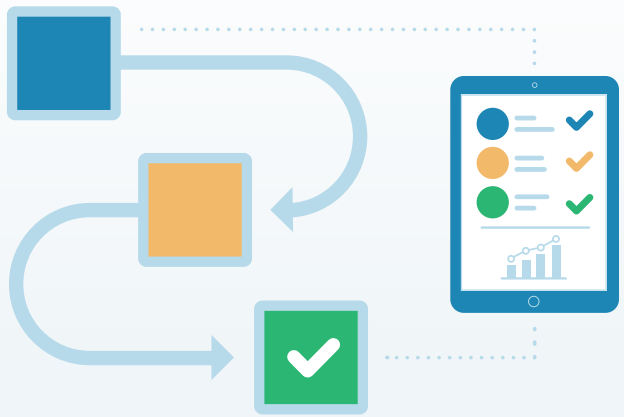
Disciplines Embedded in NPI



NPI NEGATIVE OUTCOMES



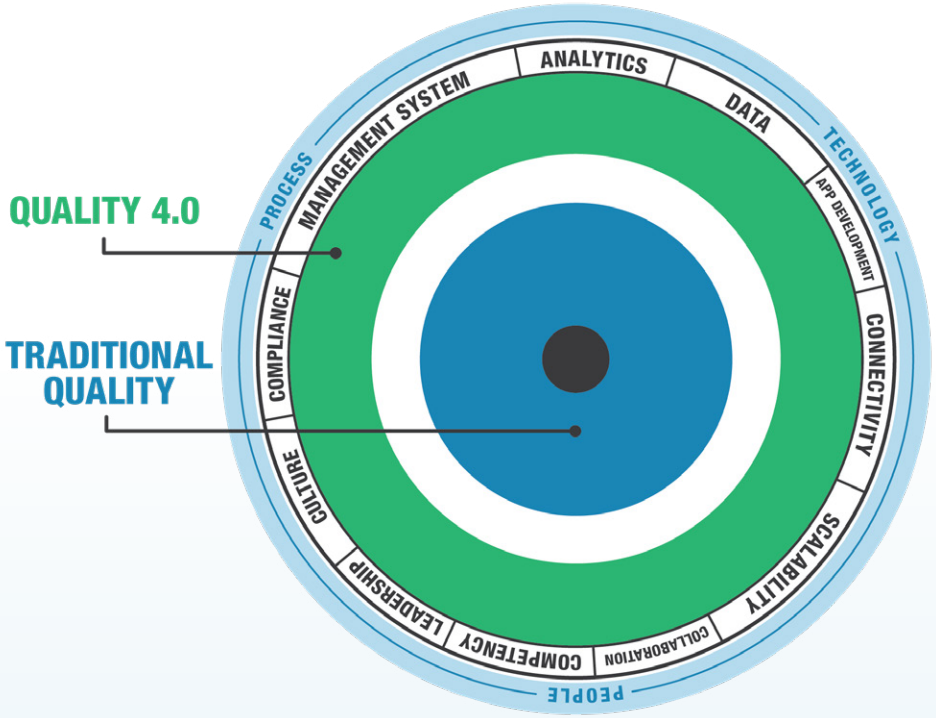
NPI POSITIVE OUTCOMES



Key to Differentiation #3 | Digitalized

The traditional approaches outlined above are important, because they form the backbone to align teams, processes, and data. Market leaders live by Deming's mantra, "In God we trust, all others bring data." Furthermore, they have built a corporate-wide data architecture that provides real-time visibility across multiple stakeholders, democratizes data, and leads to collective decisions. However, while traditional data management, visibility, and analytics are valuable, they are insufficient to achieve differentiation in the current market environment.

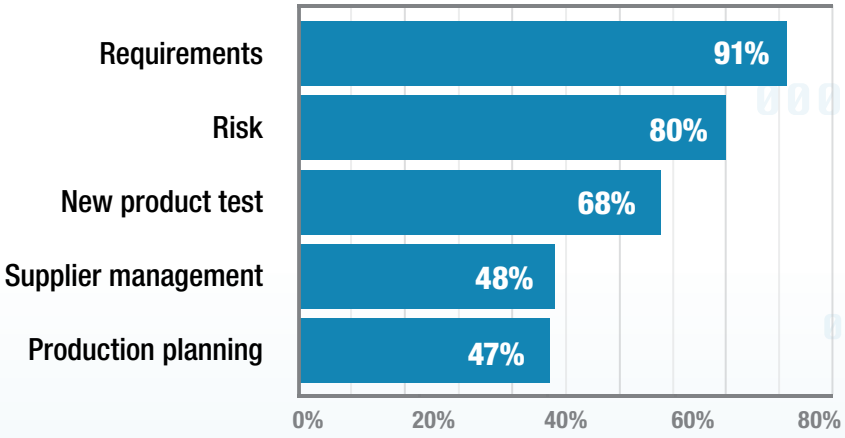
Manufacturers need a digitalization strategy. Just like today's market leaders, it should include data from traditional systems like the enterprise quality management system (EQMS), product lifecycle management (PLM), and enterprise resource planning (ERP) among others. Tomorrow's leaders will also include data from sensors, mobile devices, social media, and online marketplaces. Innovative manufacturers couple all that data with advanced analytics to capture new insights that push product performance and customer satisfaction previously unattainable levels.



State of the Market: NPI Data Management

The NPI process varies in complexity by organization, but all companies have an NPI process that includes multiple stakeholders engaged in activities similar to those shown. Just as processes should always include all relevant stakeholders, the team should be informed by data and insights from across the stakeholders. As mentioned previously, NPI data management remains a top challenge because spreadsheets and electronic documents remain the tool of choice for many critical NPI processes.

Portion of the market using spreadsheets and electronic documents to manage critical NPI data.

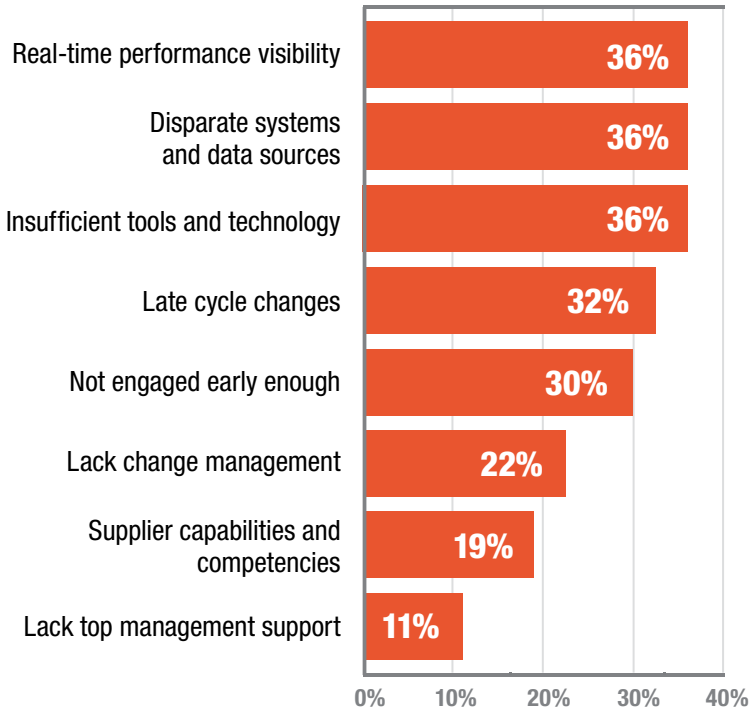


State of the Market: NPI Data Management *(Cont.)*

This creates many obstacles for collaboration, decision-making, and continuous improvement. Nearly all the top challenges experienced in production planning can be attributed to poor data management. In contrast, effective data management enables transparency, change management, and management of complexity. In turn, data transparency improves process efficiency and more importantly allows collective data consumption for better decision making. Effective change management is a critical ingredient when engaging multiple stakeholders early in NPI; without change management, the temptation is to push broad stakeholder engagement until the product is "stabilized" which is far too late in the cycle. NPI is inherently complex, with multiple revisions occurring until (and after) product launch and many potential configurations.

As leaders labor to establish transparency and change management, and ease complexity, they must understand that spreadsheets and electronic documents have a proper place. They are not a long-term solution for critical data and they create roadblocks to NPI success.

Top Three Challenges in Production Planning (development to manufacturing handoff)

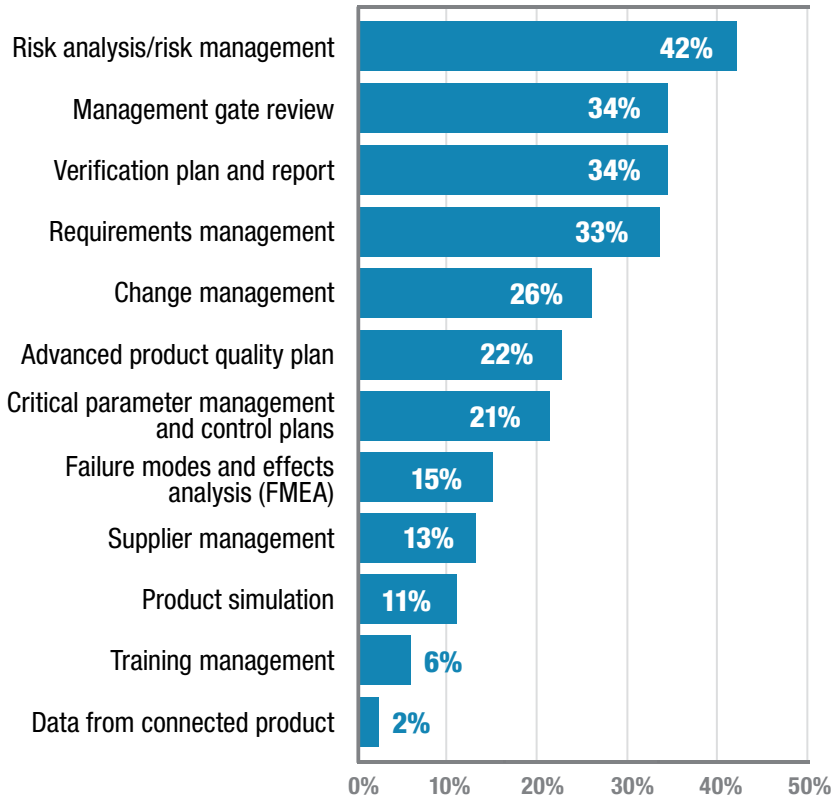


Operational Architecture and NPI

NPI doesn't end with product development or handoff to manufacturing. In fact, 34% of companies monitor the success of a new product over its entire useful life, which underscores the importance of a true lifecycle approach to NPI data. Monitoring includes data from IT and operational technology (OT) systems. IT systems, including PLM, ERP, and EQMS are traditionally used in product development and process management. OT systems, including the manufacturing executions system (MES), factory automation, and connected sensors are traditionally used in process execution and asset monitoring. Operational Architecture is how companies organize and integrate IT and OT systems and technology to execute across all business activities.

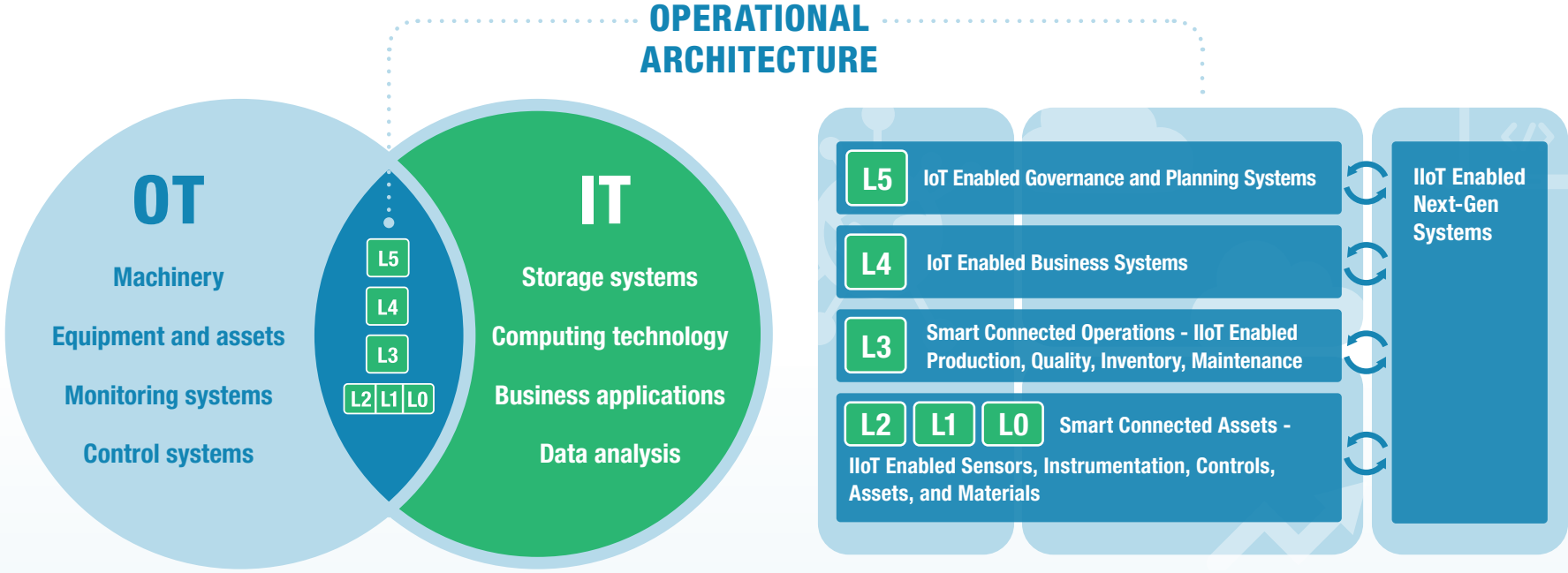
An Operational Architecture is required to take today's spreadsheet-laden NPI process and convert it to a structured and integrated system. It's the approach that connects "lessons learned" data from prior products to many systems: those that manage current product requirements and specifications and those that perform risk analysis. In turn, they feed risk-based design verification plans, critical parameters, and manufacturing quality control plans directly to the MES. Most importantly, the Operational Architecture ensures the data feeds take place in a change managed fashion and that the data is visible to management at gate reviews. These capabilities are critical to achieve successful NPI, and when connected enable new insights and performance.

Critical Capabilities for NPI Success



Operational Architecture and NPI *(Cont.)*

The Operational Architecture can also embed sensor data into processes. One example of this is "zero defect" initiatives, which build upon traditional manufacturing operations and quality systems. By coupling manufacturing operations data (including sensor data) with warranty systems, the process can detect patterns from asset sensors and predict parts that, although inspected, are still likely to fail in warranty.

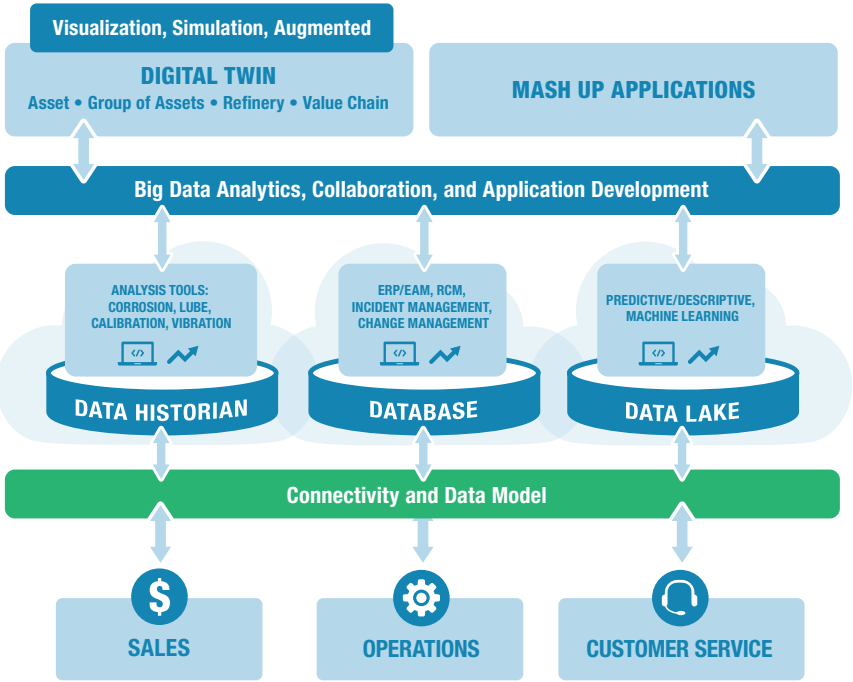


Digital Twin and NPI

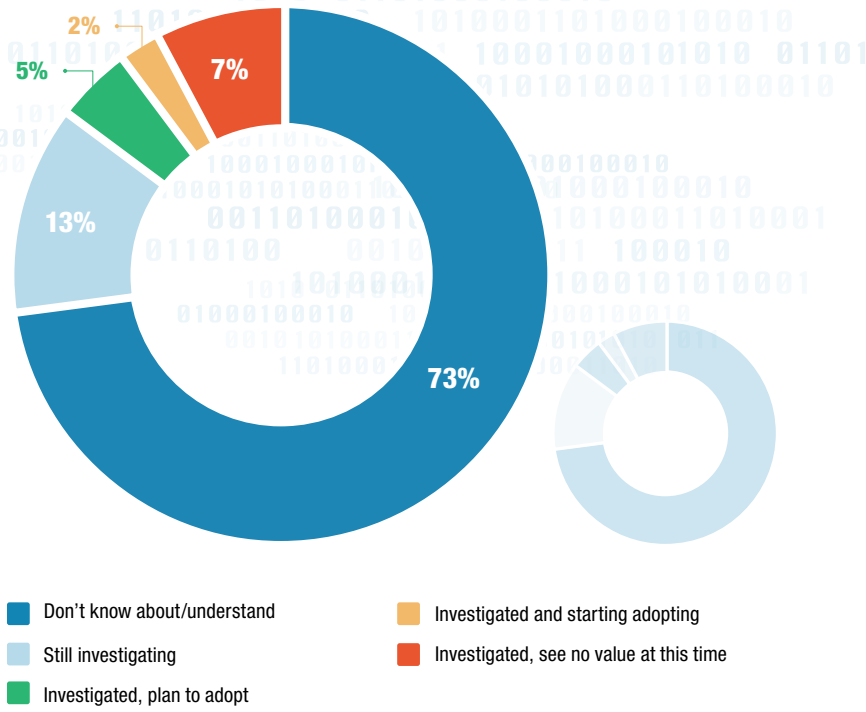
One special application of Operational Architecture is Digital Twin. LNS defines the Digital Twin mashup as an application that can connect the data from assets and the services they provide, to anyone in the workforce, suppliers, manufacturers, sales and marketing, operations and maintenance, together on one platform, one application. The interface is more than just a digital copy of a physical asset; the Digital Twin mashup offers virtual and augmented reality models that users can edit, manipulate and view in context with a larger set of assets operating around them.

Consider aerospace engine manufacturers: the digital twins of in-service engine performance are used to simulate, visualize and monitor current generation and future generation engines during development, in manufacturing, and throughout the asset lifecycle. There are many use cases of Digital Twin. As an example, a company can use a digital twin to view and understand the status of an asset, apply asset sensor data to update the digital twin in real-time, and support operational decision making.

Although Digital Twin has many potential benefits, much of the market remains unaware of it, and only a small portion has adopted the technology.



How does Digital Twin impact your business today?



SECTION 6

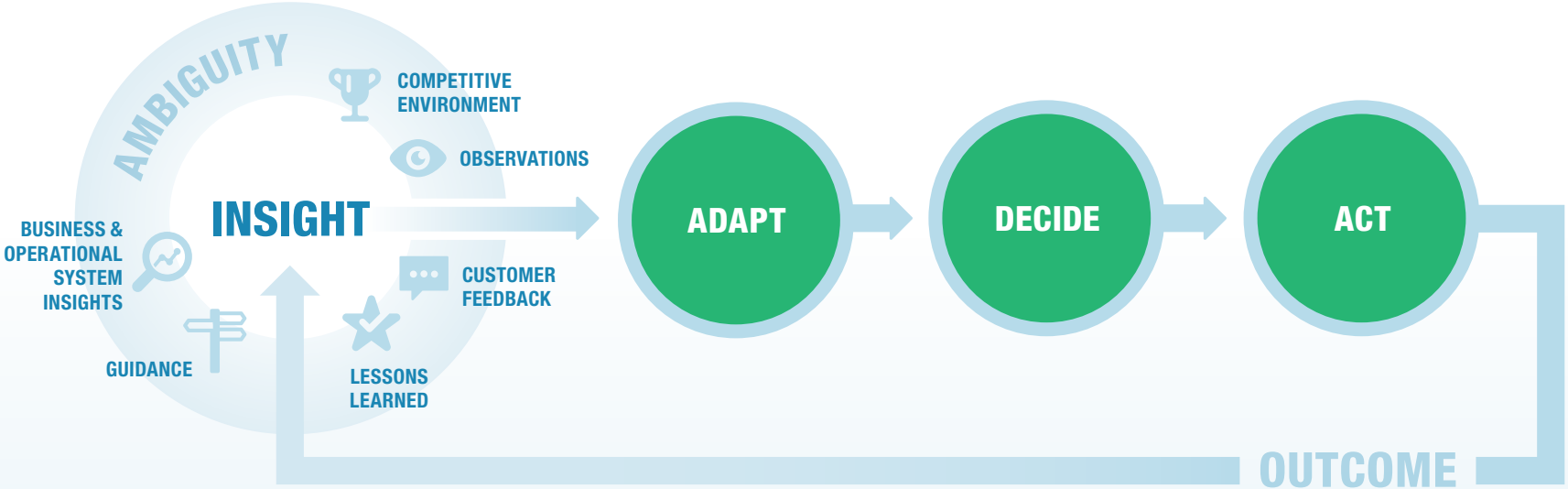
The Digital Innovation Cycle

What is the Digital Innovation Cycle?

Agility, adaptation, and innovation are prized competencies in today's business climate. Disruption is top of mind because it is both a genuine opportunity for the organization that creates or leverages it, and a (potentially serious) risk for the competitor. Today's manufacturers are exposed to unprecedented external forces, but also have the potential to access unprecedented insights. However, even with the best insights, are the correct subject matter experts involved who can interpret the insights and lead adaptation? Will internal biases prevent teams from pivoting to the best competitive decision? Will internal friction slow decision-making?

The Digital Innovation Cycle blends the elements of strategic, collaborative, and digitalized into a cycle that drives innovation and disruption, and enables manufacturers to excel in today's market. It is a framework for industrial companies to capture insights, adapt perspectives on the market, decide to commit resources based on the new perspectives, competently act, drive positive outcomes, and achieve objectives.

The Digital Innovation cycle doesn't replace existing processes such as phase-gate, agile, or plan-do-check-act. Instead, the framework captures how to embed innovation and digital insights into the existing process.

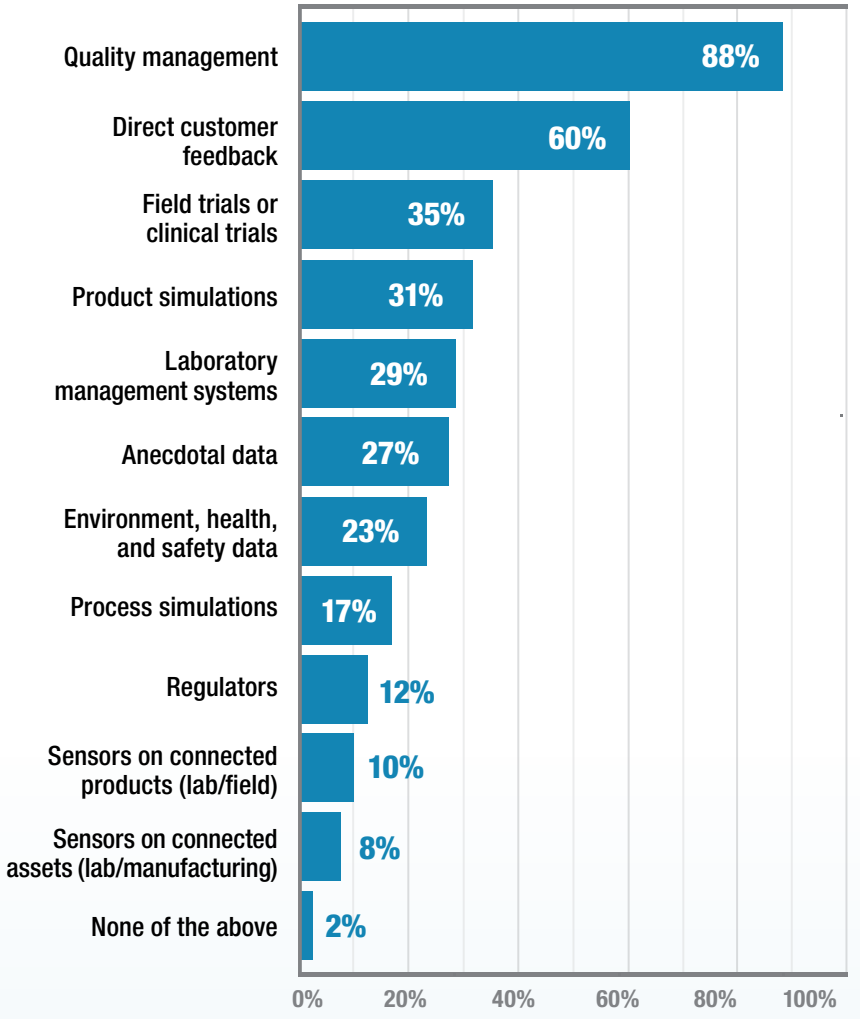


Insight and Ambiguity

Insights are the data and observation inputs into the Digital Innovation Cycle, which includes traditional inputs:

- Observations
- Customer feedback
- Actions and communications by regulators and standards bodies
- Competitive benchmarking
- Competitive actions in the market
- Implicit or explicit management guidance
- Business systems (ERP, PLM, EQMS, etc.)
- Operational systems (MES, statistical process control, data historians, etc.)
- Lessons learned

Data Sources to Drive Lessons Learned
(from prior products to new products)



Insight and Ambiguity *(Cont.)*

Digitalized inputs include internally owned IIoT data from manufacturing, laboratory operations, and in-service operation. It also spans external information such as those from social media and online marketplaces, customer operation of equipment, and the value chain and regulators. Some data has joint ownership as well. Data ownership and control is an important consideration, because while data may exist, the manufacturer may not have access to it.

Insight ambiguity is a crucial consideration. Ambiguity always exists, but to what extent in our NPI cycle? How well do we truly know the customers' use cases and expectations? How well do we capture lessons learned from prior products? LNS data indicates that the leading source of lessons learned is quality management data, which for many is highly fragmented and therefore ambiguous. Conversely, connected operations and connected products provide the opportunity to add clarity and better inform the Digital Innovation Cycle, but these are presently lightly adopted.

Velocity is also critical. Some insights are, by nature, low velocity, whereas others have the potential to be high velocity. For instance, competitive benchmarking can be an infrequent project, while a comparison of competitive performance on social media and online marketplaces can be nearly real-time.

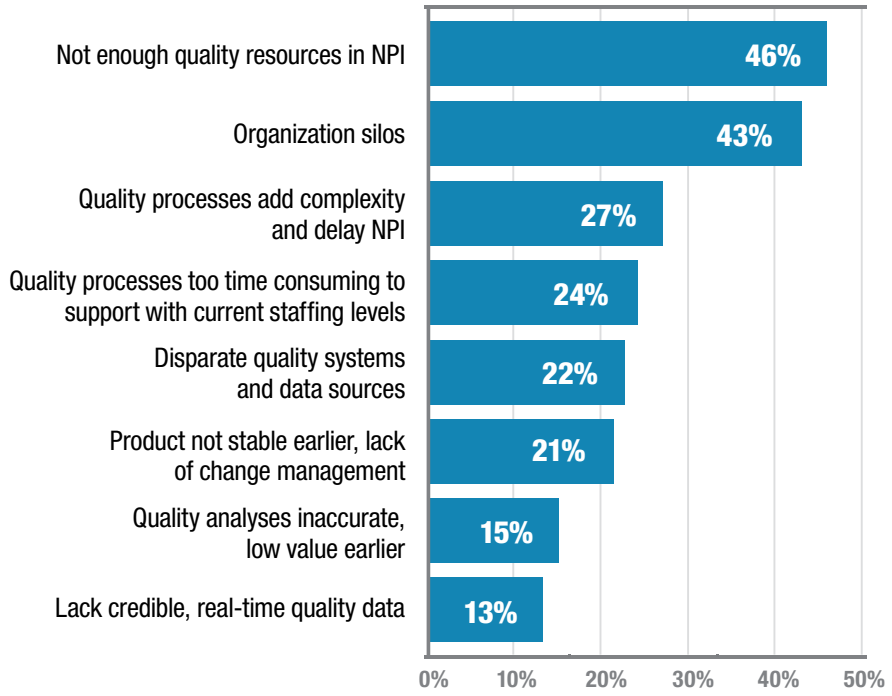
Understand the role of ambiguity and velocity, identify where to acknowledge and accept the current state and where to improve.

Adapt (Disruptive Adaptation)

Insights and data do not directly result in disruption. Disruption is achieved by people adapting to new insights and data. However, significant obstacles to disruptive adaptation are present for every manufacturer, including:

- **Resource limitations.** A shortage of talent, time, and finances are all significant concerns in NPI. Although LNS Research discovered that companies invest a median of 25% of staff into NPI, those people have many responsibilities and aren't focused on NPI alone. Manufacturers must ensure that the organizational structure and finances are structured properly for NPI success.
- **Obstacles** are at the heart of the cooperation/competition dynamic. Excessive obstacles cause culture and team environment breakdown. There are multiple goals in NPI, many of which can conflict if the obstacles to cooperate are too high. For instance, quality is a top NPI success criteria but those directly charged with responsibility for quality are often engaged much too late to have a genuine impact on NPI success. The top obstacles to early engagement are lack of quality resources in NPI, silos, and excessive process complexity exposed to other stakeholders. Realigning the organization and streamlining processes will remove obstacles and improve collaboration and collective stakeholder engagement.

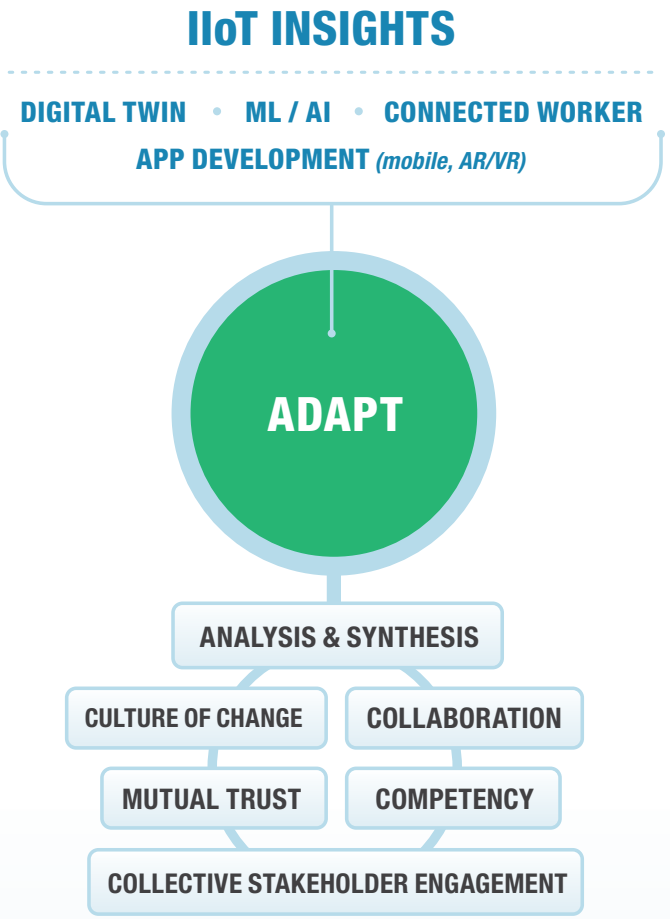
Roadblocks to Engaging Quality Early in NPI



Adapt (Disruptive Adaptation) *(Cont.)*

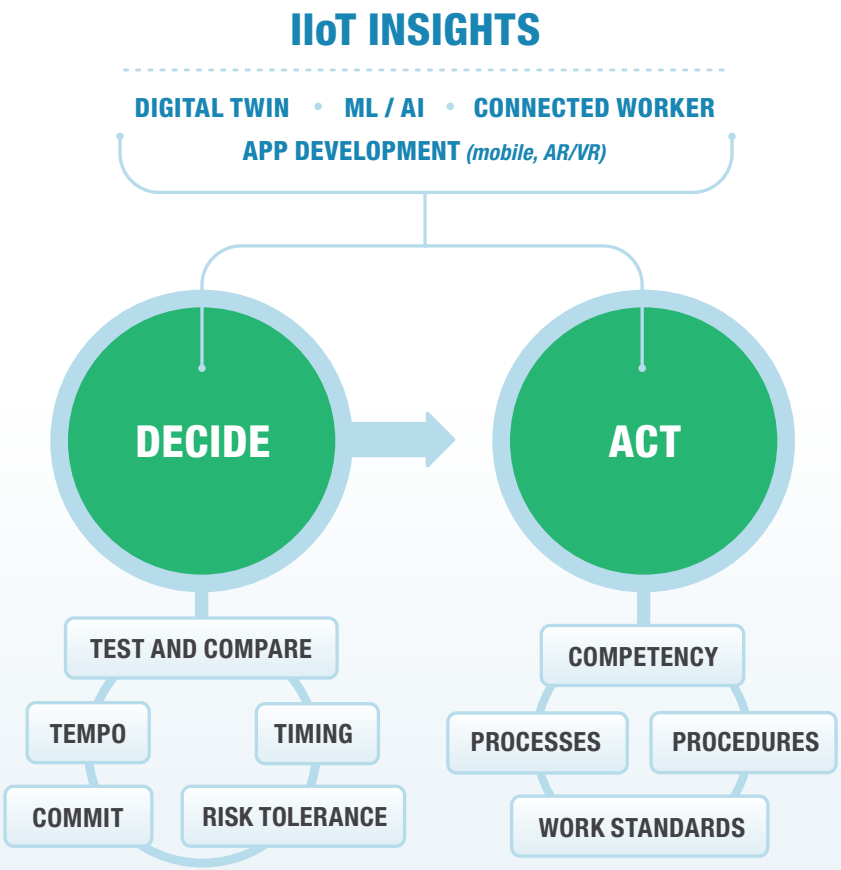
- **Collective adaptation versus silos**, versus confirmation bias. When exposed to new insights, we should analyze the data and then adapt by identifying new patterns and concepts. This uses prior experiences to put the data in context and form new ideas, and by leveraging experiences across the organization, we can arrive at better concepts. There are two major roadblocks to this: silos and confirmation bias. Silos hamper collective adaptation, while confirmation bias forces new insights to fit old ideas.

Digitalization aids disruptive adaptation. Machine learning and artificial intelligence is another "voice" in collective experience, while the Digital Twin and apps allow broad consumption, participation and visual learning.



Decide, Act

Disruption is a disturbance that interrupts an event, process, or market. Timing and tempo are critical to disruption, as they are the difference between capturing customer attention and catching competition off-beat, or being a me-too entrant. Obviously, it's possible to be too late to market and miss the opportunity — remember that 42% of companies miss the market with NPIs because of poor requirements management practices. NPI decision makers must be willing to commit to timely decisions based on sound insights and disruptive adaptation.



Disruption isn't a fit for all organizations all the time. In fact, innovation is the top objective in NPI for roughly one-third of the market. Operating as a disruptive organization and innovation leader involves risk, while organizations that follow more often than lead have a lower tolerance for risk. Regardless of risk tolerance, the company posture for risk and innovation should be clearly communicated to shape the culture of change and foster mutual trust between teams and leadership. An organization must clearly understand its risk tolerance and culture of change and use the knowledge to align decisions with desired outcomes.

Digitalization plays a role in decisions and actions. Concepts can be tested using the digital twin, and actions can be guided and improved through connected worker initiatives.

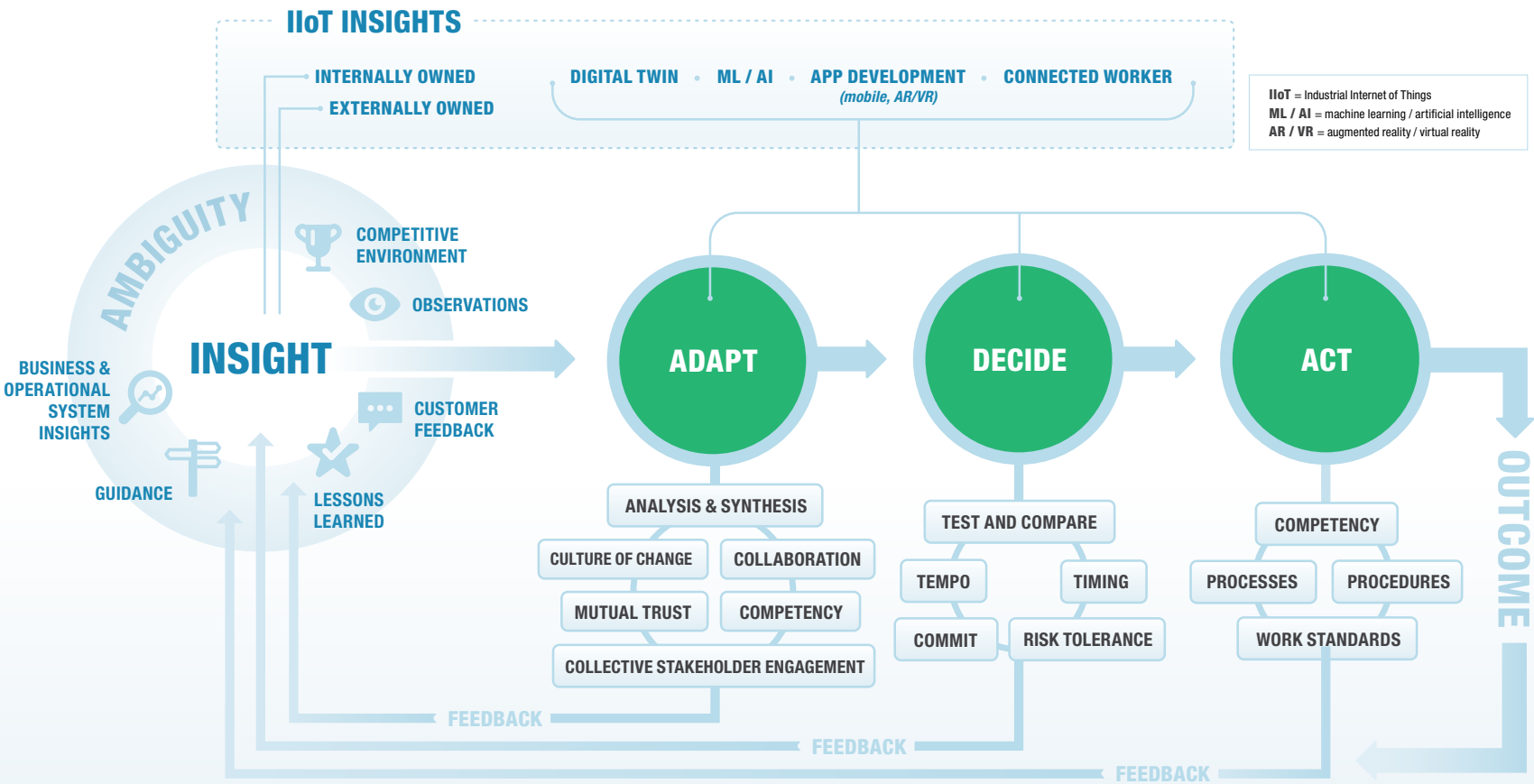
THE DIGITAL INNOVATION CYCLE by LNS Research is inspired by the work of Colonel John Boyd, a late twentieth-century military strategist and retired United States Air Force fighter pilot. Colonel Boyd determined that people and organizations observe, reorient their perspective based on new observations, decide, then act with an unexpected tempo to disrupt opponents and win. His concept influenced the F-16 and F/A-18 fighter jets and redirected U.S. military tactics toward agility and away from "force concentration" tactics that dominated western warfare for centuries.

Digital Innovation Cycle Strategy

To excel in today's highly dynamic market, manufacturers build a Digital Innovation Cycle strategy to:

- Reduce ambiguity and increase insight velocity
- Reduce obstacles to collaboration and adapt disruptively
- Decide and act to drive desired outcomes

DIGITAL INNOVATION CYCLE

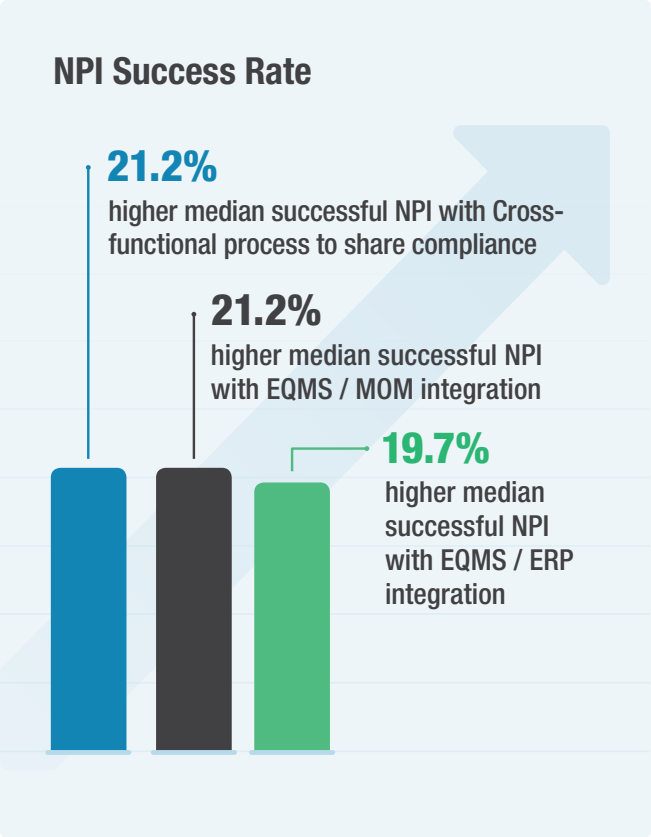


SECTION 7

Outcomes

NPI Practices Also Drive Operational Performance

LNS discovered a quantitative impact of multi-stakeholder engagement on NPI success. Those that automated processes with multiple stakeholders improved NPI success rates, as did those with cross-functional teams, processes, technology integrations, and real-time visibility to metric.



PRACTICES #1 & #2: Product portfolio management with configuration and change-managed requirements

	ADOPTED NEITHER	ADOPTED ONE	ADOPTED BOTH
OEE	72%	76%	90%
On-time delivery	81%	92%	93%
First pass yield	68%	90%	90%
Cost of poor quality	10%	7%	3%

PRACTICE #3: Cross-functional requirements validation (development, quality, manufacturing, sourcing, and service)

	NOT ADOPTED	ADOPTED	IMPROVEMENT
EQMS / MOM integration	66%	80%	21.2%
Cross-functional process to share compliance	66%	80%	21.2%
EQMS / ERP integration	66%	79%	19.7%
Automate APQP with software	68%	81%	19.1%
Automate PPAP with software	68%	79%	16.2%
Customer service has real-time visibility of quality metrics	63%	73%	15.9%
EQMS / SCM integration	67%	76%	13.4%
Automate change management with software	67%	74%	10.4%
Cross-functional team to manage quality across design, manufacturing and suppliers	67%	71%	6.0%
Formal NC/CAPA processes enterprise-wide	68%	71%	4.4%

SECTION 8

Recommendations

Using NPI for Sustainable Business Growth

Brand value, financial performance, disruption, and innovation all have their roots in successful new product introduction. However, while firms invest heavily in NPI today, their current success rate is relatively low, and market trends such as increased visibility to product performance, global pressures, and increasingly complex products make NPI success more difficult to achieve. The only way forward is to overcome obstacles by making NPI strategic, collaborative, and digitalized:

- **Improve your Digital Innovation Cycle:** This framework drives insights into innovative perspectives on the market, timely decisions, and disruptive actions.
- **Create an internal definition of NPI success:** Set priorities based on characteristics needed for success and which are additive.
- **Give NPI a health check-up:** Harmonize the process where possible, define a process owner, define success with specific metrics, and ensure that the right disciplines are involved.
- **Align strategies:** Align the objectives, competencies, culture, and organizations of NPI disciplines and functions.
- **Build a data strategy.** Companies manage much of NPI in fragmented spreadsheets and electronic documents, which creates a host of negative impacts and obstacles to collaboration.
- **Invest in digitalization:** Identify opportunities for digitalization to reduce ambiguity, and improve decisions and outcomes.

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